THE COMMONWEALTH OF MASSACHUSETTS

# REPORT
# of
# The Retirement Law Commission

## COMPOSITE ACTUARIAL VALUATION
## AS OF
## JANUARY 1, 1983

Retirement Law Commission
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The Commonwealth of Massachusetts

Retirement Law Commission

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RETIREMENT LAW COMMISSION

# COMPOSITE ACTUARIAL VALUATION REPORT
# OF
# THE CONTRIBUTORY RETIREMENT SYSTEMS OF THE COMMONWEALTH OF MASSACHUSETTS
# AS OF JANUARY 1, 1983

June, 1985

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## HIGHLIGHTS

The Massachusetts Retirement Law Commission directed the preparation of actuarial valuation reports for the 104 Contributory Retirement Systems of the Commonwealth of Massachusetts as of January 1, 1983. William M. Mercer-Meidinger, Inc. was the consulting actuary for this project. This Composite Report summarizes the results of those actuarial valuations.

The purpose of the valuations is to enable the Commission to respond to certain gubernatorial and legislative requests to perform studies and analyses of the pension benefits being paid by the Commonwealth of Massachusetts, its political subdivisions and its instrumentalities under the various statutes authorizing such pensions.

Section 1 contains the results of the actuarial valuations. The total contribution requirements shown in Section 1.1 for the systems to fund for future benefit obligations consist of a normal cost element and an amortization of the unfunded actuarial liability over a thirty-year period beginning on January 1, 1983, both expressed as a level percentage of covered payroll. The average funding contribution developed in the valuations was as follows, based on a total January 1, 1983 payroll of $4,412,721,000:

| | % of Payroll | | Amount in Millions of $ | |
|---|---|---|---|---|
| | 1983 | 1979 | 1983 | 1979 |
| Normal cost | 8.9% | 12.9% | $394.2 | $427.2 |
| Amortization cost | 13.3 | 10.9 | 584.8 | 361.5 |
| Total | 22.2% | 23.8% | $979.0 | $788.6 |

Section 1.2 shows the funding cost beginning in the 1984-85 fiscal year. The average funding contribution developed for the first five years was calculated to be as follows:

| Fiscal Year | % of Payroll | Projected Amount |
|---|---|---|
| 1984-85 | 22.8% | $1,094,633,000 |
| 1985-86 | 22.8 | 1,143,891,000 |
| 1986-87 | 22.8 | 1,195,367,000 |
| 1987-88 | 22.8 | 1,249,159,000 |
| 1988-89 | 22.8 | 1,305,371,000 |

The percentage of payroll cost was projected to remain constant at 22.8% through fiscal year 2013-14.

Section 1.2 also summarizes the projected pay-as-you-go contribution requirements for fiscal years 1985 through 2004 and compares these requirements to the funding contribution during this period.

Chapter 559 of the Acts of 1977 provided that cities, towns and districts may appropriate additional funds and hold and invest such funds in a special account for purposes of funding the retirement obligations in advance. All of the valuation results shown in this section and elsewhere in the report take into account* that certain systems have already established such accounts and have appropriated and contributed to such funds in fiscal years prior to 1984-85.

Section 1.3 summarizes the assets and actuarial liabilities of the 104 systems studied.

Section 1.4 shows the actuarial value and unfunded actuarial value of accrued vested benefits and total accrued benefits calculated in accordance with Statement No. 35 of the Financial Accounting Standards Board to be as follows:

| | Accrued Vested Benefits (billions of $) 1/1/83 | 1/1/79 | Total Accrued Benefits (billions of $) 1/1/83 | 1/1/79 |
|---|---|---|---|---|
| Actuarial value | $12.6 | $9.6 | $13.0 | $10.1 |
| Assets - statutory value | 4.1 | 2.6 | 4.1 | 2.5 |
| Unfunded actuarial value | 8.4 | 7.0 | 8.9 | 7.6 |

Section 1.5 is a commentary on the results of the 104 actuarial valuations prepared for the Massachusetts Retirement Law Commission which form the basis for the summarized results shown in this Composite Report.

The effective date of this valuation is January 1, 1983. Since that time, certain changes have been enacted that would effect the results of this report. Section 2 provides a discussion of the effects of these changes.

* Except for funding contributions by towns which are members of a county retirement system.

Section 3 describes the basis of the valuation. The eligibility and benefit provisions of Chapter 32, which were used to make the actuarial calculations, are summarized in this section. A description and summarization of the membership data and any adjustments to the raw data to make it usable for purposes of the actuarial valuations are described in this section. Finally, the actuarial cost method and actuarial assumptions are stated and explained.

A complete list of the 104 systems included in this report can be found in Appendix A.

A complete list of the twenty-one systems reported to have made contributions under Chapter 559 of the Acts of 1977 in fiscal years since 1978 can be found in Appendix B.

SECTION 1

## SUMMARY OF VALUATION RESULTS

This section sets forth the results of the actuarial valuation.

Section 1.1 shows the contributions required to fund the systems on a level basis starting on the valuation date.

Section 1.2 summarizes the twenty-year projection of pay-as-you-go and funding costs.

Section 1.3 summarizes the assets, actuarial liabilities and unfunded actuarial liabilities of the systems.

Section 1.4 shows the actuarial value and unfunded actuarial value of accrued vested benefits and total accrued benefits.

Section 1.5 is a commentary on the valuation results.

Actuarial liabilities designated for "active members" included member contribution accounts for inactive members who have not withdrawn their contributions. Actuarial liabilities designated for "retired members" include liabilities for beneficiaries receiving retirement payments.

SECTION 1.1

CONTRIBUTIONS

This section summarizes the level of contributions required for full actuarial funding starting on January 1, 1983.

The two cost components, employer normal cost and amortization of unfunded actuarial liability, are described in detail in Section 2.3.

Total annual employer cost is shown on two bases.

The first basis includes an amortization of the unfunded actuarial liability over a 30-year period beginning on January 1, 1983 as a level dollar amount. This is the procedure required for private pension plans by the Employee Retirement Income Security Act of 1974. When level dollar amortization is used, the total employer cost will normally decrease as a percentage of payroll in future years as payroll increases.

The second basis includes an amortization of the unfunded actuarial liability over a 30-year period beginning on January 1, 1983 as a level percentage of future payroll. This procedure is frequently used in funding public retirement systems. Since the normal cost component is also determined to remain level as a percentage of future payroll, the total employer cost under this procedure will remain level as a percentage of future payroll if all actuarial assumptions are exactly realized.

SECTION 1.1

CONTRIBUTIONS (cont'd)

| | State | Teachers | Boston* | Other Local Boards* | Cost-of-Living Addition** | Total |
|---|---|---|---|---|---|---|
| Total Payroll | $1,334,213,000 | $1,315,303,000 | $426,341,000 | $1,336,864,000 | $ N/A | $4,412,721,000 |
| Normal cost - employer | $ 114,703,000 (8.6%) | $ 98,601,000 (7.5%) | $ 28,441,000 (6.7%) | $ 125,150,000 (9.4%) | $ 27,303,000 | $ 394,198,000 (8.9%) |
| Normal cost - employees | $ 80,205,000 (6.0%) | $ 70,596,000 (5.4%) | $ 24,023,000 (5.7%) | $ 77,154,000 (5.8%) | $ 0 | $ 251,978,000 (5.7%) |
| Total normal cost | $ 194,908,000 (14.6%) | $ 169,197,000 (12.9%) | $ 52,464,000 (12.4%) | $ 202,304,000 (15.2%) | $ 27,303,000 | $ 646,176,000 (14.6%) |
| Total annual employer cost - normal cost plus 30 year amortization of unfunded actuarial liability as: | | | | | | |
| level dollar amount | $ 315,680,000 (23.7%) | $ 383,550,000 (29.2%) | $147,401,000 (34.7%) | $ 416,037,000 (31.2%) | $ 97,056,000 | $1,359,724,000 (30.8%) |
| level percentage of payroll | $ 236,440,000 (17.7%) | $ 271,201,000 (20.6%) | $100,498,000 (23.7%) | $ 301,347,000 (22.6%) | $ 69,555,000 | $ 979,041,000 (22.2%) |

Percentages shown after dollar cost represent cost as a percentage of payroll.

