

**Teachers' Retirement System
State of Montana**

**ACTUARIAL VALUATION
(As of July 1, 2000)**

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October 27, 2000

Teachers' Retirement Board
State of Montana
1500 Sixth Avenue
Helena, MT 59620-0139

Dear Members of the Board:

At your request, we have made an actuarial valuation of the Teachers' Retirement System of the State of Montana as of July 1, 2000. The results of the valuation are contained in the following report; they are summarized in section 1.

In brief, the current employer contribution rate, 7.58% of members' salaries, covers the continuing actuarial costs of the System and amortizes the unfunded actuarial liability over 15.1 years. Therefore, the System is actuarially sound. A summary of our findings is presented in Section 1.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the System's staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination of these data, we have found them to be reasonably consistent and comparable with data used for other purposes.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

We further certify that all costs, liabilities, rates of interest, and other factors for the System have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the System and reasonable expectations); and which, in combination, offer our best estimate of anticipated experience affecting the System. Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions.

Actuarial computations presented in this report are for purposes of determining the recommended funding amounts for the System. Actuarial computations under GASB Statements No. 25 and 27 are for purposes of fulfilling financial accounting requirements. The computations prepared for these two purposes may differ as disclosed in our report. The calculations in the enclosed report have been made on a basis consistent with our understanding of the System's funding requirements and goals, and of GASB Statements No. 25 and 27. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes.

I, Karen I. Steffen, am a member of the American Academy of Actuaries and Fellow of the Society of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

I, Mark C. Olleman, am a member of the American Academy of Actuaries and Associate of the Society of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We would like to express our appreciation to Mr. David L. Senn, Executive Director of the System, and to members of his staff, who gave substantial assistance in supplying the data on which this report is based.

Respectfully submitted,

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KIS/MCO/nlo

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Section 1

Summary of Findings

As a result of the actuarial valuation of the benefits in effect under the Montana Teachers' Retirement System as of July 1, 2000, we recommend that the current employer contribution rate, 7.58% of members' salaries, remain in effect. The contribution rate was increased from 7.47% to 7.58% in 1999 when benefits were improved.

The 7.58% rate is sufficient to meet the actuarial cost of the System accruing at the valuation date and to amortize the unfunded actuarial liability over 15.1 years. The actuarial costs are calculated using the entry age actuarial cost method. This actuarial valuation measures the adequacy of the contribution rates set in Montana State Law. MCA 19-20-604 states that the employer contribution rate will return to 7.47% when the amortization period of the System's unfunded actuarial liability is 10 years or less according to the System's latest actuarial valuation.

Experience

The 2000 actuarial valuation indicates that a substantial actuarial gain occurred during the preceding two fiscal years. The gain is primarily due to higher returns on the assets than expected by the actuarial assumptions, and is reflected in the 12.3% and 12.8% net investment return on an actuarial basis for the past two years. These asset gains, while significant, are not as pronounced as the asset gains reflected in the July 1, 1998 valuation. The following chart compares the annual returns for the past four years.

<u>Year</u>	<u>Market Return</u>	<u>Actuarial Return</u>	<u>Actuarial Return over 8.0% Assumption</u>
7/1/1996 to 6/30/1997	19.4%	14.9%	6.9%
7/1/1997 to 6/30/1998	16.6%	16.0%	8.0%
7/1/1998 to 6/30/1999	11.9%	12.3%	4.3%
7/1/1999 to 6/30/2000	7.8%	12.8%	4.8%

Asset gains result when the return on the actuarial value of assets exceeds the actuarial investment return assumption of 8.0%. The actuarial return on assets has exceeded the assumption by about 9% (4.3% + 4.8%) in the last two years as shown in the last column of the chart. In contrast, the actuarial return on assets in the two years preceding the July 1, 1998 valuation exceeded the assumption by approximately 15% (6.9% + 8.0%). The asset gains in the last two years reduced the unfunded actuarial liability (UAL) by about \$178 million. Without the asset gains the UAL would be closer to \$580 million instead of the \$402 million shown in Table 8.

Assumption Changes

The results include changes to the individual salary increase assumptions as detailed in our study, dated November 11, 1998. The results also include changes to the mortality assumptions as detailed in our study dated May 2, 2000.

Benefit and Contribution Changes

Both benefits and contribution rates have been changed since the July 1, 1998 actuarial valuation. The following benefit improvements were passed in the 1999 legislative session:

- a 1.5% guaranteed annual benefit adjustment starting 3 years after retirement, and
- a \$500 minimum benefit for members and beneficiaries retired at July 1, 1999 where the member at time of retirement had 25 years of service.

The following contribution rate increases were passed in the 1999 legislative session:

- The member contribution rate was permanently increased from 7.044% to 7.15%.
- The employer contribution rate was increased from 7.47% to 7.58% as long as the amortization period for the unfunded actuarial liability exceeds 10 years.

Impact of Changes

The effect of the asset gains and other experience on the amortization period can be distributed approximately as follows:

Amortization Period Remaining at July 1, 2000

July 1, 1998 Valuation Amortization Period		9.2 years
Passage of time		- 2.0
Effect of Changes in Benefits and Contribution Rates		+ 19.8
Effect of Changes in Actuarial Assumptions		+ 4.5
Effect of Increased ORP Contributions		<u>0.0</u>
Expected Amortization Period at July 1, 2000		31.5 years
Effect of Actuarial Experience Gains and Losses:		
Investments (Gain)	-14.2	
Salary Increases (Gain)	- 1.6	
Retired Mortality (Gain)	- 0.8	
Loss from Other Causes	+ <u>0.2</u>	- <u>16.4</u>
July 1, 2000 Valuation Amortization Period		+ 15.1 years

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Section 2

Scope of the Report

This report presents the actuarial valuation of the Montana Teachers' Retirement System as of July 1, 2000.

A summary of the findings resulting from this valuation is presented in the previous section. Section 3 describes the assets of the System. Sections 4 and 5 describe how the obligations of the System are to be met under the actuarial cost method in use.

The actuarial procedures and assumptions used in this valuation are described in Appendix A. The current benefit structure, as determined by the provisions of the governing law on July 1, 2000, is summarized in Appendix B. Schedules of valuation data classifying the data used in the valuation by various categories of contributing members, former contributing members, and beneficiaries make up Appendix C. Appendix D provides a brief summary of the System's recent experience. Comparative statistics are presented on the System's membership and contribution rates. Appendix E is a glossary of actuarial terms used in this report.

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Section 3

Assets

In many respects, an actuarial valuation can be regarded as an inventory process. The inventory is taken as of the actuarial valuation date, which for this valuation is July 1, 2000. On that date the assets available for the payment of benefits are appraised. These assets are compared with the actuarial liabilities. The actuarial process thus leads to a method of determining what contributions by members and their employers are needed to strike a balance.

