Commonwealth
Actuarial Valuation Report

January 1, 2024

PUBLIC EMPLOYEE RETIREMENT
ADMINISTRATION COMMISSION
COMMONWEALTH OF MASSACHUSETTS

PERAC ACTUARIAL VALUATION REPORT

Commonwealth

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1. INTRODUCTION & CERTIFICATION

This report presents the results of the actuarial valuation of the pension benefits that are the obligation of the Commonwealth of Massachusetts. The four components are the State Employees' Retirement System (SRS), the Massachusetts Teachers' Retirement System (TRS), Boston teachers, and the Cost-of-Living Allowance Reimbursements to Local Systems. The valuation was performed as of January 1, 2024 pursuant to Chapter 32 of the General Laws of the Commonwealth of Massachusetts, and is based on the plan provisions in effect at that time. The actuarial assumptions used to calculate the actuarial accrued liability and the normal cost primarily reflect our latest experience studies of SRS and TRS issued in 2014 and our subsequent analyses of retiree mortality. The actuarial assumptions used in this valuation are the same as those used in the January 1, 2023 actuarial valuation.

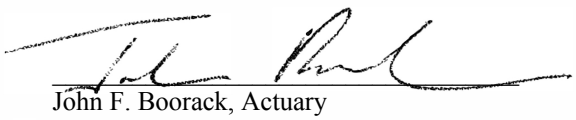
This valuation is based on member data as of December 31, 2023, which was supplied by the State, Massachusetts Teachers', and Boston Retirement Boards. We performed a number of tests on the data to ensure reasonableness and made specific assumptions for a number of TRS and Boston teachers data items. Asset information as of December 31, 2023 was provided by the Pension Reserves Investment Management (PRIM) Board. We reviewed both the membership data and financial information for reasonableness, but we did not audit this information.

This report was prepared by PERAC for the exclusive use of the State, Massachusetts Teachers' and Boston Retirement Boards, their staff and their auditors. The report was performed to determine the funded status of the Systems and the contribution requirements to ensure that System assets along with the contributions are sufficient to provide the prescribed benefits. Use of this report by other parties may not be appropriate and may result in mistaken conclusions because of the failure to understand applicable assumptions, methods or the inapplicability of the report for purposes other than those intended. PERAC should be asked to review any statement to be made based on the results presented in this report. PERAC will accept no responsibility for any such statement made without its prior review.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of natural operation of the methodology used for these measurements such as additional contribution requirements based on the plan's funded status; and changes in plan provisions or applicable law. As part of this valuation, we have not performed an analysis of the potential range of future measurements.

We, the undersigned actuaries, meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report. In our opinion, the actuarial assumptions used in this report are reasonable, are related to plan experience and expectations, and represent our best estimate of anticipated experience. We believe this report represents an accurate appraisal of the actuarial status of the Commonwealth's total pension obligation performed in accordance with generally accepted actuarial principles and practices relating to pension plans.

Respectfully submitted,
Public Employee Retirement Administration Commission



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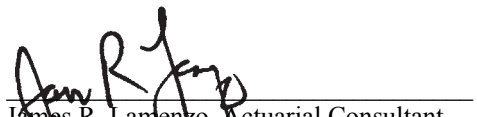

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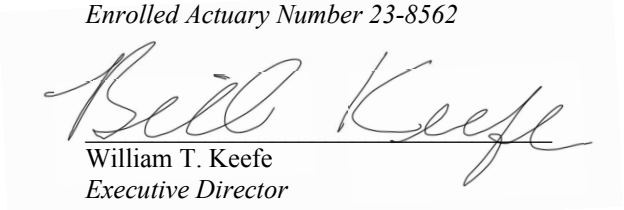

William T. Keefe
Executive Director

January 7, 2025

2. EXECUTIVE SUMMARY

A | PRINCIPAL VALUATION RESULTS

The provisions of Chapter 32, Section 22C mandate the establishment of a funding schedule for the Commonwealth of Massachusetts' pension obligation. The SRS, TRS, liabilities for Boston teachers, and State reimbursements to local systems to reflect COLAs granted from 1982 through 1996 (determined on an actuarial basis) have been the components of the Commonwealth schedule. Beginning in FY18, Chapter 5 of the Acts of 2017 required that several additional items be included in the development of the Commonwealth funding schedule but shown separately. These items include the administrative expenses of the Public Employee Retirement Administration Commission (PERAC), the employer contribution to the Optional Retirement Plan (ORP) under Section 40 of Chapter 15A, and a modification to the COLA reimbursement to local systems described above to reflect actual reimbursements. Beginning in FY24, Chapter 126 of the Acts of 2022 required the inclusion of the administrative expenses for the Department of Higher Education's deferred compensation plan (403(b) plan). The schedule, as mandated by law, calls for payment of the Normal Cost plus an amortization payment on the Unfunded Actuarial Liability (UAL).

The Commonwealth's current funding schedule was filed in January 2023 and was based on the results of the January 1, 2022 Commonwealth Actuarial Valuation. The FY25 appropriation under the schedule is $4.50 billion. The total appropriation under the schedule increases 9.63% each year until FY28. Beginning in FY29, the remaining UAL is amortized on a 4.0% annual increasing basis to FY36. The amortization of the 2015 Early Retirement Incentive (ERI) would be completed in FY27. As part of Chapter 77 of the Acts of 2023, there was a transfer of $100 million to the Commonwealth Pension Liability Fund. It is our understanding that this amount was to retire the liability associated with the 2015 ERI. The next schedule will be adopted in early 2026 based on the results of the 2025 Commonwealth actuarial valuation. As a result of the additional payment, the next schedule will not include a separate amortization for the 2015 ERI.

In the 2014 and prior actuarial valuations, the Annual Required Contribution (ARC) was developed under GASB 27 for accounting purposes. The ARC was developed using the minimum allowable schedule for local systems under Chapter 32 (UAL amortized on a 4.0% annual increasing basis to FY40). This ARC calculation is no longer applicable for GASB purposes, but we show it for comparison. Using the ARC basis and the January 1, 2024 valuation results, the FY25 appropriation would be approximately $4.611 billion. Therefore, the FY25 appropriation is 97.6% of the ARC ($4.500B/$4.611B). Based on the 2023 valuation results, the FY24 appropriation was 94.5% of the ARC. We expect this percentage to generally increase each year until ultimately the appropriation exceeds the ARC, although changes to the actuarial assumptions and actuarial gains or losses could affect this result.

The principal results of the January 1, 2024 actuarial valuation are as follows (in thousands):

Total Normal Cost	$2,608,711
Expected Employee Contributions	$1,698,536
Net Employer Normal Cost	$910,175
Total Expenses and Transfers	$158,447
Net Normal Cost Plus Expenses and Transfers	$1,068,622
Total Actuarial Accrued Liability	$120,818,654
Actuarial Value of Assets	$78,567,120
Unfunded Actuarial Liability	$42,251,534
Funded Ratio	65.0%

2. EXECUTIVE SUMMARY

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS

A comparison of the current valuation and the January 1, 2023 valuation is shown below (dollars in thousands except salary and benefit figures).

	1/1/24	1/1/23	Increase/ (Decrease)	% Increase/ (Decrease)
Total Normal Cost	$2,608,711	$2,410,519	$198,192	8.2%
Expected Employee Contributions	$1,698,536	$1,593,841	$104,695	6.6%
Net Normal Cost	$910,175	$816,678	$93,497	11.4%
Expenses	$109,920	$100,700	$9,220	9.2%
Optional Retirement Plan Payment	$22,500	$18,200	$4,300	23.6%
Deferred Comp (403(b)) Plan Payment	$627	$365	$262	71.8%
3(8)(c) Amounts Transferred to Other Systems	$25,400	$25,200	$200	0.8%
Total Expenses and Transfers	$158,447	$144,465	$13,982	9.7%
Net Normal Cost plus Expenses and Transfers	$1,068,622	$961,143	$107,479	11.2%
Total Actuarial Liability	$120,818,654	$116,211,224	$4,607,430	4.0%
Assets	$78,567,120	$73,831,127	$4,735,993	6.4%
Unfunded Actuarial Liability	$42,251,534	$42,380,097	($128,563)	(0.3%)
Funded Ratio	65.0%	63.5%	1.5%	

Total Expenses and Transfers

In our 2017 valuation, we began showing the expense and transfer items separately from the normal cost. Expenses reflect the administrative expenses from the most recent Annual Statements and include a small portion of investment-related expenses, PERAC's administrative expenses, the Optional Retirement Plan (ORP) plan, and the administrative expenses for the DHE's deferred compensation plan, the last two of which are shown separately for the SRS. The ORP payment is the amount transferred by statute from the Commonwealth (previously from SRS) to the ORP for higher education employees. By including these payments as part of the normal cost, we have treated it as a reimbursement to the pension trust fund. Finally, $25.4 million is included for amounts transferred to other systems under Section 3(8)(c) for members with SRS and TRS service who retired from another system. Section 3(8)(c) receipts from other systems are transferred to the State's general account. By including the Section 3(8)(c) disbursements with normal cost, the net Section 3(8)(c) cash flow is zero for funding purposes.

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS *(continued)*

Gain/Loss
The development of the actuarial gain/(loss) is shown in Section 5 (on page 11). During 2023, there was an overall actuarial gain of $299 million. There was a non-investment-related loss on actuarial liability of approximately $732 million. On a percentage basis, this loss is quite small (0.6% of the total actuarial liability) and reflects that the assumptions continue to be reasonable. There was a gain on assets (on an actuarial value basis) of approximately $1.03 billion. The return on assets for 2024 was approximately 8.4% on an AVA basis compared to 11.7% on a market value basis.

PERAC values system assets using a smoothing technique which spreads gains and losses over short periods (5 years) and employs a "corridor" so that the actuarial value is within 10% of the market value of assets. The calculated AVA as of January 1, 2024 is 102.2% of the market value.

The UAL decreased from $42.4 billion as of January 1, 2023 to $42.3 billion as of January 1, 2024.

Actuarial Assumptions

Investment Return

The January 1, 2024 valuation reflects a 7.0% investment return assumption (the same as the of January 1, 2023 assumption). The investment return assumption has decreased several times since January 1, 2012. As part of this valuation, we considered whether to maintain the 7.0% assumption. The Commission decided to maintain this assumption in this valuation.

