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GASB STATEMENT NO. 67 REPORT
FOR THE
TEACHERS' RETIREMENT SYSTEM
OF THE STATE OF KENTUCKY

PREPARED AS OF JUNE 30, 2018





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

November 6, 2018

Board of Trustees
Teachers' Retirement System of the
State of Kentucky
479 Versailles Road
Frankfort, KY 40601-3800

Members of the Board:

Presented in this report is information to assist the Teachers' Retirement System of the State of Kentucky (TRS), in meeting the requirements of the Governmental Accounting Standards Board (GASB) Statement No. 67. This report has been prepared as of June 30, 2018 (the Measurement Date) to assist TRS in better understanding the requirements of GASB 67 and to identify the information to be provided by TRS's actuary, Cavanaugh Macdonald Consulting (CMC).

The annual actuarial valuation used as a basis for much of the information presented in this report was performed as of June 30, 2017. The valuation was based upon data, furnished by the Executive Secretary and TRS staff, concerning active, inactive and retired members along with pertinent financial information.

To the best of our knowledge, this report is complete and accurate. The necessary calculations were performed by, and under the supervision of, independent actuaries who are members of the American Academy of Actuaries with experience in performing valuations for public retirement systems.

The calculations were prepared in accordance with the principles of practice prescribed by the Actuarial Standards Board, and, in our opinion, meet the requirements of GASB 67.

The actuarial calculations were performed by qualified actuaries according to generally accepted actuarial procedures and methods. The calculations are based on the current provisions of the System, and on actuarial assumptions that are, individually and in the aggregate, internally consistent and reasonably based on the actual experience of the System. In addition, the calculations were completed in compliance with the laws governing the System. The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.



Board of Trustees
November 6, 2018
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These results are only for financial reporting and may not be appropriate for funding purposes or other types of analysis. Calculations for purposes other than satisfying the requirements of GASB 67 may produce significantly different results. Future actuarial results may differ significantly from the current results presented in this report due to such factors as changes in plan experience or changes in economic or demographic assumptions.

Respectfully submitted,

A handwritten signature in blue ink that reads 'Edward J. Koebel'.

Edward J. Koebel, EA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Alisa Bennett'.

Alisa Bennett, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Cathy Turcot'.

Cathy Turcot
Principal and Managing Director

EJK/AB/CT:ep



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**REPORT OF THE ANNUAL GASB STATEMENT NO. 67
REQUIRED INFORMATION FOR THE
TEACHERS' RETIREMENT SYSTEM OF THE STATE OF KENTUCKY
PREPARED AS OF JUNE 30, 2018**

SECTION I – INTRODUCTION

The Governmental Accounting Standards Board issued Statement No. 67 (GASB 67), “*Financial Reporting For Pension Plans*”, in June 2012. This report, prepared as of June 30, 2018 (the Measurement Date), presents information to assist the Teachers’ Retirement System of the State of Kentucky (TRS), in meeting the requirements of GASB 67. Much of the material provided in this report is based on the data, assumptions and results of the annual actuarial valuation of TRS as of June 30, 2017. The results of that valuation were detailed in a report dated November 14, 2017.

GASB 67 requires a measurement of the Total Pension Liability (TPL) utilizing the Entry Age Normal actuarial funding method. If the valuation date at which the TPL is determined is before the measurement date, as is the case here, the TPL must be rolled forward to the measurement date. The Net Pension Liability (NPL) is then set equal to the rolled forward TPL minus the System’s Fiduciary Net Position (FNP) (basically the market values of assets) as of the Measurement Date. The benefit provisions recognized in the calculation of the TPL are summarized in Schedule B. The development of the roll-forward of the TPL is shown in the table on page 5.

Among the assumptions needed for the liability calculation is a Single Equivalent Interest Rate (SEIR) as described by GASB 67. To determine the SEIR, the FNP must be projected into the future for as long as there are anticipated benefits payable under the plan’s provisions applicable to the membership and beneficiaries of the System on the Measurement Date. Additional appropriations by the State above the statutory employer contributions were made in fiscal years 2017 and 2018 and it is our understanding that the State budget includes additional appropriations to the pension plan for fiscal years 2019 and 2020. These appropriated contributions were approximately 95% of the Actuarial Determined Contribution (ADEC). In addition to these four years of additional appropriations, the intent by the State to fund TRS pensions in the future is evident from Senate Bill 151 (2018 RS), therefore, based on the four years and the intent, future contributions were projected to be made in accordance with the Board funding policy, adjusted by a factor of 95%.

