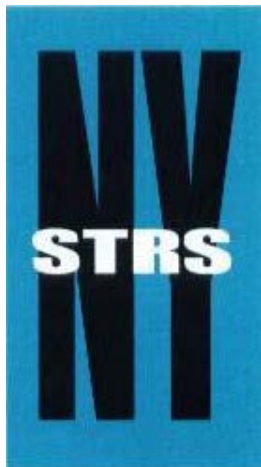


**ACTUARIAL VALUATION REPORT**

*as of*

*JUNE 30, 2016*



*New York State Teachers' Retirement System*

Office of the Actuary  
July 17, 2017

# NEW YORK STATE TEACHERS' RETIREMENT SYSTEM

## Actuarial Valuation Report as of June 30, 2016

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# NEW YORK STATE TEACHERS' RETIREMENT SYSTEM

## Actuarial Valuation Report as of June 30, 2016

### A. INTRODUCTION

This report presents the results of the annual actuarial valuation of assets and liabilities of the New York State Teachers' Retirement System as of June 30, 2016. The purpose of this report is to summarize the determination of the Employer Contribution Rate which will be applied to member salaries earned during the July 1, 2017 to June 30, 2018 fiscal year and to review the funded status of the Retirement System. Use of the valuation results contained herein for purposes other than those stated above may not be appropriate.

### B. EMPLOYER CONTRIBUTION RATE

The Employer Contribution Rate to be applied to member salaries for the July 1, 2017 to June 30, 2018 fiscal year and collected in the fiscal year ending June 30, 2019 consists of four components. These components may be described as follows:

The **Normal Rate** represents the annual cost of accruing active member benefits as well as incorporating actuarial gains and losses. The active member component includes the cost of benefits accruing on account of retirement, withdrawal, disability, death (except for the first \$50,000 of death benefits which are funded by the group life insurance rate) and the cost-of-living benefit provided during retirement. The Normal Rate is calculated in accordance with the Aggregate Actuarial Cost Method.

The **Expense Rate** is a pay-as-you-go rate representing the administrative cost of the Retirement System for the fiscal year July 1, 2018 to June 30, 2019, and is set during the budget process.

The **Group Life Insurance Rate** is a pay-as-you-go rate representing the expected benefit payments of the first \$50,000 of member death benefits for the fiscal year July 1, 2018 to June 30, 2019.

The **Excess Benefit Plan Rate** is a pay-as-you-go rate representing the expected benefit payments in excess of the Internal Revenue Code Section 415 limits for the fiscal year July 1, 2018 to June 30, 2019.

The actuarially computed Employer Contribution Rate to be applied to the member salaries for the fiscal year ending June 30, 2018 is **9.80%**. The Employer Contribution Rates determined by the actuarial valuations as of June 30, 2016 and June 30, 2015 and the changes between the two are summarized below:

	As of <u>6/30/2016</u>	As of <u>6/30/2015</u>	<u>Change</u>
Normal Rate	9.40%	11.31%	-1.91%
Expense Rate	0.27	0.27	0.00
Group Life Insurance Rate	0.13	0.13	0.00
Excess Benefit Plan Rate	<u>0.00</u>	<u>0.01</u>	<u>-0.01</u>
Employer Contribution Rate	<b>9.80%</b>	<b>11.72%</b>	<b>-1.92%</b>

The actuarial assumptions in use for the June 30, 2016 actuarial valuation were developed primarily based upon Retirement System experience and were adopted by the Retirement Board on October 29, 2015. In accordance with Sections 501, 508 and 517 of the Education Law, the Retirement Board has the authority to adopt the actuarial assumptions as recommended by the Actuary.

As in prior years, the actual employer contributions made by participating employers during the fiscal year ending June 30, 2016 were equal to the employer contributions determined in accordance with the annual actuarial valuation. Additional payments are made by certain participating employers who opted to participate in the Stable Contribution Option (SCO) program in order to repay contributions deferred in prior year(s).

### C. GAIN/LOSS IN THE EMPLOYER CONTRIBUTION RATE

The Employer Contribution Rate of 9.80% represents a 192 basis point decrease from the prior year's rate of 11.72%.

#### NORMAL RATE

The Normal Rate component of the Employer Contribution Rate has decreased by 191 basis points over the prior year's rate. This change may be broken down as follows:

<b><u>Salary/Service:</u></b>	This loss is due to salary and service data coming in higher than expected.	+0.05
<b><u>Net Investment Gain:</u></b>	The recognition of prior investment gains and losses over a five year period in accordance with the asset valuation method resulted in a net investment gain.	-1.61
<b><u>New Entrants:</u></b>	New entrants joined the Retirement System as Tier 6 members with a long-term expected normal rate of approximately 4.5% which compares favorably to the current normal rate.	-0.09
<b><u>Withdrawal:</u></b>	More members withdrew than expected.	-0.05
<b><u>Mortality:</u></b>	Members are living slightly longer than expected and receiving benefits for a longer period.	+0.03
<b><u>Retirement:</u></b>	There were fewer retirements than expected.	-0.15
<b><u>Pension Payments:</u></b>	Actual payments to retirees were less than expected.	-0.01
<b><u>Cost of Living Adjustment:</u></b>	The actual COLA increase of 1.0% was lower than the expected increase of 1.50%.	-0.08
<b><u>TOTAL CHANGE IN THE NORMAL RATE</u></b>		<b>-1.91%</b>

## OTHER COMPONENTS

The **Expense Rate** is set during the budget process and is unchanged from the previous year. This is the eighth straight year the Expense Rate will remain equal to 0.27%.

The **Group Life Insurance Rate** is unchanged from the previous year. Contributions collected have generally been more than sufficient to cover payments over the past several years, resulting in an accumulated Group Life Insurance Fund of approximately \$265 million as of June 30, 2016. The Group Life Insurance Rate is being held constant, however, in anticipation of rising payouts in the future due to the Tier 2, 3, 4, 5, and 6 post-retired death benefit and the inactive death benefit.

The **Excess Benefit Plan Rate** was changed from 0.01% to 0.00% this year. This rate represents the retirement benefits paid in excess of the Internal Revenue Code Section 415 limits. These payments are made exclusively from the Excess Benefit Plan. This fund was established in accordance with the Excess Benefit Plan which received final IRS approval in August 2001. The fund has accumulated assets of approximately \$2 million as of June 30, 2016. The rate has been set to 0 basis points this year in order to utilize the existing fund balance.

### **D. EMPLOYER CONTRIBUTION RATE HISTORY**

The following chart summarizes the Employer Contribution Rate for the last 20 years:

<i>Salary Year</i>	<i>Employer Contribution Rate</i>	<i>Salary Year</i>	<i>Employer Contribution Rate</i>
1998-1999	1.42%	2008-2009	7.63%
1999-2000	1.43	2009-2010	6.19
2000-2001	0.43	2010-2011	8.62
2001-2002	0.36	2011-2012	11.11
2002-2003	0.36	2012-2013	11.84
2003-2004	2.52	2013-2014	16.25
2004-2005	5.63	2014-2015	17.53
2005-2006	7.97	2015-2016	13.26
2006-2007	8.60	2016-2017	11.72
2007-2008	8.73	2017-2018	9.80

The complete Employer Contribution Rate history is presented in Appendix 14.

## **E. EMPLOYER CONTRIBUTION RATE DECREASE**

The Employer Contribution Rate has decreased this year from 11.72% to 9.80%, representing a decrease of approximately 16%. The Normal Rate component equals 9.40%, a decrease of approximately 17% from the prior year's Normal Rate of 11.31%. The rate of return on the System's market value of assets for the fiscal year ending June 30, 2016 was 2.3%, and the System's five-year market value rate of return now stands at 8.3%. Continued strength in the System's five-year rate of return led to an actuarial gain on investments. This was the primary reason for the decline in the Normal Rate.

The Normal Rate component of the Employer Contribution Rate is calculated in accordance with the Aggregate Actuarial Cost Method, as required by statute (New York State Education Law Section 517). Under the Aggregate Actuarial Cost Method gains and losses resulting from differences between actual and expected experience, as well as changes to assumptions or plan provisions, are amortized as part of the normal cost rate, over the expected future working lifetime of active members. Aggregate is a reasonable and accepted actuarial cost method to use for ongoing plan funding purposes and is consistent with the System's goal of accumulating sufficient assets to pay benefits as they come due.

## **F. MINOR ACTUARIAL METHOD REVISIONS**

The following actuarial methods were revised effective with the June 30, 2016 actuarial valuation:

### **ACTUARIAL VALUE OF ASSETS METHOD (NORMAL RATE)**

The actuarial value of assets (AVA) for the Normal Rate was modified to include the discounted value of member and normal rate contributions receivable for the fiscal year ending on the valuation date. Previously these contributions receivable had been included in the "Receivables" line item in the valuation. This change was cosmetic only and resulted in no cost impact to the valuation.

There was a slight impact to the System’s AVA-based funded ratio, an increase of approximately 2%.

**NORMAL RATE RECEIVABLE**

The determination of the Normal Rate was modified slightly by revising the calculation of the expected normal rate contribution receivable for the ensuing fiscal year. The projected paybase estimate used in this calculation was revised to ensure that only salaries of currently active members were included, and not those of the next year’s new entrants. The effect of this change was an increase in the Normal Rate of approximately 8 basis points (0.08%). For gain/loss purposes this change was included in the net investment gain/loss item.

**ASSET DEVELOPMENT METHOD (GROUP LIFE INSURANCE RATE)**

The development of the value of assets for the Group Life Insurance Fund was changed to reflect the actual return on System assets for the year rather than the assumed rate of return.

**G. MEMBER DATA**

The member data for the valuation was determined as of June 30, 2016. Compared with the previous year, the total number of members increased slightly from 426,173 to 427,498; the number of active members decreased from 267,715 to 266,350; the number of retired members increased from 152,608 to 155,163; and the number of beneficiaries receiving monthly benefits increased from 5,850 to 5,985.

The number of retirements increased from 6,161 during the 2014-2015 fiscal year to 6,245 during the 2015-2016 fiscal year. There was no early retirement incentive offered in the 2015-2016 fiscal year. The number of retirements over each of the last ten years is as follows:

<i>Fiscal Year</i>	<i>Total Number of Retirements</i>	<i>Fiscal Year</i>	<i>Total Number of Retirements</i>
2006-2007	6,900	2011-2012	6,033
2007-2008	6,330	2012-2013	6,330
2008-2009	5,644	2013-2014	6,547
2009-2010	5,501	2014-2015	6,161
2010-2011*	8,423	2015-2016	6,245

\*Denotes an early retirement incentive offered during that fiscal year.



Historical member statistics, including statistics specific to retired members, appear in the appendices to this report. Additional member statistics may also be found in the Retirement System's most recent Comprehensive Annual Financial Report.

## **H. FUNDED STATUS**

As of June 30, 2016, the actuarial value of plan assets was equal to \$107.0 billion. The accrued pension benefit liability calculated in accordance with the Entry Age Normal Cost Method was equal to \$109.3 billion. These two values produced a funded ratio of 97.9% as of June 30, 2016. If the market value of plan assets is used instead of the actuarial value of plan assets, the funded ratio as of June 30, 2016 would be equal to 98.4%.

For purposes of this funded ratio calculation, the plan liabilities have been calculated in accordance with the Entry Age Normal Cost Method as required by Governmental Accounting Standards Board (GASB) Statement No. 67. The Retirement System is funded in accordance with the Aggregate Cost Method. GASB Statement No. 67 requires that the Entry Age Normal Cost Method be used to calculate the accrued liability for purposes of presenting the funded ratio calculation for all plans, regardless of the cost method being used for funding purposes. Both Aggregate and Entry Age Normal are appropriate contribution allocation procedures for purposes of ongoing plan funding and are accepted actuarial cost methods.

The funded ratios provided here are an appropriate measurement of the System's funded status and can be used to generally assess the need for future contributions. While the funded ratio will fluctuate from year to year, a funded ratio of 100% is desirable and indicative of a well-funded system, although does not imply that future contributions will not be required. The funded status measurement provided here is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the System's benefit obligations such as in a plan termination situation.

Future actuarial measurements such as the funded ratio and employer contribution rate may differ significantly from the current measurements presented in this report due to such factors as: future plan experience that differs significantly from that predicted by the actuarial

assumptions; changes in the actuarial assumptions or methods; and changes in plan provisions or applicable law.

A history of the Retirement System's funded status is provided in Appendix 4 of this report.

## **I. ACTUARIAL EXPERIENCE**

Each year the Retirement System completes an experience study in order to regularly monitor the reasonableness and appropriateness of the actuarial assumptions used in the actuarial valuation. These assumptions are used to estimate the probability a member will cease teaching due to retirement, withdrawal, disability, or death. In addition, the assumptions are used to estimate future salary increases, future investment earnings, and the probability of death for retired members and beneficiaries. A listing of the actuarial assumptions is provided in Appendix 17. A summary of the results of the most recent experience study is contained in Appendix 10. The current actuarial assumptions were adopted by the Retirement Board on October 29, 2015, and first effective with the actuarial valuation of the Retirement System's assets and liabilities as of June 30, 2015. Specific details regarding the development of the present actuarial assumptions can be found in the "*Report on the 2015 Recommended Actuarial Assumptions*".

## **J. ASSET ALLOCATION**

The Retirement Board, in consultation with Retirement System staff and the System's external investment consultant AON Hewitt, annually reviews the asset allocation to determine if any changes are appropriate. In response to this review, on August 3, 2016 the Retirement Board approved several changes to the asset allocation as follows: 1) An additional 1% allocation to private equity, bringing its target allocation to 8%; 2) An additional 1% allocation to real estate, bringing its target allocation to 11%; 3) A reduction of 2% in the System's allocation to domestic equity, bringing its target allocation to 35%; 4) Addition of the new asset class entitled high yield bonds, with a target allocation of 1%; and 5) A reduction of 1% in the System's allocation to domestic fixed income, bringing its target allocation to 16%. According to AON Hewitt, the System's adopted asset allocation produces a long-term (30-year) expected annual geometric rate

of return of 6.6%, and an expected annual arithmetic rate of return of 7.3% based on their most recent report (1<sup>st</sup> quarter 2017 return assumptions).

The Retirement System's asset allocation, including targets and ranges, can be found in Appendix 12. Historical rate of return information can be found in Appendix 11. Detailed investment information is available in the System's Comprehensive Annual Financial Report.

## **K. NEW LEGISLATION**

The following legislation affecting the Retirement System was signed into law during the 2016 Legislative Session:

### **Military Service Eligibility:**

Chapter 41 of the Laws of 2016 removed existing requirements for military service to be performed during specified periods of war and certain hostilities. Eligible members may claim up to three years of service credit for military duty. Members must pay 3% (6% if Tier 6) of the salary earned during the twelve months of credited service immediately preceding the year in which a claim is made for each year of military service.

## **L. STABLE CONTRIBUTION OPTION**

Chapter 57 of the Laws of 2013, enacted on March 29, 2013, provided the Retirement System with the ability to offer a seven-year Stable Contribution Option (SCO) to public school districts and BOCES in New York State. Eligible employers had the choice of either continuing to pay the actuarially required contribution (ARC) or electing to participate in the SCO and thereby pay a stable contribution rate for up to seven years and defer payment of the difference between the ARC and the SCO to later years. At a special Retirement Board Meeting held on April 9, 2013, the Retirement Board voted to make the SCO available to eligible employers in accordance with Chapter 57. Ten participating employers elected to participate in the SCO out of 717 that were eligible. Currently, all ten participating employers who elected to participate in the SCO have opted out of the plan.

Given the very low participation rate, the financial impact of the SCO was minimal.

## **M. SENSITIVITY ANALYSIS**

Included in Appendix 13 is a Sensitivity Analysis. The purpose of this exhibit is to illustrate what the Employer Contribution Rate would have been had various actuarial assumptions been altered. The chart also gives the reader a feel for the significance of the assumptions on the valuation results, and the potential impact of modifying them.

## **N. FUTURE EXPECTATIONS**

The next Employer Contribution Rate will be determined based upon the actuarial valuation as of June 30, 2017. The capital markets had a strong year during the fiscal year ending June 30, 2017, with our main domestic equity index (S&P 1500) returning 18.1% for the fiscal year, and the international equity index (ACWI ex-US) returning 20.4% for the fiscal year. With respect to fixed income, the Barclay's US Aggregate Float Adjusted Bond index returned -0.3% for the year. This will mark the first year out of the last three that the System's rate of return exceeded its assumed rate of return. The System's five-year annualized rate of return will increase from last year's 8.3%.

## **O. CERTIFICATION**

This actuarial valuation relies on member data provided by the participating employers to the Retirement System's administrative staff. The administrative and actuarial staffs review this data for reasonability as well as reconcile it against prior data. In addition, the valuation relies on financial data provided by the Retirement System's Finance Department. All data is reviewed by the Retirement System's independent auditors as part of the annual audit. We, the undersigned, have reviewed the member data and believe it to be reasonable and appropriate for purposes of this valuation.