A new asset valuation method is being used beginning with the July 1, 2000 valuation. It was approved by the Board in November, 1998. The expected return is determined each year based on the beginning of year market value and actual cash flows during the year. Any difference between the expected market value return and the actual market value return is recognized evenly over a period of five years. The gains and losses are measured starting with the year ended June 30, 1997.

Table 1 lists the assets held and their market value for the past two years. Table 2 summarizes the fund's activity during the past two years. Table 3 summarizes the determination of the actuarial value of assets. Table 4 shows when asset gains or losses will be recognized in the actuarial value of assets. Table 5 summarizes historical asset returns since July 1, 1994 including the amount recognized by the actuarial asset valuation method which was greater or lesser than the actuarial investment return assumption.

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Table 1

**Statement of Plan Net Assets
June 30, 2000 and 1999**

ASSETS	<u>2000</u>	<u>1999</u>
Current Assets:		
Cash	\$ 1,916,110	\$ 3,306,674
Cash Equivalents-Short Term Investment Pool	36,688,720	61,559,792
Accounts Receivable	12,736,240	11,779,032
Interest Receivable	<u>5,912,427</u>	<u>7,438,288</u>
Total Current Assets	\$ 57,253,497	\$ 84,083,786
Investments, at fair value:		
Mortgages	\$ 108,366,068	\$ 102,437,199
Investment Pools	2,095,343,505	1,977,630,593
Other Investments	<u>122,957,015</u>	<u>66,557,772</u>
Total Investments	\$2,326,666,588	\$ 2,146,625,564
Securities Lending Collateral	\$ 164,091,655	\$ 164,691,227
Other Assets:		
Land and Buildings	\$ 193,844	\$ 193,844
Less: Accumulated Depreciation	(113,536)	(109,772)
Intangible Assets	2,665,846	660,425
Equipment	137,249	137,249
Less: Accumulated Depreciation	<u>(89,379)</u>	<u>(76,257)</u>
Total Other Assets	\$ 2,794,024	\$ 805,489
TOTAL ASSETS	<u>\$2,550,805,764</u>	<u>\$ 2,396,206,066</u>
LIABILITIES		
Accounts Payable	\$ 180,590	\$ 498,522
Securities Lending Liability	164,091,655	164,691,227
Compensated Absences	68,503	50,888
Property Held In Trust	10,809	20,360
Installment Purchase Payable	<u>2,158,794</u>	<u>227,068</u>
TOTAL LIABILITIES	<u>\$ 166,510,351</u>	<u>\$ 165,488,065</u>
NET ASSETS HELD IN TRUST FOR PENSION BENEFITS	<u>\$2,384,295,413</u>	<u>\$ 2,230,718,001</u>

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Table 2

**Statement of Changes in Plan Net Assets
June 30, 2000 and 1999**

ADDITIONS	<u>2000</u>	<u>1999</u>
Contributions:		
Employer	\$ 48,375,744	\$ 44,986,852
Plan Member	45,599,246	42,641,714
Other	<u>146,685</u>	<u>102,540</u>
Total Contributions	\$ 94,121,675	\$ 87,731,106
Rental Income	\$ 22,325	\$ 19,975
Workers Comp. Dividend	\$ 109	\$ 217
Investments Income:		
Net Appreciation/(Depreciation)		
In fair value of investments	\$ 72,971,749	\$ 147,506,436
Investment Earnings	<u>104,117,526</u>	<u>93,901,242</u>
Total Investment Income	\$ 177,089,275	\$ 241,407,678
Less Investment Expense	<u>\$ 2,218,534</u>	<u>\$ 1,576,861</u>
Net Investment Income	\$ 174,870,741	\$ 239,830,817
Security Lending Income	\$ 8,807,265	8,600,474
Less Security Lending Expense	<u>(8,448,563)</u>	<u>(8,110,090)</u>
Total Security Lending Income	\$ 358,702	\$ 490,384
Total Net Investment Income	\$ 175,229,443	\$ 240,321,201
DEDUCTIONS		
Benefit Payments	\$ 109,231,029	\$ 100,028,083
Withdrawals	5,271,306	5,126,013
Administrative Expense	<u>1,293,805</u>	<u>1,360,660</u>
Total Deductions	\$ 115,796,140	\$ 106,514,756
NET INCREASE IN PLAN NET ASSETS	\$ 153,577,412	\$ 221,557,743
NET ASSETS HELD IN TRUST FOR PENSION BENEFITS BEGINNING OF YEAR	\$ 2,230,718,001	\$ 2,009,159,216
Prior Period Adj.	0	1,045
END OF YEAR	<u>\$ 2,384,295,413</u>	<u>\$ 2,230,718,001</u>

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Table 3

**Determination of Actuarial Value of Assets
July 1, 2000**

Determination of Recognized Investment Gains and Losses - Five-Year Smoothing

A. Expected investment return – Year Ended 6/30/2000	\$	177,642,214
B. Actual investment return – Year Ended 6/30/2000	\$	173,958,072
C. Gains/(losses) – 2000 [B – A]	\$	(3,684,142)
D. Gains/(losses) – 1999	\$	78,945,961
E. Gains/(losses) – 1998	\$	147,873,557
F. Gains/(losses) – 1997	\$	166,072,301
G. Rounding adjustment	\$	(2)
H. Gains/(losses) recognized at July 1, 2000 [1/5 C + 1/5 D + 1/5 E + 1/5 F + G]	\$	77,841,533

Determination of Actuarial Assets

Actuarial value of assets July 1, 1999		\$ 2,012,408,180
Contributions less benefits	\$ (20,380,660)	
Expected investment return	177,642,214	
Recognized investment gains/(losses)	<u>77,841,533</u>	235,103,087
Actuarial value of assets July 1, 2000		\$ 2,247,511,267
Unrecognized Gain		136,784,146
Market Value of Assets July 1, 2000 (Actuarial Value + Unrecognized Gain)		\$ 2,384,295,413

Note: The actuarial value of assets is equal to the expected value plus a five-year smoothing of market value gains and losses. The actuarial asset method was adopted for the July 1, 2000 actuarial valuation with actuarial value of assets set equal to market value of assets at July 1, 1996. Deferred asset gains and losses prior to July 1, 1996 are ignored.