On this basis, if the FNP is not projected to be depleted at any point in the future, the long term expected rate of return on plan investments expected to be used to finance the benefit payments may be used as the SEIR. If, however, the FNP is projected to be depleted, the SEIR is determined as the single rate that will generate a present value of benefit payments equal to the sum of the present value determined by discounting all projected benefit payments through the date of depletion by the long term expected rate of return, and the present value determined by discounting those benefits after the date of depletion by a 20-year tax-exempt municipal bond (rating AA/Aa or higher) rate.

Our calculations indicate that the FNP is not projected to be depleted, therefore, the long term expected rate of return on plan investments, of 7.50 percent, expected to be used to finance benefits may be used as the SEIR. This is a change in the SEIR rate for this Measurement Date from last year, where the FNP was calculated to be depleted and an SEIR rate of 4.49 percent was determined. The sections that follow provide the results of all the necessary calculations, presented in the order laid out in GASB 67 for note disclosure and Required Supplementary Information.



SECTION II – FINANCIAL STATEMENT NOTES

The material presented herein will follow the order presented in GASB 67. Paragraph numbers are provided for ease of reference.

Paragraphs 30(a) (1)-(3): The information required is to be supplied by the System.

Paragraph 30(a) (4): The data required regarding the membership of the TRS were furnished by the System office. The following table summarizes the membership of the System as of June 30, 2017, the actuarial valuation date.

Membership

	Number
Retirees And Survivors Currently Receiving Benefits	52,966
Terminated Vested Employees Entitled To But Not Yet Receiving Benefits	8,624
Inactive Non-vested Members	42,798
Active Members	72,130
Total	176,518

Paragraphs 30(a)(5)-(6) and Paragraphs 30(b)-(f): The information required is to be supplied by the System.

Paragraphs 31(a) (1)-(4): The information is provided in the following table. As stated on the previous page, the Net Pension Liability (NPL) is equal to the Total Pension Liability (TPL) minus the Fiduciary Net Position (FNP). That result as of June 30, 2018 is presented in the table below (\$ thousands).

	Fiscal Year Ending 6/30/2018
Total Pension Liability (TPL)	\$33,708,555
Fiduciary Net Position (FNP)	<u>19,981,633</u>
Net Pension Liability (NPL)	\$13,726,922
Ratio of FNP to TPL	59.28%



Paragraph 31(b) (1)(a)-(f): This paragraph requires information regarding the actuarial assumptions used to measure the TPL. The set of actuarial assumptions utilized in developing the TPL are outlined in Schedule C. The total pension liability was determined by an actuarial valuation as of June 30, 2017, using the following actuarial assumptions, applied to all periods included in the measurement:

Inflation	3.00 percent
Salary increases	3.50 – 7.30 percent, including inflation
Investment rate of return	7.50 percent, net of pension plan investment expense, including inflation
Municipal Bond Index Rate	3.89%
Single Equivalent Interest Rate	7.50%

Mortality rates were based on the RP-2000 Combined Mortality Table for Males or Females, as appropriate, with adjustments for mortality improvements based on a projection of Scale BB to 2025, set forward two years for males and one year for females.

The actuarial assumptions used in the June 30, 2017 valuation were based on the results of an actuarial experience study for the period July 1, 2010 – June 30, 2015 adopted by the Board on September 19, 2016.

The long-term expected rate of return on pension plan investments was determined using a log-normal distribution analysis in which best-estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation.

The target asset allocation and best estimates of arithmetic real rates of return for each major asset class, as provided by TRS’s investment consultant, are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return
U.S. Equity	40.0%	4.2%
International Equity	22.0%	5.2%
Fixed Income	15.0%	1.2%
Additional Categories	8.0%	3.3%
Real Estate	6.0%	3.8%
Private Equity	7.0%	6.3%
Cash	2.0%	0.9%
Total	100.00%	



Discount rate. The discount rate used to measure the total pension liability was 7.50 percent. The projection of cash flows used to determine the discount rate assumed that plan member contributions will be made at the current contribution rates and that Employer contributions will be made at the Actuarially Determined Contribution rates, adjusted by 95%, for all fiscal years in the future. Based on those assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Paragraph 31(b) (1) (g): This paragraph requires disclosure of the sensitivity of the net pension liability to changes in the discount rate. The following presents the net pension liability of the System, calculated using the discount rate of 7.50 percent, as well as what the System's net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (6.50 percent) or 1-percentage-point higher (8.50 percent) than the current rate (\$ thousands):

