

# ACTUARIAL SECTION

## MICHIGAN ROCKS!



## HEMATITE

Hematite is the major ore used to produce iron. It has a hexagonal structure and is usually black, silver-gray, brown or red. Although there are many forms of hematite, they all have a rust-red streak. Quality specimens of hematite can be found in the Champion Mine in Marquette County.

## ACTUARY CERTIFICATION LETTER



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August 10, 2007

The Retirement Board  
Municipal Employees' Retirement System of Michigan  
1134 Municipal Way  
Lansing, Michigan 48917

Dear Board Members:

The basic financial objective of the Municipal Employees' Retirement System of Michigan (MERS) is to establish and receive contributions which:

- (1) when expressed in terms of percents of active member payroll will remain approximately level from generation to generation of Michigan citizens, and which
- (2) when combined with present assets and future investment return will be sufficient to meet the financial obligations of MERS to present and future retirees and beneficiaries.

In order to measure progress toward this fundamental objective, MERS has annual actuarial valuations performed. Separate actuarial valuations are prepared for each participating municipality and court. The valuations (i) measure present financial position, and (ii) establish contribution rates that provide for the normal cost (current cost) and level percent of payroll amortization of unfunded actuarial accrued liabilities over a reasonable period (generally 29 years). The latest completed actuarial valuations were based upon population data, asset data, and plan provision data as of December 31, 2006. These valuations determine the contribution rates for the fiscal years beginning in 2008.

The actuarial valuations are based upon financial data, plan provision data, and participant data which are prepared by retirement system staff. The data is reviewed by us for internal and year-to-year consistency as well as general reasonableness, but is not otherwise audited by us. It is also summarized and tabulated for the purpose of analyzing trends.

Actuarial valuations are based on assumptions regarding future rates of investment return and inflation, rates of retirement, withdrawal, death, disability, and pay increase among MERS members and their beneficiaries. These assumptions are adopted by the Board after considering the advice of the actuary and other professionals. The assumptions and methods utilized in this valuation comply with the requirements of Governmental Accounting Standards Board Statement No. 25. The demographic assumptions were adopted by the Retirement Board and were based upon actual experience of MERS during the years 1998 to 2003. The economic assumptions were adopted by the Board in 1998.

Assets are valued on a market related basis that fully recognizes expected investment return and averages unanticipated market return over a 10-year period.

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Based on the actuarial valuations, MERS staff prepared and we reviewed the following supporting schedules in the Comprehensive Annual Financial Report:

#### Financial Section

- Schedule of Funding Progress
- Schedule of Employer Contributions (Annual Required Contribution)

#### Actuarial Section

- Summary of Actuarial Assumptions and Methods
- Probabilities of Retirement
- Rates of Withdrawal (Excluding Death)
- Rates of Withdrawal Due to Disability
- Annual Percentage Increase in Salary
- Schedule of Active Member Valuation Data
- Mortality Tables
- Schedule of Retirees and Beneficiaries Added To and Removed From Rolls
- Solvency Test
- Summary of Plan Document Provisions

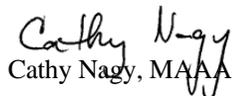
#### Statistical Section

- Schedule of Retired Members by Type of Benefit
- Schedule of Retired Members by Type of Option Selected
- Active Members Per Pension Recipient
- Benefits as Percent of Active Member Pay

To the best of our knowledge, the actuarial valuations are complete and accurate and are made in accordance with generally recognized actuarial methods, in compliance with Act No. 220 of the Public Acts of 1996, as amended, and the MERS plan document, as revised. All of the undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. **Based upon the valuation results, it is our opinion that the Municipal Employees' Retirement System of Michigan is meeting its basic financial objective and continues in sound condition in accordance with actuarial principles of level percent of payroll financing.**

Respectfully submitted,

  
Alan E. Sonnanstine, MAAA, ASA

  
Cathy Nagy, MAAA, FSA

  
W. James Koss, MAAA, ASA

AES/CN/WJK:lr

Gabriel Roeder Smith & Company

## SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

The investment return rate used in making the valuations was 8% per year, compounded annually. Adopted 1981. This rate of return is not the assumed real rate of return. The real rate of return is the rate of investment return in excess of the inflation rate. Considering other financial assumptions, the 8% investment return rate translated to an assumed real rate of return of 3.5% in excess of inflation. Adopted 1998.

