

Understanding an Actuarial Valuation Report

August 2008
Commonwealth of Massachusetts
Public Employee Retirement Administration Commission

James R. Lamenza, *PERAC Actuary*



Commonwealth of Massachusetts

Public Employee Retirement Administration Commission

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Actuary's Letter

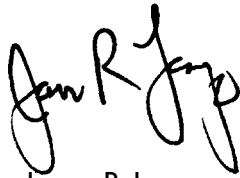
It is essential that Retirement Board Members understand valuation reports in order to effectively complete their fiduciary duties.

The purpose of this publication is to provide an advanced perspective on valuation reports and their complexities.

If you are unfamiliar with actuarial valuations, more fundamental information is available in the PERAC publication *Actuarial Valuation Basics*, available online at www.mass.gov/perac or in print form by request.

Contained in this booklet is a complete valuation of the fictional Quabbin Retirement Board. Key points about the valuation are discussed on the shaded pages.

If you have any questions regarding a PERAC valuation of your retirement system or of a more general nature, please do not hesitate to contact me.



James R. Lamenza
PERAC Actuary

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Introduction to Present Value of Future Benefits

The Present Value of Future Benefits, represented by the three diagrams that follow, is the basis for determining plan costs and liabilities.

Present Value of Future Benefits

Figure 1
The Present Value of Future Benefits is equal to the Present Value of Future Normal Cost plus the Actuarial Accrued Liability (based on members' past service).



Introduction to Present Value of Future Benefits (cont.)

Figure 2
The Unfunded Actuarial Accrued Liability (UAL) is equal to the Actuarial Accrued Liability less Plan Assets.

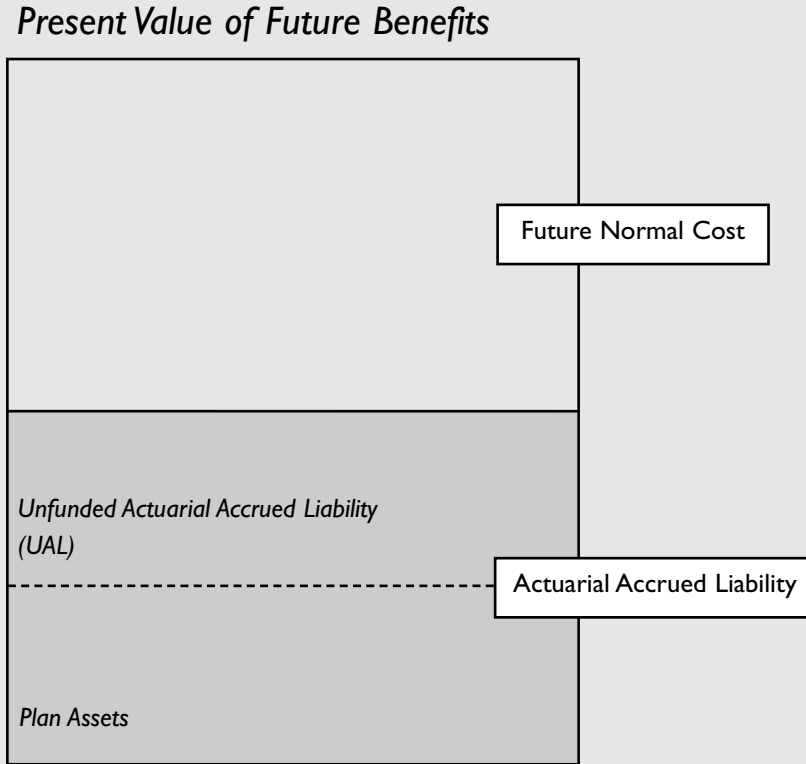
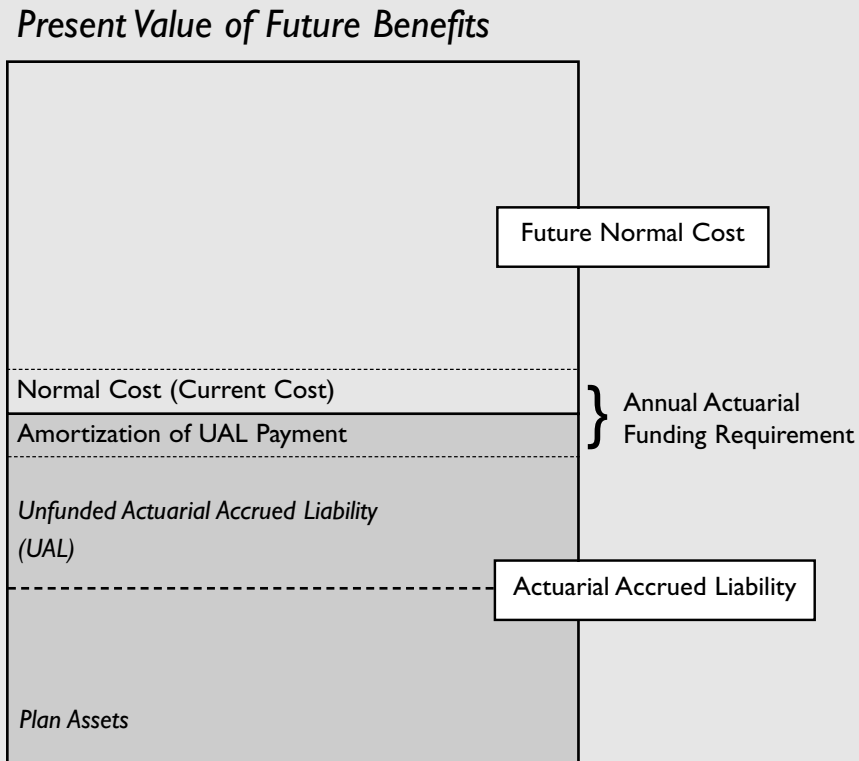


Figure 3
The Annual Actuarial Funding Requirement is equal to the Normal Cost plus the Amortization of Unfunded Actuarial Accrued Liability (UAL) Payment.



