

**MISSOURI DEPARTMENT OF TRANSPORTATION AND HIGHWAY PATROL  
EMPLOYEES' RETIREMENT SYSTEM (MPERS)**

ACTUARIAL VALUATION REPORT

AS OF JUNE 30, 2013



# TABLE OF CONTENTS

---

	<u>Pages</u>
Introduction	1-2
Summary of Results and Comments	3-13
<b>Section A: Valuation Results</b>	
Development of Contribution Rate and Liabilities	A1-A2
System Resources and Obligations	A3
Amortization of Unfunded Actuarial Accrued Liabilities	A4
GASB Reporting	A5-A7
Gain/Loss Analysis	A8-A9
<b>Section B: Summary of Benefits</b>	B1-B12
<b>Section C: Financial Information</b>	
Summary of Fund Operations	C1
Development of Actuarial Value of Assets	C2
Allocation of Assets	C3
<b>Section D: Summary of Member Data</b>	
Active Members	D1-D10
Retirees and Survivors	D11-D18
Disabled Retirees	D19-D20
<b>Section E: Assumptions Used in the Valuation and Glossary</b>	E1-E14
<b>Section F: Financial Principles and Operational Techniques</b>	F1-F4
<b>Section G: Supplemental Information for Comprehensive Annual     Financial Reporting</b>	G1-G11

October 25, 2013

The Retirement Board  
Missouri Department of Transportation  
and Highway Patrol Employees' Retirement System  
1913 William Street  
Jefferson City, Missouri 65102-1930

Ladies and Gentlemen:

The results of the regular annual actuarial valuation as of June 30, 2013 of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System, as established by Chapter 104 of the Missouri Revised Statutes, are presented in this report. The purposes of this valuation were:

- to measure the System's funding progress;
- to determine the employer contribution rate for Fiscal Year 2015;
- to determine actuarial information for reporting purposes in compliance with Governmental Accounting Standards Statements No. 25 and No. 27 for the 2013 Fiscal Year.

Your attention is directed particularly to the summary of the results on pages 3-13.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. This report should not be relied on for any purpose other than the purpose described.

The member statistical data required for the valuation together with pertinent data on financial operations was furnished by your Executive Director and his staff. Member data was reviewed for reasonableness, but was not audited by the actuary. Financial data was received in aggregate and reviewed for reasonableness. Individual investments were not reviewed. Assets are not audited by the actuary. We are not responsible for the accuracy or completeness of the data provided by MPERS.

The cooperation of the Executive Director and the staff in furnishing materials requested for this valuation, and the complete and excellent condition of the records, is acknowledged with appreciation.

The valuation results summarized in this report involve actuarial calculations that require assumptions about future events. We believe that the assumptions and methods used in this report are reasonable and appropriate for the purpose for which they have been used. However, other assumptions and methods could also be reasonable and could result in materially different results. In addition, because it is not possible or practical to consider every possible contingency, we may use summary information, estimates or simplifications of calculations to facilitate the modeling of future events. We may also exclude factors or data that are deemed to be immaterial.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in plan provisions or applicable law. This report does not contain an analysis of the potential range of such future measurements.

To the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board. The actuarial assumptions used for the valuation produce results which, individually and in the aggregate, are reasonable. The actuarial assumptions used in making the valuation are shown in Section E of this report.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. Heidi Barry is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

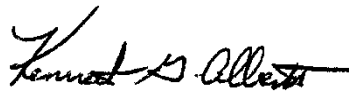
The signing actuaries are independent of the plan sponsor.

We would like to acknowledge Brian B. Murphy, FSA, MAAA as the Peer Review Actuary.

Respectfully submitted,



Heidi G. Barry, ASA, MAAA



Kenneth G. Alberts

## SUMMARY

This report contains the results of the June 30, 2013 valuation. The table below shows a summary of the data used in the valuation as well as the unfunded actuarial accrued liability for the two experience rated groups. This data was the basis for determining valuation results and recommended employer contribution rates.

	Non-Uniformed			Uniformed Patrol	Total
	Patrol Employees	MoDOT Employees	Non-Uniformed Total		
<b>Participants</b>					
Active Members					
Closed Plan	467	2,490	2,957	694	3,651
Year 2000 Plan (also closed)	508	2,142	2,650	408	3,058
Year 2011 Tier (open)	147	346	493	117	610
Total Active Members	1,122	4,978	6,100	1,219	7,319
<i>Total Active Members Prior Year</i>	<i>1,128</i>	<i>5,115</i>	<i>6,243</i>	<i>1,215</i>	<i>7,458</i>
Retiree -- Regular Pensioners					
Closed Plan	439	3,721	4,160	835	4,995
Year 2000 Plan (also closed)	442	2,676	3,118	2	3,120
Year 2011 Tier (open)	0	0	0	0	0
Total Regular Pensioners	881	6,397	7,278	837	8,115
Self Insured Disability Pensioners	5	56	61	3	64
Fully Insured Disability Pensioners	10	98	108	3	111
Terminated Vested Members	230	1,760	1,990	162	2,152
<b>Total</b>	<b>2,248</b>	<b>13,289</b>	<b>15,537</b>	<b>2,224</b>	<b>17,761</b>
Active Member Valuation Payroll	\$43,091,397	\$205,790,486	\$248,881,883	\$74,323,885	\$323,205,768
<i>Active Mem. Val. Payroll Prior Year</i>	<i>\$42,605,045</i>	<i>\$213,982,134</i>	<i>\$256,587,179</i>	<i>\$72,705,989</i>	<i>\$329,293,168</i>
Unfunded Actuarial Accrued Liability	N/A	N/A	\$1,477,201,166	\$449,372,000	\$1,926,573,166

The June 30, 2013 valuation results are used to determine the contribution rate for the plan year beginning July 1, 2014. A summary of valuation results and recommended contribution rates follows.

## SUMMARY - (CONTINUED)

The **total contribution rate** for the plan year beginning July 1, 2014 is shown below.

	<b>FY 2015 Employer Contribution Rates Expressed As % of Active Payroll For Total Benefits</b>				
	<b>Non-Uniformed</b>			<b>Uniformed Patrol Total</b>	<b>Combined Rate (MPERS Total)</b>
	<b>Civilian Patrol Employees</b>	<b>MoDOT Employees</b>	<b>Total</b>		
Normal Cost	11.27%	11.27%	11.27%	17.22%	12.66%
Unfunded Liability	46.10%	46.10%	46.10%	39.58%	44.58%
Expenses	<u>0.86%</u>	<u>0.86%</u>	<u>0.86%</u>	<u>0.86%</u>	<u>0.86%</u>
Subtotal	58.23%	58.23%	58.23%	57.66%	58.10%
Disability Insurance	0.53%	0.53%	0.53%	0.53%	0.53%
<b>Total</b>	<b>58.76%</b>	<b>58.76%</b>	<b>58.76%</b>	<b>58.19%</b>	<b>58.63%</b>
Projected \$	\$27,123,958	\$127,032,098	\$154,156,056	\$46,329,484	\$200,485,540
<i>Prior Year Projected \$</i>	<i>\$24,879,233</i>	<i>\$116,085,308</i>	<i>\$140,964,541</i>	<i>\$43,223,651</i>	<i>\$184,188,191</i>

The projected dollar amounts are the total employer rate multiplied by the valuation payroll projected to the fiscal year the rate is effective. The projection factor is 1.0541 for Non-Uniformed and 1.0712 for Uniformed. Actual contributions will be based on the actual payroll during the 2015 Fiscal Year. The total contribution is based on a 11-year amortization period for unfunded retiree liabilities and a 26-year amortization period for other unfunded liabilities from July 1, 2014 in accordance with Board policy adopted September 17, 2009.

The contributions above are Employer contributions only. In addition, Employee contributions are estimated to be (on average) 0.19% for Non-Uniformed members and 0.26% for Uniformed members.

The combined contribution rate is less than the actual benefit payout rate. The difference is intended to be made up by investment return. The ability to contribute less than the benefit payout is one of the advantages of a funded retirement plan.

Prior year projected dollars (FY 2014) are based on rates of 54.25% for Non-Uniform and 55.23% for Uniform.

## SUMMARY - (CONTINUED)

**Assumptions and Methods for the June 30, 2013 valuation:** There were no changes in benefits for the June 30, 2013 valuation. The assumptions and methods used were those adopted by the Board from the July 1, 2007 through June 30, 2012 Experience Study and titled Alternate 1 in that report. The Board formally adopted these new assumptions at the June 20, 2013 Board meeting. These changes resulted in an increase in the computed contribution rate of 4.60% for Non-Uniform and 6.02% for Uniform.

**Experience:** System assets earned a 13.0% return on a market basis, although the fund recognized a 12.0% rate of return on an actuarial basis after accounting for the smoothing of last year's loss and the 2011 and 2013 gains (please see page C-2). In aggregate, there was an experience gain of \$68 million (approximately 2.1% of beginning of year liabilities). This gain was made up of a \$56 million investment gain and a \$12 million liability gain and resulted in an increase in funding status.

The main source of the liability gain was due to pay increases (pay increases were less than expected) and turnover (more members terminated before retirement than expected). The table below shows a comparison of actual demographic activity versus expected activity (based on the prior year's valuation assumptions).

### Demographic Experience

	<u>Non-Uniformed</u>				<u>Uniformed</u>			
	<u>Number Count</u>		<u>A/E%</u>	<u>General Direction</u>	<u>Number Count</u>		<u>A/E%</u>	<u>General Direction</u>
	<u>Actual</u>	<u>Expected</u>			<u>Actual</u>	<u>Expected</u>		
Retirement	312	249.8	125%	Loss	21	28.2	74%	Gain
Death	2	8.2	24%	Gain	0	1.0	0%	Gain
Disability	22	20.0	110%	Loss	1	1.1	91%	Loss
Vested Terminations	205	114.3	179%	Gain	8	13.3	60%	Loss
Other Terminations	110	57.2	192%	Gain	5	9.3	54%	Gain
Post-Retirement Death	268	242.5	111%	Gain	28	24.9	112%	Gain

## SUMMARY - (CONTINUED)

---

**Funded Status:** The funded status changed in accordance with the table below:

<b>Funded Status as of June 30,</b>		
<b>2012</b>	<b>2013</b>	
	<b>Before Change*</b>	<b>After Change*</b>
46.3% <sup>#</sup>	49.0%	46.2%

\* *Change in methods and assumptions.*

# *Estimated to be 43.7% as of June 30, 2012 after new methods and assumptions.*

### **Funding Policy:**

*Permanent Policy:* The total contribution will be based on normal cost plus a 22-year amortization of unfunded actuarial accrued liabilities. The amortization period is a closed 22-year period starting July 1, 2014.

*Temporary Accelerated Policy:* The total contribution is based on normal cost plus an 11-year amortization period for unfunded retiree liabilities and a 26-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2014.

In accordance with RSMo 105.684 an accelerated amortization schedule was prepared and presented to the Board. This temporary accelerated policy was adopted by the Retirement Board on September 17, 2009 and will remain in effect until such time as the retiree liability becomes 100% funded or the permanent policy produces a higher contribution rate.



## SUMMARY - (CONTINUED)

**Rate Reconciliation:** The table below shows the computed rate last year and the approximate effect of the changes that occurred during the year.

	<b>Non-Uniform</b>	<b>Uniform</b>
Computed employer contribution rate, prior valuation	54.25%	55.23%
Effects of:		
Change in disability premiums	0.00%	0.00%
Change in assumptions and methods	4.60%	6.02%
Phase-in of 2011 Tier members	(0.31%)	(0.33%)
12/13 recognized investment loss/(gain)	(1.76%)	(2.17%)
12/13 liability experience loss/(gain)	(0.19%)	(1.09%)
Change in administrative expenses	(0.04%)	(0.04%)
Change due to payroll increase less than expected	2.33%	0.53%
Misc (demographic, payroll weighting, component interaction, etc.)	(0.12%)	0.04%
Computed employer contribution rate, current valuation	58.76%	58.19%

**Funded Status of Retiree Liability:** The chart below indicates the funding status of retiree liabilities on a funding value asset basis and a market value asset basis:

<u>Asset Basis</u>	<b>June 30, 2013</b>			<b>June 30, 2012</b>	
	<u>Non-Uniformed</u>	<u>Uniformed</u>	<u>Total</u>	<b>Before Change*</b>	<b>After Change*</b>
				<u>Total</u>	<u>Total</u>
Funding Value	66.7%	85.5%	71.1%	71.8%	68.4%
Market Value	67.7%	86.8%	72.1%	72.1%	68.4%

\* *Change in methods and assumptions.*

**2011 Tier:** Legislation passed in the summer of 2010 which effectively closed the Y2K Plan benefits to new hires and opened a new tier known as the 2011 Tier. All new hires after January 1, 2011 will enter the 2011 Tier. The 2011 Tier includes the following:

- 4% employee contribution rate;
- 10-year vesting;
- later retirement eligibility;
- no DROP eligibility.

There were 610 members covered under this Tier as of June 30, 2013.

## SUMMARY - (CONTINUED)

---

**Recommendation for June 30, 2013 valuation:** We recommend adopting the employer contribution rates no less than shown herein.

**Conclusion:** Based upon the results of the June 30, 2013 regular annual actuarial valuation, it is our opinion that the Missouri Department of Transportation and Highway Patrol Employees' Retirement System continues to be financed in accordance with actuarial principles of level percent of payroll financing. This statement is based upon the fact that the employer is contributing to the System based upon actuarially determined rates and presumes a continuation of payment of actuarially determined contributions. In addition, we commend the 2009 Board in its decision to more aggressively address the unfunded retiree liability issue and the 2011 Board in its decision to reflect the near term downsizing of MoDOT.

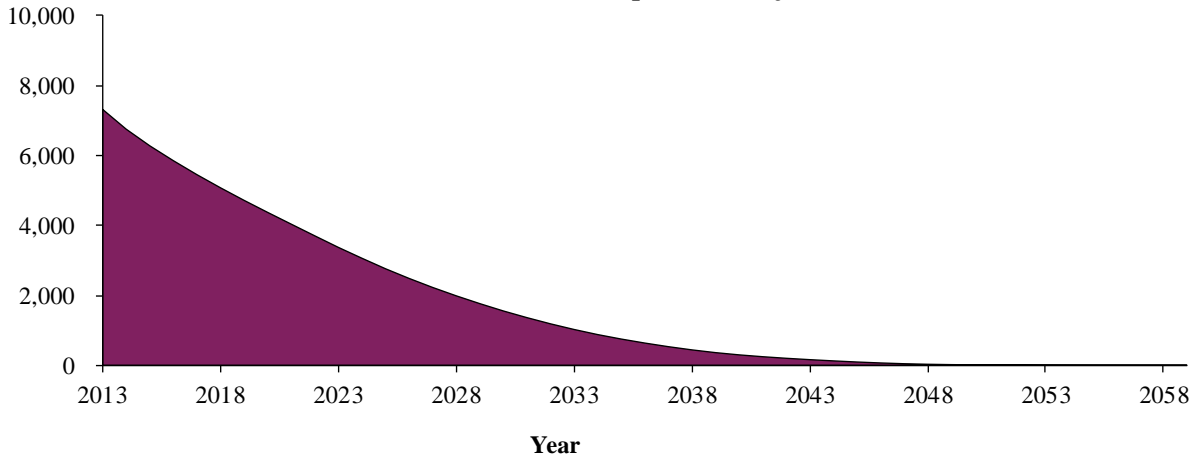
## SUMMARY OF KEY VALUATION RESULTS (CONTINUED)

Actuarial Present Value	June 30, 2013			June 30, 2012
	(1) Actuarial Present Value	(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1) - (2)	Actuarial Accrued Liabilities
<b>Active Members</b>				
Service retirement benefits based on service rendered before and likely to be rendered after valuation date	\$ 1,431,669,503	\$ 303,541,336	\$ 1,128,128,167	\$ 1,040,806,540
Disability benefits likely to be paid to present active members who become totally and permanently disabled	21,448,016	10,936,830	10,511,186	36,282,771
Survivor benefits likely to be paid to widows and children of present active members who die before retiring	16,132,132	5,561,203	10,570,929	15,632,913
Separation benefits likely to be paid to present active members	46,808,185	26,925,699	19,882,486	16,641,621
<b>Active Member Totals</b>	<b>\$ 1,516,057,836</b>	<b>\$ 346,965,068</b>	<b>\$ 1,169,092,768</b>	<b>\$ 1,109,363,845</b>
<b>Terminated Vested Members Retired Lives</b>			82,255,709	64,201,828
			2,332,627,082	2,132,712,998
<b>Total Actuarial Accrued Liability</b>			<b>\$ 3,583,975,559</b>	<b>\$ 3,306,278,671</b>
<b>Actuarial Value of Assets</b>			1,657,402,393	1,531,033,613
<b>Unfunded Actuarial Accrued Liability</b>			<b>\$ 1,926,573,166</b>	<b>\$ 1,775,245,058</b>

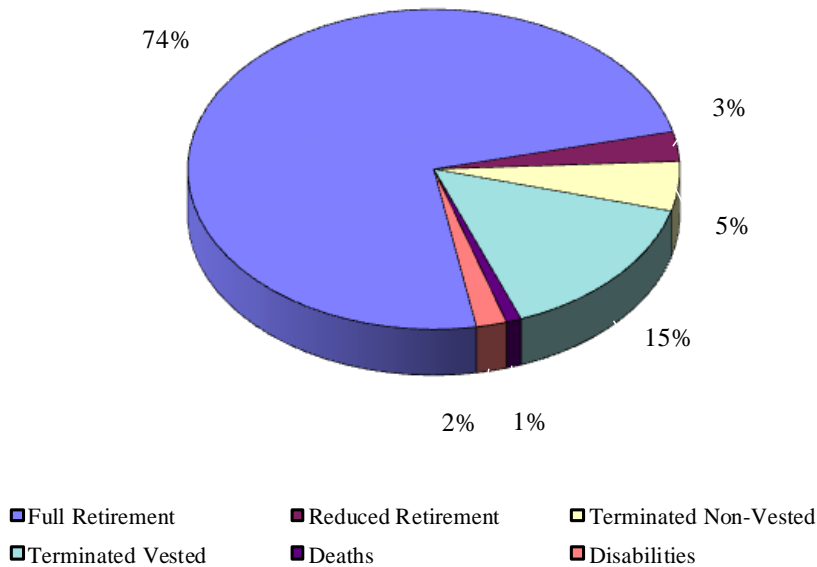
## EXPECTED DEVELOPMENT OF PRESENT POPULATION AS OF JUNE 30, 2013 (CONTINUED)

