Commonwealth
Actuarial Valuation Report

January 1, 2014

PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION COMMISSION
COMMONWEALTH OF MASSACHUSETTS

COMMONWEALTH ACTUARIAL VALUATION REPORT

January 1, 2014

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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:

- State Employees' Retirement System (SRS)
- Massachusetts Teachers' Retirement System (TRS)
- Boston Teachers
- Cost of Living Allowance Reimbursements to Local Systems

The valuation was performed as of January 1, 2014 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 accrued liability and the normal cost reflect our recent experience analyses of SRS and TRS. Our detailed experience analysis reports were released earlier this year.

This valuation is based on member data as of December 31, 2013, 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 Massachusetts Teacher data items. Asset information as of December 31, 2013 was provided by the Pension Reserves Investment Management Board. We reviewed both the membership data and financial information for reasonableness but we did not audit this information.

I am a member of the American Academy of Actuaries and meet the Qualification Standards of the Academy to render the actuarial opinion contained in this report. In my opinion, the actuarial assumptions used in this report are reasonable, are related to plan experience and expectations, and represent my best estimate of anticipated experience. I 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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Joseph E. Connarton
Executive Director

Dated: September 23, 2014

2. EXECUTIVE SUMMARY

PART 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, are the components of the Commonwealth schedule. 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, 2014 and was based on the results of the January 1, 2013 Commonwealth Actuarial Valuation. The FY14 appropriation is $1.630 billion. This amount will increase 10% in FY15, FY16 and FY17. Therefore, the appropriations for FY15 through FY17 are respectively, $1.793 billion, $1.972 billion and $2.169 billion. Beginning in FY18, total appropriations increase 7% each year until FY35 with a final amortization payment in FY36.

The FY14 appropriation is approximately 81% of the Annual Required Contribution (ARC) developed in Section 5. 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). Although the appropriations under the adopted schedule will be less than the ARC for several years, the annual increases in the schedule allow the Commonwealth to be fully funded in approximately 20 years.

The results of the January 1, 2014 actuarial valuation are as follows (in thousands):

Total Normal Cost	$1,428,124
Expected Employee Contributions	1,100,228
Net Normal Cost	$327,896

Total Actuarial Liability	$74,936,994
Assets	45,894,034
Unfunded Actuarial Liability	$29,042,960

2. EXECUTIVE SUMMARY *(continued)*

PART B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS

A comparison of the results of the current valuation and the January 1, 2013 valuation is shown below. (Dollars in thousands)

	1/1/14	1/1/13	Increase (Decrease)	Increase (Decrease)
Total Normal Cost	$1,428,124	$1,372,224	$55,900	4.1%
Expected Employee Contributions	1,100,228	1,058,399	41,829	4.0%
Net Normal Cost	$327,896	$313,825	$14,071	4.5%
Actuarial Liability				
Actives	$31,958,004	$30,833,410	$1,124,594	3.6%
Retirees and Inactives	42,978,990	41,032,422	1,946,568	4.7%
Total	$74,936,994	$71,865,832	$3,071,162	4.3%
Assets (Actuarial Value)	45,894,034	43,517,498	2,376,536	5.5%
Unfunded Actuarial Liability	$29,042,960	$28,348,334	$694,626	2.5%
Funded Ratio	61.2%	60.6%	0.6%	

The development of the actuarial gain/(loss) is shown on page 10. During 2013, there was an overall actuarial gain of $788 million. There was a non-investment loss on actuarial liability of approximately $169 million and a gain on assets (on an actuarial value basis) of approximately $957 million. The return on assets was approximately 15.4% on a market value basis compared to 10.3% on an actuarial value basis.

Since 1998, PERAC has valued 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. Due to the severity of the 2008 investment loss and later the 2011 investment loss, the actuarial value of assets was 110% of the market value in each valuation from January 1, 2009 through January 1, 2012. The 2008 investment loss was completely recognized as of January 1, 2013 and the actuarial value of assets was 99.4% of the market value of assets at that time. The calculated actuarial value of assets as of January 1, 2014 was 94.9% of the market value. The corridor does not apply in this valuation.

2. EXECUTIVE SUMMARY *(continued)*

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

The unfunded actuarial liability (UAL) decreased from $22.1 billion on January 1, 2009 to $18.6 billion on January 1, 2011. This decrease was primarily the result of the plan being subject to the 110% corridor limit in each year and the better than assumed returns in 2009 and 2010. The UAL increased to $23.6 billion as of January 1, 2012 and to $28.3 billion as of January 1, 2013. These increases primarily reflected the final recognition of the 2008 investment loss, the increase in the COLA base to $13,000, the change from an 8.25% investment return assumption to an 8.0% assumption, and the revised actuarial assumptions (retirement, termination, disability, mortality, salary increase) based on our recent experience analyses.

The UAL increased to $29.0 billion as of January 1, 2014. If plan assumptions had been exactly realized in 2013, the UAL would have been approximately $29.4 billion.

Our detailed experience analysis reports for SRS and TRS outline the basis for the demographic assumptions used in the 2013 Commonwealth actuarial valuation. These reports encompassed the years 2006-2011 and were issued earlier this year. The experience studies analyzed salary increases and rates of retirement, disability, turnover and mortality. For this valuation, we adjusted the mortality assumption by extending the mortality improvement projection used in the 2013 valuations by two years and finalizing the TRS assumption for mortality for disability retired members. The actuarial liability increased by approximately $218 million to reflect the mortality assumption change as of January 1, 2014.

The Society of Actuaries has released a draft of a revised set of mortality tables (RP-2014 Mortality Tables), developed in the same manner as the current base table (RP-2000). The final tables are expected to be published later this year. The revised tables have limited experience related to public pension plans. Since the revised table reflects more current mortality, we would prefer to use this as the base table (in conjunction with our experience analyses) in determining the mortality assumption in 2015. It is not clear at this time how plan liabilities would be impacted.

Chapter 176 of the Acts of 2011, *An Act Providing for Pension Reform and Benefit Modernization* made a number of changes to the Chapter 32 pension law for employees hired after April 1, 2012. 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).

As of January 1, 2014, there were approximately 22,000 members hired after April 1, 2012. Since these members have less than two years of service and are generally young, there is not a significant impact on plan costs (on a percentage basis) due to the 2011 legislation in this valuation. The normal cost for these members decreased approximately $25 million and the actuarial liability decreased approximately $50 million compared to what the figures would have been under the prior provisions.