Key Points & Concepts

The opening Introduction and Certification section of the valuation provides the reader with an overview of the data used to prepare the report and the actuary's certification that the valuation was performed in a professional manner.

1 **An actuarial valuation of a retirement plan** is an estimate of a plan's financial position at a specific point in time. During a valuation, an actuary takes a "snapshot" of the membership as of a given date to determine the plan's liabilities and funded status. A valuation estimates the present value of expected future cash flows.

2 **The two components that determine the valuation results** are member census data and financial data. Although PERAC reviews member and financial data for reasonableness, PERAC does not audit the information as part of the valuation.

3 Each actuarial assumption should be reasonable.

How good are the assumptions?

- Gains and losses are determined at each valuation based on actual vs. expected experience.

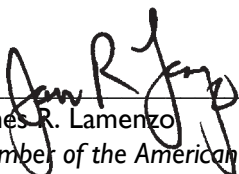
Scheduling Valuations: Adherence to a schedule of regular valuations is likely to result in the early identification of trends and appropriate adjustments being made on a timely basis. Periodic valuations enable a retirement board to guard against an unexpected and sizable increase in a system's funding schedule and appropriation amount.

Although Chapter 32 requires triennial valuations, PERAC recommends performing valuations at least every two years. In addition, we recommend interim estimated valuations be performed in off years. In the private sector annual valuations are required. PERAC's goal, with the help of private actuaries, is to conduct a valuation of each retirement system at least every two years.

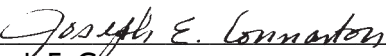
I. INTRODUCTION & CERTIFICATION

- 1** This report presents the results of the actuarial valuation of the Quabbin Contributory Retirement System. The valuation was performed as of January 1, 2008 pursuant to Chapter 32 of the General Laws of the Commonwealth of Massachusetts.
- 2** This valuation was based on member data as of December 31, 2007, which was supplied by the Retirement Board. Such tests as we deemed necessary were performed on the data to ensure accuracy. Asset information as of December 31, 2007 was provided in the Annual Statement for the Financial Condition as submitted to this office in accordance with G.L. c. 32, ss. 20(5)(h), 23(1) and 23(2)(e). Both the membership data and financial information were reviewed for reasonableness, but were not audited by us.
- 3** 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 under the system. We believe this report represents an accurate appraisal of the actuarial status of the system performed in accordance with generally accepted actuarial principles and practices relating to pension plans.

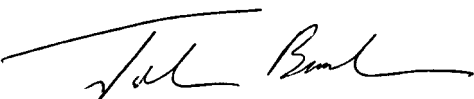
Respectfully submitted,
Public Employee Retirement Administration Commission



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



John F. Boorack
Actuarial Associate

June 30, 2008

Key Points & Concepts

The Executive Summary of the PERAC Valuation is made up of three sections highlighting the most important aspects of the report. The summary presents the system's costs and liabilities, and the cost in the next fiscal year under the plan's current funding schedule. It also provides a comparison with the results of the previous actuarial valuation, and a brief analysis of actuarial gains or losses for the system.

1

Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is accrued in the current year. The Employee Normal Cost is the amount of the expected employee contributions for the year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

2

Actuarial Accrued Liability can be described in the following ways:

- The present value of future benefits based on a member's service to date
- The accumulation of past normal costs
- Present value of Future Benefits less Present Value of Future Normal Cost
- Past service liability (but with projected assumptions)

Determining System Liabilities: For the purposes of an actuarial valuation, liabilities include Total Normal Cost and Total Actuarial Accrued Liability for the system.

- *Total Normal Cost* for the System is the sum of Normal Cost for each individual member.
- *Total Actuarial Accrued Liability* for the System is the sum of the Actuarial Liability for each individual member.

2. EXECUTIVE SUMMARY

PART A | COSTS UNDER CURRENT VALUATION

The principal results of the January 1, 2008 actuarial valuation are shown below.

Present Value of Future Benefits

Actives	\$46,679,500
Retirees, Survivors, and Inactives	<u>33,374,300</u>
Total	<u>\$80,053,800</u>

Normal Cost

1	Total Normal Cost	\$1,680,000
	Expected Employee Contributions	<u>980,800</u>
	Net Normal Cost	<u>\$699,200</u>

Actuarial Liability and Development of Unfunded Actuarial Liability

2	Actives	\$30,625,700
	Retirees, Survivors, and Inactives	<u>33,374,300</u>
	Total	\$64,000,000
	Assets	<u>43,046,500</u>
	Unfunded Actuarial Liability	<u>\$20,953,500</u>

The Board recently adopted a funding schedule effective in FY09.

Key Points & Concepts

1

Note that the Unfunded Liability increased and the Funded Ratio decreased primarily due to the actual investment return.

2. EXECUTIVE SUMMARY *(continued)*

PART B | COMPARISON WITH PRIOR VALUATION

The last full valuation was performed by PERAC as of January 1, 2006. Our Local Experience Study Analysis (issued in March, 2002) forms the basis for the actuarial assumptions (other than the investment return assumption) used in this valuation. Below we have shown the comparison between the two valuations.

