



MUNICIPAL EMPLOYEES' RETIREMENT SYSTEM OF MICHIGAN

APPENDIX TO THE ANNUAL ACTUARIAL VALUATION REPORT DECEMBER 31, 2017

Summary of Plan Provisions, Actuarial Assumptions and Actuarial Funding Method
as of December 31, 2017

Introduction

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 and for GASB purposes. 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 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, 2017 Actuarial Valuation are those adopted by the Retirement Board. The most recent study of plan experience covered the period from December 31, 2008 through December 31, 2013 and was completed in 2015. The December 31, 2017 Assumptions are based on the results of this experience study. Generally, an experience study is performed every 5 years.

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.

Summary of Plan Provisions — Defined Benefit Plan¹

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 PA 220 of 1996, and the MERS Plan Document (as revised). If any conflict occurs between the information in this summary and PA 220 of 1996 or the MERS Plan Document (as revised), the provisions of PA 220 and the MERS Plan Document govern.

Eligibility for Retirement

MERS members are eligible to retire at:

- Age T, where T is between ages 60 and 70, with enough credited service to be vested (see below).
- Age T minus 5, with 15 or more years of credited service.
- Age T minus 10, with 25 or more years of credited service.

The retirement allowance is reduced for each complete month that the retirement date precedes T, up to a maximum reduction of 60%. The monthly reduction factors for various ages T are shown in the following table:

Monthly Early Retirement Reduction Factor by Normal Retirement Age T										
60	61	62	63	64	65	66	67	68	69	70
0.50%	0.65%	0.66%	0.67%	0.68%	0.69%	0.70%	0.71%	0.72%	0.73%	0.74%

The reduction may be partially or fully waived by adopting the early retirement provisions outlined below.

Optional Retirement Programs (Unreduced Benefits)

- FA(R), where A is an age from 50 to 54, and R is between 25 and 30 years of credited service.
- FA(R), where A is an age from 55 to 65, and R is between 15 and 30 years of credited service.
- FA(R), where A is any age, and R is 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 or 30 years of credited service.
- S Points, where S is between 70 and 90, and S is the sum of the member or former member's attained age and years of credited service.

Mandatory Retirement

None.

Deferred Retirement (Vesting)

Retirement can be deferred if membership is terminated before age T 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.

¹ Please see the description of the Hybrid Plan beginning on page 9.

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

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, as applicable. 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, the "lifetime multiplier" as adopted by the employer, with a maximum benefit of 80% of FAC. (Note: some "non-standard" multipliers may be higher than 2.5%.)
- Supplemental Multiplier (in addition to the above lifetime multiplier): 0.05% of FAC to 1.50% of FAC, in increments of 0.05% of FAC, as adopted by the employer and payable only 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 the above lifetime multiplier. The combined lifetime and supplemental multipliers may not exceed 2.5%, and the combined benefit may not exceed 80% of FAC.
- Bridged Benefit: For service prior to the Bridged Benefit date, one of the Benefit Program multiplier percentages of FAC (FAC may be frozen at the Bridged Benefit Date, or may be calculated at termination of membership). For service after the Bridged Benefit date, one of the 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.
- Frozen Benefit: For service prior to the Frozen Benefit Date, one of the Benefit Program Multiplier Percentages applies.

The following legacy benefit formula options were previously included in the MERS Plan Document:

- 1.0% of FAC (no 80% of FAC maximum).
- 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. May not be adopted after January 2, 1986.
- 2.0% of FAC (no 80% of FAC maximum).

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

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 duty-related, as set forth in Section 31(4) of the MERS Plan Document.

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 duty-related, 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-related 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, waives the 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, as described in Section 34 of the MERS Plan Document. In such a case, 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, as applicable. 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 1.76%

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.

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.

Annuity Withdrawal

An employer may adopt the Annuity Withdrawal Program (AWP). Under the AWP a retiring member may elect to receive a refund of their accumulated member contributions with interest in a lump sum at retirement. The member's monthly pension would then be reduced by the actuarial equivalent of the lump sum payment. The employer has two options for the interest discount rate used to compute the actuarial equivalent reduction:

- (i) The current investment return assumption used in the annual actuarial valuations (currently 7.75%); or
- (ii) The most recent December 31 interest rate used for crediting interest on member contributions (1.76% as of December 31, 2017).