In early 2024, NEPC, the Pension Reserves Investment Trust's (PRIT) investment consultant, provided figures for 30-year expected return projections using a building block approach, the target allocation and expected long-term returns by asset class. The expected annual return is 7.7% in this study (7.2% if we assume expenses of 50 basis points and the expected return reflects a gross return). This figure is the same as the figure from the 2023 study. Note that the 7.7% average expected return does not mean that the expected return each year will be 7.7%. In fact, over the shorter term (10 years) the average expected return is 6.6% (40 basis points less than last year). Greater expected returns in later years determine NEPC's long-term projection. The NEPC projected returns are the first measure we use to determine a reasonable range for the long-term investment return assumption.

A comparison of recent expected return projections as well as historical PRIT returns is shown below.

	Expected Annual Return						
	2018	2019	2020	2021	2022	2023	2024
10-year expected return *	6.6%	6.8%	6.2%	5.8%	5.7%	7.0%	6.6%
30-year expected return	7.7%	7.9%	7.3%	6.8%	6.9%	7.7%	7.7%

* In years prior to 2020, NEPC's short-term horizon was 5-7 years

Actual Returns as of December 31, 2023	
2023	11.4%
5 years (2019-2023)	9.5%
10 years (2014-2023)	8.0%
20 years (2004-2023)	7.8%
39 years (1985-2023)	9.4%

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS *(continued)*

Besides the NEPC analysis, we review the capital market assumptions (CMAs) of other investment consultants for comparison. We estimate the short-term and long-term expected returns using these capital market assumptions and PRIT's asset allocation. The expected returns using these CMAs are generally consistent with that of NEPC.

In addition, we also reviewed the Horizon Actuarial Services Survey of Capital Market Assumptions. The latest survey compares the assumptions of 42 different investment consultants including NEPC. The Horizon study used in our analysis was published in August 2023. Since it reflects 2023 capital market assumptions, there is a one-year lag between the current results of the Horizon survey and the current NEPC study. The Horizon long-term (20 years) expected return based on its hypothetical portfolio is 7.2% (6.3% in the prior study) and is consistent with the 80-basis point increase we saw with NEPC a year ago. We also estimated the short-term and long-term results using the Horizon average expected returns by asset class and PRIT's asset allocation. This result is consistent with NEPC. The results of the Horizon survey appear to show a bottoming of the long-term expected returns two years ago.

The National Association of State Retirement Administrators (NASRA) periodically publishes a survey of investment return assumptions used by over 100 large public plans. The most recent survey available at the time of our analysis was published in July 2023. In this survey, the average investment return assumption was 6.91%, a slight decrease from the 6.93% figure published in March 2023. Although the NASRA survey does not consider different asset allocations between the plans, it demonstrates the continuing reduction, and again, perhaps a bottoming of this assumption.

We recommended maintaining the 7.0% assumption for this valuation and the Commission agreed.

We will continue to monitor this assumption in each future valuation.

Mortality

Based on our analysis of SRS and TRS retiree mortality from 2012-2014, we adopted a fully generational assumption in the 2015 valuation. In 2017, we analyzed retiree mortality experience during 2015 and 2016 and we adopted updated assumptions. For SRS, we adopted a blue-collar version of the RP-2014 table for superannuation retirees as it best matched our experience. For TRS and Boston teachers, we adopted the RP-2014 White Collar table. For TRS and Boston teachers, we performed additional analysis in 2020 and adopted the most recently released Society of Actuaries public plan mortality tables (SOA Pub-2010 Teachers (headcount weighted) tables). We maintained the base tables and the mortality improvement scale in this valuation.

Job Groups

We noted several issues relating to job group as part of the valuation data we received from SRS and made similar adjustments as we have in the past. As we have done in previous years, we changed the job group for several University of Massachusetts Police members from Group 1 to Group 2.

In the 2017 valuation, we analyzed costs for certain members of the Department of Mental Health (DMH) and Social Services who were coded as job Group 1. We determined plan liabilities for these members based on both Group 1 and Group 2 status. DMH members with certain titles and Social Services workers with 10 years of service in certain capacities are eligible to be in Group 2. Based on our discussions with SRS, most of these members will ultimately be eligible for Group 2 status. By assuming these members will ultimately be in Group 2, we are being somewhat conservative. We used the results of our 2017 work to estimate the increase in actuarial liability due to this adjustment to be approximately $150 million in this valuation.

Chapter 176 Provisions

Chapter 176 of the Acts of 2011, *An Act Providing for Pension Reform and Benefit Modernization,* made many changes to the Chapter 32 pension law. There are several changes that will have the most impact on decreasing plan liabilities over the longer term. These include an increase in the normal retirement age by two years (for example, from age 65 to age 67 for Group 1 members), an increase in the age (early retirement) reduction factor for ages below the maximum age (from a 4.0% to a 6.0% annual reduction), and an increase in the period for determining a member's average annual compensation (from 3 years to 5 years). These changes are effective only for members hired after April 1, 2012.

As of January 1, 2024, there were approximately 110,000 members hired after April 1, 2012. The normal cost is approximately $150 million lower and the actuarial liability is approximately $1.36 billion lower for these members under the new provisions compared to the figures under the prior provisions.

COLA Base

This valuation reflects a COLA base of $13,000 for the SRS and TRS and $15,000 for the Boston teachers. The 2023 valuation reflected the same COLA bases.

Teachers

We have detailed several of the assumptions we made for missing or questionable data for active members of the TRS in Part C of Section 7.

COVID-19 Pandemic

The assumptions in this report do not reflect any potential impacts of the COVID-19 pandemic on the Systems. In the short-term, the pandemic likely had a material effect on the mortality experience, and to a lesser extent, the retirement and withdrawal experience in ways not anticipated by the assumptions on which the projections are based.

2. EXECUTIVE SUMMARY *(continued)*

C | FUNDING PROGRESS

The UAL and funded ratio are measures of the plan's funded status. These measures reflect the plan's position as of January 1, 2024. We believe these measures alone are not appropriate for assessing the sufficiency of assets to cover the estimated cost of settling the Commonwealth's benefit obligations or assessing the need for or the amount of future contributions. However, we believe these measures, in conjunction with maintaining the appropriations required under the Commonwealth funding schedule, are appropriate for assessing the amount of future contributions.

The nature of actuarial funding is that assets gradually catch up to the actuarial liability. When pension funding was adopted in 1987, the initial amortization period was established as 40 years. Based on the amortization basis of the schedules adopted, the UAL was expected to increase for a period of time. However, due to actual investment returns significantly exceeding the expected return in the 1990s, the UAL actually decreased until January 1, 2000.

It is important to note that plan assets have grown faster than plan liabilities, despite recent assumption changes and plan amendments that have increased plan liabilities. As of January 1, 1990, the actuarial liability was $20.0 billion and assets were $7.8 billion. The difference of $12.2 billion was the UAL. As of January 1, 2024, the actuarial liability is $120.8 billion and the actuarial value of assets is $78.6 billion. The difference of $42.3 billion is the UAL. The actuarial liability has grown 6.0 times over this period ($120.8B / $20.0B). But assets have grown 10.1 times over this same period ($78.6B / $7.8B). For this reason, we believe the funded ratio represents a better measure of the Commonwealth's progress.

3. SUMMARY OF VALUATION RESULTS

(Dollars in thousands)

A. Number of Members on Current Valuation Date	State	Mass. Teachers	Boston Teachers	Local COLA	Total
Active Members	90,988	102,045	6,689		199,722
Vested Terminated Members	5,453	N/A	520		5,973
Non-Vested Terminated Members	31,737	N/A	3,286		35,023
Retired Members and Survivors	69,750	71,260	4,780		145,790
Total	197,928	173,305	15,275		386,508
B. Total Regular Compensation of Active Members	$7,688,333	$8,731,185	$763,795		$17,183,313
C. Present Value of Future Benefits					
Active Members	$30,552,880	$42,452,459	$3,293,762		$76,299,101
Retirees, Survivors, and Inactive Members	$30,510,925	$35,227,126	$2,909,635		$68,647,686
Total Present Value of Future Benefits	$61,063,805	$77,679,585	$6,203,397		$144,946,787
D. Normal Cost					
Total Normal Cost	$1,183,171	$1,303,855	$121,685		$2,608,711
Expected Employee Contributions	$719,934	$900,016	$78,586		$1,698,536
Net Employer Normal Cost	$463,237	$403,839	$43,099		$910,175
Total Expenses and Transfers	$95,387	$50,560	$12,500		$158,447
Net Normal Cost plus Expenses and Transfers	$558,624	$454,399	$55,599		$1,068,622
E. Actuarial Liability					
Active Members	$20,640,558	$29,438,303	$2,020,107		$52,098,968
Vested Terminated Members (a)	$1,281,856	$1,100,000	$135,052		$2,516,908
Non-Vested Terminated Members	$369,104	N/A	$82,372		$451,476
Retirees and Survivors	$28,859,965	$34,127,126	$2,692,211	$72,000	$65,751,302
Total Actuarial Liability	$51,151,483	$64,665,429	$4,929,742	$72,000	$120,818,654
F. Actuarial Value of Assets	$37,065,525	$39,078,937	$2,422,658	$0	$78,567,120
G. Unfunded Actuarial Liability: E – F	$14,085,958	$25,586,492	$2,507,084	$72,000	$42,251,534
H. Funded Ratio: F/E	72.5%	60.4%	49.1%	0.0%	65.0%

4. PLAN ASSETS

A | STATE AND MASSACHUSETTS TEACHERS'

(Dollars in thousands unless otherwise specified)

	State	Mass. Teachers
Pension Reserves Investment Trust		
Market value of assets	$36,244,038	$38,228,453
Actuarial value of assets	$37,065,525	$39,078,937
Actuarial value as a percentage of market value	102.3%	102.2%

The actuarial value of assets (AVA) is determined so that 20% of the investment gain or loss in a given year is recognized annually for the ensuing five years. Therefore, these investment gains and losses are fully recognized after five years. In addition to this treatment of gains and losses, we use a "corridor" approach so that the AVA can never be too far from the market value of assets. Under our approach for the Commonwealth, the AVA cannot be less than 90% nor greater than 110% of the market value. As of January 1, 2024, the calculated AVA is 102.2% of the MVA.