	1% Decrease (6.50%)	Current Discount Rate (7.50%)	1% Increase (8.50%)
System's net pension liability	\$17,595,452	\$13,726,922	\$10,472,071

Paragraph 31(c): June 30, 2017 is the actuarial valuation date upon which the TPL is based. An expected TPL is determined as of June 30, 2018 using standard roll forward techniques for the TPL using a discount rate of 7.50%. An expected TPL was also determined using the prior year discount rate of 4.49%, which was based on a municipal bond index rate of 3.56%. The roll forward calculation adds the annual normal cost (also called the service cost), subtracts the actual benefit payments and refunds for the plan year and then applies the assumed interest rate (SEIR) for the year. The difference between these two roll-forward amounts as of June 30, 2018 is the gain or loss due to changes in assumptions and other inputs.



In addition, we have determined an expected TPL as of June 30, 2018 based on the TPL roll forward in the June 30, 2017 GASB 67 report. The difference between this amount and the roll-forward of the actual TPL using last year's assumptions is reflected as an experience gain or loss for the year. These procedures are shown in the following table:

TPL Roll-Forward (in thousands)			
	Expected	Actual Before Assumption Changes	Actual After Assumption Changes
(a) Interest rate	4.49%	4.49%	7.50%
(b) TPL as of June 30, 2017	\$46,966,822	\$46,753,909	\$32,819,887
(c) Entry Age Normal Cost for the Year July 1, 2017 – June 30, 2018	1,104,102	1,104,102	539,205
(d) Actual Benefit Payments (including refunds) For the year July 1, 2017 – June 30, 2018	2,035,690	2,035,690	2,035,690
(e) TPL as of June 30, 2018 [(b) x (1 + (a))] + (c) – [(d) x (1 + (0.5 x (a)))]	\$48,098,343	\$47,875,870	\$33,708,555
(f) Difference between Expected and Actual Experience (Gain)/Loss		\$(222,473)	
(g) Difference due to change in Assumptions and Other Inputs (Gain)/Loss			\$(14,167,315)



SECTION III – REQUIRED SUPPLEMENTARY INFORMATION

There are several tables of Required Supplementary Information (RSI) that need to be included in the System’s financial statements:

Paragraphs 32(a)-(c): The required tables are provided in Schedule A.

Paragraph 32(d): The money-weighted rates of return required are to be supplied by the System.

Paragraph 34: In addition the following should be noted regarding the RSI:

Changes of benefit terms. None

Changes of assumptions. In the 2016 valuation, rates of withdrawal, retirement, disability, mortality and rates of salary increase were adjusted to more closely reflect actual experience. In the 2016 valuation and later, the expectation of retired life mortality was changed to the RP-2000 Mortality Tables projected to 2025 with projection scale BB, set forward two years for males and one year for females rather than the RP-2000 Mortality Tables projected to 2020 with projection scale AA, which was used prior to 2016.

In the 2011 valuation, rates of withdrawal, retirement, disability and mortality were adjusted to more closely reflect actual experience. In the 2011 valuation and later, the expectation of retired life mortality was changed to the RP-2000 Mortality Tables projected to 2020 with projection scale AA, set back one year for females rather than the 1994 Group Annuity Mortality Tables which was used prior to 2016. For the 2011 valuation through the 2013 valuation, an interest smoothing methodology was used to calculate liabilities for purposes of determining the actuarially determined contributions.

Methods and assumptions used in calculations of actuarially determined contributions. The actuarially determined contribution rates in the schedule of employer contributions are calculated as of June 30, three years prior to the end of the fiscal year in which contributions are reported (as of June 30, 2015 for the fiscal year 2018 contributions). The following actuarial methods and assumptions were used to determine contribution rates reported in the most recent year of that schedule:

Actuarial cost method	Entry age
Amortization method	Level percentage of payroll, closed
Remaining amortization period	29.3 years
Asset valuation method	5-year smoothed market
Inflation	3.50 percent
Salary increase	4.00 to 8.20 percent, including inflation
Investment rate of return	7.50 percent, net of pension plan investment expense, including inflation