*Results assume no cost of living increase.

**Additional State obligation due to cost-of-living increase for Boston and Other Local Boards.

SECTION 1.2

CONTRIBUTION PROJECTIONS

This section contains a twenty-year projection of pay-as-you-go costs and funding costs starting in the fiscal 1984-85 year.

The payroll has been projected by the assumed inflation rate (see Section 2.3). The payroll shown in this projection represents the average, or mid-point, payroll for the applicable fiscal year. Thus the payroll for the 1984-85 fiscal year exceeds the January 1, 1983 payroll by two years of inflation increases.

The pay-as-you-go contribution represents the employer's portion of the retirement allowances projected to be payable to retired employees and beneficiaries in each fiscal year. It does not include the annuity portion, which is paid from the Annuity Reserve Fund.

For some systems, the pay-as-you-go contribution exceeded the calculated funding contribution in the early years, in which case the funding contribution was increased to the level of the pay-as-you-go contribution for such years.

Percentage of payroll amounts represent the percentage of the cost to the projected payroll for the applicable fiscal year.

The additional contribution represents the amount, if any, which must be made in a particular fiscal year in excess of the pay-as-you-go contribution in order to bring the total contribution up to the level of the funding cost for the year.

Because the assumptions used to project costs are chosen for long-term expectations, the dollar amounts of funding contributions may vary somewhat from those shown in the projections in the early years. The more reliable statistic to consider in the short-term would be the percentage of payroll contribution rates, recognizing that significant cutbacks in personnel or other budget constraints could cause the percentage of payroll contribution rates to increase.

CONTRIBUTION PROJECTIONS (cont'd)

Projection for State Employees Board*
(Dollar amounts in thousands)

| Fiscal Year | Projected Payroll | Pay-as-you-go Contribution | % of Payroll | Funding Contribution | % of Payroll | Additional Contribution |
|---|---|---|---|---|---|---|
| 1984-85 | $1,456,491 | $ 165,686 | 11.4% | $263,625 | 18.1% | $ 97,939 |
| 1985-86 | 1,522,033 | 171,474 | 11.3 | 275,488 | 18.1 | 104,014 |
| 1986-87 | 1,590,525 | 177,819 | 11.2 | 287,885 | 18.1 | 110,066 |
| 1987-88 | 1,662,098 | 188,478 | 11.3 | 300,840 | 18.1 | 112,362 |
| 1988-89 | 1,736,893 | 200,783 | 11.6 | 314,378 | 18.1 | 113,595 |
| 1989-90 | 1,815,053 | 213,435 | 11.8 | 328,525 | 18.1 | 115,090 |
| 1990-91 | 1,896,730 | 227,655 | 12.0 | 343,308 | 18.1 | 115,653 |
| 1991-92 | 1,982,083 | 243,425 | 12.3 | 358,757 | 18.1 | 115,332 |
| 1992-93 | 2,071,277 | 271,703 | 13.1 | 374,901 | 18.1 | 103,198 |
| 1993-94 | 2,164,484 | 307,346 | 14.2 | 391,772 | 18.1 | 84,426 |
| 1994-95 | 2,261,886 | 339,404 | 15.0 | 409,401 | 18.1 | 69,997 |
| 1995-96 | 2,363,671 | 375,016 | 15.9 | 427,824 | 18.1 | 52,808 |
| 1996-97 | 2,470,036 | 412,085 | 16.7 | 447,077 | 18.1 | 34,992 |
| 1997-98 | 2,581,188 | 473,459 | 18.3 | 467,195 | 18.1 | 0 |
| 1998-99 | 2,697,341 | 545,005 | 20.2 | 488,219 | 18.1 | 0 |
| 1999-00 | 2,818,722 | 616,747 | 21.9 | 510,189 | 18.1 | 0 |
| 2000-01 | 2,945,564 | 694,498 | 23.6 | 533,147 | 18.1 | 0 |
| 2001-02 | 3,078,115 | 772,932 | 25.1 | 556,139 | 18.1 | 0 |
| 2002-03 | 3,216,630 | 884,376 | 27.5 | 582,210 | 18.1 | 0 |
| 2003-04 | 3,361,378 | 1,000,857 | 29.8 | 608,409 | 18.1 | 0 |

*Assumes 3% cost-of-living increase

SECTION 1.2

CONTRIBUTION PROJECTIONS (cont'd)

Projection for Teachers Board*
(Dollar amounts in thousands)

| Fiscal Year | Projected Payroll | Pay-as-you-go Contribution | % of Payroll | Funding Contribution | % of Payroll | Additional Contribution |
|---|---|---|---|---|---|---|
| 1984-85 | $1,435,661 | $183,350 | 12.8% | $304,360 | 21.2% | $121,010 |
| 1985-86 | 1,500,266 | 195,217 | 13.0 | 318,056 | 21.2 | 122,839 |
| 1986-87 | 1,567,778 | 208,436 | 13.3 | 332,369 | 21.2 | 123,933 |
| 1987-88 | 1,638,328 | 223,172 | 13.6 | 347,326 | 21.2 | 124,154 |
| 1988-89 | 1,712,053 | 239,458 | 14.0 | 362,955 | 21.2 | 123,497 |
| 1989-90 | 1,789,095 | 259,828 | 14.5 | 379,288 | 21.2 | 119,460 |
| 1990-91 | 1,869,604 | 282,347 | 15.1 | 396,356 | 21.2 | 114,009 |
| 1991-92 | 1,953,736 | 307,212 | 15.7 | 414,192 | 21.2 | 106,980 |
| 1992-93 | 2,041,655 | 334,475 | 16.4 | 432,831 | 21.2 | 98,355 |
| 1993-94 | 2,133,529 | 367,515 | 17.2 | 452,308 | 21.2 | 84,793 |
| 1994-95 | 2,229,538 | 403,622 | 18.1 | 472,662 | 21.2 | 69,040 |
| 1995-96 | 2,329,867 | 443,071 | 19.0 | 493,932 | 21.2 | 50,861 |
| 1996-97 | 2,434,711 | 485,941 | 20.0 | 516,159 | 21.2 | 30,218 |
| 1997-98 | 2,544,273 | 536,063 | 21.1 | 539,386 | 21.2 | 3,323 |
| 1998-99 | 2,658,765 | 590,088 | 22.2 | 563,658 | 21.2 | 0 |
| 1999-00 | 2,778,410 | 648,669 | 23.3 | 589,023 | 21.2 | 0 |
| 2000-01 | 2,903,438 | 712,370 | 24.5 | 615,529 | 21.2 | 0 |
| 2001-02 | 3,034,093 | 787,941 | 26.0 | 643,228 | 21.2 | 0 |
| 2002-03 | 3,170,627 | 870,899 | 27.5 | 672,173 | 21.2 | 0 |
| 2003-04 | 3,313,305 | 960,462 | 29.0 | 702,421 | 21.2 | 0 |

*Assumes 3% cost-of-living increase

SECTION 1.2

CONTRIBUTION PROJECTIONS (cont'd)