Deferred Retirement Option Program (DROP)

If a participant is covered by the Benefit Program DROP and is eligible for retirement, they have the option to elect a specified DROP period in which they will cease to accrue any additional retirement benefits, but remain employed by the participating municipality or court. The participant must elect a DROP end date at least six months after the beginning date, but no more than sixty months after the beginning date, in one-month increments

Upon the participant's election of DROP and the receipt of an application to enroll in DROP, MERS will calculate the participant's service retirement and benefit payment as of the beginning date. The Retirement System also shall calculate any age differential between the participant and the participant's beneficiary as of the calendar year of the DROP exit date in accordance with Treas. Reg. § 1.401(a)(9)-6. Upon the beginning date of the DROP period, the participant shall be responsible to continue employee contributions, if any.

On the next available benefit payment date after processing is complete, and monthly thereafter, an amount equal to 100% of the monthly service retirement benefit payment the participant would have received if he or she had retired as of the DROP beginning date will be credited to a notional account for the benefit of the participant. Funds in the DROP account are credited with interest in the amount of 3% annually, or prorated in the event of a DROP period that is less than twelve months.

Upon the end date, the participant shall receive a lump-sum distribution of the participant's DROP account and on the first day of the calendar month following end date, the participant will begin receiving monthly service retirement benefit payments.

Non-Standard Benefit Provisions

Some municipalities have collectively bargained benefit provisions that differ from the benefit provisions described in this section, and MERS has agreed to administer such provisions. 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.

Frozen Benefit Provisions

If a division has a Frozen Defined Benefit plan as described on page 4 of this appendix, the provisions of the frozen defined benefit plan formula continue to apply for ancillary (non-retirement) benefits; alternatively, should the members of the Frozen Defined Benefit plan be enrolled in the Hybrid Plan, the terms of the defined benefit component of the Hybrid Plan shall apply.

Summary of Plan Provisions – Hybrid Plan¹

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 PA 220 of 1996, and the MERS Plan Document. If any conflict occurs between the information in this summary and PA 220, or the MERS Plan Document, the provisions of PA 220 and the MERS Plan Document govern.

Hybrid Plan Part I — Defined Benefit Portion

Eligibility for Retirement

Members are eligible to retire at an age between 60 and 70, as selected by the participating municipality, with 6 or more years of service.

Optional Retirement Programs (Unreduced Benefits)

An age between 55 and 65 as selected by the participating municipality, with credited service of 25 years.

Mandatory Retirement

None.

Deferred Retirement (Vesting)

Retirement can be deferred if membership is terminated before the applicable retirement age 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, as applicable. 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.

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

¹ 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 a member's FAC
Hybrid 1.5%	1.5% of a member's FAC
Hybrid 1.75% ¹	1.75% of a member's FAC
Hybrid 2.0% ¹	2.0% of a member's FAC

¹ 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.

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-Related Death Allowance

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

Member Contributions

The Defined Benefit portion of the Hybrid plan only allows member contributions in the situation where the employer has a cap on their contributions. 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.

Annuity Withdrawal

Not available.

Deferred Retirement Option Program (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 — 2018

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 ¹
35	41,647	220,000
36	43,980	220,000
37	46,458	220,000
38	49,092	220,000
39	51,893	220,000
40	54,874	220,000
41	58,049	220,000
42	61,432	220,000
43	65,042	220,000
44	68,895	220,000
45	73,013	220,000
46	77,418	220,000
47	82,134	220,000
48	87,189	220,000
49	92,614	220,000
50	98,443	220,000
51	104,713	220,000
52	111,468	220,000
53	118,756	220,000
54	126,629	220,000
55	135,150	220,000
56	144,387	220,000
57	154,417	220,000
58	165,326	220,000
59	177,217	220,000
60	190,202	220,000
61	204,413	220,000
62	220,000	220,000
63	220,000	220,000
64	220,000	220,000
65 & older	220,000	220,000

¹ 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 — 2018

For 2017, the IRC Section 401(a)(17) limit is \$275,000. This limit is indexed with inflation in \$5,000 increments.