---

**Current Active Member Population Projection**



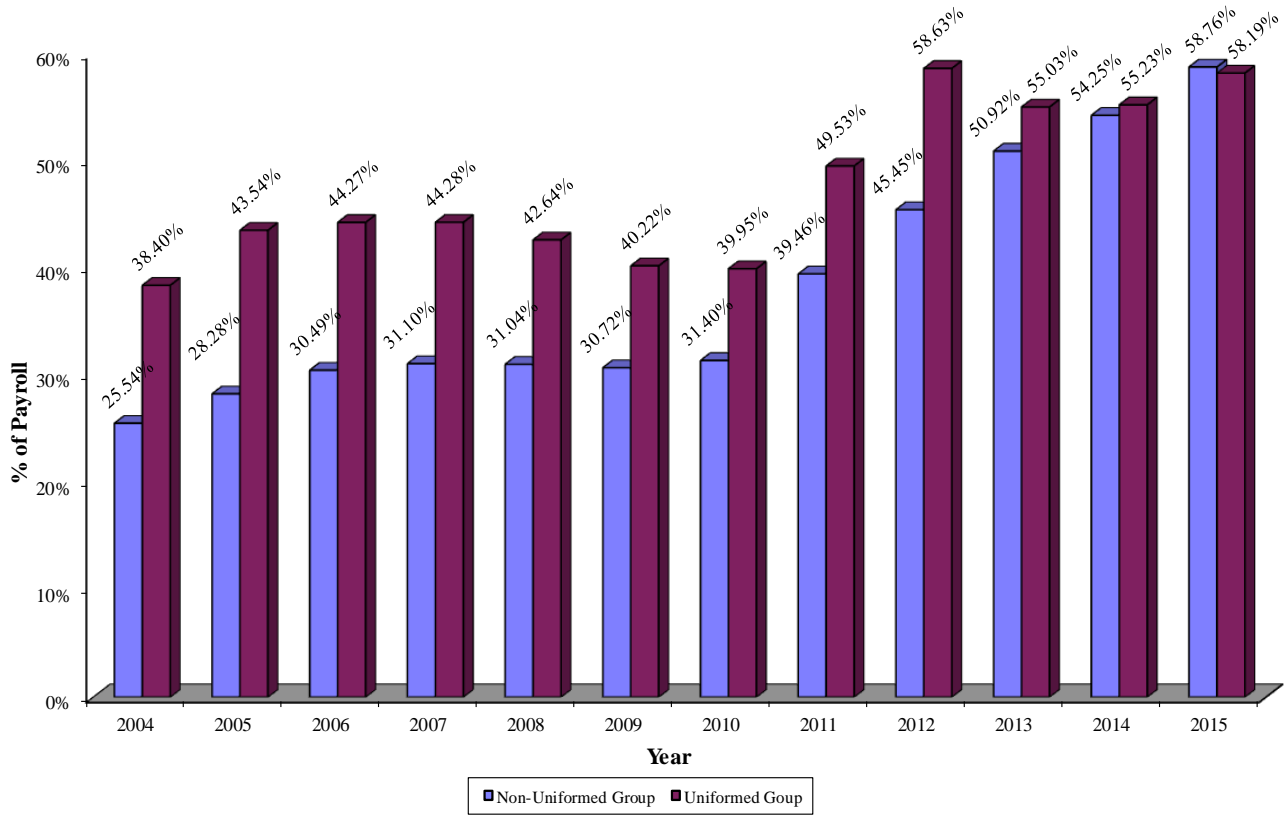
**Expected Terminations from Active Employment for Current Active Members**



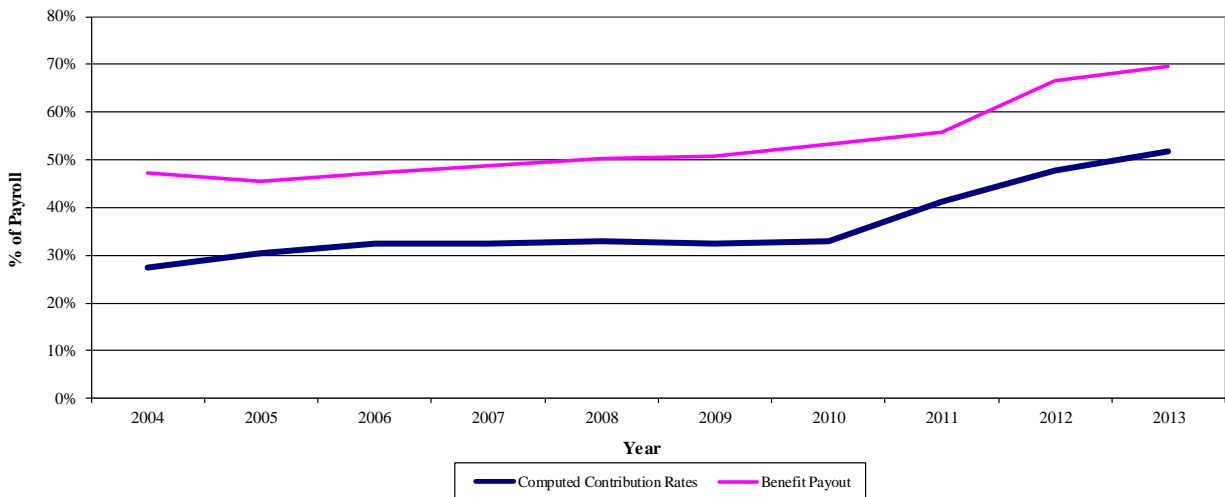
The charts above show the expected future development of the present population in simplified terms. The Retirement System presently covers 7,319 active members. Eventually, 5% of the population is expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. Of the present population, 92% is expected to receive monthly retirement benefits either by retiring directly from active service, or by separating from service with a vested benefit and 3% of the present population is expected to become eligible for death-in-service or disability benefits. Within 10 years, over half of the covered membership is expected to consist of new hires.

# HISTORICAL CONTRIBUTION RATES AND BENEFIT PAYOUTS

## Computed Contribution Rates

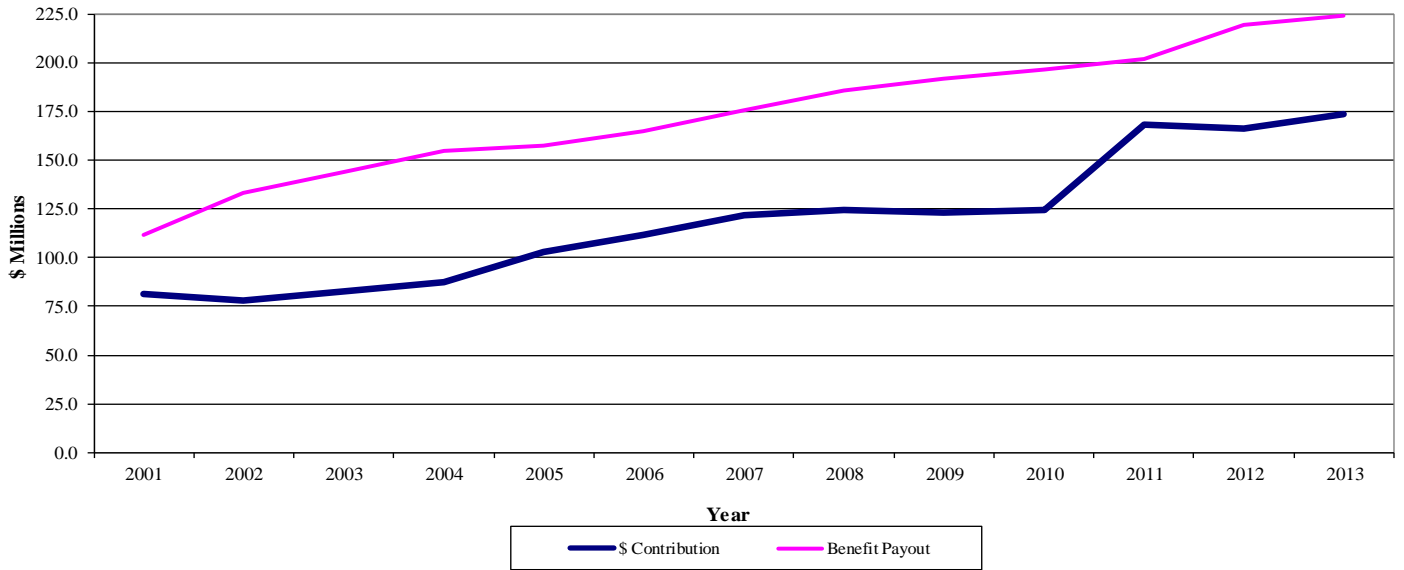


## Contribution Rates vs. Benefit Payout



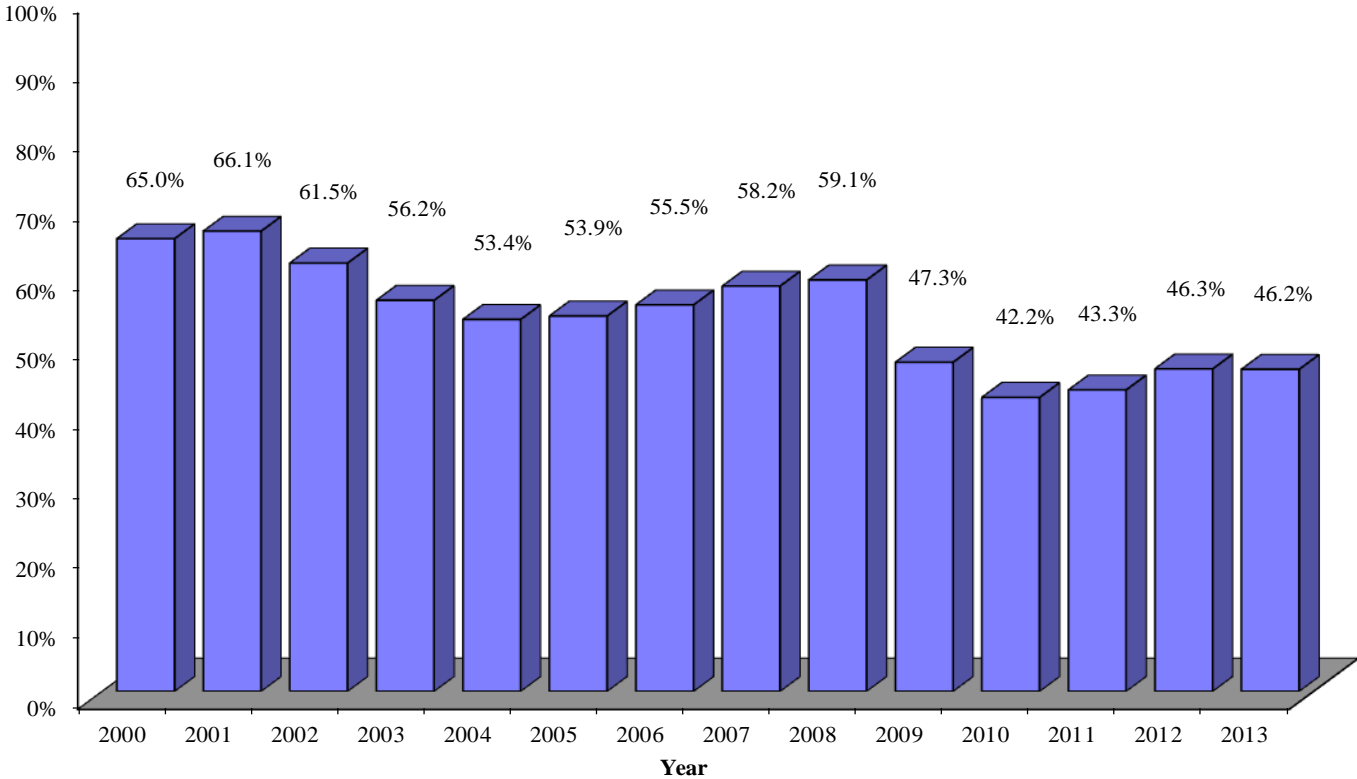
# HISTORICAL CONTRIBUTION RATES AND BENEFIT PAYOUTS (CONCLUDED)

## Contribution Dollars vs. Benefit Payout Dollars (in millions)



# HISTORICAL FUNDED RATIOS

Actuarial Value of Assets as Percents of Accrued Liabilities  
(Funded Ratio)



---

**SECTION A**

VALUATION RESULTS

---



**COMPUTED CONTRIBUTIONS TO SUPPORT BENEFITS  
FOR FISCAL YEAR 2015  
CONTRIBUTIONS COMPUTED AS OF JUNE 30, 2013**

Contributions for	Non-Uniformed Employees			Uniformed Patrol			Total
	Closed & Year 2000	2011 Tier	Total	Closed & Year 2000	2011 Tier	Total	
Normal Cost							
Age & service benefits	9.90%	7.48%	9.78%	16.24%	12.16%	15.97%	11.23%
Disability benefits #	0.48%	0.59%	0.49%	0.25%	0.20%	0.25%	0.43%
Survivor benefits	0.19%	0.24%	0.19%	0.28%	0.20%	0.27%	0.21%
Separation benefits	1.00%	0.99%	1.00%	1.00%	0.93%	0.99%	1.00%
Total Normal Cost	11.57%	9.30%	11.46%	17.77%	13.49%	17.48%	12.87%
Member Contributions	0.00%	4.00%	0.19%	0.00%	4.00%	0.26%	0.21%
Employer Normal Cost	11.57%	5.30%	11.27%	17.77%	9.49%	17.22%	12.66%
Unfunded Actuarial Accrued Liabilities*			46.10%			39.58%	44.58%
Expense Provision			0.86%			0.86%	0.86%
Subtotal			58.23%			57.66%	58.10%
Disability Insurance			0.53%			0.53%	0.53%
Total Contribution Rate			58.76%			58.19%	58.63%
Projected Dollar Contribution			\$154,156,056			\$46,329,484	\$200,485,540
Prior Year							
Total Contribution Rate			54.25%			55.23%	54.44%
Projected Dollar Contribution			\$140,964,541			\$43,223,651	\$184,188,191

# Includes costs for benefits payable after conversion to normal retirement and/or benefits payable to survivors. Costs for disability benefits payable prior to conversion are shown under Disability Insurance which is outsourced.

\* Amortized as a level-percentage of payroll over a 11-year amortization period for unfunded retiree liabilities and a 26-year amortization period for other unfunded liabilities from July 1, 2014.

## DEVELOPMENT OF LIABILITIES AS OF JUNE 30, 2013

	Non-Uniformed Employees	Uniformed Patrol	Total
<b>Present Value of Future Benefits - Inactives</b>			
Retirees and Survivors	\$ 1,774,179,833	\$ 534,677,167	\$ 2,308,857,000
Disability Pensioners	21,039,714	2,730,368	23,770,082
Vested Terminated Employees	70,588,285	11,667,424	82,255,709
Subtotal PVFB - Inactives	1,865,807,832	549,074,959	2,414,882,791
<b>Present Value of Future Benefits - Actives</b>			
Age & Service benefits	964,206,365	467,463,138	1,431,669,503
Normal and Work Related Disability benefits	17,516,409	3,931,607	21,448,016
Survivor benefits	11,187,849	4,944,283	16,132,132
Separation benefits	37,552,495	9,255,690	46,808,185
Subtotal PVFB - Actives	1,030,463,118	485,594,718	1,516,057,836
<b>Total Present Value of Future Benefits</b>	2,896,270,950	1,034,669,677	3,930,940,627
<b>Less Present Value of Future Entry Age Normal Costs</b>	221,247,729	125,717,339	346,965,068
<b>Equals Actuarial Accrued Liability</b>	2,675,023,221	908,952,338	3,583,975,559
<b>Less Actuarial Value of Assets</b>	1,197,822,055	459,580,338	1,657,402,393
<b>Equals Unfunded Actuarial Accrued Liability</b>	1,477,201,166	449,372,000	1,926,573,166
<b>Amortization Payment on UAAL*</b>	\$ 120,953,141	\$ 31,509,137	\$ 152,462,278
<b>as a % of Projected Payroll</b>	46.10%	39.58%	44.58%

\*Amortized as a level-percentage of payroll over a 11-year amortization period for unfunded retiree liabilities and a 26-year amortization period for other unfunded liabilities from July 1, 2014.

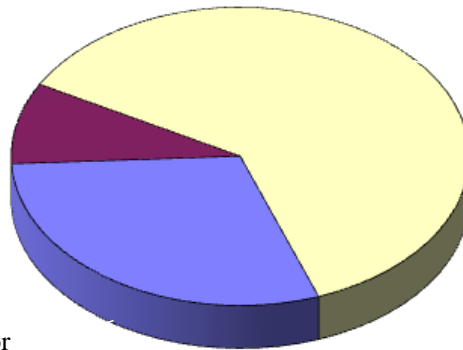
**SYSTEM RESOURCES & OBLIGATIONS**  
**SOURCES AND USES OF \$3,930.9 MILLION**  
**AS OF JUNE 30, 2013**

---

(\$ Millions)

**Uses of Funds**

To future retirees for  
service yet to be  
rendered: \$346.9

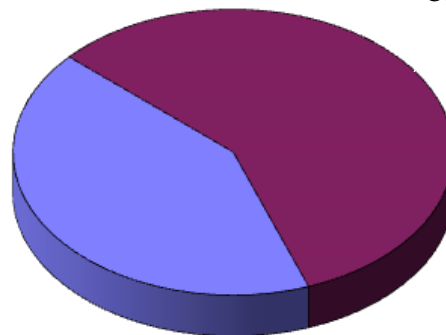


To present retirees,  
beneficiaries and vested  
terminants: \$2,414.9

To future retirees for  
service already rendered:  
\$1,169.1

**Sources of Funds**

Future  
Contributions:  
\$2,273.5



Present  
Assets:  
\$1,657.4

**FINANCING UNFUNDED ACTUARIAL ACCRUED LIABILITIES (UAAL)  
WHICH WERE CALCULATED USING A WAGE INFLATION ASSUMPTION  
OF 3.50%\* AND AN INVESTMENT RETURN ASSUMPTION OF  
7.75% COMPOUNDED ANNUALLY  
11/26 YEAR AMORTIZATION\***

Fiscal Year Ending June 30	Active Employee Payroll	Unfunded Actuarial Accrued Liability at End of Year	Annual UAAL Contributions During Fiscal Year		UAAL at Year End as % of Payroll
			Dollars	% of Payroll	
2013	\$ 323,205,767	\$ 1,926,573,166			
2014	330,402,160	1,937,326,315	\$ 133,449,432	40.39%	586.4%
2015	341,966,236	1,929,186,660	152,448,548	44.58%	564.1%
2016	353,935,054	1,914,876,296	157,784,247	44.58%	541.0%
2017	366,322,781	1,893,723,097	163,306,696	44.58%	517.0%
2018	379,144,078	1,864,996,061	169,022,430	44.58%	491.9%
2019	392,414,121	1,827,900,510	174,938,215	44.58%	465.8%
2020	406,148,615	1,781,572,907	181,061,053	44.58%	438.7%
2021	420,363,817	1,725,075,269	187,398,190	44.58%	410.4%
2022	435,076,551	1,657,389,131	193,957,126	44.58%	380.9%
2023	450,304,230	1,577,409,035	200,745,626	44.58%	350.3%
2024	466,064,878	1,483,935,510	207,771,723	44.58%	318.4%
2025	482,377,149	1,375,667,491	215,043,733	44.58%	285.2%
2026	499,260,349	1,353,268,658	124,257,963	24.89%	271.1%
2027	516,734,461	1,324,618,458	128,606,992	24.89%	256.3%
2028	534,820,167	1,289,074,369	133,108,237	24.89%	241.0%
2029	553,538,873	1,245,938,543	137,767,025	24.89%	225.1%
2030	572,912,734	1,194,453,322	142,588,871	24.89%	208.5%
2031	592,964,680	1,133,796,405	147,579,482	24.89%	191.2%
2032	613,718,444	1,063,075,630	152,744,764	24.89%	173.2%
2033	635,198,590	981,323,346	158,090,830	24.89%	154.5%
2034	657,430,541	887,490,337	163,624,009	24.89%	135.0%
2035	680,440,610	780,439,275	169,350,850	24.89%	114.7%
2036	704,256,031	658,937,650	175,278,130	24.89%	93.6%
2037	728,904,992	521,650,151	181,412,864	24.89%	71.6%
2038	754,416,667	367,130,441	187,762,314	24.89%	48.7%
2039	780,821,250	193,812,287	194,333,995	24.89%	24.8%
2040	808,149,994	0	201,135,685	24.89%	0.0%

\* Amortized as a level-percentage of payroll over a 11-year amortization period for unfunded retiree liabilities and a 26-year amortization period for other unfunded liabilities from July 1, 2014. Payroll was assumed to increase 2.22%.