Valuation assets (cash and investments) were valued for each municipality using a ten-year smoothed market value method. For the 2006 valuation and later, the excess (shortfall) of actual investment income (including interest, dividends, realized and unrealized gains or losses) over the imputed income at the valuation interest rate is considered the gain (loss) that is spread over ten years. Adopted 2006.

The Actuarial Valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA). The Retirement Board adopted the assumptions used in the Actuarial Valuations after consulting with the actuary.

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 ages in the regular mortality table have been adjusted forward by ten years to reflect the higher expected mortality rates of disabled members. Adopted 2005.

Sample probabilities of retirement with an age and service allowance are shown on page 67. Adopted 2000 and 2005.

Sample probabilities of separation from service before retirement due to disability or other causes are shown on page 69. Adopted 2000.

The salary increase assumption projects annual salary increases of 4.5% plus a percentage based on an age-related scale to reflect merit, longevity and promotional increases. Sample rates are shown on page 70. Adopted 1998 and 2005.

Total active member payroll is assumed to increase 4.5% plus a percentage based on an age-related scale to reflect merit, longevity and promotional increases. Sample rates are shown on page 70. Adopted 1998 and 2005.

An individual entry age actuarial cost method of valuation was used to determine actuarial accrued liabilities and normal cost. Adopted 1994. The standard amortization period for financing positive unfunded liabilities is 30 years, beginning with the 2005 valuation. This period is scheduled to be reduced by one year in each of the following five valuations. The period will be reestablished at 25 years for each subsequent valuation, beginning with the 2011 valuation. The standard amortization period for negative unfunded liabilities is 10 years, with the 10-year period reestablished each year. Adopted 2006.

For employers that adopt E-1 or E-2 post retirement benefit increases, retirement benefits are assumed to increase by an annual, non-compounded rate of 2.5%. Adopted 1981.

The most recent experience study for the Retirement System was completed in March 2005 and covered the period January 1, 1999, through December 31, 2003. All assumptions and method changes adopted in 2005 are based on the results of that study.

The Accelerated Funding Credit (AFC) program has been replaced with a new, less complicated program of contribution credits for overfunded employee divisions. The new program eliminates the complexities of the AFC, simplifies the calculation of the required employer contribution rates, removes much of the variability of contribution rates, and satisfies the requirement of the Governmental Accounting Standards Board. Adopted 2002.

There have been no recent changes in the nature of the plan that have had an impact on the Retirement System. Municipalities have the ability to modify those plan provisions that apply to their individual plan. The individual municipality contribution rates are modified to account for changes in provisions of the plan selected by the municipality.

There have been no changes in the actuarial assumptions or methods that have had a material impact on the December 31, 2006 Actuarial Valuation results.

The Retirement System's administrative staff has furnished the data about persons now covered and present assets. Although examined for general reasonableness, the actuary has not audited the data.

## Probabilities of Retirement for Members Eligible to Retire

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### Percent of Eligible Active Members Retiring Within the Next Year\*

<b>Retirement Ages</b>	<b>Without F50 or F55 or F(N)</b>	<b>With F55</b>	<b>With F50</b>
50			22%
51			22
52			22
53			22
54			24
55		18%	18
56		15	14
57		10	16
58		15	18
59		20	18
60	20%	20	20
61	24	24	24
62	24	24	24
63	24	24	24
64	27	27	27
65	30	30	30
66	30	30	30
67	30	30	30
68	30	30	30
69	30	30	30
70	100	100	100

\*Municipalities that adopted a non-standard benefit multiplier after December 31, 1996, that is in excess of the B-4 2.5% multiplier, will have a retirement rate equal to 75% when they first reach the age at which unreduced plan benefits are available.

