

July 10, 2018 - DRAFT

Ms. Kerrie Vanden Bosch
Director, Office of Retirement Services
530 W. Allegan
Lansing, Michigan 48933

Re: Separate Actuarial Valuation as of September 30, 2017 for University Members of MPSERS (Pension Benefits Only)

Dear Ms. Vanden Bosch:

We have completed a separate actuarial valuation for current and former employees of the seven Michigan Universities that have withdrawn from the Michigan Public School Employees Retirement System (for their employees hired on or after January 1, 1996) due to the enactment of Act No. 272 of the Public Acts of 1995. This actuarial valuation was prepared as of September 30, 2017, and utilized the same actuarial assumptions and methods used for the 2017 valuation of MPSERS, except that the unfunded actuarial accrued liability for University members is expected to be completely amortized by September 30, 2036.

The purpose of the valuation is to provide the required contribution rates for the fiscal year beginning October 1, 2019 and to evaluate the liabilities and funded status of the System for the affected members in total. This report should not be relied upon for any other purpose.

Select valuation results are presented in the following tables:

- Table 1 - Demographic Characteristics - Comparison of University and Non-University MPSERS Members as of September 30, 2017 and September 30, 2016
- Table 2 - Contribution Rates for the Indicated Fiscal Years Expressed as a Percentage of Payroll
- Table 3 - University Contribution Rates as of September 30, 2017 for the Fiscal Year Beginning October 1, 2019 – Expressed as a Percentage of Payroll and Estimated Dollars
- Table 4 - Actuarial Valuation Results as of September 30, 2017
- Table 5 - Active University MPSERS Members as of September 30, 2017 by Age and Years of Service
- Table 6 - Active University MPSERS Member Statistics by Plan Type

Table 7 - University MPSERS Pensions in Force on September 30, 2017 by Type of Pension, Selected Option, and Pension Amount

Table 8 - Summary of MPSERS Liability Transfers Between Non-University and University from October 1, 2016 through September 30, 2017

Table 9 - Allocation of September 30, 2017 MPSERS Assets Between University and Non-University Members

Table 10 - Unfunded Actuarial Accrued Liability and Actuarial Gain (Loss)

Section 41a of Act 300 of the Public Acts of 1980, as amended, provides for "... the payment schedule for universities being based on and applied to the combined payrolls of the universities' employees who are members and who were hired before January 1, 1996 and the universities' employees who would have been members on or after January 1, 1996, but for the enactment of 1995 PA 272." The total additional payroll for University employees hired since January 1, 1996 was reported to be \$104.5 million for the year ending September 30, 2017. Table 3 converts the employer percentage of payroll contribution rate that is based on payroll *only* for University MPSERS members with future benefit accruals in the defined benefit plan (110.19% for the fiscal year beginning October 1, 2019) into a contribution rate (31.38% for the fiscal year beginning October 1, 2019) based on that payroll plus a percentage (25.09% for the fiscal year beginning October 1, 2019) based on the combined payroll of University employees hired since January 1, 1996 who are not members of MPSERS and of University MPSERS members who elected not to continue future benefit accruals in the defined benefit plan. Therefore, the 2019/2020 employer contribution should be the sum of:

- a) 31.38% of University MPSERS member payroll for those continuing in the defined benefit plan, plus
- b) 25.09% of University non-MPSERS member payroll and University MPSERS member payroll for those who elected the defined contribution plan.

Please note, the amortization component of the employer contribution as a percentage of payroll has been calculated consistently with previously issued University reports. The payroll floor associated with the enactment of Act No. 136 of the Public Acts of 2016 is not reflected in this valuation report. The amortization payment portion of the employer contribution in dollars for the fiscal year beginning October 1, 2019 is \$46,726,631. The source of this payment, either from the Universities or from the State, does not impact valuation results.

