

Massachusetts Teachers' Retirement System

ACTUARIAL VALUATION REPORT

JANUARY 1, 2008

PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION COMMISSION
COMMONWEALTH OF MASSACHUSETTS



PERAC ACTUARIAL VALUATION REPORT

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January 1, 2008

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I. INTRODUCTION & CERTIFICATION

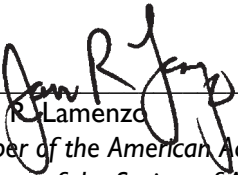
This report presents the results of the actuarial valuation of the Massachusetts Teachers' Retirement System (TRS).

The valuation was performed as of January 1, 2008 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 reflect the updated Experience Study Analysis report we issued in 2008.

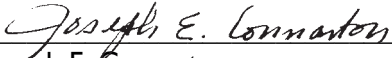
This valuation was based on member data as of December 31, 2007, which was supplied by the Retirement Board. We performed a number of tests on the data and made specific assumptions and determinations for a number of data items. We provide more detail on these issues in Section 6. Asset information as of December 31, 2007 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.

Although we have some concerns as outlined in Section 6, overall we believe this report represents an accurate appraisal of the actuarial status of the TRS performed in accordance with generally accepted actuarial principles and practices relating to pension plans. In our opinion the actuarial assumptions used in this report are reasonable, are related to plan experience and expectations, and represent our best estimate of anticipated experience.

Respectfully submitted,
Public Employee Retirement Administration Commission



James R. Lamenzo
Member of the American Academy of Actuaries
Associate of the Society of Actuaries
Enrolled Actuary Number 08-4709



Joseph E. Connarton
Executive Director

Dated: September 24, 2008

2. EXECUTIVE SUMMARY

PART A | PRINCIPAL VALUATION RESULTS

Section 22C of G.L. c. 32 mandates the establishment of a funding schedule for the Commonwealth of Massachusetts pension obligation. The Massachusetts Teachers' Retirement System (TRS) reflects one component of the Commonwealth schedule. The other components are the State 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 of the Unfunded Actuarial Liability. The law requires amortization payments such that the Unfunded Actuarial Liability is reduced to 0 by June 30, 2023. Under the current schedule, the amortization payments to eliminate the unfunded liability increase by 4.5% per year.

The results of the January 1, 2008 actuarial valuation are as follows (000s omitted):

| | |
|---------------------------------|----------------|
| Total Normal Cost | \$599,689 |
| Expected Employee Contributions | <u>498,433</u> |
| Net Normal Cost | \$101,256 |

| | |
|------------------------------|-------------------|
| Total Actuarial Liability | \$30,955,504 |
| Assets | <u>22,883,553</u> |
| Unfunded Actuarial Liability | \$8,071,951 |

2. EXECUTIVE SUMMARY *(continued)*

PART B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS

A comparison of the current valuation and the January 1, 2007 valuation is shown below.
(\$000's omitted)

| | 1/1/08 | 1/1/07 | Increase (Decrease) | Increase (Decrease) |
|---------------------------------|--------------------|--------------------|------------------------|------------------------|
| Total Normal Cost | \$599,689 | \$591,002 | \$8,687 | 1.5% |
| Expected Employee Contributions | <u>498,433</u> | <u>480,366</u> | <u>18,067</u> | 3.8% |
| Net Normal Cost | <u>\$101,256</u> | <u>\$110,636</u> | <u>(\$9,380)</u> | (8.5%) |
| Actuarial Liability | | | | |
| Actives | \$14,312,286 | \$14,293,696 | \$18,590 | 0.1% |
| Retirees and Inactives | <u>16,643,218</u> | <u>15,027,018</u> | <u>1,616,200</u> | 10.8% |
| Total | \$30,955,504 | \$29,320,714 | \$1,634,790 | 5.6% |
| Assets | <u>22,883,553</u> | <u>20,820,392</u> | <u>2,063,161</u> | 9.9% |
| Unfunded Actuarial Liability | <u>\$8,071,951</u> | <u>\$8,500,322</u> | <u>(\$428,371)</u> | (5.0%) |
| Funded Ratio | 73.9% | 71.0% | 2.9% | |

The development of the actuarial gain/(loss) is shown on page 8. During 2007, there was an overall actuarial gain of approximately \$729 million. There was a non-investment loss on actuarial liability of approximately \$213 million and a gain on assets (on an actuarial value basis) of approximately \$941 million.

We completed an updated Experience Study Analysis (covering the years 2000-2005) of the TRS in 2008. This is the first actuarial valuation using the revised assumptions. Overall the total cost using the revised assumptions is about the same as the cost using the prior assumptions. There was a slight increase in actuarial accrued liability and a slight decrease in employer normal cost.

