



**MUNICIPAL EMPLOYEES' RETIREMENT SYSTEM OF MICHIGAN**

APPENDIX TO THE ANNUAL ACTUARIAL VALUATION REPORT DECEMBER 31, 2014

Summary of Plan Provisions, Actuarial Assumptions and Actuarial Funding Method  
as of December 31, 2014

## Introduction

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An actuarial valuation is the mathematical process that estimates plan liabilities and employer contribution requirements for purposes of funding the individual employer plans within MERS. This process is repeated annually to update the liabilities and contribution requirements for changes in member census and plan features, and to reflect actual plan experience in the process. The valuation reflects the present provisions of the Municipal Employees' Retirement Act of 1984, as amended by 1996 Public Act 220 (as amended), as embodied in the MERS Plan Document (as revised). The specific benefit provisions in effect for each municipality are listed in Table 2 in the municipality's actuarial report.

In addition to using current membership and financial data, an actuarial valuation requires the use of a series of assumptions regarding uncertain future events. The assumptions and methods used in the December 31, 2014 Actuarial Valuation are those adopted by the Retirement Board. The most recent study of plan experience covered the period from December 31, 2003 through December 31, 2008. The actuarial assumptions are unchanged from those used in the December 31, 2013 valuations.

There have been no changes in the funding method, adopted by the Retirement Board beginning with the December 31, 1993 valuations. The basic funding method is entry age normal and employer contribution amounts are developed as a level percentage of projected payroll for employee divisions that are open to new employees.

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

Details on MERS plan provisions, actuarial assumptions, and actuarial methodology follow this section.

## Assumption and Method Changes for the December 31, 2014 Actuarial Valuation

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There are no changes in actuarial assumptions or methods affecting the December 31, 2014 Actuarial Valuations.

## 2009-2013 Experience Study

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The 2009-2013 Five-Year Experience Study will be completed in Summer, 2015 and will first impact the December 31, 2015 Actuarial Valuations (affecting contribution requirements for fiscal years beginning in 2017). The experience study will likely result in changes in the assumptions and methods, which would impact future contribution requirements. Note the assumptions and methods do not impact the ultimate cost of the plan; they only impact the pattern of contributions.

# Summary of Plan Provisions — Defined Benefit Plan<sup>1</sup>

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The benefits summarized in this section are intended only as general information regarding the Municipal Employees' Retirement System of Michigan. They are not a substitute for Act. No. 220 of the Public Acts of 1996, and the MERS Plan Document (as revised). If any conflict occurs between the information in this summary and Act. No. 220 of the Public Acts of 1996 (as amended) or the MERS Plan Document (as revised), the provisions of Act. No. 220 and the MERS Plan Document govern.

## Eligibility for Retirement

MERS members are eligible to retire at:

- Age 60 with enough credited service to be vested (see below).
- Age 55 with 15 or more years of credited service.
- Age 50 with 25 or more years of credited service.

The retirement allowance is reduced ½ of 1% for each complete month that the retirement date precedes 60. The reduction may be partially or fully waived by adopting the early retirement provisions outlined below.

## Optional Retirement Programs (Unreduced Benefits)

- Age 50 with a required period of credited service of either 25 or 30 years.
- Age 55 with a required period of credited service of 15, 20, 25 or 30 years.
- Any age with a required period of credited service of 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 or 30 years.

## Mandatory Retirement

None.

## Deferred Retirement (Vesting)

Retirement can be deferred if membership is terminated before age 60 other than by retirement or death, after becoming vested (10 years of credited service is required for vesting; adopting 5, 6, 7, 8 or 9 year vesting is optional). The retirement allowance begins when the application is filed with MERS and eligibility requirements for retirement are met. The deferred retirement allowance is computed in the same manner as a service retirement allowance, based on the benefit program in effect as of the date of termination of membership.

Rights to an allowance are forfeited if the member's accumulated contributions are refunded after termination of employment.

<sup>1</sup> Please see the description of the Hybrid Plan beginning on page 9.

## Final Average Compensation (FAC)

MERS Plan benefits are based on a member's FAC, subject to the dollar compensation limits under Section 401(a)(17) of the Internal Revenue Code. For this purpose, FAC means one-fifth of the aggregate amount of compensation paid to a member and earned during the period of 5 consecutive years of the member's credited service in which the aggregate compensation paid is highest. The employer may optionally adopt an FAC averaged over 3 or more years, instead of 5 years.

## Service Retirement Allowance

Credited service at time of termination of membership is multiplied by one of the following options:

- 1.00% of FAC to 2.50% of FAC, in increments of 0.05% of FAC, as adopted by the employer, with a maximum benefit of 80% of FAC.
- 1.0% of FAC (no 80% of FAC maximum). May not be adopted after January 2, 1986.
- 1.3% of FAC (no 80% of FAC maximum).
- Sum of 1.0% times the first \$4,200 of FAC, plus 1.5% times the portion of FAC over \$4,200. No 80% of FAC maximum. May not be adopted after January 2, 1986.
- 1.5% of FAC (no 80% of FAC maximum).
- Sum of 1.2% times the first \$4,200 of FAC, plus 1.7% times the portion of FAC over \$4,200. No 80% of FAC maximum. May not be adopted after January 2, 1986.
- 1.7% of FAC (no 80% of FAC maximum).
- 2.0% of FAC, payable until attainment of the age at which unreduced Social Security benefits are available (currently age 66 for normal retirement, gradually increasing to age 67). When this age is reached, the benefit reverts to between 1.0% of FAC and 1.7% of FAC adopted by the employer. No 80% of FAC maximum.
- 2.0% of FAC (no 80% of FAC maximum).
- Bridged Benefit: For service prior to the Bridged Benefit date, one of the above Benefit Program multiplier percentages of FAC (FAC may be frozen at the Bridged Benefit Date, or may be as of termination of membership). For service after the Bridged Benefit date, one of the above Benefit Program multiplier percentages of FAC (at termination of membership). The combined benefit may not exceed the larger of:
  - (i) the above benefit based on service prior to the Bridged Benefit date; and
  - (ii) 80% of FAC at termination of employment.

## Maximum Benefit Payable by MERS

The maximum benefit that may be paid by MERS is governed by Section 415 of the Internal Revenue Code. Benefits in excess of the maximum benefit will be paid by the MERS Excess Benefit Plan.

## **Act 88 (Reciprocal Retirement Act, 1961 P.A. 88)**

If the municipality has elected to come under the provision of Act 88 (see Table 2 in your municipality's actuarial report), service with former and future public employers in Michigan may be used to satisfy the service eligibility conditions of MERS. MERS maintains a statewide Act 88 adoption list:

[https://employerportal.mersofmich.com/SharepointFormsService/Default.aspx?FormName=form\\_77.pdf](https://employerportal.mersofmich.com/SharepointFormsService/Default.aspx?FormName=form_77.pdf)

## **Disability Retirement Allowance**

Total and permanent disability while employed by a participating municipality and after meeting the vesting requirement of the benefit program. The service requirement is waived if the disability is the natural and proximate result of duty-connected causes.