The valuation was based upon information furnished by the Office of Retirement Services, concerning Retirement System benefits, financial transactions, and active members, terminated members, retirees and beneficiaries. Data was checked for internal and year-to-year consistency, but was not audited by us. This report may be provided to parties other than the Office of Retirement Services only in its entirety and only with the permission of the Office of Retirement Services. GRS is not responsible for unauthorized use of this report.



The valuation summarized in this report involves actuarial calculations that require making assumptions about future events. The assumptions and methods are disclosed fully in the September 30, 2017 actuarial valuation of MPSERS. We believe that the assumptions and methods used in this report are reasonable and appropriate. However, other assumptions and methods could also be reasonable and could result in materially different results. Some of the numbers in this report are rounded. There may be cases where schedules do not add, or where they do not exactly balance to other related schedules due to rounding. The use of rounded numbers for plan liabilities should not imply a lack of precision. 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 we deem to be immaterial.

As noted in the September 30, 2017 actuarial valuation report of MPSERS, we continue to include two service purchase loads in the accrued liability due to questions from the auditor as to how purchased service is reported. We included a load of \$129,000 in the accrued liability for purchased service that has been paid for but not reported. We included a load of \$97,600 in the accrued liability for amounts included in the plan's reported assets for purchased service that has not yet been paid for by the members.

In accordance with the Dedicated Gains Policy, the Non-Hybrid plan investment return assumption was lowered from 7.50% to 7.05% effective with this valuation. This assumption change increased the accrued liabilities by \$42.8 million.

To the best of our knowledge, this report is complete and accurate and the valuation was conducted in accordance with standards of practice prescribed by the Actuarial Standards Board and in compliance with the applicable State statutes. Mita D. Drazilov and Louise M. Gates are Members of the American Academy of Actuaries (MAAA), are independent of the plan sponsor, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. It is our opinion that the actuarial assumptions used for the valuation produce results which are reasonable.

Sincerely,



Mita D. Drazilov, ASA, FCA, MAAA



Louise M. Gates, ASA, FCA, MAAA

MDD:rmn



Table 1

Demographic Characteristics Comparison of University and Non-University MPSERS Members as of September 30, 2017 and September 30, 2016

2017	Total	University MPSERS Members	Non-University MPSERS Members
<u>Active Members</u>			
Number	187,735	1,244	186,491
Average age	46.2	57.2	46.1
Average service	13.0	26.7	12.9
Reported payroll	\$ 7,880,040,886	\$ 62,264,282	\$ 7,817,776,604
Average annual payroll	\$ 41,974	\$ 50,052	\$ 41,920
<u>Inactive Vested Members</u>			
Number	22,234	399	21,835
<u>Retirees & Beneficiaries</u>			
Number	213,989	5,004	208,985
Annual pension	\$ 4,839,414,353	\$ 83,679,807	\$ 4,755,734,546
Average annual pension	\$ 22,615	\$ 16,723	\$ 22,756
2016	Total	University MPSERS Members	Non-University MPSERS Members
<u>Active Members</u>			
Number	189,761	1,398	188,363
Average age	46.2	56.8	46.1
Average service	13.0	26.1	12.9
Reported payroll	\$ 7,912,564,735	\$ 68,941,459	\$ 7,843,623,276
Average annual payroll	\$ 41,698	\$ 49,314	\$ 41,641
<u>Inactive Vested Members</u>			
Number	22,508	411	22,097
<u>Retirees & Beneficiaries</u>			
Number	211,007	4,994	206,013
Annual pension	\$ 4,709,668,096	\$ 81,665,593	\$ 4,628,002,503
Average annual pension	\$ 22,320	\$ 16,353	\$ 22,465

The above statistics include only those members entitled to some type of defined benefit from the Retirement System. Active members hired after PA 300 of 2012 who elected the pure defined contribution plan are excluded from the statistics above.