| Fiscal Year | Projected Payroll | Pay-as-you-go Contribution | % of Payroll | Funding Contribution | % of Payroll | Additional Contribution |
|---|---|---|---|---|---|---|
| | | Projection for Boston Board* (Dollar amounts in thousands) | | | | |
| 1984-85 | $ 463,554 | $108,407 | 23.4% | $112,644 | 24.3% | $4,237 |
| 1985-86 | 484,414 | 113,068 | 23.3 | 117,713 | 24.3 | 4,644 |
| 1986-87 | 506,213 | 117,754 | 23.3 | 123,010 | 24.3 | 5,256 |
| 1987-88 | 528,992 | 122,387 | 23.1 | 128,545 | 24.3 | 6,159 |
| 1988-89 | 552,797 | 126,818 | 22.9 | 134,330 | 24.3 | 7,511 |
| 1989-90 | 577,673 | 132,466 | 22.9 | 140,375 | 24.3 | 7,909 |
| 1990-91 | 603,668 | 138,203 | 22.9 | 146,691 | 24.3 | 8,489 |
| 1991-92 | 630,833 | 143,897 | 22.8 | 153,292 | 24.3 | 9,395 |
| 1992-93 | 659,221 | 151,020 | 22.9 | 160,191 | 24.3 | 9,170 |
| 1993-94 | 688,886 | 159,778 | 23.2 | 167,399 | 24.3 | 7,622 |
| 1994-95 | 719,886 | 167,457 | 23.3 | 174,932 | 24.3 | 7,475 |
| 1995-96 | 752,280 | 175,682 | 23.4 | 182,804 | 24.3 | 7,122 |
| 1996-97 | 786,133 | 184,415 | 23.5 | 191,030 | 24.3 | 6,615 |
| 1997-98 | 821,509 | 195,417 | 23.8 | 199,627 | 24.3 | 4,210 |
| 1998-99 | 858,477 | 207,476 | 24.2 | 208,610 | 24.3 | 1,134 |
| 1999-00 | 897,108 | 221,823 | 24.7 | 217,997 | 24.3 | 0 |
| 2000-01 | 937,478 | 237,301 | 25.3 | 227,807 | 24.3 | 0 |
| 2001-02 | 979,665 | 254,547 | 26.0 | 238,059 | 24.3 | 0 |
| 2002-03 | 1,023,750 | 276,345 | 27.0 | 248,771 | 24.3 | 0 |
| 2003-04 | 1,069,818 | 298,993 | 27.9 | 259,966 | 24.3 | 0 |

*Assumes no cost-of-living increases

SECTION 1.2

CONTRIBUTION PROJECTIONS (cont'd)

Projection for Other Local Boards*
(Dollar amounts in thousands)

| Fiscal Year | Projected Payroll | Pay-as-you-go Contribution | % of Payroll | Funding Contribution | % of Payroll | Additional Contribution |
|---|---|---|---|---|---|---|
| 1984-85 | $1,453,907 | $279,701 | 19.2% | $337,306 | 23.2% | $57,605 |
| 1985-86 | 1,519,332 | 299,738 | 19.7 | 352,485 | 23.2 | 52,748 |
| 1986-87 | 1,587,703 | 320,310 | 20.2 | 368,347 | 23.2 | 48,037 |
| 1987-88 | 1,659,149 | 340,926 | 20.5 | 384,923 | 23.2 | 43,997 |
| 1988-89 | 1,733,811 | 361,628 | 20.9 | 402,244 | 23.2 | 40,616 |
| 1989-90 | 1,811,833 | 386,161 | 21.3 | 420,345 | 23.2 | 34,185 |
| 1990-91 | 1,893,365 | 411,263 | 21.7 | 439,261 | 23.2 | 27,998 |
| 1991-92 | 1,978,567 | 436,598 | 22.1 | 459,028 | 23.2 | 22,429 |
| 1992-93 | 2,067,603 | 462,315 | 22.4 | 479,684 | 23.2 | 17,369 |
| 1993-94 | 2,160,645 | 493,335 | 22.8 | 501,270 | 23.2 | 7,934 |
| 1994-95 | 2,257,874 | 525,271 | 23.3 | 523,827 | 23.2 | 0 |
| 1995-96 | 2,359,479 | 557,744 | 23.6 | 547,399 | 23.3 | 0 |
| 1996-97 | 2,465,655 | 591,559 | 24.0 | 572,032 | 23.2 | 0 |
| 1997-98 | 2,576,610 | 631,480 | 24.5 | 597,773 | 23.2 | 0 |
| 1998-99 | 2,692,558 | 671,716 | 24.9 | 624,673 | 23.2 | 0 |
| 1999-00 | 2,813,723 | 712,075 | 25.3 | 652,784 | 23.2 | 0 |
| 2000-01 | 2,940,341 | 752,648 | 25.6 | 682,159 | 23.2 | 0 |
| 2001-02 | 3,072,656 | 799,410 | 26.0 | 712,856 | 23.2 | 0 |
| 2002-03 | 3,210,926 | 846,351 | 26.4 | 744,935 | 23.2 | 0 |
| 2003-04 | 3,355,418 | 892,515 | 26.6 | 778,457 | 23.2 | 0 |

*Assumes no cost-of-living increases

CONTRIBUTION PROJECTIONS (cont'd)

| Fiscal Year | Projected Payroll | Projection for Boston and Other Local Boards* (Dollar amounts in thousands) Pay-as-you-go Contribution | % of Payroll | Funding Contribution | % of Payroll | Additional Contribution |
|---|---|---|---|---|---|---|
| 1984-85 | $1,917,461 | $ 24,038 | 1.3% | $ 76,698 | 4.0% | $ 52,660 |
| 1985-86 | 2,003,746 | 32,422 | 1.6 | 80,149 | 4.0 | 47,727 |
| 1986-87 | 2,093,916 | 41,104 | 2.0 | 83,756 | 4.0 | 42,652 |
| 1987-88 | 2,188,141 | 50,047 | 2.3 | 87,525 | 4.0 | 37,478 |
| 1988-89 | 2,286,608 | 59,207 | 2.6 | 91,464 | 4.0 | 32,257 |
| 1989-90 | 2,389,506 | 69,179 | 2.9 | 95,580 | 4.0 | 26,401 |
| 1990-91 | 2,497,033 | 79,413 | 3.2 | 99,881 | 4.0 | 20,468 |
| 1991-92 | 2,609,400 | 89,856 | 3.4 | 104,375 | 4.0 | 14,519 |
| 1992-93 | 2,726,824 | 100,424 | 3.7 | 109,072 | 4.0 | 8,648 |
| 1993-94 | 2,849,531 | 112,082 | 3.9 | 113,981 | 4.0 | 1,899 |
| 1994-95 | 2,977,760 | 123,937 | 4.2 | 119,110 | 4.0 | 0 |
| 1995-96 | 3,111,759 | 135,822 | 4.4 | 124,470 | 4.0 | 0 |
| 1996-97 | 3,251,788 | 147,607 | 4.5 | 130,071 | 4.0 | 0 |
| 1997-98 | 3,398,119 | 160,469 | 4.7 | 135,924 | 4.0 | 0 |
| 1998-99 | 3,551,035 | 173,221 | 4.9 | 142,040 | 4.0 | 0 |
| 1999-00 | 3,710,831 | 185,679 | 5.0 | 148,432 | 4.0 | 0 |
| 2000-01 | 3,877,819 | 197,718 | 5.1 | 155,112 | 4.0 | 0 |
| 2001-02 | 4,052,321 | 210,764 | 5.2 | 162,092 | 4.0 | 0 |
| 2002-03 | 4,234,676 | 223,299 | 5.3 | 169,386 | 4.0 | 0 |
| 2003-04 | 4,425,236 | 235,205 | 5.3 | 177,008 | 4.0 | 0 |

*Additional State obligation due to cost-of-living increase for Boston and Other Local Boards.

SECTION 1.2

CONTRIBUTION PROJECTIONS (cont'd)

Projection for All Boards Combined
(Dollar amounts in thousands)

