

State Retirement System

Actuarial Valuation Report

January 1, 2015



PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION COMMISSION
COMMONWEALTH OF MASSACHUSETTS

PERAC ACTUARIAL VALUATION REPORT

State Retirement System

January 1, 2015

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I. INTRODUCTION & CERTIFICATION

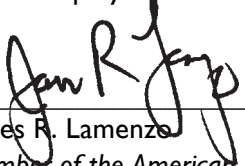
This report presents the results of the actuarial valuation of the State Retirement System. The valuation was performed as of January 1, 2015, pursuant to Chapter 32 of the General Laws of the Commonwealth of Massachusetts and based on the plan provisions at that time. The actuarial assumptions used to calculate the accrued liability and the normal cost primarily reflect our most recent Experience Study Analysis report which we issued on February 27, 2014. The actuarial assumptions used in this valuation are the same as those used in the January 1, 2014 actuarial valuation with the exception of the investment return assumption (8.0% to 7.75%) and the mortality assumption which now reflects a fully generational table.

This valuation was based on member data as of December 31, 2014, which was supplied by the State Retirement Board. Asset information as of December 31, 2014, was provided by the Pension Reserves Investment Management Board. Both the membership data and financial information were reviewed for reasonableness but not audited by us.

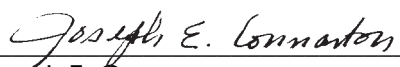
Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or 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.

I am a member of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries 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 State Retirement System performed in accordance with generally accepted actuarial principles and practices relating to pension plans.

Respectfully submitted,
Public Employee Retirement Administration Commission



James R. Lamenza
Member of the American Academy of Actuaries
Associate of the Society of Actuaries
Enrolled Actuary Number 14-4709



Joseph E. Connarton
Executive Director

Dated: May 1, 2015

2. EXECUTIVE SUMMARY

PART A | COSTS UNDER CURRENT VALUATION

The provisions of Chapter 32, Section 22C mandate the establishment of a funding schedule for the Commonwealth of Massachusetts pension obligation. The State Retirement System reflects one component of the Commonwealth schedule. The other components are the Massachusetts Teachers' Retirement System, liabilities for Boston teachers, and State reimbursements to local systems to reflect COLAs granted from 1982 through 1996. 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 FY15 appropriation is \$1.793 billion. This amount will increase 10% in FY16 and FY17. Therefore, the appropriations for FY16 and FY17 are respectively, \$1.972 billion and \$2.169 billion (although these amounts could increase to reflect pending legislation regarding an early retirement incentive program). Beginning in FY18, total appropriations increase 7% each year until FY35 with a final amortization payment in FY36.

The State Retirement System's portion of the FY16 Commonwealth appropriation is \$693.8 million.

The results of the January 1, 2015 actuarial valuation are as follows (in thousands):

Total Normal Cost	\$727,137
Expected Employee Contributions	<u>\$487,046</u>
Net Normal Cost	<u>\$240,091</u>

Total Actuarial Liability	\$33,679,150
Assets	<u>\$22,720,160</u>
Unfunded Actuarial Liability	<u>\$10,958,990</u>

2. EXECUTIVE SUMMARY *(continued)*

PART B | COMPARISON WITH PRIOR VALUATION

A comparison of the current valuation and the January 1, 2014 valuation is shown below (in thousands).

	1/1/15	1/1/14	Increase (Decrease)	Increase (Decrease)
Total Normal Cost	\$727,137	\$651,774	\$75,363	11.6%
Expected Employee Contributions	<u>487,046</u>	<u>460,187</u>	<u>26,859</u>	5.8%
Net Normal Cost	<u>\$240,091</u>	<u>\$191,587</u>	<u>\$48,504</u>	25.3%
Actuarial Liability				
Actives	\$15,894,551	\$14,539,364	\$1,355,187	9.3%
Retirees and Inactives	<u>17,784,599</u>	<u>16,140,236</u>	<u>1,644,363</u>	10.2%
Total	\$33,679,150	\$30,679,600	\$2,999,550	9.8%
Assets (Actuarial Value)	<u>\$22,720,160</u>	<u>\$21,581,133</u>	<u>\$1,139,027</u>	5.3%
Unfunded Actuarial Liability	<u>\$10,958,990</u>	<u>\$9,098,467</u>	<u>\$1,860,523</u>	20.4%
Funded Ratio	67.5%	70.3%	(2.8%)	