	PERAC 1/1/08	PERAC 1/1/06	Increase (Decrease)	% Increase (Decrease)
Total Normal Cost	\$1,680,000	\$1,580,000	\$100,000	6.3%
Expected Employee Contributions	<u>980,800</u>	<u>924,900</u>	<u>55,900</u>	6.0%
Net Normal Cost	<u>\$699,200</u>	<u>\$655,100</u>	<u>\$44,100</u>	6.7%
Actuarial Liability				
Actives	\$30,625,700	\$28,490,800	\$2,134,900	7.5%
Retirees and Inactives	<u>33,374,300</u>	<u>28,669,800</u>	<u>4,704,500</u>	16.4%
Total	\$64,000,000	\$57,160,600	\$6,839,400	12.0%
Assets	<u>43,046,500</u>	<u>39,090,000</u>	<u>3,956,500</u>	10.1%
Unfunded Actuarial Liability	<u>\$20,953,500</u>	<u>\$18,070,600</u>	<u>\$2,882,900</u>	16.0%
Funded Ratio	67.3%	68.4%	(1.1%)	

I

Key Points & Concepts

Illustration of Salary Gain or Loss (Not based on the Quabbin Valuation)

VALUATION DATE	1/07	1/08
ALL MEMBERS		
Active Members	200	240
Total Pay	\$6,000,000	\$7,320,000
% Increase		22.0%
Average Pay	\$30,000	\$30,500
% Increase		1.7%
CONTINUING MEMBERS		
Active Members	200	200
Total Pay	\$6,000,000	\$6,520,000
% Increase		8.7%
Average Pay	\$30,000	\$32,600
% Increase		8.7%

Salaries increase 8.7% for continuing members during 2007.

2. EXECUTIVE SUMMARY *(continued)*

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

Actives	PERAC 1/1/08	PERAC 1/1/06	% Difference
Number	400	377	6.1%
Total Payroll	\$12,158,000	\$11,673,582	4.1%
Average Salary	\$30,395	\$30,964	(1.8%)
Average Age	46.7	46.4	0.6%
Average Service	11.2	10.9	2.8%

Retirees and Survivors	PERAC 1/1/08	PERAC 1/1/06	% Difference
Number	220	212	3.8%
Total Benefits*	\$3,345,299	\$2,892,382	15.7%
Average Benefits*	\$15,206	\$13,643	11.5%
Average Age	70.9	71.1	(0.3%)

*excluding State reimbursed COLA

Key Points & Concepts

- 1 Retirements under Accidental Disability result in higher liabilities than expected (actuarial loss) because the benefit received under disability is generally higher than the benefit that would be received under Superannuation at the same age. Increases in pay that are less than assumed result in actuarial gains.
- 2 Returns on an actuarial basis (or market value basis if the system uses MVA) less than assumed produce losses.
- 3 Standard investment return assumption used by PERAC is 8%.

2. EXECUTIVE SUMMARY *(continued)*

PART C | GAIN/LOSS ANALYSIS AND PLAN FUNDING SCHEDULE

1

Since the last valuation, there was a loss on plan liabilities of approximately \$200,000. There were several new retirees over the past two years with annual benefits much greater than average, including one with a benefit greater than \$85,000, and there were significantly more disability retirements than expected. This was partially offset by salary increases for continuing actives being less than expected (average pay increased 2.5% per year for continuing actives).

2

The rates of return on a market value basis for 2006 and 2007 were 10.0% and 14.0% respectively. There was an asset gain on a market value basis of approximately \$3.0 million over the 2-year period. The rates of return on an actuarial value basis for 2006 and 2007 were 4.4% and 8.3% respectively. The lower returns on an actuarial basis reflect deferred gains as of January 1, 2008 that will be recognized in the next few years. There was an asset loss on an actuarial basis of approximately \$1.5 million over the 2-year period.

3

This valuation uses an investment return assumption of 8.25%, which was also used for the January 1, 2006 valuation. The standard PERAC assumption is 8.0%. Although decreasing this rate was discussed, we are maintaining the current assumption and will revisit this issue as part of the next valuation.

The funding schedule presented in this report was recently adopted by the board. The FY09 payment is maintained from the current schedule. The schedule amortizes the remaining unfunded actuarial liability through 2028 with payments increasing 4.5% each year.

Key Points & Concepts

1

In the chart at right, Normal Cost and Accrued Liabilities are delineated for retirement (superannuation), death, disability, and withdrawal (termination).

2

Found here are different views of funding using the same components:

- The Actuarial Accrued Liability (\$64,000,000) less plan Assets (\$43,046,500) is equal to the Unfunded Accrued Liability (\$20,953,500).
- The plan Assets (\$43,046,500) divided by the Actuarial Accrued Liability (\$64,000,000) is equal to the Funded Ratio (67.3%).

100% funding

If a retirement system is 100% funded, Normal Cost still applies because member benefits accrue during the current year. Also, 100% funding is a moving target because different valuation systems produce different results. Various percentages can be used as a the benchmark (95%, 105%).

Funding status can (and does) change due to law changes and benefit enhancements.