We have detailed a number of the assumptions we made for missing or questionable data for active members in Section 6. We believe these assumptions provide reasonable valuation results on an overall basis.

2. EXECUTIVE SUMMARY *(continued)*

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

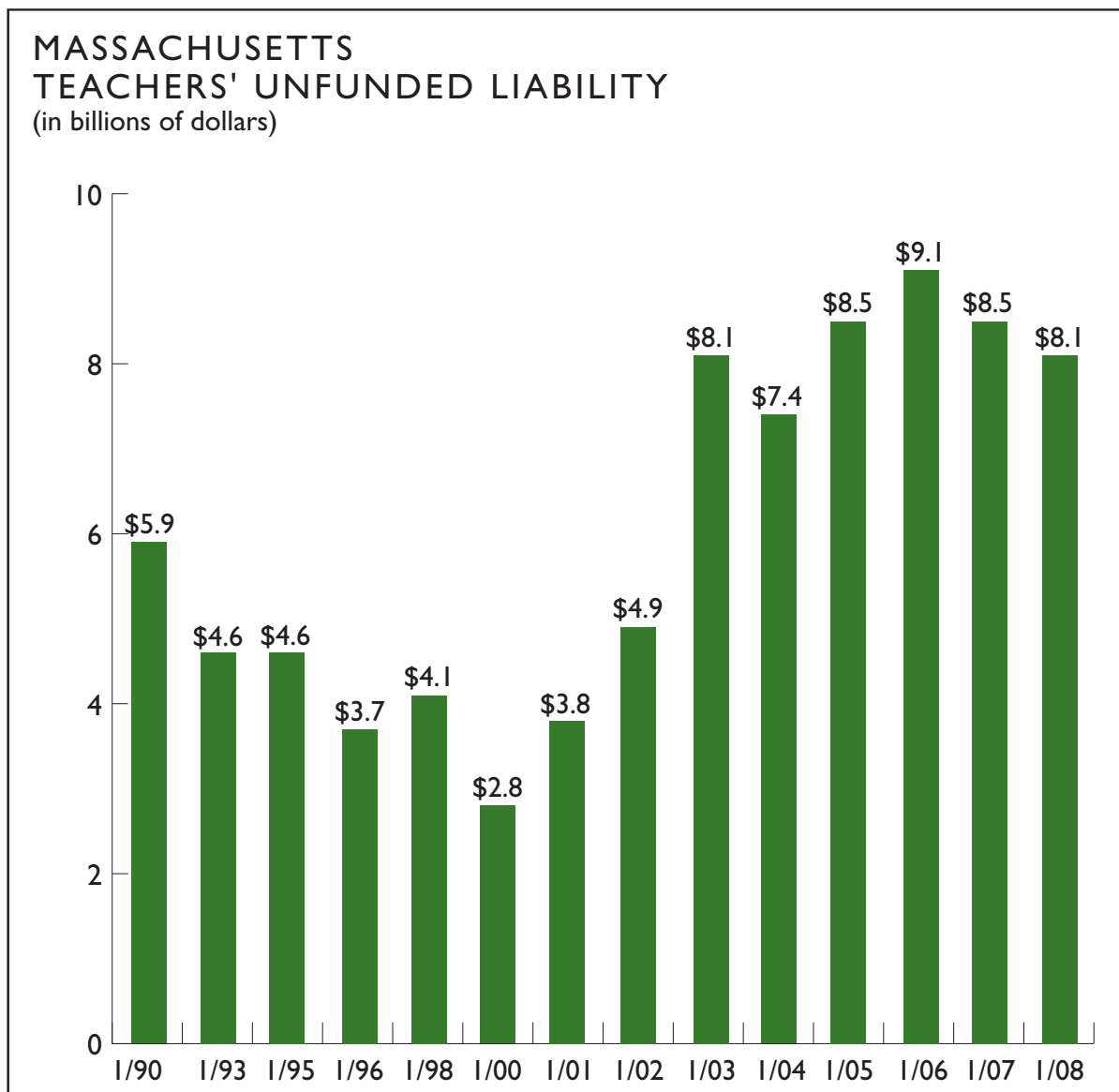
| | <u>1/1/08</u> | <u>1/1/07</u> | <u>% Difference</u> |
|-----------------|-----------------|-----------------|-------------------------|
| <u>Actives</u> | | | |
| Number | 89,636 | 88,962 | 0.8% |
| Total Payroll | \$5,163,498,060 | \$4,969,091,773 | 3.9% |
| Average Salary | \$57,605 | \$55,856 | 3.1% |
| Average Age | 44.2 | 44.3 | (0.2%) |
| Average Service | 12.9 | 13.3 | (3.0%) |

| | <u>1/1/08</u> | <u>1/1/07</u> | <u>% Difference</u> |
|-------------------------------|-----------------|-----------------|-------------------------|
| <u>Retirees and Survivors</u> | | | |
| Number | 50,024 | 47,635 | 5.0% |
| Total Benefits | \$1,718,157,754 | \$1,556,423,338 | 10.4% |
| Average Benefits | \$34,347 | \$32,674 | 5.1% |
| Average Age | 69.7 | 69.6 | 0.1% |