Funded Status

The UAL and funded ratio are measures of the plan's funded status. These measures reflect the plan's position as of January 1, 2015. We believe these measures, by themselves, are not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations or assessing the need for or the amount of future contributions. However, we believe these measures, in conjunction with the plan's funding schedule outlined on the previous page, are appropriate for assessing the amount of future contributions.

On a market value basis, the UAL would be approximately \$9.94 billion and the funded ratio would be 70.5%.

2. EXECUTIVE SUMMARY *(continued)*

PART B | COMPARISON WITH PRIOR VALUATION *(continued)*

Actives	1/1/15	1/1/14	Increase (Decrease)
Number	88,508	88,156	0.4%
Total Payroll	\$5,591,911,233	\$5,344,510,322	4.6%
Average Salary	\$63,180	\$60,626	4.2%
Average Age	47.3	47.5	(0.4%)
Average Service	13.2	13.3	(0.8%)

There were 79,920 active members as of January 1, 2014 who remained in active status as of January 1, 2015. Pay for these members increased 6.9%.

Retirees and Survivors	1/1/15	1/1/14	Increase (Decrease)
Number	57,774	56,327	2.6%
Total Benefits	\$1,780,541,594	\$1,668,889,520	6.7%
Average Benefits	\$30,819	\$29,629	4.0%
Average Age	71.9	71.9	0%

The development of the actuarial gain/(loss) is shown on page 9. During 2014 there was an overall actuarial gain of \$4 million. There was a non-investment related loss (loss on actuarial accrued liability) of \$275 million due primarily to salary increases that were greater than assumed. There was a gain of approximately \$279 million on the actuarial value of assets. The return on assets was approximately 9.3% on an actuarial value basis, compared to 8.15% on a market 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. The calculated actuarial value of assets as of January 1, 2015 is 95.7% of the market value. This figure was 95.0% as of January 1, 2014. The corridor does not apply in this valuation.

The UAL increased from \$9.1 billion as of January 1, 2014 to \$11.0 billion as of January 1, 2015. This increase reflects a change in the investment return assumption from 8.0% to 7.75% and the adoption of a fully generational mortality assumption.

2. EXECUTIVE SUMMARY *(continued)*

PART B | COMPARISON WITH PRIOR VALUATION *(continued)*

We used an 8.25% investment return assumption in our actuarial valuations prior to January 1, 2013. The January 1, 2013 valuation used an 8.0% investment return assumption. The January 1, 2015 report reflects the 7.75% investment return assumption we recently recommended based on the general trend in this assumption both in Massachusetts and nationally as well as long term anticipated investment returns. The actuarial liability increased by approximately \$804 million (2.5%) to reflect this change.

In our 2011 actuarial valuation, we began reflecting future mortality improvement (increasing life expectancy). Each year we have modified this assumption as we have moved closer to a fully generational mortality assumption that includes all expected future mortality improvements. Based on our recent analysis of State retiree mortality during 2012, 2013, and 2014, we have taken the final step and moved to a generational assumption. The 2014 valuation used a static table that projected mortality improvement to 2022 for active members and 2017 for retirees. The revised assumption reflects a two-dimensional table based on both the year and a member's age. The actuarial liability increased by approximately \$593 million (1.8%) to reflect this change.