3. SUMMARY OF VALUATION RESULTS

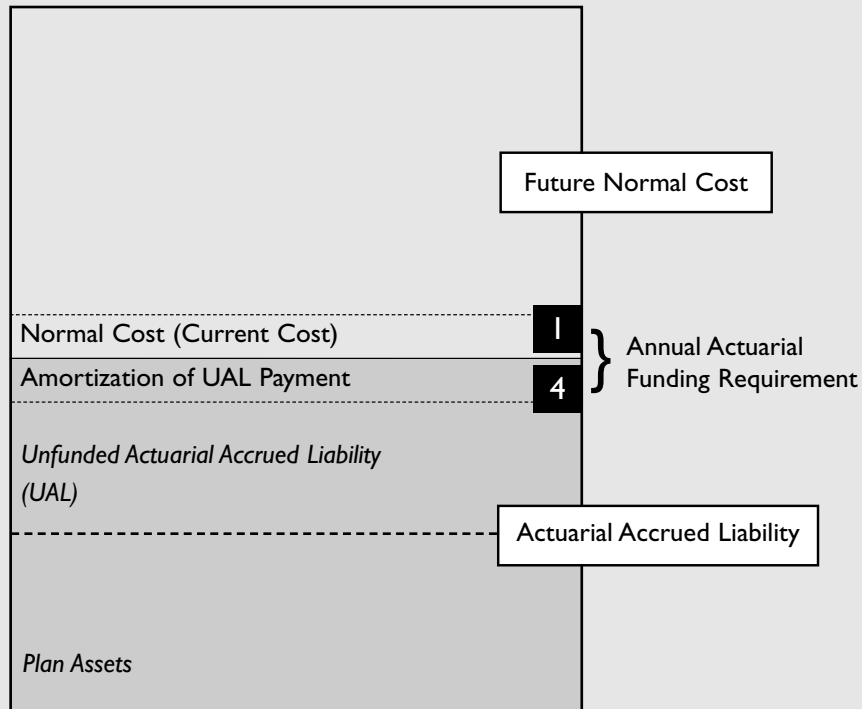
A. Number of Members on Current Valuation Date		
	Active Members	400
	Vested Terminated Members	10
	Retired Members and Survivors	<u>220</u>
	Total	630
B. Total Regular Compensation of Active Members		\$12,158,000
C. Normal Cost		
1	Superannuation	\$1,119,100
	Death	128,500
	Disability	266,300
	Termination	<u>166,100</u>
	Total Normal Cost	\$1,680,000
	Expected Employee Contributions	<u>980,800</u>
	Net Employer Normal Cost	\$699,200
D. Actuarial Liability		
	Active	
1	Superannuation	\$27,485,500
	Death	817,100
	Disability	1,610,800
	Termination	<u>712,300</u>
	Total Active	\$30,625,700
	Vested Terminated Members	1,000,000
	Non-Vested Terminated Members	400,000
	Retirees and Survivors	<u>31,974,300</u>
	Total Actuarial Liability	\$64,000,000
E. Actuarial Value of Assets		43,046,500
2	F. Unfunded Actuarial Liability: D – E	\$20,953,500
	G. Funded Ratio: E/D	67.3%

Key Points & Concepts

For further clarification, please see pages 2 and 3.

Present Value of Future Benefits

Figure 3
The Annual Actuarial Funding Requirement is equal to the Normal Cost plus the Amortization of Unfunded Actuarial Accrued Liability (UAL) Payment.



2 Credited with interest to the assumed payment date (in this case 1/1/08 to 1/1/09 at 8.25%)

3 Reflects estimated administrative expenses not including investment related expenses.

4. APPROPRIATION DEVELOPMENT FOR FISCAL YEAR 2009

PART A | DERIVATION OF APPROPRIATION

Cost Under Current Funding Schedule

1	1. a. Normal Cost as of January 1, 2008	\$699,200
	b. For FY09 (adjusted for timing) 2	\$756,900
	c. Estimated Administrative Expenses 3	\$125,000
	d. Total Employer Normal Cost (b+c)	\$881,900
4	2. a. Unfunded Actuarial Liability as of January 1, 2008	\$20,953,500
	b. FY09 amortization payment (20-year, 4.5% increasing)*	\$1,518,100
	3. Total FY09 Payment [Sum of 1(d) and 2(b)]	\$2,400,000

* FY09 appropriation was maintained at the same level as the prior schedule.

Key Points & Concepts

1 Normal cost is assumed to increase by 5.5% per year in this exhibit.

2 Actuarial Unfunded Liability:
Under an increasing schedule, the outstanding balance increases for a period of time. In the early years of the schedule, the payments are not large enough to pay the interest on the outstanding balance.

PERAC Approval of Funding Schedules

For comparison, we have shown different schedules for various years below. Note these are for illustration only, as a new schedule would be adopted at least every three years.

(DOLLARS IN THOUSANDS)

AMORTIZATION OF UAL	↑ 4.5%	↑ 2.5%	LEVEL	↑ 4.5%	↑ 2.5%	↑ 4.5%
AMORTIZATION COMPLETE	2028	2028	2028	2026	2026	2020
2009	2,435	2,696	3,056	2,554	2,808	3,160
2015	3,238	3,319	3,390	3,394	3,449	4,182
2020	4,110	3,969	3,763	4,303	4,116	5,286
2028	6,023	5,338	4,613	2,439	2,439	2,439

Conservative Actuarial Approaches

1. Adopt more conservative assumptions for investment return, salary scale, and longevity.
2. Actuarial value of assets
 - Adopted by Commonwealth
 - Reduces volatility
3. Adopt a more aggressive funding schedule.

4. APPROPRIATION DEVELOPMENT FOR FISCAL YEAR 2009

(continued)

PART B | CURRENT FUNDING SCHEDULE

Fiscal Year	1 Normal Cost	Amort. of UAL	Total Cost	2 Unfunded Act. Liab.
2009	881,900	1,518,100	2,400,000	21,800,705
2010	930,405	1,625,588	2,555,993	22,019,782
2011	981,577	1,698,740	2,680,317	22,145,099
2012	1,035,564	1,775,183	2,810,747	22,204,645
2013	1,092,520	1,855,066	2,947,586	22,189,570
2014	1,152,609	1,938,544	3,091,153	22,090,138
2015	1,216,002	2,025,779	3,241,781	21,895,649
2016	1,282,882	2,116,939	3,399,821	21,594,354
2017	1,353,441	2,212,201	3,565,642	21,173,356
2018	1,427,880	2,311,750	3,739,630	20,618,512
2019	1,506,413	2,415,779	3,922,192	19,914,319
2020	1,589,266	2,524,489	4,113,755	19,043,795
2021	1,676,676	2,638,091	4,314,767	17,988,347
2022	1,768,893	2,756,805	4,525,698	16,727,630
2023	1,866,182	2,880,861	4,747,043	15,239,389
2024	1,968,822	3,010,500	4,979,322	13,499,297
2025	2,077,107	3,145,973	5,223,080	11,480,766
2026	2,191,348	3,287,541	5,478,889	9,154,757
2027	2,311,872	3,435,481	5,747,353	6,489,559
2028	2,439,025	3,590,077	6,029,102	3,450,561
2029	2,573,171		2,573,171	0

All amounts assume payments will be made January 1 of each fiscal year.
 Amortization of unfunded liability on 4.5% annual increasing basis to FY2028.
 FY08 appropriation was maintained at the same level as the prior schedule.