Actuarial Assumptions

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 investment return assumption 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, 2017 Actuarial Valuation are unchanged from those used in the December 31, 2016 Actuarial Valuation. 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 2017 actuarial valuation, the long-term investment yield is assumed to be 7.75% annually, net of administrative and investment expenses. This assumption was first used for the December 31, 2015 actuarial valuations.

Please note that, given that the actuarial value of assets is currently 1% higher than the market value, meeting the actuarial assumption in the next few years will require average annual market returns that exceed the 7.75% investment return assumption.

Please see the Comments on Asset Smoothing 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 3.75% in the long term 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 3.75% long-term wage inflation assumption was first used for the December 31, 2015 actuarial valuations. The merit and longevity pay increase assumption was first used for the December 31, 2015 actuarial valuations.

Age	Base (Wage Inflation)	Merit and Longevity	Total Percentage Increase in Pay
20	3.75%	11.00%	14.75%
25	3.75	7.20	10.95
30	3.75	3.10	6.85
35	3.75	1.90	5.65
40	3.75	1.20	4.95
45	3.75	0.81	4.56
50	3.75	0.52	4.27
55	3.75	0.30	4.05
60	3.75	0.00	3.75

Inflation

Although no explicit price inflation assumption is used in this valuation, the long-term annual rate of price inflation implicit in the 3.75% base wage inflation is 2.5%.

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 3.75% annually. This assumption was first used for the December 31, 2015 actuarial valuations.

Increase in Final Average Compensation (FAC Loads)

The 2009-2013 and two previous 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. Loading for this anticipated increase in FAC allows the employer to fund for the anticipated higher liabilities during the working lifetime of the employee, rather than paying for the increase in the form of a liability loss after the member retires.

The Retirement Board adopted new FAC assumptions that were first used for the December 31, 2015 annual actuarial valuations. These assumptions reflect an FAC load of 0% to 12% for each municipality, based on the municipality's experience in the 2009-2013 and earlier experience studies (it is anticipated that these assumptions will be updated after every 5 year experience study). 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 employer's or 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, 2015 actuarial valuations.

Sample Years of Service	% of Active Members Withdrawing Within the Next Year
0	19.60%
1	16.30
2	13.30
3	10.50
4	8.60
5	6.90
10	4.60
15	3.40
20	2.60
25	2.20
30 and over	2.20

For the majority of the divisions in MERS, the base withdrawal rates from the table above are used. However, for larger employers (i.e. employers with 500 or more life years of exposure during the 5 year experience study period), the standard withdrawal rates are adjusted by the appropriate scaling factor based on that employer's actual withdrawal experience. A scaling factor of 100% means the municipality's experience is expected to be similar to the MERS-wide system experience. A scaling factor lower than 100% means the municipality's withdrawal experience is lower than the MERS-wide experience. A scaling factor higher than 100% means the municipality's withdrawal experience is higher than the MERS-wide experience.

The scaling factor for each division is shown in your actuarial valuation report.

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:

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

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, 2015 actuarial valuations. The Early Retirement rates were first used for the December 31, 2015 actuarial valuations.

Normal Retirement

Sample Replacement Index	Percent of Eligible Active Members Retiring Within the Next Year
5	8.0%
10	12.0
15	16.0
20	19.0
25	19.5
30	19.5
35	19.5
40	20.0
45	21.0
50	21.0
55	21.0
60	24.0
65	24.0
70	25.0
75	28.0
80	33.0
85	36.0
90	41.0
95	46.0
100+	50.0

Early Retirement – Reduced Benefit

Age	Percent of Eligible Active Members Retiring Within the Next Year
50	2.0%
51	2.0
52	3.3
53	3.8
54	5.6
55	4.3
56	4.2
57	4.1
58	5.0
59	6.2

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, 2015 actuarial valuations.