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Table 4

**Schedule of Investment Gain/(Loss) Recognition
(in millions)
July 1, 2000**

Fiscal Year Ending <u>06/30</u>	Market Value Investment Gain/(Loss) Over the <u>Expected 8%</u>	<u>Investment Gain/(Loss) Recognized in Past Years</u>				<u>Investment Gain/(Loss) Recognized in Current Year</u>	<u>Investment Gain/(Loss) to be Recognized in Future Years</u>			
		<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
1997	\$ 166.1	*	\$ 33.2	\$ 33.2	\$ 33.2	\$ 33.2	\$ 33.2			
1998	147.9			29.5	29.5	29.5	29.5	\$ 29.5		
1999	78.9				15.8	15.8	15.8	15.8	15.8	\$ 15.8
2000	(3.7)					(0.7)	(0.7)	(0.7)	(0.7)	\$ (0.7)
2001	0.0						0.0	0.0	0.0	0.0
2002	0.0							0.0	0.0	0.0
2003	0.0								0.0	0.0
2004	0.0									0.0

Total Gain/(Loss) Recognized at Each Valuation Date									
Recognized					Scheduled to be Recognized**				
*	\$33.2	\$62.7	\$78.5	\$77.8	\$77.8	\$44.6	\$15.1	\$ (0.7)	

Unrecognized Gain/(Loss) Remaining				
\$ 136.8	\$59.0	\$14.4	\$ (0.7)	\$ 0.0

* The first gain/(loss) was measured in the fiscal year ending June 30, 1997.

** The total gain/(loss) actually recognized in each future year will include additional amortizations of future gains and/or losses.

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Table 5

Historical Investment Returns*

Fiscal Year Ending	Market Returns	Actuarial Return	Actuarial Return Over 8.0% Assumption
June 30, 1995	15.7%	8.9%	0.9%
June 30, 1996	12.4	10.4	2.4
June 30, 1997	19.4	14.9	6.9
June 30, 1998	16.6	16.0	8.0
June 30, 1999	11.9	12.3	4.3
June 30, 2000	7.8	12.8	4.8

** Returns reflect all investment returns, including investment income and realized and unrealized investment gains and losses, and are net of investment expenses and administrative expenses paid by the System.*

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Section 4

Actuarial Present Value of Future Benefits

In the previous section, an actuarial valuation was related to an inventory process, and an analysis was given of the inventory of assets of the System as of the valuation date, July 1, 2000. In this section, the discussion will focus on the commitments of the System, which will be referred to as its actuarial liabilities.

Table 6 contains an analysis of the actuarial present value of all future benefits for contributing members, for former contributing members, and for beneficiaries. The analysis is given by type of benefit.

The actuarial liabilities summarized in Table 6 include the actuarial present value of all future benefits expected to be paid with respect to each member covered as of the valuation date. For an active member, this value includes a measure of both benefits already earned and future benefits to be earned. Thus, for all members, active and retired, the value extends over benefits earnable and payable for the rest of their lives and, if an optional benefit is chosen, for the lives of their surviving beneficiaries.

The actuarial valuation does not recognize liabilities for employees who become members and participate in the System after the valuation date.

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Table 6

**Actuarial Present Value of Future Benefits
for Contributing Members, Former Contributing
Members, and Beneficiaries
(All amounts are actuarial present values in millions)**

	July 1, 2000	July 1, 1998
	Total	Total
A. Active members		
Service retirement	\$ 1,559.9	\$ 1,368.7
Disability retirement	27.2	30.0
Survivors' benefits	44.1	46.4
Vested Retirement	35.0	30.1
Refund of Member Contributions	<u>35.9</u>	<u>34.9</u>
Total	\$ 1,702.1	\$ 1,510.1
B. Inactive members and annuitants		
Service retirement	\$ 1,201.7	\$ 863.5
Disability retirement	15.3	14.0
Beneficiaries*	76.0	58.3
Vested terminated members	40.0	31.6
Nonvested terminated members	<u>13.7</u>	<u>12.5</u>
Total	\$ 1,346.7	\$ 979.9
C. Grand Total	\$ 3,048.8	\$ 2,490.0

**Includes survivors of active and retired members, and children's benefits.*

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Section 5

Employer Contributions

In the previous two sections, attention has been focused on the assets and actuarial liabilities of the System. A comparison of Tables 3 and 6 indicates that there is a shortfall in current actuarial assets to meet the present value of all future benefits for current members and beneficiaries. This is the universal experience in all but a fully closed-down fund where no further contributions of any sort are anticipated.

In an active system, there will always be a difference between the actuarial liabilities and the assets. This difference has to be funded with future contributions and investment returns. An actuarial valuation sets a schedule of future contributions that will deal with this funding in an orderly fashion.

The method used to determine the incidence of the contributions in various years is called the actuarial cost method. For this valuation, the entry age actuarial cost method has been used. Under this method, or essentially any actuarial cost method, the contributions required to meet the difference between current assets and current actuarial liabilities are allocated each year between two elements:

- A normal cost amount, which ideally is relatively stable as a percentage of salary over the years; and
- Whatever amount is left over, which is used to amortize what is called the unfunded actuarial liability.

The two items described above, normal cost and unfunded actuarial liability, are the keys to understanding the actuarial cost method. Let us first discuss the normal cost.

The normal cost is the theoretical contribution rate which will meet the ongoing costs of a group of average new employees. Suppose that a group of new employees were covered under a separate fund from which all benefits and to which all contributions and associated investment return were to be paid. Under the entry age actuarial cost method, the normal cost contribution rate is that level percentage of pay which would be exactly right to maintain this fund on a stable basis. If experience were to follow the actuarial assumptions exactly, the fund would be completely liquidated with the last payment to the last survivor of the group.

We have determined the normal cost rates separately by type of benefit under the System. These are summarized in Table 7.

The term "fully funded" is often applied to a system where contributions for everyone at the normal cost rate will fully pay for the benefits of existing as well as new employees. Often, systems are not fully funded, either because of benefit improvements in the past that have not been completely paid for or actuarial deficiencies that have occurred because experience has not been as favorable as anticipated. Under these circumstances, an unfunded actuarial liability (UAL) exists.

Table 8 shows how the UAL was derived for the System. Lines A and B show, respectively, the total present value of future benefits and the portion of the future liability that is expected to be paid from future normal cost contributions, both employer and employee. Line C shows the actuarial liability: the portion of the present value of future benefits not provided by future normal cost contributions. Line D shows the actuarial value of assets available for benefits. Line E shows the unfunded actuarial liability. Lines F and G show the impact of the present value of future scheduled ORP contributions (described below) on the unfunded actuarial liability.

As can be seen from this discussion, a key consideration in the adequacy of the funding of the System is how the UAL is being amortized. Table 9 shows that the current employer and member contribution rates are adequate to pay the total normal cost rate (9.71% of pay), with enough left over to amortize the UAL in 15.1 years. Therefore, the current basis is sufficient to meet future requirements.