**GASB No. 25**  
**SCHEDULE OF FUNDING PROGRESS**  
**JUNE 30, 2013**

<b>Year Ending June 30</b>	<b>Actuarial Asset Value</b>	<b>Entry Age Accrued Liability</b>	<b>Unfunded Accrued Liability (UAAL)</b>	<b>Funded Ratio</b>	<b>Estimated Covered Payroll</b>	<b>UAAL as a Percentage of Covered Payroll</b>
2004	\$ 1,331,588,207	\$ 2,492,918,976	\$ 1,161,330,769	53.41%	\$ 316,224,468	** 367.25%
2005#	1,417,348,982	2,627,409,025	1,210,060,043	53.94%	334,030,151	** 362.26%
2006	1,521,142,953	2,740,437,837	1,219,294,884	55.51%	341,227,890	** 357.33%
2007#	1,685,807,004	2,897,267,409	1,211,460,405	58.19%	365,012,472	** 331.90%
2008	1,783,902,280	3,019,633,781	1,235,731,501	59.08%	375,600,448	** 329.00%
2009	1,471,496,660	3,113,393,645	1,641,896,985	47.26%	379,590,273	** 432.54%
2010#	1,375,844,573	3,258,866,925	1,883,022,352	42.22%	378,063,006	** 498.07%
2011	1,427,290,718	3,297,589,869	1,870,299,151	43.28%	362,654,376	** 515.72%
2012#	1,531,033,613	3,306,278,671	1,775,245,058	46.31%	341,637,559	** 519.63%
2013	1,657,402,393	3,379,579,379	1,722,176,986	49.04%	329,481,506	** 522.69%
2013#	1,657,402,393	3,583,975,559	1,926,573,166	46.24%	329,481,506	** 584.73%

\*\* Values are estimated from contribution rate and amount.

# New assumptions and/or methods adopted.

**GASB No. 25**  
**SCHEDULE OF EMPLOYER CONTRIBUTIONS**  
**NON-UNIFORMED GROUP ##**  
**JUNE 30, 2013**

<b>Valuation Date</b>	<b>Fiscal Year Ending June 30,</b>	<b>Estimated Covered Payroll</b>		<b>Actual Employer Contributions</b>	<b>Actual Employer Contribution %</b>	<b>Annual Required Contribution (ARC) %</b>	<b>Annual Pension Cost</b>	<b>Percentage of APC Contributed</b>
June 30, 2002	2004	\$ 269,890,983	**	\$ 68,932,856	25.54%	25.54%	\$ 68,932,856	100.00%
June 30, 2003	2005	283,070,661	**	80,052,383	28.28%	28.28%	80,052,383	100.00%
June 30, 2004	2006	286,784,251	**	87,440,518	30.49%	30.49%	87,440,518	100.00%
June 30, 2005	2007#	302,223,556	**	93,991,526	31.10%	31.10% @	93,991,526	100.00%
June 30, 2006	2008	307,243,438	**	95,368,363	31.04%	31.04%	95,368,363	100.00%
June 30, 2007	2009	311,718,239	**	95,759,843	30.72%	30.72%	95,759,843	100.00%
June 30, 2008	2010#	310,637,016	**	97,540,023	31.40%	31.40%	97,540,023	100.00%
June 30, 2009	2011	294,637,164	**	116,263,825	39.46%	39.46%	116,263,825	100.00%
June 30, 2010	2012#	268,722,565	**	122,134,406	45.45%	45.45%	122,134,406	100.00%
June 30, 2011	2013	254,928,368	**	129,809,525	50.92%	50.92%	129,809,525	100.00%

\*\* Values are estimated from contribution rate and amount.

# New assumptions and/or methods adopted.

@ The ARC is the rate adopted by the Retirement Board. This rate exceeded the actuarially calculated rate.

## Includes non-uniformed employees of MoDOT, Patrol, and MPERS.

This information is presented in draft form for review by the System's auditor. Please let us know if there are any items that the auditor changes so that we may maintain consistency with the System's financial statements.

**GASB No. 25**  
**SCHEDULE OF EMPLOYER CONTRIBUTIONS**  
**UNIFORMED PATROL GROUP**  
**JUNE 30, 2013**

<b>Valuation Date</b>	<b>Fiscal Year Ending June 30,</b>	<b>Estimated Covered Payroll</b>		<b>Actual Employer Contributions</b>	<b>Actual Employer Contribution %</b>	<b>Annual Required Contribution (ARC) %</b>	<b>Annual Pension Cost</b>	<b>Percentage of APC Contributed</b>
June 30, 2002	2004	\$ 46,333,484	**	\$ 17,792,058	38.40%	38.40%	\$ 17,792,058	100.00%
June 30, 2003	2005	50,959,490	**	22,187,762	43.54%	43.54%	22,187,762	100.00%
June 30, 2004	2006	54,443,639	**	24,102,199	44.27%	44.27%	24,102,199	100.00%
June 30, 2005	2007#	62,788,916	**	27,802,932	44.28%	44.28% @	27,802,932	100.00%
June 30, 2006	2008	68,357,010	**	29,147,429	42.64%	42.64%	29,147,429	100.00%
June 30, 2007	2009	67,872,034	**	27,298,132	40.22%	40.22%	27,298,132	100.00%
June 30, 2008	2010#	67,425,990	**	26,936,683	39.95%	39.95%	26,936,683	100.00%
June 30, 2009	2011	68,017,212	**	33,688,925	49.53%	49.53%	33,688,925	100.00%
June 30, 2010	2012#	72,914,994	**	42,750,061	58.63%	58.63%	42,750,061	100.00%
June 30, 2011	2013	74,553,138	**	41,026,592	55.03%	55.03%	41,026,592	100.00%

\*\* Values are estimated from contribution rate and amount.

# New assumptions and/or methods adopted.

@ The ARC is the rate adopted by the Retirement Board. This rate exceeded the actuarially calculated rate.

This information is presented in draft form for review by the System's auditor. Please let us know if there are any items that the auditor changes so that we may maintain consistency with the System's financial statements.

**DEVELOPMENT OF GAIN/(LOSS)  
JULY 1, 2012 TO JUNE 30, 2013**

	UAAL =	AAL -	Assets
Beginning of Year Values (at July 1)	\$ 1,775,245,058	\$ 3,306,278,671	\$ 1,531,033,613
Normal Cost	47,434,823	47,434,823	0
Contributions	(173,703,401)	0	173,703,401
Disbursements	0	(227,511,003)	(227,511,003)
Interest	141,249,139	265,339,848	124,090,709
Expected Value Before Any Changes	1,790,225,619	3,391,542,339	1,601,316,720
Effect of Changes in Assumptions & Methods	204,396,180	204,396,180	0
Effect of Adjustment	0	0	0
Expected Value After Changes	1,994,621,799	3,595,938,519	1,601,316,720
End of Year Values (at June 30)	1,926,573,166	3,583,975,559	1,657,402,393
Gain/(Loss) for Year	\$ 68,048,633	\$ 11,962,960	\$ 56,085,673



**DEVELOPMENT OF GAIN/(LOSS)  
JULY 1, 2012 TO JUNE 30, 2013**

	<b>Total</b>	<b>Non-Uniform</b>	<b>Uniform</b>
Beginning of Year UAAL (at July 1)	\$ 1,775,245,058	\$ 1,362,414,960	\$ 412,830,098
Normal Cost	47,434,823	33,276,150	14,158,673
Contributions	(173,703,401)	(132,265,590)	(41,437,811)
Interest	141,249,139	108,315,920	32,933,219
Net Change in LTD Assets	0	0	0
Expected Value Before Any Changes	1,790,225,619	1,371,741,440	418,484,179
Effect of Changes in Assumptions & Methods	204,396,180	150,816,121	53,580,059
Effect of Adjustment	0	0	0
Expected Value After Changes	1,994,621,799	1,522,557,561	472,064,238
End of Year UAAL (at June 30)	1,926,573,166	1,477,201,166	449,372,000
Aggregate Gain/(Loss) for Year	\$ 68,048,633	\$ 45,356,395	\$ 22,692,238
Gain/(Loss) as a % of Beginning of Year Liabilities	2.06%	1.83%	2.74%
Asset Gain/(Loss) for Year	\$ 56,085,673	\$ 41,009,454	\$ 15,076,219
Liability Gain/(Loss) for Year	11,962,960	4,346,941	7,616,019
Aggregate Gain/(Loss) for Year	\$ 68,048,633	\$ 45,356,395	\$ 22,692,238

---

## **SECTION B**

### **SUMMARY OF BENEFITS**

---

**MISSOURI DEPARTMENT OF TRANSPORTATION AND  
HIGHWAY PATROL EMPLOYEES' RETIREMENT SYSTEM  
SUMMARY OF BENEFIT PROVISIONS EVALUATED  
AS OF JUNE 30, 2013**

---

<b>Closed Plan</b>	<b>Year 2000 Plan</b>	<b>2011 Tier</b>
<b>Participation</b>	<b>Participation</b>	<b>Participation</b>
<p>Participants include: All MPERS active members, vested terminated members, disability recipients, retirees and survivors who first became members prior to July 1, 2000 and who do not elect to transfer to the Year 2000 Plan at retirement.</p>	<p>Participants include:</p> <ol style="list-style-type: none"> <li>1. All active employees who first became members on or after July 1, 2000 but prior to January 1, 2011.</li> <li>2. Closed Plan active members and vested former members who elect to transfer to the Year 2000 Plan at retirement.</li> <li>3. Closed Plan retirees who elected to transfer to the Year 2000 Plan during the election window from July 1, 2000 through July 1, 2001, and their survivors.</li> <li>4. Closed Plan members who left state employment prior to becoming vested (not eligible for a future retirement benefit) and return to work in a benefit eligible position on or after July 1, 2000.</li> </ol>	<p>Participants include:</p> <ol style="list-style-type: none"> <li>1. All employees who first become members on or after January 1, 2011.</li> </ol>

**Closed Plan****Year 2000 Plan****2011 Tier****Normal Retirement Eligibility  
(unreduced benefit)**

*Non-Uniformed Employees:* The earlier of attaining:

1. Age 65 with at least 4 years of creditable service.
2. Age 60 with at least 15 years of creditable service.
3. Age 48 with age plus creditable service equal to 80 or more.

*Uniformed Patrol Employees Only:* The earlier of attaining:

1. Age 55 with at least 4 years of creditable service.
2. Mandatory retirement at age 60 with 5 or more years of creditable service.
3. Age 48 with age plus creditable service equal to 80 or more.

**Final Average Pay Used  
for Benefit Determination**

Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). Employees retiring from active service will receive 1/12 of a year of creditable service for every 168 hours of unused sick leave (usable only for benefit computation, not eligibility).

**Normal Retirement Eligibility  
(unreduced benefit)**

*Non-Uniformed Employees:* The earlier of attaining:

1. Age 62 with at least 5 years of creditable service.
2. Age 48 with age plus creditable service equal to 80 or more.

*Uniformed Patrol Employees Only:* The earlier of attaining:

1. Mandatory retirement at age 60 with at least 5 years of creditable service.
2. Age 48 with age plus creditable service equal to 80 or more.

**Final Average Pay Used  
for Benefit Determination**

Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). All members will receive 1/12 of a year of creditable service for every 168 hours of unused sick leave (usable only for benefit computation, not eligibility).

**Normal Retirement Eligibility  
(unreduced benefit)**

*Non-Uniformed Employees:* The earlier of attaining:

1. Age 67 with at least 10 years of creditable service.
2. Age 55 with age plus creditable service equal to 90 or more.

*Uniformed Patrol Employees Only:* The earlier of attaining:

1. Age 55 with at least 10 years of creditable service.
2. Mandatory retirement at age 60.

**Final Average Pay Used  
for Benefit Determination**

Final Average Pay is the average annual pay of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining average pay). All members will receive 1/12 of a year of creditable service for every 168 hours of unused sick leave (usable only for benefit computation, not eligibility).

**Closed Plan****Year 2000 Plan****2011 Tier****Normal Retirement Benefit Amount****Non-Uniformed Employees:**

Life Benefit: 1.6% of final average pay times years of creditable service.

**Uniformed Patrol Employees:**

Life Benefit: 2.1333% of final average pay times years of creditable service.

Special Benefit: \$90 per month payable until age 65. Offset by any amount earned from gainful employment. This benefit does not apply to uniformed members hired on or after January 1, 1995.

**Early Retirement (reduced benefit)****Eligibility: Non-Uniformed Employees**

Age 55 with at least 10 years of creditable service.

**Amount:**

Normal retirement amount reduced by 0.6% for each month that retirement precedes eligibility for normal retirement.

**Uniformed Patrol** members are not eligible for early retirement.

**Normal Retirement Benefit Amount****All Employees:**

Life Benefit: 1.7% of final average pay times years of creditable service.

**Temporary Benefit:**

If member retires between ages 48 and 62 with age plus creditable service equal to 80 or more, a temporary benefit is payable in the amount of 0.8% of final average pay times years of creditable service until attainment of the minimum age at which reduced social security benefits are payable or death, whichever occurs first. All Uniformed Patrol members are eligible for the temporary benefit until age 62.

**Early Retirement (reduced benefit)****Eligibility: All Employees**

Age 57 with at least 5 years of creditable service.

**Amount:**

Normal retirement amount reduced by 0.5% for each month that retirement precedes eligibility for normal retirement.

**Normal Retirement Benefit Amount****All Employees:**

Life Benefit: 1.7% of final average pay times years of creditable service.

**Temporary Benefit:**

If member retires between ages 55 and 62 with age plus creditable service equal to 90 or more, a temporary benefit is payable in the amount of 0.8% of final average pay times years of creditable service until attainment of the minimum age at which reduced social security benefits are payable or death, whichever occurs first. All Uniformed Patrol members are eligible for the temporary benefit until age 62.

**Early Retirement (reduced benefit)****Eligibility: All Active Non-Uniformed Employees**

Age 62 with at least 10 years of creditable service.

**Amount:**

Normal retirement amount reduced by 0.5% for each month that retirement precedes eligibility for normal retirement.

---

**Closed Plan**

---

**Year 2000 Plan**

---

**2011 Tier**

---

---

**Vested Deferred Benefits*****Eligibility: All Employees***

Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for early or normal retirement, considering years of creditable service.

---

**Minimum Base Benefit**

Receive a monthly base benefit of no less than \$15 for each full year of creditable service. Must be eligible to receive a normal or early retirement benefit the first of the month immediately following the date you leave state employment. Not required to immediately start drawing a benefit.

---

**Death Prior to Retirement**

A death benefit is payable to the surviving spouse or eligible children of the member who dies after earning 3 years of creditable service. The survivor annuity shall be the total monthly payment equal to 25% of the deceased member's accrued annuity calculated as if the member was of normal retirement age as of the date of death.

The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity.

If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21.

If the death is duty-related, there is no service requirement and the minimum annuity is 50% of the final average pay (FAP) to the surviving spouse or eligible children.

---

**Vested Deferred Benefits*****Eligibility: All Employees***

Fully vested in accrued pension with 5 years of creditable service. The benefit will commence at the age the individual is eligible for early or normal retirement considering years of creditable service.

---

**Minimum Base Benefit**

Same.

---

**Death Prior to Retirement**

The spouse of the member who dies after accruing 5 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity.

If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21.

If the death is duty related, there is no service requirement and the minimum annuity is 50% of the final average pay (FAP) to the surviving spouse or eligible children.

---

**Vested Deferred Benefits*****Eligibility: All Employees***

Fully vested in accrued pension with 10 years of creditable service. The benefit will commence at the age the individual is eligible for normal retirement considering years of creditable service.

---

**Minimum Base Benefit**

Same.

---

**Death Prior to Retirement**

The spouse of the member who dies after accruing 10 years of creditable service may elect to receive an annuity as if the employee had retired on the date of death and elected a joint and 100% survivor annuity.

If no eligible spouse survives or upon the death of the spouse, 80% of the member's accrued annuity will be paid to eligible children until age 21.

If the death is duty related, there is no service requirement and the minimum annuity is 50% of the final average pay (FAP) to the surviving spouse or eligible children.

---

**Closed Plan****Year 2000 Plan****2011 Tier**

---

**Death After Retirement**

---

The benefit payable is 50% of the benefit the retired member was receiving on the date of death (the normal form of payment), or the benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement.

A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary. Additionally, a member may designate a new spouse as beneficiary in the event of the death of the spouse the member was married to at the date of retirement. The election must be completed within one year of the date of marriage.

For period certain annuities, beneficiaries may be changed at any time.

**Pop-Up Provision**

---

Benefits to members who choose a reduced survivor form of payment and whose spouse precedes the member in death, will “pop-up” or revert to the amount the member would have received had he/she not elected a reduced survivor option.

**Death After Retirement**

---

The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement.

A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary. Additionally, a member may designate a new spouse as beneficiary in the event of the death of the spouse the member was married to at the date of retirement. The election must be completed within one year of the date of marriage.

For period certain annuities, beneficiaries may be changed at any time.

**Pop-Up Provision**

---

Same.

**Death After Retirement**

---

The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement.

A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary. Additionally, a member may designate a new spouse as beneficiary in the event of the death of the spouse the member was married to at the date of retirement. The election must be completed within one year of the date of marriage.

For period certain annuities, beneficiaries may be changed at any time.

**Pop-Up Provision**

---

Same.

---

**Closed Plan****Year 2000 Plan****2011 Tier**

---

**\$5,000 Death Benefit**

MPERS provides a \$5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for normal or work-related disability benefits after September 28, 1985. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire on or after September 28, 1985 are eligible to receive this benefit.

**Purchase of Service**

**Military:** Prior to retirement, qualifying members may purchase up to a maximum of 4 years military service that includes active service, and/or active and inactive duty training from which they were honorably discharged. All months the member is eligible for must be purchased. This service credit **can** be used to satisfy the vesting requirement. Periods of military service cannot coincide with employment in a state agency.

**Police Service:** Prior to retirement, uniformed patrol members only, may purchase up to a maximum of 4 years police service. Members must purchase all months of service they are eligible for.

**\$5,000 Death Benefit**

MPERS provides a \$5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for work-related disability benefits. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire on or after September 28, 1985 are eligible to receive this benefit.

**Purchase of Service**

**Military:** Prior to retirement, qualifying members may purchase up to a maximum of 4 years military service that includes active service from which they were honorably discharged. All months the member is eligible for must be purchased. This service credit **cannot** be used to satisfy the vesting requirement. Periods of military service cannot coincide with employment in a state agency.

**Police Service:** Not available.

**\$5,000 Death Benefit**

MPERS provides a \$5,000 death benefit for a designated beneficiary(ies) of members who retire from service or were approved for work-related disability benefits. Members who die while on terminated vested status or long-term disability status do not qualify for this benefit. Long-term disability recipients who retire on or after September 28, 1985 are eligible to receive this benefit.