The benefits recognized in this actuarial valuation are prescribed by New York State statute (Article 11 of the Education Law and Articles 11, 14, 15, 18, 19, and 20 of the Retirement and Social Security Law), and are summarized in Appendix 18. All benefits are included in the actuarial valuation. The actuarial methods, calculations, and actuarial assumptions are in accordance with standards of practice prescribed by the Actuarial Standards Board and generally

accepted actuarial principles and procedures. The assumptions used in determining the liabilities and costs are internally consistent and reasonably related to actual and anticipated future experience of the Retirement System. The undersigned meet the qualification standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.



Richard A. Young, ASA, EA, MAAA, FCA  
Actuary



Suzanne Warner, ASA, MAAA  
Manager, Office of the Actuary



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Assistant Manager, Office of the Actuary



New York State Teachers' Retirement System  
Office of the Actuary  
July 17, 2017

APPENDIX 1

**RECONCILIATION OF THE MARKET VALUE OF ASSETS**

From June 30, 2015 to June 30, 2016

	Market Value* <u>(in thousands)</u>
1. Market Value of Assets as of June 30, 2015	\$109,718,917
2. Contributions and Transfers	
Employer contributions	2,046,562
Member contributions	124,587
Net transfers (in/out)	<u>4,014</u>
Subtotal	2,175,163
3. Net Investment Income/(Loss)	2,392,354
4. Distributions	
Benefit payments	6,719,866
Administrative expenses	<u>60,426</u>
Subtotal	6,780,292
5. Market Value of Assets as of June 30, 2016	\$107,506,142

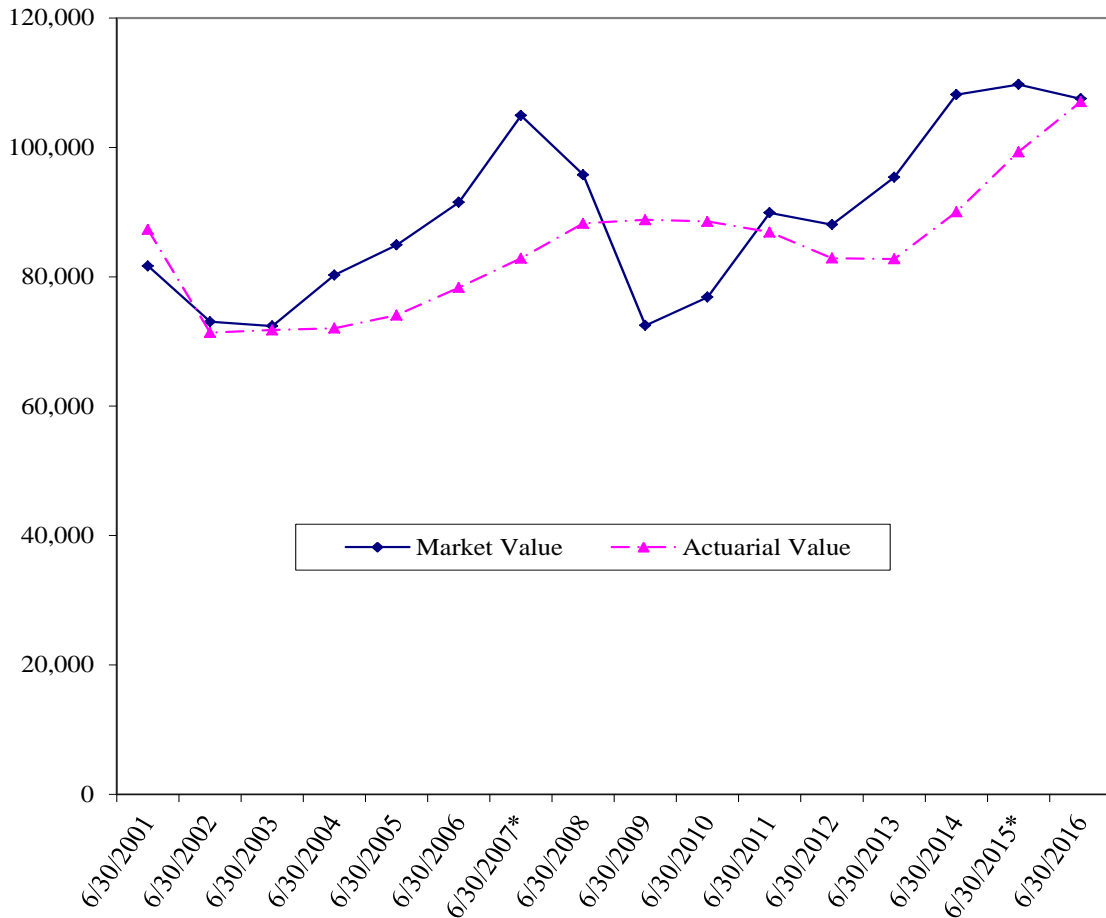
\*Totals may not add due to rounding.

APPENDIX 2

**COMPARISON OF MARKET VALUE TO ACTUARIAL VALUE OF ASSETS**  
(in Millions)

Fiscal Year Ending	Market Value	Actuarial Value	Fiscal Year Ending	Market Value	Actuarial Value
6/30/2001	\$ 81,664.2	\$ 87,295.3	6/30/2009	\$ 72,471.8	\$ 88,805.5
6/30/2002	73,041.2	71,374.4	6/30/2010	76,844.9	88,544.4
6/30/2003	72,391.5	71,780.4	6/30/2011	89,889.7	86,892.2
6/30/2004	80,276.2	72,044.4	6/30/2012	88,056.3	82,871.4
6/30/2005	84,908.5	74,074.3	6/30/2013	95,367.0	82,742.5
6/30/2006	91,492.2	78,335.8	6/30/2014	108,155.1	90,007.1
6/30/2007*	104,912.9	82,858.9	6/30/2015*	109,718.9	99,301.8
6/30/2008	95,769.3	88,254.7	6/30/2016	107,506.1	107,039.2

Market Value vs. Actuarial Value  
(in Millions)



\* The Retirement System's asset valuation method was changed effective with the June 30, 2007 and June 30, 2015 actuarial valuations

APPENDIX 3

**ACTUARIAL PRESENT VALUE OF FUTURE BENEFITS**

as of June 30, 2016 and June 30, 2015  
(in Thousands)

Each year an actuarial valuation determines the actuarial present value of future benefits (PVB), which is the present value of retirement and ancillary benefit payments, excluding group life insurance benefits, that the Retirement System can expect to pay in the future to current retirees and members. The PVB is based upon both service and salary projected to retirement. The results of the two most recent actuarial valuations are displayed in the following table.

	<b>2016</b>	<b>2015</b>
<b>Present Value of Benefits Currently Being Paid:</b>		
Service Retirement Benefits.....	\$59,300,507	\$58,061,673
Disability Retirement Benefits.....	331,309	322,369
Death Benefits.....	1,866	1,869
Survivor Benefits.....	932,669	883,930
Cost-of-Living Allowance.....	<u>5,013,195</u>	<u>4,990,575</u>
Total Present Value of Benefits Presently Being Paid	65,579,546	64,260,416
 <b>Present Value of Benefits Payable in the Future to Current Active Members:</b>		
Service Retirement Benefits.....	50,051,245	48,422,365
Disability Retirement Benefits.....	209,350	202,511
Termination Benefits.....	2,001,472	1,955,951
Death and Survivor Benefits.....	362,916	349,156
Cost-of-Living Allowance.....	<u>1,276,730</u>	<u>1,255,059</u>
Total Active Member Liabilities	53,901,713	52,185,042
 <b>Present Value of Benefits Payable in the Future to Current Inactive (Vested) Members:</b>		
Retirement Benefits.....	338,520	315,058
Death Benefits.....	311	300
Cost-of-Living Allowance.....	<u>28,275</u>	<u>26,660</u>
Total Vested Liabilities	367,106	342,018
 Unclaimed Funds.....	 15,082	 13,098
 <b>Total Actuarial Present Value of Future Benefits</b>	 <b>\$119,863,447</b>	 <b>\$116,800,574</b>

*Note: Totals may not sum due to rounding*



APPENDIX 4

**FUNDING PROGRESS**

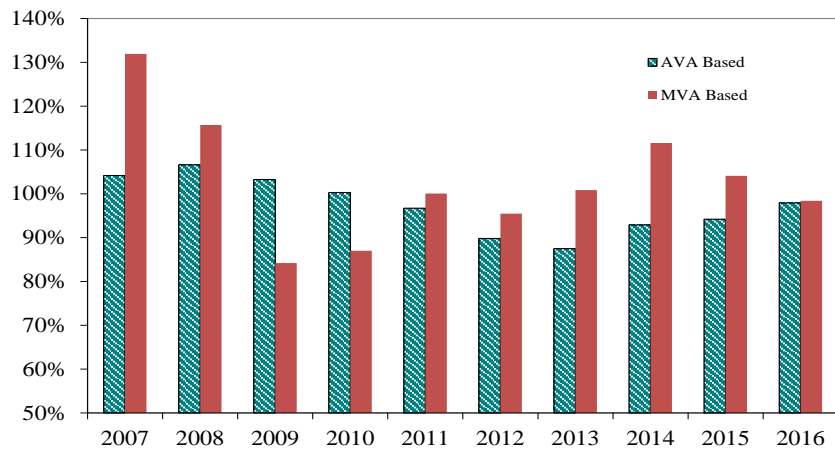
The portion of the actuarial present value of future benefits that is attributed to service rendered as of the valuation date is known as the actuarial accrued liability. In order to effectively assess the funding progress of a retirement system, it is necessary to compare the actuarial value of assets and the actuarial accrued liabilities over a period of time.

The Retirement System’s funding method has allowed the accumulation of assets appropriate for the funding of its liabilities in a systematic and reasonable manner.

**Analysis of Funding Progress  
(in Millions)**

<u>Fiscal Year Ended</u>	<u>Market Value of Assets (MVA)</u>	<u>Actuarial Value of Assets (AVA)<sup>1</sup></u>	<u>Actuarial Accrued Liability<sup>2</sup></u>	<u>Percent Funded based on</u>	
				<u>MVA</u>	<u>AVA</u>
2007	\$104,912.9	\$82,858.9	\$79,537.2	131.9%	104.2%
2008	95,769.3	88,254.7	82,777.5	115.7	106.6
2009	72,471.8	88,805.5	86,062.0	84.2	103.2
2010	76,844.9	88,544.4	88,318.8	87.0	100.3
2011	89,889.7	86,892.2	89,824.9	100.1	96.7
2012	88,056.3	82,871.4	92,250.9	95.5	89.8
2013	95,367.0	82,742.5	94,583.8	100.8	87.5
2014	108,155.1	90,007.1	96,904.5	111.6	92.9
2015	109,718.9	99,301.8	105,401.8	104.1	94.2
2016	107,506.1	107,039.2	109,305.1	98.4	97.9

**Percent Funded**



<sup>1</sup> The Retirement System’s asset valuation method was changed effective with the June 30, 2007 and June 30, 2015 actuarial valuations.

<sup>2</sup> Effective June 30, 2006, the Actuarial Accrued Liability is calculated under the Entry Age Normal Cost Method as was required by Governmental Accounting Standards Board (GASB) Statement No. 50 prior to its replacement by GASB Statement No. 67. The Retirement System is funded in accordance with the Aggregate Cost Method. GASB Statement No. 50 required that the Entry Age Normal Cost Method be used to calculate the accrued liability for purposes of presenting the funded percentage.

APPENDIX 5

**EMPLOYER CONTRIBUTION RATE**

2016 Valuation

7.50% Interest

<b>Normal Rate</b>	9.40%
<b>Group Life Insurance Rate</b>	0.13
<b>Excess Benefit Plan Rate</b>	0.00
<b>Expense Rate</b>	0.27
<b>Computed Contribution Rate as of June 30, 2016</b>	<b>9.80%</b>

**NORMAL RATE CALCULATION**

2016 Valuation

7.50% Interest

**Liabilities****Active Tier 1**

Service Pension	\$378,424,593
Disability Pension	0
Vested Pension	0
Active Death over \$50,000	3,640,887
Death Benefit After 10-Yr Withdrawal over \$50,000	0
Annuity Savings Fund	28,259
COLA	4,824,635
Total	\$386,918,374

**Active Tier 2**

Service Pension	\$502,747,833
Post Retired Death over \$50,000	398,157
Disability Pension	0
Post Disabled Death over \$50,000	0
Vested Pension	3,817
Active Death over \$50,000	1,498,150
Death Benefit After 10-Yr Withdrawal over \$50,000	0
COLA	8,007,790
Total	\$512,655,747

**Active Tier 3**

Service Pension	\$2,789,225,896
Post Retired Death over \$50,000	1,676,918
Disability Pension	43,439
Post Disabled Death over \$50,000	580
Refund on Active Death	1,984,285
Active Death over \$50,000	6,512,236
Refund on Quit	38,819
Vested Pension	382,013
Death Benefit After 10-Yr Withdrawal over \$50,000	86
Refund on Death after Vested Withdrawal	40
COLA	54,677,010
Total	\$2,854,541,322

**NORMAL RATE CALCULATION (Cont'd.)**

2016 Valuation

7.50% Interest

**Liabilities (Cont'd.)****Active Tier 4**

Service Pension	\$44,490,039,768
Post Retired Death over \$50,000	27,527,474
Disability Pension	197,049,447
Post Disabled Death over \$50,000	3,823,545
Refund on Active Death	36,352,510
Active Death over \$50,000	238,565,775
Refund on Quit	67,260,884
Vested Pension	1,765,894,771
Death Benefit After 10-Yr Withdrawal over \$50,000	2,534,522
Refund on Death after Vested Withdrawal	1,220,165
COLA	1,124,286,328
Total	\$47,954,555,189

**Active Tier 5**

Service Pension	\$637,721,400
Post Retired Death over \$50,000	472,880
Disability Pension	5,200,740
Post Disabled Death over \$50,000	96,555
Refund on Active Death	2,713,686
Active Death over \$50,000	7,277,625
Refund on Quit	31,356,265
Vested Pension	37,009,920
Death Benefit After 10-Yr Withdrawal over \$50,000	104,889
Refund on Death after Vested Withdrawal	100,565
COLA	19,023,881
Total	\$741,078,406

**Active Tier 6**

Service Pension	\$766,105,128
Post Retired Death over \$50,000	688,060
Disability Pension	7,033,649
Post Disabled Death over \$50,000	123,499
Refund on Active Death	6,470,211
Active Death over \$50,000	11,953,503
Refund on Quit	54,777,920
Vested Pension	39,261,913
Death Benefit After 10-Yr Withdrawal over \$50,000	128,989
Refund on Death after Vested Withdrawal	165,796
COLA	25,264,257
Total	\$911,972,925

**NORMAL RATE CALCULATION (Cont'd.)**

2016 Valuation

7.50% Interest

**Liabilities (Cont'd.)****Retirees**

Retired Pension	\$59,180,574,864
Retired Annuity	119,931,016
Disability Pension	330,651,562
Disability Annuity	657,415
Beneficiary Pension	919,387,751
Beneficiary Annuity	8,111,019
DBA Pension	4,859,674
DBA Annuity	310,538
Escalation	4,684,235
Post Retired Death over \$50,000	1,749,979
COLA	4,605,247,586
Catch-Up & Prior §532 Supp	403,263,659
Total	\$65,579,429,298

**Vesteds**

Inactive Vested	\$338,519,830
Death Benefit After 10-Yr Withdrawal over \$50,000	310,783
Active Vested	483,624,966
Death Benefit After 10-Yr Withdrawal over \$50,000	1,197,062
COLA	68,670,812
Total	\$892,323,453

**TIAA**

Service Pension	\$3,327,448
Disability Pension	23,166
Vested Pension	33,978
Active Death over \$50,000	4,304
COLA	250,665
Total	\$3,639,561

**Miscellaneous**

Incurred Death but not Paid	\$11,251,257
Unclaimed Non-Member Funds	15,081,688
Total	\$26,332,945

<b>Total Liabilities</b>	\$119,863,447,220
--------------------------	-------------------

**NORMAL RATE CALCULATION (Cont'd.)**2016 Valuation  
7.50% Interest**Assets for Valuation**

Current Total Assets (excluding contributions receivable)		\$105,357,811,418
Less: Expense Fund		\$60,157,274
Less: Group Life Insurance Fund		\$264,891,751
Plus: Assets Receivable from Normal Rate in 2016-2017 Fiscal Year		
	$(15,431,008,573)(0.1285)(1.0750)^{-7/24}$	\$1,941,496,617
Plus: Member Contributions Receivable in 2016-2017 Fiscal Year		
Tier 4:	$(49,506,741)(1.0750)^{-7/24}$	\$48,473,406
Tier 5:	$(16,010,492)(1.0750)^{-7/24}$	\$15,676,311
Tier 6:	$(32,954,101)(1.0750)^{-7/24}$	<u>\$32,266,263</u>
	<b>Adjusted Market Value of Assets for Normal Rate</b>	\$107,070,674,990
Less: 5 Year Smoothing Adjustment		<u>\$296,394,260</u>
	<b>Actuarial Value of Assets for Normal Rate Valuation Purposes</b>	\$106,774,280,730