The amortization of the UAL assumes contributions made as a percent of pay for members of the Optional Retirement Plan (ORP) until June 30, 2033. Under Section 19-21-203, periodic separate valuations are to be performed to measure the liabilities of benefits to be paid under the Teachers' Retirement System (TRS) for Montana University System (MUS) members. As of the 1996 valuation, there was a \$98.0 million difference, or shortfall, which is to be funded as a level percentage of future ORP salaries from July 1, 1997 to June 30, 2033. The single contribution rate determined as of July 1, 1997 was 3.97%. However, the following graded schedule for increasing the ORP contributions was adopted:

<u>ORP Contribution Rate</u>	<u>Fiscal Years Ending</u>
2.81%	June 30, 1998
3.12%	June 30, 1999
3.42%	June 30, 2000
3.73%	June 30, 2001
4.04%	June 30, 2002 to June 30, 2033

The value of future ORP payments included in the July 1, 2000 TRS valuation is \$96.4 million.

The recent asset gains, assumption changes and benefit changes will all have an impact on the liabilities for MUS members, as well as the TRS non-MUS members. A re-valuation of the ORP contribution rate is being performed and the result should be released shortly. This is consistent with MCA, Section 19-20-621 which prescribes periodic valuations to determine appropriate ORP contribution rates.

The unfunded actuarial liability at any date after establishment of a system is affected by any actuarial gains or losses arising when the actual experience of the system varies from the experience anticipated by the actuarial assumptions used in the valuations. To the extent actual experience as it develops differs from the assumptions used, so also will the actual emerging costs differ from the estimated costs. The impact of these differences in actual experience from the assumptions is included in Section 1, the Summary of Findings.

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Table 7

**Normal Cost Contribution Rates
As Percentages of Salary**

	<u>July 1, 2000</u>	<u>July 1, 1998</u>
	<u>Total</u>	<u>Total</u>
Service retirement	6.90%	6.09%
Disability retirement	0.19	0.21
Survivors' benefits	0.25	0.26
Vested retirement	0.64	0.54
Refund of member contributions	<u>1.73</u>	<u>1.78</u>
Total	9.71%	8.88%

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Table 8

**Unfunded Actuarial Liability
(All dollar amounts in millions)**

	July 1, 2000	July 1, 1998
A. Actuarial present value of all future benefits for present and former members and their survivors (Table 4)	\$ 3,048.8	\$ 2,490.0
B. Less actuarial present value of total future normal costs for present members	400.5	366.7
C. Actuarial liability	\$ 2,648.3	\$ 2,123.3
D. Less actuarial value of assets available for benefits (Table 3)	2,247.5	1,809.0
E. Unfunded actuarial liability	\$ 400.8	\$ 314.3
F. Less present value of future ORP contributions*	96.4	90.6
G. Unfunded actuarial liability funded by TRS contributions	\$ 304.4	\$ 223.7

**Paid by contributions to TRS made as a percentage of the salaries of the participants in the Optional Retirement Plan (ORP). The percentage of salary will be 3.73% for the Fiscal Year ending in 2001. The percentage of salary will be a level 4.04% for the Fiscal Years ending in 2002 through 2033.*

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Table 9

**Recommended Contribution Rates
As Percentages of Salary**

	<u>July 1, 2000</u>	<u>July 1, 1998</u>
A. Employer contribution rate*	7.58%	7.470%
B. Member contribution rate	<u>7.15</u>	<u>7.044</u>
C. Total contribution rate	14.73%	14.514%
D. Less total normal cost rate (Table 5)	<u>9.71</u>	<u>8.880</u>
E. Amount available to amortize unfunded actuarial liability**	5.02%	5.634%
F. Amortization period from Valuation Date	15.1 years	9.2 years***

* *In accordance with MCA 19-20-604, the employer contribution rate will return to 7.47% when the amortization period of the System's unfunded actuarial liability is 10 years or less according to the System's latest actuarial valuation.*

** *In addition, a percentage of the salaries of the participants in the Optional Retirement Plan (ORP) is available to help amortize the unfunded actuarial liability.*

*** *The amortization period as of July 1, 1998 was 9.2 years; thus, the expected period as of July 1, 2000 is 7.2 years assuming no changes in benefits or assumptions. After changes in benefits and contribution rates made in the 1999 legislative session, the expected period as of July 1, 2000 would have been 27.0 years.*

**Teachers' Retirement System
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Appendix A

Actuarial Procedures and Assumptions

The actuarial assumptions used in this valuation were adopted by the Board for the July 1, 2000 Actuarial Valuation. The individual salary increase assumptions were changed as a result of our study, dated November 11, 1998. The mortality assumptions were changed as a result of our retired mortality experience study, dated May 2, 2000. These assumptions are summarized in Table A-1, A-2 and A-5.

Tables A-3 through A-6 give rates of decrement for service retirement, disablement, mortality, and other terminations of employment. These rates of decrement are referred to in actuarial literature as the absolute rate of decrement, or q'_x . Table A-7 shows the assumed probability of immediate refund of contributions among members terminating with five or more years of service.

Actuarial Cost Method

The actuarial valuation was prepared using the entry age actuarial cost method. Under this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit. The portion of this actuarial present value allocated to a valuation year is called the normal cost. The normal cost was first calculated for each individual member. The normal cost rate is defined to equal the total of the individual normal costs, divided by the total pay rate.

The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets and (b) the actuarial present value of future normal costs is called the unfunded actuarial liability. The unfunded actuarial liability is amortized as a level percentage of the projected salaries of present and future members of the System.

Records and Data

The data used in the valuation consist of financial information; records of age, sex, service, salary, contribution rates, and account balances of contributing members; and records of age, sex, and amount of benefit for retired members and beneficiaries. All of the data were supplied by the System and are accepted for valuation purposes without audit.

Replacement of Terminated Members

The ages at entry and distribution by sex of future members are assumed to average the same as those of the present members they replace. If the number of active members should increase, it is further assumed that the average entry age of the larger group will be the same, from an actuarial standpoint, as that of the present group. Under these assumptions, the normal cost rates for active members will not vary with the termination of present members.

Employer Contributions

At the time of this valuation, the total employer contribution rate for normal costs and amortization of the unfunded actuarial liability was 7.58% of members' salaries. In accordance with MCA 19-20-604, the employer contribution rate will return to 7.47% when the amortization period of the System's unfunded actuarial liability is 10 years or less according to the System's latest actuarial valuation.

Administrative Expense

The administrative expenses of the System are assumed to be funded by investment earnings in excess of 8% per year.

Valuation of Assets - Actuarial Basis

The actuarial asset valuation method spreads asset gains and losses over five years. The expected return is determined each year based on the beginning of year market value and actual cash flows during the year. Any difference between the expected market value return and the actual market value return is recognized evenly over a period of five years. The gains and losses are measured starting with the year ended June 30, 1997. Adopted in the July 1, 2000 actuarial valuation.