As noted in the prior two paragraphs, the UAL as of January 1, 2015 would have been approximately \$1.4 billion lower (\$804 million plus \$593 million) if there had been no change in assumptions from the prior valuation. In addition to the 2015 assumption changes, there have been a number of other assumption changes and plan amendments since 2010 that have significantly increased the UAL. The net increase in UAL due to the 2015 assumption changes, assumption changes based on our 2014 experience study, the 2013 reduction in the investment return assumption from 8.25% to 8.0%, the adoption of a \$13,000 COLA base, the transfer of active members of sheriff departments in 6 counties to the State, and the transfer of former members of the Massachusetts Turnpike Authority Retirement System to the State is approximately \$2.5 billion. Therefore, on a comparable basis with the 2010 plan provisions and assumptions, the UAL on January 1, 2015 would be approximately \$8.5 billion. On the same basis, the funded ratio on January 1, 2015 would be approximately 73.0%.

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. 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 I 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). Since these changes are effective only for members hired after April 1, 2012, this is the third actuarial valuation to reflect these changes.

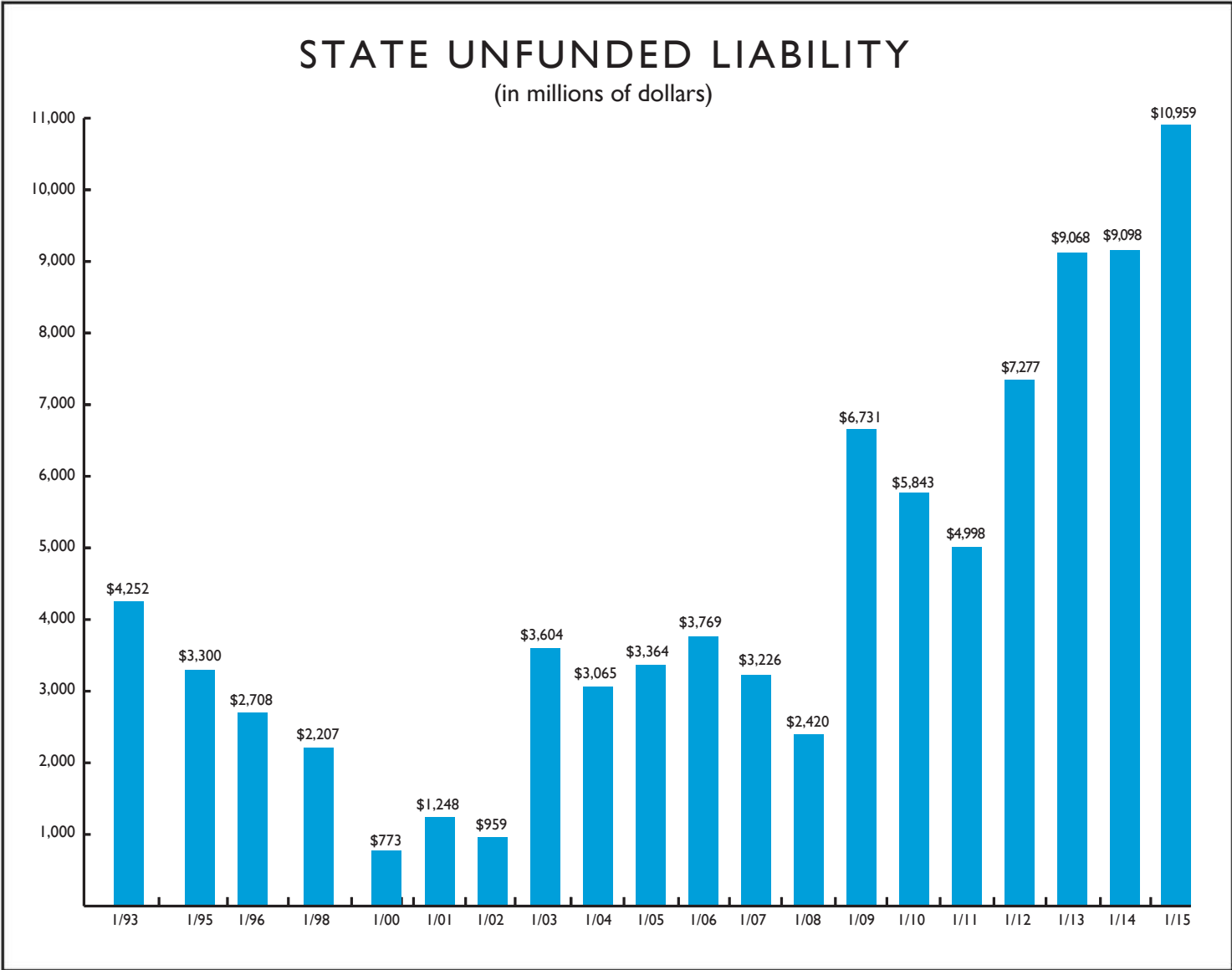
As of January 1, 2015, there were approximately 16,200 members hired after April 1, 2012. Since these members have less than three years of service and are generally young, there is still relatively little impact on plan costs (on a percentage basis) in this valuation. The employer normal cost is approximately \$16.8 million lower than it would have been if the previous provisions were in place for these members. The actuarial liability is approximately \$20 million lower than it would have been if the prior provisions were in place.