SCHEDULE A

REQUIRED SUPPLEMENTARY INFORMATION

**SCHEDULE OF CHANGES IN THE NET PENSION LIABILITY
GASB 67 Paragraph 32(a)
(\$ in Thousands)**

	2018	2017	2016	2015	2014
Total Pension Liability					
Service Cost	\$ 1,104,102	\$ 1,332,587	\$ 1,120,893	\$ 1,015,080	\$ 1,002,338
Interest	2,063,109	1,964,107	2,027,457	2,029,372	1,956,610
Benefit Changes	0	0	0	0	0
Difference between expected and actual experience	(222,473)	199,471	(58,035)	0	0
Changes of Assumption and other inputs	(14,167,315)	(2,321,327)	4,030,834	1,511,960	(353,043)
Benefit Payments	(2,004,617)	(1,918,612)	(1,833,199)	(1,741,456)	(1,654,376)
Refund of Contributions	<u>(31,073)</u>	<u>(26,305)</u>	<u>(27,748)</u>	<u>(23,033)</u>	<u>(25,462)</u>
Net Change in Total Pension Liability	(13,258,267)	(770,079)	5,260,202	2,791,923	926,067
Total Pension Liability – Beginning	<u>46,966,822</u>	<u>47,736,901</u>	<u>42,476,699</u>	<u>39,684,776</u>	<u>38,758,709</u>
Total Pension Liability – Ending (a)	<u>\$33,708,555</u>	<u>\$46,966,822</u>	<u>\$47,736,901</u>	<u>\$42,476,699</u>	<u>\$39,684,776</u>
Plan Net Position					
Contributions – State of Kentucky	\$ 969,698	\$ 981,417	\$ 484,987	\$ 480,073	\$ 483,330
Contributions – Other Employers	78,973	79,303	80,468	79,506	79,996
Contributions – Member	319,127	313,625	313,044	308,160	304,982
Net Investment Income	1,953,214	2,475,753	(245,215)	862,179	2,803,249
Benefit Payments	(2,004,617)	(1,918,612)	(1,833,199)	(1,741,456)	(1,654,376)
Administrative Expense	(11,388)	(10,314)	(8,636)	(8,869)	(7,956)
Refund of Contributions	(31,073)	(26,305)	(27,748)	(23,033)	(25,462)
Other	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Net Change in Plan Net Position	1,273,934	1,894,867	(1,236,299)	(43,440)	1,983,763
Plan Net Position – Beginning	<u>18,707,699</u>	<u>16,812,832</u>	<u>18,049,131</u>	<u>18,092,571</u>	<u>16,108,808</u>
Plan Net Position – Ending (b)	<u>\$19,981,633</u>	<u>\$18,707,699</u>	<u>\$16,812,832</u>	<u>\$18,049,131</u>	<u>\$18,092,571</u>
Net Pension Liability – Ending (a) – (b)	<u>\$13,726,922</u>	<u>\$28,259,123</u>	<u>\$30,924,069</u>	<u>\$24,427,568</u>	<u>\$21,592,205</u>



SCHEDULE A

REQUIRED SUPPLEMENTARY INFORMATION

**SCHEDULE OF THE NET PENSION LIABILITY
GASB 67 Paragraph 32(b)
(\$ in Thousands)**

	2018	2017	2016	2015	2014
Total Pension Liability	\$33,708,555	\$46,966,822	\$47,736,901	\$42,476,699	\$39,684,776
Plan Net Position	<u>19,981,633</u>	<u>18,707,699</u>	<u>16,812,832</u>	<u>18,049,131</u>	<u>18,092,571</u>
Net Pension Liability	\$13,726,922	\$28,259,123	\$30,924,069	\$24,427,568	\$21,592,205
Ratio of Plan Net Position to Total Pension Liability	59.28%	39.83%	35.22%	42.49%	45.59%
Covered Payroll	\$3,455,660	\$3,415,432	\$3,390,539	\$3,455,008	\$3,317,422
Net Pension Liability as a Percentage of Covered Payroll	397.23%	827.40%	912.07%	707.02%	650.87%