Investment Earnings

The annual rate of investment earnings of the assets of the System is assumed to be 8% per year, compounded annually.

Interest on Member Contributions

Interest on member contributions is assumed to accrue at a rate of 6% per annum, compounded annually. This assumption was set as of July 1, 1998.

Postretirement Benefit Increases

On January 1 of each year, the retirement allowance payable must be increased by 1.5% if the retiree's most recent retirement effective date is at least 36 months prior to January 1 of the year in which the adjustment is to be made.

Future Salaries

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table A-2. In addition to increases in salary due to merit and longevity, this scale includes an assumed 5.0% annual rate of increase in the general wage level of the membership. The merit and longevity increases for the MUS members did not show a pattern of increasing or decreasing with service at the time of our most recent study. Therefore, the MUS members have a flat 1% merit and longevity assumption. The general wage increase assumption was adopted July 1, 1998 and the merit and longevity scales were adopted July 1, 2000.

Montana University System (MUS) members are assumed to have a 0.63% higher average final compensation to account for the larger than average annual compensation increases observed in the years immediately preceding retirement.

Service Retirement

Table A-3 shows the annual assumed rates of retirement among members eligible for service retirement. Separate rates are used when a member is eligible for reduced benefits, for the first year a member is eligible for full benefits, and for the years following the first year a member is eligible for full benefits. The rates for General Members were adopted July 1, 1994. The rates for University Members were adopted July 1, 1996.

Disablement

The rates of disablement used in this valuation are illustrated in Table A-4. These rates were adopted July 1, 1996.

Mortality

The mortality rates used in this valuation are illustrated in Table A-5. A written description of each table used is included in Table A-1. These rates were adopted July 1, 2000.

Other Terminations of Employment

The rates of assumed future withdrawal from active service for reasons other than death, disability or retirement are shown for representative ages in Table A-6. These rates were adopted July 1, 1996.

Benefits for Terminating Members

Members terminating with less than five years of service are assumed to request an immediate withdrawal of their contributions with interest. Table A-7 shows the assumed probability of immediate refund of contributions among members terminating with five or more years of service. These rates were adopted July 1, 1996.

We estimated the present value of future benefits for terminated vested members based on their available contribution account.

Part-Time Employees

The valuation data for active members identify part-time members, but give no indication as to the number of hours worked. As done in the past, we imputed a "part-time percentage" by comparing the pay received with their annual equivalent full-time salary. Part-time members earning less than \$1,000 during the last year were valued at their current member contribution balance.

Optional Retirement Program

The total contribution received based on ORP payroll for the fiscal year ending June 30, 2000 was \$2,521,829. Based on a contribution rate of 3.42%, we assumed the total ORP payroll for the fiscal year to be \$73,737,690 (\$2,521,829 divided by 3.42%).

Buybacks, Purchase of Service, and Military Service

The active liabilities and normal cost were increased to 100.5% of their original value to fund this additional service based on a study of the System's experience for the five calendar years 1995 through 1999. Effective July 1, 2000.

Probability of Marriage

If death occurs in active status, all members are assumed to have an eligible surviving spouse and two children. The spouse is assumed to be the same age as the member.

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Table A-1

**Summary of Valuation Assumptions
(July 1, 2000)**

I. Economic assumptions	
A. General wage increases*	5.00%
B. Investment return	8.00%
C. Growth in membership	0.00%
D. Postretirement benefit increases (Starting three years after retirement)	1.50%
E. Interest on member accounts	6.00%
II. Demographic assumptions	
A. Individual salary increase due to promotion and longevity (adopted July 1, 2000)	Table A-2
B. Retirement (General Member assumptions adopted July 1, 1994) (University Member assumptions adopted July 1, 1996)	Table A-3
C. Disablement (adopted July 1, 1996)	Table A-4
D. Mortality among contributing members, service retired members, and beneficiaries 1994 Group Annuity Mortality Table, with ages set back 3 years for males and ages set back 1 year for females. (adopted July 1, 2000)	Table A-5
E. Mortality among disabled members Based on the IRS Social Security Disabled Mortality Tables published in Revenue Ruling 96-7. Males are 70% of the Male IRS table to age 80, grading into the 1983 Group Annuity Mortality Table for Males between ages 80 and 85. Females are 85% of the IRS table at all ages. (adopted July 1, 2000)	Table A-6
F. Other terminations of employment (adopted July 1, 1996)	Table A-7
G. Probability of retaining membership in the System upon vested termination (adopted July 1, 1996)	Table A-8

* *Montana University System (MUS) members are assumed to have a 0.63% higher average final compensation to account for the larger than average annual compensation increases observed in the years immediately preceding retirement.*

**Teachers' Retirement System
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Table A-2

Future Salaries

Years of Service	General Members			University Members		
	Individual Merit & Longevity	General Wage Increase	Total Salary Increase	Individual Merit & Longevity	General Wage Increase	Total Salary Increase
1	4.04%	5.00%	9.04%	1.00%	5.00%	6.00%
2	3.52	5.00	8.52	1.00	5.00	6.00
3	2.99	5.00	7.99	1.00	5.00	6.00
4	2.73	5.00	7.73	1.00	5.00	6.00
5	2.47	5.00	7.47	1.00	5.00	6.00
6	2.26	5.00	7.26	1.00	5.00	6.00
7	2.05	5.00	7.05	1.00	5.00	6.00
8	1.84	5.00	6.84	1.00	5.00	6.00
9	1.63	5.00	6.63	1.00	5.00	6.00
10	1.42	5.00	6.42	1.00	5.00	6.00
11	1.26	5.00	6.26	1.00	5.00	6.00
12	1.10	5.00	6.10	1.00	5.00	6.00
13	0.95	5.00	5.95	1.00	5.00	6.00
14	0.79	5.00	5.79	1.00	5.00	6.00
15	0.63	5.00	5.63	1.00	5.00	6.00
16	0.47	5.00	5.47	1.00	5.00	6.00
17	0.37	5.00	5.37	1.00	5.00	6.00
18	0.26	5.00	5.26	1.00	5.00	6.00
19	0.16	5.00	5.16	1.00	5.00	6.00
20	0.05	5.00	5.05	1.00	5.00	6.00
21 & Up	0.00	5.00	5.00	1.00	5.00	6.00