2. EXECUTIVE SUMMARY *(continued)*

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

Teachers

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

TRS implemented a new data system with the data submission used in this valuation. We identified several issues that TRS should review before the January 1, 2015 data submission. We are available to work on data and implementation issues with TRS.

Boston Teachers

There was a non-investment loss on actuarial liability of approximately $120 million during 2013. The loss was primarily due to pay increasing more than expected. Pay for continuing active members increased 8.9% from the January 1, 2013 valuation results. The reported pay increased about 12% since last year but part of that increase reflected a retroactive pay adjustment for the most recent contract settlement. We reduced the reported pay by 3.0% to reflect a 1.0% adjustment for 2011 and a 2.0% adjustment for 2012 both paid in 2013. Part of the increase is due to a timing issue as the 2013 reported pay includes pay for work performed in 2013 but paid in 2014. We worked with the Board to verify that the pay used in our valuation reflects correct pay. In addition, we reviewed pay on the City of Boston website and confirmed the reported pay matched the figures on the website (after the adjustment for the timing issue).

The disbursements during 2013 included a $98 million special redemption (transfer) for retirement payments made to teachers from non-teacher assets. Although this corrected the asset allocation between teachers and non-teachers, without this adjustment, the actuarial value of assets would have been approximately $100 million higher.

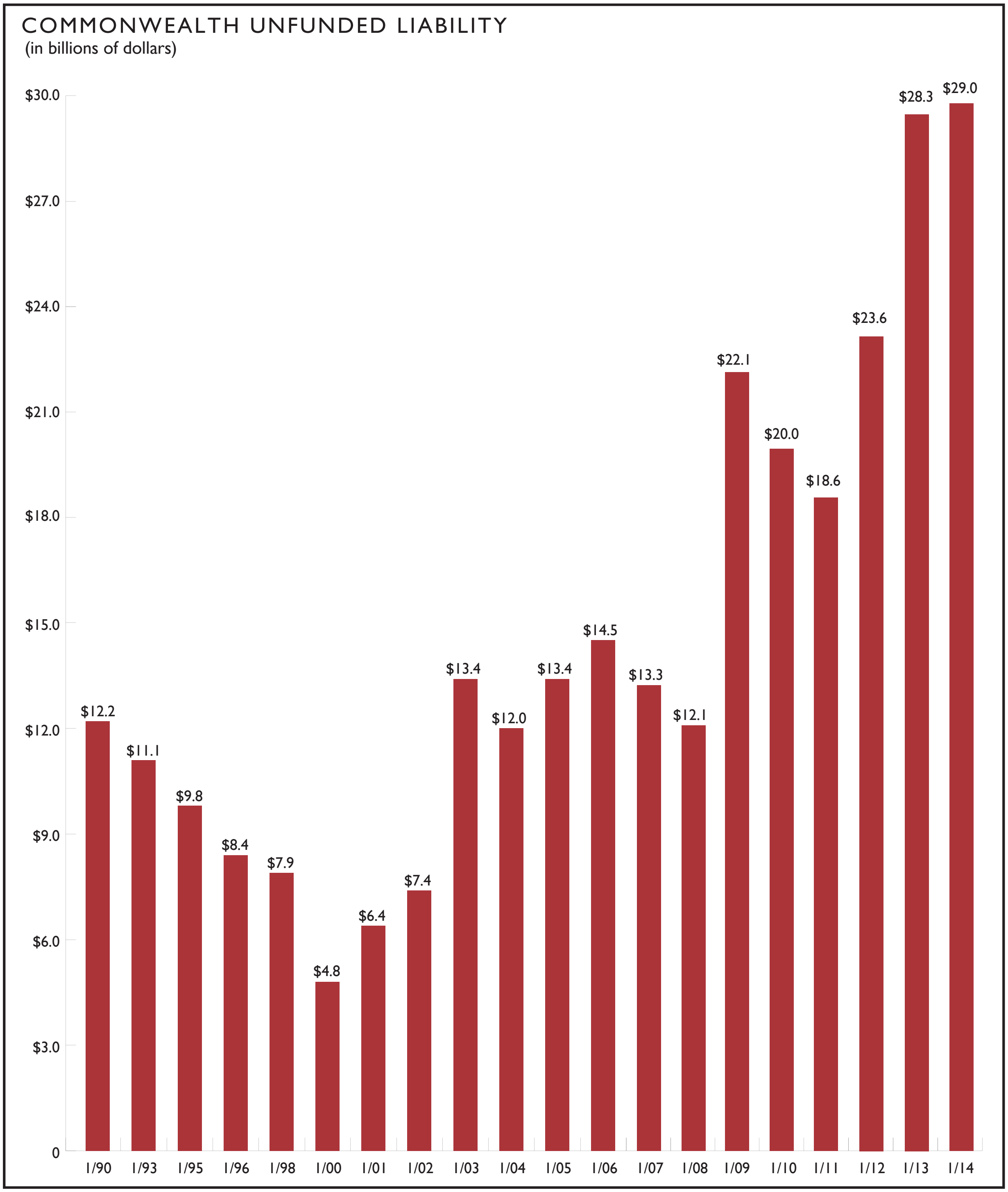
The Boston Retirement System also implemented a new data system with the data submission used in this valuation. We identified several issues that the System should review before the January 1, 2015 data submission. We are available to work on data and implementation issues with the Boston Retirement Board.

2. EXECUTIVE SUMMARY

PART C | FUNDING PROGRESS

UNFUNDED LIABILITY

The chart below shows the Commonwealth's unfunded actuarial accrued liability (UAL) since 1990. The UAL represents the actuarial accrued liability less the actuarial value of plan assets. When there is no UAL, a system is said to be "fully funded." In this exhibit, for years prior to 2000, the figures were estimated to reflect implementation of updated actuarial software.