The September 30, 2016 inactive counts include 4,640 people (including 36 University people) who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

The September 30, 2017 inactive counts include 4,230 people (including 36 University people) who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

Table 2

Contribution Rates for the Indicated Fiscal Years Expressed as a Percentage of Payroll

Total - All MPSERS Members			
Valuation Date Fiscal Year Beginning	September 30, 2017 October 1, 2019	September 30, 2016 October 1, 2018	September 30, 2015 October 1, 2017
Total Normal Cost	10.62 %	9.19 %	8.29 %
Member Contributions	<u>4.94</u>	<u>4.73</u>	<u>4.69</u>
Employer Normal Cost	5.68 %	4.46 %	3.60 %
Amortization Payment	<u>24.07</u>	<u>24.01</u>	<u>22.18</u>
Total Employer Contribution	N/A	N/A	N/A
Projected Active Member Payroll For Fiscal Year (in millions)			
Normal Cost \$	\$8,726.9	\$8,761.3	\$8,864.0
Amortization \$	\$9,090.0	\$9,072.4	\$9,136.4
University MPSERS Members			
Valuation Date Fiscal Year Beginning	September 30, 2017 October 1, 2019	September 30, 2016 October 1, 2018	September 30, 2015 October 1, 2017
Total Normal Cost	9.45 %	8.42 %	7.41 %
Member Contributions	<u>3.16</u>	<u>3.13</u>	<u>3.14</u>
Employer Normal Cost	6.29 %	5.29 %	4.27 %
Amortization Payment	<u>103.90</u>	<u>92.11</u>	<u>80.88</u>
Total Employer Contribution	110.19 %	97.40 %	85.15 %
Projected Active Member Payroll ⁽¹⁾ For Fiscal Year (in millions)			
Normal Cost \$	\$45.0	\$51.0	\$55.4
Amortization \$	\$45.0	\$51.0	\$55.4
Non-University MPSERS Members			
Valuation Date Fiscal Year Beginning	September 30, 2017 October 1, 2019	September 30, 2016 October 1, 2018	September 30, 2015 October 1, 2017
Total Normal Cost	10.63 %	9.19 %	8.30 %
Member Contributions	<u>4.95</u>	<u>4.74</u>	<u>4.70</u>
Employer Normal Cost	5.68 %	4.45 %	3.60 %
Amortization Payment	<u>23.67</u>	<u>23.63</u>	<u>21.82</u>
Total Employer Contribution	N/A	N/A	N/A
Projected Active Member Payroll ⁽²⁾ For Fiscal Year (in millions)			
Normal Cost \$	\$8,681.9	\$8,710.3	\$8,808.6
Amortization \$	\$9,045.0	\$9,021.4	\$9,081.0

⁽¹⁾ Payroll for University members of MPSERS with future defined benefit accruals.

⁽²⁾ Payroll for Non-University members of MPSERS and University members of MPSERS with future defined contribution accruals.

Table 3

**University Contribution Rates as of September 30, 2017
for the Fiscal Year Beginning October 1, 2019
Expressed as a Percentage of Payroll and Estimated Dollars**

	Using Only Payroll of University Members of MPSERS with Future Defined Benefit Accruals		Also Using Payroll of University Non-Members Hired Since January 1, 1996 and University Members of MPSERS with Future Defined Contribution Accruals For Amortization Payment	
	Percentage of Pay	Dollar Amount (In Millions)	Percentage of Pay	Dollar Amount (In Millions)
Normal Cost	9.45 %	\$ 4.250	9.45 %	\$ 4.250
Member Contributions	<u>3.16</u>	<u>1.421</u>	<u>3.16</u>	<u>1.421</u>
Employer Normal Cost	6.29 %	\$ 2.829	6.29 %	\$ 2.829
Amortization Payment	<u>103.90</u>	<u>46.727</u>	<u>25.09</u>	<u>46.726</u>
Total Employer Contribution	110.19 %	\$ 49.555	31.38 %	\$ 49.555
Projected Payroll (In Millions)				
For Normal Cost		\$ 44.973		\$ 44.973
For Amortization Payment		\$ 44.973		\$ 186.221

This exhibit does not reflect the payroll floor associated with Act No. 136 of the Public Acts of 2016 (see page 2).