**Teachers' Retirement System
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Table A-3

Retirement

Annual Rates

Age	General Members			University Members		
	Eligible for Reduced Benefits	First Year Eligible for Full Benefits	Thereafter	Eligible for Reduced Benefits	First Year Eligible for Full Benefits	Thereafter
50	5.0%	15.4%	10.0%	2.5%	9.5%	4.9%
51	5.3	15.6	10.0	2.7	9.5	4.9
52	5.6	15.8	10.0	3.0	9.5	6.8
53	6.0	16.1	10.0	3.2	9.5	6.8
54	6.3	16.4	10.0	3.4	14.0	6.8
55	6.7	16.9	12.5	3.7	15.7	6.8
56	7.1	17.5	12.5	4.2	18.2	6.8
57	7.6	18.2	12.5	4.4	18.6	7.7
58	8.0	19.2	12.5	4.9	19.2	8.6
59	8.5	20.4	12.5	5.4	20.4	10.4
60	*	22.0	20.0	*	22.0	12.2
61		22.0	20.0		22.0	14.0
62		22.0	20.0		22.0	18.2
63		22.0	20.0		22.0	14.0
64		22.0	20.0		22.0	18.2
65		22.0	20.0		22.0	26.1
66		22.0	20.0		22.0	22.2
67		22.0	20.0		22.0	22.2
68		22.0	20.0		22.0	22.2
69		22.0	20.0		22.0	22.2
70		**	**		**	**

**All benefits are unreduced after attaining age 60.
**Immediate retirement is assumed at age 70 or over.*

**Teachers' Retirement System
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Table A-4

Disablement

Annual Rates

<u>Age</u>	<u>General Members</u>	<u>University Members</u>
25	.009%	.003%
30	.018	.006
35	.036	.012
40	.063	.021
45	.108	.036
50	.164	.055
55	.248	.083
60	.377	.126

**Teachers' Retirement System
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Table A-5

Mortality

Annual Rates

Age	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
	Men	Women	Men	Women
25	.06%	.03%	1.92%	1.02%
30	.07	.03	2.15	1.26
35	.08	.04	2.39	1.50
40	.09	.07	2.69	1.75
45	.13	.09	3.01	2.04
50	.19	.13	3.36	2.38
55	.32	.21	3.72	2.77
60	.56	.39	4.07	3.23
65	1.01	.76	4.46	3.76
70	1.80	1.27	5.13	4.36
75	2.85	2.04	6.22	5.32
80	4.52	3.54	7.50	6.84
85	7.55	6.10	11.48	9.30

**Teachers' Retirement System
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Table A-6

**Other Terminations of Employment
Among Members Not Eligible to Retire**

Annual Rates

<u>Age</u>	<u>General and University Members</u>
25	22.22%
30	13.95
35	8.30
40	5.84
45	4.19
50	3.60
55	3.02
60	2.67

**Teachers' Retirement System
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Table A-7

**Probability of Retaining Membership in the System
Upon Vested Termination**

<u>Age</u>	<u>Probability of Retaining Membership</u>
25	60%
30	60
35	60
40	60
45	63
50	71
55	75

**Teachers' Retirement System
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Appendix B

Summary of Benefit Provisions

Effective Date	September 1, 1937
Vesting Period	5 years. No benefits are payable unless the member has a vested right, except the return of employee contributions with interest.
Final Compensation	Average of highest 3 consecutive years of earned compensation.
Normal Form of Benefits	Life only annuity. All benefits cease upon death; however, in no event will the member receive less than the amount of employee contributions with interest.
Normal Retirement Benefits	
Eligibility:	25 years of service or age 60 and 5 years of service.
Benefit:	The retirement benefit is equal to 1/60 of final compensation for each year of service.
Early Retirement Benefits	
Eligibility:	5 years of service and age 50.
Benefit:	The retirement benefit is calculated in the same manner as described for normal retirement, but the benefit is reduced 1/2 of 1% for each of the first 60 months early and 3/10 of 1% for each of the next 60 months early.

Death Benefit

Eligibility: 5 years of service.

Benefit: The death benefit is equal to 1/60 of final compensation for each year of service accrued at date of death, with an actuarial adjustment based on the relation of the member's age at death to the beneficiary's age. A monthly benefit of \$200 is paid to each child until age 18. In addition, a lump-sum benefit of \$500 is paid upon the death of an active or retired member.

Disability Benefit

Eligibility: 5 years of service.

Benefit: The disability benefit is equal to 1/60 of final compensation for each year of service accrued at date of disability. The minimum benefit is 1/4 of the final compensation.

Withdrawal Benefits

With less than 5 years of service, the accumulated employee contributions with interest are returned. With more than 5 years, the member may elect a refund of contributions with interest or leave the contributions and interest in the System and retain a vested right to retirement benefits.

Contributions

Member: 7.150% of compensation.
Employer: 7.580% of compensation.

MCA 19-20-604 specifies that the employer contribution rate will return to 7.47% when the amortization period of the System's unfunded actuarial liability is 10 years or less according to the System's latest actuarial valuation.

Interest on Member Contributions

Interest on member contributions is currently being credited at a rate of 5.5% per annum.

Cost-of-Living Adjustments

On January 1 of each year, the retirement allowance payable must be increased by 1.5% if the retiree's most recent retirement effective date is at least 36 months prior to January 1 of the year in which the adjustment is to be made.

**Teachers' Retirement System
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Appendix C

Valuation Data

This valuation is based upon the membership of the System as of July 1, 2000. Membership data were supplied by the System and accepted for valuation purposes without audit. However, tests were performed to ensure that the data are sufficiently accurate for valuation purposes.

Table C-1 contains summaries of the data for contributing members. For full-time members, values shown in the tables are the numbers of members and their total and average annual salaries. For part-time members, only the numbers of members are shown.

Active Members	Number	Annual Salaries in Millions
Full-Time Members	13,289	\$ 477.2
Part-Time Members*	<u>4,245</u>	<u>42.0</u>
Total Contributing Members*	17,534	\$ 519.2
Active Members with Annual Compensation less than \$1,000	<u>886</u>	
Total Active Members	18,420	

** Excludes part-time members with annual compensation less than \$1,000.*

Table C-2 presents distributions of the following:

- Members receiving service retirement benefits.
- Members receiving disability retirement benefits.
- Survivors of deceased retired members receiving benefits.
- Survivors of deceased active members.
- Child beneficiaries.
- Terminated vested members.

The following is a summary of retired members and beneficiaries currently receiving benefits:

Type of Annuitant	Number	Annual Benefits in Thousands	Average Annual Benefits
Service Retirement	7,781	\$ 107,783	\$ 13,852
Survivors of Deceased Retired Members	<u>606</u>	<u>4,999</u>	<u>8,249</u>
Total Service Retirement (including survivors)	8,387	112,782	13,447
Disability Retirement	200	1,528	7,641
Survivors of Deceased Active Members	393	2,819	7,174
Child Beneficiaries	<u>41</u>	<u>98</u>	<u>2,400</u>
Total Annuitants	9,021	\$ 117,227	\$ 12,995

Terminated Members with Contributions Not Withdrawn*	Number
Vested Terminated Members	1,256
Non-Vested Terminated Members	<u>9,308</u>
Total Terminated Members	10,564

* Includes 107 records provided in the active data with salary equal to zero and contributions greater than zero.