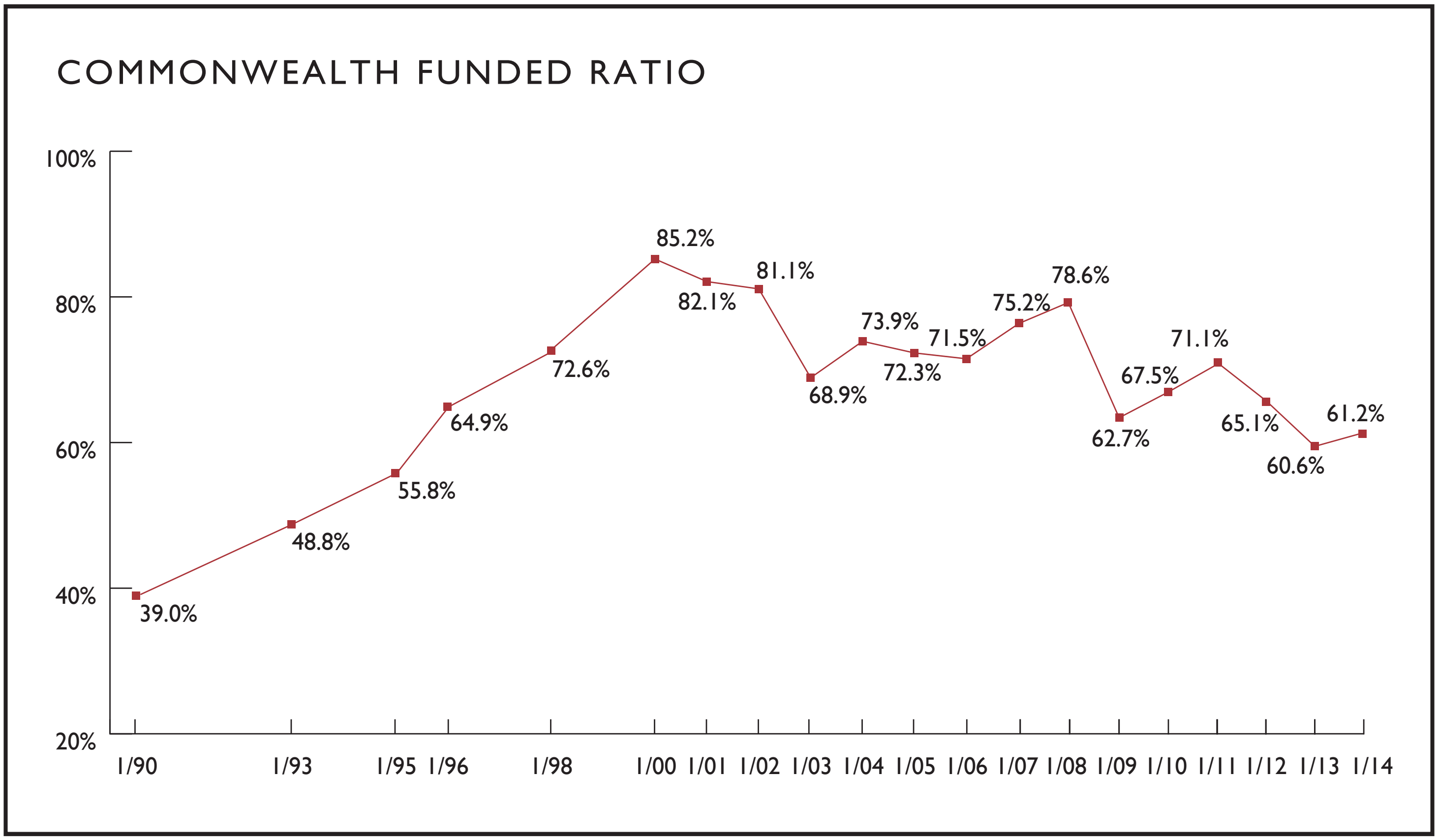


2. EXECUTIVE SUMMARY

PART C | FUNDING PROGRESS

FUNDED RATIO

The chart below shows the Commonwealth's funded ratio progress since 1990. The funded ratio represents the actuarial value of plan assets divided by the actuarial accrued liability. When the funded ratio reaches 100%, a system is said to be "fully funded." In this exhibit, for years prior to 2000, the figures were estimated to reflect implementation of updated actuarial software.



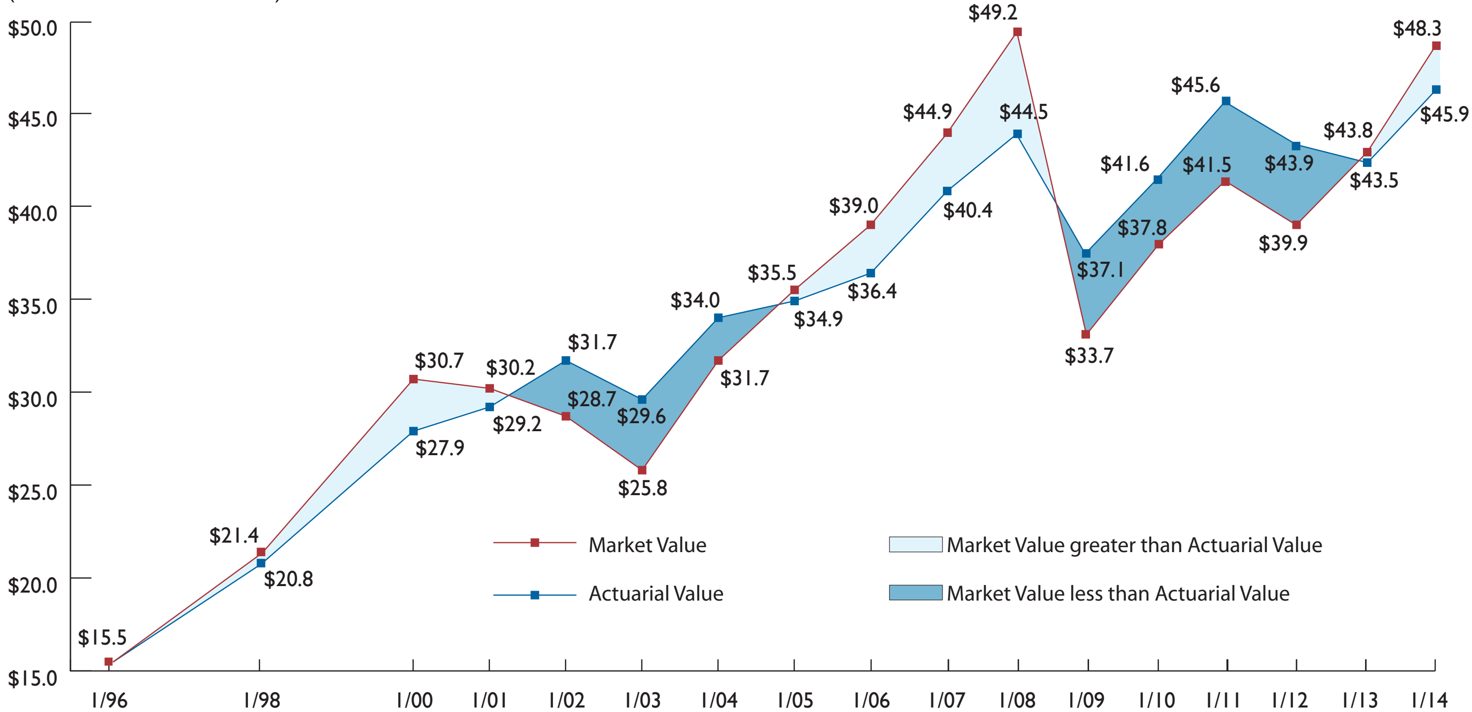
2. EXECUTIVE SUMMARY

PART C | FUNDING PROGRESS

COMPARISON OF MARKET AND ACTUARIAL VALUE OF ASSETS

In valuations prior to 1998, plan assets were determined at market value. As part of the 1998 valuation, this methodology was adjusted to reduce the potential volatility in the market value approach from year to year. The actuarial method smoothes gains and losses over a five-year period. Investment gains and losses are not fully realized until five years have elapsed. Therefore, in some years the actuarial value will be less than the market value, and in other years, it will exceed the market value.