B | BOSTON TEACHERS

Based on the enactment of Chapter 112 of the Acts of 2010, the assets of the Boston teachers are maintained by PRIM. The transfer of these assets occurred during 2010. We set the actuarial value of assets for Boston teachers to 102.2% of the market value based on the results for SRS and TRS.

Pension Reserves Investment Trust	
Market value of assets	$2,370,507
Actuarial value of assets	$2,422,658
Actuarial value as a percentage of market value	102.2%

4. PLAN ASSETS *(continued)*

C | DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS (In thousands)

State and Massachusetts Teachers' Retirement Systems only (excluding Boston teachers)

	2023	2024
A. Market Value Tracking		
1. Beginning of year Market Value of Assets	68,058,532	74,472,491
2. Cash Flow		
a. Net receipts *	1,833,523	
b. Net disbursements *	3,270,164	
c. Cash flow: (a) – (b)	(1,436,641)	
3. End of year Market Value of Assets	74,472,491	
4. Investment income including appreciation: (3) – (1) – (2(c))	7,850,600	
B. Expected market value development		
1. Beginning of year Market Value of Assets	68,058,532	
2. Cash flow (A2(i))	(1,436,641)	
3. Expected Return on (1)	4,764,097	
4. Expected return on cash flow A2(i) x 0.07 / 2	(50,282)	
5. Expected Market Value of Assets end of year (1)+(2)+(3)+(4)	71,335,706	
C. Gain/(loss) for year: A3-B5	3,136,785	
D. Development of Actuarial Value of Assets		
1. Beginning of year Market Value of Assets	68,058,532	74,472,491
2a. Asset gain/(loss) in prior year	(13,898,819)	3,136,785
b. Asset gain/(loss) in 2nd prior year	8,810,066	(13,898,819)
c. Asset gain/(loss) in 3rd prior year	3,169,332	8,810,066
d. Asset gain/(loss) in 4th prior year	5,036,915	3,169,332
3. Unrecognized gain/(loss) .8 x [2a] + .6 x [2b] + .4 x [2c] +.2 x [2d]	(3,557,900)	(1,671,970)
4. Beginning of year Actuarial Value of Assets: [1] - [3]	71,616,432	76,144,461
5. Actuarial Value of Assets / Market Value of Assets	105.2%	102.2%
6. Adjusted Actuarial Value of Assets: (4) but not less than 90% nor greater than 110% of market value	71,616,432	76,144,461

* Reflects actual cash flow of PRIT fund

5. DEVELOPMENT OF THE ACTUARIAL GAIN OR LOSS (In millions)

A | GAIN/(LOSS) ON ACTUARIAL LIABILITY

	State	Mass. Teachers	Boston Teachers	Local COLA	Total
1. Actuarial Liability 1/1/23	49,200	62,286	4,644	81	116,211
2. Total Normal Cost 1/1/23	1,080	1,224	107	0	2,411
3. Interest on (1) and (2)	3,520	4,446	333	6	8,304
4. Benefits paid during 2023 [a]	2,850	3,475	271	12	6,608
5. Interest on (4) assuming mid-year payment	100	122	9	0	231
6. Expected Actuarial Liability 1/1/24: (1)+(2)+(3)-(4)-(5)	50,850	64,359	4,803	74	120,086
7. Actuarial Liability 1/1/24	51,151	64,665	4,930	72	120,818
8. Total Gain/(Loss): (6)-(7)	(301)	(306)	(127)	2	(732)

B | GAIN/(LOSS) ON PLAN ASSETS

1. Actuarial Value of Assets (AVA) 1/1/23	35,080	36,537	2,214	0	73,831
2. Interest on (1)	2,456	2,558	155	0	5,168
3. Net Receipts 2023 [b]	816	1,017	238	0	2,071
4. Net Disbursements 2023 [b]	1,751	1,519	206	0	3,476
5. Net Cash Flow 2023: (3)-(4)	(935)	(502)	32	0	(1,405)
6. Interest on (5) assuming mid-year payment [c]	(33)	(18)	(7)	0	(58)
7. Expected AVA 1/1/24: (1)+(2)+(5)+(6)	36,568	38,575	2,394	0	77,537
8. AVA 1/1/24	37,065	39,079	2,423	0	78,567
9. Total Gain/(Loss) on Assets: (8)-(7)	497	504	29	0	1,030

C | TOTAL GAIN/(LOSS)

1. Actuarial liability Gain/(Loss) (A8)	(301)	(306)	(127)	2	(732)
2. Asset Gain/(Loss) (B9)	497	504	29	0	1,030
3. Total Gain/(Loss): (1)+(2)	196	198	(98)	2	299

Figures may not add due to rounding.

[a] Estimated
[b] Reflects actual cash flow from the PRIT fund
[c] For Boston teachers, receipts are received in December, disbursements are assumed to be paid mid-year

6. AUDIT INFORMATION

The Commonwealth valuation reports prior to 2015 included information required under Governmental Accounting Standards Board (GASB) Statement No. 27 (GASB 27). The Commonwealth began implementing GASB 27 in Fiscal Year 1996. GASB 27 has been replaced by GASB 68. In addition, GASB 67 replaced the requirements under GASB 25.

GASB 67 reflects plan financial statement reporting and was first effective for the plan year June 30, 2014. GASB 68 reflects employer financial statement reporting and was first effective for the fiscal year ending June 30, 2015.

We have not provided any GASB 67 or GASB 68 exhibits for SRS or TRS in this valuation report. These exhibits are provided separately.

7. INFORMATION ON SYSTEM MEMBERSHIP

A | STATE ACTIVE MEMBERS

A critical element of an actuarial valuation is accurate and up-to-date membership information. PERAC conducted an extensive review of member data submitted for this valuation.

	Actives
Number of Members	90,988
Average Age	46.6
Average Service	11.4
Average Salary	$84,498
Average Annuity Savings Fund Balance	$73,496

Age by Service Distribution of Active Members

Years of Service

Present Age	0 - 4	5 –9	10 - 14	15 - 19	20 - 24	25 - 29	30+	Total
0 - 24	2,780	7						2,787
25 - 29	6,375	782	1					7,158
30 - 34	5,877	3,326	656	3				9,862
35 - 39	4,589	3,338	2,397	803	7			11,134
40 - 44	3,501	2,563	1,976	2,510	424	5		10,979
45 - 49	2,792	1,881	1,585	1,908	1,595	462	10	10,233
50 - 54	2,527	1,728	1,478	1,934	1,722	1,841	624	11,854
55 - 59	2,208	1,608	1,398	1,757	1,443	1,572	1,925	11,911
60 - 64	1,329	1,241	1,135	1,416	1,205	1,049	1,794	9,169
65+	639	793	757	923	824	708	1,257	5,901
Total	32,617	17,267	11,383	11,254	7,220	5,637	5,610	90,988

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

A | STATE ACTIVE MEMBERS *(continued)*

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	2,787	$145,139,919	$52,077
25 - 29	7,158	$454,174,402	$63,450
30 - 34	9,862	$718,572,373	$72,863
35 - 39	11,134	$889,576,881	$79,897
40 - 44	10,979	$946,812,589	$86,239
45 - 49	10,233	$914,225,362	$89,341
50 - 54	11,854	$1,089,236,730	$91,888
55 - 59	11,911	$1,108,687,219	$93,081
60 - 64	9,169	$857,278,555	$93,497
65+	5,901	$564,629,452	$95,684
Total	90,988	$7,688,333,482	$84,498

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

B | STATE RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	59,181	530	3,412	6,627	69,750
Average Age	73.0	65.0	65.9	74.8	72.7
Average Annual Benefit	$43,826	$23,572	$48,282	$24,753	$42,078

Benefit by Payment and Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Total Annuity	$552,099,667	$2,240,217	$15,066,580	$28,495,550	$597,902,014
Pension (excluding State reimbursed COLA)	$2,041,543,833	$10,252,766	$149,669,883	$135,539,948	$2,337,006,430
Total	$2,593,643,500	$12,492,983	$164,736,463	$164,035,498	$2,934,908,444

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

B | STATE RETIREES & SURVIVORS *(continued)*

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	204	$6,894,076	$33,794
40 - 44	152	$6,309,895	$41,512
45 - 49	396	$16,290,894	$41,139
50 - 54	1,219	$58,934,303	$48,346
55 - 59	3,622	$170,365,353	$47,036
60 - 64	8,131	$372,205,049	$45,776
65 - 69	13,397	$601,254,889	$44,880
70 - 74	14,925	$655,631,637	$43,928
75 - 79	12,620	$519,674,926	$41,179
80 - 84	7,826	$296,363,333	$37,869
85 - 89	4,336	$147,782,165	$34,083
90+	2,922	$83,201,924	$28,474
Totals	69,750	$2,934,908,444	$42,078

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

C | MASSACHUSETTS TEACHERS' ACTIVE MEMBERS

A critical element of an actuarial valuation is accurate and up-to-date membership information. As part of this valuation, PERAC analyzed the member data provided by the TRS. We made several assumptions about missing, questionable, or unavailable data.

Until the January 1, 2006 actuarial valuation, we had estimated the total creditable service for each member for the actuarial valuation. The estimate was based on either the employment date (date of hire as a teacher) or the adjusted employment date and was set equal to the greater of the two calculated service amounts. We used this methodology, which we believed was conservative, because we had no way to assess additional costs for members who buy back service near retirement. Since 2006, we increased the plan liabilities to reflect this additional cost associated with members who buy back service near retirement.

For members with a date of birth and/or date of hire that seemed questionable, we assumed (based on credited service or date of birth) the member was hired at age 30 (or at a younger age, if the member was under 30).

Based on our experience with prior years' data, buyback issues, and questions to TRS regarding specific members, we made several adjustments. Members whose pay was less than $5,000 were assumed to be inactive. For members with pay between $5,000 and $20,000, we used an estimated pay of $50,000. For members with submitted pay over $150,000, we compared this year's figure to the pay used in the prior valuation. We adjusted this year's figure based on the amount contributed if we believed it was overstated.