**Receivables**

Assets Receivable from Normal Rate in 2017-2018 Fiscal Year		
(2016-2017 Paybase)(2015 Normal Rate)(1.0750) <sup>-1 7/24</sup>		
	$(14,931,971,072)(0.1131)(1.0750)^{-1 7/24}$	\$1,538,191,753
Present Value of Future Member Contributions		
(Tier 4 Present Value of Future Employee Contributions)(1.0750) <sup>-7/24</sup>		
	$(105,776,858 - 49,506,741)(1.0750)^{-7/24}$	\$55,095,613
(Tier 5 Present Value of Future Employee Contributions)(1.0750) <sup>-7/24</sup>		
	$(213,652,726 - 16,010,492)(1.0750)^{-7/24}$	\$193,516,924
(Tier 6 Present Value of Future Employee Contributions)(1.0750) <sup>-7/24</sup>		
	$(503,477,321 - 32,954,101)(1.0750)^{-7/24}$	<u>\$460,702,171</u>
	<b>Total Receivables</b>	\$2,247,506,461

**NORMAL RATE CALCULATION (Cont'd.)**

2016 Valuation

7.50% Interest

**Present Value of Future Salaries**

	<u>Total PVFS</u>	
Tier 1	\$99,272,442	
Tier 2	161,312,649	
Tier 3	916,363,395	
Tier 4	102,313,276,424	
Tier 5	5,229,569,355	
Tier 6	<u>9,135,370,877</u>	
	\$117,855,165,142	$\times (1.0750)^{-7/24} = \$115,395,219,788$

**Normal Rate**

$$\frac{\text{Total Liabilities - (Assets + Receivables)}}{\text{Present Value of Future Salaries}}$$

$$\frac{\$10,841,660,029}{\$115,395,219,788} = 9.3952\%$$

9.40% (rounded)

## APPENDIX 5 (Cont'd.)

**GROUP LIFE INSURANCE FUND**

2016 Valuation

7.50% Interest

<b>GLIF Balance as of June 30, 2015</b>	<b>\$255,144,068</b>
Benefit Payments During 2015 - 2016	\$15,784,982
Contributions During 2015 - 2016	\$19,527,764
GLIF Net Investment Income During 2015 - 2016 (Based on 2015 - 2016 Market Value of Assets Rate of Return of 2.30%)	\$6,004,901
<b>GLIF Balance as of June 30, 2016</b>	<b>\$264,891,751</b>
Estimated Benefit Payments During 2016 - 2017	\$16,000,000
Contributions During 2016 - 2017	\$20,060,311
GLIF Estimated Net Investment Income During 2016 - 2017 (Based on Estimated 2016 - 2017 Market Value of Assets Rate of Return of 7.50%)	\$20,332,137
<b>Estimated GLIF Balance as of June 30, 2017</b>	<b>\$289,284,199</b>

**Calculation of the GLIF Rate for the June 30, 2016 Actuarial Valuation:**

Expected Salaries for the 2016 - 2017 Fiscal Year	\$15,883,000,000
GLIF Rate	0.13%
Expected Contribution for the 2017 - 2018 Fiscal Year	\$20,647,900

Keep GLIF Rate at 0.13% as expected contribution will likely cover expected GLIF benefit payments, and once that is no longer true (as death benefits increase) GLIF balance can begin to be used



APPENDIX 5 (Cont'd.)

**EXCESS BENEFIT PLAN FUND\***  
2016 Valuation

<b>Excess Benefit Plan Balance as of June 30, 2015</b>	<b>\$2,516,706</b>
Final Adjustment for the Fiscal Year Ending June 30, 2015	\$145,635
Benefit Payments during 2015 – 2016	\$600,000
Contribution during 2015 – 2016	\$0
Net Investment Income (including miscellaneous adjustments) during 2015 - 2016 *	\$69
<b>Excess Benefit Plan Balance as of June 30, 2016</b>	<b>\$2,062,410</b>
Final Adjustment for the Fiscal Year Ending June 30, 2016	\$113,982
Estimated Benefit Payments during 2016 - 2017	\$600,000
Contribution during 2016 – 2017	\$1,543,101
Expected Net Investment Income during 2016 - 2017 *	\$0
<b>Expected Excess Benefit Plan Balance as of June 30, 2017</b>	<b>\$3,119,493</b>

**Calculation of the Excess Benefit Plan Rate for the June 30, 2016 Actuarial Valuation:**

Put the Excess Benefit Plan rate at 0.00% in order to use up the balance that has built up in the fund.

\* Fund is in a zero-interest checking account

APPENDIX 5 (Cont'd.)

The Administrative Rate and Employer Contributions<sup>1</sup>

The administrative portion (Rate) of the employer contribution rate is adopted annually by the Retirement Board in the amount necessary to defray Retirement Administration related expenses for the following fiscal year. The first step in determining the rate is to divide the projected Retirement Administration related expenses by the projected member salary base. Consideration is also given to the overall status of the fund balance.

It is anticipated that there will be no change to the Rate in 2018-19 and it is projected to be sustained for at least the next four years at 0.27% of member salary.

Member Salary Base		Rate (%)	Employer Contributions (Net of Billing Adjustments)		Increase/Decrease in Contributions to the Administrative Fund
Year	Amount		Year Collected	Amount	Percent
2018-19	\$16,597,000,000 *	0.27 *	2019-20	\$44,812,000 *	2.21% *
2017-18	16,239,000,000 *	0.27 *	2018-19	43,845,000 *	2.24% *
2016-17	15,883,000,000 *	0.27	2017-18	42,884,000 *	2.93% *
2015-16	15,431,009,000	0.27	2016-17	41,664,000 *	2.73% *
2014-15	15,021,357,000	0.27	2015-16	40,558,000	1.65%
2013-14	14,771,301,000	0.27	2014-15	39,899,000	0.85%
2012-13	14,647,830,000	0.27	2013-14	39,561,000	0.08%

\*Estimated.

Estimated Member Salary Base

The member salary base is actuarially determined; it increases as new members join the System and as members receive pay increases from their employers. Annual retirements and other forms of separation from service mitigate this increase. The member salary base is projected to increase 2.00% on average per year from 2017 through 2019.

The Proposed Administrative Rate Calculation (2018 – 19)

Several factors are considered when anticipating expenses used in calculating the administrative rate, which include general price increases, an estimated 12% increase in ERS and capital asset additions.

**Rate Calculation**

$$\frac{\text{Projected 2018-19 Administrative Expenses}}{\text{Estimated 2017-18 Member Salary Base}} = \frac{\$48,949,639}{\$16,239,000,000} = 0.30\%$$

$$\text{Proposed Administrative Expense Rate for 2018-19 Collections:} = \underline{0.27\%}$$

<sup>1</sup> From the NYSTRS 2017-18 Operating Budget Report

APPENDIX 5 (Cont'd.)

**ASSET VALUATION METHOD  
DEVELOPMENT OF SMOOTHING ADJUSTMENT**

<u>FYE</u>	<u>Market Value</u>	<u>Contributions</u>	<u>Benefit Payments</u>	<u>Average Market Value<sup>1</sup></u>
6/30/2011	88,414,049,393	1,072,744,659	5,751,514,083	
6/30/2012	86,303,987,073	1,479,186,529	5,979,984,123	86,471,814,456
6/30/2013	93,531,255,172	1,765,812,556	6,194,057,011	84,457,742,461
6/30/2014	105,671,560,226	1,858,234,634	6,399,153,913	91,647,927,748
6/30/2015	106,997,313,385	2,499,130,479	6,588,088,885	104,147,733,206
6/30/2016	105,357,811,418	2,726,314,201	6,780,291,815	105,538,306,703

<u>FYE</u>	<u>Actual Gain<sup>2</sup></u>	<u>Expected Gain<sup>3</sup></u>	<u>Unexpected Gain<sup>4</sup></u>	<u>Smoothing Adjustment<sup>5</sup></u>
6/30/2011	15,395,104,554			
6/30/2012	659,956,804	2,594,154,434	(1,934,197,630)	
6/30/2013	9,635,631,237	2,533,732,274	7,101,898,963	
6/30/2014	14,601,733,266	2,749,437,832	11,852,295,434	
6/30/2015	5,400,265,487	7,811,079,990	(2,410,814,503)	
6/30/2016	2,392,354,248	7,915,373,003	(5,523,018,755)	<b>296,394,260</b>

<sup>1</sup> Average Market Value = Market Value<sub>(previous yr)</sub> - (.5 x Benefit Payments) + ((8.5/12) x Contributions)

<sup>2</sup> Actual Gain = Net Appreciation for fiscal years ending prior to 6/30/2015  
Actual Gain = Net Investment Income for fiscal years ending on or after 6/30/2015

<sup>3</sup> Expected Gain = 3.0% x Average Market Value for fiscal years ending prior to 6/30/2015  
Expected Gain = 7.5% x Average Market Value for fiscal years ending on or after 6/30/2015

<sup>4</sup> Unexpected Gain = Actual Gain - Expected Gain

<sup>5</sup> Smoothing Adjustment = (.20 x Unexpected Gain 6/30/2013)  
+ (.40 x Unexpected Gain 6/30/2014)  
+ (.60 x Unexpected Gain 6/30/2015)  
+ (.80 x Unexpected Gain 6/30/2016)

APPENDIX 6

**MEMBER RECONCILIATION**

**ACTIVE MEMBERS:**

	<u>Male</u>	<u>Female</u>	<u>Total</u>
June 30, 2015.....	63,531	204,184	<b>267,715</b>
Changes During Year:			
Added.....	2,422	8,624	<b>11,046</b>
Withdrawn.....	1,277	4,694	<b>5,971</b>
Retired.....	1,315	4,930	<b>6,245</b>
Died.....	64	131	<b>195</b>
June 30, 2016.....	63,297	203,053	<b>266,350</b>

**MEMBERS RETIRED FOR:**

	<u>Service*</u>			<u>Disability</u>			<u>Total</u>		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
June 30, 2015.....	50,144	100,360	150,504	479	1,625	2,104	<b>50,623</b>	<b>101,985</b>	<b>152,608</b>
Changes During Year:									
Retired.....	1,292	4,829	6,121	23	101	124	<b>1,315</b>	<b>4,930</b>	<b>6,245</b>
Died.....	1,393	2,009	3,402	32	69	101	<b>1,425</b>	<b>2,078</b>	<b>3,503</b>
Lump Sum.....	44	143	187	0	0	0	<b>44</b>	<b>143</b>	<b>187</b>
Restored to Active Membership....	0	0	0	0	0	0	<b>0</b>	<b>0</b>	<b>0</b>
June 30, 2016.....	49,999	103,037	153,036	470	1,657	2,127 **	<b>50,469</b>	<b>104,694</b>	<b>155,163</b>

**BENEFICIARIES OF DECEASED:**

	<u>Service Annuitants</u>			<u>Disability Annuitants</u>			<u>Active Members</u>			<u>Total</u>		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
June 30, 2015.....	1,219	4,219	5,438	102	171	273	28	111	139	<b>1,349</b>	<b>4,501</b>	<b>5,850</b>
Changes During Year:												
Added.....	137	325	462	5	7	12	0	0	0	<b>142</b>	<b>332</b>	<b>474</b>
Died.....	99	220	319	4	9	13	1	6	7	<b>104</b>	<b>235</b>	<b>339</b>
June 30, 2016.....	1,257	4,324	5,581	103	169	272	27	105	132	<b>1,387</b>	<b>4,598</b>	<b>5,985</b>

**SUMMARY:**

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Active Members.....	63,297	203,053	<b>266,350</b>
Retired Members.....	50,469	104,694	<b>155,163</b>
Beneficiaries.....	1,387	4,598	<b>5,985</b>
Total.....	115,153	312,345	<b>427,498</b>

\*Also includes vested retirees.

\*\*Includes 22 males and 49 females retired for disability who receive a service benefit.

APPENDIX 7

**DISTRIBUTION OF ACTIVE MEMBERS**

Distribution by Age as of June 30, 2016

<u>Age</u>	<u>Male</u>	<u>Female</u>	<u>Total Members</u>
15-19	9	30	39
20-24	1,075	3,765	4,840
25-29	5,581	18,784	24,365
30-34	8,485	26,257	34,742
35-39	9,700	28,684	38,384
40-44	10,011	28,098	38,109
45-49	9,941	30,205	40,146
50-54	7,965	26,959	34,924
55-59	5,604	22,071	27,675
60-64	3,314	13,378	16,692
65-69	1,175	3,902	5,077
70-74	308	689	997
75-79	83	180	263
80-84	35	42	77
85 or older	<u>11</u>	<u>9</u>	<u>20</u>
Total	63,297	203,053	266,350

*Average Male age is 43 years 4 months*

*Average Female age is 43 years 10 months*

APPENDIX 7 (Cont'd.)

Distribution by Age and Tier of Membership as of June 30, 2016

<u>Age</u>	<u>Tier 1</u>	<u>Tier 2</u>	<u>Tier 3</u>	<u>Tier 4</u>	<u>Tier 5</u>	<u>Tier 6</u>	<u>Total Members</u>
15-19	0	0	0	0	0	39	39
20-24	0	0	0	10	127	4,703	4,840
25-29	0	0	0	4,380	6,666	13,319	24,365
30-34	0	0	0	24,356	4,916	5,470	34,742
35-39	0	0	0	32,998	1,893	3,493	38,384
40-44	0	0	0	33,984	1,346	2,779	38,109
45-49	0	0	1	36,226	1,278	2,641	40,146
50-54	0	1	65	32,056	1,014	1,788	34,924
55-59	1	32	2,193	23,618	684	1,147	27,675
60-64	38	487	2,269	12,928	411	559	16,692
65-69	480	407	321	3,543	145	181	5,077
70-74	210	29	54	619	45	40	997
75-79	64	16	14	149	11	9	263
80-84	27	2	2	39	4	3	77
85 or older	12	0	1	6	0	1	20
Total	832	974	4,920	204,912	18,540	36,172	266,350
Average Age (yrs. – mos.)	69-7	64-7	60-2	45-8	35-8	33-7	43-9

APPENDIX 7 (Cont'd.)

Distribution of Active Members by Age and New York State Service as of June 30, 2016

**Male**

<u>Age</u>	<u>Less Than 10 Years New York State Service</u>	<u>10 or More Years New York State Service</u>	<u>Total New York State Service</u>
15-19	9	0	9
20-24	1,075	0	1,075
25-29	5,581	0	5,581
30-34	7,535	950	8,485
35-39	4,144	5,556	9,700
40-44	2,520	7,491	10,011
45-49	1,976	7,965	9,941
50-54	1,582	6,383	7,965
55-59	1,165	4,439	5,604
60-64	869	2,445	3,314
65-69	431	744	1,175
70-74	165	143	308
75-79	48	35	83
80-84	26	9	35
85 or older	7	4	11
Total	27,133	36,164	63,297

**Female**

<u>Age</u>	<u>Less Than 10 Years New York State Service</u>	<u>10 or More Years New York State Service</u>	<u>Total New York State Service</u>
15-19	30	0	30
20-24	3,765	0	3,765
25-29	18,783	1	18,784
30-34	23,303	2,954	26,257
35-39	12,985	15,699	28,684
40-44	9,207	18,891	28,098
45-49	9,513	20,692	30,205
50-54	7,507	19,452	26,959
55-59	4,984	17,087	22,071
60-64	2,408	10,970	13,378
65-69	887	3,015	3,902
70-74	243	446	689
75-79	68	112	180
80-84	21	21	42
85 or older	3	6	9
Total	93,707	109,346	203,053

APPENDIX 7 (Cont'd.)

Distribution of Active Members by Total Service and by Gender as of June 30, 2016

<u>Years of Service</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
0-4	17,150	56,056	73,206
5-9	9,393	35,053	44,446
10-14	11,204	37,461	48,665
15-19	11,680	34,734	46,414
20-24	6,957	19,350	26,307
25-29	4,000	12,740	16,740
30-34	2,149	6,150	8,299
35 or more	<u>764</u>	<u>1,509</u>	<u>2,273</u>
Total	63,297	203,053	266,350

*Average Male has 12 Years of Total Service*

*Average Female has 12 Years of Total Service*



APPENDIX 7 (Cont'd.)

Distribution of Active Members by Total Service and Tier of Membership as of June 30, 2016

<u>Years of Service</u>	<u>Tier 1</u>	<u>Tier 2</u>	<u>Tier 3</u>	<u>Tier 4</u>	<u>Tier 5</u>	<u>Tier 6</u>	<u>Total</u>
0-4	109	50	50	23,021	13,939	36,037	73,206
5-9	36	51	119	39,574	4,567	99	44,446
10-14	66	78	229	48,242	22	28	48,665
15-19	56	74	333	45,937	10	4	46,414
20-24	75	121	476	25,629	2	4	26,307
25-29	103	156	686	15,795	0	0	16,740
30-34	108	127	1,438	6,626	0	0	8,299
35 or more	279	317	1,589	88	0	0	2,273
Total	832	974	4,920	204,912	18,540	36,172	266,350
Average Service (yrs. – mos.)	26-8	26-8	29-2	14-0	2-5	1-2	11-8

APPENDIX 7 (Cont'd.)