Sample Ages	Percent Becoming Disabled Within the Next Year
20	0.02%
25	0.02
30	0.02
35	0.05
40	0.08
45	0.20
50	0.29
55	0.38
60	0.39
65	0.39

Eighty percent (80%) of the disabilities are assumed to be non-duty and 20% of the disabilities are assumed to be duty related. For those plans which have adopted disability provision D-2, 40% of the disabilities are assumed to be non-duty and 60% 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 non-disabled plan members is a 50% Male - 50% Female blend of the following tables:

1. The RP-2014 Healthy Annuitant Mortality Tables, with rates multiplied by 105%
2. The RP-2014 Employee Mortality Tables
3. The RP-2014 Juvenile Mortality Tables

For ages 0-17 we use the rates in Table 3; for ages 18-49 we use the rates in Table 2; for ages 70 and older we use the rates in Table 1; and for ages 50-69 we blend Table 2 and Table 1 as follows:

- a. Age 50, use 60% of Table 2 and 40% of Table 1
- b. Age 51, use 57% of Table 2 and 43% of Table 1
- c. Etc. ...
- d. Age 69, use 3% of Table 2 and 97% of Table 1

The mortality table used to project the mortality experience of disabled plan members is a 50% Male - 50% Female blend of the RP-2014 Disabled Retiree Mortality Tables.

These mortality tables were first used for the December 31, 2015 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 mortality assumptions include a 10% margin for future mortality improvements, relative to the actual mortality experience seen in the 2009-2013 Experience Study.

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

Age	Expected Years of Life Remaining	Mortality Rates
20	63.06	0.03%
25	58.15	0.03
30	53.24	0.03
35	48.33	0.04
40	43.43	0.05
45	38.56	0.08
50	33.74	0.23
55	29.18	0.37
60	24.79	0.58
65	20.59	0.94
70	16.66	1.56
75	13.07	2.51
80	9.85	4.18

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

Age	Expected Years of Life Remaining	Mortality Rates
20	46.95	0.47%
25	43.14	0.54
30	39.24	0.55
35	35.33	0.65
40	31.52	0.82
45	27.98	1.30
50	24.87	1.62
55	21.91	1.89
60	18.97	2.18
65	16.04	2.63
70	13.19	3.43
75	10.54	4.77
80	8.18	6.88

Miscellaneous and Technical Assumptions

- Loads - Vested Liabilities
 - 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 3.75% 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 3.75% 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 out of the Qualified Benefit Plan.
- 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 3%, which is consistent with the 2.5% 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.
- Traditional DROP Each eligible member was assumed to enter the DROP when first eligible and stay in the DROP program for 3 years. At the end of the 3 year period, the member was assumed to receive their DROP account balance with interest and the monthly benefit.
- Data Adjustments - The gender was not reported for a small number of active members. These active members were assumed to be male.
- Non-vested former members active in a DC plan - Liabilities in excess of accumulated member contributions are not included in the valuation until the former member earns total vesting service to become vested in the defined benefit plan. We did not receive sufficient data on these individuals to calculate the liability in excess of accumulated contributions, however, we believe this amount, if any, is likely to be immaterial to the calculation.
- Non-vested former members active in another DB or Hybrid plan - Liabilities for these former members were included in the valuation.

Actuarial Funding Method

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 a given valuation date, 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 (UAL) as of December 31, 2017 (see Table 10 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 2019). This allows the 2017 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.

For valuation years through 2015, the projected total unfunded accrued liability was then amortized over the appropriate period for each division to determine the amortization payment. For divisions that will have no new hires this was the dollar amortization payment. For divisions that are open to new hires this payment was divided by the projected fiscal year payroll to determine the amortization payment as a percentage of active member payroll. The resulting amortization contributions were displayed in Table 1 for each division. For purposes of determining the amortization payment, payments are projected to increase 3.75% a year.

Beginning with the December 31, 2016 Annual Valuation, the various types of UAL are amortized over different amortization periods. Dollar and percentage contributions are determined as above for each piece (layer) of UAL.

The MERS funding policy uses a level-percent-of-payroll amortization method. This means that the annual amortization payment dollars will increase each year at the assumed wage inflation of 3.75%. One result of the level percent of pay amortization method is that the outstanding balance of the UAL will increase in nominal dollars each year for amortization periods longer than around 18 years (although it will decline in real, inflation-adjusted terms). This is called negative amortization. This phenomenon ceases once the amortization periods become shorter than 18 years.