Table 4

Actuarial Valuation Results as of September 30, 2017

	Total All MPSERS Members	University MPSERS Members	Non-University MPSERS Members
(1) Fiscal Year Ending September 30,	2020	2020	2020
(2) Total Normal Cost of Benefits (as a % of member pay)	10.62%	9.45%	10.63%
(3) Member Contribution % (weighted average)	<u>4.94%</u>	<u>3.16%</u>	<u>4.95%</u>
(4) Employer Normal Cost % = (2) - (3)	5.68%	6.29%	5.68%
(5) Projected Active Member Payroll for Fiscal Year - Normal Cost \$	\$8,726,859,711	\$44,972,696	\$8,681,887,015
(6) Employer Normal Cost \$ = (4) x (5) ¹	496,109,570	2,828,783	493,280,787
(7) Actuarial Accrued Liability - Total	76,693,475,788	1,128,117,496	75,565,358,292
Active employees	22,592,166,543	272,856,081	22,319,310,462
Inactive vested members ²	2,116,097,352	25,604,219	2,090,493,133
Other inactive members ³	107,465,380	2,563,920	104,901,460
Retirees and surviving beneficiaries	51,877,746,513	827,093,276	51,050,653,237
(8) Funding Value of Assets	47,255,286,564	522,014,179	46,733,272,385
(9) Unfunded Actuarial Accrued Liabilities (UAAL) = (7) - (8)	29,438,189,224	606,103,317	28,832,085,907
(10) Amortization Period (years)	Multiple Periods	17	Multiple Periods
(11) Amortization Factor (level percent of payroll payments)	N/A	12.71979307	N/A
(12) Amortization Payment %	24.07%	103.90%	23.67%
(13) Projected Active Member Payroll for Fiscal Year - Amortization \$	\$9,090,040,556	\$44,972,696	\$9,045,067,860
(14) Amortization Payment \$ = (12) x (13)	2,187,972,761	46,726,631	2,141,246,130
(15) Total Computed Employer Contribution % = (4) + (12)	N/A	110.19%	N/A
(16) Total Computed Employer Contribution \$ = (6) + (14)	\$ 2,684,082,331	\$ 49,555,414	\$ 2,634,526,917

¹ The formula in line (6) only applies to the University column. This is because of the effect of the Pension Plus Plan and the Pension Plus 2 Plan provisions on the Total and Non-University columns.

² Includes pending refunds of employee contributions for former employees who terminated without a vested benefit.

³ Includes liabilities for employees who transferred to the DC pension plan in connection with PA 300.

Table 5**Active University MPSERS Members as of September 30, 2017
by Age and Years of Service**

Age	Years of Service							Total Count	Total Pay	Average Pay
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 & up			
35 - 39		1						1	\$ 42,979	\$ 42,979
40 - 44	3	4	3	11	15			36	1,589,295	44,147
45 - 49	9	16	18	12	40	38	3	136	6,365,542	46,805
50 - 54	4	7	9	19	57	87	73	256	12,747,205	49,794
55 - 59	12	8	12	19	45	95	163	354	16,863,001	47,636
60 - 64	5	12	6	11	36	74	165	309	15,891,814	51,430
65 - 69	6	7	5	3	7	19	57	104	6,309,317	60,667
70 & Over	10	3	2	3	5	4	21	48	2,455,129	51,149
Total	49	58	55	78	205	317	482	1,244	\$ 62,264,282	\$ 50,052

The September 30, 2017 active statistics exclude 36 University people who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

As of September 30, 2017, the total University payroll (MPSERS members and Non-MPSERS members) was reported to be \$168.0 million.