Total and Average Earnings by Tier of Membership  
for Active Members as of June 30, 2016

	<u>Total Earnings</u>	<u>Average Earnings*</u>	<u>Average Earnings* of full-time members</u>
Tier 1	\$66,170,325	\$98,030	\$106,990
Tier 2	\$84,566,828	\$100,317	\$106,466
Tier 3	\$457,659,407	\$100,013	\$103,156
Tier 4	\$13,309,413,840	\$78,338	\$83,227
Tier 5	\$457,442,642	\$44,019	\$55,245
Tier 6	<u>\$872,773,806</u>	<u>\$30,095</u>	<u>\$47,446</u>
Total	\$15,248,026,848	\$70,795	\$79,813

\* Average earnings calculated using only those active members with earnings during the 2015-16 school year.

APPENDIX 8

**HISTORICAL MEMBER STATISTICS**

**Active Members and Annuitants 1925-2016**

<u>As of June 30</u>	<u>Active Members</u>	<u>Retirees &amp; Beneficiaries</u>
1925	29,057	1,815
1930	39,663	2,732
1935	45,031	3,919
1940	48,193	4,771
1945	52,359	5,637
1950	56,504	6,374
1955	71,273	7,897
1960	99,555	10,796
1965	129,543	16,043
1970	186,914	22,700
1975	227,038	35,252
1980	203,330	46,812
1985	178,516	57,366
1990	195,194	69,127
1995	199,398	82,459
2000	224,986	100,839
2005	260,356	125,325
2010	285,774	141,716
2015	267,715	158,458
2016	266,350	161,148

**Number of Active Members by Tier**

<u>As of June 30</u>	<u>Tier 1</u>	<u>Tier 2</u>	<u>Tier 3</u>	<u>Tier 4</u>	<u>Tier 5</u>	<u>Tier 6</u>	<u>Total</u>
1997	53,502	16,186	23,861	110,167	--	--	203,716
1998	49,266	15,860	23,302	120,652	--	--	209,080
1999	50,859	15,776	20,726	128,906	--	--	216,267
2000	47,234	15,700	20,159	141,893	--	--	224,986
2001	41,169	15,472	19,914	157,795	--	--	234,350
2002	35,601	15,121	19,674	172,438	--	--	242,834
2003	28,327	14,463	19,083	185,374	--	--	247,247
2004	22,986	13,947	18,835	198,747	--	--	254,515
2005	17,901	13,210	18,535	210,710	--	--	260,356
2006	13,621	12,084	18,173	220,532	--	--	264,410
2007	10,838	10,178	17,743	231,286	--	--	270,045
2008	8,630	8,171	17,007	241,093	--	--	274,901
2009	6,943	6,752	16,111	250,532	--	--	280,338
2010	5,582	5,706	14,942	255,966	3,578	--	285,774
2011	3,814	4,137	12,690	247,530	12,264	--	280,435
2012	2,756	3,253	11,180	239,199	19,969	916	277,273
2013	1,968	2,447	9,450	231,258	19,452	8,753	273,328
2014	1,439	1,810	7,753	222,545	19,124	17,368	270,039
2015	1,116	1,348	6,222	214,020	18,878	26,131	267,715
2016	832	974	4,920	204,912	18,540	36,172	266,350

APPENDIX 9

**RETIREMENT STATISTICS**

**RETIREMENT STATISTICS 2015-16 MEMBERS RETIRED FOR:**

	<b>Service*</b>	<b>Disability</b>
Number Retired.....	<b>6,121</b>	<b>124</b>
Age at Retirement:		
Average.....	61 yrs., 2 mos.	50 yrs., 7 mos.
Median.....	61 yrs., 7 mos.	50 yrs., 10 mos.
Years of Service:		
Average.....	25 yrs., 0 mos.	18 yrs., 2 mos.
Median.....	27 yrs., 0 mos.	16 yrs., 8 mos.
**Benefit:		
Average.....	\$44,215	\$27,116
Median.....	\$45,200	\$24,306
Final Average Salary (FAS):		
Average.....	\$84,308	\$74,341
Median.....	\$83,908	\$71,999
***Benefit as % of FAS:		
Average.....	47.02%	35.30%
Median.....	52.41%	33.33%

**2015-16 MEMBERS RETIRED FOR SERVICE\* WITH:**

	<b>Less Than 20 Yrs. N.Y.</b>	<b>Between 20 Yrs. N.Y. and 35 Yrs. Total</b>	<b>35 Yrs. Total or More</b>
Number Retired.....	<b>1,532</b>	<b>3,981</b>	<b>608</b>
Age at Retirement:			
Average.....	61 yrs., 6 mos.	60 yrs., 10 mos.	62 yrs., 9 mos.
Median.....	61 yrs., 10 mos.	61 yrs., 4 mos.	62 yrs., 1 mos.
Years of Service:			
Average.....	12 yrs., 2 mos.	27 yrs., 8 mos.	38 yrs., 3 mos.
Median.....	12 yrs., 3 mos.	29 yrs., 4 mos.	37 yrs., 1 mos.
**Benefit:			
Average.....	\$9,654	\$51,685	\$82,389
Median.....	\$6,752	\$50,698	\$76,382
Final Average Salary (FAS):			
Average.....	\$48,594	\$93,758	\$112,418
Median.....	\$41,945	\$90,299	\$105,165
***Benefit as % of FAS:			
Average.....	18.12%	54.17%	73.00%
Median.....	17.83%	58.00%	71.17%

\*Also includes vested retirees.

\*\*The Maximum, even though the member may have chosen an option.

\*\*\*The average and median of individual benefits as percentages of final average salary.

APPENDIX 9 (Cont'd.)

**RETIREMENT STATISTICS ALL RETIREES AS OF JUNE 30, 2016 RETIRED FOR:**

	<b>Service*</b>	<b>Disability</b>
Number Retired.....	<b>153,107</b>	<b>2,056</b>
Age at Retirement:		
Average.....	58 yrs., 8 mos.	49 yrs., 6 mos.
Median.....	57 yrs., 7 mos.	50 yrs., 3 mos.
Age at June 30, 2016:		
Average.....	72 yrs., 4 mos.	64 yrs., 10 mos.
Median.....	70 yrs., 8 mos.	65 yrs., 3 mos.
Years of Service:		
Average.....	28 yrs., 2 mos.	18 yrs., 4 mos.
Median.....	30 yrs., 3 mos.	17 yrs., 6 mos.
**Benefit:		
Average.....	\$41,192	\$19,872
Median.....	\$41,220	\$18,254
Final Average Salary (FAS):		
Average.....	\$70,007	\$54,663
Median.....	\$68,853	\$52,783
***Benefit as % of FAS:		
Average.....	54.49%	35.61%
Median.....	60.44%	33.33%

**ALL RETIREES AS OF JUNE 30, 2016 RETIRED FOR SERVICE\* WITH:**

	<b>Less Than 20 Yrs. N.Y.</b>	<b>Between 20 Yrs. N.Y. and 35 Yrs. Total</b>	<b>35 Yrs. Total or More</b>
Number Retired.....	<b>26,064</b>	<b>91,611</b>	<b>35,432</b>
Age at Retirement:			
Average.....	58 yrs., 11 mos.	58 yrs., 5 mos.	58 yrs., 11 mos.
Median.....	57 yrs., 5 mos.	57 yrs., 2 mos.	58 yrs., 4 mos.
Years of Service:			
Average.....	13 yrs., 6 mos.	28 yrs., 7 mos.	37 yrs., 5 mos.
Median.....	13 yrs., 8 mos.	30 yrs., 0 mos.	36 yrs., 8 mos.
**Benefit:			
Average.....	\$8,282	\$41,318	\$65,073
Median.....	\$6,188	\$40,345	\$61,033
Final Average Salary (FAS):			
Average.....	\$39,299	\$72,017	\$87,399
Median.....	\$32,821	\$69,690	\$82,614
***Benefit as % of FAS:			
Average.....	20.64%	56.50%	74.21%
Median.....	19.54%	59.78%	73.56%

\*Also includes vested retirees.

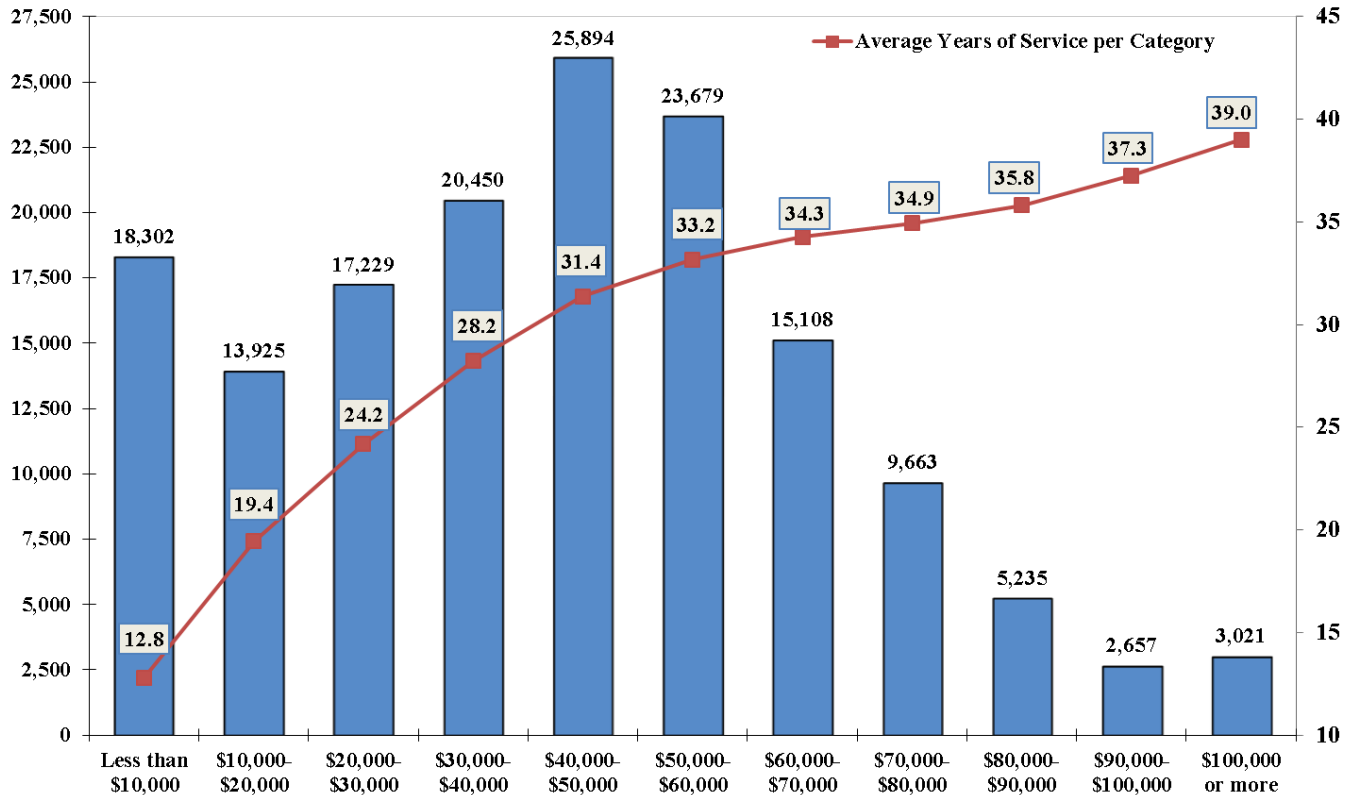
\*\*The Maximum, even though the member may have chosen an option.

\*\*\*The average and median of individual benefits as percentages of final average salary.

**Retired Members' Characteristics<sup>1</sup>  
By Year of Retirement**

Retired in Fiscal <u>Year Ended</u>	Number of <u>Retired Members</u>	Average Age at Retirement <u>(yrs.- mos.)</u>	Average Service at Retirement <u>(yrs.- mos.)</u>	Average Final <u>Average Salary</u>	Average Maximum <u>Annual Benefit</u>
2007	6,900	58-7	28-1	\$74,185	\$44,204
2008	6,330	58-11	27-8	77,066	45,779
2009	5,644	59-6	27-7	78,050	46,061
2010	5,501	60-0	27-5	79,615	46,489
2011	8,423	60-3	28-7	85,010	51,200
2012	6,033	60-9	26-3	82,461	45,759
2013	6,330	60-10	25-6	81,987	44,768
2014	6,547	61-0	25-4	84,545	44,978
2015	6,161	60-11	25-4	84,362	44,487
2016	6,245	61-2	25-0	84,308	44,215

**Distribution of the Annual Benefit<sup>2</sup> of All Retired Members**



<sup>1</sup> Averages are for service and vested retirees.

<sup>2</sup> Maximum annual retirement benefit as of June 30, 2016 including supplementation and COLA.

APPENDIX 10

2012-2016 EXPERIENCE STUDY  
 NUMBER OF SERVICE RETIREMENTS  
 TIER 1 AND TIERS 2, 3, 4 AT LEAST AGE 62 OR WITH 30 YEARS OF SERVICE  
 AND TIER 5 AT LEAST AGE 62  
 EXPOSURE BASED ON ACTIVE TEACHERS  
 ASSUMPTIONS ADOPTED OCTOBER 2015

AGE	MALE				FEMALE			
	EXPOSURES	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	EXPOSURES	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
50	9	0	0.00	N/A	22	0	0.00	N/A
51	34	0	0.00	N/A	76	0	0.00	N/A
52	254	0	0.00	N/A	621	0	0.00	N/A
53	644	0	0.00	N/A	1,595	0	0.00	N/A
54	1,072	49	0.00	N/A	2,655	97	0.00	N/A
55	1,439	466	441.33	1.056	3,480	1,177	1,092.69	1.077
56	1,303	370	365.86	1.011	3,139	989	904.40	1.094
57	1,266	304	319.60	0.951	2,820	768	759.91	1.011
58	1,257	319	326.11	0.978	2,786	744	727.19	1.023
59	1,222	315	350.16	0.900	2,749	779	738.89	1.054
60	1,172	335	364.50	0.919	2,617	826	731.22	1.130
61	1,047	329	335.28	0.981	2,554	772	707.88	1.091
62	3,052	741	824.96	0.898	12,796	3,418	3,290.58	1.039
63	2,296	474	526.59	0.900	8,922	1,945	2,078.35	0.936
64	1,809	336	374.21	0.898	6,629	1,306	1,453.24	0.899
65	1,371	287	287.47	0.998	4,957	1,192	1,181.11	1.009
66	1,033	251	224.61	1.117	3,386	894	827.96	1.080
67	747	172	162.05	1.061	2,195	516	519.75	0.993
68	533	114	111.02	1.027	1,561	343	343.99	0.997
69	381	78	71.28	1.094	1,132	244	261.42	0.933
70	295	59	48.25	1.223	838	190	192.15	0.989
71	209	26	30.66	0.848	594	134	125.96	1.064
72	161	30	27.31	1.098	446	86	80.48	1.069
73	126	28	21.09	1.328	320	62	58.60	1.058
74	92	12	15.11	0.794	229	42	44.00	0.955
75	71	6	9.50	0.632	171	27	32.60	0.828
76	306	53	306.00	0.173	563	100	563.00	0.178
TOTAL	23,201	5,154	5,542.95	0.930	69,853	16,651	16,715.37	0.996

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF SERVICE RETIREMENTS  
 TIERS 2,3,4 LESS THAN AGE 62 AND WITH LESS THAN 30 YEARS OF SERVICE  
 EXPOSURE BASED ON ACTIVE TEACHERS  
 ASSUMPTIONS ADOPTED OCTOBER 2015

AGE	MALE				FEMALE			
	EXPOSURES	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	EXPOSURES	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
50	6,431	0	0.00	N/A	21,873	0	0.00	N/A
51	6,191	0	0.00	N/A	22,083	0	0.00	N/A
52	5,748	0	0.00	N/A	21,501	0	0.00	N/A
53	5,269	0	0.00	N/A	20,483	0	0.00	N/A
54	4,752	26	0.00	N/A	19,533	124	0.00	N/A
55	4,317	124	137.99	0.899	18,415	596	636.51	0.936
56	3,909	110	124.24	0.885	17,080	541	610.80	0.886
57	3,592	85	130.25	0.653	16,357	507	682.90	0.742
58	3,276	110	143.81	0.765	15,625	594	724.20	0.820
59	3,015	128	170.04	0.753	14,771	688	891.27	0.772
60	2,769	132	176.05	0.750	13,826	853	973.56	0.876
61	2,465	190	178.01	1.067	12,239	1,015	1,010.82	1.004
TOTAL	51,734	905	1,060.39	0.853	213,786	4,918	5,530.06	0.889



APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF SERVICE RETIREMENTS  
 TIER 5 LESS THAN AGE 62 AND WITH LESS THAN 30 YEARS OF SERVICE  
 EXPOSURE BASED ON ACTIVE TEACHERS  
 ASSUMPTIONS ADOPTED OCTOBER 2015

AGE	MALE				FEMALE			
	EXPOSURES <sup>1</sup>	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	EXPOSURES <sup>1</sup>	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
50	0	0	0.00	N/A	4	0	0.00	N/A
51	0	0	0.00	N/A	5	0	0.00	N/A
52	0	0	0.00	N/A	2	0	0.00	N/A
53	0	0	0.00	N/A	3	0	0.00	N/A
54	0	0	0.00	N/A	2	0	0.00	N/A
55	0	0	0.00	0.000	8	0	0.14	0.000
56	0	0	0.00	0.000	5	1	0.09	11.111
57	1	0	0.02	0.000	6	0	0.13	0.000
58	0	0	0.00	0.000	3	0	0.07	0.000
59	0	0	0.00	0.000	4	0	0.12	0.000
60	0	0	0.00	0.000	2	1	0.07	14.286
61	0	0	0.00	0.000	5	1	0.21	4.762
TOTAL	1	0	0.02	0.000	49	3	0.83	3.614

<sup>1</sup> Exposures have at least 10 years of credited service.