The allowance is computed in the same manner as a service retirement allowance, except that the reduction for retirement before age 60 is not applied.

If disability is due to duty-connected causes, the amount of the retirement allowance shall not be less than 25% of the member's FAC.

Adoption of optional Benefit Program D-2 provides a retirement allowance for a duty-connected disability that is the greater of:

- (i) 25% of the member's FAC; or
- (ii) A benefit based on 10 years of credited service in addition to the member's actual period of service, provided the total years of service do not exceed the greater of 30 years or the member's actual period of service.

## **Non-Duty Death Allowance**

If a member or vested former member with the minimum years of service required to be vested dies before retirement, a monthly survivor allowance may be payable.

If the member is married, the spouse is the automatic beneficiary unless the spouse, in writing, declines a benefit in favor of another named beneficiary.

A contingent survivor beneficiary (named in an Option II Contingent Beneficiary Designation form filed with MERS) will receive a retirement allowance computed in the same manner as a service retirement allowance, based on service and FAC at death, but reduced to reflect an Option II (100% joint and survivor) election. The reduction for retirement before age 60 is not applied. Payment of a retirement allowance to the contingent survivor beneficiary of a deceased member commences immediately. Payment of a retirement allowance to the contingent survivor beneficiary of a deceased vested former member commences on the date the member would have first satisfied eligibility for retirement with an unreduced service retirement allowance.

If there is no named beneficiary and the member leaves a spouse, the spouse will receive an Option II survivor allowance. Payment of a retirement allowance to the surviving spouse of a deceased member commences immediately. Payment of a retirement allowance to the surviving spouse of a deceased vested former member commences on the date the member would have first satisfied eligibility for retirement for an unreduced service retirement allowance. The amount of a surviving spouse's retirement allowance shall be 85% of the deceased member's or deceased vested former member's accrued

retirement allowance computed in the same manner as a service retirement allowance, based on service and FAC at time of death.

The amount of a surviving spouse's benefit is always the larger of:

- (i) the benefit computed as a contingent survivor beneficiary; and
- (ii) the 85% of accrued retirement allowance benefit described above.

If there is no named beneficiary and no retirement allowance being paid to a surviving spouse, unmarried children under age 21 will be paid an equal share of 50% of the deceased member's or deceased vested former member's accrued retirement allowance. The reduction for retirement before age 60 is not applied.

If no retirement allowance becomes payable at death, the member's accumulated contributions, if any, are paid to the beneficiary or to the decedent's estate.

## **Duty-Connected Death Allowance**

A duty death allowance, computed in the same manner as a non-duty death allowance, may be payable to a spouse or child(ren) if death occurs as the natural and proximate result of performance of duty with a participating municipality. The vesting requirement is waived, and the minimum benefit is 25% of the deceased member's FAC.

Adoption of optional Benefit Program D-2 provides a retirement allowance for a duty-connected death that is the greater of:

- (i) 25% of the member's FAC; or
- (ii) A benefit based on 10 years of credited service in addition to the member's actual period of service, provided the total years of service do not exceed the greater of 30 years or the member's actual period of service.

## **Member Contributions**

Each member contributes a percent of annual compensation, as selected by the municipality, on the member's annual compensation up to the compensation limit under Section 401(a)(17) of the Internal Revenue Code. Any percentage from 0% to 10% (in 0.1% increments) may be selected. A 3%/5% contribution program was available prior to 1985 and may be continued (until any new benefit programs are adopted), but not adopted, after 1984. Under this program they contribute 3% of the first \$4,200 of annual compensation and 5% of portions of annual compensation over \$4,200. Interest is credited to accumulated member contributions each December 31 (and reflected in the Annual Member Statement provided to each member) at a rate determined by MERS, currently the one-year U.S. Treasury Bill rate determined as of each December 31. The interest rate credited for the 12-month period ending on the valuation date was 0.22%.

If a member leaves the employ of the municipality or dies without a retirement allowance or other benefit payable on their account, the member's accumulated contributions plus interest (as described above) are refunded with spousal consent, to the member, if living, or to the member's surviving spouse, if any, or to a named beneficiary (after spousal consent, if applicable).

**Note for MERS' Defined Contribution Plan:** The Annual Actuarial Valuation addresses assets and liabilities for participation under the MERS Defined Benefit Plan and Hybrid Plan. The MERS Defined Contribution Plan, which first became available for adoption in late 1997, is not addressed in the valuation results as it is not a defined benefit plan.

## Post-Retirement Adjustments

Employers may adopt post-retirement cost-of-living adjustments (COLA):

**One-Time COLA** for present retirees and beneficiaries. The amount of the increase is equal to the number of years since the later of retirement or the date specified in the adopting resolution times either:

- (i) a fixed percentage of the present benefit; or
- (ii) a fixed dollar amount.

This COLA may be readopted from time to time.

**Annual COLA** – provides automatic annual benefit increases. The COLA may apply to either:

- (i) retirees (and their beneficiaries) retired before the effective date of the COLA; or
- (ii) retirees (and their beneficiaries) retired on or after the effective date of the COLA.

The amount of the annual increase may be either:

- (i) a percentage of the original (base) retirement benefit (non-compounded COLA); or
- (ii) a percentage of the present retirement benefit (compounded COLA); or
- (iii) a fixed dollar amount.

Such increases are further limited to increases in the Consumer Price Index (CPI) if the COLA was adopted before January 1, 1999. For all adoptions or readoptions after that date, the increase is not limited by the CPI increase.

## Death-After-Retirement Surviving Spouse Benefit

A retiring member electing the Straight Life (highest) form of retirement payment is normally paid a lifetime retirement allowance, with payments terminating at death. The retiring member could provide benefits to a surviving spouse or another named beneficiary by electing Option II (100% continuation to beneficiary) or Option II-A (75% continuation to beneficiary) or Option III (50% continuation to beneficiary). A surviving spouse is automatically the beneficiary to an Option II, IIA or III allowance unless the spouse, in writing, relinquishes the benefit to the member electing a Straight Life allowance or to another named beneficiary. Electing these alternate forms of payment would lower the retiring member's retirement allowance.

If Benefit Program RS50% is adopted, a member retiring on or after the effective date of Benefit RS50% may elect the Straight Life form of retirement payment and still provide a 50% survivor benefit to their spouse. To be eligible for a surviving spouse benefit, the retiring member and spouse must have been married to each other both at the time of death and during the full one-year period just before retirement.