2. EXECUTIVE SUMMARY *(continued)*

PART C | FUNDING PROGRESS

The chart below compares the Unfunded Actuarial Accrued Liability (UAL) since 1993. 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, estimates were developed to reflect implementation of new actuarial software.

The UAL increased \$1.86 billion since January 1, 2014. Most of this increase is due to changes in the actuarial assumptions. If we used the 2014 valuation assumptions, the UAL would be \$9.56 billion as of January 1, 2015. The change in the investment return assumption increased the UAL by \$804 million. The change in the mortality assumption increased the UAL by \$594 million.

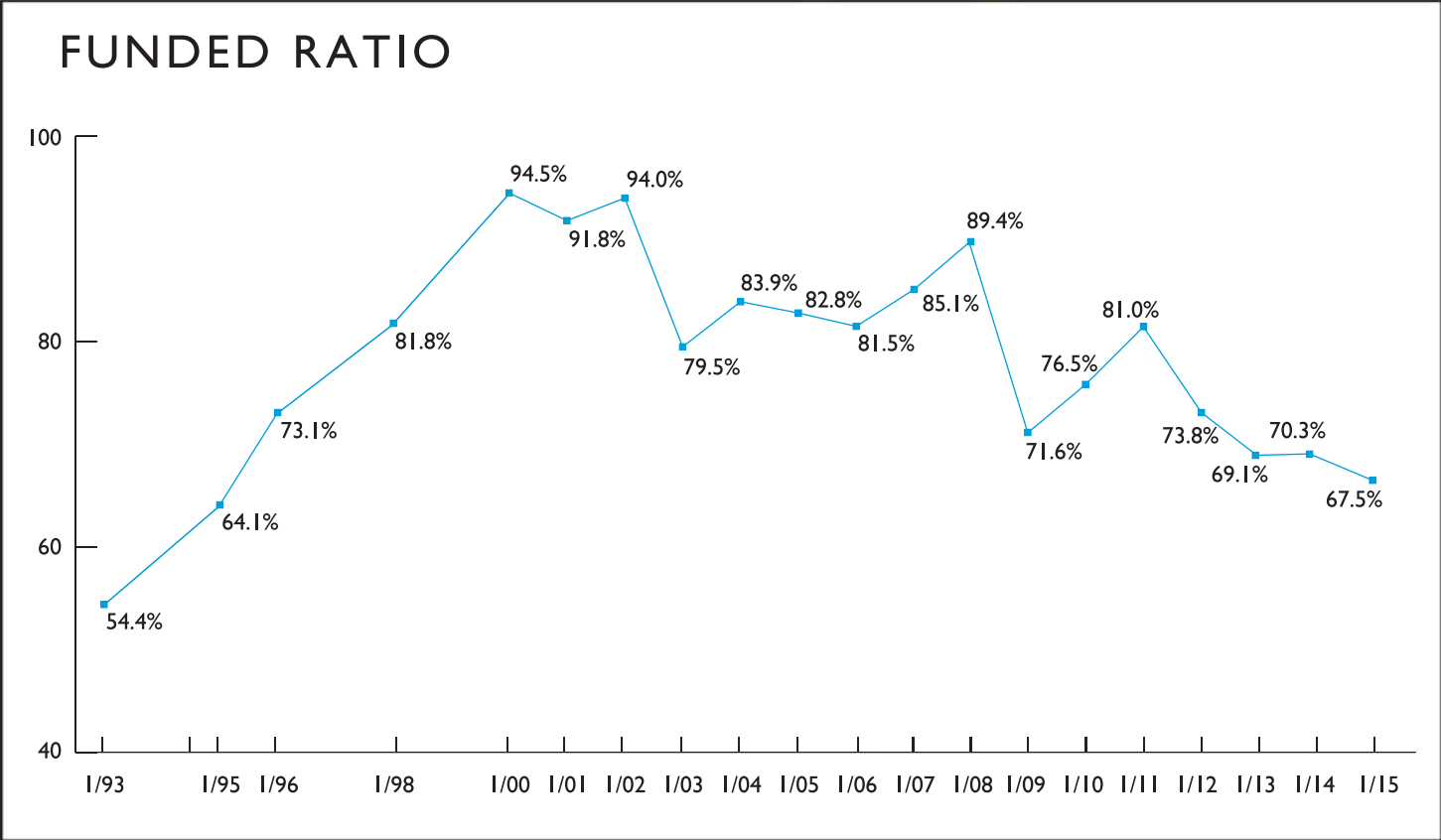


2. EXECUTIVE SUMMARY *(continued)*

PART C | FUNDING PROGRESS *(continued)*

The chart below shows the State’s funded ratio progress since 1993. 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, estimates were developed to reflect implementation of new actuarial software.

The funded ratio decreased from 70.3% as of January 1, 2014 to 67.5% as of January 1, 2015. Most of this decrease is due to changes in the actuarial assumptions. If we used the 2014 valuation assumptions, the funded ratio would be 70.4% as of January 1, 2015. The change in the investment return assumption decreased the funded ratio to 68.7%. The change in the mortality assumption decreased the funded ratio to 67.5%.



3. SUMMARY OF VALUATION RESULTS

(Dollars in thousands)

A. Number of Members	
Active	88,508
Vested Terminated	4,340
Retired/ Beneficiaries	<u>57,774</u>
Total	150,622