Key Points & Concepts

1

The Governmental Accounting Standards Board (GASB) established Statement 25. GASB 25 superseded GASB 5 in 1997. The intent of GASB disclosures is to enable readers of financial statements to compare plans on an “apples to apples” basis.

2

This schedule reflects funding progress for the last six years.

5. GASB STATEMENT NO. 25: ACTUARIAL INFORMATION

1

The actuarial information required by Governmental Accounting Standards Board (GASB) Statement No. 25 is shown below.

Schedule of Funding Progress

2

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL)* (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Cov. Payroll ((b-a)/c)
1/1/2008	\$43,046,500	\$64,000,000	\$20,953,500	67.3%	\$12,158,000	172.3%
1/1/2006	\$39,090,000	\$57,160,600	\$18,070,600	68.4%	\$11,673,582	154.8%
1/1/2004	\$34,826,200	\$52,857,300	\$18,031,100	65.9%	\$11,668,400	154.5%

*excludes State reimbursed COLA

Notes To Schedules

Additional information as of the latest actuarial valuation follows.

Valuation Date	January 1, 2008
Actuarial Cost Method	Individual entry age normal
Amortization Method	4.5% increasing
Remaining Amortization Period	20 years
Asset Valuation Method	Actuarial value, 5-year smoothing

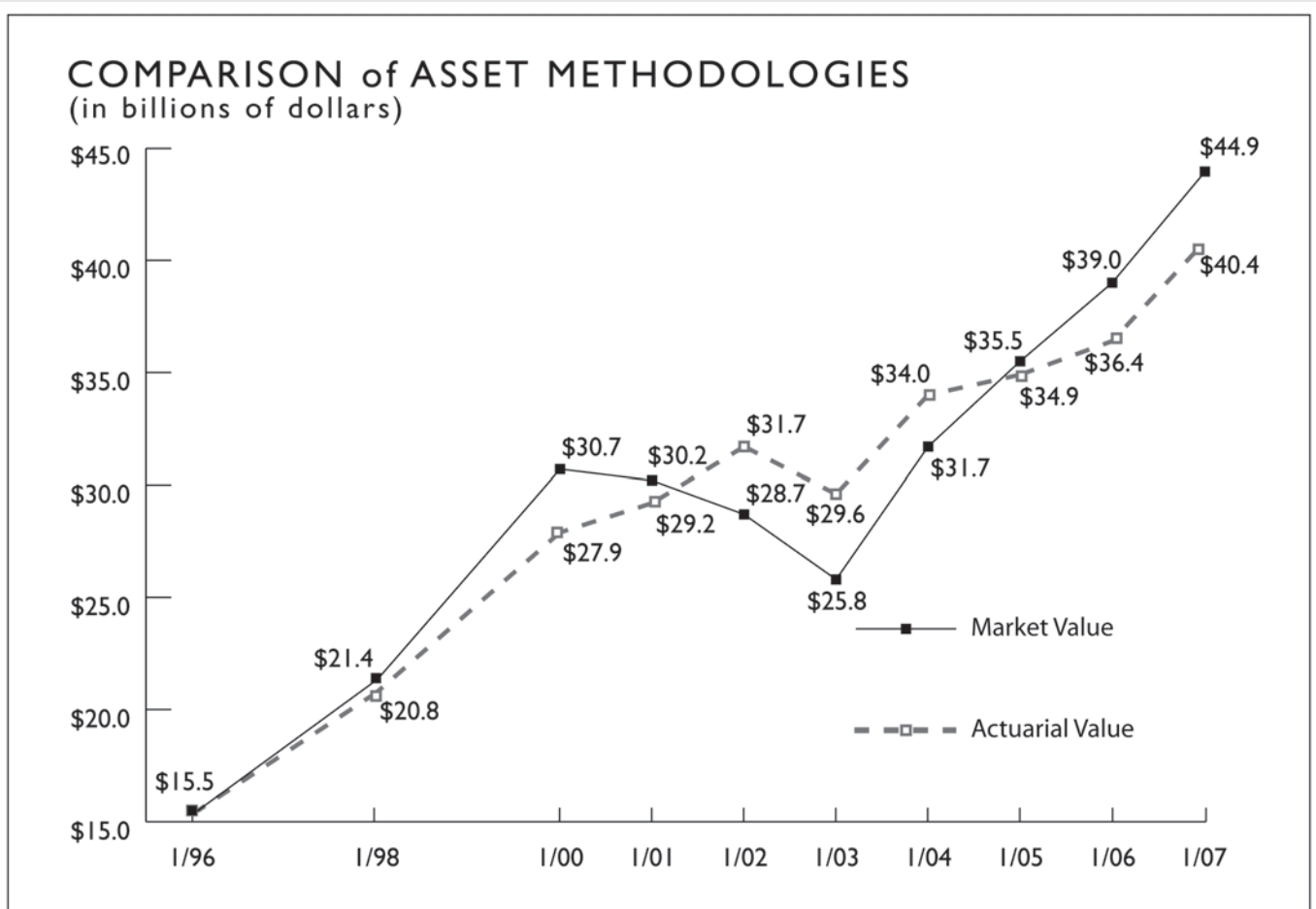
Principal Actuarial Assumptions:

Investment Rate of Return	8.25%
Projected Salary Increases	Service based table with ultimate rates of 4.75%, 5.00%, and 5.25% for groups 1, 2, and 4 respectively.