## **Delayed Retirement Option Partial Lump Sum (DROP+)**

Any member who is eligible to retire with full, immediate retirement benefits has the option to:

- (i) Retire immediately and receive a monthly benefit payable immediately; or
- (ii) Delay their retirement date and continue to work.

If the member is covered by DROP+ and they retire at least 12 months after first becoming eligible for unreduced benefits, at actual retirement the member *has the option* to receive a partial lump sum and a reduced monthly benefit:

- (i) The member can elect a lump sum equal to 12, 24, 36, 48, or 60 times the their monthly accrued benefit (if they have delayed retirement at least that many months).
- (ii) For each 12 months included in the lump sum, the member's lifetime benefit is reduced by the DROP+ percentage adopted by the employer. The employer can adopt any of the following DROP+ reduction percentages: 6%, 7%, 8%, 9% or 10%.

DROP+ may not be adopted after June 30, 2013.

## **Non-Standard Benefit Provisions**

Some municipalities have collectively bargained benefit provisions that differ from the benefit provisions described in this section. Such benefit provisions, if any, are listed in Table 2 of a municipality's annual actuarial valuation report, or are reflected in the actuarial assumptions that are specific to a municipality and are listed on the last page of a municipality's annual actuarial valuation report.

# Summary of Plan Provisions – Hybrid Plan<sup>1</sup>

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The benefits summarized in this section are intended only as general information regarding the Municipal Employees' Retirement System of Michigan. They are not a substitute for Act. No. 220 of the Public Acts of 1996, and the MERS Plan Document as revised. If any conflict occurs between the information in this summary and Act. No. 220 of the Public Acts of 1996 (as amended), or the MERS Plan Document (as revised), the provisions of Act. No. 220 and the MERS Plan Document govern.

## Hybrid Plan Part I — Defined Benefit Portion

### Eligibility for Retirement

Members are eligible to retire at age 60 with 6 or more years of service.

### Optional Retirement Programs (Unreduced Benefits)

Age 55 with a required period of credited service of 25 years.

### Mandatory Retirement

None

### Deferred Retirement (Vesting)

Retirement can be deferred if membership is terminated before age 60 other than by retirement or death, after becoming vested (6 years of credited service is required for vesting). The retirement allowance begins when the application is filed with MERS and eligibility requirements for retirement are met. The deferred retirement allowance is computed in the same manner as a service retirement allowance, based on the final average compensation and years of service at termination of membership.

### Final Average Compensation (FAC)

Benefits are based on a member's FAC, subject to the dollar compensation limits under Section 401(a)(17) of the Internal Revenue Code. For this purpose, FAC means one-third of the aggregate amount of compensation paid to a member and earned during the period of 3 consecutive years of the member's credited service in which the aggregate compensation paid is highest.

<sup>1</sup> Please see the description of the Defined Benefit Plan beginning on page 3.

## Service Retirement Allowance

Credited service at time of termination of membership is multiplied by one of the following options:

Hybrid 1.0%	1.0% of a member's FAC
Hybrid 1.25%	1.25% of FAC
Hybrid 1.5%	1.5% of FAC
Hybrid 1.75% <sup>1</sup>	1.75% of FAC
Hybrid 2.0% <sup>1</sup>	2.0% of FAC

<sup>1</sup> Available to those without social security coverage.

## Maximum Benefit Payable by MERS

The maximum benefit that may be paid by MERS is governed by Section 415 of the Internal Revenue Code. Benefits in excess of the maximum benefit will be paid by the MERS Excess Benefit Plan.

## Act 88 (Reciprocal Retirement Act, 1961 P.A. 88)

If the municipality has elected to come under the provision of Act 88 (see Table 2 in your municipality's actuarial report), service with former and future public employers in Michigan may be used to satisfy the service eligibility conditions of MERS. MERS maintains a statewide Act 88 adoption list:

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## Disability Retirement Allowance

Benefits are the same as under the Defined Benefit Plan, except that optional Benefit Program D-2 does not apply.

## Non-Duty Death Allowance

Benefits are the same as under the Defined Benefit Plan.

## Duty-Connected Death Allowance

Benefits are the same as under the Defined Benefit Plan, except that optional Benefit Program D-2 does not apply.

## Member Contributions

None, unless required to comply with a state statute that places restrictions on employer contributions to retirement plans. Each municipality's actuarial valuation reflects the member contribution provisions reported by MERS.

## Post-Retirement Adjustments

Not available.

## Death-After-Retirement Surviving Spouse Benefit

The same optional forms of payment are available as under the Defined Benefit Plan, except that the optional Benefit Program RS50% does not apply.

## Delayed Retirement Option Partial Lump Sum (DROP+)

Not available.

## Hybrid Plan Part II - Defined Contribution Portion

### Employer Contributions and Vesting

The employer contribution amount is any percentage of compensation allowed by federal law.

The vesting schedule for employer contributions is one of the following schedules, as adopted by the employer:

- (i) Immediate vesting upon participation; or
- (ii) 100% vesting after stated years (participant is 100% vested after not to exceed maximum 5 years of service ("cliff" vesting)); or
- (iii) Graded vesting percentages per year of service, not to exceed maximum 6 years of service for 100% vesting, nor be less than certain stated minimums.

### Member Contributions and Vesting

The member contribution amount is any amount allowed by federal law and subject to procedures established by the Retirement Board.

The vesting schedule for member contributions is 100% immediate vesting.

**Note:** The Annual Actuarial Valuation addresses assets and liabilities for participation under the MERS Defined Benefit Plan and the Defined Benefit portion of the Hybrid Plan. The Defined Contribution portion of the Hybrid Plan is not addressed in the valuation results.

## Municipal Employees' Retirement System of Michigan IRC Section 415(b)(1)(A) Benefit Dollar Limits — 2015

The limits are based on the retiree's age at retirement. The limit at ages 62-65 is indexed with inflation, in \$5,000 increments. The limits at earlier ages are then increased proportionately. The limit applies to the retiree's or beneficiary's employer-financed straight life benefit, except in the case of an Option II, IIA, or III election with the retiree's spouse as named beneficiary, in which case the limit applies to the employer-financed portion of the reduced joint and survivor benefit.

Age at Retirement	General Employees	Police and Fire Members <sup>1</sup>
35	\$ 38,506	\$210,000
36	40,687	210,000
37	43,005	210,000
38	45,471	210,000
39	48,096	210,000
40	50,892	210,000
41	53,873	210,000
42	57,054	210,000
43	60,451	210,000
44	64,082	210,000
45	67,967	210,000
46	72,128	210,000
47	76,590	210,000
48	81,380	210,000
49	86,528	210,000
50	92,070	210,000
51	98,043	210,000
52	104,492	210,000
53	111,465	210,000
54	119,017	210,000
55	127,213	210,000
56	136,122	210,000
57	145,825	210,000
58	156,414	210,000
59	167,995	210,000
60	180,688	210,000
61	194,636	210,000
62	210,000	210,000
63	210,000	210,000
64	210,000	210,000
65 & older	210,000	210,000

<sup>1</sup> Requires that the member have at least 15 years of police, fire, and/or armed forces service as defined in IRC regulations. Otherwise use the limits for general members.