B. Total Payroll	\$5,591,911
C. Normal Cost	
Superannuation	\$518,701
Death	57,659
Disability	78,921
Termination	<u>71,856</u>
Total Normal Cost	\$727,137
Expected Employee Contributions	<u>487,046</u>
Net Employer Normal Cost	\$240,091
D. Actuarial Liability	
Active	
Superannuation	\$14,784,528
Death	346,491
Disability	416,485
Termination	<u>347,047</u>
Total Active	\$15,894,551
Vested Terminated	746,623
Non-Vested Terminated	196,766
Retirees and Survivors	<u>16,841,210</u>
Total Actuarial Liability	\$33,679,150
E. Actuarial Value of Assets	22,720,160
F. Unfunded Actuarial Liability: D – E	\$10,958,990
G. Funded Ratio: E/D	67.5%

4. DEVELOPMENT OF THE ACTUARIAL GAIN OR LOSS

(in millions)

A. Gain/(loss) on Actuarial Liability	
1. Actuarial Liability 1/1/14	30,679
2. Total Normal Cost 1/1/14	652
3. Interest on (1) and (2) at 8.0%	2,506
4. Benefits paid during 2014 [a]	1,760
5. Interest on (4) assuming mid-year payment	70
6. Expected Actuarial Liability 1/1/15 before adjustments: (1)+(2)+(3)-(4)-(5)	32,007
7. Increase due to change in assumptions	1,397
8. Expected Actuarial Liability 1/1/15: (6)+(7)	33,404
9. Actuarial Liability 1/1/15	33,679
10. Gain/(loss): (8)-(9)	(275)
B. Gain/(loss) on assets	
11. Actuarial Value of Assets (AVA) 1/1/14	21,581
12. Interest on (11) at 8.0%	1,726
13. Net Receipts [b]	562
14. Net Disbursements [b]	1,395
15. Net Cash Flow: (13)-(14)	(833)
16. Interest on (15) assuming mid-year payment	(33)
17. Expected AVA 1/1/15: (11)+(12)+(15)+(16)	22,441
18. AVA 1/1/15	22,720
19. Gain/(loss): (18)-(17)	279
C. Total Gain/(loss): (10)+(19)	4