**Purchase of Service**

**Military:** Not available.

**Police Service:** Not available.



**Closed Plan****Year 2000 Plan****2011 Tier**

**Portability:** Section 105.691 allows vested members to acquire (purchase/transfer) service credit for any non-federal, full-time public sector employment within Missouri.

Service may be purchased/transferred by using the member's own money and/or using the value of the retirement benefit in the prior retirement plan if that plan has an agreement with MPERS. Any non-federal public employment **not covered** by a retirement plan must be purchased.

**Public Employment Prior Service (Subsidized purchase):**

Section 104.040.6 allows, prior to retirement, members may purchase up to a maximum of 4 years full-time "public employment". Public employment refers to employment with a city, county, municipality, public school, or other political subdivision. Federal and out-of-state employment is not eligible. Members must purchase all months of service they are eligible for up to 4 years.

**Disability**

Benefits that may be payable during the period of disability (whether Normal, Work-related, or LTD) are administered through a separate program and were not considered for purposes of the valuation.

Normal retirement benefits become payable at the time a disabled member becomes eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability.

**Portability:** Same as Closed Plan Section 105.691.

In addition, Section 104.1090 provides that in-state vested service with another retirement system may be granted after 10 years of state service if the other retirement plan agrees to transfer assets equal to the accrued liability to MPERS.

Service may be purchased/transferred by using the member's own money and/or using the value of the retirement benefit in the prior retirement plan if that plan has an agreement with MPERS. Any non-federal public employment **not covered** by a retirement plan must be purchased.

**Public Employment Prior Service (Subsidized purchase):**

Not available.

**Disability**

Same.

**Portability:** Same as Closed Plan Section 105.691.

In addition, Section 104.1090 provides that in-state vested service with another retirement system may be granted after 10 years of state service if the other retirement plan agrees to transfer assets equal to the accrued liability to MPERS.

Service may be purchased/transferred by using the member's own money and/or using the value of the retirement benefit in the prior retirement plan if that plan has an agreement with MPERS. Any non-federal public employment **not covered** by a retirement plan must be purchased.

**Public Employment Prior Service (Subsidized purchase):**

Not available.

**Disability**

Same.

**Closed Plan****Year 2000 Plan****2011 Tier****Post-Retirement Benefit Adjustments**

For active and inactive employees hired prior to August 28, 1997 and current retirees, the benefits of pensioners and their beneficiaries are increased annually by 80% of the increase in the Consumer Price Index (subject to a maximum increase of 5% and a minimum of 4%). These increases are made until the total of the increases reaches 65% of initial benefit at which time the increases will have the minimum removed.

For employees hired on or after August 28, 1997 the annual percentage increase is equal to the lesser of:

- i) 80% of the CPI-U increase, or
- ii) 5%.

**Member Contributions**

None.

**Post-Retirement Benefit Adjustments**

Benefits are increased to retired members (including survivors) annually in accordance with the following:

Annual benefit percentage increase equal to the lesser of:

- i) 80% of the CPI-U increase, or
- ii) 5%.

**Member Contributions**

None.

**Post-Retirement Benefit Adjustments**

Benefits are increased to retired members (including survivors) annually in accordance with the following:

Annual benefit percentage increase equal to the lesser of:

- iii) 80% of the CPI-U increase, or
- iv) 5%.

**Member Contributions**

4% contributions with interest credited to the account annually at 4%. The state of Missouri employer shall pick up and pay the contributions. A deduction shall be made from each member's compensation equal to the amount of the member's contributions picked up by the employer.

## **The Closed Plan & Year 2000 Plan BackDROP Option**

Legislation effective January 1, 2002 provides a Deferred Retirement Option Provision (BackDROP) to members of MPERS. It is available in both the Closed Plan and the Year 2000 Plan.

To be eligible to participate in the BackDROP, a member must have been eligible to retire under normal age and/or service conditions for at least two years. A retroactive starting date is established for BackDROP purposes which is the later of: 1) the member's normal retirement date, or 2) five years prior to the annuity starting date under the retirement plan selected by the member.

The BackDROP period for the accumulation of the BackDROP account is from the retroactive starting date to the annuity starting date. This results in a BackDROP period of one to five years depending upon the individual situation.

A theoretical BackDROP account is accumulated that includes 90% of the value of the benefit payments that would have been paid during the BackDROP period had the member retired at the retroactive starting date. These payments include applicable post-retirement benefit increases. These payments do not include any reduction for spouse options during the BackDROP period. The member may choose the BackDROP period in twelve-month increments or their maximum period, not to exceed 60 months.

The member is paid the resulting lump sum value of the BackDROP account as of the annuity starting date or as three equal annual installments beginning at the annuity starting date.

The annuity benefit payable from the actual retirement date is computed with years of service and final average pay as of the retroactive starting date for the BackDROP. Post-retirement benefit increases that occurred during the BackDROP period are applied in the calculation of the monthly annuity.

**SAMPLE BENEFIT COMPUTATION FOR CLOSED PLAN MEMBERS  
RETIRING JULY 1, 2013  
NON-UNIFORMED EMPLOYEE**

	<b>Data</b>	<b>Description</b>
A.	\$40,000	Final Average Pay
B.	20	Years of Creditable Service
C.	60	Age of Retiree
D.	50%	Automatic percentage to continue to spouse after retirant's death

**Sample Computation Steps**

E. Retirement Benefit Formula:  $0.016 \times 20 \times \$40,000 = \$12,800$

**Benefit payable to:**

F. Retiree while spouse is alive (E)	\$ 12,800
G. Spouse after retiree's death (D x E)	\$ 6,400
H. Retiree after spouse's death	\$ 12,800

Year Ended June 30	Annual Amount Payable if Price Inflation is 3.0% and Post-Retirement Increases are 2.4%
2014	\$12,800
2015	13,107
2016	13,422
2017	13,744
2018	14,074
2019	14,412
2020	14,757
2021	15,112
2022	15,474
2023	15,846

**SAMPLE BENEFIT COMPUTATION FOR CLOSED PLAN MEMBERS  
RETIRING JULY 1, 2013  
UNIFORMED PATROL**

	<b>Data</b>	<b>Description</b>
A.	\$40,000	Final Average Pay
B.	20	Years of Creditable Service
C.	60	Age of Retiree
D.	50%	Automatic percentage to continue to spouse after retirant's death

**Sample Computation Steps**

E. Retirement Benefit Formula:  $0.021333 \times 20 \times \$40,000 = \$17,066$

**Benefit payable to:**

F. Retiree while spouse is alive (E)	\$ 17,066
G. Spouse after retiree's death (D x E)	\$ 8,533
H. Retiree after spouse's death	\$ 17,066

Amounts shown below do not include the \$1,080 annual supplementary benefit payable to age 65.

<b>Year Ended June 30</b>	<b>Annual Amount Payable if Price Inflation is 3.0% and Post-Retirement Increases are 2.4%</b>
2014	\$17,066
2015	17,476
2016	17,895
2017	18,324
2018	18,764
2019	19,215
2020	19,676
2021	20,148
2022	20,632
2023	21,127

# SAMPLE BENEFIT COMPUTATION FOR YEAR 2000 PLAN MEMBERS RETIRING JULY 1, 2013

	Data	Description
A.	\$40,000	Final Average Pay
B.	20	Years of Creditable Service
C.	60	Age of Retiree
D.	0%	Automatic percentage to continue to spouse after retirant's death

E1. Retirement Benefit Formula:  $0.017 \times 20 \times \$40,000 = \$13,600$

E2. Supplemental Benefit Formula:  $.008 \times 20 \times \$40,000 = \$6,400$

**Benefit payable to:**

F1. Retiree prior to age 62 (E1+E2)	\$ 20,000
F2. Retiree after age 62 (E1)	\$ 13,600
G. Spouse after retiree's death (D x E)	\$ 0

Year Ended June 30	Annual Amount Payable if Price Inflation is 3.0% and Post-Retirement Increases are 2.4%
2014	\$20,000
2015	20,480
2016	14,261
2017	14,603
2018	14,953
2019	15,312
2020	15,680
2021	16,056
2022	16,441
2023	16,836

---

**SECTION C**

FINANCIAL INFORMATION

---

## SUMMARY OF FUND OPERATIONS

	2013	2012
Market Value of Fund (Beginning of Fiscal Year)	\$1,538,652,957	\$1,552,347,992
Post Valuation Audit Adjustment	2,750,589	3,332,684
Contributions		
Employee	503,550	202,749
Employer	170,836,117	164,884,467
Transfer from MOSERS	1,727,834	265,253
Service Purchase (Employee)	635,900	908,948
Total Contributions	\$ 173,703,401	\$ 166,261,417
Investment Return		
Interest	\$ 11,035,651	\$ 18,741,892
Dividends	7,950,397	5,892,801
Real Estate	13,894,347	12,130,170
Realized Capital Gains	82,947,929	88,933,340
Realized Capital Losses	(49,212,967)	(36,776,086)
Miscellaneous Income	0	0
Securities Lending Income	174,860	210,034
Other	11,743	17,966
Total Investment Return	\$ 66,801,960	\$ 89,150,117
Other Income (Rental Income and Misc)	1,650	11,008
Increase (Decrease) in Unrealized Appreciation	145,984,054	(32,284,245)
Benefit Payments		
Retirement Payments	\$ 206,451,507	\$ 196,760,645
Retirement Payments - BackDROP	13,426,923	18,138,891
Death Benefits	665,000	660,000
Long-Term Disability Payments	79,964	85,240
Insured Disability Program	1,512,685	1,592,734
Employee Contribution Refunds	29,300	373
Service Transfer Payments - Employer	2,357,080	2,475,144
Total Benefit Payments	\$ 224,522,459	\$ 219,713,027
Expenses		
Investment	\$ 18,513,737	\$ 17,259,856
Other	2,988,544	3,193,133
Total Expenses	\$ 21,502,281	\$ 20,452,989
Market Value of Fund (End of Fiscal Year)	\$1,681,869,871	\$1,538,652,957



# MISSOURI MPERS

## DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS

Valuation Date of June 30	2009	2010	2011	2012	2013	2014	2015
<b>A. Actuarial value at beginning of year</b>	\$1,783,902,280	\$1,471,496,660	\$1,375,844,573	\$1,427,290,718	\$1,531,033,613		
<b>B. Market value at end of year</b>	1,226,247,217	1,309,502,954	1,552,347,992	1,538,652,957	1,681,869,871		
<b>C. Market value at beginning of year</b>	1,717,754,176	1,226,247,217	1,309,502,954	1,552,347,992	1,538,652,957		
<b>D. Cash flow</b>							
D1. Contributions	123,057,975	124,476,706	168,061,372	166,261,417	173,703,401		
D2. Benefit Payments	(192,014,685)	(196,721,274)	(202,153,768)	(219,713,027)	(224,522,459)		
D3. Administrative Expenses	(2,603,223)	(2,413,554)	(2,834,887)	(3,193,133)	(2,988,544)		
D4. Non-Investment Net Cash Flow	(71,559,933)	(74,658,122)	(36,927,283)	(56,644,743)	(53,807,602)		
<b>E. Investment income</b>							
E1. Market Total (B - C - D4)	(419,947,026)	157,913,859	279,772,321	42,949,708	197,024,516		
E2. Assumed Rate of Return	8.25%	8.25%	8.25%	8.25%	8.25%		
E3. Amount for Immediate Recognition (A+.5xD4)xE2	144,220,091	118,318,827	111,983,927	115,414,889	124,090,709		
E4. Amount for Phased-In Recognition	(564,167,117)	39,595,032	167,788,394	(72,465,181)	72,933,807		
<b>F. Phased-in recognition of investment income</b>							
F1. Current Year (33 1/3% of E4)	(188,055,706)	13,198,344	55,929,465	(24,155,060)	24,311,269		
F2. First Prior Year	(59,772,826)	(92,738,309)	13,198,344	55,929,465	(24,155,060)	\$24,311,269	
F3. Second Prior Year	53,397,549	(59,772,827)	(92,738,308)	13,198,344	55,929,464	(24,155,060)	\$24,311,269
F4. Total Recognized Investment Gain (F1 + F2 + F3)	(194,430,983)	(139,312,792)	(23,610,499)	44,972,749	56,085,673	156,209	24,311,269
<b>G. Actuarial value at end of year (A + D4 + E3 + F4)</b>	1,662,131,455	1,375,844,573	1,427,290,718	1,531,033,613	1,657,402,393		
Less LTD Assets	0	0	0	0	0		
<b>H. Preliminary Plan AVA</b>	1,662,131,455	1,375,844,573	1,427,290,718	1,531,033,613	1,657,402,393		
<b>I. Corridor (Maximum of 120% of Market Value)</b>	1,471,496,660	1,571,403,545	1,862,817,590	1,846,383,548	2,018,243,845		
<b>J. Corridor (Minimum of 80% of Market Value)</b>	980,997,774	1,047,602,363	1,241,878,394	1,230,922,366	1,345,495,897		
<b>K. Additional Investment Gain/(Loss) recognized due to corridor</b>	190,634,795	0	0	0	0		
<b>L. Final Plan AVA after corridor adjustment, if any difference between market and actuarial values</b>	1,471,496,660	1,375,844,573	1,427,290,718	1,531,033,613	1,657,402,393		
Market Rate of Return	(24.97)%	13.28%	21.67%	2.82%	13.03%		
Ratio of Funding Value to Market Value	120.00%	105.07%	91.94%	99.50%	98.55%		
Funding Value Rate of Return	(3.04)%	(1.46)%	6.51%	11.46%	11.98%		

## ALLOCATION OF ASSETS BETWEEN GROUPS

---

The division between the Uniformed Patrol and Non-Uniformed Employee groups is in proportion to their market value of assets, as shown below:

<u>Allocation of Other Income</u>	<b>June 30</b>	
	<b>2013</b>	<b>2012</b>
1. Other Income	\$ 1,650	\$ 11,008
2. Investment Income		
a) Uniformed Patrol	18,341,847	23,862,539
b) Non-Uniformed Employees	48,460,113	65,287,578
c) Total	<u>66,801,960</u>	<u>89,150,117</u>
3. Other Income Split		
a) Uniformed Patrol		
(2a) / (2c) x (1)	453	2,946
b) Non-Uniformed Employees		
(2b) / (2c) x (1)	1,197	8,062
c) Total	<u>1,650</u>	<u>11,008</u>

<u>Allocation of Funding Value of Assets</u>	<b>June 30</b>	
	<b>2013</b>	<b>2012</b>
1. Funding Value of Assets	\$1,657,402,393	\$1,531,033,613
2. Market Value of Assets		
a) Uniformed Patrol	466,364,914	417,913,038
b) Non-Uniformed Employees	1,215,504,957	1,120,739,919
c) Total	<u>1,681,869,871</u>	<u>1,538,652,957</u>
3. Funding Value of Assets Split		
a) Uniformed Patrol		
(2a) / (2c) x (1)	459,580,338	415,843,550
b) Non-Uniformed Employees		
(2b) / (2c) x (1)	1,197,822,055	1,115,190,063
4. Total Assets Allocated	<u>1,657,402,393</u>	<u>1,531,033,613</u>

---

## **SECTION D**

### SUMMARY OF MEMBER DATA

---

**CIVILIAN PATROL CLOSED ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

---

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34		1	1	2				4	\$ 135,966
35-39			15	17				32	1,377,244
40-44		1	12	34	10			57	2,619,056
45-49		1	10	42	33	18	1	105	4,513,195
50-54			13	27	36	36	17	129	5,662,061
55-59			6	24	18	16	13	77	3,389,928
60			4	6		4	1	15	560,737
61			2	4	1	3	2	12	589,453
62				2	4	2	5	13	581,532
63				3		2		5	178,957
64				1	4		1	6	197,950
65			1	2	1	2		6	215,519
66						1		1	39,711
67					2			2	67,546
68									
69					1			1	21,103
70				1				1	31,236
Over 70						1		1	35,522
<b>Totals</b>		<b>3</b>	<b>64</b>	<b>165</b>	<b>110</b>	<b>85</b>	<b>40</b>	<b>467</b>	<b>\$20,216,716</b>

Average Age: 50.8 years  
Average Service: 21.2 years  
Average Pay: \$43,291

**CIVILIAN PATROL YEAR 2000 ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

---

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24	2							2	\$ 56,412
25-29	45	21	1					67	2,559,372
30-34	19	60	17					96	3,897,367
35-39	10	38	24					72	2,867,649
40-44	17	32	18					67	2,355,174
45-49	9	31	18					58	2,127,879
50-54	15	19	29	1				64	2,264,248
55-59	5	19	16					40	1,326,593
60	1	3	3					7	206,011
61	1	4	2					7	250,562
62	1		2					3	97,957
63		2	3					5	157,015
64	1	1	2					4	138,492
65	1	1	1					3	101,725
66		1	2					3	87,103
67	1	2						3	99,806
68									
69		2	1					3	96,638
70			1					1	29,052
Over 70		2	1					3	77,118
<b>Totals</b>	<b>128</b>	<b>238</b>	<b>141</b>	<b>1</b>				<b>508</b>	<b>\$18,796,173</b>

Average Age: 42.3 years  
Average Service: 7.6 years  
Average Pay: \$37,000

**CIVILIAN PATROL 2011 TIER ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

---

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24	25							25	\$ 608,868
25-29	47							47	1,449,944
30-34	13							13	364,416
35-39	13							13	351,498
40-44	15							15	418,415
45-49	13							13	359,131
50-54	7							7	175,966
55-59	9							9	234,192
60	1							1	11,696
61									
62	3							3	79,596
63									
64									
65									
66									
67									
68									
69									
70									
Over 70	1							1	24,786
<b>Totals</b>	<b>147</b>							<b>147</b>	<b>\$ 4,078,508</b>

Average Age: 35.1 years  
Average Service: 1.3 years  
Average Pay: \$27,745

**MoDOT CLOSED ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34			27	2				29	\$ 1,112,219
35-39			128	77	2			207	9,324,338
40-44			86	259	96	3		444	21,543,826
45-49		2	90	168	212	120	10	602	29,125,301
50-54			68	154	167	235	51	675	32,707,823
55-59			41	111	92	81	47	372	17,125,988
60			6	16	9	8	4	43	1,815,398
61		1	7	7	14	7	1	37	1,550,919
62			6	8	3	6	2	25	1,157,555
63			5	2	7	3	2	19	968,577
64			6	1		1	2	10	442,469
65				6	2	1	2	11	565,516
66				3	5	1		9	399,638
67				1		1		2	69,895
68									
69						1		1	41,425
70									
Over 70					3		1	4	207,515
<b>Totals</b>		<b>3</b>	<b>470</b>	<b>815</b>	<b>612</b>	<b>468</b>	<b>122</b>	<b>2,490</b>	<b>\$118,158,402</b>