## IRC Section 401(a)(17) Compensation Limit — 2015

For 2015 the IRC Section 401(a)(17) limit is \$265,000. This limit is indexed with inflation in \$5,000 increments.

## Actuarial Assumptions

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To calculate MERS contribution requirements, assumptions are made about future events that could affect the amount and timing of benefits to be paid and the assets to be accumulated. The economic and demographic assumptions include:

- An assumed rate of investment return that is used to discount liabilities and project what plan assets will earn.
- A mortality table projecting the number of members who will die before retirement and the duration of benefit payments after retirement.
- Assumed retirement rates projecting when members will retire and commence receiving retirement benefits.
- A set of withdrawal and disability rates to estimate the number of members who will leave the work force before retirement.
- Assumed rates of pay increase to project member compensation in future years.

The actuarial assumptions used in connection with this December 31, 2014 Actuarial Valuation are unchanged from the December 31, 2013 valuation assumptions. The actuarial assumptions currently used are summarized below and on the following pages.

### Interest Rate

Funding plan benefits involves the accumulation of assets to pay benefits in the future. These assets are invested and the net rate of investment earnings is a significant factor in determining the contributions required to support the ultimate cost of benefits. For the 2014 actuarial valuation, the long-term investment yield is assumed to be 8% annually, net of administrative and investment expenses. This assumption was first used for the December 31, 1981 actuarial valuations.

Please note that, given that the actuarial value of assets is currently 6% higher than the market value, meeting the actuarial assumption in the next few years will require average annual market returns that exceed the 8% investment return assumption.

**Please see the Comments on the Investment Markets in your municipality's Annual Actuarial Valuation Report.**

## Pay Increases

Because benefits are based on a member's final average compensation (FAC), it is necessary to make an assumption with respect to each member's estimated pay progression. The pay increase assumption used in the actuarial valuation projects annual pay increases of 4.5% in the long term (2% and 3% for calendar years 2015 and 2016, respectively) plus a percentage based on an age-related scale to reflect merit, longevity and promotional pay increases.

The pay increase assumption for selected ages is shown below. The 4.5% long-term wage inflation assumption was first used for the December 31, 1997 actuarial valuations. The merit and longevity pay increase assumption was first used for the December 31, 2011 actuarial valuations.

Age	Base (Wage Inflation) <sup>1</sup>	Merit and Longevity	Total Percentage Increase in Pay
20	4.50%	13.00%	17.50%
25	4.50	6.80	11.30
30	4.50	3.26	7.76
35	4.50	2.05	6.55
40	4.50	1.30	5.80
45	4.50	0.81	5.31
50	4.50	0.52	5.02
55	4.50	0.30	4.80
60	4.50	0.00	4.50

<sup>1</sup> For calendar years 2015 and 2016 the wage inflation assumption is 2% and 3%, respectively, instead of 4.5%. This assumption was first used for the December 31, 2012 actuarial valuations.

## Inflation

Although no specific price inflation assumption is needed for this valuation, the 4.5% long-term wage inflation assumption would be consistent with a price inflation of 3% - 4%.

## Payroll Growth

For divisions that are open to new hires, the number of active members is projected to remain constant, and the total payroll is projected to increase 4.5% annually in the long term (2% and 3% annually for calendar years 2015 and 2016, respectively). This assumption was first used for the December 31, 1997 actuarial valuations.

## **Increase in Final Average Compensation (FAC)**

The 1999-2003 and 2004-2008 experience studies determined that for some retirees of some municipalities, the actual FAC at retirement was larger than would be expected based on reported annual pays and FAC's for the years just before retirement. Some possible sources for the differences are:

- Lump sum payments for unused paid time off. Unused sick leave payouts have been excluded from FAC since the mid 1970s. However, since that time it has become popular to combine sick and vacation time into paid time off, which is included in the FAC. Consequently, the lump sums that are includible in FAC have grown over the years.
- Extra overtime pay during the final year of employment. Our studies only reflect any increase in overtime during the final year, not any increase that occurs during the full 3 or more year averaging period.

We analyzed the variation among municipalities. The amount of unexpected FAC increase varies quite a bit between municipalities. Some municipalities show no sign of FAC loading, while other municipalities show increases above the average increase. This is presumably the result of different personnel policies among municipalities.

The Retirement Board adopted new FAC assumptions that were first used for the December 31, 2011 annual actuarial valuations. These assumptions reflect an FAC load of 0% to 8% for each municipality, based on the municipality's experience. The FAC increase assumption(s) for your municipality are shown in your annual actuarial valuation report. Note that for divisions that adopted Sick Leave in FAC (SLIF), the assumption is developed individually for each division, based on the specific SLIF provision and/or past experience.

## Withdrawal Rates

The withdrawal rates are used to estimate the number of employees at each age that are expected to terminate employment before qualifying for retirement benefits. The withdrawal rates do not apply to members eligible to retire, and do not include separation on account of death or disability. The assumed rates of withdrawal applied in the current valuation are based on years of service, and scaled up or down according to each division's experience.

Sample rates of withdrawal from active employment, before application of the scaling factor, are shown below. These rates were first used for the December 31, 2008 actuarial valuations.

The base withdrawal rates (see the table below) are multiplied by the scaling factor to obtain the assumed withdrawal rates. The scaling factor for each division is shown in your actuarial valuation report.

<b>Sample Years of Service</b>	<b>% of Active Members Withdrawing Within the Next Year</b>
0	20.00%
1	17.00
2	14.00
3	11.00
4	9.00
5	6.50
10	5.00
15	3.70
20	3.00
25	2.70
30	2.60
34 and over	2.40

## Retirement Rates

A schedule of retirement rates is used to measure the probability of eligible members retiring during the next year. The retirement rates for Normal Retirement are determined by each member's replacement index at the time of retirement. The replacement index is defined as the approximate percentage of the member's pay (after reducing for their member contributions) that will be replaced by the member's benefit at retirement. The index is calculated as:

$$\text{Replacement Index} = 100 \times \text{Accrued Benefit} \text{ divided by } [\text{Pay less Member Contributions}]$$

The assumed retirement percentage is 100% at the later of age 70 or a member's age on the valuation date.

Retirement rates for Early (reduced) Retirement are determined by the member's age at early retirement.