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF SERVICE RETIREMENTS  
 TIER 6  
 EXPOSURE BASED ON ACTIVE TEACHERS  
 ASSUMPTIONS ADOPTED OCTOBER 2015

AGE	MALE				FEMALE			
	EXPOSURES <sup>1</sup>	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	EXPOSURES <sup>1</sup>	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
50	0	0	0.00	N/A	2	0	0.00	N/A
51	0	0	0.00	N/A	0	0	0.00	N/A
52	0	0	0.00	N/A	1	0	0.00	N/A
53	0	0	0.00	N/A	1	0	0.00	N/A
54	0	0	0.00	N/A	1	0	0.00	N/A
55	0	0	0.00	0.000	0	0	0.00	0.000
56	0	0	0.00	0.000	2	0	0.04	0.000
57	0	0	0.00	0.000	1	0	0.02	0.000
58	0	0	0.00	0.000	0	0	0.00	0.000
59	0	0	0.00	0.000	0	0	0.00	0.000
60	0	0	0.00	0.000	1	0	0.04	0.000
61	0	0	0.00	0.000	1	0	0.04	0.000
62	0	0	0.00	0.000	2	0	0.09	0.000
63	0	0	0.00	0.000	1	0	0.31	0.000
64	0	0	0.00	0.000	0	0	0.00	0.000
65	1	1	0.25	4.000	0	0	0.00	0.000
66	0	0	0.00	0.000	1	0	0.26	0.000
67	1	1	0.29	3.448	0	0	0.00	0.000
68	0	0	0.00	0.000	0	0	0.00	0.000
69	0	0	0.00	0.000	0	0	0.00	0.000
70	0	0	0.00	0.000	0	0	0.00	0.000
71	0	0	0.00	0.000	0	0	0.00	0.000
72	0	0	0.00	0.000	0	0	0.00	0.000
73	0	0	0.00	0.000	0	0	0.00	0.000
74	1	0	0.22	0.000	0	0	0.00	0.000
75	0	0	0.00	0.000	0	0	0.00	0.000
76	0	0	0.00	0.000	0	0	0.00	0.000
TOTAL	3	2	0.54	3.704	14	0	0.80	0.000

<sup>1</sup> Exposures have at least 10 years of credited service.

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF DEATHS AMONG ACTIVE MEMBERS  
 EXPOSURE BASED ON ACTIVE TEACHERS  
 ASSUMPTIONS ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
20	0	0.24	0.000	1	0.40	2.500
25	6	5.08	1.181	5	6.68	0.749
30	10	9.15	1.093	13	12.11	1.073
35	12	14.17	0.847	14	16.44	0.852
40	16	20.96	0.763	18	25.62	0.703
45	23	27.02	0.851	48	44.32	1.083
50	26	27.85	0.934	56	63.65	0.880
55	32	32.81	0.975	87	81.90	1.062
60	37	40.37	0.917	94	84.22	1.116
65	20	28.96	0.691	34	37.97	0.895
70	10	11.87	0.842	14	11.12	1.259
75	5	3.59	1.393	7	2.91	2.405
TOTAL	197	222.07	0.887	391	387.34	1.009

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF DISABILITY RETIREMENTS  
 EXPOSURE BASED ON ACTIVE TEACHERS  
 ASSUMPTIONS ADOPTED OCTOBER 2015

CENTRAL <u>AGE</u>	MALE			FEMALE		
	<u>ACTUAL</u>	<u>EXPECTED</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>	<u>ACTUAL</u>	<u>EXPECTED</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>
30	0	0.18	0.000	0	0.47	0.000
35	3	2.87	1.045	8	9.42	0.849
40	15	9.77	1.535	48	25.70	1.868
45	14	18.66	0.750	59	57.19	1.032
50	31	29.51	1.050	125	113.53	1.101
54	14	14.98	0.935	59	62.82	0.939
TOTAL	77	75.97	1.014	299	269.13	1.111

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 COMPARISON OF SALARY SCALE TO ACTUAL SALARY INCREASES  
 ASSUMPTIONS ADOPTED OCTOBER 2015

MALE

<u>PREVIOUS YEAR'S SERVICE</u>	<u>PREVIOUS YEAR'S DURATION*</u>	<u>PREVIOUS YEAR'S SALARIES</u>	<u>ACTUAL SALARIES</u>	<u>EXPECTED SALARIES**</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>
0-0 to 0-4	0	166,194,338	203,284,022	182,813,772	1.112
0-5 to 1-4	1	367,998,316	408,425,254	404,798,148	1.009
1-5 to 2-4	2	348,847,087	373,626,036	373,266,383	1.001
2-5 to 3-4	3	357,016,980	376,344,064	378,652,209	0.994
3-5 to 4-4	4	401,727,090	420,905,585	422,697,244	0.996
4-5 to 5-4	5	471,294,349	490,989,306	493,539,442	0.995
5-5 to 6-4	6	530,931,932	551,427,009	554,558,403	0.994
6-5 to 7-4	7	604,701,404	626,637,147	630,764,035	0.993
7-5 to 8-4	8	673,439,670	697,462,931	701,858,824	0.994
8-5 to 9-4	9	750,902,828	777,013,132	782,065,295	0.994
9-5 to 10-4	10	827,865,316	855,342,158	861,559,434	0.993
10-5 to 11-4	11	920,561,355	949,665,391	957,199,697	0.992
11-5 to 12-4	12	970,869,698	1,001,358,553	1,008,442,355	0.993
12-5 to 13-4	13	1,011,705,451	1,042,458,095	1,049,644,405	0.993
13-5 to 14-4	14	1,003,483,460	1,032,398,552	1,039,709,213	0.993
14-5 to 15-4	15	981,576,834	1,009,483,942	1,015,539,392	0.994
15-5 to 16-4	16	912,671,567	937,728,121	942,880,996	0.995
16-5 to 17-4	17	840,992,911	862,481,220	867,652,386	0.994
17-5 to 18-4	18	757,647,538	776,157,589	780,680,023	0.994
18-5 to 19-4	19	686,455,586	702,970,427	706,568,735	0.995
19-5 to 20-4	20	596,018,168	609,832,333	612,825,880	0.995
20-5 to 21-4	21	538,348,157	549,372,860	552,991,227	0.993
21-5 to 22-4	22	500,365,130	510,140,421	513,524,733	0.993
22-5 to 23-4	23	470,025,162	478,831,338	481,963,801	0.994
23-5 to 24-4	24	441,774,621	450,554,760	452,598,099	0.995
24-5 to 25-4	25	442,591,551	450,174,237	453,080,971	0.994
25-5 to 26-4	26	426,122,858	433,163,064	435,881,071	0.994
26-5 to 27-4	27	407,305,632	414,038,891	416,347,817	0.994
27-5 to 28-4	28	371,579,250	376,696,776	379,568,204	0.992
28-5 to 29-4	29	342,462,080	347,671,803	349,653,784	0.994
29-5 to 30-4	30	274,050,431	275,156,208	279,695,870	0.984
30-5 to 31-4	31	214,573,573	217,229,968	218,907,959	0.992
31-5 to 32-4	32	178,539,518	178,923,248	182,110,308	0.982
32-5 to 33-4	33	147,182,140	148,233,027	150,052,192	0.988
33-5 to 34-4	34	117,585,994	118,102,553	119,855,404	0.985
34-5 to 35-4	35	101,643,380	101,956,768	103,574,604	0.984
35-5 to 36-4	36	79,600,594	79,885,126	81,081,165	0.985
36-5 to 37-4	37	65,789,793	66,125,162	66,974,009	0.987
37-5 to 38-4	38	53,471,950	52,798,238	54,413,056	0.970
38-5 or more	39	168,819,333	167,637,254	171,790,553	0.976
<b>TOTAL</b>		<b>19,524,733,025</b>	<b>20,122,682,569</b>	<b>20,231,781,100</b>	<b>0.995</b>

\*For service less than 5 months duration is set to one.

\*\*Totals may not add due to rounding.

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 COMPARISON OF SALARY SCALE TO ACTUAL SALARY INCREASES  
 ASSUMPTIONS ADOPTED OCTOBER 2015

FEMALE

<u>PREVIOUS YEAR'S SERVICE</u>	<u>PREVIOUS YEAR'S DURATION*</u>	<u>PREVIOUS YEAR'S SALARIES</u>	<u>ACTUAL SALARIES</u>	<u>EXPECTED SALARIES**</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>
0-0 to 0-4	0	491,817,708	604,628,004	540,999,479	1.118
0-5 to 1-4	1	1,118,148,241	1,250,287,719	1,229,963,065	1.017
1-5 to 2-4	2	1,041,294,929	1,120,849,555	1,114,185,574	1.006
2-5 to 3-4	3	1,086,612,642	1,146,592,643	1,152,461,368	0.995
3-5 to 4-4	4	1,247,582,139	1,303,256,538	1,312,705,927	0.993
4-5 to 5-4	5	1,442,897,406	1,502,384,763	1,511,002,164	0.994
5-5 to 6-4	6	1,632,349,863	1,693,934,844	1,704,989,432	0.994
6-5 to 7-4	7	1,837,209,312	1,906,931,083	1,916,393,033	0.995
7-5 to 8-4	8	2,007,512,405	2,080,899,268	2,092,229,428	0.995
8-5 to 9-4	9	2,187,797,045	2,265,916,898	2,278,590,622	0.994
9-5 to 10-4	10	2,375,184,140	2,457,037,136	2,471,854,135	0.994
10-5 to 11-4	11	2,588,020,434	2,676,863,787	2,691,023,647	0.995
11-5 to 12-4	12	2,705,269,515	2,794,573,917	2,809,963,445	0.995
12-5 to 13-4	13	2,753,687,581	2,846,068,528	2,856,950,865	0.996
13-5 to 14-4	14	2,699,899,204	2,787,450,650	2,797,365,565	0.996
14-5 to 15-4	15	2,563,931,897	2,640,921,217	2,652,643,941	0.996
15-5 to 16-4	16	2,332,655,975	2,398,723,217	2,409,866,888	0.995
16-5 to 17-4	17	2,135,399,474	2,193,542,500	2,203,091,637	0.996
17-5 to 18-4	18	1,949,758,863	1,999,055,851	2,009,031,532	0.995
18-5 to 19-4	19	1,779,985,217	1,825,984,691	1,832,138,784	0.997
19-5 to 20-4	20	1,620,685,628	1,658,867,039	1,666,388,963	0.995
20-5 to 21-4	21	1,511,432,420	1,544,762,073	1,552,543,382	0.995
21-5 to 22-4	22	1,430,843,637	1,461,795,923	1,468,474,825	0.995
22-5 to 23-4	23	1,371,519,732	1,398,039,424	1,406,356,333	0.994
23-5 to 24-4	24	1,345,891,957	1,373,263,460	1,378,866,310	0.996
24-5 to 25-4	25	1,328,167,804	1,354,087,025	1,359,645,381	0.996
25-5 to 26-4	26	1,260,733,089	1,283,712,166	1,289,603,877	0.995
26-5 to 27-4	27	1,174,341,120	1,194,841,798	1,200,411,493	0.995
27-5 to 28-4	28	1,049,215,026	1,066,149,824	1,071,773,149	0.995
28-5 to 29-4	29	927,351,885	942,518,190	946,826,275	0.995
29-5 to 30-4	30	708,388,425	713,508,665	722,981,227	0.987
30-5 to 31-4	31	521,410,412	526,663,562	531,942,902	0.990
31-5 to 32-4	32	411,288,258	414,511,206	419,514,023	0.988
32-5 to 33-4	33	303,428,875	305,418,087	309,345,738	0.987
33-5 to 34-4	34	233,859,485	234,921,554	238,372,973	0.986
34-5 to 35-4	35	177,672,145	179,049,580	181,047,916	0.989
35-5 to 36-4	36	125,882,043	127,165,064	128,223,449	0.992
36-5 to 37-4	37	92,579,947	93,276,242	94,246,386	0.990
37-5 to 38-4	38	63,864,044	64,336,061	64,988,051	0.990
38-5 or more	39	177,557,331	177,899,243	180,682,340	0.985
<b>TOTAL</b>		<b>53,813,127,253</b>	<b>55,610,688,995</b>	<b>55,799,685,524</b>	<b>0.997</b>

\*For service less than 5 months duration is set to one.

\*\*Totals may not add due to rounding.

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF WITHDRAWALS  
 EXPOSURE BASED ON ACTIVE TEACHERS  
 ASSUMPTIONS ADOPTED OCTOBER 2015

CENTRAL <u>AGE</u>	MALE			FEMALE		
	<u>ACTUAL</u>	<u>EXPECTED</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>	<u>ACTUAL</u>	<u>EXPECTED</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>
20	241	262.47	0.918	703	776.64	0.905
25	3,130	2,991.18	1.046	9,908	9,492.34	1.044
30	2,645	2,255.99	1.172	7,949	7,533.39	1.055
35	1,558	1,379.04	1.130	5,539	5,204.15	1.064
40	1,072	998.49	1.074	4,038	3,783.57	1.067
45	918	877.05	1.047	3,715	3,521.49	1.055
50	766	746.96	1.025	3,419	3,093.91	1.105
54	246	269.79	0.912	1,104	1,068.71	1.033
TOTAL	10,576	9,780.97	1.081	36,375	34,474.20	1.055

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF DEATHS AMONG MEMBERS RETIRED FOR DISABILITY  
 MORTALITY ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
30	0	0.00	N/A	0	0.00	N/A
35	2	0.62	3.226	3	2.43	1.235
40	7	5.76	1.215	8	11.62	0.688
45	3	6.04	0.497	21	16.97	1.237
50	10	11.30	0.885	29	36.21	0.801
55	17	12.85	1.323	51	53.49	0.953
60	15	14.72	1.019	58	52.29	1.109
65	25	21.36	1.170	50	52.74	0.948
70	13	19.40	0.670	40	38.04	1.052
75	15	14.52	1.033	27	23.63	1.143
80	10	13.32	0.751	31	26.71	1.161
85	11	12.86	0.855	21	24.67	0.851
90	10	4.90	2.041	13	18.58	0.700
95	1	0.52	1.923	6	7.67	0.782
100	0	0.00	N/A	2	1.38	1.449
105	0	0.00	N/A	1	0.46	2.174
110	0	0.00	N/A	0	0.00	N/A
TOTAL	139	138.17	1.006	361	366.89	0.984



APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF DEATHS AMONG MEMBERS RETIRED FOR SERVICE  
 MORTALITY ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
55	16	13.10	1.221	46	28.66	1.605
60	117	104.66	1.118	212	209.98	1.010
65	392	410.90	0.954	574	620.86	0.925
70	654	687.92	0.951	766	805.33	0.951
75	833	851.02	0.979	828	903.98	0.916
80	1,316	1,323.19	0.995	1,310	1,294.90	1.012
85	1,534	1,600.23	0.959	1,872	1,940.21	0.965
90	1,223	1,207.69	1.013	2,007	2,036.04	0.986
95	479	416.54	1.150	1,500	1,500.92	0.999
100	80	71.01	1.127	522	487.29	1.071
105	4	5.32	0.752	84	77.04	1.090
110	0	0.00	N/A	1	0.45	2.222
TOTAL	6,648	6,691.58	0.993	9,722	9,905.66	0.981

APPENDIX 10 (Cont'd.)