Average Age: 49.0 years  
Average Service: 20.7 years  
Average Pay: \$47,453

**MoDOT YEAR 2000 ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24	14							14	\$ 395,834
25-29	96	111						207	7,543,993
30-34	70	235	98					403	16,106,117
35-39	71	168	128					367	14,090,313
40-44	63	149	95	1				308	11,298,490
45-49	40	129	91					260	9,227,283
50-54	49	140	107	1	2			299	10,941,627
55-59	31	102	52	1				186	6,668,149
60	3	17	12	1	1			34	1,279,144
61	2	8	8	1				19	663,116
62	1	4	8					13	468,843
63	2	5	2					9	296,471
64		2	2					4	152,100
65		3	3					6	222,954
66	1	5	1					7	270,638
67				1				1	56,583
68		1						1	32,880
69		1	1					2	67,756
70	1							1	12,081
Over 70		1						1	33,166
<b>Totals</b>	<b>444</b>	<b>1,081</b>	<b>608</b>	<b>6</b>	<b>3</b>			<b>2,142</b>	<b>\$79,827,538</b>

Average Age: 41.9 years  
Average Service: 8.0 years  
Average Pay: \$37,268



**MoDOT 2011 TIER ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

---

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20	1							1	\$ 21,246
20-24	42							42	846,943
25-29	75							75	1,585,381
30-34	54							54	1,151,963
35-39	39							39	912,167
40-44	42							42	968,556
45-49	27							27	813,556
50-54	36							36	832,238
55-59	23							23	498,427
60	1							1	30,748
61	2							2	48,846
62	1							1	25,966
63									
64	1							1	27,655
65									
66	1							1	17,018
67									
68	1							1	23,836
69									
70									
Over 70									
<b>Totals</b>	<b>346</b>							<b>346</b>	<b>\$7,804,546</b>

Average Age: 36.9 years

Average Service: 0.4 years

Average Pay: \$22,556

**UNIFORMED PATROL CLOSED ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

---

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24									
25-29									
30-34			2					2	\$ 118,558
35-39			30	42				72	4,365,072
40-44		1	20	183	16			220	14,619,128
45-49	1		6	79	97	15		198	14,387,315
50-54			1	21	31	69	21	143	11,175,283
55-59				2	6	19	31	58	4,732,365
60							2	2	152,917
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
Over 70									
<b>Totals</b>	<b>1</b>	<b>1</b>	<b>59</b>	<b>327</b>	<b>150</b>	<b>103</b>	<b>54</b>	<b>695</b>	<b>\$49,550,638</b>

Average Age: 46.2 years  
Average Service: 21.0 years  
Average Pay: \$71,296

**UNIFORMED PATROL YEAR 2000 ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

---

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24	3							3	\$ 120,663
25-29	62	51						113	5,334,420
30-34	14	96	26					136	6,776,433
35-39	8	27	65					100	5,111,786
40-44	3	12	26					41	2,052,095
45-49	1	5	6					12	593,297
50-54			1					1	59,636
55-59			1					1	51,520
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
Over 70									
<b>Totals</b>	<b>91</b>	<b>191</b>	<b>125</b>					<b>407</b>	<b>\$20,099,850</b>

Average Age: 33.3 years  
Average Service: 7.7 years  
Average Pay: \$49,385

**UNIFORMED PATROL 2011 TIER ACTIVE MEMBERS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE AND YEARS OF SERVICE**

---

Attained Age	Count by Complete Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30+	No.	Valuation Payroll
Under 20									
20-24	37							37	\$1,436,164
25-29	58							58	2,397,936
30-34	13							13	508,026
35-39	5							5	193,021
40-44	3							3	107,201
45-49	1							1	31,049
50-54									
55-59									
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
Over 70									
<b>Totals</b>	<b>117</b>							<b>117</b>	<b>\$4,673,397</b>

Average Age: 27.1 years  
Average Service: 1.6 years  
Average Pay: \$39,944

## GROWTH OF ACTIVE MEMBER PAYROLL

---

Actuarial Valuation for June 30,	Number	Covered Payroll	Average Pay	% Change in Average Pay from Prior Year
1989	8,181	\$194,452,400	\$23,769	(0.5)%
1990	8,256	211,414,753	25,607	7.7 %
1991	8,308	220,856,988	26,584	3.8 %
1992	8,591	228,503,592	26,598	0.1 %
1993	8,658	236,236,082	27,285	2.6 %
1994	8,849	242,864,780	27,445	0.6 %
1995	8,904	250,529,253	28,137	2.5 %
1996	9,023	264,196,115	29,280	4.1 %
1997	8,997	280,209,116	31,145	6.4 %
1998	8,871	284,889,796	32,115	3.1 %
1999	9,140	298,673,247	32,678	1.8 %
2000	9,171	312,532,009	34,078	4.3 %
2001	9,087	327,049,257	35,991	5.6 %
2002	8,695	312,747,492	35,969	(0.1)%
2003	8,892	318,744,192	35,846	(0.3)%
2004	9,002	328,210,887	36,460	1.7 %
2005	9,193	345,695,867	37,604	3.1 %
2006	9,033	348,614,699	38,593	2.6 %
2007	8,640	360,842,421	41,764	8.2 %
2008	8,599	369,424,653	42,961	2.9 %
2009	8,784	377,652,245	42,993	0.1 %
2010	8,457	369,911,252	43,740	1.7 %
2011	8,231	361,639,001	43,936	0.4 %
2012	7,458	329,293,168	44,153	0.5 %
2013	7,319	323,205,767	44,160	0.0 %
<b>Ten-Year Average:</b>				2.1 %

**COUNT AND TOTAL MONTHLY BENEFITS OF  
CIVILIAN PATROL CLOSED RETIRED (NON-DISABLED)  
MEMBERS AND SURVIVORS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE**

---

Age	Number	Monthly Amount
Less than 20		
20-24		
25-29		
30-34		
35-39		
40-44		
45-49		
50-54	7	\$ 9,546
55-59	19	22,096
60-64	41	58,028
65-69	62	76,324
70-74	72	135,533
75-79	95	164,082
80-84	87	134,825
85-89	41	58,534
90 & Over	15	12,642
<b>TOTAL</b>	<b>439</b>	<b>\$ 671,610</b>

**COUNT AND TOTAL MONTHLY BENEFITS OF  
CIVILIAN PATROL YEAR 2000 RETIRED (NON-DISABLED)  
MEMBERS AND SURVIVORS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE**

---

Age	Number	Monthly Amount
Less than 20		
20-24		
25-29		
30-34		
35-39		
40-44		
45-49		
50-54	19	\$ 49,850
55-59	92	224,332
60-64	148	254,448
65-69	121	168,401
70-74	50	75,623
75-79	4	1,793
80-84	3	2,802
85-89	2	2,502
90 & Over	3	4,603
<b>TOTAL</b>	<b>442</b>	<b>\$ 784,354</b>

**COUNT AND TOTAL MONTHLY BENEFITS OF  
 MoDOT CLOSED RETIRED (NON-DISABLED)  
 MEMBERS AND SURVIVORS  
 AS OF JUNE 30, 2013  
 BY ATTAINED AGE**

---

Age	Number	Monthly Amount
Less than 20	10	\$ 5,827
20-24	2	561
25-29		
30-34		
35-39	4	2,085
40-44	7	6,312
45-49	23	20,296
50-54	42	51,357
55-59	149	172,975
60-64	282	358,287
65-69	366	556,216
70-74	654	1,389,453
75-79	883	2,021,052
80-84	671	1,362,930
85-89	415	698,694
90 & Over	213	207,584
<b>TOTAL</b>	<b>3,721</b>	<b>\$ 6,853,629</b>



**COUNT AND TOTAL MONTHLY BENEFITS OF  
 MoDOT YEAR 2000 RETIRED (NON-DISABLED)  
 MEMBERS AND SURVIVORS  
 AS OF JUNE 30, 2013  
 BY ATTAINED AGE**

---

Age	Number	Monthly Amount
Less than 20	8	\$ 1,346
20-24	1	36
25-29		
30-34		
35-39		
40-44	3	2,026
45-49	5	8,606
50-54	230	678,235
55-59	568	1,473,423
60-64	749	1,410,549
65-69	708	1,191,349
70-74	294	498,832
75-79	31	41,026
80-84	23	37,896
85-89	36	58,641
90 & Over	20	26,675
<b>TOTAL</b>	<b>2,676</b>	<b>\$ 5,428,640</b>

**COUNT AND TOTAL MONTHLY BENEFITS OF  
UNIFORMED PATROL CLOSED RETIRED (NON-DISABLED)  
MEMBERS AND SURVIVORS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE**

---

Age	Number	Monthly Amount
Less than 20	3	\$ 2,983
20-24	2	426
25-29		
30-34	2	2,573
35-39	4	9,409
40-44	4	8,345
45-49	1	2,380
50-54	19	68,160
55-59	103	420,104
60-64	165	726,624
65-69	168	758,119
70-74	144	677,849
75-79	92	439,502
80-84	67	292,353
85-89	41	132,064
90 & Over	20	52,121
<b>TOTAL</b>	<b>835</b>	<b>\$ 3,593,012</b>

**COUNT AND TOTAL MONTHLY BENEFITS OF  
UNIFORMED PATROL YEAR 2000 RETIRED (NON-DISABLED)  
MEMBERS AND SURVIVORS  
AS OF JUNE 30, 2013  
BY ATTAINED AGE**

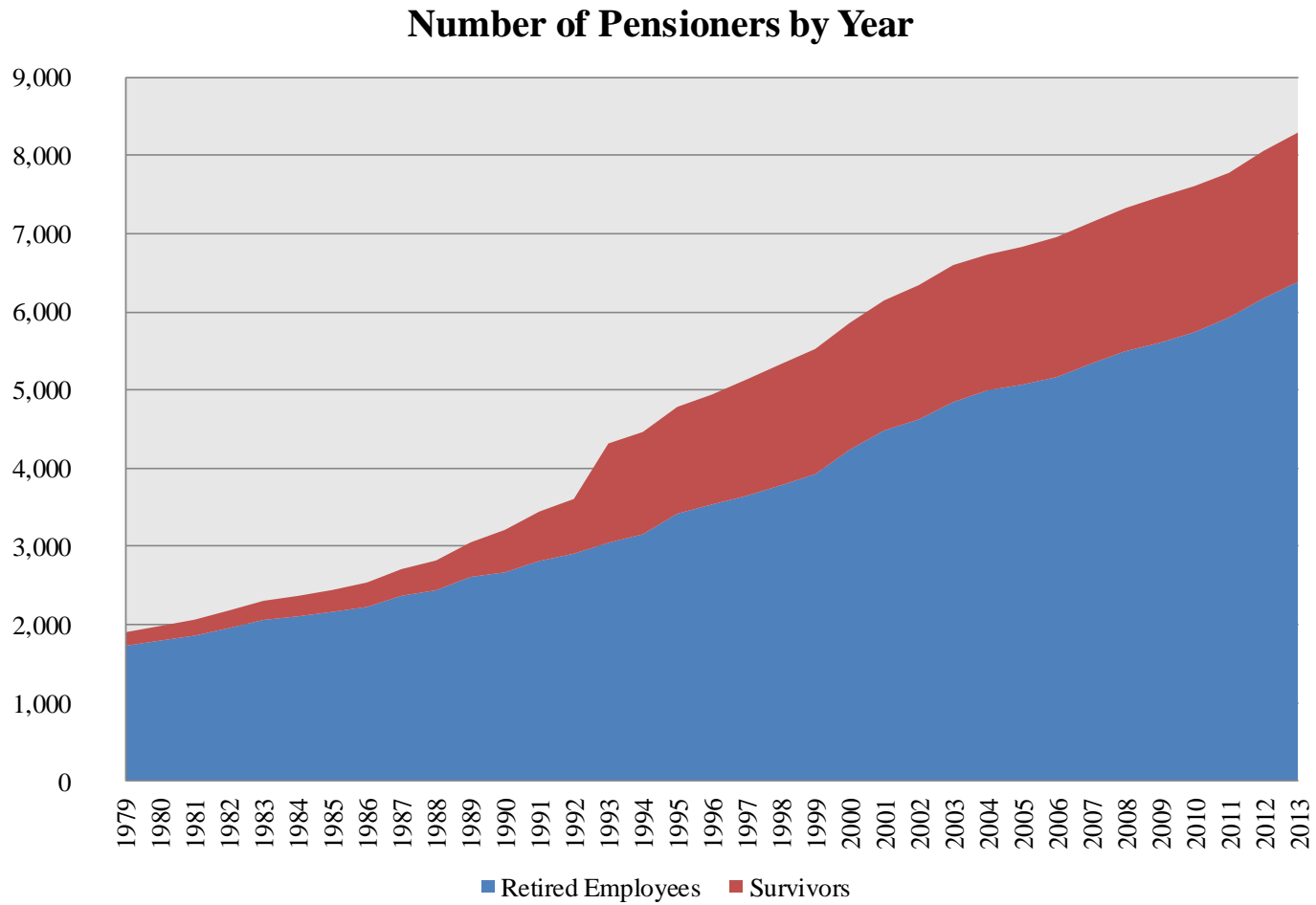
---

Age	Number	Monthly Amount
Less than 20		
20-24		
25-29		
30-34		
35-39	2	\$ 2,442
40-44		
45-49		
50-54		
55-59		
60-64		
65-69		
70-74		
75-79		
80-84		
85-89		
90 & Over		
<b>TOTAL</b>	<b>2</b>	<b>\$ 2,442</b>

## GROWTH OF PENSION POPULATION BY YEAR

Year	Retired Employees	Survivors	Total	% Increase	Annual Benefits	Active Payroll	Benefits as a % of Payroll
1979	1,730	174	1,904	5.6%			
1980	1,797	186	1,983	4.1%			
1981	1,860	204	2,064	4.1%			
1982	1,957	225	2,182	5.7%			
1983	2,061	244	2,305	5.6%			
1984	2,107	261	2,368	2.7%			
1985	2,164	280	2,444	3.2%			
1986	2,227	312	2,539	3.9%			
1987	2,369	341	2,710	6.7%			
1988	2,440	380	2,820	4.1%			
1989	2,610	441	3,051	8.2%			
1990	2,669	543	3,212	5.3%			
1991	2,814	632	3,446	7.3%			
1992	2,908	699	3,607	4.7%			
1993	3,047	1,269	4,316	19.7%			
1994	3,156	1,307	4,463	3.4%			
1995	3,419	1,365	4,784	7.2%			
1996	3,536	1,405	4,941	3.3%			
1997	3,646	1,486	5,132	3.9%			
1998	3,781	1,549	5,330	3.9%	\$ 80,686,152	\$284,889,796	28.3%
1999	3,924	1,600	5,524	3.6%	91,512,311	298,673,247	30.6%
2000	4,236	1,621	5,857	6.0%	100,794,676	312,532,009	32.3%
2001	4,482	1,663	6,145	4.9%	115,998,915	327,049,257	35.5%
2002	4,623	1,716	6,339	3.2%	125,623,460	312,747,492	40.2%
2003	4,845	1,751	6,596	4.1%	136,320,125	318,744,192	42.8%
2004	4,996	1,735	6,731	2.0%	142,359,307	328,210,887	43.4%
2005	5,068	1,761	6,829	1.5%	148,340,170	345,695,867	42.9%
2006	5,164	1,790	6,954	1.8%	155,230,301	348,614,699	44.5%
2007	5,336	1,805	7,141	2.7%	164,048,455	360,842,421	45.5%
2008	5,496	1,829	7,325	2.6%	172,112,941	369,424,653	46.6%
2009	5,604	1,866	7,470	2.0%	179,850,466	377,652,245	47.6%
2010	5,739	1,867	7,606	1.8%	187,267,535	369,911,252	50.6%
2011	5,926	1,849	7,775	2.2%	191,892,660	361,639,001	53.1%
2012	6,172	1,883	8,055	3.6%	201,906,768	329,293,168	61.3%
2013	6,382	1,908	8,290	2.9%	210,904,464	323,205,767	65.3%

# GROWTH OF PENSION POPULATION BY YEAR



**SELF INSURED DISABLED RETIRED MEMBERS  
AS OF JUNE 30, 2013**

---

Age	Number	Monthly Amount
Less than 20		
20-24		
25-29		
30-34		
35-39	2	\$ 4,591
40-44	2	2,533
45-49	7	6,116
50-54	19	19,039
55-59	9	14,838
60-64	10	11,616
65-69	7	9,379
70-74	5	6,857
75-79	2	2,543
80-84	1	105
85-89		
90 & Over		
<b>TOTAL</b>	<b>64</b>	<b>\$ 77,617</b>

These members became disabled prior to outsourcing disability claims. Liabilities for these members include benefits payable during and after the period of disability.

**FULLY INSURED DISABLED RETIRED MEMBERS  
AS OF JUNE 30, 2013**

---

Age	Number	Monthly Amount
Less than 20		
20-24		
25-29	2	\$ 4,938
30-34		
35-39	9	21,391
40-44	6	12,690
45-49	19	37,983
50-54	31	49,319
55-59	30	29,430
60-64	14	8,317
65-69		
70-74		
75-79		
80-84		
85-89		
90 & Over		
<b>TOTAL</b>	<b>111</b>	<b>\$ 164,068</b>

These members became disabled after disability claims became outsourced. Liabilities for these members during the period of disability are an obligation of the insurance company and not included in this valuation. Liabilities for these members after the period of disability are included in the valuation.

---

## **SECTION E**

### **ASSUMPTIONS USED IN THE VALUATION AND GLOSSARY**

---



# SUMMARY OF VALUATION METHOD AND ASSUMPTIONS

## JUNE 30, 2013

---

*The actuarial assumptions used* in the valuation are shown in this Section of the report unless stated otherwise. The assumptions were established for the June 30, 2013 actuarial valuation, following a five-year actuarial investigation. They were adopted by the Board after obtaining the advice of the Actuary and other professionals.

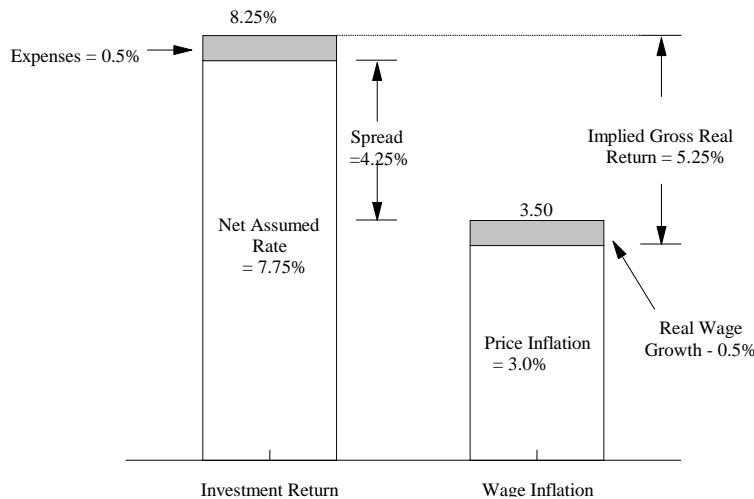
### Economic Assumptions

*The investment return rate* used in making the valuations was 7.75% per year, compounded annually (net after investment expenses). The *wage inflation rate* was assumed to be 3.50%. The real rate of return over wage growth is defined to be the portion of total investment return, which is more than the rate of wage inflation. The 7.75% investment return rate and 3.50% wage inflation rate translates to an assumed real rate of return over wage growth net of expenses of 4.25%. Based upon other assumptions, the net real rate of return over price inflation is 4.75%.

*Pay increase assumptions for merit and seniority* for individual active members are shown on pages E-3 and E-4. Part of the total assumed pay increase at each age is for merit and/or seniority, and the other 3.50% recognizes wage inflation. *The active member payroll* for MoDOT members is assumed to increase 1.50% annually next year and 3.50% annually thereafter. The active member payroll for all other members is assumed to increase 3.50% annually for all years.