COMPARISON of ASSET METHODOLOGIES
(in billions of dollars)



3. SUMMARY OF VALUATION RESULTS

(Dollars in thousands)

A. Number of Members	State	Mass. Teachers	Boston Teachers	Local COLA	Total
Active	88,156	88,788	5,961		182,905
Vested Terminated	4,216	0	0		4,216
Retired/ Beneficiaries	56,327	61,034	4,394		121,755
Total	148,699	149,822	10,355		308,876
B. Total Payroll	$5,344,510	$5,962,650	$486,628		$11,793,788
C. Normal Cost					
Superannuation	$472,457	$604,519	49,235		$1,126,211
Death	42,997	27,808	1,975		72,780
Disability	72,306	9,189	685		82,180
Termination	64,014	76,800	6,139		146,953
Total Normal Cost	$651,774	$718,316	$58,034		$1,428,124
Expected Employee Contributions	460,187	591,582	48,459		1,100,228
Net Employer Normal Cost	$191,587	$126,734	$9,575		$327,896
D. Actuarial Liability					
Active					
Superannuation	$13,554,681	$15,473,158	1,191,364		30,219,203
Death	298,404	227,192	17,199		542,795
Disability	370,033	84,431	6,842		461,306
Termination	316,246	388,700	29,754		734,700
Total Active	$14,539,364	$16,173,481	$1,245,159		$31,958,004
Vested Terminated (a)	666,942	600,000	34,813		1,301,755
Non-Vested Terminated	197,401	0	42,987		240,388
Retirees and Survivors	15,275,893	23,968,214	1,991,940	200,800	41,436,847
Total Actuarial Liability	$30,679,600	$40,741,695	$3,314,899	$200,800	$74,936,994
E. Actuarial Value of Assets	21,581,133	22,940,196	1,372,705	0	45,894,034
F. Unfunded Actuarial Liability	$9,098,467	$17,801,499	$1,942,194	200,800	29,042,960
G. Funded Ratio: E/D	70.3%	56.3%	41.4%	0.0%	61.2%

(a) Massachusetts Teachers' amount is estimated and includes non-vested terminated members.
Boston teachers' amount is estimated. Only the Annuity Savings Fund balance was available for inactive members.

4. DEVELOPMENT OF THE ACTUARIAL GAIN OR LOSS *(in millions)*

		State	Mass. Teachers	Boston Teachers	Local COLA	Total
A.	Gain/(loss) on Actuarial Liability					
1.	Actuarial Liability 1/1/13	29,385	39,135	3,101	244	71,865
2.	Total Normal Cost 1/1/13	628	692	52	0	1,372
3.	Interest on (1) and (2) at 8.0%	2,401	3,186	252	20	5,859
4.	Benefits paid during 2013 [a]	1,650	2,475	210	35	4,370
5.	Interest on (4) assuming mid year payment	66	99	8	1	175
6.	Expected Actuarial Liability before adjustments: (1)+(2)+(3)-(4)-(5)	30,698	40,439	3,187	227	74,551
7.	Increase due to change in mortality assumption	102	108	8	0	218
8.	Expected Actuarial Liability 1/1/14: (6)+(7)	30,800	40,547	3,195	227	74,769
9.	Actuarial Liability 1/1/14	30,680	40,742	3,315	201	74,938
10.	Gain/(loss): (8)-(9)	120	(195)	(120)	26	(169)
B.	Gain/(loss) on assets					
11.	Actuarial Value of Assets (AVA) 1/1/13	20,317	21,787	1,413	0	43,517
12.	Interest on (11) at 8.0%	1,625	1,743	113	0	3,481
13.	Net Receipts [b]	543	701	100	0	1,344
14.	Net Disbursements [b]	1,315	1,747	264	0	3,326
15.	Net Cash Flow: (13)-(14)	(772)	(1,046)	(164)	0	(1,982)
16.	Interest on (15) [c]	(31)	(42)	(7)	0	(79)
17.	Expected AVA 1/1/14: (11)+(12)+(15)+(16)	21,139	22,442	1,355	0	44,937
18.	AVA 1/1/14	21,581	22,940	1,373	0	45,894
19.	Gain/(loss): (18)-(17)	442	498	18	0	957
C.	Total Gain/(loss): (10)+(19)	562	303	(103)	26	788

[a] Estimated

[b] Amounts actually received or disbursed by the fund.

[c] Assumes time weighting based on monthly cash flow. Boston Teachers assumed mid year.

Figures may not add due to rounding.

5. AUDIT INFORMATION

PART A | OVERVIEW

We have included the actuarial information required by GASB Statement No. 27 in this report. The Commonwealth of Massachusetts began implementing Statement No. 27 in Fiscal Year 1996.

Under GASB Statement No. 27, an Annual Required Contribution (ARC) must be calculated each year. The same methods and assumptions that are used to determine funding requirements are used in this calculation. At this time, the methods and assumptions used by the Commonwealth to determine the funding schedule are well within the parameters established by Statement No. 27.

When GASB 27 was implemented in FY96, a Net Pension Obligation (NPO) at transition was calculated. This was essentially the cumulative difference between the employer's required contributions and the contributions actually made by the employer for all years, beginning with Fiscal Year 1988. In each year since FY96, the NPO has been updated.

After the January 1, 2006 actuarial valuation was released, the Comptroller's office requested we recalculate the GASB 27 development from inception through FY06 assuming a zero pension obligation as of June 30, 1997. Those results were first shown in the January 1, 2007 valuation report.