The Normal Retirement rates below were first used for the December 31, 2009 actuarial valuations. The Early Retirement rates were first used for the December 31, 2011 actuarial valuations.

### Normal Retirement

Sample Replacement Index	Percent of Eligible Active Members Retiring Within the Next Year
5	5%
10	11
15	16
20	19
25	20
30	20
35	20
40	20
45	20
50	20
55	21
60	22
65	24
70	24
75	28
80	32
85	38
90	45
95	48
100+	50

### Early Retirement – Reduced Benefit

Age	Percent of Eligible Active Members Retiring Within the Next Year
50	1.60%
51	1.60
52	2.30
53	3.30
54	4.50
55	3.50
56	3.25
57	3.00
58	4.50
59	5.75

## Disability Rates

Disability rates are used in the valuation to estimate the incidence of member disability in future years.

The assumed rates of disablement at various ages are shown below. These rates were first used for the December 31, 2011 actuarial valuations.

Sample Ages	Percent Becoming Disabled Within the Next Year
20	0.02%
25	0.02
30	0.02
35	0.06
40	0.06
45	0.11
50	0.24
55	0.60
60	0.60
65	0.60

Eighty-five percent (85%) of the disabilities are assumed to be non-duty and 15% of the disabilities are assumed to be duty related. For those plans which have adopted disability provision D-2, 55% of the disabilities are assumed to be non-duty and 45% are assumed to be duty related.

## Mortality Table

In estimating the amount of the reserves required at the time of retirement to pay a member's benefit for the remainder of their lifetime, it is necessary to make an assumption with respect to the probability of surviving to retirement and the life expectancy after retirement.

The mortality table used to project the mortality experience of plan members is a 50% Male - 50% Female blend of the 1994 Group Annuity Mortality Table. For disabled retirees, the regular mortality table is used with a 10-year set forward in ages to reflect the higher expected mortality rates of disabled members. These mortality tables were first used for the December 31, 2004 actuarial valuations.

Ninety percent (90%) of active member deaths are assumed to be non-duty deaths and 10% of the deaths are assumed to be duty related.

Possible future mortality improvements are reflected in the mortality assumption. The results of the 2004-2008 Experience Study showed that retirees were not living as long as projected by the current mortality table. Actual deaths during the period exceeded expected deaths by 12%.

The life expectancies and mortality rates projected for **non-disabled** members are shown below for selected ages:

<b>Age</b>	<b>Expected Years of Life Remaining</b>	<b>Mortality Rates</b>
20	61.55	0.04%
25	56.68	0.05
30	51.82	0.06
35	46.97	0.07
40	42.13	0.09
45	37.34	0.13
50	32.60	0.20
55	27.98	0.34
60	23.53	0.62
65	19.40	1.16
70	15.66	1.87
75	12.24	2.99
80	9.25	5.07

The life expectancies and mortality rates projected for **disabled** members are shown below for selected ages:

<b>Age</b>	<b>Expected Years of Life Remaining</b>	<b>Mortality Rates</b>
20	51.82	0.06%
25	46.97	0.07
30	42.13	0.09
35	37.34	0.13
40	32.60	0.20
45	27.98	0.34
50	23.53	0.62
55	19.40	1.16
60	15.66	1.87
65	12.24	2.99
70	9.25	5.07
75	6.81	8.25
80	4.85	13.46

## Miscellaneous and Technical Assumptions

- |                            |   |
|----------------------------|---|
| Loads                      | - Vesting liabilities are increased by 2% to reflect the value of the potential survivor benefit payable in case of death during the benefit deferral period.   |
| Marriage Assumptions       | - Seventy percent (70%) of males and 70% of females are assumed to be married for purposes of death-in-service benefits. Male spouses are assumed to be three years older than female spouses.  |
| Pay Increase Timing        | - Beginning of valuation year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.   |
| Pay Adjustment             | - None.   |
| Decrement Timing           | - Decrements of all types are assumed to occur mid-year.  |
| Future Service             | - Members are assumed to earn 1.0 years of service in each future year.   |
| Eligibility Testing        | - Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.  |
| Benefit Service            | - Exact fractional service is used to determine the amount of benefit payable. Benefit service is the service used in the benefit formula.  |
| Eligibility Service        | - The larger of reported Eligibility Service and reported Vesting Service was used as eligibility service in the valuation. Eligibility service is the service used to meet the conditions for retirement, and is generally equal to or larger than benefit service.                                      |
| Decrement Relativity       | - Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.   |
| Decrement Operation        | - Disability and withdrawal do not operate during retirement eligibility.   |
| Normal Form of Payment     | - Future retiring members are assumed to elect the Straight Life form of payment (see page 7 regarding death-after-retirement benefits).  |
| Incidence of Contributions | - Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made. New entrant normal cost contributions are applied to the funding of new entrant benefits. |

- Maximum Compensation - The dollar compensation limits under Section 401(a)(17) of the Internal Revenue Code are projected to increase 4.5% annually. No member or employer contributions are projected to be made on the portion of any member's annual compensation in excess of the IRC Section 401(a)(17) limit for the year.
- Maximum Benefit - The dollar benefit limitations under Section 415 of the Internal Revenue Code are projected to increase 4.5% annually. Employee divisions 02, 20-29 (Police), 05 and 50-59 (Fire) are presumed eligible for the public safety benefit limits. No benefits in excess of the IRC 415 limits are projected to be paid, except as provided under the Qualified Excess Benefit Arrangement.
- Member Contribution Interest - The interest rate credited on member contributions is the one-year Treasury Bill rate as of December 31, determined annually. The long-term rate assumed in the valuation is 4%, which is consistent with the 3% to 4% price inflation assumption.
- DROP+ Assumptions - Each eligible member is assumed to make the DROP+ election with the most valuable combination of lump sum and reduced monthly benefit.
- The retirement probabilities shown earlier are used for members who are *not* covered by Benefit Program DROP+. For those covered by Benefit Program DROP+, it is assumed that retirement will be delayed long enough to become eligible for at least 4 years' worth of DROP+ lump sum.
- Data Adjustments - The gender was not reported for a small number of active members. These active members were assumed to be male.

## Actuarial Funding Method

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The Retirement Board has adopted funding methodology for the Retirement System to achieve the following major objectives:

- Develop level required contribution rates as a percentage of payroll (for divisions that are open to new hires);
- Finance benefits earned by present employees on a current basis;
- Accumulate assets to enhance members' benefit security;
- Produce investment earnings on accumulated assets to help meet future benefit costs;
- Make it possible to estimate the long-term actuarial cost of proposed amendments to System provisions; and
- Assist in maintaining the Retirement System's long-term financial viability.