*The price inflation rate* is assumed to be 3.00% annually. This is the inflation rate upon which the post-retirement increases are based. The difference between wage and price inflation of 0.5% is attributable to overall productivity increases and macroeconomic factors.

*The number of active members* is assumed to continue at the present number.



**SUMMARY OF VALUATION METHOD AND ASSUMPTIONS**  
**JUNE 30, 2013**  
**(CONTINUED)**

---

**Non-Economic Assumptions**

*The mortality tables*, for post-retirement mortality, used in evaluating allowances to be paid to non-disabled pensioners were the RP-2000 Combined Healthy Mortality Tables projected 16 years and set back 1 year for males and females. Pre-retirement mortality used was 70% for males and 50% for females of the post-retirement tables set back 1 year for males and set back 1 year for females. Disabled pension mortality was based on PBGC Disabled Mortality tables. Related values are shown on page E-5. The healthy mortality tables include a margin for mortality improvement. The margin is in the 16-year projection. The disabled mortality tables do not include a margin for mortality improvement.

*The probabilities of age and service retirement* are shown on page E-7. Upon retirement, members are assumed to pick the BackDROP period that when combined with the remaining annuity produces the highest liability.

*The probabilities of withdrawal from service* are shown on pages E-9 and E-10. *The probabilities of disability* are shown on page E-8.

*The entry age normal actuarial cost method of valuation* was used in determining liabilities and normal cost.

Differences in the past between assumed experience and actual experience (“actuarial gains and losses”) become part of actuarial accrued liabilities.

Unfunded actuarial accrued liabilities are amortized to produce payments (principal & interest) which are level percents of payroll contributions.

*Employer contributions* were assumed to be *paid in equal installments* throughout the employer fiscal year.

*Present assets (cash & investments)* were used with a market value adjustment. Assets may be used in the valuation prior to the final audit. The exact method is shown on page C-2.

*The data about persons now covered and about present assets* were furnished by the System’s administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary. Data was furnished as of May 31 and assumed to be statistically equivalent to June 30.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA) who has experience performing public plan valuations.

# AGE BASED SALARY SCALE

## All Plan Participants

Age	Salary Increase Assumptions for an Individual Member					
	Non-Uniformed			Uniformed		
	Merit & Seniority	Base (Economic)	Increase Next Year	Merit & Seniority	Base (Economic)	Increase Next Year
20	4.40%	3.50%	7.90%	6.00%	3.50%	9.50%
21	4.11%	3.50%	7.61%	6.00%	3.50%	9.50%
22	3.84%	3.50%	7.34%	6.00%	3.50%	9.50%
23	3.60%	3.50%	7.10%	5.48%	3.50%	8.98%
24	3.38%	3.50%	6.88%	4.89%	3.50%	8.39%
25	3.18%	3.50%	6.68%	4.25%	3.50%	7.75%
26	3.08%	3.50%	6.58%	3.54%	3.50%	7.04%
27	2.90%	3.50%	6.40%	3.38%	3.50%	6.88%
28	2.82%	3.50%	6.32%	3.08%	3.50%	6.58%
29	2.66%	3.50%	6.16%	2.78%	3.50%	6.28%
30	2.59%	3.50%	6.09%	2.48%	3.50%	5.98%
31	2.44%	3.50%	5.94%	2.18%	3.50%	5.68%
32	2.39%	3.50%	5.89%	1.88%	3.50%	5.38%
33	2.25%	3.50%	5.75%	1.76%	3.50%	5.26%
34	2.20%	3.50%	5.70%	1.65%	3.50%	5.15%
35	2.09%	3.50%	5.59%	1.54%	3.50%	5.04%
36	1.97%	3.50%	5.47%	1.43%	3.50%	4.93%
37	1.87%	3.50%	5.37%	1.31%	3.50%	4.81%
38	1.76%	3.50%	5.26%	1.24%	3.50%	4.74%
39	1.60%	3.50%	5.10%	1.16%	3.50%	4.66%
40	1.44%	3.50%	4.94%	1.09%	3.50%	4.59%
41	1.23%	3.50%	4.73%	1.01%	3.50%	4.51%
42	1.09%	3.50%	4.59%	0.94%	3.50%	4.44%
43	0.95%	3.50%	4.45%	0.86%	3.50%	4.36%
44	0.81%	3.50%	4.31%	0.79%	3.50%	4.29%
45	0.68%	3.50%	4.18%	0.71%	3.50%	4.21%
46	0.56%	3.50%	4.06%	0.64%	3.50%	4.14%
47	0.43%	3.50%	3.93%	0.56%	3.50%	4.06%
48	0.31%	3.50%	3.81%	0.53%	3.50%	4.03%
49	0.18%	3.50%	3.68%	0.49%	3.50%	3.99%
50	0.12%	3.50%	3.62%	0.45%	3.50%	3.95%
51	0.06%	3.50%	3.56%	0.41%	3.50%	3.91%
52	0.06%	3.50%	3.56%	0.38%	3.50%	3.88%
53	0.00%	3.50%	3.50%	0.35%	3.50%	3.85%
54	0.00%	3.50%	3.50%	0.32%	3.50%	3.82%
55	0.00%	3.50%	3.50%	0.29%	3.50%	3.79%
56	0.00%	3.50%	3.50%	0.26%	3.50%	3.76%
57	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
58	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
59	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
60	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
Ref.	11			403		

# SERVICE BASED SALARY SCALE

---

## Non-Uniformed Plan Participants

% Merit Increases in Salaries Next Year*	
Service Index	Rate
1	8.0%
2	7.0%
3	4.5%
4	4.0%
Ref	519

## Uniformed Plan Participants

% Merit Increases in Salaries Next Year*	
Service Index	Rate
1	10.0%
2	10.0%
Ref	518

\* For Non-Uniformed members with 4 or less years of service and Uniformed members with 2 or less years of service, the service based table overwrites the age based table on page E-3.

## POST-RETIREMENT MORTALITY

Age	Regular		Disabled		Age	Regular		Disabled	
	Male	Female	Male	Female		Male	Female	Male	Female
21	0.00025	0.00015	0.04589	0.02630	61	0.00521	0.00467	0.05928	0.03390
22	0.00027	0.00015	0.04589	0.02630	62	0.00603	0.00537	0.06109	0.03470
23	0.00028	0.00015	0.04589	0.02630	63	0.00688	0.00614	0.06242	0.03550
24	0.00029	0.00015	0.04589	0.02630	64	0.00799	0.00706	0.06346	0.03620
25	0.00031	0.00016	0.04589	0.02630	65	0.00900	0.00796	0.06441	0.03700
26	0.00032	0.00017	0.04380	0.02570	66	0.01017	0.00896	0.06527	0.03780
27	0.00034	0.00018	0.04142	0.02530	67	0.01169	0.01011	0.06622	0.03860
28	0.00035	0.00018	0.03905	0.02470	68	0.01304	0.01123	0.06736	0.03940
29	0.00036	0.00019	0.03686	0.02420	69	0.01426	0.01241	0.06869	0.04020
30	0.00038	0.00020	0.03439	0.02370	70	0.01580	0.01372	0.07021	0.04110
31	0.00041	0.00023	0.03221	0.02320	71	0.01744	0.01545	0.07192	0.04210
32	0.00046	0.00027	0.03040	0.02270	72	0.01929	0.01687	0.07372	0.04330
33	0.00052	0.00031	0.02869	0.02220	73	0.02142	0.01877	0.07562	0.04470
34	0.00058	0.00034	0.02736	0.02180	74	0.02386	0.02053	0.07771	0.04650
35	0.00065	0.00037	0.02641	0.02140	75	0.02662	0.02275	0.07999	0.04920
36	0.00071	0.00040	0.02584	0.02120	76	0.03019	0.02472	0.08256	0.05290
37	0.00078	0.00042	0.02575	0.02100	77	0.03365	0.02723	0.08626	0.05780
38	0.00083	0.00045	0.02594	0.02080	78	0.03805	0.03048	0.09139	0.06310
39	0.00088	0.00048	0.02622	0.02080	79	0.04297	0.03360	0.09909	0.06860
40	0.00091	0.00051	0.02679	0.02090	80	0.04853	0.03709	0.10716	0.07460
41	0.00095	0.00055	0.02736	0.02100	81	0.05481	0.04100	0.11600	0.08130
42	0.00099	0.00061	0.02822	0.02130	82	0.06234	0.04538	0.12559	0.08850
43	0.00104	0.00067	0.02898	0.02160	83	0.07078	0.05031	0.13604	0.09620
44	0.00109	0.00074	0.02983	0.02190	84	0.07890	0.05586	0.14735	0.10430
45	0.00115	0.00081	0.03059	0.02240	85	0.08917	0.06213	0.15970	0.11280
46	0.00122	0.00087	0.03135	0.02290	86	0.09898	0.07034	0.17338	0.12210
47	0.00129	0.00093	0.03230	0.02350	87	0.10974	0.07972	0.18810	0.13220
48	0.00136	0.00099	0.03354	0.02420	88	0.12355	0.09035	0.20425	0.14320
49	0.00144	0.00107	0.03487	0.02490	89	0.13898	0.10064	0.22135	0.15510
50	0.00152	0.00116	0.03639	0.02570	90	0.15359	0.11356	0.23988	0.16820
51	0.00160	0.00127	0.03810	0.02640	91	0.17202	0.12550	0.26021	0.18250
52	0.00180	0.00143	0.03990	0.02720	92	0.18736	0.13782	0.28234	0.19800
53	0.00193	0.00161	0.04171	0.02810	93	0.20644	0.15022	0.30647	0.21500
54	0.00211	0.00182	0.04370	0.02880	94	0.22270	0.16506	0.33203	0.23300
55	0.00231	0.00206	0.04579	0.02950	95	0.23893	0.17704	0.35996	0.25250
56	0.00267	0.00239	0.04807	0.03010	96	0.25906	0.18838	0.39036	0.27390
57	0.00314	0.00281	0.05045	0.03070	97	0.27496	0.19891	0.42351	0.29720
58	0.00357	0.00321	0.05273	0.03150	98	0.29040	0.21182	0.45961	0.32260
59	0.00407	0.00362	0.05520	0.03230	99	0.31029	0.22039	0.49809	0.34950
60	0.00459	0.00410	0.05729	0.03310	100	0.32496	0.22771	0.53998	0.37890
Ref	#508sb1x1	#509sb1x1	#250sb0x0.95	#251sb0x1		#508sb1x1	#509sb1x1	#250sb0x0.95	#251sb0x1

Pre-Retirement mortality is 70% of the regular post-retirement mortality values for males and 50% of the regular post-retirement mortality values for females.

**JOINT LIFE RETIREMENT VALUES**  
**(7.75% INTEREST)**

---

<b>Sample Attained</b>	<b>Present Value of \$1 Monthly for Life</b>		<b>Future Life Expectancy (years)</b>		
	<b>Ages</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>
50	\$147.46	\$147.37	33.34	35.39	
55	142.23	142.00	28.61	30.63	
60	135.19	134.87	24.03	26.02	
65	126.18	125.80	19.69	21.67	
70	115.18	114.73	15.71	17.66	
75	101.84	101.56	12.07	14.01	
80	86.45	86.42	8.86	10.73	
Ref:	#508sb1x1	#509sb1x1			

The present values shown above are for illustrative purposes only and include a 50% survivor benefit but do not include the value of future post-retirement increases. Males are assumed to be 3 years older than their spouses.

## RATES OF RETIREMENT

Age	Closed and Year 2000 Plans					2011 Tier			
	Non-Uniformed				Uniformed	Non-Uniformed			Uniformed
	Male		Female			Normal		Early	
	Normal	Early	Normal	Early	Normal	Age & Service	Rule of 90		Normal
50	0.3000		0.2500		0.3500				
51	0.2500		0.2000		0.1500				
52	0.2600		0.2000		0.1500				
53	0.2600		0.2000		0.1500				
54	0.2400		0.2400		0.1500				
55	0.2700	0.0300	0.3200	0.0300	0.2000		0.3000		0.3000
56	0.3000	0.0300	0.3500	0.0300	0.1500		0.3000		0.3000
57	0.2600	0.0400	0.2900	0.0300	0.3000		0.3000		0.3000
58	0.2200	0.0200	0.2500	0.0300	0.3500		0.3000		0.3000
59	0.2500	0.0400	0.3000	0.0300	0.5000		0.3000		0.3000
60	0.1900	0.0800	0.2200	0.0600	1.0000		0.3000		0.3000
61	0.1800	0.0400	0.2200	0.0500	1.0000		0.3000		0.3000
62	0.4500	0.3000	0.3600	0.3000	1.0000		0.3000	0.1000	0.3000
63	0.3700	0.4000	0.2200	0.3000	1.0000		0.3000	0.1000	0.3000
64	0.2500	0.4000	0.2000	0.2500	1.0000		0.3000	0.1000	0.3000
65	0.3500		0.3500		1.0000		0.3000	0.1000	0.3000
66	0.4000		0.4500		1.0000		0.3000	0.1000	0.3000
67	0.2500		0.4000		1.0000	0.5000	0.3000		0.3000
68	0.3000		0.4000		1.0000	0.5000	0.3000		0.3000
69	0.3000		0.4000		1.0000	0.5000	0.3000		0.3000
70	0.4000		0.5000		1.0000	1.0000	1.0000		1.0000
71	0.5000		0.5000		1.0000	1.0000	1.0000		1.0000
72	0.5000		1.0000		1.0000	1.0000	1.0000		1.0000
73	0.5000								
74	1.0000								
Ref	2265	2267	2266	2268	2264	1873	1875	1262	1875

# RATES OF DISABILITY

## All Plan Participants

Age	Non-Uniformed		Uniformed		Age	Non-Uniformed		Uniformed	
	Male	Female	Male	Female		Male	Female	Male	Female
21	0.0000	0.0006	0.0000	0.0000	51	0.0037	0.0059	0.0022	0.0022
22	0.0004	0.0006	0.0000	0.0000	52	0.0041	0.0063	0.0024	0.0024
23	0.0004	0.0007	0.0000	0.0000	53	0.0046	0.0067	0.0028	0.0028
24	0.0004	0.0007	0.0000	0.0000	54	0.0054	0.0071	0.0031	0.0031
25	0.0004	0.0007	0.0001	0.0001	55	0.0062	0.0074	0.0035	0.0035
26	0.0004	0.0007	0.0001	0.0001	56	0.0072	0.0078	0.0039	0.0039
27	0.0004	0.0008	0.0002	0.0002	57	0.0082	0.0082	0.0043	0.0043
28	0.0007	0.0008	0.0002	0.0002	58	0.0093	0.0086	0.0048	0.0048
29	0.0009	0.0008	0.0002	0.0002	59	0.0102	0.0090	0.0052	0.0052
30	0.0009	0.0008	0.0002	0.0002	60	0.0112	0.0090	0.0058	0.0058
31	0.0011	0.0009	0.0002	0.0002	61	0.0120	0.0090	0.0063	0.0063
32	0.0011	0.0010	0.0002	0.0002	62	0.0126	0.0090	0.0070	0.0070
33	0.0011	0.0011	0.0002	0.0002	63	0.0128	0.0090	0.0077	0.0077
34	0.0011	0.0012	0.0002	0.0002	64	0.0128	0.0090	0.0077	0.0077
35	0.0013	0.0013	0.0002	0.0002	65	0.0000	0.0090	0.0000	0.0000
36	0.0013	0.0014	0.0002	0.0002	66	0.0000	0.0090	0.0000	0.0000
37	0.0013	0.0015	0.0003	0.0003	67	0.0000	0.0090	0.0000	0.0000
38	0.0015	0.0015	0.0003	0.0003	68	0.0000	0.0090	0.0000	0.0000
39	0.0017	0.0016	0.0004	0.0004	69	0.0000	0.0090	0.0000	0.0000
40	0.0017	0.0017	0.0005	0.0005	70	0.0000	0.0090	0.0000	0.0000
41	0.0018	0.0021	0.0006	0.0006	71	0.0000	0.0090	0.0000	0.0000
42	0.0020	0.0025	0.0006	0.0006	72	0.0000	0.0090	0.0000	0.0000
43	0.0021	0.0029	0.0007	0.0007	73	0.0000	0.0090	0.0000	0.0000
44	0.0022	0.0032	0.0008	0.0008	74	0.0000	0.0090	0.0000	0.0000
45	0.0023	0.0036	0.0009	0.0009	75	0.0000	0.0090	0.0000	0.0000
46	0.0026	0.0040	0.0011	0.0011	76	0.0000	0.0090	0.0000	0.0000
47	0.0028	0.0044	0.0012	0.0012	77	0.0000	0.0090	0.0000	0.0000
48	0.0030	0.0048	0.0014	0.0014	78	0.0000	0.0090	0.0000	0.0000
49	0.0031	0.0052	0.0016	0.0016	79	0.0000	0.0090	0.0000	0.0000
50	0.0033	0.0055	0.0019	0.0019	80	0.0000	0.0090	0.0000	0.0000
Ref	#186x0.8	#517x0.6	#19x0.75	#19x0.75		#186x0.8	#517x0.6	#19x0.75	#19x0.75



## RATES OF SEPARATION FROM ACTIVE EMPLOYMENT LESS THAN 5 YEARS OF SERVICE

---

### All Plan Participants

Service	Non-Uniformed		Uniformed	
	Male	Female	Male	Female
0-1	0.3000	0.2000	0.1000	0.1000
1-2	0.1600	0.1400	0.0700	0.0700
2-3	0.0900	0.1100	0.0325	0.0325
3-4	0.0700	0.0900	0.0300	0.0300
4-5	0.0550	0.0500	0.0275	0.0275
Ref	852	853	851	851

This assumption was first used in the June 30, 2013 valuation.