The different types of UAL are defined below in the table below:

Type of UAL	Definition
Initial UAL	UAL as of December 31, 2015 UAL, or the valuation date the municipality joined MERS
Gain/Loss	UAL attributable to differences between the actuarial assumptions and the experience of the plan for the twelve months prior to the valuation date
Plan Amendment	UAL arising from adoption of a benefit change
Assumption Change	UAL arising from a change in assumptions
Method Change	UAL arising from a change in methods (i.e. funding method or asset method)
Early Retirement Incentive	UAL arising from adoption of an Early Retirement Incentive program
Merged Division Balance	Aggregate UAL resulting when divisions merge

Beginning in the December 31, 2016 annual actuarial valuation, the different sources of UAL are amortized over separate closed amortization periods as shown in the table that follows, unless the remaining period on the Initial UAL is longer in which case the longer period is used.

If in a valuation the total Unfunded Liability switches from positive to negative or negative to positive, all existing layers are eliminated and a new layer is established.

Amortization Periods for Sources of Unfunded Accrued Liability (UAL)

(First Applicable to the December 31, 2016 Annual Actuarial Valuation)

Source of UAL	Amortization Period ¹	
	Open Divisions	Closed Divisions
Initial UAL	21 years ²	Accelerated or Non-Accelerated Option
Future Active and Inactive Plan Amendments	10 years ³	5 years ³
Future Liability and Asset Gain or Loss	15 years	10 years
Future Assumption or Method Changes	15 years	10 years
Future Early Retirement Incentives	5 years ³	5 years ³

¹ A shorter amortization period may be suggested for poorly funded divisions (subject to MERS CEO and actuary discussion).

² 25 years in the year a municipality first joins MERS, subject to CEO and actuary discussion.

³ Only applies to divisions that are over 100% funded before and after the benefit provision change.

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.

The minimum contribution requirement is equal to the excess of three years of projected annual retiree benefit payments over the projected market value of assets. For open divisions this minimum first applied beginning with the December 31, 2015 annual valuations.

The standard amortization period for negative initial UAL is 10 years, with the 10 year period re-established with each annual valuation.

Prior to December 31, 2016, various amortization policies have been in place. In many instances, the amortization policy already in effect for a division's 12/31/2015 UAL is maintained for the Remaining 12/31/2015 UAL. The table below shows the different types of amortization policies that are still being used in the annual valuations for these cases:

Type of Amortization	Description
Non-accelerated amortization (can apply to both open and closed divisions)	Amortization period declines by 1 each year until the UAL is paid off
Accelerated to 5 –Year amortization (applies to closed-not-linked divisions only and cannot be adopted after 2016)	Declines by 2 years each year until it reaches 6 or 5 years, then declines by 1 each year until UAL is paid off
Accelerated to 15-Year amortization (applies to closed-not-linked divisions only and cannot be adopted after 2016)	Declines by 2 years each year until it reaches 16 or 15 years, then declines by 1 each year until UAL is paid off
Extended amortization (applies to the initial UAL only)	Declines by 1 year each year until UAL is paid off.
Custom amortization (can apply to both open and closed divisions)	Various amortization schedules adopted by employers that do not fit the descriptions of the other schedules listed above

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

If new hires, transfers and rehires in a division 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. (Note that assets cannot be shared if the new tier of benefits is a defined contribution plan.) This allows multiple divisions to be "linked" and financed as if they were one division.

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

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. For the December 31, 2017 valuation the difference in investment income between expected return and market return is recognized over a 5-year period at the rate of 20% per year. This asset valuation method was first adopted for the December 31, 2016 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 7.75% 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 20% of the current year's gain (loss) plus 20% of the gain (loss) from each of the 4 preceding years. This is a change from the 2015 and prior valuations where a 10 year smoothing period was used. For purposes of transitioning from the 10 year to the 5 year method, the entirety of prior unrecognized gains and losses at December 31, 2016 is combined into a single item and will be recognized over the next four years.

During 2017, 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 6.08%. The corresponding amounts for 2016, 2015, 2014, and 2013 were 5.14%, 5.21%, 5.90%, and 6.04%, respectively.

For the December 31, 2017 valuation, the actuarial value of assets is equal to 101.13% of market value (compared to 107.71%, 113.54%, 105.99%, and 106.18%, in 2016, 2015, 2014, and 2013, 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 tables on the following pages provide 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 1% higher than the market value, meeting the actuarial assumption in the next few years will require average annual market returns that exceed the 7.75% investment return assumption.