The basic funding objective is a level pattern of cost as a percentage of pay throughout each member's working lifetime. The funding method used in this actuarial valuation – the entry age normal cost method – was first used for the December 31, 1993 actuarial valuations and is intended to:

- (i) Meet this funding objective; and
- (ii) Result in a relatively level long-term contribution requirement as a percentage of pay.

Under the entry age normal cost method, the total actuarially-determined contribution requirement is equal to the sum of the normal cost plus the payment required to fund the unfunded actuarial accrued liability over a period of years. Funding or amortizing the unfunded actuarial accrued liability includes a payment toward the liability (principal) plus a payment to reflect the time value of money (interest).

### Normal Cost

In general terms, the normal cost is the cost of benefit rights accruing on the basis of current service. Technically, the normal cost rate is the level percentage-of-pay contribution required each year, with respect to each member, to accumulate over their projected working lifetime the reserves needed to meet the cost of earned benefits. The normal cost represents the ultimate cost of the Retirement System, if the unfunded liability is paid up and the actual experience of the System conforms to the assumptions.

### Actuarial Accrued Liability

The total actuarial present value of future benefits is computed using the valuation's actuarial assumptions. Subtracting the present value of future normal costs results in the actuarial accrued liability.

The total actuarial accrued liability essentially represents the amount that would have been accumulated as of December 31, 2014, if:

- (i) Contributions sufficient to meet the normal costs of the Retirement System had been made each year in the past;
- (ii) Benefit provisions had always been the same as current benefit provisions; and
- (iii) Actual past experience had always conformed to current actuarial assumptions.

If assets equaled the total accrued liability, there would be no unfunded liability and future contribution requirements would consist solely of the calculated normal cost rates.

## **Amortization of Unfunded Actuarial Accrued Liability**

The unfunded accrued liability as of December 31, 2014 (see Table 6 of your municipality's annual actuarial valuation report) is projected to the beginning of the fiscal year for which employer contributions are being calculated (fiscal year beginning in 2016). This allows the 2014 valuation to take into account the expected future contributions that are based on past valuations. This projection process will result in more stable computed contribution rates, and was first used for the December 31, 2004 actuarial valuations.

The projected unfunded accrued liability is then amortized over the appropriate period for each division (see Table 1 of your municipality's annual actuarial valuation report) to determine the amortization payment. For divisions that will have no new hires this is the dollar amortization payment. For divisions that are open to new hires this payment is divided by the projected fiscal year payroll to determine the amortization payment as a percentage of active member payroll. The resulting amortization contributions are displayed in Table 1 for each division. For purposes of determining the amortization payment, payments are projected to increase 4.5% a year.

The standard amortization period to fund the unfunded liability is 24 years for positive unfunded liabilities in the 2014 valuation. This period will be reduced by one year in each successive annual valuation, until the unfunded liability is paid off. Section 20m of Act No. 314 of the Public Acts of 1965 as amended (MCL 38.1140m) requires that the amortization period not exceed 30 years.

The standard amortization period for negative unfunded liabilities is 10 years, with the 10 year period reestablished with each annual actuarial valuation.

For divisions that are closed to new hires, and the new hires are not covered by MERS Defined Benefit Plan or Hybrid Plan provisions (in a linked division), the amortization period is shortened in order to ensure adequate funding of the closed division. The employer has two amortization options. Under Amortization Option A, the otherwise applicable MERS-wide standard amortization period for positive unfunded liabilities in effect in the valuation year in which the division is closed is decreased annually by 2 years until the period reaches 6 or 5 years. Each year thereafter the amortization period decreases one year each valuation year until the unfunded liability is paid off. Under Amortization Option B, the amortization period is decreased annually by 2 years until the period reaches 16 or 15 years. Each year thereafter the amortization period decreases one year each valuation year until the unfunded liability is paid off. In addition, the minimum contribution requirement for a closed division is equal to the excess of three years of annual retiree benefit payments over the current market value of assets. An employer that elected Amortization Option A may later change to Amortization Option B.

Amortization periods that are shorter than the above standard periods may be elected by a municipality (but not shorter than 5 years for negative unfunded liabilities), and some municipalities have done so.

## Open Divisions and Closed Divisions

Open divisions will include the future new hires within an employee classification (bargaining unit). Rehired members will also become members of the open division. Members transferred to the employee classification will also become members of the open division, unless the Alternate Transfer Provision is adopted by the municipality. In the latter case, each transferring member is given a choice of entering the open division or a closed division within the employee classification (if there are still active members in the closed division, and the closed division is of the same type - defined benefit, hybrid, or defined contribution - as the division from which the member transferred).

There may also be one or more divisions within the employee classification that no longer accept new hires. These are generally referred to as closed divisions, but in some situations are linked to the open division with the new hires (for actuarial valuation purposes - see Linked Divisions below). Note that a division is also treated like a closed division if the division has no active members reported as of the valuation date.

## Linked Divisions

The closed division funding policy was adopted by the Retirement Board (Amended Amortization Policy for Closed Divisions Within Open Municipalities, as revised by the Retirement Board on November 13, 2014). The purpose is to ensure that a defined benefit division that is closed to new hires does not run out of money. Funding the unfunded liabilities over the MERS standard amortization period will often deplete a closed division's assets before the death of the last participant in the division. Assets cannot be shared between the closed defined benefit division and a defined contribution plan covering the new hires, or a non-MERS defined benefit plan covering the new hires, even if the employees are part of the same employee classification (bargaining unit).

However, if the new hires, transfers and rehires are covered by a new tier of benefits in the MERS Defined Benefit Plan (including the defined benefit portion of the MERS Hybrid Plan), there can be a sharing of employer assets between the defined benefit division with no new hires (with the old benefit structure) and the defined benefit or hybrid division covering the new hires within the same employee classification. The employer can avoid the required more rapid amortization of the unfunded liabilities by putting new hires into a MERS Defined Benefit Plan or MERS Hybrid Plan division, instead of a defined contribution plan or non-MERS defined benefit plan.

If a division with no new hires is "linked" to an open MERS Defined Benefit Plan or MERS Hybrid Plan division, this is indicated in Table 2 of your municipality's annual actuarial valuation report. Both of the linked divisions will use the standard open division funding policy.

## Asset Valuation Method

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The actuarial value of assets is determined on the basis of a method that calculates expected investment income at the valuation rate of return and adds a portion of the difference between the expected investment income and actual investment income earned on a market value basis. The difference in investment income between expected return and market return is recognized over a 10-year period at the rate of 10% per year. This asset valuation method was first adopted for the December 31, 2005 valuation, and is applied as follows:

Actuarial Value equals:

- (i) Actuarial value of assets from the previous actuarial valuation; plus
- (ii) Aggregate employer and member contributions since the last valuation; minus
- (iii) Benefit payments and refunds of member contributions since the last valuation; plus
- (iv) Estimated investment income at the 8% valuation interest rate; plus
- (v) Portion of gain (loss) recognized in the current valuation.