2. EXECUTIVE SUMMARY *(continued)*

PART C | FUNDING PROGRESS UNFUNDED RATIO

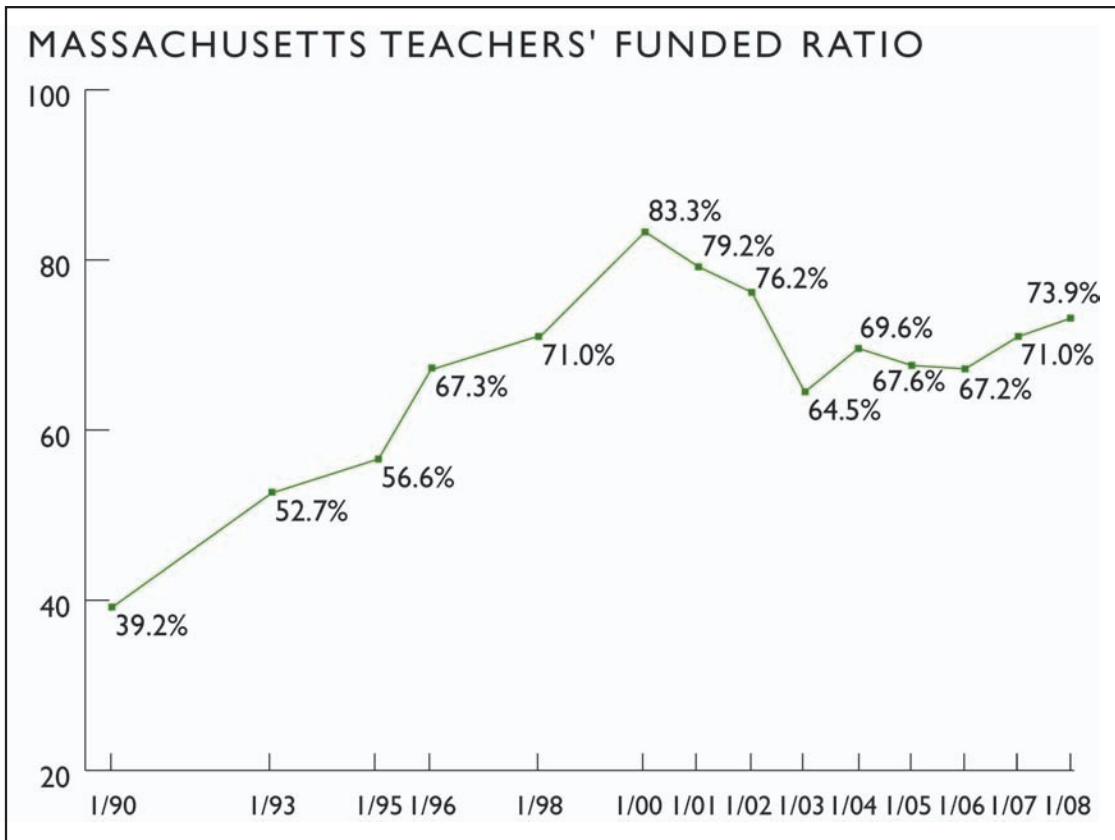
The chart below shows the unfunded actuarial accrued liability (UAL) since 1990. The UAL represents the actuarial accrued liability less the actuarial value of plan assets. When there is no UAL, a system is said to be “fully funded”. In this exhibit, for years prior to 2000, estimates were developed to reflect implementation of new actuarial software.



2. EXECUTIVE SUMMARY *(continued)*

PART C | FUNDING PROGRESS *(continued)* FUNDED RATIO

The chart below shows the 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, estimates were developed to reflect implementation of new actuarial software.