SCHEDULE A

REQUIRED SUPPLEMENTARY INFORMATION

**SCHEDULE OF EMPLOYER CONTRIBUTIONS
GASB 67 Paragraph 32(c)
(\$ in Thousands)**

	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
Covered Payroll	\$ 3,455,660	\$ 3,415,432	\$ 3,390,539	\$ 3,455,008	\$ 3,317,422	\$ 3,310,710	\$ 3,310,176	\$ 3,283,749	\$ 3,321,614	\$ 3,253,077
Actual Employer Contributions	\$ 1,048,671	\$ 1,060,720	\$ 565,455	\$ 559,579	\$ 563,326	\$ 568,233	\$ 557,340	\$ 1,037,936	\$ 479,805	\$ 442,550
Actuarially Determined Employer Contributions	<u>1,083,466</u>	<u>1,076,617</u>	<u>999,270</u>	<u>913,654</u>	<u>823,446</u>	<u>802,985</u>	<u>757,822</u>	<u>678,741</u>	<u>633,938</u>	<u>600,283</u>
Annual Contribution Excess (Deficiency)	<u>\$ (34,795)</u>	<u>\$ (15,807)</u>	<u>\$ (433,815)</u>	<u>\$ (354,075)</u>	<u>\$ (260,120)</u>	<u>\$ (234,752)</u>	<u>\$ (200,482)</u>	<u>\$ 359,195</u>	<u>\$ (154,133)</u>	<u>\$ (157,733)</u>
Actual Contribution as a Percentage of Covered Payroll	30.35%	31.06%	16.68%	16.20%	16.98%	17.16%	16.84%	31.61%	14.44%	13.60%



SCHEDULE B

SUMMARY OF MAIN BENEFIT PROVISIONS

The Teachers' Retirement System of the State of Kentucky was established on July 1, 1940. The valuation took into account amendments to the System effective through June 30, 2017. The following summary describes the main benefit and contribution provisions of the System as interpreted for the valuation.

1 - DEFINITIONS

"Final average salary" means the average of the five highest annual salaries which the member has received for service in a covered position and on which the member has made contributions or on which the public board, institution or agency has picked up the member contributions. For a member who retires after attaining age 55 with 27 years of service, "final average salary" means the average of the three highest annual salaries.

2 - BENEFITS

Service Retirement Allowance

Members Before 7/1/2008

Condition for Allowance

Completion of 27 years of service or attainment of age 55 and 5 years of service.

Amount of Allowance

The annual retirement allowance for non-university members is equal to:

- (a) 2.0% of final average salary multiplied by service before July 1, 1983, plus
- (b) 2.5% of final average salary multiplied by service after July 1, 1983.
- (c) For individuals who become members of the Retirement System on or after July 1, 2002 and have less than 10 years of service at retirement, the retirement allowance is 2.0% of final average salary multiplied by service. If, however, they have 10 or more years, they receive a benefit percentage of 2.5% for all years of service up to 30 years.



- (d) For members retiring on or after July 1, 2004, the retirement allowance formula is 3.0% of final average salary for each year of service credit earned in excess of 30 years.

The annual retirement allowance for university members is equal to 2.0% of final average salary multiplied by all years of service.

For all members, the annual allowance is reduced by 5% per year from the earlier of age 60 or the date the member would have completed 27 years of service.

The minimum annual service allowance for all members is \$440 multiplied by credited service.

Members on and after 7/1/2008

Condition for Retirement

Completion of 27 years of service, attainment of age 60 and 5 years of service or attainment of age 55 and 10 years of service.

Amount of Allowance

The annual retirement allowance for non-university members is equal to:

- 1.7% of final average salary if service is 10 years or less.
- 2.0% of final average salary if service is greater than 10 years and no more than 20 years.
- 2.3% of final average salary if service is greater than 20 years but no more than 26 years.
- 2.5% of final average salary if service is greater than 26 years but no more than 30 years.
- 3.0% of final average salary for years of service greater than 30 years.

The annual retirement allowance for university members is equal to:

- 1.5% of final average salary if service is 10 years or less.
- 1.7% of final average salary if service is greater than 10 years and no more than 20 years.
- 1.85% of final average salary if service is greater than 20 years but less than 27 years.
- 2.0% of final average salary if service is greater than or equal to 27 years.

For all members, the annual allowance is reduced by 6% per year from the earlier of age 60 or the date the member would have completed 27 years of service.



Disability Retirement Allowance

Condition for Allowance Totally and permanently incapable of being employed as a teacher and under age 60 but after completing 5 years of service.