As part of this valuation, we brought the NPO forward from FY13 to FY14. For FY14, the amortization cost was determined using a 4.0% annual increasing amortization to FY40 (minimum schedule under Chapter 32). The current schedule used by the Commonwealth has a FY14 appropriation of $1.630 billion and increases by 10% in FY15, FY16, and FY17. Beginning in FY18, the appropriation increases 7% each year until FY35 with a final amortization payment in FY36.

Note that, in any year, the <u>amount</u> of the ARC will not equal the Commonwealth's appropriation amounts for the following reasons:

1. The ARC is based upon the most recent valuation, whereas the funding schedule is generally submitted to the legislature 15 months after the valuation upon which it is based. The funding schedule is then set for the upcoming three fiscal years.

2. Amortization bases of actuarial gains and losses and plan amendments may be amortized on a different basis than the rest of the funding schedule. However, the amortization cost that GASB 27 reflects is an amortization of the entire unfunded liability which is roughly equivalent to the current schedule. The initial current schedule amounts are less than the ARC based on the FY40 schedule described above. However, the scheduled appropriations increase faster than the FY40 schedule and the scheduled payments should exceed the ARC by FY21.

3. Although there is no difference in the totals, until FY11 contributions had been allocated in a slightly different manner between the State and local COLA portions. For purposes of Statement No. 27, a larger contribution was made to the State, with a lesser amount to the COLA. This was done so the NPO for the local COLA remained at zero. No assets are attributed to the local COLA. We stopped making this adjustment in FY11.

5. AUDIT INFORMATION *(continued)*

PART B | GASB STATEMENT NO. 27 (Dollars in thousands)

	State	Mass. Teachers	Boston Teachers	Local COLA	Total
1. Annual Required Contribution (ARC) for FY14					
a. Normal Cost	191,587	126,734	9,575	0	327,896
b. Amortization Cost	527,322	1,031,727	112,564	11,638	1,683,251
c. ARC: (a) + (b)	718,909	1,158,461	122,139	11,638	2,011,147
2. Amount under (over) funded from prior year (NPO)	460,644	1,170,962	198,668	(13,723)	1,816,551
3. Interest on NPO	36,852	93,677	15,893	(1,098)	145,324
4. Amortization of NPO	26,698	67,866	11,514	(795)	105,282
5. Pension Cost: (1c) + (3) – (4)	729,063	1,184,272	126,518	11,335	2,051,189
6. Actual Contribution *	573,428	935,936	99,532	21,104	1,630,000
7. (5) – (6)	155,635	248,336	26,986	(9,769)	421,189
8. Net Pension Obligation/(Asset): (2)+ (7)	616,279	1,419,297	225,654	(23,492)	2,237,740

* estimated allocation

Totals may not add exactly due to rounding.

6. ASSETS

PART A | STATE AND MASSACHUSETTS TEACHERS'

(Dollars in thousands)

	State	Mass. Teachers
Pension Reserves Investment Trust		
Market Value	$22,721,053	$24,183,391
Actuarial Value	$21,581,133	$22,940,196
Actuarial Value as a Percentage of Market Value	95.0%	94.9%

The Market Value of Assets shown above for the State consists of the assets as of December 31, 2013 for the State Employees' Retirement System ($22.532 billion) and the assets remaining in the Massachusetts Turnpike Authority Employees' Retirement System fund ($188.9 million).

The actuarial value of assets is determined so that 20% of the investment gain and loss in a given year is recognized annually for the next 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 actuarial value of assets can never be too far from the market value of assets. Under our approach for the Commonwealth, the actuarial value cannot be less than 90% nor greater than 110% of the market value.

PART 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 to 94.9% of the market value based on the results for State and Massachusetts Teachers.

Market Value	$1,446,476
Actuarial Value	$1,372,705

PART C | IMPACT OF 2008 LOSS AND ASSET CORRIDOR

Due to the severity of the 2008 investment loss, the actuarial value of assets had been 110% of the market value in each valuation from January 1, 2009 through January 1, 2012. The 2008 investment loss was completely recognized as of January 1, 2013 and the actuarial value of assets was 99.4% of the market value. As of January 1, 2014, the actuarial value of assets is 94.9% of the market value and the corridor does not apply in this valuation.

6. ASSETS *(continued)*

PART D | DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS

(Dollars in thousands)

A. Development of 12/31/13 expected actuarial value of assets (AVA)	State	Mass. Teachers	Total
1. Market Value (MV) 12/31/12	20,405,004	21,934,211	42,339,215
2. Actuarial Value 12/31/12 (as calculated)	20,317,389	21,787,470	42,104,859
3. Net Receipts 2013	543,356	700,702	1,244,058
4. Net Disbursements 2013	1,315,481	1,747,097	3,062,578
5. Net Cash Flow: (3)-(4)	(772,125)	(1,046,395)	(1,818,520)
6. Expected Investment Return on (2): 0.08 x (2)	1,625,391	1,742,998	3,368,389
7. Expected Investment Return on (5): ½x 0.08 x (5)	(30,885)	(41,856)	(72,741)
8. Expected AVA 12/31/13: (2)+(5)+(6)+(7)	21,139,770	22,442,217	43,581,987
B. Previous differences not yet amortized			
1. Unrecognized amount of 12/31/12 difference			
a. .2 x 2009 Gain/(loss)	194,285	219,926	414,211
b. .4 x 2010 Gain/(loss)	249,981	274,690	524,671
c. .6 x 2011 Gain/(loss)	(1,049,807)	(1,094,519)	(2,144,326)
d. .8 x 2012 Gain/(loss)	693,155	746,645	1,439,800
e. Total	87,615	146,742	234,357
C. Gain/(loss) from 2013			
1. Market Value 12/31/13	22,721,053	24,183,391	46,904,444
2. Expected Market Value 12/31/13: A(8)+B(1e)	21,227,385	22,588,958	43,816,344
3. Gain/ (loss) from 2013 investment: (1)-(2)	1,493,668	1,594,433	3,088,100
D. Development of AVA 12/31/13			
1. 2013 Gain/(loss)	1,493,668	1,594,433	3,088,100
2. 2012 Gain/(loss)	866,444	933,306	1,799,750
3. 2011 Gain/(loss)	(1,749,678)	(1,824,198)	(3,573,876)
4. 2010 Gain/(loss)	624,953	686,724	1,311,677
5. 2009 Gain/(loss)	971,427	1,099,630	2,071,057
6. 20% of 2013 Gain/(loss)	298,734	318,887	617,620
7. 20% of 2012 Gain/(loss)	173,289	186,661	359,950
8. 20% of 2011 Gain/(loss)	(349,936)	(364,840)	(714,775)
9. 20% of 2010 Gain/(loss)	124,991	137,345	262,335
10. 20% of 2009 Gain/(loss)	194,285	219,926	414,211
11. Total	441,363	497,979	939,342
12. Actuarial Value 12/31/13: A(8)+D(11)	21,581,133	22,940,196	44,521,329
13. Percentage of Market Value	95.0%	94.9%	94.9%
14. Actuarial Value: (12) but not less than 90% of C(1)	21,581,133	22,940,196	44,521,329

7. SYSTEM MEMBERSHIP

PART A | STATE 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 State Retirement System.