3. SUMMARY OF VALUATION RESULTS

(dollars in thousands)

| | |
|---------------------------------|-------------------|
| A. Number of Members | |
| Active | 89,636 |
| Vested Terminated | N/A |
| Retired/ Beneficiaries | <u>50,024</u> |
| Total | 139,660 |
| B. Total Payroll | |
| | \$5,163,498 |
| C. Normal Cost | |
| Superannuation | \$494,410 |
| Death | 27,068 |
| Disability | 8,131 |
| Termination | <u>70,080</u> |
| Total Normal Cost | \$599,689 |
| Expected Employee Contributions | <u>498,433</u> |
| Net Employer Normal Cost | \$101,256 |
| D. Actuarial Liability | |
| Active | |
| Superannuation | \$13,735,873 |
| Death | 194,779 |
| Disability | 73,562 |
| Termination | <u>308,072</u> |
| Total Active | \$14,312,286 |
| Vested Terminated (a) | 500,000 |
| Non-Vested Terminated | N/A |
| Retirees and Survivors | <u>16,143,218</u> |
| Total Actuarial Liability | \$30,955,504 |
| E. Actuarial Value of Assets | |
| | <u>22,883,553</u> |
| F. Unfunded Actuarial Liability | |
| | \$8,071,951 |
| G. Funded Ratio: E/D | |
| | 73.9% |

(a) estimated and includes non-vested terminated members.

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

| | |
|---|--------|
| A. Gain/(loss) on Actuarial Liability | |
| 1. Actuarial Liability 1/1/2007 | 29,321 |
| 2. Total Normal Cost 1/1/2007 | 591 |
| 3. Interest on (1) and (2) at 8.25% | 2,468 |
| 4. Benefits paid during 2007 [a] | 1,732 |
| 5. Interest on (4) assuming mid-year payment | 71 |
| 6. Expected Actuarial Liability 1/1/2008: (1)+(2)+(3)-(4)-(5) | 30,576 |
| 7. Increase (decrease) in liability due to assumption change | 167 |
| 8. Expected Actuarial Liability after assumption change (6)+(7) | 30,743 |
| 9. Actuarial Liability 1/1/2008 | 30,956 |
| 10. Gain/(loss): (8)-(9) | (213) |
| | |
| B. Gain/(loss) on assets | |
| 11. Actuarial Value of Assets (AVA) 1/1/2007 | 20,821 |
| 12. Interest on (11) at 8.25% | 1,718 |
| 13. Net Receipts [b] | 559 |
| 14. Net Disbursements [b] | 1,123 |
| 15. Net Cash Flow: (13)-(14) | (564) |
| 16. Interest on (15) [c] | (33) |
| 17. Expected AVA 1/1/2008: (11)+(12)+(15)+(16) | 21,942 |
| 18. AVA 1/1/2008 | 22,883 |
| 19. Gain/(loss): (18)-(17) | 941 |
| | |
| C. Total Gain/(loss): (10)+(19) | 729 |

[a] Estimated

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

[c] Assumes time weighting based on the monthly cash flow.

5. ASSETS

PART A | ASSET ALLOCATION (dollars in thousands)

Investment in the Pension Reserves

Investment Trust

| | |
|---|--------------|
| Market value | \$25,316,044 |
| Actuarial value | \$22,883,553 |
| Actuarial value as a percentage of market value | 90.4% |

Under the actuarial value of assets corridor approach, the actuarial value of assets cannot be less than 90% or greater than 110% of market value.

5. ASSETS *(continued)*

PART B | DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS (in thousands)

A. Development of 12/31/07 expected actuarial value of assets (AVA)

| | |
|---|------------|
| 1. Market Value (MV) 12/31/06 | 23,133,769 |
| 2. Actuarial Value 12/31/06 (as calculated) | 20,504,714 |
| 3. Net Receipts 2007 | 559,130 |
| 4. Net Disbursements 2007 | 1,123,144 |
| 5. Net Cash Flow: (3)-(4) | (564,014) |
| 6. Expected Investment Return on (2): 0.0825x(2) | 1,691,639 |
| 7. Expected Investment Return on (5): $\frac{1}{2} \times 0.0825 \times (5)$ | (23,266) |
| 8. Expected AVA 12/31/07: (2)+(5)+(6)+(7) | 21,609,073 |

B. Previous differences not yet amortized

| | |
|---|-----------|
| 1. Unrecognized amount of 12/31/06 difference | |
| a. .2 x 2003 Gain/(loss) | 379,348 |
| b. .4 x 2004 Gain/(loss) | 304,467 |
| c. .6 x 2005 Gain/(loss) | 492,054 |
| d. .8 x 2006 Gain/(loss) | 1,453,186 |
| e. Total | 2,629,055 |

C. Gain/(loss) from 2007

| | |
|---|------------|
| 1. Market Value 12/31/07 | 25,316,044 |
| 2. Expected Market Value 12/31/07: A(8)+B(1e) | 24,238,128 |
| 3. Gain/ (loss) from 2007 investment: (1)-(2) | 1,077,916 |