Amount of Allowance The disability allowance is equal to the greater of the service retirement allowance or 60% of the member's final average salary. The disability allowance is payable over an entitlement period equal to 25% of the service credited to the member at the date of disability or five years, whichever is longer. After the disability entitlement period has expired and if the member remains disabled, he will be retired under service retirement. The service retirement allowance will be computed with service credit given for the period of disability retirement. The allowance will not be less than \$6,000 per year. The service retirement allowance will not be reduced for commencement of the allowance before age 60 or the completion of 27 years of service.

Benefits Payable on Separation from Service

Any member who ceases to be in service is entitled to receive his contributions with allowable interest. A member who has completed 5 years of creditable service and leaves his contributions with the System may be continued in the membership of the System after separation from service, and file application for service retirement after the attainment of age 60.

Life Insurance

A separate Life Insurance fund has been created as of June 30, 2000 to pay benefits on behalf of deceased TRS active and retired members.



Death Benefits

A surviving spouse of an active member with less than 10 years of service may elect to receive an annual allowance of \$2,880 except that if income from other sources exceeds \$6,600 per year the annual allowance will be \$2,160.

A surviving spouse of an active member with 10 or more years of service may elect to receive an allowance which is the actuarial equivalent of the allowance the deceased member would have received upon retirement. The allowance will commence on the date the deceased member would have been eligible for service retirement and will be payable during the life of the spouse.

If the deceased member is survived by unmarried children under age 18 the following schedule of annual allowances applies:

<u>Number of Children</u>	<u>Annual Allowance</u>
1	\$ 2,400
2	4,080
3	4,800
4 or more	5,280

The allowances are payable until a child attains age 18, or age 23 if a full-time student.

If the member has no eligible survivor, a refund of his accumulated contributions is payable to his estate.

Options

In lieu of the regular Option 1, a retirement allowance payable in the form of a life annuity with refundable balance, any member before retirement may elect to receive a reduced allowance which is actuarially equivalent to the full allowance, in one of the following forms:

Option 2. A single life annuity payable during the member's lifetime with payments for 10 years certain.

Option 3. At the death of the member his allowance is continued throughout the life of his beneficiary.

Option 3(a). At the death of the beneficiary designated by the member under Option 3, the member's benefit will revert to what would have been paid had he not selected an option.

Option 4. At the death of the member one half of his allowance is continued throughout the life of his beneficiary.

Option 4(a). At the death of the beneficiary designated by the member under Option 4, the member's benefit will revert to what would have been paid had he not selected an option.



Post-Retirement Adjustments

The retirement allowance of each retired member and of each beneficiary shall be increased by 1.50% each July 1.

3 - CONTRIBUTIONS

Member Contributions

University members contribute 7.625% of salary to the Retirement System. Non-university members contribute 9.105% of salary to the Retirement System. Member contributions are picked up by the employer.



SCHEDULE C

STATEMENT OF ACTUARIAL ASSUMPTIONS AND METHODS

The assumptions and methods used in the valuation were selected based on the actuarial experience study prepared as of June 30, 2015, submitted to and adopted by the Board on September 19, 2016.

INVESTMENT RATE OF RETURN: 7.50% per annum, compounded annually, including price inflation at 3.00% per annum.

SALARY INCREASES: Representative values of the assumed annual rates of future salary increases are as follows and include wage inflation at 3.50% per annum:

<u>Age</u>	<u>Annual Rate</u>
20	7.20%
25	6.40
30	5.40
35	4.70
40	4.20
45	3.80
50	3.70
55	3.50
60	3.50
65	3.50

SEPARATIONS FROM SERVICE: Representative values of the assumed annual rates of death, disability, withdrawal, service retirement and early retirement are as follows:

Males

Age	Annual Rate of							
	DEATH	DISABILITY	WITHDRAWAL			RETIREMENT		
			Service			Before 27 Years of Service	After 27 Years of Service*	
			0 – 4	5 – 9	10+			
20	0.019%	0.01%	11.00%					
25	0.021	0.01	11.00		3.00%			
30	0.025	0.01	11.00		3.00	3.00%		
35	0.043	0.04	12.00		3.50	1.40		
40	0.060	0.09	12.00		4.50	1.40		
45	0.084	0.20	12.00		4.50	1.30		17.0%
50	0.119	0.30	14.00		4.50	1.90		17.0
55	0.202	0.58	15.00		4.50	2.40	5.0%	45.0
60	0.340	0.75	15.00		4.00	2.40	13.0	35.0
62	0.419	0.75	15.00		3.80	2.40	15.0	25.0
65	0.565	0.75	15.00		3.50	2.40	20.0	25.0
70	0.913	0.75	20.00		0.00	0.00	20.0	20.0
75	1.556	0.75	20.00		0.00	0.00	100.0	100.0

*Plus 7.5% in year when first eligible for unreduced retirement with 27 years of service.