**Teachers' Retirement System
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Table C-1

**Active Members Distribution of
Full-Time Employees and Salaries
as of July 1, 2000**

Number of Employees - By Age Group - All Members

Age	Completed Years of Service												Totals	
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+		
< 25	21	87	13	1	0	0	0	0	0	0	0	0	0	122
25 to 29	43	296	225	288	115	0	0	0	0	0	0	0	0	967
30 to 34	24	100	104	210	684	99	0	0	0	0	0	0	0	1,221
35 to 39	18	95	67	140	453	455	145	0	0	0	0	0	0	1,373
40 to 44	26	81	73	106	441	417	596	150	0	0	0	0	0	1,890
45 to 49	11	83	60	128	426	498	540	736	271	0	0	0	0	2,753
50 to 54	13	48	57	105	309	468	431	520	795	203	0	0	0	2,949
55 to 59	8	24	15	35	105	158	191	230	271	373	52	0	0	1,462
60 to 64	0	8	7	8	26	47	64	65	81	91	66	4	4	467
65 to 69	0	0	0	4	6	10	11	14	6	10	8	1	1	70
70 and up	2	0	1	0	1	3	1	2	0	4	0	1	1	15
Totals	166	822	622	1,025	2,566	2,155	1,979	1,717	1,424	681	126	6	6	13,289

**Teachers' Retirement System
State of Montana**

Table C-1

**Active Members Distribution of
Full-Time Employees and Salaries
as of July 1, 2000**

Annual Salaries in Thousands - By Age Group - All Members

Age	Completed Years of Service												Totals
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	
< 25	213	1,859	287	23	0	0	0	0	0	0	0	0	2,382
25 to 29	369	6,467	5,105	6,911	2,995	0	0	0	0	0	0	0	21,847
30 to 34	233	2,253	2,535	5,261	19,348	3,174	0	0	0	0	0	0	32,803
35 to 39	137	2,263	1,613	3,780	13,744	15,499	5,515	0	0	0	0	0	42,552
40 to 44	285	1,835	1,769	2,880	13,582	14,645	23,571	6,083	0	0	0	0	64,651
45 to 49	89	2,164	1,497	3,508	13,526	18,064	21,714	30,965	11,549	0	0	0	103,077
50 to 54	154	1,322	1,716	3,174	10,511	17,042	18,246	23,456	35,517	9,039	0	0	120,176
55 to 59	118	726	403	1,241	3,398	6,025	8,191	10,582	12,981	17,711	2,282	0	63,660
60 to 64	0	146	234	292	907	1,783	2,859	3,012	3,691	5,193	3,608	174	21,898
65 to 69	0	0	0	65	249	491	657	671	250	470	575	72	3,500
70 and up	3	0	52	0	24	121	37	90	0	247	0	39	613
Totals	1,602	19,036	15,211	27,136	78,285	76,844	80,791	74,859	63,988	32,660	6,464	284	477,160

**Teachers' Retirement System
State of Montana**

Table C-1

**Active Members Distribution of
Full-Time Employees and Salaries
as of July 1, 2000**

Average Annual Salary - By Age Group - All Members

Age	<u>Completed Years of Service</u>												Totals
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	
< 25	10,144	21,368	22,111	22,794	0	0	0	0	0	0	0	0	19,527
25 to 29	8,580	21,849	22,688	23,998	26,041	0	0	0	0	0	0	0	22,593
30 to 34	9,715	22,532	24,371	25,054	28,286	32,056	0	0	0	0	0	0	26,866
35 to 39	7,626	23,821	24,078	27,000	30,341	34,064	38,034	0	0	0	0	0	30,992
40 to 44	10,970	22,655	24,235	27,167	30,799	35,121	39,549	40,554	0	0	0	0	34,207
45 to 49	8,114	26,073	24,949	27,410	31,752	36,273	40,211	42,072	42,618	0	0	0	37,442
50 to 54	11,859	27,538	30,103	30,227	34,015	36,414	42,335	45,108	44,675	44,527	0	0	40,752
55 to 59	14,723	30,270	26,882	35,467	32,366	38,135	42,887	46,011	47,899	47,482	43,883	0	43,543
60 to 64	0	18,241	33,454	36,504	34,874	37,939	44,672	46,337	45,566	57,070	54,660	43,406	46,891
65 to 69	0	0	0	16,353	41,558	49,090	59,742	47,897	41,702	47,009	71,851	71,593	50,001
70 and up	1,355	0	51,833	0	24,176	40,303	37,000	44,869	0	61,818	0	39,263	40,860
Totals	9,648	23,158	24,455	26,474	30,509	35,658	40,824	43,599	44,935	47,960	51,304	47,413	35,906

**Teachers' Retirement System
State of Montana**

Table C-1

**Active Members Distribution of
Part-Time Employees and Salaries
as of July 1, 2000**

Number of Employees - By Age Group - All Members

Age	<u>Completed Years of Service</u>												Totals			
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+				
< 25	104	42	8	3	0	0	0	0	0	0	0	0	0	157		
25 to 29	176	120	44	55	32	0	0	0	0	0	0	0	0	427		
30 to 34	105	75	49	45	83	34	0	0	0	0	0	0	0	391		
35 to 39	120	111	60	90	75	55	33	0	0	0	0	0	0	544		
40 to 44	114	138	76	119	170	58	50	31	0	0	0	0	0	756		
45 to 49	114	116	89	128	248	94	43	41	17	0	0	0	0	890		
50 to 54	72	64	39	72	153	87	43	15	16	14	0	0	0	575		
55 to 59	31	30	16	33	73	43	28	19	12	4	5	0	0	294		
60 to 64	12	15	12	15	26	26	11	9	5	4	1	1	1	137		
65 to 69	5	10	5	2	10	7	2	3	4	1	0	2	2	51		
70 and up	4	4	2	3	4	4	2	0	0	0	0	0	0	23		
Totals	857	725	400	565	874	408	212	118	54	23	6	3	3	4,245		
															Part-Time Members with Annual Compensation less than \$1,000	886
															Total Part-Time Members	5,131

**Teachers' Retirement System
State of Montana**

Table C-2

Distribution of Inactive Lives

Members Receiving Service Retirement Benefits as of July 1, 2000

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	69	982	14,237
50 to 54	463	7,943	17,156
55 to 59	1,054	18,830	17,865
60 to 64	1,333	22,861	17,150
65 to 69	1,394	22,417	16,081
70 to 74	1,051	14,139	13,453
75 to 79	828	9,245	11,165
80 to 84	699	6,014	8,604
85 to 89	493	3,249	6,590
90 and up	397	2,102	5,295
Total	7,781	107,782	13,852