Key Points & Concepts

I Plan assets presented in the chart at right are valued by smoothing or recognizing gains and losses over a period of 5 years. This methodology, which is commonly used in both the public and private sectors, reduces the potential volatility in the market value approach.

Commonwealth Actuarial Valuation Report January 1, 2007 Comparing Market Value to Smoothed Actuarial Value



6. PLAN ASSETS

A | BREAKDOWN OF ASSETS BY INVESTMENT TYPE

Cash and Cash Equivalents	\$1,150,600
Equities	26,610,600
Fixed Income Securities	17,711,000
Interest Due and Accrued	4,000
Accounts Receivable	425,300
Accounts Payable	<u>(1,500)</u>
Total	\$45,900,000

B | BREAKDOWN OF ASSETS BY FUND

Annuity Savings Fund	\$12,625,700
Annuity Reserve Fund	2,125,400
Military Fund	0
Pension Fund	3,060,700
Pension Reserve Fund	<u>28,088,200</u>
Total	\$45,900,000

C | MARKET VALUE OF ASSETS

\$45,900,000

D | ACTUARIAL VALUE OF ASSETS

\$43,046,500



Key Points & Concepts

The Quabbin Retirement System uses a corridor of 85% - 115% of Market Value Assets (MVA) when developing the Actuarial Value of Assets (AVA). The AVA for this plan must fall within this range. Note that the AVA was 98.1% and 93.8% of MVA as of 1/1/07 and 1/1/08 respectively. Private sector rules allow a corridor of 80% - 120%. Massachusetts public plans use a corridor of either 85% - 115% or 90% - 110%.

6. PLAN ASSETS *(continued)*

E | DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS

	2007	2008
A. Development of total investment income including appreciation		
1. Beginning of year market value	40,953,800	45,900,000
2a. Employee contributions	998,000	
b. Employer contributions	2,300,000	
c. Other receipts	428,000	
d. Total receipts: (a) + (b) + (c)	3,726,000	
e. Benefit payments	3,469,600	
f. Expenses	400,000	
g. Other disbursements	399,500	
h. Total disbursements: (e) + (f) + (g)	4,269,100	
i. Cash flow before receivables: (d) – (h)	(543,100)	
j. Net receivables current year	423,800	
k. Net receivables prior year	502,900	
l. Total cash flow after receivables: (i) + (j) – (k)	(622,200)	
3. End of year market value	45,900,000	
4. Investment income including appreciation: (3) – (1) – (2(l))	5,568,400	
B. Expected market value development		
1. Beginning of year market value	40,953,800	
2. Cash flow (A2(l))	(622,200)	
3. Expected Return on (1)	3,378,689	
4. Expected return on cash flow excluding receivables A2(i) x 0.0825 / 2	(22,401)	
5. Expected market value end of year (1)+(2)+(3)+(4)	43,687,888	
C. Gain/(loss) for year: A3-B5	2,212,112	
D. Development of Actuarial Value of Assets		
1. Beginning of year market value	40,953,800	45,900,000
2a. Asset gain/(loss) in prior year	686,700	2,212,112
b. Asset gain/(loss) in 2 nd prior year	517,300	686,700
c. Asset gain/(loss) in 3 rd prior year	2,324,500	517,300
d. Asset gain/(loss) in 4 th prior year	(5,095,400)	2,324,500
3. Unrecognized gain/(loss) .8 x [2a] + .6 x [2b] + .4 x [2c] +.2 x [2d]	770,460	2,853,530
4. Beginning of year actuarial value of assets: [1] - [3]	40,183,340	43,046,470
5. Actuarial value / Market value	98.1%	93.8%
6. Adjusted actuarial value: (4) but not less than 85% nor greater than 115% of market value		43,046,470

Key Points & Concepts

Data Review

When the retirement board reviews a valuation report, it is important that they examine Section 7 membership data for reasonableness. The data displayed there represents the culmination of the data clean up process. The process begins with the review of a retirement system's membership data. PERAC's Actuarial Unit prepares listings of **questionable** data items. If data is erroneous, it is essential that corrections be made in the retirement board's database (not just in the copies of the files used by the actuarial team) so that the error(s) will not surface again in future data listings.

PERAC's actuarial software has been designed to provide **warnings** when certain data elements do not appear to match established criteria. The parameters that we use in our reasonableness tests do not change from year to year. For example, PERAC's system will flag the current payable amount for a retiree if the original amount of benefit plus COLAs does not equal the current amount payable. The warning may indeed be triggered by an incorrect entry for original amount of benefit. However, if the member has died and the beneficiary is receiving the benefit or a Section 90C benefit has been granted, the data provided may actually be correct. In such instances, the retirement board should simply annotate the correction on the data list, and return it to the actuary (assuming a full valuation is being performed).

Retirement boards are encouraged to retain PERAC's data listings. Just as actuaries conduct a preliminary review of prior valuation reports before beginning a new valuation study, so should retirement boards conduct a review of prior year(s) data listing(s) before reviewing data listings associated with a current valuation. Since PERAC may identify the same record or records as being questionable each year, retirement board staff can save time by referencing prior year's documentation.

Data clean up is a time-consuming, labor-intensive task—for both retirement board and actuarial staff. It can often represent as much as 75% of the total time involved in completing a valuation. PERAC strongly encourages retirement boards to maintain up-to-date, accurate membership databases. Retirement boards should consider periodically auditing their databases to identify missing and/or erroneous entries. Data maintenance should be viewed as an on-going responsibility rather than an isolated, annual or biennial project.