Table 6

Active University MPSERS Member Statistics by Plan Type

	September 30, 2016	September 30, 2017
Basic Members		
Number	620	539
Average Age	57.6 years	58.2 years
Average Service	29.4 years	30.2 years
Reported Payroll	\$ 32,204,469	\$ 28,618,848
Average Annual Pay	\$ 51,943	\$ 53,096
MIP Members		
Number	778	705
Average Age	56.1 years	56.4 years
Average Service	23.5 years	24.0 years
Reported Payroll	\$ 36,736,990	\$ 33,645,434
Average Annual Pay	\$ 47,220	\$ 47,724
Total		
Number	1,398	1,244
Average Age	56.8 years	57.2 years
Average Service	26.1 years	26.7 years
Reported Payroll	\$ 68,941,459	\$ 62,264,282
Average Annual Pay	\$ 49,314	\$ 50,052

The September 30, 2016 total active count excludes 36 University people who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

The September 30, 2017 total active count excludes 36 University people who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

As of September 30, 2017, the total University payroll (MPSERS members and Non-MPSERS members) was reported to be \$168.0 million.

Table 7

University MPSERS Pensions in Force on September 30, 2017 by Type of Pension, Selected Option, and Pension Amount

Amount of Monthly Benefit	Number of Retirees	Type of Retirement*						Selected Option**				
		1	2	3	4	5	6	Opt. 1	Opt. 2	Opt. 3	Opt. 4	Opt 1E 2E,3E,4E
\$ 1 - 200	353	286	61	1	3	0	2	159	109	54	7	24
201 - 400	537	422	72	5	31	0	7	267	144	80	11	35
401 - 600	528	407	62	5	38	0	16	243	145	77	14	49
601 - 800	488	379	54	5	36	0	14	232	114	78	17	47
801 - 1,000	470	402	29	4	28	0	7	236	91	71	23	49
1,001 - 1,200	407	340	39	2	19	0	7	176	88	79	30	34
1,201 - 1,400	341	296	28	1	11	0	5	135	94	65	28	19
1,401 - 1,600	322	288	25	0	4	0	5	129	74	62	25	32
1,601 - 1,800	256	227	21	0	4	0	4	103	54	49	24	26
1,801 - 2,000	208	182	22	0	2	0	2	82	52	42	17	15
Over 2,000	1,094	976	100	0	6	0	12	411	319	217	92	55
Totals	5,004	4,205	513	23	182	0	81	2,173	1,284	874	288	385

* Type of Retirement

- 1 – Normal retirement for age & service
- 2 – Survivor payment – normal retirement
- 3 – Duty disability retirement (including survivors)
- 4 – Non-duty disability retirement (including survivors)
- 5 – Survivor payment – duty death in service
- 6 – Survivor payment – non-duty death in service

** Selected Option

- Opt. 1 – Straight life allowance
- Opt. 2 – 100% survivor option
- Opt. 3 – 50% survivor option
- Opt. 4 – 75% survivor option
- Opt. 1E, 2E, 3E, 4E – Equated retirement options

Table 8

Summary of MPSERS Liability Transfers Between Non-University & University from October 1, 2016 through September 30, 2017