D. Development of AVA 12/31/07

| | |
|---|----------------|
| 1. 2007 Gain/(loss) | 1,077,916 |
| 2. 2006 Gain/(loss) | 1,816,482 |
| 3. 2005 Gain/(loss) | 820,090 |
| 4. 2004 Gain/(loss) | 761,168 |
| 5. 2003 Gain/(loss) | 1,896,741 |
| 6. 20% of 2007 Gain/(loss) | 215,583 |
| 7. 20% of 2006 Gain/(loss) | 363,296 |
| 8. 20% of 2005 Gain/(loss) | 164,018 |
| 9. 20% of 2004 Gain/(loss) | 152,234 |
| 10. 20% of 2003 Gain/(loss) | <u>379,348</u> |
| 11. Total | 1,274,479 |
| 12. Actuarial Value 12/31/07: A8+D11 | 22,883,553 |
| 13. Percentage of Market Value | 90.4% |
| 14. Actuarial Value 12/31/2007: not less than 90% of market value | 22,883,553 |

6. SYSTEM MEMBERSHIP

PART A | 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, with the help of the TRS, 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 better reflect this cost, we adjusted our normal cost and liability figures as of January 1, 2006 and again with this valuation. We used a 1% loading factor based on our analysis.

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 and buyback issues, 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 \$20,000. For members with calculated 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.

Pay for all members hired in 2007 was annualized. We assumed a rate of pay of \$50,000 for members hired after October 1.

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.

6. SYSTEM MEMBERSHIP *(continued)*

PART A | ACTIVE MEMBERS *(continued)*

| | Actives |
|--------------------------------------|----------|
| Number of Members | 89,636 |
| Average Age | 44.2 |
| Average Service | 12.9 |
| Average Salary | \$57,605 |
| Average Annuity Savings Fund Balance | \$48,941 |

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 | 2,551 | 1 | | | | | | 2,552 |
| 25 - 29 | 8,818 | 2,027 | 3 | | | | | 10,848 |
| 30 - 34 | 4,121 | 5,389 | 1,398 | 2 | | | | 10,910 |
| 35 - 39 | 2,545 | 3,632 | 4,519 | 542 | | | | 11,238 |
| 40 - 44 | 2,273 | 2,271 | 2,536 | 1,650 | 668 | 2 | | 9,400 |
| 45 - 49 | 2,115 | 2,457 | 1,986 | 1,119 | 2,266 | 401 | | 10,344 |
| 50 - 54 | 1,497 | 2,340 | 2,130 | 1,218 | 1,696 | 2,782 | 1,830 | 13,493 |
| 55 - 59 | 1,192 | 1,453 | 1,575 | 1,257 | 1,563 | 1,326 | 6,798 | 15,164 |
| 60 - 64 | 265 | 510 | 519 | 459 | 651 | 330 | 2,148 | 4,882 |
| 65+ | 39 | 78 | 77 | 70 | 117 | 69 | 355 | 805 |
| Total | 25,416 | 20,158 | 14,743 | 6,317 | 6,961 | 4,910 | 11,131 | 89,636 |

6. 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 | 2,552 | \$105,760,382 | \$41,442 |
| 25 - 29 | 10,848 | \$472,232,798 | \$43,532 |
| 30 - 34 | 10,910 | \$543,820,874 | \$49,846 |
| 35 - 39 | 11,238 | \$626,060,290 | \$55,709 |
| 40 - 44 | 9,400 | \$538,489,261 | \$57,286 |
| 45 - 49 | 10,344 | \$609,865,411 | \$58,958 |
| 50 - 54 | 13,493 | \$853,027,455 | \$63,220 |
| 55 - 59 | 15,164 | \$1,022,461,317 | \$67,427 |
| 60 - 64 | 4,882 | \$336,165,155 | \$68,858 |
| 65+ | 805 | \$55,615,117 | \$69,087 |
| Total | 89,636 | \$5,163,498,060 | \$57,605 |

6. SYSTEM MEMBERSHIP *(continued)*

PART B | RETIREES AND SURVIVORS

| | Superannuation | Ordinary Disability | Accidental Disability | Survivors | Total |
|------------------------|----------------|---------------------|-----------------------|-----------|----------|
| Number of Members | 45,888 | 427 | 298 | 3,411 | 50,024 |
| Average Age | 69.6 | 67.1 | 67.7 | 71.6 | 69.7 |
| Average Annual Benefit | \$35,889 | \$18,256 | \$32,813 | \$15,741 | \$34,347 |