| Fiscal Year | Projected Payroll | Pay-as-you-go Contribution | % of Payroll | Funding Contribution | % of Payroll | Additional Contribution |
|---|---|---|---|---|---|---|
| 1984-85 | $ 4,809,613 | $ 761,182 | 15.8% | $1,094,633 | 22.8% | $333,451 |
| 1985-86 | 5,026,045 | 811,919 | 16.2 | 1,143,891 | 22.8 | 331,972 |
| 1986-87 | 5,252,219 | 865,423 | 16.5 | 1,195,367 | 22.8 | 329,944 |
| 1987-88 | 5,488,567 | 925,010 | 16.9 | 1,249,159 | 22.8 | 324,149 |
| 1988-89 | 5,735,554 | 987,894 | 17.2 | 1,305,371 | 22.8 | 317,477 |
| 1989-90 | 5,993,654 | 1,061,069 | 17.7 | 1,364,113 | 22.8 | 303,044 |
| 1990-91 | 6,263,367 | 1,138,881 | 18.2 | 1,425,497 | 22.8 | 286,616 |
| 1991-92 | 6,545,219 | 1,220,988 | 18.7 | 1,489,644 | 22.8 | 268,656 |
| 1992-93 | 6,839,756 | 1,319,937 | 19.3 | 1,556,679 | 22.8 | 236,742 |
| 1993-94 | 7,147,544 | 1,440,056 | 20.1 | 1,626,730 | 22.8 | 186,674 |
| 1994-95 | 7,469,184 | 1,559,691 | 20.9 | 1,699,932 | 22.8 | 140,241 |
| 1995-96 | 7,805,297 | 1,687,335 | 21.6 | 1,776,429 | 22.8 | 89,094 |
| 1996-97 | 8,156,535 | 1,821,607 | 22.3 | 1,856,369 | 22.8 | 34,762 |
| 1997-98 | 8,523,580 | 1,996,888 | 23.4 | 1,939,905 | 22.8 | 0 |
| 1998-99 | 8,907,141 | 2,187,506 | 24.6 | 2,027,200 | 22.8 | 0 |
| 1999-00 | 9,307,963 | 2,384,993 | 25.6 | 2,118,425 | 22.8 | 0 |
| 2000-01 | 9,726,821 | 2,594,535 | 26.7 | 2,213,754 | 22.8 | 0 |
| 2001-02 | 10,164,529 | 2,825,594 | 27.8 | 2,313,374 | 22.8 | 0 |
| 2002-03 | 10,621,933 | 3,101,270 | 29.2 | 2,417,475 | 22.8 | 0 |
| 2003-04 | 11,099,919 | 3,388,032 | 30.5 | 2,526,261 | 22.8 | 0 |

SECTION 1.3

## ASSETS AND ACTUARIAL LIABILITIES, JANUARY 1, 1983

This section summarizes the assets and actuarial liabilities of the systems included in the valuation.

The actuarial liabilities are computed in accordance with the procedures described in Section 2.3. The unfunded actuarial liability represents the amount as of the valuation date which must be funded by future amortization payments. It does not represent the unfunded value of benefits earned by members for service prior to the valuation date; these amounts are shown in Section 1.4 of this report. The chief significance of the unfunded actuarial liabilities as they relate to the financial contribution of the employer is the ability of that employer to support the cost of amortizing them over a reasonable number of years.

Assets include amounts appropriated under Chapter 559 of the Acts of 1977 as shown in Appendix B in Section 3.

ASSETS AND ACTUARIAL LIABILITIES (cont'd)

| | State | Teachers | Boston* | Other Local Boards | Cost-of-Living Addition | Total |
|---|---|---|---|---|---|---|
| Actuarial liability - active members | $1,927,397,000 | $3,171,224,000 | $ 929,408,000 | $2,627,484,000 | $247,276,000 | $ 8,902,789,000 |
| Actuarial liability - retired members | 1,721,637,000 | 1,638,028,000 | 900,617,000 | 2,187,772,000 | 606,859,000 | 7,054,913,000 |
| Total actuarial liability | $3,649,034,000 | $4,809,252,000 | $1,830,025,000 | $4,815,256,000 | $854,135,000 | $15,957,702,000 |
| Assets | 1,188,011,000 | 1,319,972,000 | 373,320,000 | 1,253,271,000 | 0 | 4,134,574,000 |
| Unfunded actuarial liability | $2,461,023,000 | $3,489,280,000 | $1,456,705,000 | $3,561,985,000 | $854,135,000 | $11,823,128,000 |

*Includes Boston teachers, for whom the Commonwealth has assumed the obligation for retirement payments in the past.

SECTION 1.4

# FINANCIAL DISCLOSURE

This section contains certain financial disclosure information required by the Statement of Financial Accounting Standards No. 35, published in March, 1980 by the Financial Accounting Standards Board. The introduction of the Statement says in part:

> "1. This Statement establishes standards of financial accounting and reporting for the annual financial statements of a defined benefit pension plan... Plans covered are those that principally provide pension benefits but may also provide benefits on death, disability, or termination of employment.
>
> 2. This Statement applies to an ongoing plan that provides pension benefits for the employees of one or more employers, including state and local governments..."

The information shown in this section follows the procedures set forth in Statement No. 35 except in the reporting of the plan's assets, which are to be shown at fair market value. In this instance, statutory values are shown since fair market values were not available from the Annual Reports to the Public Employees Retirement Administration (PERA).

The actuarial value of accrued benefits represents the actuarial value, on the valuation date (January 1, 1983), of benefits earned by active and retired members based on their creditable service and earnings up to the valuation date. Statement No. 35 refers to those benefits as "accumulated plan benefits" and defines them as:

> "...those future benefit payments that are attributable under the plan's provisions to employees' service rendered to the benefit information date. Their measure is primarily based on employees' history of pay and service and other appropriate factors as of that date. Future salary changes are not considered. Future years of service are considered only in determining employees' expected eligibility for particular types of benefits, for example, early retirement, death and disability benefits."

The statement continues,

> "To measure their actuarial present value, assumptions are used to adjust those accumulated plan benefits to reflect the time value of money (through discounts for interest) and the probability of payment (by means of decrements such as for death, disability, withdrawal, or retirement) between the benefit information date and the expected date of payment. An assumption of an ongoing plan underlies those assumptions."

In addition to the actuarial value of total accrued benefits, this section summarizes the actuarial value of accrued vested benefits. Vested benefits are those benefits which do not depend upon the member remaining in service in order to be entitled to them. Member accumulated contributions for those members who have not yet attained a sufficient number of years of service to be vested are included in the actuarial value of vested accrued benefits.

SECTION 1.4

FINANCIAL DISCLOSURE (cont'd)

| | State | Teachers | Boston | Other Local Boards | Cost-of-Living Addition | Total |
|---|---|---|---|---|---|---|
| Actuarial value of accrued vested benefits | $2,749,777,000 | $3,421,226,000 | $1,503,352,000 | $4,061,927,000 | $843,274,000 | $12,579,556,000 |
| Assets | 1,188,011,000 | 1,319,972,000 | 373,320,000 | 1,253,271,000 | 0 | 4,134,574,000 |
| Unfunded value of accrued vested benefits | $1,561,766,000 | $2,101,254,000 | $1,130,032,000 | $2,808,656,000 | $843,274,000 | $ 8,444,982,000 |
| Actuarial value of total accrued benefits | $3,009,254,000 | $3,439,925,000 | $1,516,386,000 | $4,166,405,000 | $882,303,000 | $13,014,273,000 |
| Assets | 1,188,011,000 | 1,319,972,000 | 373,320,000 | 1,253,271,000 | 0 | 4,134,574,000 |
| Unfunded value of total accrued benefits | $1,821,243,000 | $2,119,953,000 | $1,143,066,000 | $2,913,134,000 | $882,303,000 | $8,879,699,000 |

## SECTION 1.5

## COMMENTARY

The effective date of this valuation is January 1, 1983. The effective date of the preceding valuation was January 1, 1979. It is not possible to analyze with precision the reasons for the changes in the valuation results from 1979 to 1983, since the membership data is more complete in this valuation compared to the valuation in 1979. There is included in this section a table comparing some of the results of the 1979 and 1983 valuations.

The Commissioners, the Commission staff, and many state and local officials are to be congratulated on their efforts to obtain the detailed information necessary to perform actuarial valuations for the 104 systems included in this report. The reliability of the results of any actuarial valuation or study cannot be any greater than the reliability of the data used for such study. For this reason, the maintenance of a complete and up-to-date data bank on active and retired members of the various retirement systems is the first and most important step in providing the necessary information to public officials and the general public on the status of those systems and the effect of any proposed changes to them.

Certain actuarial assumptions were different in 1983 from those used in the 1979 valuation. Chief among these were the investment return assumption, which was 7-1/2% in 1983 compared to 7% in 1979, and the salary increase assumption, which was 6% in 1983 compared to 5-1/2% in 1979. In addition, the rate of post-retirement cost-of-living increases assumed in the 1983 study was 3% compared to 4-1/2% in the 1979 report. These changes have caused the results of the 1983 valuation to show slightly lower costs than if the 1979 assumptions were used. These changes can be justified by the changes in economic conditions between 1979 and 1983.

Recognizing the difference in actuarial assumptions and the greater reliability of the 1983 data compared to 1979, the following comparisons are made.