Females

Age	Annual Rate of						
	DEATH	DISABILITY	WITHDRAWAL			RETIREMENT	
			Service			Before 27 Years of Service	After 27 Years of Service*
			0 – 4	5 – 9	10+		
20	0.007%	0.01%	9.00%				
25	0.008	0.01	9.00	4.00%			
30	0.010	0.03	12.00	4.00	1.65%		
35	0.018	0.06	12.00	4.00	1.50		
40	0.026	0.12	12.00	4.00	1.30		
45	0.042	0.25	13.00	4.00	1.20		15.0%
50	0.062	0.44	13.00	5.00	1.50		18.0
55	0.096	0.65	15.00	5.00	2.00	5.5%	50.0
60	0.157	0.85	15.00	5.00	2.00	14.0	40.0
62	0.197	0.85	15.00	4.60	2.00	14.0	40.0
65	0.287	0.85	15.00	4.00	2.00	22.0	35.0
70	0.495	0.85	15.00	0.00	0.00	20.0	35.0
75	0.831	0.85	15.00	0.00	0.00	100.0	100.0

*Plus 7.5% in year when first eligible for unreduced retirement with 27 years of service.

DEATHS AFTER RETIREMENT: The RP-2000 Combined Mortality Table projected to 2025 using scale BB (set forward two years for males and one year for females) is used for death after service retirement and beneficiaries. The RP-2000 Disabled Mortality Table (set forward two years for males and seven years for females) is used for death after disability retirement. There is a margin for future mortality improvement in the tables used by the System. Based on the results of the most recent experience study adopted by the Board on September 19, 2016, the numbers of expected future deaths are 15-19% less than the actual number of deaths that occurred during the study period for healthy retirees and 13-17% less than expected under the selected table for disabled retirees. Representative values of the assumed annual rates of death after service retirement and after disability retirement are shown below:

Age	Annual Rate of Death After			
	Service Retirement		Disability Retirement	
	Male	Female	Male	Female
45	0.1609%	0.1135%	2.3306%	1.2482%
50	0.2474	0.1718	2.9279	1.5650
55	0.4246	0.2658	3.4400	1.7807
60	0.6985	0.4409	3.5881	2.3164
65	1.1300	0.8100	3.8275	3.1687
70	1.8697	1.3739	4.7566	4.4032
75	3.2147	2.2899	6.3153	6.0857
80	5.5160	3.7551	8.3527	8.4679
85	9.5631	6.3873	10.9122	12.7572
90	17.2787	11.2476	17.2787	19.4718
95	27.1263	18.1190	27.1263	24.2074



ASSETS: Market Value

EXPENSE LOAD: None.

PERCENT MARRIED: 100%, with females 3 years younger than males.

LOADS: Unused sick leave: 2% of active liability



SCHEDULE D

ACTUARIAL COST METHOD

1. The valuation is prepared on the projected benefit basis, under which the present value, at the interest rate assumed to be earned in the future, of each active member's expected benefit at retirement or death is determined, based on his age, service, sex and compensation. The calculations take into account the probability of a member's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his terminating with a service, disability or survivor's benefit. Future salary increases and post-retirement cost-of-living adjustments are also anticipated. The present value of the expected benefits payable on account of the active members is added to the present value of the expected future payments to retired members and beneficiaries and inactive members to obtain the present value of all expected benefits payable from the System on account of the present group of members and beneficiaries.
2. The employer contributions required to support the benefits of the System are determined following a level funding approach, and consist of a normal contribution and an accrued liability contribution.
3. The normal contribution is determined using the "entry age normal" method. Under this method, a calculation is made to determine the uniform and constant percentage rate of employer contribution which, if applied to the compensation of the average new member during the entire period of his anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his behalf.
4. The unfunded accrued liability is determined by subtracting the present value of prospective employer normal contributions and member contributions, together with the current actuarial value of assets held, from the present value of expected benefits to be paid from the System.