Benefit by Retirement Type

| | Superannuation | Ordinary Disability | Accidental Disability | Survivors | Total |
|---------|-----------------|---------------------|-----------------------|--------------|-----------------|
| Annuity | \$231,377,803 | \$586,811 | \$383,014 | \$3,761,975 | \$236,109,603 |
| Pension | \$1,415,514,569 | \$7,208,511 | \$9,395,211 | \$49,929,860 | \$1,482,048,151 |
| Total | \$1,646,892,372 | \$7,795,322 | \$9,778,225 | \$53,691,835 | \$1,718,157,754 |

6. SYSTEM MEMBERSHIP *(continued)*

PART B | RETIREES & SURVIVORS *(continued)*

Benefit by Age Distribution

| Present Age | Number of Members | Total Benefits | Average Benefits |
|--------------|-------------------|-----------------|------------------|
| Less than 40 | 101 | \$2,036,689 | \$20,165 |
| 40 – 44 | 40 | \$607,003 | \$15,175 |
| 45 – 49 | 70 | \$1,034,102 | \$14,773 |
| 50 – 54 | 296 | \$6,053,186 | \$20,450 |
| 55 – 59 | 5,995 | \$255,331,690 | \$42,591 |
| 60 – 64 | 12,863 | \$554,089,993 | \$43,076 |
| 65 – 69 | 9,600 | \$361,389,529 | \$37,645 |
| 70 – 74 | 7,027 | \$223,492,442 | \$31,805 |
| 75 – 79 | 6,024 | \$159,943,866 | \$26,551 |
| 80 – 84 | 4,078 | \$87,743,106 | \$21,516 |
| 85 – 89 | 2,377 | \$41,953,730 | \$17,650 |
| 90+ | 1,553 | \$24,482,418 | \$15,765 |
| Totals | 50,024 | \$1,718,157,754 | \$34,347 |

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

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.

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 value of assets as of January 1, 2008 is 90.4% of the market value.

8. ACTUARIAL ASSUMPTIONS

INVESTMENT RETURN 8.25% per year

INTEREST RATE CREDITED TO
THE ANNUITY SAVINGS FUND 3.5% per year

COST OF LIVING
INCREASES (COLA) 3% per year

MORTALITY Pre-retirement mortality reflects RP-2000 Employees table projected 10 years with Scale AA (gender distinct). Post-retirement mortality reflects RP-2000 Healthy Annuitant table projected 10 years with scale AA (gender distinct). For disabled members, the mortality rate is assumed to be in accordance with the RP-2000 Table (gender distinct) set forward 3 years for males. It is assumed that 55% of pre-retirement deaths are job-related. For members retired under an Accidental Disability, 40% of deaths are assumed to be from the same cause as the disability.

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

Service

| | |
|-----|-------|
| 0 | 8.00% |
| 1 | 7.75% |
| 2 | 7.50% |
| 3 | 7.25% |
| 4 | 7.00% |
| 5 | 6.75% |
| 6 | 6.50% |
| 7 | 6.25% |
| 8 | 6.00% |
| 9 | 5.75% |
| 10 | 5.50% |
| 11 | 5.25% |
| 12 | 5.00% |
| 13 | 5.00% |
| 14+ | 4.75% |

8. ACTUARIAL ASSUMPTIONS *(continued)*

RETIREMENT

Males

| | Not in Retirement Plus | |
|-----|------------------------|------|
| | Less than 20 | 20+ |
| 47 | 0.00 | 0.00 |
| 48 | 0.00 | 0.00 |
| 49 | 0.00 | 0.00 |
| 50 | 0.00 | 0.02 |
| 51 | 0.00 | 0.02 |
| 52 | 0.00 | 0.02 |
| 53 | 0.00 | 0.02 |
| 54 | 0.00 | 0.02 |
| 55 | 0.06 | 0.05 |
| 56 | 0.06 | 0.05 |
| 57 | 0.07 | 0.05 |
| 58 | 0.07 | 0.06 |
| 59 | 0.10 | 0.07 |
| 60 | 0.15 | 0.20 |
| 61 | 0.20 | 0.35 |
| 62 | 0.20 | 0.35 |
| 63 | 0.20 | 0.35 |
| 64 | 0.25 | 0.35 |
| 65 | 0.30 | 0.40 |
| 66 | 0.30 | 0.30 |
| 67 | 0.30 | 0.30 |
| 68 | 0.30 | 0.30 |
| 69 | 0.30 | 0.30 |
| 70+ | 1.00 | 1.00 |