7. 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	400	10
Average Age	46.7	53.4
Average Service	11.2	17.3
Average Salary	\$30,395	\$30,300
Average Annuity Savings Fund Balance	\$26,114	\$43,926

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	9							9
25 - 29	22	4	1					27
30 - 34	10	11	1	2				24
35 - 39	22	11	13	3				49
40 - 44	20	16	9	6	5	2		58
45 - 49	14	16	9	6	5	4		54
50 - 54	11	17	24	6	7	9	8	82
55 - 59	11	8	9	14	10	3	12	67
60 - 64	5	4	2	4	5	0	5	25
65+	0	1	1	0	0	3	0	5
Total	124	88	69	41	32	21	25	400

Key Points & Concepts

Retirement boards should review the demographic summaries provided as part of each valuation report. The board may be able to recognize some data issues more readily than the actuary. PERAC compares the demographic information from valuation to valuation for reasonableness.

7. 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	9	\$176,137	\$19,571
25 - 29	27	\$611,808	\$22,660
30 - 34	24	\$727,428	\$30,310
35 - 39	49	\$1,569,822	\$32,037
40 - 44	58	\$1,740,940	\$30,016
45 - 49	54	\$1,590,634	\$29,456
50 - 54	82	\$2,561,075	\$31,233
55 - 59	67	\$2,405,426	\$35,902
60 - 64	25	\$669,764	\$26,791
65+	5	\$104,966	\$20,993
Total	400	\$12,158,000	\$30,395

Key Points & Concepts

Retirement boards should review the retiree summary especially the member counts by retirement type and total benefits paid. The actuary reviews the information for reasonableness.

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

PART B | RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	175	2	14	29	220
Average Age	71.8	68.6	57.5	72.4	70.9
Average Annual Benefit	\$15,791	\$8,931	\$23,706	\$10,964	\$15,596

Benefit by Payment and Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Total Annuity	\$400,538	\$2,236	\$23,135	\$26,774	\$452,683
Pension (excluding State reimbursed COLA)	\$2,295,760	\$15,626	\$304,123	\$277,107	\$2,892,616
State reimbursed COLA	\$67,182	\$0	\$4,629	\$14,080	\$85,891
Total	\$2,763,480	\$17,862	\$331,887	\$317,961	\$3,431,190

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7. 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	1	\$26,337	\$26,337
40 - 44	3	\$89,955	\$29,985
45 - 49	2	\$47,066	\$23,533
50 - 54	11	\$195,281	\$17,753
55 - 59	17	\$343,665	\$20,216
60 - 64	41	\$836,090	\$20,392
65 - 69	39	\$769,356	\$19,727
70 - 74	22	\$331,720	\$15,078
75 - 79	27	\$268,492	\$9,944
80 - 84	31	\$309,263	\$9,976
85 - 89	16	\$125,133	\$7,821
90+	10	\$88,832	\$8,883
Totals	220	\$3,431,190	\$15,596

Key Points & Concepts

1

The Entry Age Normal Cost Method is required for most Chapter 32 plans.

2

Normal Cost remains level as a percentage of pay except for plan changes and actuarial assumption changes.

3

See Section 6 (page 22) for a comparison of market value and a smoothed actuarial value approach.

8. VALUATION COST METHODS

PART A | ACTUARIAL COST METHOD

1 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.

2 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

3 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 or losses occurring 5 years ago are recognized. The actuarial value of assets will be adjusted, if necessary, in order to remain between 85% and 115% of market value.

Key Points & Concepts

- I These assumptions carry the most weight in determining plan costs.

The actuarial assumptions were last revised in light of the *Local System Experience Study Analysis*. The assumptions shown reflect the current PERAC standard assumption set.

9. ACTUARIAL ASSUMPTIONS

INVESTMENT RETURN 8.25% per year **I**

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

COST OF LIVING INCREASES 3.0% per year

SALARY INCREASE **I**

Service	Group 1	Group 2	Group 4
0	7.00%	7.00%	8.00%
1	6.50%	6.50%	7.50%
2	6.50%	6.50%	7.00%
3	6.00%	6.00%	6.50%
4	6.00%	6.00%	6.00%
5	5.50%	5.50%	6.00%
6	5.50%	5.50%	5.50%
7	5.00%	5.00%	5.50%
8	5.00%	5.00%	5.25%
9	4.75%	5.00%	5.25%
10+	4.75%	5.00%	5.25%

MORTALITY

Pre-retirement rates reflect the RP-2000 Employees table (gender distinct). Post-retirement rates reflect the RP- 2000 Healthy Annuitant table (gender distinct). For disabled retirees, this table is set forward 2 years. 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.

Key Points & Concepts

Illustration of Impact of Different Investment Return Assumptions

January 1, 2008 Valuation (in thousands)	8.0%	8.25%
1. Total Normal Cost	1,765	1,680
2. Employee Contributions	<u>981</u>	<u>981</u>
3. Net Normal Cost	784	699
4. Actuarial Liability		
a. Active	31,703	30,626
b. Retired	<u>33,968</u>	<u>33,374</u>
c. Total (including inactive)	65,671	64,000
5. Assets	43,047	43,047
6. Unfunded Liability: (4c) - (5)	22,624	20,953
7. Funded Ratio: (5) / (4c)	65.5%	67.3%
8. Amortization of Unfunded Liability (20 yr., 4.5% inc.)	1,519	1,435
9. FY09 Appropriation: (3) + (8)	2,487	2,310

with assumed payment date 1/1/09

Illustration of 0% Return in 2008 on Funding Schedule

(in thousands)	1/08	1/09
1. Total Normal Cost	1,680	1,772
2. Employee Contributions	<u>981</u>	<u>1,040</u>
3. Net Normal Cost	699	732
4. Actuarial Liability		
a. Active	30,626	32,900
b. Retired	<u>33,374</u>	<u>35,800</u>
c. Total (including inactive)	64,000	68,700
5. Assets	43,047	42,700
6. Unfunded Liability: (4c) - (5)	20,953	26,000
7. Funded Ratio: (5) / (4c)	67.3%	62.2%
8. Amortization of Unfunded Liability to 2028	1,435	1,845
9. a. FY09 Appropriation	2,310	n/a
b. FY10 Appropriation	2,422	2,789

Assumed benefit payments \$4.0 million per year. Assumed inv. ret. assumption: 8.0%.
Administrative expenses not included.