Active payroll increased by 33% from 1979 to 1983. There was, however, considerable variation in this statistic among individual systems. Some local systems saw increases of 30% to 40% in active payroll over the period, while a few showed very slight increases. Payroll for state system members increased by 43%; payroll for teachers increased by 44%.

The total employer normal cost rose by 8% over the four-year period. This was caused by the combination of payroll increase and a decrease in the normal cost rate from 12.9% to 8.9% of payroll. Total level funding cost (level percentage of payroll) decreased from 23.8% of payroll to 22.2%. These changes were caused partially by the difference in data accuracy and changes in actuarial assumptions, but also reflect a decrease in the cost due to the $30,000 cap on benefit recognized earnings for members entering the systems after January 1, 1979. If the $30,000 limit had not been recognized in this report, the level funding cost would be about $62 million higher for 1983.

The member contribution rate rose from 5.4% to 5.7% of payroll, reflecting the greater number of members contributing at the 7% rate.

The unfunded actuarial liability increased by 30% from 1979 to 1983, in dollar terms, an increase of $2.7 billion. Increases in payroll combined with the lack of adequate funding contributed heavily to this change. In addition, it appears that as a result of Proposition 2 1/2 most systems experienced a significant increase in the number of retirements. The actuarial liability for all retired members of all systems increased by $2.0 billion, or 40%, and the increase in this statistic for the state system which assumed all cost-of-living increases for local systems beginning July 1, 1981 and also the transfer of county court personnel into its system after the 1979 study was 80%.

This valuation, as well as the 1979 study, provides the financial disclosure information in accordance with the latest accounting standards published by the Financial Accounting Standards Board.

The twenty-year projections of funding and pay-as-you-go costs show very clearly the kind of cost stability that can be attained under a program of advance funding. It is encouraging to observe the number of systems which have embarked upon such a program as a result of the 1977 legislation. It is also possible for towns which participate in a county retirement system to utilize this cost-stabilizing technique, as some are now doing and others are actively investigating.

Table Comparing Valuation Results in 1983 and 1979

Total Level Percentage of Payroll Costs

| | 1983 | | 1979 | |
|---|---|---|---|---|
| | Millions of $ | % of Pay | Million of $ | % of Pay |
| State | $236.4 | 17.7% | $200.6 | 21.5% |
| Teachers | 271.2 | 20.6 | 185.2 | 20.3 |
| Local Boards: | | | | |
| No Future COLA | $401.8 | 22.8% | -- | -- |
| Future COLA | 69.6 | 3.9 | -- | -- |
| Total Local Boards | $471.4 | 26.7% | $402.8 | 27.5% |
| Total | $979.0 | 22.2% | $788.6 | 23.8% |

Unfunded Present Value of Accrued Benefits

| | 1983 | | 1979 | |
|---|---|---|---|---|
| | Millions of $ | % Funded* | Million of $ | % Funded* |
| State | $1,821 | 39.5% | $1,745 | 28.1% |
| Teachers | 2,120 | 38.4 | 1,816 | 30.8 |
| Local Boards: | | | | |
| No Future COLA | $4,056 | 28.6% | -- | -- |
| Future COLA | 882 | 0 | -- | -- |
| Total Local Boards | $8,879 | 31.8% | $7,580 | 25.2% |

* % of Total Present Value of Accrued Benefits covered by statutory assets.

SECTION 2

## DISCUSSION OF RETIREMENT SYSTEM CHANGES SINCE JANUARY 1, 1983

This section provides a discussion by the consulting actuary of events which have occurred between January 1, 1983 and January 1, 1985 which in its judgement have a direct bearing on the cost of the pension plans valued in this report. Specifics follow:

A. Chapter 661 of the Massachusetts Acts of 1983. This was a very complex piece of legislation that affected many aspects of the retirement system. However, there are only three areas which bear on the values presented in this report and even these have only an indirect effect.

1. Interest on Employee Contributions - (see Chapter 661, Section 4). Members who terminate with less than five years of service will receive a return of their employee contributions with no interest. Those terminating with between five and ten years of service will receive interest at one-half the regular rate. Prior to Chapter 661 these people would have received interest at the full regular rate.

   This provision has been further modified (See Chapter 373 of the Massachusetts Acts of 1984) to apply only to people hired after January 1, 1984. Consequently, it would have no direct effect on the January 1, 1983 valuation (which is based on a January 1, 1983 employee census). This provision does, however, imply a small benefit decrease for future hires, thus costs for this group will be somewhat lower than for those hired prior to January 1, 1984. The cost decrease derived from this provision is very small ($1-2 million per year for all systems combined), and it will be 10 years before it is fully realized.

2. Increase in Employee Contributions - (see Chapter 661, Section 9). The employee contribution rate for employees entering service after January 1, 1984 was moved to 8%. Once again, this has no effect on the January 1, 1983 employee census and would have no effect on the underlying valuation. Gradually as a larger and larger portion of the total employee group are post January 1, 1984 hires this will, of course, create a shift in the systems cost from the employer to the employee. It will take 5 to 10 years before this change will have a noticeable financial effect on the system. Ultimately (30 to 40 years hence), it will decrease employer costs by about $50 million a year (in 1984 dollars) for the entire system.

3. Change in Investment Rules (see Chapter 661, Sections 18 and 20). Rules governing the type and distribution of investments were changed to allow for greater discretion on the part of the various boards making those investments. For local boards this increased discretion is only allowable under certain guidelines to be issued by the Public Employee Retirement Administration (PERA).

Arguably, by increasing investment latitude, greater earnings may be generated from the systems' assets than realized historically. There is also an increased risk of making bad investments. Given that the changes authorized by these sections have not been fully implemented at this time and that it will take several more years to demonstrate an ability to increase the return on invested assets, we feel it is inadvisable to try to quantify the effect of this change for this valuation. Each time an actuarial valuation is performed, the interest rate used to discount liabilities is reevaluated in light of current conditions. When the next actuarial valuation is performed, we will consider the performance of the Pension Reserve Investment Trust (PRIT) as part of the reevaluation process, thus giving specific financial recognition to any improvement in investment performance.

In summary, the specific cost reduction components of Chapter 661 were either relatively small and deferred into future (items #1 and #2 above) or somewhat speculative (item #3 above). Chapter 661 did contain other provisions, which in the long term, will increase the rate of funding, i.e., the annual dollar input to the fund. These are not cost reductions, but they do serve to recognize and fund pension costs on a more timely basis, thus helping to alleviate future cost escalation.

B. Increased Survivor Benefits (see Chapter 389 of the Massachusetts Acts of 1984). This legislation raised the minimum monthly survivor benefits payable under Chapter 32, Section 12(2)(d) of the Massachusetts General Laws as follows:

| | Old | New |
|---|---|---|
| Spouse | $140 | $250 |
| First Child | 80 | 120 |
| Per Child after First | 60 | 90 |

Costs for this change for 1985 were estimated as follows:

| Group | Annual Funding Cost Increase: Millions of $ | Annual Funding Cost Increase: % of Payroll | Increase in Annual Pay-as-you-go Millions of $ | Increase in Accrued Benefit Liabilities Millions of $ |
|---|---|---|---|---|
| State | $2.6 | 0.2% | $1.1 | $12.6 |
| Teachers | 1.5 | 0.1 | 1.1 | 12.6 |
| Boston | 0.9 | 0.2 | 0.6 | 6.7 |
| Other Boards | 3.5 | 0.3 | 1.5 | 16.5 |
| Total | $8.5 | 0.2% | $4.3 | $48.4 |

C. Cost-of-Living Increases (see Chapter 234 of the Massachusetts Acts of 1984, Line Item 0612-1100 and Section 16). This valuation assumes future cost-of-living increases of 3% per year on the first $7,000 of annual retirement allowance. This legislation granted a 4% cost-of-living increase for fiscal year 1984-85 and changed the maximum retirement allowance level to which cost-of-living increases apply (see Chapter 32, Section 102(c) of the Massachusetts General Laws) from $7,000 per year to $8,000 per year for fiscal years 1985-86 and thereafter. We estimated these changes would have the following effects:

1984-85 Increase in Pay-as-you-go Costs
Millions of Dollars

| Group | 3% Increase | 4% Increase | Difference |
|---|---|---|---|
| State | $ 4.8 | $ 6.3 | $1.5 |
| Teachers | 4.8 | 6.5 | 1.7 |
| Boston | 2.7 | 3.6 | 0.9 |
| Other Boards | 8.3 | 11.1 | 2.8 |
| Total | $20.6 | $27.5 | $6.9 |

Increase in Unfunded Liabilities Due to Above
Millions of Dollars

| Group | 3% Increase | 4% Increase | Difference |
|---|---|---|---|
| State | $ 46.7 | $ 62.3 | $15.6 |
| Teachers | 44.4 | 59.3 | 14.9 |
| Boston | 26.2 | 34.9 | 8.7 |
| Other Boards | 84.5 | 112.6 | 28.1 |
| Total | $201.8 | $269.1 | $67.3 |

Since this actuarial valuation anticipates a 3% cost-of-living adjustment, the legislation authorizing 4% for 1984-85 increases valuation results only by the last column shown above, i.e., total 1984-85 pay-as-you-go by $6.9 million and unfunded liabilities by $67.3 million. Should 4% increases become a permanent feature of the system in the future, cost increases would become substantially larger than those shown above.