Transfers between segments	
Transfers to University	
a) 6 Non-University actives as of 10/1/2016 who transferred to University actives by 10/1/2017	\$ 838,048
b) 0 Non-University terminated vested as of 10/1/2016 who transferred to University actives by 10/1/2017	0
c) 0 Non-University pensioners as of 10/1/2016 who transferred to University actives by 10/1/2017	0
d) 1 Non-University actives as of 10/1/2016 who transferred to University terminated vesteds by 10/1/2017	115,014
e) 1 Non-University terminated vesteds as of 10/1/2016 who transferred to University terminated vesteds by 10/1/2017	334,439
f) 0 Non-University pensioners as of 10/1/2016 who transferred to University terminated vesteds by 10/1/2017	0
g) 0 Non-University actives as of 10/1/2016 who transferred to University pensioners by 10/1/2017	0
h) 2 Non-University terminated vested as of 10/1/2016 who transferred to University pensioners by 10/1/2017	238,280
i) 0 Non-University pensioners as of 10/1/2016 who transferred to University pensioners by 10/1/2017	0
j) Total Transfers into University	\$ 1,525,781
Transfers from University	
k) 9 University actives as of 10/1/2016 who transferred to Non-University actives by 10/1/2017	\$ 2,158,365
l) 3 University terminated vesteds as of 10/1/2016 who transferred to Non-University actives by 10/1/2017	46,929
m) 0 University pensioners as of 10/1/2016 who transferred to Non-University actives by 10/1/2017	0
n) 2 University actives as of 10/1/2016 who transferred to Non-University terminated vesteds by 10/1/2017	395,091
o) 3 University terminated vested as of 10/1/2016 who transferred to Non-University terminated vesteds by 10/1/2017	196,786
p) 0 University pensioners as of 10/1/2016 who transferred to Non-University terminated vesteds by 10/1/2017	0
q) 0 University actives as of 10/1/2016 who transferred to Non-University pensioners by 10/1/2017	0
r) 0 University terminated vested as of 10/1/2016 who transferred to Non-University pensioners by 10/1/2017	0
s) 5 University pensioners as of 10/1/2016 who transferred to Non-University pensioners by 10/1/2017	271,391
t) Total Transfers from University	\$ 3,068,562
u) Total Net Transfers (j - t)	\$ (1,542,781)

Table 9

Allocation of September 30, 2017 MPERS Assets Between University and Non-University Members

Year Ended September 30, 2017	Total MPERS	MPERS University	MPERS Non-University
A. Funding Value Beginning of Year	\$ 43,203,593,340	\$ 487,577,728	\$ 42,716,015,612
B. Market Value			
B1. Market Value End of Year	47,011,783,071	518,815,498	46,492,967,573
B2. Market Value Beginning of Year	43,460,578,748	492,315,440	42,968,263,308
B3. Audit Adjustment	-	-	-
C. Non-Investment Net Cash Flow			
C1. Member Contributions	427,988,238	2,424,454	425,563,784
C2. Employer Contributions	2,398,950,106	46,946,092 ³	2,352,004,014
C3. Benefit Payments	(4,806,958,754)	(83,531,989)	(4,723,426,765)
C4. Contribution Refunds / Transfers	(26,111,404)	-	(26,111,404)
C5. Administrative Expenses ¹	Included in D1	Included in D1	Included in D1
C6. University Employer Contribution Refund	-	-	-
C7. University/Non-University Participant Transfer	-	(1,542,781)	1,542,781
C8. Total Net Cash Flow: C1 + C2 + C3 + C4 + C5 + C6 + C7	(2,006,131,814)	(35,704,224)	(1,970,427,590)
D. Investment Return			
D1. Market Return Total: B1 - B2 - B3 - C8 ¹	5,557,336,137	62,204,282	5,495,131,855
D2. Assumed Rate of Return ²	N/A	7.50%	N/A
D3. Market Rate of Return	13.09%	13.09%	13.09%
D4. Dedicated Gains Policy Trigger (Excess Return %)	5.51%	5.51%	5.51%
D5. Market Return for Immediate Recognition: D4 x (B2 + B3 + (C8 - C7)/2)	2,322,904,508	26,185,433	2,296,719,075
D6. Assumed Amount of Return: D2 x (A + B3 + (C8 - C7)/2)	3,163,545,672	35,287,275	3,128,258,397
D7. Amount Subject to Phase-In: D1 - D5 - D6	70,885,957	731,574	70,154,383
E. Phased-In Recognition of Investment Return			
E1. Current Year: 0.20 x D7	14,177,192	146,315	14,030,877
E2. First Prior Year	(25,962,780)	(224,653)	(25,738,127)
E3. Second Prior Year	(433,451,498)	(6,257,797)	(427,193,701)
E4. Third Prior Year	644,579,078	9,405,612	635,173,466
E5. Fourth Prior Year	372,032,866	5,598,490	366,434,376
E6. Total Phase-Ins	571,374,858	8,667,967	562,706,891
F. Funding Value End of Year			
F1. Preliminary Funding Value End of Year: A + B3 + C8 + D5 + D6 + E6	\$ 47,255,286,564	\$ 522,014,179	\$ 46,733,272,385
F2. Corridor Percent	30%	30%	30%
F3. Upper Corridor Limit: (100% + F2) x B1	61,115,317,992	674,460,147	60,440,857,845
F4. Lower Corridor Limit: (100% - F2) x B1	32,908,248,150	363,170,849	32,545,077,301
F5. Funding Value End of Year	\$ 47,255,286,564	\$ 522,014,179	\$ 46,733,272,385
G. Difference Between Market and Funding Value	(243,503,493)	(3,198,681)	(240,304,812)
H. Recognized Rate of Return	14.35 %	14.91 %	14.35 %
I. Market Rate of Return	13.09 %	13.09 %	13.09 %
J. Ratio of Funding Value to Market Value	1.0052	1.0062	1.0052