Determining valuation pay for members with reported pay less than $20,000 is difficult. Although we make the assumptions outlined above, we know there will always be a significant number of members that fall into this category for a variety of reasons including leaves of absence and part-time employment. We believe our overall assumption is reasonable but know some members that we have deemed inactive are active members. To reflect this uncertainty, we made an additional increase to the calculated plan liabilities consistent with last year.

We increased the normal cost by 2.0% and the active actuarial liability by 1.0% to reflect the service buyback and various data issues.

Pay for all members hired in 2023 was annualized.

Because we could not determine the number of vested terminations, we estimated a combined inactive (terminated vested plus terminated with an ASF balance) liability. This is the same methodology we have used in prior valuations.

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

C | MASSACHUSETTS TEACHERS' ACTIVE MEMBERS *(continued)*

A critical element of an actuarial valuation is accurate and up-to-date membership information. As part of this valuation, PERAC analyzed the member date provided by the Massachusetts Teachers' Retirement System.

	Actives
Number of Members	102,045
Average Age	43.8
Average Service	13.2
Average Salary	$85,562
Average Annuity Savings Fund Balance	$91,705

Age by Service Distribution of Active Members

	Years of Service							
Present Age	0 - 4	5 –9	10 - 14	15 - 19	20 - 24	25 - 29	30+	Total
0 - 24	2,645							2,645
25 - 29	8,580	1,654	3					10,237
30 - 34	5,133	6,576	1,324	6				13,039
35 - 39	3,093	3,852	5,539	1,641	6			14,131
40 - 44	2,535	2,019	2,803	6,360	1,570	9		15,296
45 - 49	1,874	1,431	1,455	3,078	5,379	1,111	7	14,335
50 - 54	1,376	1,117	1,274	1,783	3,373	4,525	886	14,334
55 - 59	859	731	1,027	1,602	1,928	2,368	2,058	10,573
60 - 64	393	317	485	1,082	1,274	1,009	968	5,528
65+	167	120	170	330	429	303	408	1,927
Total	26,655	17,817	14,080	15,882	13,959	9,325	4,327	102,045

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

C | MASSACHUSETTS TEACHERS' ACTIVE MEMBERS *(continued)*

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	2,645	$142,657,401	$53,935
25 - 29	10,237	$620,214,741	$60,586
30 - 34	13,039	$936,305,661	$71,808
35 - 39	14,131	$1,174,018,579	$83,081
40 - 44	15,296	$1,387,422,184	$90,705
45 - 49	14,335	$1,352,387,236	$94,342
50 - 54	14,334	$1,383,826,647	$96,542
55 - 59	10,573	$1,019,771,583	$96,451
60 - 64	5,528	$531,722,940	$96,187
65+	1,927	$182,858,310	$94,893
Total	102,045	$8,731,185,282	$85,562

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

D | MASSACHUSETTS TEACHERS' RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	66,574	356	275	4,055	71,260
Average Age	74.5	67.9	73.4	77.5	74.7
Average Annual Benefit	$50,663	$25,405	$48,417	$25,710	$49,108

Benefit by Payment and Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Total Annuity	$709,070,890	$1,913,971	$1,279,679	$20,365,312	$732,629,852
Pension (excluding State reimbursed COLA)	$2,663,743,910	$7,130,264	$12,035,081	$83,890,312	$2,766,799,567
Total	$3,372,814,800	$9,044,235	$13,314,760	$104,255,624	$3,499,429,419

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

D | MASSACHUSETTS TEACHERS' RETIREES & SURVIVORS *(continued)*

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	27	$375,758	$13,917
40 - 44	52	$900,934	$17,326
45 - 49	87	$1,485,807	$17,078
50 - 54	278	$6,551,306	$23,566
55 - 59	1,618	$71,953,282	$44,471
60 - 64	5,653	$292,750,785	$51,787
65 - 69	11,357	$593,183,966	$52,231
70 - 74	18,576	$977,787,972	$52,637
75 - 79	17,420	$880,800,809	$50,563
80 - 84	9,052	$414,183,545	$45,756
85 - 89	4,353	$171,437,235	$39,384
90+	2,787	$88,018,020	$31,582
Totals	71,260	$3,499,429,419	$49,108

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

E | BOSTON TEACHERS ACTIVE MEMBERS

A critical element of an actuarial valuation is accurate and up-to-date membership information. PERAC conducted an extensive review of member data submitted for this valuation.

	Actives
Number of Members	6,689
Average Age	43.7
Average Service	10.7
Average Salary	$114,187
Average Annuity Savings Fund Balance	$109,873

Age by Service Distribution of Active Members

	Years of Service							
Present Age	0 - 4	5 –9	10 - 14	15 - 19	20 - 24	25 - 29	30+	Total
0 - 24	54							54
25 - 29	500	68						568
30 - 34	540	452	67					1,059
35 - 39	351	354	347	53				1,105
40 - 44	261	186	236	327	48	1		1,059
45 - 49	190	86	140	219	220	27	1	883
50 - 54	159	85	102	137	171	137	27	818
55 - 59	127	36	82	66	95	100	100	606
60 - 64	75	23	42	59	58	49	61	367
65+	53	8	19	26	27	21	16	170
Total	2,310	1,298	1,035	887	619	335	205	6,689

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

E | BOSTON TEACHERS ACTIVE MEMBERS *(continued)*

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	54	$3,874,035	$71,741
25 - 29	568	$49,536,919	$87,213
30 - 34	1,059	$110,133,559	$103,998
35 - 39	1,105	$124,990,979	$113,114
40 - 44	1,059	$126,295,888	$119,260
45 - 49	883	$108,757,573	$123,168
50 - 54	818	$101,287,754	$123,824
55 - 59	606	$75,577,046	$124,715
60 - 64	367	$44,421,616	$121,040
65+	170	$18,919,818	$111,293
Total	6,689	$763,795,187	$114,187

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

F | BOSTON TEACHERS RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	4,350	39	65	326	4,780
Average Age	75.0	65.7	73.2	74.5	74.9
Average Annual Benefit	$60,420	$27,558	$57,148	$30,841	$58,090

Benefit by Payment and Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Total Annuity	$54,900,349	$274,012	$413,497	$1,862,593	$57,450,451
Pension (excluding State reimbursed COLA)	$207,928,237	$800,766	$3,301,148	$8,191,436	$220,221,587
Total	$262,828,586	$1,074,778	$3,714,645	$10,054,029	$277,672,038

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

F | BOSTON TEACHERS RETIREES & SURVIVORS *(continued)*

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	12	$340,697	$28,391
40 - 44	8	$245,012	$30,627
45 - 49	10	$315,353	$31,535
50 - 54	12	$359,313	$29,943
55 - 59	88	$4,048,874	$46,010
60 - 64	334	$20,840,158	$62,396
65 - 69	723	$45,651,490	$63,142
70 - 74	1,183	$75,218,289	$63,583
75 - 79	1,277	$75,490,629	$59,116
80 - 84	658	$34,871,842	$52,997
85 - 89	290	$13,278,067	$45,786
90+	185	$7,012,314	$37,904
Totals	4,780	$277,672,038	$58,090

8. VALUATION COST METHODS

A | ACTUARIAL COST METHOD

The Actuarial Cost Method which was used to determine pension liabilities in this valuation is known as the *Entry Age Normal Cost Method***.** Under this method the *Normal Cost* for each active member on the valuation date is determined as the level percent of salary, which, if paid annually from the date the employee first became a member of the retirement system, would fully fund by retirement, death, disability or termination, the projected benefits which the member is expected to receive. The *Actuarial Liability* for each member is determined as the present value as of the valuation date of all projected benefits which the member is expected to receive, minus the present value of future annual Normal Cost payments expected to be made to the fund. Since only active members have a Normal Cost, the Actuarial Liability for inactive members, retirees and survivors is simply equal to the present value of all projected benefits. The sum of Normal Cost and Actuarial Liability for each member is equal to the Normal Cost and Actuarial Liability for the Plan. The *Unfunded Actuarial Liability* is the Actuarial Liability less current assets.

The Normal Cost for a member will remain a level percent of salary for each year of membership except for changes in provisions of the Plan or the actuarial assumptions employed in projection of benefits and present value determinations. The Normal Cost for the entire system will also change due to the addition of new members or the retirement, death or termination of members. The Actuarial Liability for a member will increase each year to reflect the additional accrual of Normal Cost. It will also change if the Plan provisions or actuarial assumptions are changed.

Differences each year between the actual experience of the Plan and the experience projected by the actuarial assumptions are reflected by adjustments to the Unfunded Actuarial Liability. An experience difference which increases the Unfunded Actuarial Liability is called an *Actuarial Loss* and one which decreases the Unfunded Actuarial Liability is called an *Actuarial Gain.*

B | ASSET VALUATION METHOD

The actuarial value of assets is determined in accordance with the deferred recognition method under which 20% of the gains or losses occurring in the prior year are recognized, 40% of those occurring 2 years ago are recognized, etc., so that 100% of gains or losses occurring 5 years ago are recognized. The actuarial value of assets will be adjusted, if necessary, in order to remain between 90% and 110% of market value. The actuarial value of assets as of January 1, 2024 is 102.2% of the market value.

C | LOW-DEFAULT-RISK OBLIGATION MEASURE (LDROM)

The Low-Default-Risk Obligation Measure (LDROM) was determined using the *Entry Age Normal Cost Method* (the same method used to determine the plan's actuarial liabilities). The LDROM was calculated using the same assumptions as used to determine the plan's actuarial liabilities except the LDROM was calculated using a 4.76% discount rate.

For more information on the LDROM, see our discussion in Section 9 of this report.

9. ACTUARIAL DISCLOSURES

A | RISK

Risk is defined as the potential for differences in future plan measurements resulting from actual future experience deviating from actual assumed experience. The plan is subject to a number of risks that could affect the plan's future financial condition. Examples of risk include the following:

Investment risk – the potential that investment returns will be different than expected;

Asset/liability mismatch risk – the potential that changes in asset values are not matched by changes in the liabilities;

Interest rate risk – the potential that interest rates will be different than expected;

Longevity and demographic risk – the potential that mortality or other demographic experience will be different than expected;

Contribution risk – the potential that employer contributions to the plan will not be made or will not be made at the assumed level.