Members Receiving Disability Retirement Benefits as of July 1, 2000

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	20	165	8,227
50 to 54	30	268	8,946
55 to 59	27	228	8,451
60 to 64	31	251	8,108
65 to 69	20	159	7,958
70 to 74	24	177	7,359
75 to 79	17	117	6,907
80 to 84	21	111	5,287
85 to 89	7	38	5,462
90 and up	3	13	4,426
Total	200	1,528	7,641

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Table C-2

Distribution of Inactive Lives

Survivors of Deceased Retired Members as of July 1, 2000

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	22	142	6,464
50 to 54	23	176	7,651
55 to 59	26	229	8,822
60 to 64	43	422	9,818
65 to 69	75	755	10,069
70 to 74	76	775	10,197
75 to 79	123	961	7,813
80 to 84	97	785	8,092
85 to 89	65	390	5,998
90 and up	56	363	6,486
Total	606	4,999	8,249

Survivors of Deceased Active Members as of July 1, 2000

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	86	399	4,643
50 to 54	56	353	6,305
55 to 59	43	437	10,156
60 to 64	37	303	8,183
65 to 69	36	308	8,563
70 to 74	46	423	9,193
75 to 79	42	353	8,399
80 to 84	28	134	4,781
85 to 89	12	70	5,815
90 and up	7	40	5,689
Total	393	2,819	7,174

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Table C-2

Distribution of Inactive Lives

Terminated Vested Members as of July 1, 2000
Number of Persons

Age	Number
<25	9
25 to 30	72
30 to 35	115
35 to 40	215
40 to 45	289
45 to 50	276
50 to 55	209
55 to 60	58
60 to 65	8
65 and up	5
Total	1,256

Child Beneficiaries as of July 1, 2000 *
Number of Persons

Age	Number
<5	1
5 to 6	1
7 to 8	5
9 to 10	2
11 to 12	3
13 to 14	4
15 to 16	14
17 to 18	11
Total	41

** Child Beneficiaries all receive \$200 per month, for a total of \$98,400 per year.*

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Appendix D

Comparative Schedules

This section contains tables that summarize the experience of the System shown in present and past valuation reports.

Table D-1 shows a summary of the active members covered as of the various valuation dates.

Table D-2 shows a summary of the retired and inactive members as of the various valuation dates.

Table D-3 summarizes the contribution rates determined by each annual actuarial valuation.

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Table D-1

Active Membership Data

Valuation Date (July 1)	Active Members								
	Full-Time Members	Part-Time Members**	Total Contributing Members**	Part-Time Members Annual Compensation less than \$1,000	Annual Full-Time Salaries in Thousands	Average Full-Time Annual Salary	Average Age**	Average Years of Service**	Average Hire Age**
1987	13,105	1,955	15,060	*	\$340,481	\$25,981	*	*	*
1989	12,546	2,541	15,087	*	339,866	27,090	*	*	*
1992	13,502	3,141	16,643	*	401,092	29,706	42.4	11.6	30.8
1994	14,938	2,637	17,575	377	416,968	27,914	42.5	11.0	31.5
1996	13,251	5,444	18,695	1,295	424,085	32,004	43.3	11.6	31.7
1998	13,545	4,647	18,192	776	459,191	33,901	44.0	12.1	31.9
2000	13,289	4,245	17,534	886	477,160	35,906	44.5	12.2	32.3

* *Not available.*

** *Excludes part-time active members with annual compensation less than \$1,000.*

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Table D-2

Retired and Inactive Membership Data

Valuation Date (July 1)	All Annuitants					Terminated Members	
	Number	Annual Benefits in Thousands	Average Annual Benefit	Average Current Age	Average Age at Retirement	Number Vested Terminated	Number Non-Vested Terminated
1987	6,036	\$ 43,236	\$ 7,163	*	*	*	*
1989	6,330	49,546	7,827	*	*	*	*
1992	6,927	63,483	9,165	*	*	*	*
1994	7,530	78,183	10,383	*	*	1,105	5,722
1996	7,896	87,351	11,063	*	*	1,152	6,479
1998	8,362	99,040	11,844	69.6	57.3	1,190	8,158
2000	9,021	117,227	12,995	69.3	57.0	1,256	9,308

* *Not available.*

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Table D-3

Contribution Rates

Valuation Date (July 1)	Contribution Rates			Normal Cost Rate	UAL Rate**
	Employee	Employer	Total		
1989*	7.044%	7.459%	14.503%	8.827	5.676%
1992	7.044%	7.459%	14.503%	9.876	4.627%
1994	7.044%	7.470%	14.514%	9.494	5.020%
1996	7.044%	7.470%	14.514%	9.328	5.186%
1998	7.044%	7.470%	14.514%	8.880	5.634%
2000	7.15%	7.58%	14.73%	9.71	5.02%

* Valuation performed by Hendrickson, Miller & Associates, Inc.

** The unfunded actuarial liability rate is the amount available to amortize the unfunded actuarial liability. It is equal to the total contribution rate, minus the normal cost rate.

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Appendix E

Glossary

The following definitions are largely excerpts from a list adopted in 1981 by the major actuarial organizations in the United States. In some cases the definitions have been modified for specific applicability to the Teachers' Retirement System Retirement System. Defined terms are capitalized throughout this Appendix.

Actuarial Assumptions

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disablement, and retirement; changes in compensation, rates of investment earnings, and asset appreciation or depreciation; procedures used to determine the Actuarial Value of Assets; and other relevant items.

Actuarial Cost Method

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of such value to time periods, usually in the form of a Normal Cost and an Actuarial Liability.

Actuarial 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, as determined in accordance with a particular Actuarial Cost Method.

Actuarial Present Value

The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions.

Actuarial Valuation

The determination, as of a valuation date, of the Normal Cost, Actuarial Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

Actuarial Value of Assets

The value of cash, investments and other property belonging to a pension plan, as used by the actuary for the purpose of an Actuarial Valuation.

Actuarially Equivalent

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

Amortization Payment

That portion of the pension plan contribution which is designed to pay interest on and to amortize the Unfunded Actuarial Liability.

Entry Age Actuarial Cost Method

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a valuation date by the Actuarial Present Value of future Normal Costs is called the Actuarial Liability.

Normal Cost

That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method.

Actuarial Liability

That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of pension plan benefits and expenses which is not provided for by future Normal Costs.

Unfunded Actuarial Liability

The excess of the Actuarial Liability over the Actuarial Value of Assets.

Accrued Benefit

The amount of an individual's benefit (whether or not vested) as of a specific date, determined in accordance with the terms of a pension plan and based on compensation and service to that date.

Projected Benefits

Those pension plan benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits.

Unaccrued Benefit

The excess of an individual's Projected Benefits over the Accrued Benefits as of a specified date.