| | Retirement Plus | | |
|-----|-----------------|-------|------|
| | Less than 20 | 20-30 | 30+ |
| 47 | 0.00 | 0.00 | 0.00 |
| 48 | 0.00 | 0.00 | 0.00 |
| 49 | 0.00 | 0.00 | 0.00 |
| 50 | 0.00 | 0.01 | 0.02 |
| 51 | 0.00 | 0.01 | 0.02 |
| 52 | 0.00 | 0.01 | 0.02 |
| 53 | 0.00 | 0.01 | 0.02 |
| 54 | 0.00 | 0.01 | 0.02 |
| 55 | 0.03 | 0.03 | 0.06 |
| 56 | 0.08 | 0.05 | 0.20 |
| 57 | 0.15 | 0.08 | 0.35 |
| 58 | 0.15 | 0.10 | 0.50 |
| 59 | 0.20 | 0.20 | 0.50 |
| 60 | 0.15 | 0.20 | 0.50 |
| 61 | 0.30 | 0.25 | 0.50 |
| 62 | 0.20 | 0.30 | 0.40 |
| 63 | 0.30 | 0.30 | 0.40 |
| 64 | 0.40 | 0.30 | 0.40 |
| 65 | 0.40 | 0.40 | 0.50 |
| 66 | 0.40 | 0.30 | 0.50 |
| 67 | 0.40 | 0.30 | 0.50 |
| 68 | 0.40 | 0.30 | 0.50 |
| 69 | 0.40 | 0.30 | 0.50 |
| 70+ | 1.00 | 1.00 | 1.00 |

8. ACTUARIAL ASSUMPTIONS *(continued)*

RETIREMENT

Females

| | Not in Retirement Plus | |
|-----|------------------------|------|
| | Less than 20 | 20+ |
| 47 | 0.00 | 0.00 |
| 48 | 0.00 | 0.00 |
| 49 | 0.00 | 0.00 |
| 50 | 0.00 | 0.02 |
| 51 | 0.00 | 0.02 |
| 52 | 0.00 | 0.02 |
| 53 | 0.00 | 0.02 |
| 54 | 0.00 | 0.02 |
| 55 | 0.06 | 0.05 |
| 56 | 0.06 | 0.05 |
| 57 | 0.07 | 0.05 |
| 58 | 0.07 | 0.07 |
| 59 | 0.10 | 0.10 |
| 60 | 0.15 | 0.20 |
| 61 | 0.20 | 0.30 |
| 62 | 0.20 | 0.30 |
| 63 | 0.20 | 0.30 |
| 64 | 0.25 | 0.30 |
| 65 | 0.30 | 0.40 |
| 66 | 0.30 | 0.40 |
| 67 | 0.30 | 0.40 |
| 68 | 0.30 | 0.40 |
| 69 | 0.30 | 0.40 |
| 70+ | 1.00 | 1.00 |

| | 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 | 0.015 | 0.02 |
| 51 | 0.00 | 0.015 | 0.02 |
| 52 | 0.00 | 0.015 | 0.02 |
| 53 | 0.00 | 0.015 | 0.02 |
| 54 | 0.00 | 0.015 | 0.02 |
| 55 | 0.02 | 0.03 | 0.06 |
| 56 | 0.02 | 0.03 | 0.15 |
| 57 | 0.08 | 0.07 | 0.30 |
| 58 | 0.10 | 0.07 | 0.35 |
| 59 | 0.15 | 0.11 | 0.35 |
| 60 | 0.20 | 0.16 | 0.35 |
| 61 | 0.20 | 0.20 | 0.35 |
| 62 | 0.25 | 0.30 | 0.40 |
| 63 | 0.24 | 0.30 | 0.30 |
| 64 | 0.20 | 0.30 | 0.35 |
| 65 | 0.30 | 0.30 | 0.35 |
| 66 | 0.30 | 0.30 | 0.35 |
| 67 | 0.30 | 0.30 | 0.30 |
| 68 | 0.30 | 0.30 | 0.30 |
| 69 | 0.30 | 0.30 | 0.30 |
| 70+ | 1.00 | 1.00 | 1.00 |

8. ACTUARIAL ASSUMPTIONS *(continued)*

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

| Age | |
|-----|---------|
| 20 | 0.00004 |
| 30 | 0.00006 |
| 40 | 0.00010 |
| 50 | 0.00050 |
| 60 | 0.00100 |

It is also assumed that 35% of disabilities will be job-related for Teachers.