[a] Estimated

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

5. PLAN ASSETS

PART A | SUMMARY OF ASSETS (dollars in thousands unless otherwise specified)

Pension Reserves Investment Trust (State Retirement System)	
Market value	\$23,739,487
Actuarial value	\$22,720,160

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 of assets cannot be less than 90% nor greater than 110% of the market value.

Due to the severity of the 2008 investment loss, and later the 2011 investment loss, the calculated actuarial value of assets had been greater than 110% of the market value each year from January 1, 2009 through January 1, 2012. Therefore, the actuarial value was set at 110% of the market value for those years. As of January 1, 2013, the 2008 loss was completely recognized and the actuarial value of assets was 99.6% of the market value. As of January 1, 2014, the actuarial value of assets was 95.0% of the market value. As of January 1, 2015 the actuarial value of assets was 95.7% of the market value. The corridor does not apply in this valuation.

The Market Value of Assets includes \$188.1 million in the PRIT account for former members of the Massachusetts Turnpike Authority Employees’ Retirement System.

5. PLAN ASSETS *(continued)*

PART B | ACTUARIAL VALUE OF ASSETS

	(Dollars in thousands)
A. Development of 12/31/14 expected actuarial value of assets	
1. Market value of assets (MVA) 12/31/13	\$22,721,053
2. Actuarial value of assets (AVA) 12/31/13 (as calculated)	\$21,581,133
3. Net Receipts 2014 *	\$562,314
4. Net Disbursements 2014 *	\$1,395,162
5. Net Cash Flow (3) - (4)	(\$832,848)
6. Expected investment return on (2): $0.08 \times (2)$	\$1,726,491
7. Expected investment return on (5): $\frac{1}{2} \times 0.08 \times (5)$	(\$33,314)
8. Expected AVA 12/31/14: (2) + (5) + (6) + (7)	\$22,441,462
B. Previous differences not yet amortized	
1. Unrecognized amount of 12/31/13 difference	
a. .2 x 2010 gain	\$124,991
b. .4 x 2011 gain	(\$699,871)
c. .6 x 2012 gain	\$519,866
d. .8 x 2013 gain	\$1,194,934
e. Total	\$1,139,920
C. Gain/(loss) from 2014	
1. Market value of assets 12/31/14	\$23,739,487
2. Expected market value 12/31/14: A(8) + B(1e)	\$23,581,382
3. Gain/ (loss) from 2014 investment: (1) - (2)	\$158,105
D. Development of AVA 12/31/14	
1. 2014 gain/(loss)	\$158,105
2. 2013 gain/(loss)	\$1,493,668
3. 2012 gain/(loss)	\$866,444
4. 2011 gain/(loss)	(\$1,749,678)
5. 2010 gain/(loss)	\$624,953
6. 20% of 2014 gain/(loss)	\$31,621
7. 20% of 2013 gain/(loss)	\$298,734
8. 20% of 2012 gain/(loss)	\$173,289
9. 20% of 2011 gain/(loss)	(\$349,936)
10. 20% of 2010 gain/(loss)	\$124,991
11. Total: (6) + (7) + (8) + (9) + (10)	\$278,698
12. Calculated actuarial value 12/31/14: A(8) + D(11)	\$22,720,160
13. Percentage of Market value	95.7%
14. Actuarial value: (12) but not less than 90% nor greater than 110% of C(1)	\$22,720,160

* Reflects actual cash flow of PRIT fund.

6. INFORMATION ON SYSTEM MEMBERSHIP

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.