	Actives	Vested Terminations
Number of Members	88,156	4,216
Average Age	47.5	53.5
Average Service	13.3	15.7
Average Salary	$60,626	$54,138
Average Annuity Savings Fund Balance	$59,478	$59,664

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	2,056	12						2,068
25 - 29	5,614	1,259	13					6,886
30 - 34	4,120	3,505	605	7				8,237
35 - 39	2,735	2,640	2,041	602	14			8,032
40 - 44	2,325	2,518	2,113	2,388	849	59		10,252
45 - 49	2,272	2,284	1,911	2,101	2,079	1,314	61	12,022
50 - 54	2,006	2,145	1,777	1,756	1,961	2,650	1,233	13,528
55 - 59	1,496	1,789	1,763	1,662	1,573	2,176	2,670	13,129
60 - 64	805	1,253	1,189	1,238	1,104	1,538	2,164	9,291
65+	308	572	644	648	573	785	1,181	4,711
Total	23,737	17,977	12,056	10,402	8,153	8,522	7,309	88,156

PART A | STATE ACTIVE MEMBERS *(continued)*

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	2,068	$68,668,501	$33,205
25 - 29	6,886	$295,418,730	$42,901
30 - 34	8,237	$420,301,433	$51,026
35 - 39	8,032	$456,456,106	$56,830
40 - 44	10,252	$631,383,550	$61,586
45 - 49	12,022	$756,044,536	$62,888
50 - 54	13,528	$868,560,023	$64,205
55 - 59	13,129	$872,849,294	$66,483
60 - 64	9,291	$641,831,549	$69,081
65+	4,711	$332,996,600	$70,685
Total	88,156	$5,344,510,322	$60,626

7. SYSTEM MEMBERSHIP *(continued)*

PART B | STATE RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	46,035	631	3,179	6,482	56,327
Average Age	72.1	65.3	63.5	75.6	71.9
Average Annual Benefit	$31,178	$18,701	$36,889	$16,127	$29,629

Benefit by Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Annuity	$259,819,862	$1,815,920	$8,418,909	$15,525,957	$285,580,648
Pension	$1,175,467,313	$9,984,263	$108,850,666	$89,006,630	$1,383,308,872
Total	$1,435,287,175	$11,800,183	$117,269,575	$104,532,587	$1,668,889,520

7. SYSTEM MEMBERSHIP *(continued)*

PART B | STATE RETIREES & SURVIVORS *(continued)*

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	108	$2,786,303	$25,799
40 – 44	308	$9,774,132	$31,734
45 – 49	936	$31,304,080	$33,445
50 – 54	1,650	$53,020,278	$32,134
55 – 59	3,766	$110,647,112	$29,381
60 – 64	7,704	$262,056,227	$34,016
65 – 69	11,406	$389,597,766	$34,157
70 – 74	9,501	$302,984,702	$31,890
75 – 79	7,177	$203,131,877	$28,303
80 – 84	6,165	$154,631,285	$25,082
85 – 89	4,685	$100,865,017	$21,529
90+	2,921	$48,090,741	$16,464
Totals	56,327	$1,668,889,520	$29,629

7. SYSTEM MEMBERSHIP *(continued)*

PART 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. In 2006, we compared the service estimated for valuation purposes with actual service for over 6,800 members who retired in 2004 and 2005. We found that, in total, our methodology slightly understated service. To estimate this additional cost, we increased the plan liabilities as of January 1, 2006. We have continued using this methodology in each valuation.

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 $10,000, 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 last year's 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 $10,000 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 this year.

Pay for all members hired in 2013 was annualized.

Since the annuity savings fund contributions (ASF) provided did not reflect the ASF contribution for the year, we estimated them based on the reported salary and contribution rate.

In the 2013 valuation, we increased the normal cost and active actuarial liability by 2.0% to reflect the service buyback and various data issues. For this valuation, we increased that amount to 2.5% to include an estimate for the members with reported pay less than $10,000.

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.

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

	Actives
Number of Members	88,788
Average Age	44.0
Average Service	12.9
Average Salary	$67,156
Average Annuity Savings Fund Balance	$64,301

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	1,876							1,876
25 - 29	7,761	1,631						9,392
30 - 34	4,585	6,865	1,520	1				12,971
35 - 39	2,026	3,357	5,309	1,083	4			11,779
40 - 44	1,584	1,902	3,672	4,419	790	23		12,390
45 - 49	1,485	1,773	2,277	2,606	1,876	686	13	10,716
50 - 54	996	1,603	2,162	1,806	1,111	2,189	588	10,455
55 - 59	575	981	1,877	1,886	1,093	1,528	2,662	10,602
60 - 64	230	526	936	1,131	881	971	2,336	7,011
65+	29	101	205	238	167	211	645	1,596
Total	21,147	18,739	17,958	13,170	5,922	5,608	6,244	88,788

7. SYSTEM MEMBERSHIP *(continued)*

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

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	1,876	$80,332,990	$42,821
25 - 29	9,392	$458,986,831	$48,870
30 - 34	12,971	$751,334,741	$57,924
35 - 39	11,779	$789,684,223	$67,042
40 - 44	12,390	$880,419,048	$71,059
45 - 49	10,716	$763,604,019	$71,258
50 - 54	10,455	$763,522,563	$73,029
55 - 59	10,602	$803,330,405	$75,772
60 - 64	7,011	$543,223,209	$77,482
65+	1,596	$128,211,892	$80,333
Total	88,788	$5,962,649,921	$67,156

7. SYSTEM MEMBERSHIP *(continued)*

PART D | MASSACHUSETTS TEACHERS' RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	56,586	426	323	3,699	61,034
Average Age	70.9	67.1	70.0	74.9	71.1
Average Annual Benefit	$42,657	$20,509	$38,234	$18,442	$41,012

Benefit by Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Annuity	$437,339,208	$1,596,666	$1,155,010	$12,041,465	$452,132,349
Pension	$1,976,466,264	$7,140,051	$11,194,502	$56,173,653	$2,050,974,470
Total	$2,413,805,472	$8,736,717	$12,349,512	$68,215,118	$2,503,106,819

7. SYSTEM MEMBERSHIP *(continued)*

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

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	58	$983,739	$16,961
40 – 44	48	$621,876	$12,956
45 – 49	94	$1,437,384	$15,291
50 – 54	206	$4,098,150	$19,894
55 – 59	2,268	$97,813,253	$43,128
60 – 64	12,525	$610,802,472	$48,767
65 – 69	17,597	$817,015,715	$46,429
70 – 74	10,984	$454,833,557	$41,409
75 – 79	6,830	$241,138,330	$35,306
80 – 84	5,217	$157,304,509	$30,152
85 – 89	3,233	$79,181,415	$24,492
90+	1,974	$37,876,418	$19,188
Totals	61,034	$2,503,106,819	$41,012

7. SYSTEM MEMBERSHIP *(continued)*

PART E | BOSTON 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 Boston Retirement System.