WITHDRAWAL

Based on an analysis of past experience. In addition to being age and service based, Teacher rates are also gender based. Sample annual rates are shown below.

| Age | Service | 0 | | 5 | | 10+ | |
|-----|---------|-------|--------|-------|--------|-------|--------|
| | | Male | Female | Male | Female | Male | Female |
| 20 | | 0.120 | 0.100 | 0.045 | 0.090 | 0.010 | 0.050 |
| 30 | | 0.114 | 0.120 | 0.045 | 0.090 | 0.010 | 0.050 |
| 40 | | 0.097 | 0.110 | 0.054 | 0.065 | 0.017 | 0.029 |
| 50 | | 0.100 | 0.082 | 0.048 | 0.042 | 0.022 | 0.021 |

9. SUMMARY OF PLAN PROVISIONS

ADMINISTRATION

There are 106 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.

MEMBERSHIP

Membership 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.

There are 4 classes of membership in the Commonwealth. Members of the Massachusetts Teachers' System are classified in Group 1.

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:

| | |
|--------------------|---|
| 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. |

RATE OF INTEREST

Interest on regular deductions made after January 1, 1984 is a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average

9. SUMMARY OF PLAN PROVISIONS (*continued*)

rates paid on individual savings accounts by a representative sample of at least 10 financial institutions.

RETIREMENT AGE

There is no mandatory retirement age for employees in Groups 1 and 2. Most Group 4 members must retire at age 65. The mandatory retirement age for Group 3 members is 55, however, a Federal court order has enjoined the State Police from retiring any members on account of age.

SUPERANNUATION RETIREMENT

A member 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

AMOUNT OF BENEFIT

A member's annual allowance is determined by multiplying the member's average salary by a benefit rate related to the member's age and job classification at retirement, and the resulting product by his creditable service. The amount determined by the benefit formula cannot exceed 80% of the 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.
- Average Salary is the average annual rate of regular compensation received during the 3 consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.
- The Benefit Rate varies with the member's retirement age, but the highest rate of 2.5% applies to Group 1 employees who retire at or after age 65, Group 2 employees who retire at or after age 60, and to Group 4 employees who retire at or after age 55. A .1% reduction is applied for each year of age under the maximum age for the member's group. For Group 2 employees who terminate from service under age 55, the benefit rate for a Group 1 employee shall be used.
- For 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

9. SUMMARY OF PLAN PROVISIONS *(continued)*

each year of service in excess of 24. The amount determined cannot exceed 80% of the average salary.

- For Group 3 members, the rate is 3% for any age.

DEFERRED VESTED BENEFIT

A participant who has completed 10 or more years of creditable service is eligible for a deferred vested retirement benefit. Elected officials and others who were hired prior to 1978 may be vested after 6 years in accordance with G.L. c. 32, s. 10.

The participant's accrued benefit is payable commencing at age 55, or the completion of 20 years, or may be deferred until later at the participant's option.

WITHDRAWAL OF CONTRIBUTIONS

Member contributions may be withdrawn upon termination of employment. Employees who first become members on or after January 1, 1984, may receive only limited interest on their contributions if they voluntarily terminate their service. Those who leave service with less than 5 years receive no interest; those who leave service with greater than 5 but less than 10 years receive 50% of the interest credited.

ORDINARY DISABILITY

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

Veterans with ten years of creditable service who become totally and permanently disabled by reason of a non-job related condition prior to reaching "maximum age".

Retirement Allowance: 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/she will receive an allowance that is not less than the allowance he/she would have received if retired for superannuation.

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 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 \$667.92 per year (or \$312.00 per year in systems in which the local option contained in G.L. c. 32, s.7(2)(a)(iii) has not been adopted), 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 21 for any child who is a full time student at an accredited educational institution.

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 \$667.92 per year, per child, payable to the spouse or legal guardian until all dependent children reach age 18 or 21 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.

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 \$6,000.

DEATH IN ACTIVE SERVICE

Eligibility: At least 2 years of service

Allowance: An immediate allowance equal to that which would have been payable had the member retired and elected Option C on the day before his or her death. For death occurring prior to the member's superannuation retirement age, the age 55 benefit rate 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 \$3,000, 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 full time students, unless mentally or physically incapacitated.

COST OF LIVING

Chapter 17 of the Acts of 1997 provides that the first \$12,000 of a retiree's total allowance is subject to an annual cost-of-living adjustment (COLA). Each year PERAC notifies the Massachusetts General Court of the percentage increase in the Consumer Price Index used for indexing Social Security benefits. This COLA is subject to an annual vote of the Massachusetts General Court, but cannot exceed 3.0%.

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 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 pre-deceases 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 pre-deceases 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.

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.

PERAC

Five Middlesex Avenue | Suite 304

Somerville, MA 02145

Ph: 617.666.4446 | Fax: 617.628.4002

TTY: 617.591.8917 | Web: www.mass.gov/perac