For the above purpose, gain (loss) is defined as the excess during the period of the investment return on the market value of assets over the expected investment income. The portion recognized in the valuation is 10% of the current year's gain (loss) plus 10% of the gain (loss) from each of the 9 preceding years. The cumulative difference between the market value and valuation assets as of December 31, 2005 is recognized over 9 years.

During 2014, the approximate net investment return on average total assets at actuarial value (determined as the actuarial value of investment income divided by the average actuarial value of assets during the year) was 5.90%. The corresponding amounts for 2013, 2012, 2011 and 2010 were 6.04%, 5.42%, 5.19% and 5.74%, respectively.

For the December 31, 2014 valuation, the actuarial value of assets is equal to 105.99% of market value (compared to 106.18%, 114.36%, 120.58% and 116.29% in 2013, 2012, 2011 and 2010, respectively). This percentage is applied to each division's reported market value of assets to estimate the actuarial value of assets for the division. The chart on the following pages provides the details of the derivation of the actuarial value of assets for the retirement system in the aggregate.

Note that, given that the actuarial value of assets is currently 6% higher than the market value, meeting the actuarial assumption in the next few years will require average annual market returns that exceed the 8% investment return assumption.

**Please see the Comments on the Investment Markets in your municipality's annual actuarial valuation report.**

**Municipal Employees' Retirement System of Michigan**  
Derivation of Actuarial Value of Assets

Valuation Date December 31	2001	2002	2003	2004	2005
1. Beginning of Year Assets					
a) Market Value	\$3,788,886,471	\$3,647,820,869	\$3,285,304,333	\$4,071,997,180	\$4,619,201,287
b) Valuation Assets	3,791,423,339	4,034,377,419	4,134,404,645	4,459,492,020	4,732,208,229
2. End of Year Market Value Assets	3,647,820,869	3,285,304,333	4,071,997,180	4,619,201,287	4,906,288,690
3. Net Additions to Market Value					
a) Net Contributions	154,103,475	167,427,558	223,450,393	223,057,268	277,589,524
b) Net Investment Income = (3d) - (3a) - (3c)	(93,269,286)	(324,926,459)	792,139,959	577,562,751	288,223,418
c) Benefit Payments	(201,899,791)	(205,017,635)	(228,897,505)	(253,415,912)	(278,725,539)
d) Total Additions to Market Value = (2) - (1a)	(141,065,602)	(362,516,536)	786,692,847	547,204,107	287,087,403
4. Average Valuation Assets = (1b) + .5x[(3a)+(3c)]	3,767,525,181	4,015,582,381	4,131,681,089	4,444,312,698	4,731,640,222
5. Expected Income at Valuation Rate = 8% x (4)	301,402,014	321,246,590	330,534,487	355,545,016	378,531,218
6. Gain (Loss) = (3b) - (5)	(394,671,300)	(646,173,049)	461,605,472	222,017,735	(90,307,800)
7. Phased-In Recognition of Investment Return					
a) Current Year: 0.2 x (6)	(78,934,260)	(129,234,610)		44,403,547	(18,061,560)
b) First Prior Year	(79,670,266)	(78,934,260)			44,403,547
c) Second Prior Year	63,981,441	(79,670,266)			
d) Third Prior Year	40,228,410	63,981,441			
e) Fourth Prior Year	43,743,057	40,228,408			
f) 1999-2003 Years Combined	N/A	N/A	0	(96,873,710)	(96,873,710)
g) Total Recognized Investment Gain (Loss)	(10,651,618)	(183,629,287)	0	(52,470,163)	(70,531,723)
8. Change in Valuation Assets (3a) + (3c) + (5) + (7g)	242,954,080	100,027,226	325,087,375	272,716,209	306,863,480
9. End of Year Assets					
a) Market Value = (2)	3,647,820,869	3,285,304,333	4,071,997,180	4,619,201,287	4,906,288,690
b) Valuation Assets = (1b) + (8)	4,034,377,419	4,134,404,645	4,459,492,020	4,732,208,229	5,039,071,709
c) Difference Between Market & Valuation Assets	(386,556,550)	(849,100,312)	(387,494,840)	(113,006,942)	(132,783,019)
10. Recognized Rate of Return = [(5) + (7g)] / (4)	7.72%	3.43%	8.00%	6.82%	6.51%
11. Market Rate of Return	(2.48%)	(8.95%)	24.13%	14.24%	6.24%
12. Valuation Asset Adjustment Factor = (9b) / (9a)	1.105969	1.258454	1.095161	1.024465	1.027064

**Municipal Employees' Retirement System of Michigan**  
Derivation of Actuarial Value of Assets (Cont.)

Valuation Date December 31	2006	2007	2008	2009	2010
1. Beginning of Year Assets					
a) Market Value	\$4,906,288,690	\$5,590,042,317	\$6,071,046,914	\$4,512,260,955	\$5,276,645,338
b) Valuation Assets	5,039,071,709	5,512,924,466	6,001,040,078	6,278,731,673	6,604,608,397
2. End of Year Market Value Assets	5,590,042,317	6,071,046,914	4,512,260,955	5,276,645,338	5,971,593,444
3. Net Additions to Market Value					
a) Net Contributions	371,505,157	386,942,952	374,214,134	413,354,720	423,489,032
b) Net Investment Income = (3d) - (3a) - (3c)	622,409,716	442,377,206	(1,553,001,917)	771,066,207	733,059,352
c) Benefit Payments	(310,161,246)	(348,315,561)	(379,998,176)	(420,036,544)	(461,600,278)
d) Total Additions to Market Value = (2) - (1a)	683,753,627	481,004,597	(1,558,785,959)	764,384,383	694,948,106
4. Average Valuation Assets = (1b) + .5x[(3a)+(3c)]	5,069,743,665	5,532,238,162	5,998,148,057	6,275,390,761	6,585,552,774
5. Expected Income at Valuation Rate = 8% x (4)	405,579,493	442,579,053	479,851,845	502,031,261	526,844,222
6. Gain (Loss) = (3b) - (5)	216,830,223	(201,847)	(2,032,853,762)	269,034,946	206,215,130
7. Phased-In Recognition of Investment Return					
a) Current Year: 0.1 x (6)	21,683,022	(20,185)	(203,285,376)	26,903,495	20,621,513
b) First Prior Year	(14,753,669)	21,683,022	(20,185)	(203,285,376)	26,903,495
c) Second Prior Year		(14,753,669)	21,683,022	(20,185)	(203,285,376)
d) Third Prior Year			(14,753,669)	21,683,022	(20,185)
e) Fourth Prior Year				(14,753,669)	21,683,022
f) Fifth Prior Year					(14,753,669)
g) Sixth Prior Year					
h) Seventh Prior Year					
i) Eighth Prior Year					
j) Ninth Prior Year					
k) Total Recognized Investment Gain (Loss)	6,929,353	6,909,168	(196,376,208)	(169,472,713)	(148,851,200)
8. Change in Valuation Assets (3a) + (3c) + (5) + (7k)	473,852,757	488,115,612	277,691,595	325,876,724	339,881,776
9. End of Year Assets					
a) Market Value = (2)	5,590,042,317	6,071,046,914	4,512,260,955	5,276,645,338	5,971,593,444
b) Valuation Assets = (1b) + (8)	5,512,924,466	6,001,040,078	6,278,731,673	6,604,608,397	6,944,490,173
c) Difference Between Market & Valuation Assets	77,117,851	70,006,836	(1,766,470,718)	(1,327,963,059)	(972,896,729)
10. Recognized Rate of Return = [(5) + (7k)] / (4)	8.14%	8.12%	4.73%	5.30%	5.74%
11. Market Rate of Return	12.61%	7.89%	(25.59%)	17.10%	13.94%
12. Valuation Asset Adjustment Factor = (9b) / (9a)	0.986204	0.988469	1.391482	1.251668	1.162921