The increase in the maximum retirement allowance eligible for increase from $7,000 a year to $8,000 a year will cost about $2 million in pay-as-you-go cost if a 4% increase is given in fiscal 1985-86. We have not exactly estimated the effect of this on unfunded liabilities, but it would be well in excess of $100 million.

SECTION 3

BASIS OF VALUATION

In this section, the basis of the actuarial valuations is described. This information -- the benefit and eligibility provisions of Chapter 32 of the General Laws and the census of participating members -- is the foundation of the valuations, since these are the present facts upon which benefit payments will depend.

The valuations are based on the premise that the systems will continue in existence, so that future events must also be considered. These future events are assumed to occur in accordance with the actuarial assumptions and concern such events as the earnings on invested assets, the number of members who will remain to retirement, their ages at retirement and expected benefits.

The actuarial assumptions and the actuarial cost method which have been adopted by the Commission to provide information on the proper funding levels to fund the systems in a reasonable manner and on future cash requirements for the systems, are described in this section.

SECTION 3.1

SUMMARY OF PRINCIPAL BENEFIT AND
ELIGIBILITY PROVISIONS, JANUARY 1, 1979

| | |
|---|---|
| CATEGORY OF MEMBER | Group 1: Most general employees in state and local government.<br>Group 2: Certain specified hazardous duty positions.<br>Group 3: State police, certain other positions in Department of Public Safety.<br>Group 4: Police and firefighters in local systems. |
| MEMBER CONTRIBUTIONS | Hired prior to January 1, 1975: 5% of salary<br>Hired between January 1, 1975 and December 31, 1983: 7% of salary<br>Hired on or after January 1, 1984: 8% of salary |
| CREDITABLE SERVICE | All membership service, plus military service up to four years and certain other purchased service. |
| RETIREMENT | |
| Eligibility | Age 55 or 20 years of service.<br>Group 3: Later of age 50 or 20 years of service. |
| Benefit | Group 1: 2.5% at retirement age 65 or over<br>Group 2: 2.5% at retirement age 60 or over<br>Group 4: 2.5% at retirement age 55 or over |

| | |
|---|---|
| RETIREMENT | |
| Benefit (cont'd) | Percentages on the preceding page are reduced by 0.1% for each year younger at retirement than age shown on the preceding page, and multiplied by final three-year average annual rate of regular compensation*. |
| | Group 3: 50% of final year's rate of regular compensation, plus an additional 1% for each year of service in excess of 20. |
| | Veterans (all groups) receive an additional $15.00 annually for each year of service to a maximum of $300.00. |
| FORM OF BENEFIT | Normal (Option A) -- Life annuity |
| | Option B -- Life annuity with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefits paid to member. |
| | Option C -- Life annuity with 66-2/3% of benefit continued after death of member to designated joint annuitant. |
| VESTING | |
| Requirement | Ten years of service. |
| Benefit | If over age 55, accrued retirement benefit payable immediately or deferred to a maximum of age 70. |
| | If under age 55, accrued retirement benefit payable at age 55 <u>or</u> withdrawal of member contributions plus credited interest. |

* For members who first became employed after January 1, 1979, a maximum of $30,000 of compensation is recognized.

| | |
|---|---|
| **DISABILITY -- OCCUPATIONAL** | |
| Requirement | No service or age requirement. |
| Benefit | 72% of final rate of regular compensation plus $312.00 per year for each child plus annuity based on accumulated member contributions with credited interest.<br><br>Maximum of 100% of final salary rate. |
| **DISABILITY -- NON-OCCUPATIONAL** | |
| Requirement | Veterans -- 10 years service<br>Non-veterans -- 15 years service |
| Benefit | Veterans -- 50% of final rate of regular compensation plus additional 1% for each year of service over 10 years to a maximum of 15 additional years plus annuity based on accumulated member contributions plus credited interest.<br><br>Non-veterans -- accrued retirement benefit as if member were age 55. |
| **SURVIVOR BENEFITS -- (Death in Active Service)** | |
| **OCCUPATIONAL** | |
| Requirement | No age or service requirement. |
| Benefit | Same as occupational disability benefit. |

| | |
|---|---|
| SURVIVOR BENEFITS (Death in Active Service) | |
| NON-OCCUPATIONAL | |
| Requirement | Two years service, married for one year. |
| Benefit | Accrued retirement benefit as if Option C had been elected with a minimum of $140.00 per month to widow plus $80.00 if one child plus $60.00 each additional child or refund of member contributions with credited interest. |
| COST-OF-LIVING INCREASES | If the Consumer Price Index for the year increases by at least 3% over the Consumer Price Index last used to determine a cost-of-living increase to pensioners, the general court determines a cost-of-living increase to be applied to the first $7,000* of annual pension effective on the following July 1. |

*Amended to $8,000 effective July 1, 1985.

SECTION 3.2

MEMBERSHIP DATA

The actuarial valuation and the calculation of liabilities and funding costs are based on the membership data furnished by the Commission. The data was validated for internal consistency and reconciled with the Annual Reports prepared each year by each board for PERA. Many error conditions or inconsistencies in data were brought to the attention of the Commission and resolved prior to the preparation of the actuarial valuations. Where it was not possible to obtain corrected data within the time allowed, reasonable adjustments or assumptions were made for the valuation.

For the majority of the systems, the data was eventually brought to the level of 90% to 100% correct, complete and consistent with the Annual Reports prepared for PERA. In these cases, the individual reports indicate that the data was 90% to 100% complete, with no other qualification on the reliability of the valuation results. For certain systems, the data was less than 90% correct and complete, and adjustments were made to the final valuation results to make those results representative of the liabilities and costs of the system. For one local system, no data was furnished in computer readable form before the final cutoff date established by the Commission. For this system, a projection was made using the data furnished for the January 1, 1979 actuarial valuation for active members and the December 31, 1982 Annuity Reserve data for retired members.

The results of the valuation for the systems which did not submit at least 90% complete and correct data were qualified because of the missing data, necessitating the use of certain procedures to bring the results to a basis representative of the liabilities and costs of the systems. Details on these qualifications may be found in the individual actuarial valuation reports for those systems.

State Employees

The data for active members contained 139,598 computer tape records, of which 59,478 were assumed to be currently inactive based on earnings shown for 1982, and the remaining 80,120 were assumed to be currently active.

Of the 80,120 active member records, 2% were missing a sex code and we assumed they were male members. Due to missing age and/or service information, we made the following additional assumptions:

| Membership Date | % of Total | Assumption |
|---|---|---|
| 1945 for all members hired on or before 1945 | .6% | Age 55 with 35 years service |
| 1972 for all members hired between 1946 and 1972 | 33.2% | 20% - age 50 with 30 years service<br>20% - age 45 with 25 years service<br>20% - age 40 with 20 years service<br>20% - age 35 with 15 years service<br>20% - age 30 with 10 years service |
| Membership date between 1973 and 1982, no birth date | 45.5% | Age 45 with service according to membership dates. |

No assumptions or adjustments were required to be made to the retired member data, which included 29,485 retired members.