¹ Allocated in proportion to average market value.

² Discount rate was 7.5% for the Non-Hybrid groups and 7.0% for the Hybrid group for the September 30, 2016 valuation.

³ Includes non-member employer contributions.

Table 10

Unfunded Actuarial Accrued Liability and Actuarial Gain (Loss)

	Unfunded Actuarial Accrued Liability as of September 30, 2017		
	All MPSERS Members	University MPSERS Members	Non-University MPSERS Members
1. Actuarial accrued liability	\$76,693,475,788	\$1,128,117,496	\$75,565,358,292
2. Valuation assets	<u>47,255,286,564</u>	<u>522,014,179</u>	<u>46,733,272,385</u>
3. Unfunded (overfunded) actuarial accrued liability = (1) - (2)	29,438,189,224	606,103,317	28,832,085,907
	Derivation of Actuarial Gain (Loss)		
	All MPSERS Members	University MPSERS Members	Non-University MPSERS Members
4. Unfunded Actuarial Accrued Liability (UAAL) - Previous Valuation	\$ 29,106,852,486	\$ 605,234,876	\$ 28,501,617,610
5. Total Normal Cost (employer plus member) for Year Ending 9/30/2017	763,146,945	5,242,653	757,904,292
6. Total Contributions (employer plus member) for Year Ending 9/30/2017	2,826,938,344	49,370,546	2,777,567,798
7. Interest on:			
a. UAAL: Discount Rate ¹ x (4)	2,183,014,826	45,392,616	2,137,622,210
b. Normal Cost and Contributions: Discount Rate ¹ / 2 x [(5) - (6)]	<u>(77,385,420)</u>	<u>(1,654,796)</u>	<u>(75,730,624)</u>
c. Net Total: (a) + (b)	2,105,629,406	43,737,820	2,061,891,586
8. Change in UAAL due to Benefit Changes	0	0	0
9. Change in UAAL due to Assumption Changes	3,366,343,725	42,823,608	3,323,520,117
10. Expected UAAL Current Year: (4) + (5) - (6) + (7c) + (8) + (9)	32,515,034,218	647,668,411	31,867,365,807
11. Actual UAAL Current Year	29,438,189,224	606,103,317	28,832,085,907
12. Experience Gain/(Loss): (10) - (11)	3,076,844,994	41,565,094	3,035,279,900
13. Actuarial accrued liability at start of year	72,310,445,826	1,092,812,604	71,217,633,222
14. Gain (loss) as percent of pension actuarial accrued liabilities at start of year	4.26%	3.80%	4.26%
15. Portion of gain (loss) due to investment performance	2,894,279,366 ²	34,853,400 ²	2,859,425,966

¹ Discount rate was 7.5% for the Non-Hybrid groups and 7.0% for the Hybrid group for the September 30, 2016 valuation.

² Please note that row 15 above includes the accelerated recognition of investment gains associated with the Dedicated Gains Policy, if applicable.