2012-2016 EXPERIENCE STUDY  
 NUMBER OF DEATHS AMONG BENEFICIARIES  
 MORTALITY ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
5	0	0.00	N/A	0	0.00	N/A
10	0	0.00	N/A	0	0.00	N/A
15	0	0.00	N/A	0	0.00	N/A
20	0	0.00	N/A	0	0.00	N/A
25	0	0.00	N/A	0	0.00	N/A
30	0	0.00	N/A	0	0.00	N/A
35	0	0.00	N/A	0	0.00	N/A
40	0	0.00	N/A	0	0.00	N/A
45	0	0.03	0.000	0	0.05	0.000
50	0	0.14	0.000	0	0.14	0.000
55	2	0.42	4.762	0	0.57	0.000
60	4	1.52	2.632	4	2.54	1.575
65	10	5.54	1.805	16	9.52	1.681
70	17	11.44	1.486	30	24.77	1.211
75	24	18.98	1.264	55	53.96	1.019
80	53	44.26	1.197	132	113.41	1.164
85	98	83.95	1.167	218	229.90	0.948
90	97	112.99	0.858	323	343.72	0.940
95	69	75.29	0.916	252	239.13	1.054
100	20	26.16	0.765	68	76.00	0.895
105	0	1.23	0.000	7	11.70	0.598
110	0	0.00	N/A	1	2.28	0.439
TOTAL	394	381.95	1.032	1,106	1,107.69	0.998

APPENDIX 11

**RATES OF RETURN**

Investment Rate of Return<sup>1</sup>  
on  
Market and Actuarial Value of Assets

as of June 30, 2016

Annualized rates of return over the last:

	<u>Based Upon Market Value of Assets</u>	<u>Based Upon Actuarial Value of Assets<sup>2</sup></u>
1 Year:	2.3%	10.0%
3 Years:	8.4%	13.2%
5 Years:	8.3%	9.0%
10 Years:	6.2%	8.3%
15 Years:	6.4%	6.4%
20 Years:	7.6%	
25 Years:	8.7%	

Annualized inflation over the last:

	<u>Inflation Assumption</u>		<u>COLA Benefit</u>	
	<u>Actual</u>	<u>Expected</u>	<u>Actual</u>	<u>Expected<sup>3</sup></u>
1 Year:	0.85%	2.5%	1.0 %	1.5%
3 Years:	0.76%	2.5%	1.0%	1.5%
5 Years:	1.28%	2.5%	1.1%	1.5%

<sup>1</sup> The interest rate for valuation purposes is a level 7.5%.

<sup>2</sup> The Retirement System's asset valuation method was changed effective with the June 30, 2007 and June 30, 2015 actuarial valuations.

<sup>3</sup> The annual percentage for estimating future COLA benefit payments is 1.5%. The COLA percentage is one-half of the increase in the CPI with a floor of 1.0% and a cap of 3.0%. Therefore the estimate of inflation for the COLA benefit is the result of analyzing available CPI data with percentages bounded between 2.0% and 6.0%, and reduced by 50%. The COLA benefit was first initiated in 2001.

APPENDIX 11 (Cont'd.)

**RATES OF RETURN (Cont'd.)**

Annual Rates of Return through June 30, 2016

<u>Year Ending June 30th</u>	<u>Annual Rate of Return</u>	<u>Year Ending June 30th</u>	<u>Annual Rate of Return</u>
1983	37.1%	2006	11.8%
1984	-4.8%	2007	19.4%
1985	31.3%	2008	-6.3%
1986	28.4%	2009	-20.5%
1987	14.6%	2010	12.1%
1988	-1.5%	2011	23.2%
1989	16.8%	2012	2.8%
1990	11.4%	2013	13.7%
1991	8.3%	2014	18.2%
1992	13.0%	2015	5.2%
1993	13.6%	2016	2.3%
1994	1.8%		
1995	19.3%		
1996	18.8%		
1997	22.0%		
1998	21.5%		
1999	14.0%		
2000	6.8%		
2001	-5.7%		
2002	-6.8%		
2003	4.0%		
2004	16.1%		
2005	10.6%		

APPENDIX 12

**ASSET ALLOCATION**

The table below displays the Retirement System’s asset allocation targets, actual allocation percentages, and ranges as of June 30, 2016.

	<b>Target</b>	<b>Actual</b>	<b>Range</b>
<b>Domestic Equity</b>	37%	38.8%	32-42%
<b>International Equity</b>	18%	16.8%	14-22%
<b>Real Estate</b>	10%	11.1%	6-14%
<b>Private Equity</b>	<u>7%</u>	<u>7.6%</u>	4-12%
<i>Total Equities</i>	72%	74.3%	
<b>Domestic Fixed Income</b>	17%	15.8%	13-22%
<b>Global Bonds</b>	2%	1.9%	0-3%
<b>Mortgages</b>	8%	5.8%	5-11%
<b>Cash Equivalents</b>	<u>1%</u>	<u>2.2%</u>	0-4%
<i>Total Fixed Income</i>	28%	25.7%	

APPENDIX 13

**SENSITIVITY ANALYSIS**

Valuation results are highly dependent on the actuarial assumptions used to project future events. If actual experience emerges differently from the assumptions used in the valuation process, actuarial gains or losses will result, and future Employer Contribution Rates will be higher or lower. In this section, results of a sensitivity analysis are presented in order to illustrate how deviations in specific assumptions would have changed the current Employer Contribution Rate of 9.80%.

It is important to note that the results displayed here, with the exception of those for the investment return, are the consequence of altering each assumption individually without accounting for possible correlation between assumptions. Therefore, these results are presented in order to provide an illustration as to the order of magnitude that a variation in key assumptions could have on valuation results. There is no guarantee that future experience will be consistent with either our current or the following alternative set of assumptions.

<u>Assumption</u>	<u>Adjustment Made</u>	<u>Calculated Employer Contribution Rate</u>
<b>Current Assumptions</b>		<b>9.80%</b>
<b>Investment Return<sup>1</sup></b>	Decrease from 7.50% to 7.25%	12.60%
<b>Investment Return<sup>1</sup></b>	Decrease from 7.50% to 7.00%	15.45%
<b>Investment Return<sup>1</sup></b>	Decrease from 7.50% to 6.50%	21.44%
<b>Salary Scale</b>	Decrease of 10%	8.92%
<b>Salary Scale</b>	Increase of 10%	10.67%
<b>Service Retirement Rates</b>	Decrease of 10%	8.96%
<b>Service Retirement Rates</b>	Increase of 10%	10.51%
<b>Healthy Annuitant Mortality</b>	Decrease of 10%	11.44%
<b>Healthy Annuitant Mortality</b>	Increase of 10%	8.27%
<b>Active Mortality</b>	Decrease of 10%	9.81%
<b>Active Mortality</b>	Increase of 10%	9.78%

<sup>1</sup> In the event that a change to the long term investment return assumption would be warranted, it is likely that a related change to the salary scale assumption would also be necessary in order for these assumptions to remain consistent with overall inflation. Therefore, for the results presented here, the salary scale assumption was decreased by one-half of the reduction in the investment return assumption.

APPENDIX 14

**HISTORY OF THE EMPLOYER CONTRIBUTION RATE**

<u>Salary Year</u>	<u>Employer Contribution Rate</u>	<u>Salary Year</u>	<u>Employer Contribution Rate</u>	<u>Salary Year</u>	<u>Employer Contribution Rate</u>
1921-22	5.10 %	1956-57	10.90 %	1991-92	6.64 %
1922-23	5.10	1957-58	11.20	1992-93	8.00
1923-24	5.20	1958-59	13.40	1993-94	8.41
1924-25	5.20	1959-60	14.00	1994-95	7.24
1925-26	5.20	1960-61	18.35	1995-96	6.37
1926-27	5.20	1961-62	18.55	1996-97	3.57
1927-28	5.20	1962-63	19.55	1997-98	1.25
1928-29	5.30	1963-64	21.13	1998-99	1.42
1929-30	5.50	1964-65	17.67	1999-00	1.43
1930-31	5.50	1965-66	17.70	2000-01	0.43
1931-32	5.50	1966-67	17.72	2001-02	0.36
1932-33	5.50	1967-68	18.50	2002-03	0.36
1933-34	5.50	1968-69	18.80	2003-04	2.52
1934-35	5.60	1969-70	18.60	2004-05	5.63
1935-36	5.70	1970-71	18.80	2005-06	7.97
1936-37	5.80	1971-72	18.80	2006-07	8.60
1937-38	5.93	1972-73	18.80	2007-08	8.73
1938-39	6.03	1973-74	18.80	2008-09	7.63
1939-40	6.13	1974-75	18.80	2009-10	6.19
1940-41	6.23	1975-76	19.40	2010-11	8.62
1941-42	6.33	1976-77	19.40	2011-12	11.11
1942-43	6.43	1977-78	20.40	2012-13	11.84
1943-44	6.53	1978-79	21.40	2013-14	16.25
1944-45	7.10	1979-80	22.49	2014-15	17.53
1945-46	7.20	1980-81	23.49	2015-16	13.26
1946-47	7.50	1981-82	23.49	2016-17	11.72
1947-48	7.80	1982-83	23.49	2017-18	9.80
1948-49	8.00	1983-84	22.90		
1949-50	8.40	1984-85	22.80		
1950-51	8.80	1985-86	21.40		
1951-52	9.60	1986-87	18.80	<b>Average</b>	<b>10.95 %</b>
1952-53	9.90	1987-88	16.83		
1953-54	9.90	1988-89	14.79		
1954-55	10.30	1989-90	6.87		
1955-56	10.40	1990-91	6.84		

**HISTORY OF THE MEMBER CONTRIBUTION RATE**

<u>Year of Membership</u>	<u>Required Contribution</u>
1921	4%
1948	5% (new members - 1948 and after)
1948	Voluntary 4% <u>could</u> be contributed (all members eligible)
1951	If member elected special retirement allowance: 4% went to 6.5%, 5% went to 8% (all members eligible)
1957	If member elected 1/120th plan: 6.5% went to 9%, 8% went to 11% (all members eligible)
1968	0%
1976	3% (new members - 1976 and after)
2000	3% employee contribution ceases after ten years of service or membership
2010	3.5% throughout career for members joining 1/1/2010 – 3/31/2012
2012	Throughout career for members joining on or after 4/1/2012: <ul style="list-style-type: none"> <li>- 3.0% if salary less than or equal to \$45,000</li> <li>- 3.5% if salary greater than \$45,000 and less than or equal to \$55,000</li> <li>- 4.5% if salary greater than \$55,000 and less than or equal to \$75,000</li> <li>- 5.75% if salary greater than \$75,000 and less than or equal to \$100,000</li> <li>- 6.0% if salary greater than \$100,000 and less than or equal to \$179,000</li> </ul>

As of August 1, 1921, when the Retirement System was established, members contributed 4% of salary. These contributions were used to fund a separate annuity, over and above the regular pension. New members on or after July 1, 1948 were required to contribute 5% of salary. Additional contributions, not in excess of 4% of salary, were permitted during the five-year period beginning July 1, 1948.

Under the provisions of a law passed in 1950, members could elect before July 1, 1951, or within one year of their date of membership, if later, to contribute towards a special service retirement allowance that would allow them to retire up to five years earlier. If their rate of contribution had been 4%, their new rate would be 6.5%. If their rate of contribution had been 5%, their new rate would be 8%. In 1956, an amendment was passed which provided additional benefits for service in excess of 25 years, but not in excess of 35 years, for those members who elected to contribute an additional 2.5% or 3% of their salaries. This increased the rate of contribution to 9% or 11% depending on whether the member's rate of contribution had been 6.5% or 8%.

Throughout the 1960's the advent of the "take-home pay" program effectively reduced the required contribution rate to zero for many members. As of July 1, 1968, all members were no longer required to make contributions, nor permitted to make voluntary contributions unless they had been making them previously.



**HISTORY OF THE MEMBER CONTRIBUTION RATE (Cont'd.)**

The law that created Tier 3 in 1976 reinstated member contributions and required members who joined the System after July 26, 1976 to contribute 3% of their annual salary. This money, however, helps fund the member's pension and does not fund a separate annuity as before. Effective October 1, 2000, however, in accordance with Chapter 126 of the Laws of 2000, the 3% required member contribution ceases upon the attainment of the earlier of 10 years of service credit or 10 years of membership.

In accordance with Tier 5, enacted in 2009, members joining on or after January 1, 2010 and prior to April 1, 2012 must contribute 3.5% of salary throughout their working career towards the funding of their pension. Tier 6, enacted in 2012, requires members joining on or after April 1, 2012 to contribute between 3.0% and 6.0% of salary throughout their working career towards the funding of their pension. The contribution percentage for Tier 6 members can vary during their working career depending on the salary received.

**ACTUARIAL VALUATION INFORMATION**1. Actuarial Cost Method

The cost method used to determine the liabilities and normal cost in this valuation is the Aggregate Cost Method. This funding method is required by statute, specifically Section 517 of the New York State Education Law.

Each year a normal rate percentage is developed as a level percentage of total member compensation. This percentage equals the portion of the actuarial present value of projected benefits which exceeds the actuarial value of assets divided by one percent of the present value of future compensation of the active members, as of the valuation date.

The cost of death benefits up to \$50,000, Retirement System administrative expenses, and benefits in excess of the IRC §415 limits are each determined using the pay-as-you-go method which is not considered to be an actuarial cost method.

Each year, actuarial gains and losses will occur because actual experience will vary from the actuarial assumptions. All gains and losses are automatically amortized as part of the normal rate, over the expected future working lifetime of active members.

The average expected future working lifetime for our active population as determined by the actuarial valuation as of June 30, 2016 is 13.18 years.

2. Asset Valuation Method

The actuarial value of assets for the normal rate is determined by recognizing each year's net investment income/loss in excess of (or less than) 7.50% at a rate of 20% per year, until fully recognized after five years. For fiscal years ending prior to June 30, 2015, realized and unrealized appreciation in excess of (or less than) the assumed inflationary rate of 3% is recognized at a rate of 20% per year, until fully recognized after five years.

The actuarial value of assets for the expense, group life insurance, and excess benefit plan rates is equal to the fair market value of assets, excluding contributions receivable.

3. Actuarial Assumptions

The current actuarial assumptions were adopted by the Retirement Board on October 29, 2015 and were effective with the June 30, 2015 actuarial valuation. Specific details regarding the development of the present actuarial assumptions can be found in the "*Report on the 2015 Recommended Actuarial Assumptions.*"

APPENDIX 16 (Cont'd.)

**ACTUARIAL VALUATION INFORMATION (Cont'd.)**

The withdrawal rates are the assumed rates of termination of employment from all causes other than death, disability or retirement. The withdrawal rates vary by gender, age and service. The withdrawal rates for active members age 55 or older are set to the age 54 withdrawal rates.

The healthy annuitant mortality rates are the assumed rates of death for service and deferred retired members and beneficiaries. The healthy annuitant mortality rates vary by gender and age. Future mortality improvement was projected on a generational basis using the Society of Actuaries Mortality Projection Scale MP-2014. For determining the present value of future COLA and supplementation for current retirees and vesteds an approximation is made to estimate the impact of future mortality improvement.

The salary scale is the assumed annual rate of increase in compensation. The rates are based upon salary experience for members, vary by service and are independent of the member's gender. Cost-of-living, merit and productivity increases are included in these rates.

**PRESENT ACTUARIAL ASSUMPTIONS**

Actuarial assumptions have been developed based upon actual member experience. Various actuarial and graduation techniques are applied to experience data and tables are developed. An experience study is performed annually and assumptions are revised when warranted. The current actuarial assumptions were adopted by the Retirement Board on October 29, 2015. Specific details regarding the development of the present actuarial assumptions can be found in the “*Report on the 2015 Recommended Actuarial Assumptions*”.

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  - a) Tier 1 Members and Tier 2, 3 and 4 Members at Least Age 62 or with 30 Years of Service and Tier 5 Members at Least Age 62
  - b) Tier 2, 3 and 4 Members Less Than Age 62 and with Less than 30 Years of Service
  - c) Tier 5 Members Less Than Age 62 and with Less than 30 Years of Service
  - d) Tier 5 Members Less Than Age 62 and with 30 Years of Service
  - e) Tier 6 Members
- V. Service and Deferred Annuitant and Beneficiary Base Mortality Rates
- VI. Disabled Annuitant Base Mortality Rates
- VII. Salary Scale
- VIII. Valuation Interest Assumption

APPENDIX 17 (Cont'd.)

Mortality Rates  
for Active Members

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
20	0.000189	20	0.000108
21	0.000212	21	0.000112
22	0.000233	22	0.000112
23	0.000258	23	0.000112
24	0.000281	24	0.000112
25	0.000286	25	0.000112
26	0.000286	26	0.000112
27	0.000287	27	0.000112
28	0.000288	28	0.000119
29	0.000290	29	0.000124
30	0.000293	30	0.000129
31	0.000298	31	0.000132
32	0.000305	32	0.000135
33	0.000314	33	0.000137
34	0.000326	34	0.000140
35	0.000342	35	0.000144
36	0.000361	36	0.000151
37	0.000384	37	0.000160
38	0.000410	38	0.000174
39	0.000441	39	0.000191
40	0.000474	40	0.000213
41	0.000510	41	0.000239
42	0.000548	42	0.000269
43	0.000586	43	0.000302
44	0.000624	44	0.000338
45	0.000661	45	0.000374
46	0.000697	46	0.000412
47	0.000732	47	0.000450
48	0.000765	48	0.000487
49	0.000800	49	0.000523
50	0.000836	50	0.000559
51	0.000876	51	0.000595
52	0.000923	52	0.000632
53	0.000979	53	0.000671
54	0.001050	54	0.000711

APPENDIX 17 (Cont'd.)