## Teachers

The data for active members contained 71,783 computer tape records, of which 8,695 were assumed to be currently inactive based on earnings shown for 1982, and the remaining 63,088 were assumed to be currently active. Of the 63,088 active member records, 12% were missing a sex code and we assumed they were female members.

No assumptions or adjustments were required to be made to the retired member data, which included 20,420 retired members.

## City of Boston

The data for active members contained 25,424 computer tape records, of which 2,867 were assumed to be currently inactive and the remaining 22,557 were assumed to be currently active. Of the 22,557 active member records, 16% were missing age information and were assumed to be age 45, and 5% were missing service information and were assumed to have 15 years service credit.

No assumptions or adjustments were required to be made to the retired member data, which included 12,807 retired members.

## Other Local Boards
## (Cities, Counties, Towns, and Authorities)

Actuarial valuations were done for a total of 101 local systems. Of this number, 97 submitted data which was 90% to 100% complete, representing 86,472 active members and 43,107 retired members.

Three systems submitted data which was less than 90% complete, representing 4,439 active members and 3,033 retired members.

One system did not submit data by the cutoff date, representing 777 active members and 397 retired members.

A summary of the participant data used for the valuation is shown on the following page.

## Summary of Participant Data

| Board | Group 1 and 2 | Group 3 | Group 4 | Total Active | Inactive* | Retired** |
|---|---|---|---|---|---|---|
| State | 79,032 | 1,088 | 0 | 80,120 | 59,478 | 29,485 |
| Teachers | 63,088 | 0 | 0 | 63,088 | 8,695 | 20,420 |
| Boston | 19,476 | 0 | 3,081 | 22,557 | 2,867 | 12,807 |
| Other Local Boards | 69,925 | 0 | 21,763 | 91,688 | 9,582 | 46,537 |
| Totals | 231,521 | 1,088 | 24,844 | 257,453 | 80,622 | 109,249 |

* Inactive members are not currently in service, but have left their contributions in the system.

**Includes beneficiaries receiving retirement payments.

## SECTION 3.3 - ACTUARIAL BASIS

### GENERAL

A retirement system is somewhat unique in the field of employee fringe benefits in that benefits are earned, and thus a labor cost incurred, while the employee is working, but there is no cash expense until after the employee retires. A young employee earning pension credits by his employment this year may not start to collect those benefits for another 30, 35 or 40 years. For this reason, it has been deemed advisable, and in fact made mandatory in the private sector by the Employee Retirement Income Security Act of 1974 (ERISA), to fund in advance for future pension obligations.

A funding program is simply a device by which the labor costs incurred while an employee is working and earning pension credits are assigned to and funded during the working lifetime of the employee, rather than being deferred to the time when the employee has retired and is collecting benefits.

The ultimate obligation for pension payments requires long-range forecasting by the actuary of certain events, such as:

- -- mortality rates among members
- -- turnover rates among members
- -- ages at which members will retire and collect benefits
- -- investment return on contributions to the pension fund
- -- rate at which members' salaries will increase
- -- rate at which inflation will require post-retirement adjustments to pensions.

These are called <u>actuarial assumptions</u>, and are used in projecting the long-term cost of the system. Of that cost, members' contributions are usually fixed as a specified percentage of their salaries, with the employer paying the balance of the cost. Therefore, it is essentially the employer's cost that is being projected using the actuarial assumptions.

These actuarial assumptions will predict the time when certain benefits will be paid and the amount of these payments. This will enable the actuary to place a specific value on all of those benefits at a particular date, usually a valuation date, by discounting with interest from the dates of expected payment to the valuation date.

The actuarial cost method allocates the total value of all benefits to time periods, usually over the working lifetime of the member, for expensing and funding for the benefits. Most actuarial cost methods assign a portion of the total value of benefits to years of members' employment before the valuation date and the balance to years of employment after the valuation date. Each individual year's portion of the total value assigned to years after the valuation date is referred to as the normal cost of the retirement program. This is what the full cost of the system would be if it had always been funded according to that cost method from the time the first member was hired, the plan had never been amended to increase benefits, and all actuarial assumptions had been exactly realized.

The accumulated value, on the valuation date, of the total value of benefits assigned to periods prior to the valuation date (prior years' normal costs) is referred to as the actuarial accrued liability or actuarial liability. To the extent that the actuarial liability exceeds the assets of the system, there exists an unfunded actuarial liability. The unfunded actuarial liability is usually amortized over a specified number of years, either as a level dollar amount or as a level percentage of future payroll.

While an unfunded actuarial liability exists, the cost of funding the system is composed of two components: the normal cost and an amortization cost for the unfunded actuarial liability. After the fixed period of amortization, the total annual cost of funding consists of the normal cost alone.

When the experience varies from that anticipated by the actuarial assumptions, actuarial gains or losses occur, the effect of which may be spread into future normal costs or future amortization costs, depending on the actuarial cost method used.

SECTION 3.3 - ACTUARIAL BASIS (cont'd)

ACTUARIAL COST METHOD

The actuarial cost method used to determine liabilities and costs as of January 1, 1983 and to project future funding requirements is known as the Entry Age Normal Cost Method. Under this method, the annual normal cost of the system is determined as the aggregate level percentage of payroll necessary to fund all benefits expected to be paid if such percentage of each member's pay was and will be contributed from entry into the system until retirement, death or termination of employment. The actuarial liability on the valuation date is calculated as the amount which would be on hand if all prior normal costs had been fully funded. The unfunded actuarial liability on January 1, 1983 is the actuarial liability less the assets.

The system is expected to contribute the normal cost each year and to amortize the unfunded actuarial liability over a period of thirty years on the basis of a level percentage of payroll.

SECTION 3.3 - ACTUARIAL BASIS (cont'd)

ACTUARIAL ASSUMPTIONS

Actuarial assumptions were recommended to the Commission by the actuary. After some modifications as a result of discussion between the actuary and the Commission, the following actuarial assumptions were adopted for use in this valuation:

Mortality was assumed to be in accordance with the 1971 Group Annuity Mortality Table, with ages set back six years for females. This table is the most recently developed mortality table using a large body of data collected on a national scale.

Investment return on current assets and future contributions was assumed to be at the rate of 7-1/2% per year, compounded annually. This return includes interest, dividends and realized and unrealized gains.

Salary increases were assumed to occur at the rate of 6% per year.

Inflation increase was assumed to be at the rate of 4-1/2% per year.

Cost-of-living increases were assumed to occur at the rate of 3% per year for the State and Teachers System. No cost-of-living increases were assumed for Boston and the other Local Boards.

Rates of disablement were assumed to occur in accordance with Social Security experience published in 1972, as illustrated by the following sample rates:

| Age | Percentage Becoming Disabled During Year: Group 1, 2 or 3 | Group 4 |
|---|---|---|
| 20 | 0.06% | 0.12% |
| 30 | 0.11 | 0.22 |
| 40 | 0.22 | 0.44 |
| 50 | 0.61 | 1.21 |

For Groups 1 and 2, it was assumed that 50% of the disabilities were occupational, and for Groups 3 and 4, 90% of the disabilities were occupational.

Rates of turnover (terminations of employment before becoming eligible for retirement) for Groups 1 and 2 were in accordance with tables published in The Actuary's Pension Handbook: Crocker, Sarason and Straight, 1955, as illustrated by the following sample rates:

| | Percentage Terminating During Year | | |
|---|---|---|---|
| Age | State Teachers Groups 1 and 2 | Boston Groups 1 and 2 | Locals Groups 1 and 2 |
| 20 | 5.44% | 6.58% | 7.94% |
| 30 | 3.70 | 4.83 | 7.22 |
| 40 | 1.13 | 3.84 | 5.15 |
| 50 | 0.00 | 1.52 | 2.56 |
| Table | T-1 | T-3 | T-5 |

No turnover was assumed for Groups 3 and 4.