## Normal Retirement – Service Based Benefit F(N) Adopted

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### Percent of Eligible Active Members Retiring Within the Next Year

Age		Age		Age	
40	22%	51	22%	61	24%
41	22	52	22	62	24
42	22	53	22	63	24
43	22	54	24	64	27
44	22	55	18	65	30
45	22	56	14	66	30
46	22	57	16	67	30
47	22	58	18	68	30
48	22	59	18	69	30
49	22	60	20	70	100
50	22				

Municipalities that have adopted a non-standard benefit multiplier after December 31, 1996 that is in excess of the B-4, 2.5% multiplier, will have a retirement rate equal to 75% at the first age at which unreduced plan benefits are available.

## Early Retirement – Reduced Benefit

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Retirement Ages	Percent of Eligible Active Members Retiring Within Next Year
50	2%
51	2
52	3
53	5
54	8
55	4
56	4
57	4
58	6
59	8

### Rates of Withdrawal (Excluding Death or Disability) from Active Employment Before Retirement

Sample Ages	Years of Service	Percent of Active Members Withdrawing Within Next Year
	0	18%
	1	18
	2	16
	3	12
	4	10
20	5 and over	9
25		9
30		9
35		7
40		5
45		4
50		4
55		3
60		3
65		2
70		0

### Rates of Withdrawal Due to Disability\* Percent Becoming Disabled Within Next Year

Sample Ages	Percent of Active Members Becoming Disabled Within Next Year
20	0.02%
25	0.02
30	0.02
35	0.06
40	0.06
45	0.11
50	0.24
55	0.41
60	0.41
65	0.41

\* 85% of the disabilities are assumed to be non-duty, and 15% of the disabilities are assumed to be duty related. For those plans that have adopted disability provision D-2, 70% of the disabilities are assumed to be non-duty, and 30% are assumed to be duty related.

## Annual Percentage Increase in Salary

Sample Ages	Base Inflation	Merit and Longevity	Total Percentage Increase in Salary
20	4.50%	8.40%	12.90%
25	4.50	5.33	9.83
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

## Schedule of Active Member Valuation Data

Valuation Dec 31	Participating Municipalities	Active Members	Active Members Annual Payroll	Annual Average Pay	Percent Increase in Average Pay	Persons on Deferred Status
1997	529	36,547	\$ 1,068,597,733	\$ 29,239	3.0%	3,752
1998	541	36,817	1,163,056,817	31,590	8.0	4,369
1999	552	36,472	1,179,274,854	32,334	2.4	4,794
2000	560	36,573	1,225,992,204	33,522	3.7	5,303
2001	561	36,583	1,271,563,960	34,758	3.7	5,799
2002	575	37,043	1,327,360,448	35,833	3.1	5,510
2003	594	37,159	1,381,197,725	37,170	3.7	5,575
2004	615	36,766	1,437,211,517	39,091	5.2	5,804
2005	644	36,467	1,462,411,810	40,102	2.6	6,126
2006	668	36,846	1,545,886,480	41,955	4.6	6,235

## MORTALITY TABLES

In estimating the amount of the reserves required at the time of retirement to pay a member’s benefit for the remainder of the member’s lifetime, it is necessary to make an assumption with respect to the probability of surviving to retirement and 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 ages in the regular mortality table is used with a 10-year set forward in ages to reflect the higher expected mortality rates of disabled members.

The life expectancies and mortality rates projected by the 1994 Group Annuity Mortality table for non-disabled members are shown below for selected ages:

### Non-Disabled

Age	Expected Years of Life Remaining	Mortality Rates
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 by the 1994 Group Annuity Mortality table for disabled members are shown below for selected ages:

### Disabled

Age	Expected Years of Life Remaining	Mortality Rates
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