In this section, we provide a brief analysis of several risk measures that we believe are most significant for the plan. A more detailed risk assessment that includes further scenario testing (assessing the impact of one or several events on the plan's financial condition, for example projecting plan investment returns), stress testing (assessing the impact of an adverse change in one or several factors), sensitivity testing (assessing the impact of a change in an actuarial assumption), or stochastic modeling (generating numerous possible outcomes by allowing for random variations in input items to assess the distribution of the outcomes) may provide a better understanding than the analysis in this section.

Unfunded Actuarial Liability and Funded Ratio

The plan's unfunded actuarial liability (UAL) and the funded ratio for the past 10 years are shown below. The UAL is the Actuarial Liability less the Actuarial Value of Assets. The funded ratio is the Actuarial Value of Assets divided by the Actuarial Liability. The retirement system is said to be fully funded when the UAL is zero, or said another way, when the funded ratio is 100%. Actuarial valuations have been performed every year over this period (except in 2020) and the valuation results are determined as of January 1.

SRS Unfunded Actuarial Liability and Funded Ratio

	Valuation Date									
	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
UAL (in billions)	$9.1	$11.0	$13.5	$13.5	$14.2	$15.5	$15.3	$12.8	$14.1	$14.1
Funded Ratio	70.3%	67.5%	63.5%	64.7%	64.9%	63.7%	66.5%	72.9%	71.3%	72.5%

TRS Unfunded Actuarial Liability and Funded Ratio

	Valuation Date									
	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
UAL (in billions)	$17.8	$20.2	$22.0	$23.6	$24.6	$26.0	$27.7	$24.7	$25.7	$25.6
Funded Ratio	56.3%	54.3%	52.8%	52.1%	52.4%	51.7%	53.0%	59.0%	58.7%	60.4%

9. ACTUARIAL DISCLOSURES *(continued)*

A | RISK *(continued)*

Investment Return Assumption and Funding Schedule

Investment return assumption:	7.0%
Amortization of UAL basis:	9.63% total appropriation increase to FY28, then 4.0% increasing amortization of the remaining UAL to FY36

The investment return assumption of 7.0% is consistent with our 2024 recommended assumption. Currently, more than 75% of Chapter 32 systems use an assumption of 7.0% or lower.

It is important to note that our emphasis since 2013 has been for systems to establish funding schedules that complete the amortization of the UAL no later than FY35. This allows systems some flexibility in the event of another market downturn. In 2011, the Commonwealth adopted a schedule that extended the amortization of the UAL to FY40 due to the 2008 investment loss. In 2014, the schedule reduced the amortization period to FY36. The 2017 and 2020 schedules maintained the FY36 date by increasing the level of future appropriations. The 2023 schedule maintained the 9.63% annual increase from the 2020 schedule until FY28 but reverts to a traditional increasing amortization schedule in FY29 and maintains the FY36 payoff date.

A related priority to fully funding the System by FY35 is limiting the amount and period of "negative amortization". Negative amortization occurs while the UAL increases in the funding schedule. The reason it occurs is that the amortization payment for a given year is not large enough to pay the interest on the UAL. Negative amortization often occurs in amortization schedules with annual increasing payments. Negative amortization is acceptable as long as it is only for a limited period of time. We believe the goal for all systems should be to eliminate negative amortization as soon as possible. The current schedule has no negative amortization.

Several Massachusetts systems have adopted schedules that increase the total appropriation by a set percentage for a period of time (or the entire length of the schedule). The Commonwealth schedule reflects this methodology. Since the level of annual increase exceeds 6.0% for the next few years, there is some risk in whether such a level of annual increase is sustainable. However, the Commonwealth has consistently met (and increased as necessary) the higher level of appropriations since the 2011 schedule was adopted.

9. ACTUARIAL DISCLOSURES *(continued)*

A | RISK *(continued)*

Maturity and Volatility Measures

There are several plan maturity and volatility ratios that can provide significant insight into the level of a plan's risk. To illustrate, we are providing two such measures. In both cases, we show the 10-year history of the ratio. In addition, we comment on how the results compare with other local systems. We believe that these measures are more useful when compared to historical averages and the results of other plans. See our notes earlier in this section regarding the assumption changes over this period which significantly affect these results.

Retiree Actuarial Liability / Total Actuarial Liability

This ratio measures the percentage of actuarial liability due to the plan's retirees. Higher ratios and/or an increase in this ratio indicate a system that is more mature or becoming more mature. As this ratio increases, it generally indicates the retired population is increasing faster than the active member population and there is a greater likelihood of negative cash flow (benefit payments exceeding employer and employee contributions). Retirees in pay status are more expensive than younger members. As a plan matures, it becomes more sensitive to investment volatility and the plan will have more difficulty recovering from losses even with increases in employer contributions.

SRS Retiree Actuarial Liability / Total Actuarial Liability

Valuation Date									
2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
0.50	0.50	0.53	0.54	0.54	0.55	0.56	0.57	0.57	0.56

TRS Retiree Actuarial Liability / Total Actuarial Liability

Valuation Date									
2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
0.59	0.59	0.58	0.58	0.58	0.57	0.55	0.55	0.54	0.53

The ratios for SRS show a slow, steady increase until 2024. The ratios for TRS show a slow, steady decrease until 2024. Both plans are fairly mature. Public sector plans often have aging populations generating an increase in this ratio. We have found this to be generally true for the systems for which PERAC is the actuary. In 2014, this ratio ranged from .35 to .63. In recent valuations this range has increased to .51 to .67. Many local systems have seen an increase in this ratio over the past 10-15 years as the number of retirees, and specifically the retiree liability has increased as a percentage of the total. A number of systems have had fairly consistent ratios and a few have had decreasing ratios. Such systems have already reached and or maintained a more mature level.

9. ACTUARIAL DISCLOSURES *(continued)*

A | RISK *(continued)*

Actuarial Liability / Pay

This measure reflects how a change in actuarial liability (and therefore UAL) may impact the adequacy of contributions. As this ratio increases, plan contributions (using a traditional amortization schedule) increase as a percentage of pay. Furthermore, like the Retiree Liability ratio noted above, higher ratios exacerbate the impact of investment losses on plan contributions.

SRS Actuarial Liability / Pay

Valuation Date									
2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
5.7	6.0	6.4	6.5	6.6	6.7	7.0	7.1	6.9	6.7

TRS Actuarial Liability / Pay

Valuation Date									
2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
6.8	7.1	7.3	7.5	7.6	7.6	7.7	7.8	7.4	7.4

Both systems show mostly increasing rates with decreases since 2022. For comparison with other PERAC systems, in 2014, this ratio ranged from 4.5 to 7.6. For more recent valuations this range has increased. The ratios currently range from 5.1 to 8.7. This ratio has increased for most local systems indicating increasing levels of risk.

Impact of Investment Returns on Unfunded Liability and Funded Ratio (Market Value Basis)

We have prepared a simple 5-year projection illustrating the potential impact of actual investment returns on funding levels. For this estimate, we used the market value of assets and did not attempt to develop an actuarial value of assets. In projecting the actuarial liability, we assumed the January 1, 2024 actuarial assumptions are exactly realized over the next 5 years and that there are no changes in assumptions over this period.

We first projected the market value of assets assuming the actual return for each of the next 5 years is 7.0% (the assumption used in the valuation). For comparison, we have also shown the results if the return were 3.0% each year. The 3.0% assumption is not intended to be a worst-case basis, but only to reflect the impact of a lower short-term return than the current plan assumption. As discussed earlier in the Executive Summary, projected returns are lower over the next 10 years than over the next 30 years.

State Retirement System Projections

	Valuation Date					
	2024	2025	2026	2027	2028	2029
UAL (in billions)						
7.0%	$14.9	$15.2	$15.5	$15.8	$16.1	$16.4
3.0%	$14.9	$16.6	$18.4	$20.4	$22.5	$24.7
Funded Ratio						
7.0%	70.9%	71.3%	71.8%	72.2%	72.7%	73.1%
3.0%	70.9%	68.6%	66.4%	64.1%	61.9%	59.6%

9. ACTUARIAL DISCLOSURES *(continued)*

A | RISK *(continued)*

Massachusetts Teachers' Retirement System Projections

	Valuation Date					
	2024	2025	2026	2027	2028	2029
UAL (in billions)						
7.0%	$26.4	$26.6	$26.8	$26.9	$27.0	$27.1
3.0%	$26.4	$28.1	$29.9	$31.8	$33.9	$36.1
Funded Ratio						
7.0%	59.1%	60.3%	61.4%	62.6%	63.8%	65.0%
3.0%	59.1%	58.0%	56.9%	55.7%	54.5%	53.3%

For this comparison, we assumed that for the 3.0% projections, the appropriation for the next 5 years would remain as in the current funding schedule (and the same as that if the actual returns were 7.0% per year). If returns were actually 3.0% per year, the funding schedule would need to be increased before FY29.

Cash Flow

Cash flow reflects receipts (primarily employee and employer contributions) less disbursements (primarily benefit payments and expenses). We use the information provided in the Annual Statement but subtract any investment income credit or excess investment income entries from the total receipts. Then we measure the ratio of receipts to disbursements. A ratio greater than 1.0 means receipts are greater than disbursements (positive cash flow). Likewise, a ratio less than 1.0 means receipts are less than disbursements (negative cash flow).

Most Massachusetts public systems have negative cash flow. This is not a significant issue for long-term funding but presents potential issues for short-term funding. All else being equal, over the short term, a negative cash flow produces a yearly funded ratio lower than it would have been if there were positive cash flow. This is because a portion of the investment earnings are being used to pay the net benefits and expenses. Therefore, less of the investment earnings are included in the end of the year value of the plan assets resulting in a lower MVA and a lower funded ratio. This may dampen funded ratio expectations somewhat when reviewing 5-year projections. The SRS has ratios of 0.68, 0.74 and 0.73 using the 2021, 2022 and 2023 Annual Statements respectively. The TRS has ratios of 0.84, 0.93 and 0.93 using the 2021, 2022 and 2023 Annual Statements respectively. Since the ratios are significantly less than 1.0, there may be an appreciable impact on our 5-year funded ratio projections.