# RATES OF SEPARATION FROM ACTIVE EMPLOYMENT MORE THAN 5 YEARS OF SERVICE

---

## All Plan Participants

Age	Non-Uniformed		Uniformed	
	Male	Female	Male	Female
25	0.0575	0.0510	0.0270	0.0270
26	0.0575	0.0510	0.0270	0.0270
27	0.0575	0.0510	0.0270	0.0270
28	0.0554	0.0510	0.0270	0.0270
29	0.0533	0.0510	0.0270	0.0270
30	0.0512	0.0510	0.0270	0.0270
31	0.0492	0.0510	0.0270	0.0270
32	0.0472	0.0510	0.0261	0.0261
33	0.0452	0.0493	0.0236	0.0236
34	0.0432	0.0476	0.0213	0.0213
35	0.0412	0.0459	0.0191	0.0191
36	0.0393	0.0442	0.0170	0.0170
37	0.0375	0.0425	0.0152	0.0152
38	0.0356	0.0408	0.0136	0.0136
39	0.0338	0.0391	0.0122	0.0122
40	0.0321	0.0374	0.0113	0.0113
41	0.0304	0.0357	0.0105	0.0105
42	0.0287	0.0340	0.0098	0.0098
43	0.0271	0.0323	0.0092	0.0092
44	0.0256	0.0306	0.0085	0.0085
45	0.0241	0.0289	0.0079	0.0079
46	0.0226	0.0272	0.0072	0.0072
47	0.0213	0.0255	0.0065	0.0065
48	0.0200	0.0238	0.0058	0.0058
49	0.0188	0.0221	0.0052	0.0052
50	0.0176	0.0204	0.0046	0.0046
51	0.0165	0.0187	0.0038	0.0038
52	0.0155	0.0170	0.0033	0.0033
53	0.0146	0.0153	0.0029	0.0029
54	0.0137	0.0136	0.0028	0.0028
55	0.0129	0.0119	0.0023	0.0023
56	0.0123	0.0102	0.0025	0.0025
57	0.0116	0.0085	0.0019	0.0019
58	0.0111	0.0068	0.0019	0.0019
59	0.0107	0.0051	0.0018	0.0018
60	0.0104	0.0034	0.0017	0.0017
61	0.0102	0.0017		
62	0.0101	0.0000		
63	0.0101	0.0000		
64	0.0102	0.0000		
65	0.0104	0.0000		
66	0.0107	0.0000		
67	0.0111	0.0000		
68	0.0111	0.0000		
69	0.0111	0.0000		
Ref	#63x0.7	#684x0.85	#1272x1	#1272x1

## MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

---

<b>Administrative Expenses:</b>	0.86% of payroll, based upon actual results from previous year.
<b>Disability Expenses:</b>	0.53% of payroll included in contribution. Retirement system pays premium directly to an outside insurance company or TPA.
<b>Marriage Assumption:</b>	90% of participants are assumed to be married for purposes of death-in-service benefits. Applies to disabled members entitled to future retirement benefits also.
<b>Pay Increase Timing:</b>	Beginning of (Fiscal) year.  This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
<b>Decrement Timing:</b>	Decrements of all types are assumed to occur mid-year.
<b>Eligibility Testing:</b>	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
<b>Benefit Service:</b>	Exact fractional service is used to determine the amount of benefit payable.
<b>Decrement Relativity:</b>	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
<b>Normal Form of Benefit:</b>	The assumed normal form of benefit is a 50% joint & survivor benefit for married members in the Closed Plan and a straight life benefit for all other members.
<b>Optional Benefit Factors:</b>	Optional Benefit Factors are in accordance with tables adopted by the Board.
<b>Active Member Data:</b>	Actual census date of data was May 31. Data was assumed to be statistically equivalent to June 30.
<b>Other:</b>	Turnover decrements do not operate during retirement eligibility.
<b>Miscellaneous Loading:</b>	The calculated normal and early retirement benefits for the Closed and Year 2000 plans were increased by 3.0% for Uniformed and 2.6% for Non-Uniformed to account for the inclusion of unused sick leave in the calculation of Average Pay. The calculated normal and early retirement benefits for the 2011 Tier plan were increased by 1.5% for Uniformed and 1.0% for Non-Uniformed to account for the inclusion of unused sick leave in the calculation of Average Pay. Post disability benefit liabilities were increased by 50% for all future disabilities to account for potential survivor benefits payable by the retirement system during the period of disability. Current self-insured disability retiree liabilities are increased by 23% to account for future survivor benefits.

## **METHOD OF FINANCING FUTURE BENEFITS FOR PRESENT ACTIVE MEMBERS**

---

The valuation was prepared in accordance with Section 104.1066 of the Missouri Revised Statutes, which requires the use of the entry-age normal actuarial cost method for determining normal cost and level percent-of-payroll financing of unfunded actuarial accrued liabilities. Details of the application of these methods are described below.

*Normal cost* and the allocation of present values between service rendered before and after the valuation date were determined using an individual entry-age actuarial cost method having the following characteristics:

- (i) the annual normal cost for each individual active member, payable from the date of employment to the date of retirement, is sufficient to accumulate the value of the member's benefit at the time of retirement;
- (ii) each annual normal cost is a constant percentage of the member's year by year projected covered pay.

The *Value of Future Benefits* was calculated using the benefits assumed to be payable in the future to current active, terminated vested and retired members. It was assumed that current active and retired Uniformed Patrol members hired prior to July 1, 2000 would elect to retain the benefits under the current plan. Computed costs were increased in accordance with the loads described on page E-11.

The *Present Value of Future Normal Costs* was defined as the average normal cost rate multiplied by the present value of future payroll for the group.

The *Actuarial Accrued Liabilities* were defined as the difference between the present value of future benefits and the present value of future normal costs.

Actuarial Accrued Liabilities, less pension assets as of June 30, 2013, resulted in *Unfunded Actuarial Accrued Liabilities* which were amortized using the following funding policy.

*Permanent Policy:* The total contribution will be based on normal cost plus a 22-year amortization of unfunded actuarial accrued liabilities. The amortization period is a closed 22-year period starting July 1, 2014.

*Temporary Accelerated Policy:* The total contribution is based on normal cost plus a 11-year amortization period for unfunded retiree liabilities and a 26-year amortization period for other unfunded liabilities. Both amortization periods are closed periods starting July 1, 2014.

This temporary accelerated policy was adopted by the Retirement Board on September 17, 2009 and will remain in effect until such time as the retiree liability becomes 100% funded or the permanent policy produces a higher contribution rate.

# JUNE 30, 2013 ACTUARIAL VALUATION

## GLOSSARY

---

**Actuarial Accrued Liability.** The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as “accrued liability” or “past service liability”.

**Accrued Service.** The service credited under the plan which was rendered before the date of the actuarial valuation.

**Actuarial Assumptions.** Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

**Actuarial Cost Method.** A mathematical budgeting procedure for allocating the dollar amount of the “actuarial present value of future plan benefits” between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the “actuarial funding method”.

**Actuarial Equivalent.** A series of payments is called an actuarial equivalent of another series of payments if the two series have the same actuarial present value.

**Actuarial Present Value.** The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

**Actuarial value of assets.** Also referred to as funding value of assets, smoothed market value of assets, or valuation assets.

Valuation assets recognize assumed investment return fully each year. Differences between actual and assumed investment return are phased in over a closed 3-year period. This treatment helps remove the timing of investment activities from the valuation process. During periods when investment performance exceeds the assumed rate, valuation assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, valuation assets will tend to be greater than market value. If assumed rates are exactly realized for 3 consecutive years, valuation assets will become equal to market value.

**Actuary.** A person who is trained in the applications of probability and compound interest to problems in business and finance that involve payment of money in the future, contingent upon the occurrence of future events. Most actuaries in the United States are Members of the American Academy of Actuaries. The Society of Actuaries is an international research, education and membership organization for actuaries in the life and health insurance, employee benefits, and pension fields. It administers a series of examinations leading initially to Associateship and the designation A.S.A. and ultimately to Fellowship with the designation F.S.A.

## JUNE 30, 2013 ACTUARIAL VALUATION GLOSSARY (CONCLUDED)

---

***Amortization.*** Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

***Experience Gain (Loss).*** A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

***Normal Cost.*** The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as “current service cost”. Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

***Plan Termination Liability.*** The actuarial present value of future plan benefits based on the assumption that there will be no further accruals for future service and salary. The termination liability will generally be less than the liabilities computed on a “going concern” basis and is not normally determined in a routine actuarial valuation.

***Reserve Account.*** An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

***Unfunded Actuarial Accrued Liability.*** The difference between the actuarial accrued liability and actuarial value of assets. Sometimes referred to as “unfunded accrued liability”.

The existence of unfunded actuarial accrued liabilities is not in itself bad, any more than a mortgage on a house is bad. Unfunded actuarial accrued liabilities do not represent a debt that is payable today. What is important is the ability to amortize the unfunded actuarial accrued liabilities and the trend in their amount (after due allowance for devaluation of the dollar).

***Valuation Payroll.*** Active member payroll that is intended to reflect the annual salary considered as covered compensation for Retirement System benefits.

---

**SECTION F**

FINANCIAL PRINCIPLES AND OPERATIONAL TECHNIQUES

---

## FINANCIAL PRINCIPLES AND OPERATIONAL TECHNIQUES OF THE RETIREMENT SYSTEM

---

***Promises Made, and To Be Paid For.*** As each year is completed, the Retirement System in effect hands an “IOU” to each member then acquiring a year of service credit -- the “IOU” says: “The Missouri Department of Transportation and Highway Patrol Employees’ Retirement System owes you one year’s worth of retirement benefits, payments in cash commencing when you qualify for retirement.”

The principal related financial question is: When shall the money required to cover the “IOU” be contributed? This year, when the benefit of the member’s service is received? Or, some future year when the “IOU” becomes a cash demand?

***The objective of level percent-of-payroll financing is that this year’s taxpayers contribute the money to cover the IOUs being handed out this year.*** By following this objective, ***the employer contribution rate will remain approximately level from year to year*** --- and will not have to be increased for future generations of taxpayers. However, “Level percent-of-payroll” does NOT mean “Fixed percent-of-payroll”. The level percent-of-payroll is an estimate that may change from one year to the next.

(There are systems which have a design for deferring contributions to future taxpayers, lured by a lower contribution rate now and putting aside the consequence that the contribution rate must then relentlessly grow much greater over decades of time.)

An inevitable by-product of the level-cost design is the accumulation of reserve assets, for decades, and the income produced when the assets are invested. ***Invested assets are a by-product and not the objective.*** Investment income becomes the 3rd contributor for benefits to employees, and is interlocked with the contribution amounts required from employees and employer.



## FINANCIAL PRINCIPLES AND OPERATIONAL TECHNIQUES OF THE RETIREMENT SYSTEM (CONCLUDED)

---

Translated to actuarial terminology, this level-cost objective means that the contribution rates must total at least the following:

*Normal Cost* (the value assigned to service being rendered this year)

. . . plus . . .

*Interest on Unfunded Actuarial Accrued Liabilities* (the difference between liabilities for service already rendered and the accrued assets of the Retirement System).

***Computing Contributions To Support System Benefits.*** From a given schedule of benefits and from the employee data and asset data furnished by the system, the actuary determines the contribution rates to support the benefits, by means of *an actuarial valuation*.

An actuarial valuation has a number of ingredients such as: the rate of investment return which plan assets will earn; the rates of withdrawal of active members who leave covered employment; the rates of mortality; the rates of disability; the rates of pay increases and the assumed age or ages at actual retirement.

In an actuarial valuation the actuary must assume what the above rates will be, for the next year and for decades in the future. Only the subsequent actual experience of the plan can indicate the degree of accuracy of the assumptions.

***Reconciling Differences Between Assumed Experience and Actual Experience.*** Once actual experience has occurred and has been observed, it will not coincide exactly with assumed experience, regardless of the skill of the actuary and the many calculations made. Most retirement systems cope with such differences by having annual actuarial valuations. Each actuarial valuation is a complete recalculation of assumed future experience, taking into account all past differences between assumed and actual experience. The result is *continuing adjustments to the financial position*.

## THE ACTUARIAL VALUATION PROCESS

---

The *actuarial valuation* is the mathematical process by which the contribution rate is determined, and the flow of activity constituting the valuation may be summarized as follows:

- A. ***Covered people data*** furnished by plan administrator, including:
  - Retired lives now receiving benefits
  - Former employees with vested benefits not yet payable
  - Active employees
  
- B. + ***Asset data*** (cash & investments), furnished by the plan administrator
  
- C. + ***Benefit provisions*** which specify eligibility and amounts of pensions
  
- D. + ***Assumptions concerning future experience in various risk areas***, which are established by the Retirement Board after consulting with the actuary
  
- E. + ***The funding method*** for employer contributions (the long-term, planned pattern for employer contributions)
  
- F. + ***Mathematically combining the assumptions, the funding method, and the data***
  
- G. = Determination of:
  - Plan Financial Position and/or
  - New Employer Contribution Rate

## MEANING OF "UNFUNDED ACTUARIAL ACCRUED LIABILITIES"

---

*“Actuarial accrued liabilities” are the portion of the present value of plan promises to pay benefits in the future that are not covered by future normal cost contributions.* A liability has been established (“accrued”) because the service has been rendered but the resulting monthly cash benefit may not be payable until years in the future. Actuarial accrued liabilities are the result of complex mathematical calculations, which are made by the plan’s actuary.

If “actuarial accrued liabilities” exceed the plan’s accrued assets (cash & investments), the difference is *“unfunded actuarial accrued liabilities.”* This is the usual condition. If the plan’s assets equaled the plan’s “actuarial accrued liabilities,” then the plan would be termed “fully funded.” This is an unusual condition.

---

Each time a plan adds a new benefit, which applies to service already rendered, an “actuarial accrued liability” is created, which is also an “unfunded actuarial accrued liability” because the plan can’t print instant cash to cover the value of the new benefit promises. Payment for such unfunded actuarial accrued liabilities is spread over a period of years, commonly in the 20-30 year range.

Unfunded actuarial accrued liabilities can occur in another way: if actual plan experience is less favorable than assumed plan experience, the difference is added to unfunded actuarial accrued liabilities. In plans where benefits are directly related to an employee’s pay near time of retirement, unfunded actuarial accrued liabilities rose dramatically during the 1970’s. Unexpected rates of pay increase created additional actuarial accrued liabilities, which could not be matched by reasonable investment results. More recent experience has generally been more favorable with some reductions in unfunded actuarial accrued liabilities.

---

*The existence of unfunded actuarial accrued liabilities is not bad, but the changes from year to year in the amount of unfunded actuarial accrued liabilities are important, --- “bad” or “good” or somewhere in between.*

Even though unfunded actuarial accrued liabilities don’t constitute a bill payable immediately, it is important that policy-makers prevent the amount from becoming unreasonably high and *it is vital for plans to have a sound method for making payments toward them* so that they are controlled.

---

**SECTION G**

SUPPLEMENTAL INFORMATION FOR COMPREHENSIVE ANNUAL  
FINANCIAL REPORTING

---

October 25, 2013

The Retirement Board  
Missouri Department of Transportation  
and Highway Patrol Employees' Retirement System  
1913 William Street  
Jefferson City, Missouri 65102-1930

Ladies and Gentlemen:

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. This report should not be relied on for any purpose other than the purpose described.

The basic financial objective of the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS) is to establish and receive contributions which:

- (1) when expressed in terms of percents of active member payroll, will remain approximately level from generation to generation of Missouri citizens, and
- (2) when combined with present assets and future investment returns, will be sufficient to meet the present and future financial obligations of MPERS.

In order to measure progress toward this fundamental objective, MPERS has annual actuarial valuations performed. The valuations (i) measure present financial position, and (ii) establish contribution rates that provide for the current cost and level percent-of-payroll amortization of unfunded actuarial liabilities over a reasonable period. An actuarial valuation was performed based upon benefit conditions, data and assumptions as of June 30, 2013. This valuation indicates that contribution rates for the period beginning July 1, 2014 that are at least equal to the calculated contributions rates will meet the Board's financial objective. The calculated contribution rates are 58.76% of payroll for the 6,100 Non-Uniformed employees and 58.19% of payroll for the 1,219 Uniformed patrol employees.

The plan administrative staff provides the actuary with data for the actuarial valuation. The actuary relies on the data after reviewing it for internal and year to year consistency. Member data was not otherwise audited by the actuary. The actuary summarizes and tabulates population data in order to analyze longer term trends. We are not responsible for the accuracy or completeness of the data provided by MPERS.

Gabriel, Roeder, Smith & Company was responsible for the following schedules found in the Actuarial Section:

- Summary of Actuarial Assumptions and Methods
  - Probabilities of Separation From Active Employment
  - Individual Salary Increases
  - Joint Life Retirement Values
  - Probabilities of Retirement for Members
  - Probabilities of Disability for Members
- Summary of Member Data Included in Valuations
  - Active Members by Attained Age and Years of Service
  - Schedule of Active Member Valuation Data
- Solvency Test
- Derivation of Financial Experience
- Schedule of Retirees and Beneficiaries Added and Removed
- Summary of Plan Provisions
- Legislative Changes

Actuarial valuations are based upon assumptions regarding future activity in specific risk areas including the rates of investment return and payroll growth, eligibility for the various classes of benefits, and longevity among retired lives. These assumptions are adopted by the Board after considering the advice of the actuary and other professionals. The assumptions and the methods comply with the requirements of Statements No. 25 and No. 43 of the Governmental Accounting Standards Board. Each actuarial valuation takes into account all prior differences between actual and assumed experience in each risk area and adjusts the contribution rates as needed. Actuarial methods and assumptions were adopted by the Board pursuant to the June 30, 2012 Experience Study. In order to gain a full understanding of the actuarial condition of the plan it is important to read the entire actuarial report.

To the best of our knowledge, the report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board. The actuarial assumptions used for the valuation produce results which, individually and in the aggregate, are reasonable.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. Heidi Barry is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

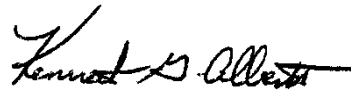
The signing actuaries are independent of the plan sponsor.

**Based upon the valuation results, it is our opinion that the Missouri Department of Transportation and Highway Patrol Employees' Retirement System continues to operate in accordance with actuarial principles of level percent-of-payroll financing. It is important to the well-being of the System that it continues to receive contributions at the actuarially determined levels. It is also important to continue to monitor both the total funded status and the funded status of the retiree liabilities to ensure that the funding policy is consistent with the expected life span of the respective unfunded obligation.**

Respectfully submitted,



Heidi G. Barry, ASA, MAAA



Kenneth G. Alberts

## SOLVENCY TEST

The MPERS funding objective is to meet long term benefit promises through contributions that remain approximately level from year to year as a percent of member payroll. If the contributions to the System are level in concept and soundly executed, the System will *pay all promised benefits when due – the ultimate test of financial soundness.*

A *solvency test* is one means of checking a system's progress under its funding program. In a solvency test for a non-contributory plan, the plan's present assets (cash and investments) are compared with: 1) The liabilities for future benefits to present retired lives and 2) The liabilities for service already rendered by members. In a system that has been following the discipline of level percent of payroll financing, the liabilities for future benefits to present retired lives (liability 1) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by members (liability 2) will be partially covered by the remainder of present assets. The larger the funded portion of liability 2, the stronger the condition of the system.

The schedule below illustrates the history of liability 2 of the System.

Val. Date June 30	(1) Member Contributions	(2) Retirees and Benef.	(3) Active and Inactive Members	Present Valuation Assets	Portion of Present Values Covered by Present Assets			
					(1)	(2)	(3)	Total
-----\$ Millions-----								
1999	0	1,132	921	1,243	100%	100%	12%	61%
2000	0	1,238	951	1,423	100%	100%	19%	65%
2001	0	1,375	926	1,521	100%	100%	16%	66%
2002#	0	1,470	888	1,451	100%	99%	0%	62%
2003	0	1,555	863	1,364	100%	88%	0%	56%
2004	0	1,626	867	1,332	100%	82%	0%	53%
2005	0	1,669	958	1,417	100%	85%	0%	54%
2006	0	1,734	1,007	1,521	100%	88%	0%	56%
2007	0	1,810	1,087	1,686	100%	93%	0%	58%
2008	0	1,873	1,147	1,784	100%	95%	0%	59%
2009	0	1,947	1,166	1,471	100%	76%	0%	47%
2010#	0	2,034	1,225	1,376	100%	68%	0%	42%
2011	0	2,045	1,253	1,427	100%	70%	0%	43%
2012#	0	2,133	1,173	1,531	100%	72%	0%	46%
2013#	1	2,333	1,250	1,657	100%	71%	0%	46%

# New assumptions and/or methods adopted.



## DERIVATION OF EXPERIENCE GAIN (LOSS)

Actual experience will never coincide exactly with assumed experience (except by coincidence). Gains and losses may offset each other over a period of years, but sizeable year-to-year variations from assumed experience are common. Detail on the derivation of the experience gain (loss) is shown below.