	Actives
Number of Members	5,961
Average Age	42.9
Average Service	12.8
Average Salary	$81,635
Average Annuity Savings Fund Balance	$75,447

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	141							141
25 - 29	563	115						678
30 - 34	361	511	109	11				992
35 - 39	164	340	334	80	11			929
40 - 44	101	142	205	239	86	13		786
45 - 49	63	85	121	139	140	78	12	638
50 - 54	51	84	88	97	99	170	47	636
55 - 59	35	57	75	97	93	153	141	651
60 - 64	20	27	47	60	48	82	109	393
65+	5	6	11	15	21	15	44	117
Total	1,504	1,367	990	738	498	511	353	5,961

7. SYSTEM MEMBERSHIP *(continued)*

PART E | BOSTON TEACHERS' ACTIVE MEMBERS *(continued)*

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	141	$7,134,726	$50,601
25 - 29	678	$41,558,766	$61,296
30 - 34	992	$75,390,797	$75,999
35 - 39	929	$76,194,160	$82,017
40 - 44	786	$67,353,630	$85,692
45 - 49	638	$55,948,290	$87,693
50 - 54	636	$56,298,232	$88,519
55 - 59	651	$59,917,560	$92,039
60 - 64	393	$36,176,209	$92,051
65+	117	$10,655,599	$91,073
Total	5,961	$486,627,967	$81,635

7. SYSTEM MEMBERSHIP *(continued)*

PART F | BOSTON TEACHERS' RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	3,988	42	71	293	4,394
Average Age	71.3	67.6	71.2	74.7	71.5
Average Annual Benefit	$50,329	$22,424	$44,348	$20,340	$47,966

Benefit by Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Annuity	$37,671,480	$169,130	$302,102	$1,057,886	$39,200,598
Pension	$163,039,294	$772,658	$2,846,541	$4,901,644	$171,560,137
Total	$200,710,774	$941,788	$3,148,643	$5,959,530	$210,760,735

7. SYSTEM MEMBERSHIP *(continued)*

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

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	4	$91,458	$22,864
40 - 44	1	$18,085	$18,085
45 - 49	6	$105,912	$17,652
50 - 54	18	$449,070	$24,948
55 - 59	157	$7,325,803	$46,661
60 - 64	825	$48,518,365	$58,810
65 - 69	1,308	$71,064,622	$54,331
70 - 74	809	$38,913,256	$48,100
75 - 79	471	$19,263,097	$40,898
80 - 84	357	$12,620,738	$35,352
85 - 89	290	$8,822,548	$30,423
90+	148	$3,567,781	$24,107
Totals	4,394	$210,760,735	$47,966

8. VALUATION COST METHODS

PART 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 retirement system member, 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 inactives, retirees, and survivors is simply equal to the present value of all projected benefits. 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 be changed by the addition of new members or the retirement, death, disability, 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 change.

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 an *Actuarial Loss* and one which decreases the Unfunded Actuarial Liability is called an *Actuarial Gain.*

PART 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, etc., so that 100% of gains and 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, 2014 is 94.9% of the market value.

In valuations prior to 1998, plan assets were determined at market value. As part of the 1998 valuation, this methodology was adjusted to reduce the potential volatility in the market value approach from year to year.

9. ACTUARIAL ASSUMPTIONS

INVESTMENT RETURN	8.00% per year
INTEREST RATE CREDITED TO THE ANNUITY SAVINGS FUND	3.5% per year
COST OF LIVING INCREASES (COLA)	3% per year (on the first $13,000 of an allowance)

MORTALITY

State: Pre-retirement mortality reflects RP-2000 Employees table projected 22 years with Scale AA (gender distinct).
Teachers: Pre-retirement mortality reflects RP-2000 Employees table adjusted for "white-collar" employment projected 22 years with Scale AA (gender distinct). *2013 assumption reflected same table but projected 20 years.* Sample rates shown below.

State: Post-retirement mortality reflects RP-2000 Healthy Annuitant table projected 17 years with Scale AA (gender distinct).
Teachers: Post-retirement mortality reflects RP-2000 Healthy Annuitant table adjusted for large annuity amounts and projected 17 years with Scale AA (gender distinct). *2013 assumption reflected same table but projected 15 years.* Sample rates shown below.

State: For disabled members, the mortality rate is assumed to be in accordance with the RP-2000 Table projected 7 years with Scale AA (gender distinct) set forward 3 years for males.
Teachers: For disabled members, post-retirement mortality reflects RP-2000 Healthy Annuitant table adjusted for large annuity amounts and projected 7 years with Scale AA (gender distinct) set forward 3 years for males. *2013 assumption reflected 2013 non-disabled retiree assumption.* Sample rates shown below.

It is assumed that 55% 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

9. ACTUARIAL ASSUMPTIONS (continued)

MORTALITY (continued)

Sample Pre-retirement mortality rates for Teachers and Boston teachers

Deaths per 1000

Age	Males	Females
20	0.181	0.134
25	0.241	0.152
30	0.318	0.212
35	0.553	0.365
40	0.723	0.460
45	1.018	0.710
50	1.319	1.092
55	1.807	1.989

Sample Post-retirement mortality rates for Teachers and Boston teachers

Deaths per 1000

	Non-Disabled		Disabled	
Age	Males	Females	Males	Females
55	3.197	2.495	4.823	2.704
60	4.985	4.783	8.021	5.028
65	8.659	7.804	12.862	8.205
70	12.881	12.914	19.956	13.578
75	22.030	21.576	36.363	23.381
80	42.865	37.864	68.571	40.620

9. ACTUARIAL ASSUMPTIONS *(continued)*

SALARY INCREASE

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

Increases for State employees are 3.5% for 2013, 3.75% for 2014 and 4.0% for 2015. Increases after 2015 are based on service as shown below.