PART A | ACTIVE MEMBERS

	Actives	Vested Terminations
Number of Members	88,508	4,340
Average Age	47.3	53.8
Average Service	13.2	15.9
Average Salary	\$63,180	\$54,826
Average Annuity Savings Fund Balance	\$60,553	\$60,743

Age by Service Distribution of Active Members

Present Age	Years of Service							Total
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30+	
0 - 24	2,180	7						2,187
25 - 29	6,160	1,015	15					7,190
30 - 34	4,704	3,244	710	10				8,668
35 - 39	3,008	2,502	2,049	650	6			8,215
40 - 44	2,519	2,247	1,982	2,345	748	40		9,881
45 - 49	2,353	2,022	1,940	2,149	2,067	1,204	72	11,807
50 - 54	2,180	1,981	1,763	1,871	1,779	2,555	1,245	13,374
55 - 59	1,587	1,632	1,703	1,703	1,568	2,125	2,762	13,080
60 - 64	883	1,127	1,241	1,276	1,086	1,426	2,209	9,248
65+	318	563	704	690	554	763	1,266	4,858
Total	25,892	16,340	12,107	10,694	7,808	8,113	7,554	88,508

6. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

PART A | ACTIVE MEMBERS *(continued)*

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	2,187	\$74,988,730	\$34,288
25 - 29	7,190	\$321,987,111	\$44,783
30 - 34	8,668	\$460,822,889	\$53,164
35 - 39	8,215	\$484,242,151	\$58,946
40 - 44	9,881	\$631,792,032	\$63,940
45 - 49	11,807	\$781,815,437	\$66,216
50 - 54	13,374	\$898,584,108	\$67,189
55 - 59	13,080	\$904,545,282	\$69,155
60 - 64	9,248	\$671,220,934	\$72,580
65+	4,858	\$361,912,559	\$74,498
Total	88,508	\$5,591,911,233	\$63,180

6. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

PART B | RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	47,381	642	3,238	6,513	57,774
Average Age	72.1	65.1	63.7	75.3	71.9
Average Annual Benefit	\$32,406	\$19,259	\$38,151	\$16,766	\$30,819

Benefit by Payment and Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Annuity	\$283,898,107	\$1,936,752	\$9,186,012	\$16,411,332	\$311,432,203
Pension	\$1,251,551,857	\$10,427,211	\$114,347,357	\$92,782,966	\$1,469,109,391
Total	\$1,535,449,964	\$12,363,963	\$123,533,369	\$109,194,298	\$1,780,541,594

6. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

PART B | RETIREES & SURVIVORS *(continued)*

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	126	\$3,164,237	\$25,113
40 - 44	258	\$8,158,379	\$31,622
45 - 49	922	\$31,893,091	\$34,591
50 - 54	1,641	\$54,183,306	\$33,018
55 - 59	3,808	\$116,470,519	\$30,586
60 - 64	7,903	\$276,105,256	\$34,937
65 - 69	12,078	\$426,405,957	\$35,304
70 - 74	9,985	\$329,964,845	\$33,046
75 - 79	7,352	\$218,490,491	\$29,719
80 - 84	6,051	\$158,540,642	\$26,201
85 - 89	4,606	\$103,501,180	\$22,471
90+	3,044	\$53,663,691	\$17,629
Totals	57,774	\$1,780,541,594	\$30,819

7. 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 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 inactives, 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*.

PART B | ASSET VALUATION METHOD

In valuations prior to 1998, plan assets were determined at market value. As part of the 1998 valuation, this methodology was adjusted so that investment gains and losses for a given year would not be fully recognized until five years have passed. This calculation recognizes 20% of the gain or loss occurring in the prior year, 40% of those gains or losses occurring two years ago, etc., so that 100% of the gain or loss occurring 5 or more years ago is recognized. This approach reduces the potential volatility in the market value approach from year to year. Under our corridor approach, the actuarial value of assets cannot be less than 90% nor greater than 110% of the market value. The actuarial value of assets as of January 1, 2015 is 95.7% of the market value.

8. ACTUARIAL ASSUMPTIONS

Investment Return

7.75% per year net of investment expenses (*prior assumption 8.0%*)

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.