Mortality Rates  
for Active Members  
(cont'd.)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.001139	55	0.000755
56	0.001251	56	0.000802
57	0.001391	57	0.000854
58	0.001565	58	0.000911
59	0.001779	59	0.000973
60	0.002039	60	0.001042
61	0.002349	61	0.001117
62	0.002716	62	0.001199
63	0.003143	63	0.001291
64	0.003636	64	0.001393
65	0.004197	65	0.001509
66	0.004828	66	0.001642
67	0.005370	67	0.001797
68	0.006058	68	0.001981
69	0.006834	69	0.002350
70	0.007709	70	0.002550
71	0.008696	71	0.002864
72	0.009810	72	0.003217
73	0.011066	73	0.003613
74	0.012483	74	0.004058
75	0.014082	75	0.004558

APPENDIX 17 (Cont'd.)

Disability Retirement Rates  
for Active Members

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
30	0.000003	30	0.000005
31	0.000008	31	0.000008
32	0.000015	32	0.000010
33	0.000024	33	0.000037
34	0.000040	34	0.000076
35	0.000062	35	0.000098
36	0.000091	36	0.000102
37	0.000126	37	0.000105
38	0.000164	38	0.000126
39	0.000196	39	0.000159
40	0.000226	40	0.000214
41	0.000245	41	0.000274
42	0.000278	42	0.000310
43	0.000330	43	0.000376
44	0.000398	44	0.000452
45	0.000470	45	0.000501
46	0.000530	46	0.000522
47	0.000569	47	0.000568
48	0.000611	48	0.000666
49	0.000707	49	0.000818
50	0.000889	50	0.000986
51	0.001091	51	0.001187
52	0.001190	52	0.001325
53	0.001250	53	0.001380
54	0.001225	54	0.001375

APPENDIX 17 (Cont'd.)

Withdrawal Rates  
for Active Members

Males

<u>Age</u>	10 or more Years of Service										
	<u>0 Years of Service</u>	<u>1 Year of Service</u>	<u>2 Years of Service</u>	<u>3 Years of Service</u>	<u>4 Years of Service</u>	<u>5 Years of Service</u>	<u>6 Years of Service</u>	<u>7 Years of Service</u>	<u>8 Years of Service</u>	<u>9 Years of Service</u>	<u>10 Years of Service</u>
20	0.254275	0.165892	0.116327	0.094647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
21	0.254275	0.139607	0.116327	0.094647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
22	0.258777	0.126464	0.116327	0.094647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
23	0.267780	0.124274	0.116327	0.094647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
24	0.281285	0.133035	0.119082	0.088647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
25	0.294790	0.168083	0.124171	0.081761	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
26	0.308295	0.185606	0.128845	0.077761	0.057858	0.036379	0.020319	0.011763	0.011922	0.007796	0.008873
27	0.319549	0.194368	0.131962	0.080715	0.059296	0.036635	0.020319	0.011763	0.012975	0.007796	0.008873
28	0.325176	0.196558	0.134039	0.083668	0.061071	0.036892	0.020319	0.011763	0.013931	0.007796	0.008873
29	0.328927	0.194368	0.135424	0.086621	0.064622	0.037533	0.021368	0.012912	0.014537	0.007796	0.008873
30	0.330803	0.190091	0.136168	0.089575	0.068227	0.040481	0.025825	0.019809	0.015106	0.007796	0.008873
31	0.322070	0.187568	0.131286	0.093049	0.069540	0.043533	0.031397	0.022317	0.015955	0.007796	0.008873
32	0.313337	0.185045	0.125654	0.096523	0.070854	0.046585	0.036969	0.023571	0.018078	0.007796	0.008873
33	0.304605	0.182523	0.123777	0.099997	0.072167	0.049638	0.039754	0.023884	0.020201	0.008513	0.008873
34	0.295872	0.180000	0.126812	0.103470	0.073481	0.052690	0.041147	0.023963	0.022323	0.011216	0.008873
35	0.287140	0.177477	0.133047	0.105207	0.074794	0.055742	0.041993	0.023963	0.023738	0.015946	0.008508
36	0.286690	0.171821	0.138075	0.104196	0.077092	0.060321	0.041209	0.023963	0.024021	0.019585	0.008299
37	0.286241	0.166165	0.135561	0.101447	0.076326	0.064899	0.040425	0.023963	0.024163	0.020908	0.008091
38	0.285791	0.160509	0.130616	0.098699	0.075560	0.067189	0.039641	0.025293	0.024233	0.021664	0.007882
39	0.285342	0.154853	0.130202	0.095950	0.074219	0.067761	0.038857	0.034440	0.024269	0.021916	0.007673
40	0.284892	0.152025	0.129787	0.093202	0.069959	0.067904	0.038073	0.037085	0.025711	0.021664	0.007464
41	0.289068	0.152732	0.132358	0.094006	0.067933	0.064863	0.035133	0.037747	0.027438	0.021286	0.007534
42	0.293244	0.156266	0.134928	0.094810	0.066920	0.057260	0.033664	0.037747	0.029166	0.020625	0.007638
43	0.297420	0.159800	0.137499	0.095614	0.065907	0.053458	0.035133	0.037747	0.030893	0.018971	0.007795
44	0.301596	0.163334	0.140070	0.096418	0.064894	0.052983	0.038073	0.037747	0.032620	0.016781	0.008147
45	0.303684	0.166868	0.142640	0.086769	0.063881	0.052698	0.045610	0.037747	0.033484	0.015314	0.008659
46	0.297917	0.169216	0.142902	0.077120	0.064110	0.054366	0.053147	0.037747	0.032404	0.014047	0.008915
47	0.290062	0.171564	0.143164	0.073904	0.067541	0.055072	0.060684	0.037747	0.029166	0.014943	0.009043
48	0.282207	0.173912	0.143426	0.077120	0.070973	0.057785	0.064453	0.038438	0.027546	0.020435	0.009106
49	0.274352	0.176260	0.143687	0.092398	0.072689	0.059956	0.065709	0.042311	0.028356	0.022630	0.009170
50	0.266497	0.178609	0.143949	0.099585	0.072689	0.061041	0.065709	0.044893	0.032404	0.023728	0.009227
51	0.258643	0.178609	0.144211	0.106772	0.072689	0.061041	0.065709	0.045754	0.036452	0.023728	0.009227
52	0.250788	0.178609	0.144211	0.110366	0.072689	0.061041	0.065709	0.047475	0.037465	0.023728	0.009227
53	0.246860	0.178609	0.144211	0.110366	0.072689	0.061041	0.065709	0.048336	0.037754	0.023728	0.009227
54	0.246860	0.178609	0.144211	0.110366	0.072689	0.061041	0.065709	0.051133	0.037754	0.023728	0.009227



APPENDIX 17 (Cont'd.)

Withdrawal Rates  
for Active Members

Females

<u>Age</u>	<u>0 Years Of Service</u>	<u>1 Year of Service</u>	<u>2 Years of Service</u>	<u>3 Years of Service</u>	<u>4 Years of Service</u>	<u>5 Years of Service</u>	<u>6 Years of Service</u>	<u>7 Years of Service</u>	<u>8 Years of Service</u>	<u>9 Years of Service</u>	<u>10 or more Years of Service</u>
20	0.221624	0.111743	0.100290	0.059871	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
21	0.222584	0.102302	0.100290	0.059871	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
22	0.227539	0.100414	0.100290	0.059871	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
23	0.241991	0.107967	0.100290	0.059871	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
24	0.306350	0.130625	0.100290	0.059474	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
25	0.332325	0.175943	0.102290	0.064680	0.042156	0.051015	0.040469	0.030151	0.037037	0.022766	0.019527
26	0.353217	0.189852	0.106684	0.072489	0.048382	0.047684	0.039012	0.030151	0.037037	0.022766	0.019527
27	0.360933	0.198520	0.127538	0.080297	0.051495	0.039255	0.037846	0.030151	0.037037	0.022766	0.019527
28	0.360817	0.202853	0.141441	0.088106	0.054608	0.042029	0.037458	0.030151	0.035810	0.022766	0.019527
29	0.354235	0.205020	0.141602	0.095915	0.057721	0.048963	0.039012	0.031232	0.032407	0.022766	0.019527
30	0.346747	0.202316	0.139988	0.099819	0.073286	0.053123	0.042120	0.033722	0.029005	0.022766	0.019527
31	0.343752	0.199612	0.136830	0.106115	0.076094	0.060404	0.051611	0.036984	0.029725	0.024035	0.019527
32	0.335848	0.195888	0.133673	0.109263	0.078901	0.067684	0.056356	0.040686	0.032607	0.026574	0.019527
33	0.327944	0.192164	0.130516	0.112411	0.081709	0.071845	0.058505	0.043387	0.035489	0.027589	0.019527
34	0.320040	0.188440	0.127358	0.113290	0.084516	0.072885	0.060654	0.045088	0.038371	0.030635	0.019527
35	0.312137	0.181656	0.124201	0.113729	0.087323	0.073130	0.061088	0.046793	0.039811	0.033681	0.018793
36	0.304496	0.174543	0.122312	0.110640	0.086076	0.070552	0.058894	0.048497	0.040833	0.035204	0.017327
37	0.296856	0.167429	0.120422	0.105598	0.084828	0.067974	0.056701	0.048838	0.040413	0.034443	0.015860
38	0.289215	0.160316	0.118533	0.100557	0.082956	0.065396	0.054507	0.049179	0.039994	0.033681	0.014393
39	0.281575	0.153202	0.116644	0.095515	0.080149	0.062819	0.052314	0.049213	0.039574	0.031777	0.012192
40	0.273935	0.146089	0.114754	0.092994	0.073750	0.060241	0.050120	0.049359	0.039155	0.030254	0.011459
41	0.269779	0.144793	0.111172	0.091252	0.074162	0.059860	0.048675	0.044929	0.037437	0.030242	0.011182
42	0.265623	0.143498	0.107590	0.092030	0.074575	0.059479	0.047230	0.040499	0.035718	0.030230	0.010905
43	0.261467	0.142203	0.104009	0.092809	0.074987	0.059098	0.045785	0.036070	0.034000	0.030218	0.010628
44	0.257311	0.140908	0.100427	0.093587	0.075400	0.058717	0.044339	0.035516	0.032282	0.030207	0.010351
45	0.253155	0.140260	0.098636	0.094366	0.075812	0.058336	0.043617	0.038284	0.030564	0.030195	0.010074
46	0.257124	0.142616	0.099349	0.095174	0.074383	0.058048	0.044604	0.038381	0.030284	0.029256	0.009941
47	0.267047	0.143794	0.101854	0.095983	0.072954	0.057761	0.046315	0.038478	0.030004	0.028317	0.009808
48	0.276970	0.147033	0.104358	0.096791	0.071525	0.057474	0.048025	0.038574	0.029724	0.027377	0.009675
49	0.286893	0.151626	0.106862	0.097600	0.070096	0.057187	0.049735	0.038671	0.029444	0.026438	0.009542
50	0.296815	0.154630	0.109367	0.098408	0.068667	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409
51	0.299296	0.157633	0.111871	0.098408	0.067238	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409
52	0.299296	0.160636	0.111871	0.098408	0.067238	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409
53	0.299296	0.162138	0.111871	0.098408	0.067238	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409
54	0.299296	0.162138	0.111871	0.098408	0.067238	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409

APPENDIX 17 (Cont'd.)

Service Retirement Rates  
 For Tier 1 Members and Tier 2, 3, and 4 Members  
 at Least Age 62 or with 30 Years of Service  
 and Tier 5 Members at Least Age 62

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.306695	55	0.313992
56	0.280779	56	0.288116
57	0.252448	57	0.269473
58	0.259437	58	0.261016
59	0.286545	59	0.268785
60	0.311011	60	0.279410
61	0.320232	61	0.277166
62	0.270303	62	0.257157
63	0.229352	63	0.232947
64	0.206863	64	0.219224
65	0.209678	65	0.238272
66	0.217437	66	0.244523
67	0.216934	67	0.236791
68	0.208294	68	0.220367
69	0.187086	69	0.230935
70	0.163555	70	0.229295
71	0.146721	71	0.212056
72	0.169602	72	0.180451
73	0.167377	73	0.183107
74	0.164226	74	0.192125
75	0.133890	75	0.190633
76+	1.000000	76+	1.000000

APPENDIX 17 (Cont'd.)

Service Retirement Rates  
 For Tier 2, 3, and 4 Members Less Than Age 62  
 and with Less Than 30 Years of Service

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.031965	55	0.034565
56	0.031782	56	0.035761
57	0.036262	57	0.041750
58	0.043899	58	0.046349
59	0.056398	59	0.060339
60	0.063578	60	0.070415
61	0.072217	61	0.082590

APPENDIX 17 (Cont'd.)

Service Retirement Rates  
 For Tier 5 Members Less Than Age 62  
 and with Less Than 30 Years of Service

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.015983	55	0.017283
56	0.015891	56	0.017881
57	0.018131	57	0.020875
58	0.021950	58	0.023175
59	0.028199	59	0.030170
60	0.031789	60	0.035208
61	0.036109	61	0.041295

APPENDIX 17 (Cont'd.)

Service Retirement Rates  
 For Tier 5 Members Less Than Age 62  
 and with 30 Years of Service

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.015983	55	0.017283
56	0.015891	56	0.017881
57	0.306695	57	0.313992
58	0.280779	58	0.288116
59	0.252448	59	0.269473
60	0.259437	60	0.261016
61	0.286545	61	0.268785

APPENDIX 17 (Cont'd.)

Service Retirement Rates  
For Tier 6 Members

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.015983	55	0.017283
56	0.015891	56	0.017881
57	0.018131	57	0.020875
58	0.021950	58	0.023175
59	0.028199	59	0.030170
60	0.031789	60	0.035208
61	0.036109	61	0.041295
62	0.039942	62	0.046683
63	0.306695	63	0.313992
64	0.280779	64	0.288116
65	0.252448	65	0.269473
66	0.259437	66	0.261016
67	0.286545	67	0.268785
68	0.311011	68	0.279410
69	0.320232	69	0.277166
70	0.270303	70	0.257157
71	0.229352	71	0.232947
72	0.206863	72	0.219224
73	0.209678	73	0.238272
74	0.217437	74	0.244523
75	0.216934	75	0.236791
76+	1.000000	76+	1.000000

APPENDIX 17 (Cont'd.)

Mortality Base Rates for Service  
and Deferred Annuity and Beneficiaries

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
1	0.000410	1	0.000361
2	0.000277	2	0.000236
3	0.000230	3	0.000176
4	0.000179	4	0.000132
5	0.000157	5	0.000119
6	0.000141	6	0.000110
7	0.000124	7	0.000102
8	0.000105	8	0.000094
9	0.000085	9	0.000087
10	0.000072	10	0.000082
11	0.000076	11	0.000084
12	0.000113	12	0.000097
13	0.000149	13	0.000110
14	0.000183	14	0.000121
15	0.000218	15	0.000132
16	0.000253	16	0.000142
17	0.000290	17	0.000150
18	0.000256	18	0.000144
19	0.000288	19	0.000148
20	0.000317	20	0.000148
21	0.000351	21	0.000148
22	0.000381	22	0.000148
23	0.000397	23	0.000152
24	0.000403	24	0.000155
25	0.000378	25	0.000158
26	0.000361	26	0.000164
27	0.000351	27	0.000171
28	0.000347	28	0.000179
29	0.000348	29	0.000189
30	0.000353	30	0.000199

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd.)

Mortality Base Rates for Service  
and Deferred Annuity and Beneficiaries  
(cont'd.)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
31	0.000361	31	0.000211
32	0.000372	32	0.000223
33	0.000384	33	0.000236
34	0.000397	34	0.000249
35	0.000408	35	0.000262
36	0.000418	36	0.000275
37	0.000430	37	0.000291
38	0.000445	38	0.000310
39	0.000464	39	0.000334
40	0.000490	40	0.000362
41	0.000524	41	0.000396
42	0.000566	42	0.000436
43	0.000619	43	0.000484
44	0.000684	44	0.000539
45	0.000760	45	0.000601
46	0.000849	46	0.000671
47	0.000949	47	0.000747
48	0.001060	48	0.000829
49	0.001183	49	0.000916
50	0.001316	50	0.001008
51	0.001461	51	0.001104
52	0.001618	52	0.001203
53	0.001951	53	0.001419
54	0.002311	54	0.001645
55	0.002522	55	0.001805
56	0.002753	56	0.001980
57	0.003004	57	0.002172
58	0.003279	58	0.002382
59	0.003579	59	0.002613
60	0.003906	60	0.002866

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.