Please see the Comments on Asset Smoothing 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	\$8,063,083,723
b) Valuation Assets	6,944,490,173	7,157,148,344	7,843,152,666	8,124,887,439	8,546,363,754
2. End of Year Market Value Assets	5,935,528,263	6,858,525,416	7,651,705,376	8,063,083,723	7,886,133,448
3. Net Additions to Market Value					
a) Net Contributions	362,710,568	856,171,348	476,725,412	651,265,712	717,870,630
b) Net Investment Income = (3d) - (3a) - (3c)	108,045,293	633,022,713	979,236,854	467,398,803	(139,840,580)
c) Benefit Payments	(506,821,042)	(566,196,908)	(662,782,306)	(707,286,168)	(754,980,325)
d) Total Additions to Market Value = (2) - (1a)	(36,065,181)	922,997,153	793,179,960	411,378,347	(176,950,275)
4. Average Valuation Assets = (1b) + .5x[(3a)+(3c)]	6,872,434,936	7,302,135,564	7,750,124,219	8,096,877,211	8,527,808,907
5. Expected Income at Valuation Rate = 8% x (4)	549,794,795	584,170,845	620,009,938	647,750,177	682,224,713
6. Gain (Loss) = (3b) - (5)	(441,749,502)	48,851,868	359,226,916	(180,351,374)	(822,065,293)
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)	(82,206,529)
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)	(237,706,265)
8. Change in Valuation Assets (3a) + (3c) + (5) + (7k)	212,658,171	686,004,322	281,734,773	421,476,315	407,408,753
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	7,886,133,448
b) Valuation Assets = (1b) + (8)	7,157,148,344	7,843,152,666	8,124,887,439	8,546,363,754	8,953,772,507
c) Difference Between Market & Valuation Assets	(1,221,620,081)	(984,627,250)	(473,182,063)	(483,280,031)	(1,067,639,059)
10. Recognized Rate of Return = [(5) + (7k)] / (4)	5.19%	5.42%	6.04%	5.90%	5.21%
11. Market Rate of Return	1.83%	10.41%	14.47%	6.13%	(1.74%)
12. Valuation Asset Adjustment Factor = (9b) / (9a)	1.205815	1.143563	1.061840	1.059937	1.135382

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	\$7,886,133,448	\$8,490,200,180			
b) Valuation Assets	8,953,772,507	9,144,749,435			
2. End of Year Market Value Assets	8,490,200,180	9,438,790,673			
3. Net Additions to Market Value					
a) Net Contributions	654,676,753	698,797,543			
b) Net Investment Income = (3d) - (3a) - (3c)	866,474,132	1,099,526,793			
c) Benefit Payments	(917,084,153)	(849,733,843)			
d) Total Additions to Market Value = (2) - (1a)	604,066,732	948,590,493			
4. Average Valuation Assets = (1b) + .5x[(3a)+(3c)]	8,822,568,807	9,069,281,285			
5. Expected Income at Valuation Rate=7.75% x (4)	683,749,083	702,869,300			
6. Gain (Loss) = (3b) - (5)	182,725,049	396,657,493			
7. Phased-In Recognition of Investment Return					
a) Current Year: 0.2 x (6)	36,545,010	79,331,499			
b) First Prior Year	(266,909,765)	36,545,010	79,331,499		
c) Second Prior Year		(266,909,765)	36,545,010	79,331,499	
d) Third Prior Year			(266,909,765)	36,545,010	79,331,499
e) Fourth Prior Year				(266,909,764)	36,545,010
f) Total Recognized Investment Gain (Loss)	(230,364,755)	(151,033,256)	(151,033,256)	(151,033,256)	115,876,509
8. Change in Valuation Assets (3a) + (3c) + (5) + (7f)	190,976,928	400,899,744			
9. End of Year Assets					
a) Market Value = (2)	8,490,200,180	9,438,790,673			
b) Valuation Assets = (1b) + (8)	9,144,749,435	9,545,649,179			
c) Difference Between Market & Valuation Assets	(654,549,255)	(106,858,506)			
10. Recognized Rate of Return = [(5) + (7f)] / (4)	5.14%	6.08%			
11. Market Rate of Return	11.17%	13.07%			
12. Valuation Asset Adjustment Factor = (9b) / (9a)	1.077095	1.011321			