9. ACTUARIAL DISCLOSURES *(continued)*

B | LOW-DEFAULT-RISK OBLIGATION MEASURE (LDROM)

For plan years after February 15, 2023, Actuarial Standard of Practice Number 4 (ASOP 4) requires the disclosure of a new liability measure. This measure is known as the Low-Default-Risk Obligation Measure (LDROM). The LDROM is calculated using a different discount rate than the discount rate used for funding purposes. The discount rate used for the LDROM is based on the short duration Financial Times Stock Exchange (FTSE) Pension Liability Index published as of December 31, 2023. The LDROM discount rate will typically be vastly lower than the discount rate based on the plan's actual investment portfolio. As a result, the LDROM will be significantly greater than the plan's funding liability. For the LDROM calculation this year, we used a discount rate of 4.76%.

The LDROM is not intended to be a measure of the plan's funding nor is it intended to be a measure of the plan's health. Most importantly, the LDROM is not the "true measure" of the plan's liabilities.

	(in thousands)
LDROM Liability as of January 1, 2024	$157,410,000
Funding Actuarial Accrued Liability as of January 1, 2024	$120,818,654

The LDROM helps understand the cost of investing in an all-bond portfolio and significantly lowering expected long-term investment returns. The funded status and Actuarially Determined Contributions are determined using the expected return on assets which reflects the actual investment portfolio. Benefit security for members of the plan relies on a combination of the assets in the plan, the investment returns generated on those assets and the promise of future contributions from the plan sponsors.

Since the assets are not invested in an all-bond portfolio, the LDROM does not indicate the funding status or progress, nor provide information on necessary plan contributions or the security of plan participants. The difference between the plan's Actuarial Accrued Liability and the LDROM can be thought of as representing the expected taxpayer savings from investing in the plan's diversified portfolio compared to investing only in high quality bonds.

C | REASONABLE ACTUARIALLY DETERMINED CONTRIBUTION (ADC)

For plan years after February 15, 2023, Actuarial Standard of Practice Number 4 (ASOP 4) also requires the disclosure of a reasonable Actuarially Determined Contribution (ADC). This reasonable ADC, if different from the Commonwealth's scheduled ADC, is not intended to be the Commonwealth's true funding measure. We believe that the Commonwealth's current schedule meets the requirements of a reasonable amortization method under ASOP 4. As such, the Commonwealth's reasonable ADC for FY25 is equal to the scheduled FY25 payment of $4.50 billion.

D | ACTUARIAL MODELS

The software used in our actuarial valuations measures the present value of the plan's actuarial liabilities from which we develop funding schedules that determine annual appropriations for each system. The software was created and is maintained by a national vendor of actuarial software. We have used this software for over 25 years. We periodically review the results of the software by analyzing detailed individual test lives and have compared our results to those of other actuaries using the same data set. The valuation output is prepared before a final review by the actuary.

In addition, we used a simple projection model prepared in a spreadsheet, to perform a rough analysis of the impact of investment returns on the unfunded actuarial liability and funded ratio for the next five years. The work is tailored to each valuation and reviewed by the actuary.

10. ACTUARIAL ASSUMPTIONS

Investment Return/Discount Rate

7.0% per year net of investment expenses *(same as the prior assumption)*

The investment return assumption is a long-term assumption and is based on capital market expectations by asset class, historical returns, and professional judgment. We considered analysis prepared by PRIM's investment advisor using a building block approach which included expected returns by asset class, risk analysis, and the determination of a 30-year expected target rate of return.

Discount Rate (for LDROM only)

4.76% (based on short duration FTSE Pension Liability Index published as of December 31, 2023)

Inflation

2.5% per year

Interest Rate Credited to the Annuity Savings Fund

3.5% per year

Assumed Rate of Cost-of-Living Increases (COLA)

3.0% per year (on the first $13,000 of an allowance; $15,000 for Boston teachers)

Mortality

State:
Pre-retirement mortality reflects the RP-2014 Blue Collar Employees table projected generationally with Scale MP-2021, set forward 1 year for females. *(Same as the prior assumption)*

Post-retirement mortality reflects the RP-2014 Blue Collar Healthy Annuitant table projected generationally with Scale MP-2021, set forward 1 year for females. *(Same as the prior assumption)*

For disabled retirees, mortality reflects the post-retirement mortality described in the previous paragraph, set forward 1 year. *(Same as the prior assumption)*

Teachers:
Pre-retirement mortality reflects SOA Pub-2010 Teachers (headcount) Employees table projected generationally with MP-2021 (gender distinct). *(Same as the prior assumption.)*

Post-retirement mortality reflects SOA Pub-2010 Teachers (headcount) Healthy Retirees table projected generationally with MP-2021 (gender distinct). *(Same as the prior assumption)*

For disabled members, the mortality reflects SOA Pub-2010 Teachers (headcount) Healthy Retirees table projected generationally with MP-2021 (gender distinct). *(Same as the prior assumption)*

It is assumed that 75% of pre-retirement deaths are job-related for Group 1 and 2 members and 90% are job-related for Group 4 members. For members retired under an Accidental Disability, 40% of deaths are assumed to be from the same cause as the disability.

10. ACTUARIAL ASSUMPTIONS *(continued)*

Mortality ***(continued)***

The mortality assumptions reflect our recent experience analysis published in 2014 (based on the years 2006-2011), updated to reflect actual experience from 2012 through 2016 for post-retirement mortality, and professional judgment. As such, this assumption reflects observed current mortality as well as expected mortality improvement.

Salary Increase

Service	Groups 1&2	Group 3	Group 4
0	7.00%	7.00%	9.00%
1	6.50%	7.00%	8.00%
2	6.00%	7.00%	7.50%
3	5.50%	7.00%	7.00%
4	5.50%	6.75%	6.75%
5	5.25%	6.25%	6.25%
6	5.00%	5.25%	5.75%
7	4.75%	4.75%	5.25%
8-12	4.75%	4.75%	4.75%
13-15	4.50%	4.75%	4.75%
16-19	4.25%	4.75%	4.75%
20+	4.00%	4.50%	4.50%

Service	Teachers
0	7.50%
1	7.10%
2	7.00%
3	6.90%
4	6.80%
5	6.70%
6	6.60%
7	6.50%
8	6.30%
9	6.10%
10	5.90%
11	5.70%
12	5.20%
13	4.70%
14	4.35%
15-16	4.20%
17-19	4.10%
20+	4.00%

The salary increase assumption reflects both prior experience (2014 study) and professional judgment.

10. ACTUARIAL ASSUMPTIONS *(continued)*

Retirement

State

	Group 1		Group 2	Group 3	Group 4
Age	Male	Female			
45	0.000	0.000	0.000	0.020	0.060
46	0.000	0.000	0.000	0.020	0.060
47	0.000	0.000	0.000	0.050	0.060
48	0.000	0.000	0.000	0.050	0.060
49	0.000	0.000	0.000	0.050	0.060
50	0.010	0.015	0.020	0.050	0.060
51	0.010	0.015	0.020	0.060	0.060
52	0.010	0.020	0.020	0.070	0.060
53	0.010	0.025	0.030	0.080	0.075
54	0.020	0.025	0.040	0.090	0.150
55	0.020	0.055	0.075	0.100	0.250
56	0.025	0.065	0.075	0.100	0.150
57	0.025	0.065	0.080	0.110	0.150
58	0.050	0.065	0.100	0.110	0.150
59	0.065	0.065	0.120	0.120	0.150
60	0.120	0.050	0.150	0.140	0.200
61	0.200	0.130	0.150	0.150	0.200
62	0.300	0.150	0.150	0.150	0.200
63	0.250	0.125	0.150	0.150	0.200
64	0.220	0.180	0.200	0.250	0.300
65	0.400	0.150	0.200	0.250	0.500
66	0.250	0.200	0.200	0.250	0.250
67	0.250	0.200	0.200	0.250	0.250
68	0.300	0.250	0.200	0.250	0.250
69	0.300	0.200	0.200	0.250	0.250
70 and after	1.000	1.000	1.000	1.000	1.000

Retirement rates are based on our most recent experience analysis which reviewed age, service, gender and job group. The assumption reflects this analysis as well as professional judgment.

10. ACTUARIAL ASSUMPTIONS *(continued)*

Retirement ***(continued)***

Teachers

Males

	Not in Retirement Plus	
Age	Less than 20	20+
47	0.000	0.000
48	0.000	0.000
49	0.000	0.000
50	0.000	0.020
51	0.000	0.020
52	0.000	0.020
53	0.000	0.020
54	0.000	0.030
55	0.035	0.030
56	0.035	0.035
57	0.050	0.040
58	0.055	0.050
59	0.060	0.060
60	0.075	0.150
61	0.120	0.250
62	0.140	0.300
63	0.140	0.300
64	0.140	0.300
65	0.300	0.300
66	0.300	0.250
67	0.300	0.250
68	0.300	0.250
69	0.300	0.250
70+	1.000	1.000

	Retirement Plus		
Age	Less than 20	20-30	30+
47	0.00	0.000	0.00
48	0.00	0.000	0.00
49	0.00	0.000	0.00
50	0.00	0.010	0.02
51	0.00	0.010	0.02
52	0.00	0.010	0.02
53	0.00	0.015	0.02
54	0.00	0.025	0.02
55	0.05	0.030	0.06
56	0.05	0.060	0.20
57	0.05	0.100	0.40
58	0.05	0.150	0.50
59	0.10	0.200	0.50
60	0.10	0.250	0.40
61	0.20	0.300	0.40
62	0.20	0.350	0.35
63	0.25	0.400	0.35
64	0.25	0.400	0.35
65	0.25	0.400	0.35
66	0.30	0.300	0.40
67	0.30	0.300	0.40
68	0.30	0.300	0.40
69	0.30	0.300	0.40
70+	1.00	1.000	1.00

10. ACTUARIAL ASSUMPTIONS *(continued)*

Retirement ***(continued)***

Teachers

Females

	Not in Retirement Plus	
Age	Less than 20	20+
47	0.000	0.000
48	0.000	0.000
49	0.000	0.000
50	0.000	0.010
51	0.000	0.010
52	0.000	0.015
53	0.000	0.020
54	0.000	0.020
55	0.035	0.040
56	0.035	0.040
57	0.035	0.040
58	0.050	0.060
59	0.065	0.080
60	0.085	0.150
61	0.100	0.200
62	0.120	0.200
63	0.120	0.250
64	0.200	0.300
65	0.300	0.400
66	0.300	0.300
67	0.300	0.300
68	0.300	0.300
69	0.300	0.300
70+	1.000	1.000

	Retirement Plus		
Age	Less than 20	20-30	30+
47	0.00	0.00	0.000
48	0.00	0.00	0.000
49	0.00	0.00	0.000
50	0.00	0.01	0.015
51	0.00	0.01	0.015
52	0.00	0.01	0.015
53	0.00	0.01	0.015
54	0.00	0.01	0.020
55	0.03	0.03	0.050
56	0.03	0.05	0.150
57	0.04	0.08	0.350
58	0.08	0.10	0.350
59	0.08	0.15	0.350
60	0.10	0.20	0.350
61	0.12	0.25	0.350
62	0.12	0.30	0.350
63	0.15	0.30	0.350
64	0.20	0.30	0.350
65	0.25	0.40	0.350
66	0.25	0.30	0.350
67	0.30	0.30	0.300
68	0.30	0.30	0.300
69	0.30	0.30	0.300
70+	1.00	1.00	1.000

Retirement rates are based on our most recent experience analysis (2014) which reviewed age, service, gender, and job group. The assumption reflects this analysis and professional judgment.