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)

Mortality

Pre-retirement mortality reflects RP-2000 Employees table projected generationally with Scale BB and a base year of 2009 (gender distinct). (*Prior assumption- RP-2000 Employees table projected 22 years with Scale AA.*)

Post-retirement mortality reflects RP-2000 Healthy Annuitant table projected generationally with Scale BB and a base year of 2009 (gender distinct). (*Prior assumption- RP-2000 Healthy Annuitant table projected 17 years with Scale AA.*)

For disabled members, the mortality rate is assumed to be in accordance with the RP-2000 Healthy Annuitant Table projected generationally with Scale BB and a base year of 2015 (gender distinct). (*Prior assumption RP-2000 Healthy Annuitant table projected 7 years with Scale AA set forward 3 years for males.*)

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.

The mortality assumptions reflect our recent experience analysis published in 2014 (based on the years 2006-2011), updated to reflect data through January 1, 2015 for post-retirement mortality, and professional judgment. As such, this assumption reflects observed current mortality as well as expected mortality improvement. The pre-retirement mortality and disabled member assumptions reflect both the prior analysis and the more recent work.

8. ACTUARIAL ASSUMPTIONS *(continued)*

Salary Increase

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

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

<u>Service</u>	<u>Groups 1 & 2</u>	<u>Group 3</u>	<u>Group 4</u>
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%

The salary increase assumption reflects both prior experience (2014 study) and professional judgment. The assumption for 2013 to 2015 was modified to reflect current conditions.

Disability

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

<u>Age</u>	<u>Group 1</u>	<u>Group 2</u>	<u>Group 3</u>	<u>Group 4</u>
20	0.00010	0.00052	0.0010	0.0020
30	0.00010	0.00072	0.0016	0.0021
40	0.00068	0.00210	0.0036	0.0071
50	0.00133	0.00420	0.0094	0.0110
60	0.00120	0.00500	0.0430	0.0080

It is also assumed that 75% of disabilities will be job-related for Group 1 and 2 members, and 95% will be job-related for Group 3 and 4 members.

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.

8. ACTUARIAL ASSUMPTIONS *(continued)*

Retirement

Age	Group 1		Group 2	Group 3	Group 4
	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

See page 20 for an explanation of retirement rates for employees hired on or after April 2, 2012.

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

8. ACTUARIAL ASSUMPTIONS *(continued)*

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. 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

Groups 3 & 4

<u>Service</u>	<u>Group 3</u>	<u>Group 4</u>
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

See below 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, service, gender and job group. Final assumptions reflect this analysis as well as professional judgment.

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.

Loading and Administrative Expenses

We increased the normal cost by 1% and the actuarial accrued liability of active members by approximately \$100 million 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, an amount of \$16 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.

9. 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 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 in the retirement system:

Group 1:

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

Group 2:

Certain specified hazardous duty positions.

Group 3:

Officers and inspectors of the Department of State Police.

Group 4:

Corrections officers, 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
1979 to present:	12% of regular compensation for State Police officers 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.

9. 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.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

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.

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.

9. 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.

DISABILITY RETIREMENT

The Massachusetts Retirement Plan provides two 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 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.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

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 is no minimum age or service requirement.

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 \$821.52 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 \$821.52 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 of such a firefighter, public prosecutor, police officer or corrections officer may receive a one-time payment of \$150,000.00 from the State Retirement Board.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

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 the Option C benefit that 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 I 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 \$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.

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.

9. 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 is unmarried at the time of retirement for a member whose retirement becomes effective on or after February 2, 1992, the child, parent, or sibling of the employee) for the life of the beneficiary. If the beneficiary pre-deceases the retiree, the benefit payable to the retiree increases (or "pops up") to Option A based on the factor used to determine the Option C benefit at retirement. 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.

10. 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.

10. GLOSSARY OF TERMS *(continued)*

ANNUAL STATEMENT

The statement submitted to PERAC each year that describes the asset holdings and Fund balances as of December 31 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 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

10. 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 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.

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 ACCRUED LIABILITY

The excess of the Actuarial Accrued Liability over the Assets.

PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION COMMISSION

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