For Teachers, increases are based on service as shown on the next page.

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%

9. ACTUARIAL ASSUMPTIONS *(continued)*

RETIREMENT

	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	0.030	0.030	0.020	0.050	0.060
51	0.030	0.030	0.020	0.060	0.060
52	0.030	0.030	0.020	0.070	0.060
53	0.030	0.030	0.030	0.080	0.075
54	0.030	0.035	0.040	0.090	0.150
55	0.035	0.050	0.075	0.100	0.250
56	0.035	0.050	0.075	0.100	0.150
57	0.040	0.055	0.080	0.110	0.150
58	0.050	0.060	0.100	0.110	0.150
59	0.060	0.065	0.120	0.120	0.150
60	0.090	0.075	0.150	0.140	0.200
61	0.110	0.100	0.150	0.150	0.200
62	0.150	0.150	0.150	0.150	0.200
63	0.150	0.150	0.150	0.150	0.200
64	0.160	0.150	0.200	0.250	0.300
65	0.200	0.200	0.200	0.250	0.500
66	0.200	0.200	0.200	0.250	0.250
67	0.200	0.200	0.200	0.250	0.250
68	0.200	0.200	0.200	0.250	0.250
69	0.200	0.200	0.200	0.250	0.250
70	1.000	1.000	1.000	1.000	1.000

9. ACTUARIAL ASSUMPTIONS *(continued)*

Teachers

Males

	Not in Retirement Plus	
	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		
	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

9. ACTUARIAL ASSUMPTIONS *(continued)*

Teachers

Females

	Not in Retirement Plus	
	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		
	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

9. ACTUARIAL ASSUMPTIONS *(continued)*

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 assumed that 75% of disabilities will be job-related for Group 1 and 2 members (other than Teachers), 95% will be job-related for Group 3 and 4 members, and 35% will be job-related for Teachers.

WITHDRAWAL

Based on an 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 of service, rates are age based. In addition to being 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.

Groups 1 & 2

Age		Service	
	0	5	10+
20	0.270	0.000	0.000
30	0.230	0.100	0.045
40	0.160	0.080	0.030
50	0.180	0.060	0.030

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

9. ACTUARIAL ASSUMPTIONS *(continued)*

Teachers

Age	Service 0		Service 5		Service 10+	
	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

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 in 3 years older than the female spouse.

LOADING AND ADMINISTRATIVE EXPENSES

State

We increased the total normal cost by 2% and the actuarial accrued liability of active members by approximately 1% 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 Sections10, 28M, 28N, 65D, and 100. In addition, an amount of $18 million has been included in the normal cost to reflect a portion of administrative and other expenses paid by the fund and net Section 3(8)(c) cash flow.

Teachers

We increased the total normal cost and the actuarial accrued liability of active members by 2.5% to account for buybacks at retirement and various data issues including the status of members with reported pay of less than $10,000. In addition, an amount of $14 million has been included in the normal cost to reflect a portion of administrative and other expenses paid by the fund and net Section 3(8)(c) cash flow.

Boston Teachers

We increased the total normal cost and the actuarial accrued liability of active members by 2%. In addition, an amount of $3.5 million has been included in the normal cost to reflect a portion of administrative and other expenses paid by the fund.

10. SUMMARY OF PLAN PROVISIONS

ADMINISTRATION

There are 105 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 establishes benefits, contribution requirements, and an accounting and funds structure for all systems.

PARTICIPATION

Participation is mandatory for nearly all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal, or intermittent employment is governed by regulations promulgated by each retirement board, and approved by PERAC. Membership is optional for certain elected officials. There are 4 classes of membership in the Commonwealth:

Group 1:

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

Group 2:

Certain specified hazardous duty positions.

Group 3:

State police officers and inspectors

Group 4:

Police officers, firefighters, corrections officers, and other specified hazardous positions.

MEMBER CONTRIBUTIONS

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

Date of Membership	Contribution Rate
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 (State Police)
7/1/01 to present:	11% of regular compensation (for teachers hired after 7/1/01 and those accepting provisions of Chapter 114 of the Acts of 2000)
1979 to present:	an additional 2% of regular compensation in excess of $30,000.

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.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

RATE OF INTEREST

Interest on regular deductions made after January 1, 1984 is at 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 hired prior to 1978, or if classified in Group 4.

AMOUNT OF 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 or her 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 employees 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 three consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.

• 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 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 Group 4 employees who retire at or after age 55. A .125% reduction is applied for each year of age under the maximum age for the member's group.

• For a teacher who 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.

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.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

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. Group 4 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 70½.

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.

ORDINARY DISABILITY

Eligibility: Non-veterans who become totally and permanently disabled by reason of a non-job related condition with at least ten years of creditable service.

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.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

ACCIDENTAL DISABILITY

Eligibility: Applies to members who become permanently incapacitated from 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. However, 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 $797.64 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. 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.

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 $797.64 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 resulting 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 of a firefighter, public prosecutor, police officer or corrections officer killed in the line of duty may receive a one time payment of $100,000 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

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 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 superannuation retirement age, the age 60 benefit rate is used. If the member died after age 60, the actual age is used. 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 $9,000, 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.

COST OF LIVING

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

10. SUMMARY OF PLAN PROVISIONS *(continued)*

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 remains unmarried 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 predeceases the retiree, the benefit payable increases (or "pops up") 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 predeceases the retiree, the benefit payable "pops up" 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.

11. 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, rather than 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 reduce the Unfunded Accrued Liability.

11. GLOSSARY OF TERMS *(continued)*

ANNUAL STATEMENT

The statement submitted to PERAC each year that describes the asset holdings and Fund balances as of December 3l as well as 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, are 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 and inactive members.

ASSETS

The value of securities held by the plan.

COST OF BENEFITS

The estimated payment from the pension system for benefits for the fiscal year.

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 22C of M.G.L. Chapter 32.

GASB

Governmental Accounting Standards Board

11. GLOSSARY OF TERMS *(continued)*

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.

PENSION FUND

The fund into which appropriation amounts, as determined by PERAC are paid and from which pension benefits are paid.

PENSION RESERVE FUND

The fund that 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.

SPECIAL FUND FOR MILITARY SERVICE CREDIT

The fund which is credited with an amount 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 ACCRUED LIABILITY

The excess of the Actuarial Accrued Liability over the Assets.

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