Retirements were assumed to occur in accordance with the following distribution by age at retirement, taken from an analysis of actual retirement practices over recent years:

| | Percentage of Total Retirements at Ages | | |
|---|---|---|---|
| Age | State, Teachers Groups 1 and 2 | Boston, Locals Groups 1 and 2 | Group 4 |
| 50 | 0.00% | 0.00% | 32.01% |
| 51 | 0.00 | 0.00 | 4.88 |
| 52 | 0.00 | 0.00 | 3.74 |
| 53 | 0.00 | 0.00 | 4.77 |
| 54 | 0.00 | 0.00 | 4.20 |
| 55 | 12.55 | 8.02 | 7.83 |
| 56 | 2.81 | 1.51 | 3.86 |
| 57 | 2.62 | 2.07 | 3.52 |
| 58 | 2.74 | 3.81 | 4.20 |
| 59 | 2.76 | 2.64 | 3.52 |
| 60 | 6.00 | 4.88 | 6.58 |
| 61 | 4.88 | 5.38 | 2.84 |
| 62 | 9.92 | 10.48 | 3.52 |
| 63 | 5.97 | 6.11 | 1.82 |
| 64 | 5.16 | 6.61 | 2.38 |
| 65 | 15.91 | 16.42 | 10.33 |
| 66 | 6.35 | 7.51 | 0.00 |
| 67 | 4.82 | 4.48 | 0.00 |
| 68 | 3.79 | 4.60 | 0.00 |
| 69 | 3.48 | 4.49 | 0.00 |
| 70 | 10.24 | 10.99 | 0.00 |
| | 100.00% | 100.00% | 100.00% |

Group 3 employees were expected to retire at the later of age 50 or 20 years of service.

Assets are valued at statutory values as shown in the Annual Reports to PERA. Assets include appropriations made under Chapter 559 of the Acts of 1977 as shown in Appendix B.

The greatest degree of attention is usually given to the so-called "economic" assumptions. The economic assumptions are those which will be affected by a change in the rate of inflation, such as investment return, salary increases and cost-of-living increases. Even more important than the absolute rates assumed is the consistency among the three assumptions; i.e., that all assume the same underlying rate of inflation.

When the underlying rate of inflation is increased or decreased, the change in liabilities and costs due to higher or lower projected benefits from the salary increase and cost-of-living assumption changes is offset to a major degree by the change in the investment earnings assumption.

In this case, a 4-1/2% annual rate of inflation is assumed. Salary increases were assumed at the inflation rate plus an additional 1-1/2% for merit and productivity increases. Investment return was assumed at the inflation rate plus a 3% "real rate of return". Cost of living increases to retired members in the State and Teachers System were assumed to occur at the rate of 3% per year.

These assumptions are used to make extremely long-term projections of future benefit liabilities. For this reason, the assumptions may not appear to be consistent with recent experience and the short-term outlook for inflation, salary increases and available interest rates. They are, however, considered appropriate for the longer term.

SECTION 4

## APPENDIX A - 104 CONTRIBUTORY RETIREMENT SYSTEMS

### Counties

101 Barnstable
102 Berkshire
103 Bristol
104 Dukes
105 Essex
106 Franklin
107 Hampden
108 Hampshire
109 Middlesex
110 Norfolk
111 Plymouth
112 Worcester

### Cities & Towns

001 Adams
002 Amesbury
003 Andover
004 Arlington
005 Athol
006 Attleboro
007 Belmont
008 Beverly
009 Boston
010 Braintree
011 Brockton
012 Brookline
013 Cambridge
014 Chelsea
015 Chicopee
016 Clinton
017 Concord
018 Danvers
019 Dedham
020 Easthampton
021 Everett
022 Fairhaven
023 Fall River
024 Falmouth
025 Fitchburg
026 Framingham
027 Gardner
028 Gloucester
029 Greenfield
030 Haverhill
031 Hingham
032 Holyoke
033 Hull
034 Lawrence
035 Leominster
036 Lexington
037 Lowell
038 Lynn
039 Malden
040 Marblehead
041 Marlborough
042 Maynard
043 Medford
044 Melrose
045 Methuen
046 Milford
047 Milton
048 Montague
049 Natick
050 Needham
051 New Bedford
052 Newburyport
053 Newton
054 North Adams
055 Northampton
056 North Attleboro
057 Northbridge
058 Norwood
059 Peabody
060 Pittsfield
061 Plymouth
062 Quincy
063 Reading
064 Revere
065 Salem
066 Saugus
067 Shrewsbury
068 Somerville
069 Southbridge
070 Springfield
071 Stoneham
072 Swampscott
073 Taunton
074 Wakefield
075 Waltham
076 Watertown
077 Webster
078 Wellesley
079 Westfield
080 West Springfield
081 Weymouth
082 Winchester
083 Winthrop
084 Woburn
085 Worcester

### Other

201 State Employees
301 Teachers
401 Mass. Turnpike Authority
402 Mass. Housing Finance
403 Mass. Port Authority
405 Blue Hills Regional
406 Greater Lawrence Sanitary District

SECTION 4

APPENDIX B - CONTRIBUTORY RETIREMENT SYSTEMS WITH CONTRIBUTIONS UNDER CHAPTER 559 OF THE ACTS OF 1977

| | 1979 | 1980 | 1981 | 1982 | Total Value December 31, 1982 |
|---|---|---|---|---|---|
| Andover | $ 0 | $ 62,000 | $150,000 | $150,000 | $ 411,331.59 |
| Arlington | 250,000 | 315,000 | 380,000 | 445,000 | 2,453,914.06 |
| Belmont | 0 | 0 | 250,000 | 250,000 | 500,000.00 |
| Braintree | 397,000 | 354,000 | 460,000 | 0 | 2,278,634.48 |
| Brookline | 0 | 300,000 | 300,000 | 0 | 1,115,811.27 |
| Concord | 50,000 | 50,000 | 175,000 | 100,000 | 1,095,374.52 |
| Dedham | 25,000 | 180,000 | 320,000 | 0 | 703,372.49 |
| Danvers | | | 300,000 | 100,000 | 497,983.59 |
| Fall River | 0 | 1,000,000 | 600,000 | 0 | 2,165,939.13 |
| Falmouth | | | 94,000 | 100,000 | 223,616.95 |
| Holyoke | | | | 125,000 | 142,306.18 |
| Lexington | 100,000 | 200,000 | 200,000 | 200,000 | 1,241,408.89 |
| Maynard | 25,000 | 18,000 | 18,000 | 18,000 | 108,139.11 |
| Methuen | 20,000 | 20,000 | 20,000 | 0 | 74,181.00 |
| Milton | 40,000 | 80,000 | 121,000 | 0 | 723,019.63 |
| Needham | 85,000 | 175,000 | 340,000 | 620,000 | 1,367,120.00 |
| Norwood | 0 | 0 | 150,000 | 350,000 | 1,328,585.46 |
| Plymouth | 0 | 50,000 | 85,000 | 0 | 196,329.41 |
| Watertown | 0 | 400,000 | 300,000 | 200,000 | 1,715,911.84 |
| Wellesley | 255,000 | 341,000 | 629,000 | 902,000 | 3,757,121.00 |
| Weymouth | | | 150,000 | 0 | 194,904.00 |

SECTION 5

GLOSSARY

This glossary summarizes the actuarial terms contained in the Composite Report.

Accrued Benefit

The amount of an individual's benefit (whether or not vested) as of a specified date, determined in accordance with the terms of the pension plan and based on compensation and service to that date.

Actuarial Accrued Liability or Actuarial Liability

That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of pension plan benefits which is not provided for by future Normal Costs.

Actuarial Assumptions

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, turnover, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation or depreciation; and other relevant items.

Actuarial Cost Method

A procedure for determining the Actuarial Present Value of pension plan benefits and for developing an actuarial equivalent allocation of such value to time periods, usually in the form of a Normal Cost and an Actuarial Accrued Liability.

Actuarial Present Value

The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions.

Actuarial Value of Assets

The value of cash, investments and other properties belonging to a pension plan, as used by the actuary for purposes of an Actuarial Valuation.

Entry Age Normal Cost Method

The method under which the Actuarial Present Value of the projected benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings (or service) of the individual between entry age and assumed exit age(s). The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a valuation date by the Actuarial Present Value of future Normal Costs is called the Actuarial Accrued Liability.

Normal Cost

That portion of the Actuarial Present Value of pension plan benefits which is allocated to a valuation year by the Actuarial Cost Method.

Unfunded Actuarial Liability

The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.