## Schedule of Retirees and Beneficiaries Added to and Removed from Rolls

Valuation Dec 31	Added to Rolls		Removed From Rolls		End-of-Year Rolls	
	Retirees/ Beneficiaries Number	Annual Allowance	Retirees/ Beneficiaries Number	Annual Allowance	Retirees/ Beneficiaries Number	Annual Allowance
1997	1,504	\$ 16,305,680	531	\$ 3,033,941	14,236	\$ 123,112,929
1998	1,122	19,230,034	568	3,642,223	14,790	138,700,740
1999	1,312	19,663,240	777	5,592,269	15,325	152,771,711
2000	1,319	23,588,044	369	2,810,133	16,275	173,549,622
2001	1,238	22,971,336	608	4,735,312	16,905	191,785,646
2002	1,275	25,079,342	642	5,882,066	17,538	210,982,922
2003	1,577	31,229,077	672	5,623,367	18,443	236,588,632
2004	1,553	32,303,049	725	6,669,694	19,271	262,221,987
2005	1,666	32,839,907	782	7,000,257	20,155	288,061,637
2006	2,071	38,752,141	762	4,291,133	21,464	322,522,645

Valuation Dec 31	End-of-Year Rolls		% Increase in Annual Allowance	Average Annual Allowance
	Retirees/ Beneficiaries Number	Annual Allowance		
1997	14,236	\$ 123,112,929	12.1%	\$ 8,648
1998	14,790	138,700,740	12.7	9,378
1999	15,325	152,771,711	10.1	9,969
2000	16,275	173,549,622	13.6	10,664
2001	16,905	191,785,646	10.5	11,345
2002	17,538	210,982,922	10.0	12,030
2003	18,443	236,588,632	12.1	12,828
2004	19,271	262,221,987	10.8	13,607
2005	20,155	288,061,637	9.9	14,292
2006	21,464	322,522,645	12.0	15,026

## SOLVENCY TEST

The Solvency Test is another means of checking a retirement system's progress under its funding program, based on the aggregate accrued liability. In this test, the plan's present assets (actuarial value) are compared with obligations in order of priority: (1) active member contributions on deposit; (2) the present value of future benefits to present retired lives; (3) the aggregate accrued liability for present active members. In a system that has been following the discipline of level percent of payroll financing, the obligation for active member contributions on deposit (present value 1) and the present value of future benefits to present retired lives (present value 2) will be fully covered by present assets (except in rare circumstances). In addition, the aggregate accrued liability for present active members (present value 3) will be partially covered by the remainder of present assets. Generally, if a retirement system has been using level cost financing, the funded portion of present value 3 will increase over time.

The Solvency Test illustrates the history of the obligation of the Retirement System and reflects the MERS policy of following the discipline of level percent payroll financing. The solvency of the system remains sound. The previous years market downturn has affected the funding level of the system somewhat; however, many municipalities have adopted richer benefits in recent years that have dampened the funding level of the system. The system as a whole remains on track for meeting its obligations.

### Solvency Test (Dollars in Millions)

Valuation Date Dec 31	Aggregate Accrued Liabilities			Valuation Assets	Portion of Accrued Liabilities Covered by Valuation Assets		
	(1) Active Member Contributions	(2) Retirees and Beneficiaries	(3) Active Members (Employer- Financed Portion)		(1)	(2)	(3)
1997	* \$ 277.5	\$ 1,174.7	\$ 1,833.0	\$ 2,692.7	100%	100%	67.7%
1998	291.9	1,316.2	1,983.9	3,030.4	100	100	71.7
1999	305.5	1,463.2	2,066.9	3,464.9	100	100	82.1
2000	318.4	1,744.6	2,334.0	3,787.2	100	100	73.9
2001	336.5	1,944.6	2,502.8	4,034.4	100	100	70.1
2002	359.2	2,159.1	2,662.8	4,133.0	100	100	60.6
2003	396.7	2,435.2	2,835.8	4,459.5	100	100	57.4
2004	422.5	2,696.6	3,045.7	4,732.2	100	100	53.0
2005	463.0	2,966.2	3,179.9	5,026.1	100	100	50.2
2006	518.0	3,314.5	3,355.2	5,493.8	100	100	49.5

\* 1997 had revised economic assumptions.

## SUMMARY OF PLAN DOCUMENT PROVISIONS

The benefits summarized in this section are intended only as general information regarding the Municipal Employees' Retirement System. 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 or the MERS Plan Document, as revised, the provision of Act No. 220 and the MERS Plan Document govern.

The December 31, 2006 Actuarial Valuation was based upon the provisions of the MERS Plan Document summarized below. This information is related to the MERS Defined Benefit plan.