APPENDIX 17 (Cont'd.)

Mortality Base Rates for Service  
and Deferred Annuitants and Beneficiaries  
(cont'd.)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
61	0.004264	61	0.003053
62	0.004654	62	0.003298
63	0.005050	63	0.003604
64	0.005564	64	0.003976
65	0.006204	65	0.004417
66	0.006976	66	0.004931
67	0.007886	67	0.005524
68	0.008942	68	0.006203
69	0.010151	69	0.006979
70	0.011524	70	0.007864
71	0.013074	71	0.008874
72	0.014821	72	0.010029
73	0.016788	73	0.011349
74	0.019009	74	0.012863
75	0.021524	75	0.014602
76	0.024380	76	0.016603
77	0.027633	77	0.018909
78	0.031346	78	0.021567
79	0.035590	79	0.024631
80	0.040445	80	0.028162
81	0.045997	81	0.032228
82	0.052342	82	0.036904
83	0.059585	83	0.042268
84	0.067844	84	0.048410
85	0.077246	85	0.055421
86	0.087929	86	0.063404
87	0.100040	87	0.072465
88	0.113741	88	0.082724
89	0.129208	89	0.094308
90	0.141713	90	0.107360

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd.)

Mortality Base Rates for Service  
and Deferred Annuitants and Beneficiaries  
(cont'd.)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
91	0.158130	91	0.122037
92	0.175288	92	0.138518
93	0.193131	93	0.157000
94	0.211674	94	0.177701
95	0.230976	95	0.191477
96	0.251106	96	0.210235
97	0.272113	97	0.229998
98	0.293848	98	0.250723
99	0.313988	99	0.270858
100	0.334365	100	0.291040
101	0.354599	101	0.311444
102	0.374524	102	0.331900
103	0.393982	103	0.352232
104	0.412831	104	0.372273
105	0.430946	105	0.391860
106	0.448227	106	0.410849
107	0.464592	107	0.429112
108	0.479987	108	0.446544
109	0.494376	109	0.463061
110	0.500000	110	0.478604

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd.)

Mortality Base Rates for  
Disabled Annuitants

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
30	0.180013	30	0.106487
31	0.180013	31	0.106487
32	0.180013	32	0.106487
33	0.180013	33	0.103280
34	0.173269	34	0.100083
35	0.166522	35	0.096905
36	0.159773	36	0.093763
37	0.153024	37	0.090676
38	0.146284	38	0.087665
39	0.139576	39	0.084746
40	0.132936	40	0.081925
41	0.126401	41	0.079198
42	0.120012	42	0.076550
43	0.113802	43	0.073965
44	0.107801	44	0.071430
45	0.102029	45	0.068936
46	0.096503	46	0.066480
47	0.091236	47	0.064061
48	0.086231	48	0.061677
49	0.081479	49	0.059314
50	0.076958	50	0.056949
51	0.072640	51	0.054543
52	0.068494	52	0.052046
53	0.064498	53	0.049422
54	0.060638	54	0.046664
55	0.056938	55	0.043813
56	0.053442	56	0.040949
57	0.050216	57	0.038174
58	0.047308	58	0.035582
59	0.044759	59	0.033251

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

## APPENDIX 17 (Cont'd.)

Mortality Base Rates for  
Disabled Annuitants  
(cont'd.)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
60	0.042595	60	0.031256
61	0.040829	61	0.029665
62	0.039455	62	0.028522
63	0.038461	63	0.027851
64	0.037830	64	0.027664
65	0.037550	65	0.027957
66	0.037620	66	0.028701
67	0.038040	67	0.029851
68	0.038798	68	0.031348
69	0.039890	69	0.033140
70	0.041328	70	0.035196
71	0.043137	71	0.037505
72	0.045337	72	0.040079
73	0.047925	73	0.042938
74	0.050890	74	0.046105
75	0.054216	75	0.049628
76	0.057882	76	0.053557
77	0.061871	77	0.057934
78	0.066162	78	0.062794
79	0.070742	79	0.068155
80	0.075602	80	0.074002
81	0.080733	81	0.080289
82	0.086134	82	0.086960
83	0.087929	83	0.093972
84	0.100040	84	0.101322
85	0.113741	85	0.109018
86	0.129208	86	0.117066
87	0.141713	87	0.122037
88	0.158130	88	0.138518
89	0.175288	89	0.157000

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd.)

Mortality Base Rates for  
Disabled Annuitants  
(cont'd.)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
90	0.193131	90	0.177701
91	0.211674	91	0.191477
92	0.230976	92	0.210235
93	0.251106	93	0.229998
94	0.272113	94	0.250723
95	0.293848	95	0.270858
96	0.313988	96	0.291040
97	0.334365	97	0.311444
98	0.354599	98	0.331900
99	0.374524	99	0.352232
100	0.393982	100	0.372273
101	0.412831	101	0.391860
102	0.430946	102	0.410849
103	0.448227	103	0.429112
104	0.464592	104	0.446544
105	0.479987	105	0.463061
106	0.494376	106	0.478604
107	0.500000	107	0.478604
108	0.500000	108	0.478604
109	0.500000	109	0.478604
110	0.500000	110	0.478604

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

## APPENDIX 17 (Cont'd.)

## Salary Scale

<u>Duration</u>	<u>Rate</u>	<u>Duration</u>	<u>Rate</u>
1	1.1000	21	1.0272
2	1.0700	22	1.0263
3	1.0606	23	1.0254
4	1.0522	24	1.0245
5	1.0472	25	1.0237
6	1.0445	26	1.0229
7	1.0431	27	1.0222
8	1.0422	28	1.0215
9	1.0415	29	1.0210
10	1.0407	30	1.0206
11	1.0398	31	1.0202
12	1.0387	32	1.0200
13	1.0375	33	1.0195
14	1.0361	34	1.0193
15	1.0346	35	1.0190
16	1.0331	36	1.0186
17	1.0317	37	1.0180
18	1.0304	38	1.0176
19	1.0293	39	1.0176
20	1.0282		

Valuation Rate of Interest Assumption

The interest rate for valuation purposes is a level 7.5%. This valuation rate of interest is made up of a 2.5%<sup>1</sup> annual rate of inflation and a 5.0% real rate of return.

The valuation rate of interest assumption represents our best estimate of the anticipated annual rate of return on plan assets over a very long-term horizon.

The valuation rate of interest assumption is developed based upon the Retirement System's specific asset allocation, and capital market assumptions, based upon recommendations from AON Hewitt, the System's investment consultant. Using expected returns and standard deviations for each asset class, and including anticipated correlation between the classes, a long-term anticipated rate of return is developed. Based on their 1<sup>st</sup> quarter 2017 capital market return assumptions, AON Hewitt has estimated the geometric annual rate of return to be 6.6%, and the arithmetic annual rate of return to be 7.3%, given the System's asset allocation. This analysis is performed annually, and intended to be over a 30-year time horizon.

For a complete explanation of the rationale behind the System's valuation rate of interest assumption, please see pages 28 through 33 of the "*Report on the 2015 Recommended Actuarial Assumptions*".

Projected COLA Assumption

The annual percentage for estimating future COLA benefit payments is 1.5%.<sup>2</sup>

IRC Section 415(b) and 401(a)(17)

For purposes of the normal rate, the limitations under IRC Section 415(b) were not reflected due to immateriality. The IRC Section 401(a)(17) limit for the fiscal year ending June 30, 2016 was reflected for members with a membership date on or after July 1, 1996.

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<sup>1</sup> The average annual rate of increase in the Consumer Price Index (CPI) for 1925 – 2016 was 2.92%.

<sup>2</sup> The COLA percentage is one-half of the increase in the CPI with a floor of 1.0% and a cap of 3.0%. Therefore the estimate of inflation for the COLA benefit is the result of analyzing available CPI data with percentages bounded between 2.0% and 6.0%, and reduced by 50%.

## SUMMARY OF BENEFIT PROVISIONS

### 1. Membership

Membership is mandatory for all full-time New York State public school teachers, outside New York City, except those employed under the Comprehensive Employment and Training Act (CETA). Membership is optional for teachers employed on other than a full-time basis and for certain employees of the State University of New York, community colleges, and the State Education Department. Generally, the membership of any person credited with less than 5 years of service will terminate when seven years have elapsed since (s)he last rendered at least 20 days of credited service in a school year.

Tiers are determined by a member's most recent date of membership in the Retirement System as follows:

Tier 1:	Membership prior to 7/1/1973;
Tier 2:	Membership 7/1/1973 – 7/26/1976;
Tier 3:	Membership 7/27/1976 – 8/31/1983;
Tier 4:	Membership 9/1/1983 – 12/31/2009;
Tier 5:	Membership 1/1/2010 – 3/31/2012;
Tier 6:	Membership on or after 4/1/2012.

Tier 3 members are entitled to receive the benefits of either Tier 3 or Tier 4, however, they may not mix the provisions of the two tiers. For valuation purposes, Tier 3 members are assumed to receive the Tier 4 benefit at retirement, as that is generally always the larger benefit.

### 2. Service Retirement

The service retirement benefits are payable for life generally as follows:

#### Tier 1:

##### *Non-Contributory Plan*

For Tier 1 members with a date of membership prior to July 1, 1970 the benefit is generally calculated as:

##### *For New York State service prior to 7/1/1959 and all out-of-state service:*

1/100<sup>th</sup> of final average salary (FAS) per year for each of the first 25 years of service, plus 1/120<sup>th</sup> of FAS per year for each of the next 10 years of service, plus 1/140<sup>th</sup> of FAS per year for each year of NYS service in excess of 35, *plus*

##### *For New York State service subsequent to 7/1/1959:*

1/50<sup>th</sup> of final average salary (FAS) per year for each of the first 25 years of NYS service, plus 1/60<sup>th</sup> of FAS per year for each of the next 10 years of NYS service, plus 1/70<sup>th</sup> of FAS per year for each year of NYS service in excess of 35.



## APPENDIX 18 (Cont'd.)

Non-Contributory Plan members generally may retire at:

- Age 55 with 20 years of total service or
- Any age with 35 years of total service.

### Career Plan

If 20 or more years of NYS service: 2% of final average salary (FAS) per year of NYS service after July 1, 1959, plus 1.8% of FAS per year of NYS service prior to that date, plus 1% of FAS per year of out-of-state service. Out-of-state service is allowed only up to a maximum of 10 years, and only to the extent that it does not raise the total service credit to greater than 35 years. The maximum pension permitted is 75% of FAS.

If less than 20 years of NYS service, the above formula is used except the benefit is reduced by 5% for each year of service less than 20, subject to a maximum reduction of 50%.

Career Plan members generally may retire at:

- Age 55 with 2 years of NYS service or
- Any age with 35 years of total service.

The provisions of Article 19 of the Retirement and Social Security Law, effective July 11, 2000, provides to eligible Tier 1 and 2 members additional service credit of one-twelfth of a year of service for each year of retirement credit as of the date of retirement or death, up to a maximum of two additional years. The maximum pension, as a result of Article 19, can be 79% of FAS.

Tier 2: Computed under the Tier 1 Career Plan formula, but may be reduced for early retirement, as noted below.

Tier 2 members generally may retire at:

- Age 62 with 5 years of service,
- Age 55 with 30 years of service, or
- Age 55 with 5 years of service, with benefit reduced by 6% for each of the first 2 years under age 62 and 3% for each of the next 5 years.

Tier 3:  $1\frac{2}{3}\%$  of FAS per year of NYS service (if less than 20 years) or 2% of FAS per year of NYS service (if 20 to 30 years). There is no additional benefit for more than 30 years of service. At age 62 the benefit is reduced by 50% of the primary Social Security benefit accrued while in NYS public employment. A member may be eligible for automatic cost-of-living adjustments.

Tier 3 members generally may retire at:

- Age 62 with 5 years of service,
- Age 55 with 30 years of service, or
- Age 55 with 5 years of service, with benefit reduced by 1/15th for each of the first 2 years under age 62 and 1/30th for each of the next 5 years.

## APPENDIX 18 (Cont'd.)

Tier 4:  $1\frac{2}{3}\%$  of FAS per year of NYS service (if less than 20 years), or 2% of FAS per year of NYS service (if 20 to 30 years), plus  $1\frac{1}{2}\%$  of FAS per year of NYS service in excess of 30 years.

Tier 4 members generally may retire at:

- Age 62 with 5 years of service,
- Age 55 with 30 years of service, or
- Age 55 with 5 years of service, with benefit reduced by 6% for each of the first 2 years under age 62 and 3% for each of the next 5 years.

Tier 5:  $1\frac{2}{3}\%$  of FAS per year of NYS service (if less than 25 years), or 2% of FAS per year of NYS service (if 25 to 30 years), plus  $1\frac{1}{2}\%$  of FAS per year of NYS service in excess of 30 years.

Tier 5 members generally may retire at:

- Age 62 with 10 years of service,
- Age 57 with 30 years of service, or
- Age 55 with 10 years of service, with benefit reduced by  $6\frac{2}{3}\%$  for each of the first 2 years under age 62 and 5% for each of the next 5 years.

Tier 6:  $1\frac{2}{3}\%$  of FAS per year of NYS service (if less than 20 years), 1.75% of FAS per year of NYS service (if credited with 20 years) or 35% plus 2% per year of NYS service in excess of 20 years (if beyond 20 years).

Tier 6 members generally may retire at:

- Age 63 with 10 years of service,
- Age 55 with 10 years of service, with benefit reduced by 6.5% for each year under age 63.

### 3. Disability Retirement

Generally a member with at least 10 years of service may qualify for a disability retirement benefit of the smaller of 1)  $1\frac{2}{3}\%$  of FAS per year of projected service to age 60 or 2)  $\frac{1}{3}$  of FAS; but the benefit shall not be less than  $1\frac{2}{3}\%$  of FAS per year of completed service.

### 4. Death Benefits

#### *a) Active Service*

The Tier 1 death benefit is generally equal to the greater of 1) 3 times annual salary after 36 years of service (proportionately reduced for less than 36 years) or 2) for members who are at least age 55 with 20 years of service, the pension reserve calculated under a prior, lower service retirement formula.

APPENDIX 18 (Cont'd.)

The death benefit for Tier 2, 3, 4, 5 and 6 members is generally equal to one of the following two options based on the member's election at entry: 1) 3 times annual salary after 3 years of service (proportionately reduced for service under 3 years) or 2) the greater of (1) above or the Tier 1 death benefit.

*b) Not in Active Service*

The death benefit for members of all tiers with at least ten years of service credit who die when not in active service is equal to one-half the active member death benefit.

5. Deferred Retirement

*Tiers 1-4:*

A member with at least 5 years of credited service who ceases teaching has a vested right to receive a deferred service retirement benefit. A member with at least five, but less than ten years of service credit, has the choice of receiving a refund of their member contributions with interest or a deferred service retirement benefit. A member with ten or more years of service credit will receive the deferred service retirement benefit.

*Tiers 5 and 6:*

A member with at least 10 years of credited service who ceases teaching has a vested right to receive a deferred service retirement benefit. Members with less than 10 years of credited service who cease teaching may receive a refund of their member contributions with interest.

6. Member Contributions

Certain Tier 1 and 2 members may elect to contribute in order to receive an additional benefit upon retirement. Tier 3 and 4 members are required to contribute 3% of pay to fund a portion of their benefit. Effective October 1, 2000, such contributions cease upon the attainment of the earlier of 10 years of service credit or 10 years of membership. Tier 5 members are required to contribute 3.5% of their salary throughout their active membership.

Tier 6 members are required to contribute throughout their active membership. From 4/1/2012 through 3/31/2013, all Tier 6 members were required to contribute 3.5%. Beginning 4/1/2013 members are required to contribute in accordance with the following schedule:

<u>Salary</u>	<u>Contribution Rate</u>
\$45,000 and less	3.00%
More than \$45,000 to \$55,000	3.50%
More than \$55,000 to \$75,000	4.50%
More than \$75,000 to \$100,000	5.75%
More than \$100,000 to \$179,000 (the limit currently equal to the NYS governor's salary)	6.00%

## APPENDIX 18 (Cont'd.)

For purposes of administration, a Tier 6 member's contribution rate in any given year is based on regular compensation earned two years prior. During the member's first three years of membership, he/she will contribute a percentage based on a salary projection provided by the employer.

### 7. Cost-of-Living Adjustment (COLA)

A permanent, annually-adjusted cost-of-living benefit is provided to both current and future retired members. This benefit was first paid commencing September 2001, and is increased every September thereafter, to retired members who meet one of the following eligibility criteria:

- Age 62 and retired for 5 years,
- Age 55 and retired for 10 years, or
- Retired for 5 years under a disability retirement.

The annual COLA percentage is equal to 50% of the increase in the annual CPI; not to exceed 3% nor be lower than 1%. It is applied to the first \$18,000 of annual benefit. Additionally, commencing September 2000, members retired before 1997 are eligible for a "Catch-Up" supplemental benefit upon satisfaction of the above eligibility criteria.