10. ACTUARIAL ASSUMPTIONS *(continued)*

Withdrawal

Based on analysis of past experience. For Groups 1 and 2, rates are both age and service based for service up to 10 years. After 10 years, rates are age based. In addition to be age and service based, Teacher rates are also gender based. For Groups 3 and 4 rates are service based. Sample annual rates are shown below.

State

	Groups 1 & 2		
Age	Service		
	0	5	10+
20	0.270	0.120	0.045
30	0.230	0.100	0.045
40	0.160	0.080	0.030
50	0.180	0.060	0.030

Groups 3 & 4		
Service	Group 3	Group 4
0	0.007	0.090
5	0.007	0.060
10	0.005	0.035
15	0.005	0.020
20+	0.005	0.015

Teachers

	Service					
	0		5		10+	
Age	Male	Female	Male	Female	Male	Female
20	0.130	0.100	0.055	0.070	0.015	0.050
30	0.150	0.150	0.054	0.088	0.015	0.045
40	0.133	0.105	0.052	0.050	0.017	0.022
50	0.162	0.098	0.070	0.050	0.023	0.020

See the next page for an explanation of withdrawal rates for employees hired on or after April 2, 2012.

Withdrawal rates are based on our most recent experience analysis (2014) which reviewed age, gender and job group. Final assumptions reflect this analysis as well as professional judgment.

Disability

Based on an analysis of past experience. Sample annual rates are shown below.

Age	Group 1	Group 2	Group 3	Group 4	Teachers
20	0.00010	0.00052	0.0010	0.0020	0.00004
30	0.00010	0.00072	0.0016	0.0021	0.00006
40	0.00068	0.00210	0.0036	0.0071	0.00010
50	0.00133	0.00420	0.0094	0.0110	0.00050
60	0.00120	0.00500	0.0430	0.0080	0.00070

It is also assumed that the percentage of job-related disabilities is 75% for Group 1 and 2 members (other than teachers), 95% for Group 3 and 4 members, and 35% for teachers.

Disability rates are based on our most recent experience analysis (2014) which reviewed age, gender and job group. Final assumptions reflect this analysis as well as professional judgment.

10. ACTUARIAL ASSUMPTIONS *(continued)*

Loading and Administrative Expenses

State:

We increased the normal cost by 2% and the actuarial accrued liability of active members by 1.75% to account for certain Chapter 32 benefits that cannot be readily valued with our software system. Such benefits include, but are not limited to, benefits provided under Sections 10, 28M, 28N, 65D, and 100. In addition, we increased the normal cost by 1.5% and the actuarial accrued liability of active members by 0.75% million to estimate the impact of potential changes in job group status for certain members of DMH and Social Services.

Teachers:

We increased the normal cost by 2% and the actuarial accrued liability of active members by 1% to account for buybacks at retirement and various data issues including the status of members with reported pay of less than $20,000.

Boston Teachers:

We increased the normal cost by 2% and the actuarial accrued liability of active members by 1%.

Members Hired on or After April 2, 2012

Chapter 176 of the Acts of 2011 changed the retirement eligibility for the different job groups. For example, Group 1 eligibility changed from 55 years old with 10 years of service to 60 years old with 10 years of service (Chapter 176 removed the provision that allowed retirement at any age with 20 years of service). Our software system is programmed such that at any given age, a member is assumed to either retire or terminate, but not both. Therefore, we adjusted the retirement and termination rates for members impacted by Chapter 176. For example, for Group 1 members, we removed retirement rates for ages 50-59. Termination rates remain in effect for those years. We will monitor these assumptions going forward.

Family Composition

It is assumed that 80% of plan participants are married and that the male spouse is 3 years older than the female spouse.

11. SUMMARY OF PLAN PROVISIONS

ADMINISTRATION

There are 104 contributory retirement systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by Chapter 32 of the Massachusetts General Laws. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.

PARTICIPATION

Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the retirement board, and approved by PERAC. Membership is optional for certain elected officials.

There are 4 classes of membership under Chapter 32, but one of these classes, Group 3, is made up exclusively of the State Police who are in the State Retirement System. The other 3 classes are as follows:

Group 1:

General employees, including clerical, administrative, technical and all other employees not otherwise classified, as well as all teachers.

Group 2:

Certain specified hazardous duty positions.

Group 3:

Officers and inspectors of the Department of State Police.

Group 4:

Police officers, firefighters, and other specified hazardous positions.

MEMBER CONTRIBUTIONS

Member contributions vary depending on the most recent date of membership:

Prior to 1975:	5% of regular compensation
1975 - 1983:	7% of regular compensation
1984 to 6/30/96:	8% of regular compensation
7/1/96 to present:	9% of regular compensation
7/1/96 to present:	12% of regular compensation for State Police officers
7/1/01 to present:	11% of regular compensation (for teachers hired after 7/1/01 and those accepting the provisions of Chapter 114 of the Acts of 2000)
1979 to present:	an additional 2% of regular compensation in excess of $30,000 except for teachers subject to Chapter 114 of the Acts of 2000.

In addition, members of Group 1 who join the system on or after April 2, 2012 will have their withholding rate reduced to 6 % after achieving 30 years of creditable service.

11. SUMMARY OF PLAN PROVISIONS *(continued)*

RATE OF INTEREST

Interest on regular deductions made after January 1, 1984 is a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average rates paid on individual savings accounts by a representative sample of at least 10 financial institutions.

RETIREMENT AGE

The mandatory retirement age for some Group 2 and Group 4 employees is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 2 and Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for employees in Group 1.

SUPERANNUATION RETIREMENT

A person who became a member before April 2, 2012 is eligible for a superannuation retirement allowance (service retirement) upon meeting the following conditions:

- completion of 20 years of service, or
- attainment of age 55 if hired prior to 1978, or if classified in Group 4, or
- attainment of age 55 with 10 years of service, if hired after 1978, and if classified in Group 1 or 2

A person who became a member on or after April 2, 2012 is eligible for a superannuation retirement allowance (service retirement) upon meeting the following conditions:

- attainment of age 60 with 10 years of service if classified in Group 1, or
- attainment of age 55 with 10 years of service if classified in Group 2, or
- attainment of age 55 if classified in Group 4.

AMOUNT OF SUPERANNUATION BENEFIT

A member's annual allowance is determined by multiplying average salary by a benefit rate related to the member's age and job classification at retirement, and the resulting product by his creditable service. The amount determined by the benefit formula cannot exceed 80% of the member's highest three year (or five year salary as discussed below) average salary. For veterans as defined in G.L. c. 32, s. 1, there is an additional benefit of $15 per year for each year of creditable service, up to a maximum of $300.

- Salary is defined as gross regular compensation. For persons who become members after January 1, 2011, regular compensation is limited to 64% of the federal limit found in 26 U.S.C. 401(a)(17). In addition, regular compensation for members who retire after April 2, 2012 will be limited to prohibit "spiking" of a member's salary to increase the retirement benefit.

- For persons who became members prior to April 2, 2012, Average Salary is the average annual rate of regular compensation received during the 3 consecutive years that produce the highest average, or, if greater, during the last 3 years (whether or not consecutive) preceding retirement.

11. SUMMARY OF PLAN PROVISIONS *(continued)*

AMOUNT OF SUPERANNUATION BENEFIT *(continued)*

• For persons who became members on or after April 2, 2012, Average Salary is the average annual rate of regular compensation received during the 5 consecutive years that produce the highest average, or, if greater, during the last 5 years (whether or not consecutive) preceding retirement.

• The Benefit Rate varies with the member's retirement age. For persons who became members prior to April 2, 2012 the highest rate of 2.5% applies to Group 1 employees who retire at or after age 65, Group 2 employees who retire at or after age 60, and to Group 4 employees who retire at or after age 55. A .1% reduction is applied for each year of age under the maximum age for the member's group. For Group 2 employees who terminate from service under age 55, the benefit rate for a Group 1 employee shall be used.

• For persons who became members on or after April 2, 2012 and retire with less than 30 years of creditable service, the highest rate of 2.5% applies to Group 1 employees who retire at or after age 67, Group 2 employees who retire at or after age 62, and to Group 4 employees who retire at or after age 57. A .15% reduction is applied for each year of age under the maximum age for the member's group.

• For persons who became members on or after April 2, 2012 and retire with more than 30 years of creditable service, the highest rate of 2.5% applies to Group 1 employees who retire at or after age 67, Group 2 employees who retire at or after age 62, and to Group 4 employees who retire at or after age 57. A .125% reduction is applied for each year of age under the maximum age for the member's group.

• For a teacher who became a member prior to April 2, 2012 and is subject to the provisions of Chapter 114 of the Acts of 2000 and who has completed at least 30 years of creditable service, the benefit rate is multiplied by the creditable service and the resulting percentage is increased by 2% per year for each year of service in excess of 24. The amount determined cannot exceed 80% of the average salary.