	<b>\$ Millions</b>
UAAL Beginning of Year (at July 1)	\$ 1,775,245,058
Normal Cost	47,434,823
Contributions	(173,703,401)
Interest	141,249,139
Net Change in LTD Assets	-
Expected UAAL Before Any Changes	1,790,225,619
Effect of Changes in Assumptions & Methods	204,396,180
Effect of Adjustment	-
Expected UAAL After Changes	1,994,621,799
End of Year UAAL (at June 30)	\$ 1,926,573,166
Gain/(Loss) for Year	\$ 68,048,633
Gain/(Loss) as a percent of actuarial accrued liabilities at start of year (\$3,306.3 million)	2.1%

<b>Valuation Date June 30</b>	<b>Experience Gain (Loss) as % of Beginning Accrued Liability</b>
1999	(7.7)%
2000	(0.1)%
2001	(9.3)%
2002	(4.5)%
2003	(5.2)%
2004	(2.9)%
2005	(1.5)%
2006	1.4 %
2007	1.1 %
2008	(0.2)%
2009	(12.6)%
2010	(3.8)%
2011	2.2 %
2012	3.2 %
<b>2013</b>	<b>2.1 %</b>

## SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

Valuation Date:	June 30, 2013
Actuarial Cost Method:	Entry Age
Amortized Method:	Closed, level percent of payroll
Remaining Amortization Period:	18 years#
Asset Valuation Method:	3-year smoothing
Actuarial Assumptions:	
Investment Rate of Return:	7.75%
Projected Salary Increase:	3.50% to 11.00%
Cost-of-Living Adjustments:	2.40% Compound
Includes Wage Inflation at:	3.50%

# Single equivalent period.

An actuarial valuation is based upon an actuarial cost method, an asset valuation method, and actuarial assumptions. These methods and assumptions are chosen by the Board of Trustees after consultation with the Actuary and other advisors.

The actuarial cost method is called the Entry Age Actuarial Cost Method. This method is consistent with the Board's level percent of payroll funding objective. With this method, the level percent of payroll is determined that will fund a member's retirement benefit over the member's entire working lifetime, from date of hire (Entry Age) to date of exit from the active member population. Differences in the past between assumed and actual experience become part of unfunded actuarial accrued liabilities and are amortized with level percent of payroll contributions. This cost method was first used in the **June 30, 1999** valuation.

The asset valuation method is a three year smoothed market value method in which assumed investment return is recognized immediately each year and differences between actual and assumed investment return are phased in over a closed three year period. This asset valuation method is intended to give recognition to the long term accuracy of market values while filtering out and dampening short term market swings. This method was first used in the **June 30, 1999** valuation.

The actuarial assumptions used in producing the valuation fall into two broad classes: economic assumptions, and demographic assumptions. Economic assumptions refer to long term rates of investment return, wage growth, covered population growth, and inflation. Demographic assumptions refer to retirement rates, turnover rates, disability rates, merit and seniority pay increases, and mortality rates. The current assumptions are based upon a 2007-2012 study of experience of the MPERS. The assumptions are reviewed from time to time to keep them reasonably current with expected experience.

### ***Economic Assumptions***

***The investment return rate*** used in making the valuation was 7.75% per year, compounded annually (net after administrative expenses). This rate of return is not the assumed real rate of return. The real rate of return over wage inflation is defined to be the portion of investment return which is more than the wage inflation rate. Considering wage inflation recognition of 3.50%, the 7.75% rate translates to an assumed real rate of return over wage inflation of 4.25%. This rate was first used for the **June 30, 2013** valuation.

## SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS (CONCLUDED)

*Pay increase assumptions* for individual active members are shown on Tables VI and VII. Part of the assumption for each age is for a merit and/or seniority increase, and the other 3.50% recognizes wage inflation. These rates were first used for the **June 30, 2013** valuation.

*Price Inflation* is assumed to be 3.0%. This results in a 2.4% annual COLA assumption. It is assumed that the 2.4% COLA will always be paid.

The Active Member Group size is assumed to remain constant at its present level.

*The active member payroll* for MoDOT members is assumed to increase 1.50% next year and 3.50% annually thereafter. The active member payroll for all other members is assumed to increase 3.50% annually for all years.

### *Non Economic Assumptions*

*The mortality table* used to measure retired life mortality was the RP-2000 Combined Healthy Mortality Table projected 16 years and set back 1 year for males and females. Related values are shown on Table I. This table was first used for the **June 30, 2013** valuation. Disabled pension mortality was based on PBGC Disabled Mortality tables. The healthy mortality tables include a margin for mortality improvement. The margin is in the 16-year projection. The disabled mortality tables do not include a margin for mortality improvement.

*The probabilities of retirement* for members eligible to retire are shown on Table II. The rates for full retirement were first used in the **June 30, 2013** valuation. The rates for reduced retirement were first used in the **June 30, 2013** valuation. Upon retirement, members are assumed to pick the BackDROP period that when combined with the remaining annuity produces the highest liability.

*The probabilities of disability* for members eligible to retire are shown on Table III. The rates for disability were first used in the **June 30, 2013** valuation.

*The probabilities of withdrawal* from service, death in service and disability are shown for sample ages on Tables IV and V. The death-in-service and disability rates were first used in the **June 30, 2013** valuation. The withdrawal rates were first used in the **June 30, 2013** valuation.

*The data about persons now covered and about present assets* was furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary. Data was furnished as of May 31 and assumed to be statistically equivalent to June 30.

---

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA).

**TABLE I**  
**JOINT LIFE RETIREMENT VALUES**  
**(7.75% INTEREST)**

---

<b>Sample Attained</b>	<b>Present Value of \$1 Monthly for Life</b>		<b>Future Life Expectancy (years)</b>	
	<b>Ages</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
50	\$147.46	\$147.37	33.34	35.39
55	142.23	142.00	28.61	30.63
60	135.19	134.87	24.03	26.02
65	126.18	125.80	19.69	21.67
70	115.18	114.73	15.71	17.66
75	101.84	101.56	12.07	14.01
80	86.45	86.42	8.86	10.73
Ref:	#508sb1x1	#509sb1x1		

The present values shown above are for illustrative purposes only and include a 50% survivor benefit but do not include the value of future post-retirement increases. Males are assumed to be 3 years older than their spouses.

**TABLE II**  
**RATES OF RETIREMENT**

Age	Closed and Year 2000 Plans					2011 Tier			
	Non-Uniformed				Uniformed	Non-Uniformed			Uniformed
	Male		Female			Normal		Early	
	Normal	Early	Normal	Early	Normal	Age & Service	Rule of 90		Normal
50	0.3000		0.2500		0.3500				
51	0.2500		0.2000		0.1500				
52	0.2600		0.2000		0.1500				
53	0.2600		0.2000		0.1500				
54	0.2400		0.2400		0.1500				
55	0.2700	0.0300	0.3200	0.0300	0.2000		0.3000		0.3000
56	0.3000	0.0300	0.3500	0.0300	0.1500		0.3000		0.3000
57	0.2600	0.0400	0.2900	0.0300	0.3000		0.3000		0.3000
58	0.2200	0.0200	0.2500	0.0300	0.3500		0.3000		0.3000
59	0.2500	0.0400	0.3000	0.0300	0.5000		0.3000		0.3000
60	0.1900	0.0800	0.2200	0.0600	1.0000		0.3000		0.3000
61	0.1800	0.0400	0.2200	0.0500	1.0000		0.3000		0.3000
62	0.4500	0.3000	0.3600	0.3000	1.0000		0.3000	0.1000	0.3000
63	0.3700	0.4000	0.2200	0.3000	1.0000		0.3000	0.1000	0.3000
64	0.2500	0.4000	0.2000	0.2500	1.0000		0.3000	0.1000	0.3000
65	0.3500		0.3500		1.0000		0.3000	0.1000	0.3000
66	0.4000		0.4500		1.0000		0.3000	0.1000	0.3000
67	0.2500		0.4000		1.0000	0.5000	0.3000		0.3000
68	0.3000		0.4000		1.0000	0.5000	0.3000		0.3000
69	0.3000		0.4000		1.0000	0.5000	0.3000		0.3000
70	0.4000		0.5000		1.0000	1.0000	1.0000		1.0000
71	0.5000		0.5000		1.0000	1.0000	1.0000		1.0000
72	0.5000		1.0000		1.0000	1.0000	1.0000		1.0000
73	0.5000								
74	1.0000								
Ref	2265	2267	2266	2268	2264	1873	1875	1262	1875

**TABLE III**  
**RATES OF DISABILITY**

**All Plan Participants**

Age	Non-Uniformed		Uniformed		Age	Non-Uniformed		Uniformed	
	Male	Female	Male	Female		Male	Female	Male	Female
21	0.0000	0.0006	0.0000	0.0000	51	0.0037	0.0059	0.0022	0.0022
22	0.0004	0.0006	0.0000	0.0000	52	0.0041	0.0063	0.0024	0.0024
23	0.0004	0.0007	0.0000	0.0000	53	0.0046	0.0067	0.0028	0.0028
24	0.0004	0.0007	0.0000	0.0000	54	0.0054	0.0071	0.0031	0.0031
25	0.0004	0.0007	0.0001	0.0001	55	0.0062	0.0074	0.0035	0.0035
26	0.0004	0.0007	0.0001	0.0001	56	0.0072	0.0078	0.0039	0.0039
27	0.0004	0.0008	0.0002	0.0002	57	0.0082	0.0082	0.0043	0.0043
28	0.0007	0.0008	0.0002	0.0002	58	0.0093	0.0086	0.0048	0.0048
29	0.0009	0.0008	0.0002	0.0002	59	0.0102	0.0090	0.0052	0.0052
30	0.0009	0.0008	0.0002	0.0002	60	0.0112	0.0090	0.0058	0.0058
31	0.0011	0.0009	0.0002	0.0002	61	0.0120	0.0090	0.0063	0.0063
32	0.0011	0.0010	0.0002	0.0002	62	0.0126	0.0090	0.0070	0.0070
33	0.0011	0.0011	0.0002	0.0002	63	0.0128	0.0090	0.0077	0.0077
34	0.0011	0.0012	0.0002	0.0002	64	0.0128	0.0090	0.0077	0.0077
35	0.0013	0.0013	0.0002	0.0002	65	0.0000	0.0090	0.0000	0.0000
36	0.0013	0.0014	0.0002	0.0002	66	0.0000	0.0090	0.0000	0.0000
37	0.0013	0.0015	0.0003	0.0003	67	0.0000	0.0090	0.0000	0.0000
38	0.0015	0.0015	0.0003	0.0003	68	0.0000	0.0090	0.0000	0.0000
39	0.0017	0.0016	0.0004	0.0004	69	0.0000	0.0090	0.0000	0.0000
40	0.0017	0.0017	0.0005	0.0005	70	0.0000	0.0090	0.0000	0.0000
41	0.0018	0.0021	0.0006	0.0006	71	0.0000	0.0090	0.0000	0.0000
42	0.0020	0.0025	0.0006	0.0006	72	0.0000	0.0090	0.0000	0.0000
43	0.0021	0.0029	0.0007	0.0007	73	0.0000	0.0090	0.0000	0.0000
44	0.0022	0.0032	0.0008	0.0008	74	0.0000	0.0090	0.0000	0.0000
45	0.0023	0.0036	0.0009	0.0009	75	0.0000	0.0090	0.0000	0.0000
46	0.0026	0.0040	0.0011	0.0011	76	0.0000	0.0090	0.0000	0.0000
47	0.0028	0.0044	0.0012	0.0012	77	0.0000	0.0090	0.0000	0.0000
48	0.0030	0.0048	0.0014	0.0014	78	0.0000	0.0090	0.0000	0.0000
49	0.0031	0.0052	0.0016	0.0016	79	0.0000	0.0090	0.0000	0.0000
50	0.0033	0.0055	0.0019	0.0019	80	0.0000	0.0090	0.0000	0.0000
Ref	#186x0.8	#517x0.6	#19x0.75	#19x0.75		#186x0.8	#517x0.6	#19x0.75	#19x0.75

**TABLE IV**  
**RATES OF SEPARATION FROM ACTIVE EMPLOYMENT**  
**LESS THAN 5 YEARS OF SERVICE**

---

**All Plan Participants**

<b>Service</b>	<b>Non-Uniformed</b>		<b>Uniformed</b>	
	<b>Male</b>	<b>Female</b>	<b>Male</b>	<b>Female</b>
0-1	0.3000	0.2000	0.1000	0.1000
1-2	0.1600	0.1400	0.0700	0.0700
2-3	0.0900	0.1100	0.0325	0.0325
3-4	0.0700	0.0900	0.0300	0.0300
4-5	0.0550	0.0500	0.0275	0.0275
Ref	852	853	851	851

**TABLE V**  
**RATES OF SEPARATION FROM ACTIVE EMPLOYMENT**  
**MORE THAN 5 YEARS OF SERVICE**

---

**All Plan Participants**

Age	Non-Uniformed		Uniformed	
	Male	Female	Male	Female
25	0.0575	0.0510	0.0270	0.0270
26	0.0575	0.0510	0.0270	0.0270
27	0.0575	0.0510	0.0270	0.0270
28	0.0554	0.0510	0.0270	0.0270
29	0.0533	0.0510	0.0270	0.0270
30	0.0512	0.0510	0.0270	0.0270
31	0.0492	0.0510	0.0270	0.0270
32	0.0472	0.0510	0.0261	0.0261
33	0.0452	0.0493	0.0236	0.0236
34	0.0432	0.0476	0.0213	0.0213
35	0.0412	0.0459	0.0191	0.0191
36	0.0393	0.0442	0.0170	0.0170
37	0.0375	0.0425	0.0152	0.0152
38	0.0356	0.0408	0.0136	0.0136
39	0.0338	0.0391	0.0122	0.0122
40	0.0321	0.0374	0.0113	0.0113
41	0.0304	0.0357	0.0105	0.0105
42	0.0287	0.0340	0.0098	0.0098
43	0.0271	0.0323	0.0092	0.0092
44	0.0256	0.0306	0.0085	0.0085
45	0.0241	0.0289	0.0079	0.0079
46	0.0226	0.0272	0.0072	0.0072
47	0.0213	0.0255	0.0065	0.0065
48	0.0200	0.0238	0.0058	0.0058
49	0.0188	0.0221	0.0052	0.0052
50	0.0176	0.0204	0.0046	0.0046
51	0.0165	0.0187	0.0038	0.0038
52	0.0155	0.0170	0.0033	0.0033
53	0.0146	0.0153	0.0029	0.0029
54	0.0137	0.0136	0.0028	0.0028
55	0.0129	0.0119	0.0023	0.0023
56	0.0123	0.0102	0.0025	0.0025
57	0.0116	0.0085	0.0019	0.0019
58	0.0111	0.0068	0.0019	0.0019
59	0.0107	0.0051	0.0018	0.0018
60	0.0104	0.0034	0.0017	0.0017
61	0.0102	0.0017		
62	0.0101	0.0000		
63	0.0101	0.0000		
64	0.0102	0.0000		
65	0.0104	0.0000		
66	0.0107	0.0000		
67	0.0111	0.0000		
68	0.0111	0.0000		
69	0.0111	0.0000		
Ref	#63x0.7	#684x0.85	#1272x1	#1272x1



**TABLE VI**  
**AGE BASED SALARY SCALE**

**All Plan Participants**

Age	Salary Increase Assumptions for an Individual Member					
	Non-Uniformed			Uniformed		
	Merit & Seniority	Base (Economic)	Increase Next Year	Merit & Seniority	Base (Economic)	Increase Next Year
20	4.40%	3.50%	7.90%	6.00%	3.50%	9.50%
21	4.11%	3.50%	7.61%	6.00%	3.50%	9.50%
22	3.84%	3.50%	7.34%	6.00%	3.50%	9.50%
23	3.60%	3.50%	7.10%	5.48%	3.50%	8.98%
24	3.38%	3.50%	6.88%	4.89%	3.50%	8.39%
25	3.18%	3.50%	6.68%	4.25%	3.50%	7.75%
26	3.08%	3.50%	6.58%	3.54%	3.50%	7.04%
27	2.90%	3.50%	6.40%	3.38%	3.50%	6.88%
28	2.82%	3.50%	6.32%	3.08%	3.50%	6.58%
29	2.66%	3.50%	6.16%	2.78%	3.50%	6.28%
30	2.59%	3.50%	6.09%	2.48%	3.50%	5.98%
31	2.44%	3.50%	5.94%	2.18%	3.50%	5.68%
32	2.39%	3.50%	5.89%	1.88%	3.50%	5.38%
33	2.25%	3.50%	5.75%	1.76%	3.50%	5.26%
34	2.20%	3.50%	5.70%	1.65%	3.50%	5.15%
35	2.09%	3.50%	5.59%	1.54%	3.50%	5.04%
36	1.97%	3.50%	5.47%	1.43%	3.50%	4.93%
37	1.87%	3.50%	5.37%	1.31%	3.50%	4.81%
38	1.76%	3.50%	5.26%	1.24%	3.50%	4.74%
39	1.60%	3.50%	5.10%	1.16%	3.50%	4.66%
40	1.44%	3.50%	4.94%	1.09%	3.50%	4.59%
41	1.23%	3.50%	4.73%	1.01%	3.50%	4.51%
42	1.09%	3.50%	4.59%	0.94%	3.50%	4.44%
43	0.95%	3.50%	4.45%	0.86%	3.50%	4.36%
44	0.81%	3.50%	4.31%	0.79%	3.50%	4.29%
45	0.68%	3.50%	4.18%	0.71%	3.50%	4.21%
46	0.56%	3.50%	4.06%	0.64%	3.50%	4.14%
47	0.43%	3.50%	3.93%	0.56%	3.50%	4.06%
48	0.31%	3.50%	3.81%	0.53%	3.50%	4.03%
49	0.18%	3.50%	3.68%	0.49%	3.50%	3.99%
50	0.12%	3.50%	3.62%	0.45%	3.50%	3.95%
51	0.06%	3.50%	3.56%	0.41%	3.50%	3.91%
52	0.06%	3.50%	3.56%	0.38%	3.50%	3.88%
53	0.00%	3.50%	3.50%	0.35%	3.50%	3.85%
54	0.00%	3.50%	3.50%	0.32%	3.50%	3.82%
55	0.00%	3.50%	3.50%	0.29%	3.50%	3.79%
56	0.00%	3.50%	3.50%	0.26%	3.50%	3.76%
57	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
58	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
59	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
60	0.00%	3.50%	3.50%	0.23%	3.50%	3.73%
Ref.	11			403		

**TABLE VII**  
**SERVICE BASED SALARY SCALE**

---

**Non-Uniformed Plan Participants**

<b>% Merit Increases in Salaries Next Year*</b>	
<b>Service Index</b>	<b>Rate</b>
1	8.0%
2	7.0%
3	4.5%
4	4.0%
Ref	519

**Uniformed Plan Participants**

<b>% Merit Increases in Salaries Next Year*</b>	
<b>Service Index</b>	<b>Rate</b>
1	10.0%
2	10.0%
Ref	518

\* For Non-Uniformed members with 4 or less years of service and Uniformed members with 2 or less years of service, the service based table overwrites the age based table on page G-10.