**Municipal Employees' Retirement System of Michigan**  
Derivation of Actuarial Value of Assets (Cont.)

Valuation Date December 31	2011	2012	2013	2014	2015
1. Beginning of Year Assets					
a) Market Value	\$5,971,593,444	\$5,935,528,263	\$6,858,525,416	\$7,651,705,376	
b) Valuation Assets	6,944,490,173	7,157,148,344	7,843,152,666	8,124,887,439	
2. End of Year Market Value Assets	5,935,528,263	6,858,525,416	7,651,705,376	8,063,083,723	
3. Net Additions to Market Value					
a) Net Contributions	362,710,568	856,171,348	476,725,412	651,265,712	
b) Net Investment Income = (3d) - (3a) - (3c)	108,045,293	633,022,713	979,236,854	467,398,803	
c) Benefit Payments	(506,821,042)	(566,196,908)	(662,782,306)	(707,286,168)	
d) Total Additions to Market Value = (2) - (1a)	(36,065,181)	922,997,153	793,179,960	411,378,347	
4. Average Valuation Assets = (1b) + .5x[(3a)+(3c)]	6,872,434,936	7,302,135,564	7,750,124,219	8,096,877,211	
5. Expected Income at Valuation Rate = 8% x (4)	549,794,795	584,170,845	620,009,938	647,750,177	
6. Gain (Loss) = (3b) - (5)	(441,749,502)	48,851,868	359,226,916	(180,351,374)	
7. Phased-In Recognition of Investment Return					
a) Current Year: 0.1 x (6)	(44,174,950)	4,885,187	35,922,692	(18,035,137)	
b) First Prior Year	20,621,513	(44,174,950)	4,885,187	35,922,692	(18,035,137)
c) Second Prior Year	26,903,495	20,621,513	(44,174,950)	4,885,187	35,922,692
d) Third Prior Year	(203,285,376)	26,903,495	20,621,513	(44,174,950)	4,885,187
e) Fourth Prior Year	(20,185)	(203,285,376)	26,903,495	20,621,513	(44,174,950)
f) Fifth Prior Year	21,683,022	(20,185)	(203,285,376)	26,903,495	20,621,513
g) Sixth Prior Year	(14,753,669)	21,683,022	(20,185)	(203,285,376)	26,903,495
h) Seventh Prior Year		(14,753,669)	21,683,022	(20,185)	(203,285,376)
i) Eighth Prior Year			(14,753,669)	21,683,022	(20,185)
j) Ninth Prior Year				(14,753,667)	21,683,025
k) Total Recognized Investment Gain (Loss)	(193,026,150)	(188,140,963)	(152,218,271)	(170,253,406)	(155,499,736)
8. Change in Valuation Assets (3a) + (3c) + (5) + (7k)	212,658,171	686,004,322	281,734,773	421,476,315	
9. End of Year Assets					
a) Market Value = (2)	5,935,528,263	6,858,525,416	7,651,705,376	8,063,083,723	
b) Valuation Assets = (1b) + (8)	7,157,148,344	7,843,152,666	8,124,887,439	8,546,363,754	
c) Difference Between Market & Valuation Assets	(1,221,620,081)	(984,627,250)	(473,182,063)	(483,280,031)	
10. Recognized Rate of Return = [(5) + (7k)] / (4)	5.19%	5.42%	6.04%	5.90%	
11. Market Rate of Return	1.83%	10.41%	14.47%	6.13%	
12. Valuation Asset Adjustment Factor = (9b) / (9a)	1.205815	1.143563	1.061840	1.059937	

**Municipal Employees' Retirement System of Michigan**  
 Derivation of Actuarial Value of Assets (Cont.)

Valuation Date December 31	2016	2017	2018	2019	2020
1. Beginning of Year Assets a) Market Value b) Valuation Assets					
2. End of Year Market Value Assets					
3. Net Additions to Market Value a) Net Contributions b) Net Investment Income = (3d) - (3a) - (3c) c) Benefit Payments d) Total Additions to Market Value = (2) - (1a)					
4. Average Valuation Assets = (1b) + .5x[(3a)+(3c)]					
5. Expected Income at Valuation Rate = 8% x (4)					
6. Gain (Loss) = (3b) - (5)					
7. Phased-In Recognition of Investment Return a) Current Year: 0.1 x (6) b) First Prior Year c) Second Prior Year d) Third Prior Year e) Fourth Prior Year f) Fifth Prior Year g) Sixth Prior Year h) Seventh Prior Year i) Eighth Prior Year j) Ninth Prior Year k) Total Recognized Investment Gain (Loss)	(18,035,137) 35,922,692 4,885,187 (44,174,950) 20,621,513 26,903,495 (203,285,376) (20,182) (177,182,758)	(18,035,137) 35,922,692 4,885,187 20,621,513 26,903,495 (203,285,378) (177,162,578)	(18,035,137) 35,922,692 4,885,187 20,621,513 26,903,491 26,122,796	(18,035,137) 35,922,692 4,885,187 (44,174,950) 20,621,513 (780,695)	(18,035,137) 35,922,692 4,885,187 (44,174,952) (21,402,210)
8. Change in Valuation Assets (3a) + (3c) + (5) + (7k)					
9. End of Year Assets a) Market Value = (2) b) Valuation Assets = (1b) + (8) c) Difference Between Market & Valuation Assets					
10. Recognized Rate of Return = [(5) + (7k)] / (4)					
11. Market Rate of Return					
12. Valuation Asset Adjustment Factor = (9b) / (9a)					