• For a teacher who became a member on or after April 2, 2012 and is subject to the provisions of Chapter 114 of the Acts of 2000 and who has completed at least 30 years of creditable service, the benefit rate is multiplied by the creditable service and the resulting percentage is increased by 2% per year for each year of service in excess of 23. The amount determined cannot exceed 80% of the average salary.

• The allowance of State Police officers is calculated using a slightly different formula. Information regarding this formula can be obtained directly from the State Retirement Board.

DEFERRED VESTED BENEFIT

A participant who has attained the requisite years of creditable service can elect to defer his or her retirement until a later date. Certain public safety employees cannot defer beyond age 65. All participants must begin to receive a retirement allowance or withdraw their accumulated deductions no later than April 15 of the calendar year following the year they reach age 73.

WITHDRAWAL OF CONTRIBUTIONS

Member contributions may be withdrawn upon termination of employment. The interest rate for employees who first become members on or after January 1, 1984 who voluntarily withdraw their contributions with less than 10 years of service will be 3%. Interest payable on all other withdrawals will be set at regular interest.

11. SUMMARY OF PLAN PROVISIONS *(continued)*

DISABILITY RETIREMENT

The Massachusetts Retirement Plan provides 2 types of disability retirement benefits:

ORDINARY DISABILITY

Eligibility: Non-veterans who become totally and permanently disabled by reason of a non-job-related condition with at least 10 years of creditable service (or 15 years creditable service in systems in which the local option contained in G.L. c. 32, s.6(1) has not been adopted).

Veterans with ten years of creditable service who become totally and permanently disabled by reason of a non-job-related condition prior to reaching "maximum age". "Maximum age" applies only to employees classified in Group 4 who are subject to mandatory retirement.

Retirement Allowance: For persons who became members prior to April 2, 2012, the benefit is equal to the accrued superannuation retirement benefit as if the member was age 55. If the member is a veteran, the benefit is 50% of the member's final rate of salary during the preceding 12 months, plus an annuity based upon accumulated member contributions plus credited interest. If the member is over age 55, he or she will receive not less than the superannuation allowance to which he or she is entitled.

For persons in Group 1 who became members on or after April 2, 2012, the benefit is equal to the accrued superannuation retirement benefit as if the member was age 60. If the member is a veteran, the benefit is 50% of the member's final rate of salary during the preceding 12 months, plus an annuity based upon accumulated member contributions plus credited interest. If the member is over age 60, he or she will receive not less than the superannuation allowance to which he or she would have been entitled had they retired for superannuation.

For persons in Group 2 and Group 4 who became members on or after April 2, 2012, the benefit is equal to the accrued superannuation retirement benefit as if the member was age 55. If the member is a veteran, the benefit is 50% of the member's final rate of salary during the preceding 12 months, plus an annuity based upon accumulated member contributions plus credited interest. If the member is over age 55, he or she will receive not less than the superannuation allowance to which he or she is entitled.

ACCIDENTAL DISABILITY

Eligibility: Applies to members who become permanently and totally unable to perform the essential duties of the position as a result of a personal injury sustained or hazard undergone while in the performance of duties. There are no minimum age or service requirements.

Retirement Allowance: 72% of salary plus an annuity based on accumulated member contributions, with interest. This amount is not to exceed 100% of pay. For those who became members in service after January 1, 1988 or who have not been members in service continually since that date, the amount is limited to 75% of pay. There is an additional pension of $1,092.60 per year, per child who is under 18 at the time of the member's retirement, with no age limitation if the child is mentally or physically incapacitated from earning. The additional pension may continue up to age 22 for any child who is a full-time student at an accredited educational institution. For systems that have adopted Chapter 157 of the Acts of 2005, veterans as defined in G.L. c. 32, s. 1 receive an additional benefit of $15 per year for each year of creditable service, up to a maximum of $300.

11. SUMMARY OF PLAN PROVISIONS *(continued)*

ACCIDENTAL DEATH

Eligibility: Applies to members who die as a result of a work-related injury or if the member was retired for accidental disability and the death was the natural and proximate result of the injury or hazard undergone on account of which such member was retired.

Allowance: An immediate payment to a named beneficiary equal to the accumulated deductions at the time of death, plus a pension equal to 72% of current salary and payable to the surviving spouse, dependent children or the dependent parent, plus a supplement of $1,092.60 per year, per child, payable to the spouse or legal guardian until all dependent children reach age 18 or 22 if a full time student, unless mentally or physically incapacitated.

The surviving spouse of a member of a police or fire department or any corrections officer who, under specific and limited circumstances detailed in the statute, suffers an accident, and is killed or sustains injuries while in the performance of his duties that results in his death, may receive a pension equal to the maximum salary for the position held by the member upon his death.

In addition, an eligible family member may receive a one-time payment of $300,000.00 from the State Retirement Board.

DEATH AFTER ACCIDENTAL DISABILITY RETIREMENT

Effective November 7, 1996, Accidental Disability retirees were allowed to select Option C at retirement and provide a benefit for an eligible survivor. For Accidental Disability retirees prior to November 7, 1996, who could not select Option C, if the member's death is from a cause unrelated to the condition for which the member received accidental disability benefits, a surviving spouse will receive an annual allowance of $12,000.

DEATH IN ACTIVE SERVICE *(OPTION D)*

Allowance: An immediate allowance equal to that which would have been payable had the member retired and selected Option C on the day before his or her death. For a member who became a member prior to April 2, 2012 whose death occurred prior to the member's minimum superannuation retirement age, the age 55 benefit rate is used. For a member classified in Group 1 who became a member on or after April 2, 2012 whose death occurred prior to the member's minimum superannuation retirement age, the age 60 benefit rate is used. If the member died after age 60, the actual age is used. For a member classified in Group 2 or Group 4 who became a member on or after April 2, 2012 and whose death occurred prior to the member's minimum superannuation retirement age, the benefit shall be calculated using an age 55 factor. The minimum annual allowance payable to the surviving spouse of a member in service who dies with at least two years of creditable service is $6,000, provided that the member and the spouse were married for at least one year and living together on the member's date of death.

The surviving spouse of such a member in service receives an additional allowance equal to the sum of $1,440 per year for the first child and $1,080 per year for each additional child until all dependent children reach age 18 or 22 if a full-time student, unless mentally or physically incapacitated.

11. SUMMARY OF PLAN PROVISIONS *(continued)*

COST OF LIVING

A cost of living adjustment (COLA) is determined based on the increase in the Consumer Price Index (CPI) used for indexing Social Security benefits, but cannot exceed 3.0% of the first $13,000 of a retiree's benefit. For Boston teachers, the COLA cannot exceed 3% on the first $15,000 of a retiree's benefit.

METHODS OF PAYMENT

A member may elect to receive his or her retirement allowance in one of 3 forms of payment.

Option A: Total annual allowance, payable in monthly installments, commencing at retirement and terminating at the member's death.

Option B: A reduced annual allowance, payable in monthly installments, commencing at retirement and terminating at the death of the member, provided, however, that if the total amount of the annuity portion received by the member is less than the amount of his or her accumulated deductions, including interest, the difference or balance of his accumulated deductions will be paid in a lump sum to the retiree's beneficiary or beneficiaries of choice.

Option C: A reduced annual allowance, payable in monthly installments, commencing at retirement. At the death of the retired employee, 2/3 of the allowance is payable to the member's designated beneficiary (who may be the spouse, or former spouse who is unmarried at the time of retirement for a member whose retirement becomes effective on or after February 2, 1992, child, parent, sister, or brother of the employee) for the life of the beneficiary. For members who retired on or after January 12, 1988, if the beneficiary pre-deceases the retiree, the benefit payable increases (or "pops up" to Option A) based on the factor used to determine the Option C benefit at retirement. For members who retired prior to January 12, 1988, if the System has accepted Section 288 of Chapter 194 of the Acts of 1998 and the beneficiary pre-deceases the retiree, the benefit payable "pops up" to Option A in the same fashion. The Option C became available to accidental disability retirees on November 7, 1996.

ALLOCATION OF PENSION COSTS

If a member's total creditable service was partly earned by employment in more than one retirement system, the cost of the "pension portion" is allocated between the different systems pro rata based on the member's service within each retirement system. If a member received regular compensation concurrently from two or more systems on or after January 1, 2010, and was not vested in both systems as of January 1, 2010, such a pro-ration will not be undertaken. This is because such a person will receive a separate retirement allowance from each system.

12. GLOSSARY OF TERMS

Actuarial Accrued Liability – That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

Actuarial Assumptions – Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the amount and duration of pension benefits, such as: mortality, withdrawal, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

Actuarial Cost Method (or Funding Method) – A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the Normal Cost and the Actuarial Accrued Liability.

Actuarial Gain or Loss (or Experience Gain or Loss) – A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between two Actuarial Valuation dates.

> **Note:** The effect on the Accrued Liability and/or the Normal Cost resulting from changes in the Actuarial Assumptions, the Actuarial Cost Method, or pension plan provisions would be described as such, not as an Actuarial Gain (Loss).

Actuarial Present Value – The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

Amortization Payment – That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

Annual Statement - The statement submitted to PERAC each year that describes the asset holdings and Fund balances as of December 3l and the transactions during the calendar year that affected the financial condition of the retirement system.

Annuity Reserve Fund – The fund into which total accumulated deductions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

Annuity Savings Fund – The fund in which employee contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).

Assets – The value of securities as described in Section 8.

Cost of Benefits – The estimated payment from the pension system for benefits for the fiscal year. This was the minimum amount payable during the first six years of some funding schedules.

Funding Schedule – The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22(6A), Section 22D or Section 22F of M.G.L. Chapter 32.

GASB – Governmental Accounting Standards Board

Normal Cost – Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits, which is to be paid in a single fiscal year. The Employee Normal Cost is the amount of the expected employee contributions for the fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

12. GLOSSARY OF TERMS *(continued)*

Pension Fund – The fund into which appropriation amounts as determined by PERAC are deposited and from which pension benefits are paid.

Pension Reserve Fund – The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

Present Value of Future Benefits - The value on the valuation date of all of the future benefits that are expected to be paid to members of the System discounted with interest and the probability of benefit receipt

Special Fund for Military Service Credit – The fund which is credited with amounts paid by the retirement board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the retirement board. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

Unfunded Actuarial Accrued Liability – The excess of the Actuarial Accrued Liability over the Assets.

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