9. ACTUARIAL ASSUMPTIONS *(continued)*

WITHDRAWAL

Based on analysis of past experience. Annual rates are based on years of service. Sample annual rates for Groups 1 and 2 are shown below. For Group 4 members the rate is 0.015 each year for service up to and including 10 years. No withdrawal is assumed thereafter.

Service	Groups 1 & 2
0	0.150
5	0.076
10	0.054
15	0.033
20	0.020

DISABILITY

Based on an analysis of past experience. It is also assumed that the percentage of job-related disabilities is 55% for Groups 1 & 2 and 90% for Group 4.

Age	Groups 1 & 2	Group 4
20	0.00010	0.0010
30	0.00030	0.0030
40	0.00101	0.0030
50	0.00192	0.0125
60	0.00280	0.0085

ADMINISTRATIVE EXPENSES

An amount of \$125,000 has been included in the Normal Cost for FY09. This amount is assumed to increase by the salary increase assumption each year.

9. ACTUARIAL ASSUMPTIONS *(continued)*

RETIREMENT (SUPERANNUATION)

Age	Groups 1 & 2		Group 4
	Male	Female	
45-49	0.000	0.000	0.010
50	0.010	0.015	0.020
51	0.010	0.015	0.020
52	0.010	0.020	0.020
53	0.010	0.025	0.050
54	0.020	0.025	0.075
55	0.020	0.055	0.150
56	0.025	0.065	0.100
57	0.025	0.065	0.100
58	0.050	0.065	0.100
59	0.065	0.065	0.150
60	0.120	0.050	0.200
61	0.200	0.130	0.200
62	0.300	0.150	0.250
63	0.250	0.125	0.250
64	0.220	0.180	0.300
65	0.400	0.150	1.000
66	0.250	0.200	1.000
67	0.250	0.200	1.000
68	0.300	0.250	1.000
69	0.300	0.200	1.000
70 and after	1.000	1.000	1.000

10. 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 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 3 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 4:

Police officers, firefighters, and other specified hazardous positions.

MEMBER CONTRIBUTIONS

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

Prior to 1975:	5% of regular compensation
1975 - 1983:	7% of regular compensation
1984 to 6/30/96:	8% of regular compensation
7/1/96 to present:	9% of regular compensation
1979 to present:	an additional 2% of regular compensation in excess of \$30,000.

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RATE OF INTEREST

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

10. SUMMARY OF PLAN PROVISIONS *(continued)*

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 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 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 average salary by a benefit rate related to the member's age and job classification at retirement, and the resulting product by his creditable service. The amount determined by the benefit formula cannot exceed 80% of the member's highest three year 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.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

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.

DISABILITY RETIREMENT

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

ORDINARY DISABILITY

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

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

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 or she will receive not less than the superannuation allowance to which he or she is entitled.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

ACCIDENTAL DISABILITY

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

Retirement Allowance: 72% of salary plus an annuity based on accumulated member contributions, with interest. This amount is not to exceed 100% of pay. For those who became members in service after January 1, 1988 or who have not been members in service continually since that date, the amount is limited to 75% of pay. There is an additional pension of \$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 22 for any child who is a full time student at an accredited educational institution. For systems that have adopted Chapter 157 of the Acts of 2005, veterans as defined in G.L. c. 32, s. 1 receive an additional benefit of \$15 per year for each year of creditable service, up to a maximum of \$300.

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 (or \$312.00 per year in systems in which the local option contained in G.L. c. 32, s. 9(2)(d)(ii) has not been adopted), payable to the spouse or legal guardian until all dependent children reach age 18 or 22 if a full-time student, unless mentally or physically incapacitated.

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

In addition, an eligible family member may receive a one time payment of \$100,000.00 from the State Retirement Board.

10. 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

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 a full-time student, unless mentally or physically incapacitated.

COST OF LIVING

If a system has accepted Chapter 17 of the Acts of 1997, and the retirement board votes to pay a cost of living increase for that year, the percentage is determined based on the increase in the Consumer Price Index (CPI) used for indexing Social Security benefits, but cannot exceed 3.0%. Section 51 of Chapter 127 of the Acts of 1999, if accepted, allows boards to grant COLA increases greater than that determined by CPI but not to exceed 3.0%. The first \$12,000 of a retiree's total allowance is subject to a cost-of-living adjustment. The total cost of living adjustment for periods from 1981 through 1996 is paid for by the Commonwealth of Massachusetts.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

METHODS OF PAYMENT

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

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

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

Option C: A reduced annual allowance, payable in monthly installments, commencing at retirement. At the death of the retired employee, 2/3 of the allowance is payable to the member's designated beneficiary (who may be the spouse, or former spouse who remains unmarried for a member whose retirement becomes effective on or after February 2, 1992, child, parent, sister, or brother of the employee) for the life of the beneficiary. For members who retired on or after January 12, 1988, if the beneficiary 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.

II. 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.

II. 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 as described in Section VIII.

COST OF BENEFITS

The estimated payment from the pension system for benefits for the fiscal year. This is the minimum amount payable during the first six years of some Funding Schedules.

FUNDING SCHEDULE

The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22D of M.G.L. Chapter 32.

GASB

Governmental Accounting Standards Board

II. 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.

Commonwealth of Massachusetts
Public Employee Retirement Administration Commission
5 Middlesex Avenue, Suite 304
Somerville, MA 02145
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