Monthly retirement payments are made over the lifetime of the retiree and/or over the lifetime of the beneficiary, depending upon choice of benefits adopted by each municipality and final payment option elected by the retiring member.

Vesting occurs after ten years of credited service unless the municipality selects a lesser number of years.

Final Average Compensation (FAC) is the highest monthly average of a member's compensation over a consecutive period of months of credited service. The municipality selects the number of months. FAC-3 is over 36 months. FAC-5 is over 60 months.

Normal retirement for a member occurs after vesting and attaining age 60. The municipality may choose other combinations of age and service such as age 55 and 15 years service, age 50 and 25 years of service, etc. There is no mandatory retirement age.

### **Benefit Formula**

The annual benefit equals a specified percentage of the member's FAC multiplied by the number of years and months of credited service. The plan has several benefit programs available with percentages that vary from 1.3% to 2.5% that may be selected by a participating municipality.

### **Early Retirement**

Early retirement occurs if the vested member meets the credited service requirements but not the age requirement. The monthly payment is reduced (unless waived by the municipality) for each month that the member is younger than the minimum retirement age.

### **Deferred Retirement**

Deferred retirement occurs when the employee leaves MERS covered employment after vesting but before reaching the minimum retirement age. This member or beneficiary will become eligible for the deferred allowance once the member reaches the minimum retirement age provided the member's contributions remain on deposit with MERS.

### **Disability Benefit – Duty or Non-Duty**

Duty disability is available to a member who becomes totally and permanently disabled due to a duty-related injury or disease. This benefit is calculated like a normal allowance without regard to the vesting requirement or to age. The benefit shall not be less than 25% of FAC.

Non-duty disability is available to a vested member who becomes totally and permanently disabled for reasons other than from duty-related causes. This allowance is calculated like a normal allowance without regard to age.

Benefits for duty and non-duty disability retirants who have not attained age 60 shall not exceed the difference between 100% of FAC and the amount of the retirant's considered income. Continuing medical examinations may be required.

### **Survivor Benefit**

Upon death of a vested non-retired member, the eligible surviving dependents would receive a portion of the normal retirement at the time of death. The surviving spouse would receive 85%. If no surviving spouse, each unmarried child under 21 would receive an equal share of 50%. If the death were duty related, the surviving spouse would receive the higher of 85% or 25% of the FAC after waiver of the vesting requirement.

### **Post Retirement Adjustments**

Each municipality may elect to provide post retirement adjustments to retirees and their beneficiaries. The municipality can choose one-time adjustments or an annual adjustment for all retirees or for future retirees only. This Cost of Living Adjustment (COLA)-type of increase is effective in January of each year.

### **Forms of Benefit Payment**

The member elects one of the following payment options as part of the retirement application process. Once the election is made, it is irrevocable after receipt of first payment. The options include:

1. Straight life over the retirant's life only.
2. Reduced to cover retirant and beneficiary as long as either live.
3. Reduced to cover retirant for their lifetime and further reduced to 75% or 50% of the original reduced amount to cover beneficiary if the beneficiary outlives the retirant.
4. A reduced benefit for the retirant's life guaranteed for a specified number of years. The reduced benefit continues for the beneficiary even if the retirant dies, but terminates after the guaranteed number of years.

### **Changes in Plan Provisions**

There have been no changes in the Plan Document that have had a material impact on the December 31, 2006, Actuarial Valuation.

Pursuant to a collective bargaining agreement, a participating municipality may provide for retirement benefits that are modifications of standard retirement benefits otherwise included in the plan. These modifications were taken into consideration when determining the municipality contribution rates on the December 31, 2006, Actuarial Valuation.



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### FELDSPAR

Feldspar is the name of a group of rock-forming minerals. They are composed of potassium, sodium, calcium and occasionally barium.

They appear as small glassy crystals or crystalline rocks.

Feldspar is one of the most abundant minerals; about 60 percent of the earth's outer crust is composed of it. Some noteworthy specimens come from glacial debris in Michigan near Randville in Dickinson County. It can also be found on northern Lake Michigan and southern Lake Superior.