

STANDARDS FOR ACTUARIAL WORK  
ESTABLISHED BY THE STATE OF  
MINNESOTA LEGISLATIVE COMMISSION  
ON PENSIONS AND RETIREMENT

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## PREFACE

These standards were adopted by the Legislative Commission on Pensions and Retirement as of June 30, 1985, and amended on July 21, 1986, July 28, 1986, August 26, 1987, August 22, 1988, September 20, 1989, July 8, 1992, June 13, 1996, August 23, 2001, and August 20, 2007. All actuarial work for retirement plans subject only to Minnesota Statutes, Section 356.215 and not subject to Minnesota Statutes, Section 356.216, as of dates after June 30, 1988, must be prepared in accordance with the appropriate standards in effect as of the date of the valuation.

The standards set out herein contain a number of technical pension actuarial terms. Definitions of these terms are found in Section X. Actuarial terminology used herein is in accordance with the terminology adopted by the American Academy of Actuaries. Where such terminology conflicts with the terminology of the Minnesota Statutes, the statutory term is noted in the definition.

These standards may be amended at any time by the Legislative Commission on Pensions and Retirement. Any such amendment is effective for the actuarial valuation performed as of the first valuation date following the effective date of the amendment except as otherwise provided by the Legislative Commission on Pensions and Retirement.

For each retirement plan subject to Minnesota Statutes, Section 356.215, the valuation date for each valuation performed under these standards shall be July 1.

These standards are adopted for actuarial purposes only. They do not constitute or reflect terms of a contract between the state, or a fund, and the members of a fund; nor do they constitute or reflect a promise by the state, or a fund, to maintain a current benefit or pension plan practice, or to implement a projected or authorized benefit or practice. A member of a fund should not rely upon the implementation or maintenance of a benefit or pension plan practice because of an assumption reflected in these standards.

I. Introduction

A. These standards have been promulgated by the Legislative Commission on Pension and Retirement in order to implement Minnesota Statutes, Section 356.215.

B. The purposes of these standards are:

- (1) To ensure that sound actuarial procedures are utilized in developing actuarial assumptions, actuarial valuations, and cost estimates for proposed legislation for each retirement plan.
- (2) To establish sufficient uniformity of actuarial procedure that financial comparability of the retirement plans of the State of Minnesota is maximized.
- (3) To facilitate the development of sound public policy decision making in the pension area by the Legislature and the Legislative Commission on Pensions and Retirement.

C. Scope of the standards

(1) These standards apply to the following retirement plans. When "plan" or "retirement plan" is used, such terms refer to statutory retirement provisions as constituted on the date of valuation of the following:

- (a) Minnesota State Retirement System ("MSRS"), including:
  - (i) General State Employees - Minnesota Statutes, Chapter 352
  - (ii) Correctional Employees - Minnesota Statutes, Chapter 352
  - (iii) Legislators - Minnesota Statutes, Chapter 3A
  - (iv) Judges - Minnesota Statutes, Chapter 490
  - (v) State Patrol - Minnesota Statutes, Chapter 352B
  - (vi) Elective State Officers - Minnesota Statutes, Chapter 352C
  - (vii) Military Affairs Department Special Coverage Program - Minnesota Statutes, Chapter 352

- (viii) Transportation Department Pilot Special Coverage Program  
- Minnesota Statutes, Chapter 352
  - (ix) State Fire Marshal Division Employee Special Coverage  
Program – Minnesota Statutes, Chapter 352
  - (x) University Hospital Employee Special Retirement Coverage  
– Minnesota Statutes, Chapter 352F.
- (b) Public Employee Retirement Association (PERA)
- (i) General Employees - Minnesota Statutes, Chapter 353
  - (ii) Police and Fire - Minnesota Statutes, Chapter 353
  - (iii) Local Police and Fire Relief Association Consolidation  
Accounts - Minnesota Statutes, Chapters 353A and 353B
  - (iv) Local Government Correctional Service Retirement Plan -  
Minnesota Statutes, Chapter 353 E
  - (v) Privatized Public Employee Special Retirement Coverage –  
Minnesota Statutes, Chapter 353F.
- (c) Teachers Retirement Association (TRA) - Minnesota Statutes,  
Chapter 354.
- (d) Minneapolis Employees Retirement Fund (MERF) - Minnesota  
Statutes, Chapter 422A.
- (e) Minneapolis Teachers Retirement Fund Association - Minnesota  
Statutes, Chapter 354A.
- (f) St. Paul Teachers Retirement Fund Association - Minnesota  
Statutes, Chapter 354A.
- (g) Duluth Teachers Retirement Fund Association - Minnesota Statutes,  
Chapter 354A.
- (2) All actuarial valuations performed by an Actuary retained to do the work  
for any retirement plan as of a date on or after July 1, 1985 must be

developed in accordance with these standards. Special procedures for the Relief Association Accounts are contained in Section VII.

- (3) All experience studies performed by an Actuary retained to do the work for any retirement plan as of a date on or after July 1, 1985 must be developed in accordance with these standards.
- (4) All cost estimates relative to proposed legislative changes in the eligibility or benefit provisions of any retirement plan performed by an Actuary retained to do the work on or after July 1, 1985 must be developed in accordance with these standards.

D. Alternative to the Standards

- (1) The board of a retirement plan may use a different basis or assumptions as permitted by Minnesota Statutes, Section 356.23 for submitting alternative reports and valuations to the Legislature, if the different assumptions and basis are clearly disclosed.
- (2) The board of a retirement plan that prepares an alternative valuation must also prepare a supplemental valuation in accordance with Minnesota Statutes, Section 356.215, and these standards.

## II. Actuarial Assumptions

### A. General

- (1) Any actuarial valuation is based upon a projection of expected benefits to be paid in future years by a retirement plan. Any projection of future events requires the use of assumptions relative to the forces which affect those future events.
- (2) There are two general types of actuarial assumptions used in actuarial valuations of a retirement plan:
  - (a) Economic Assumptions
  - (b) Demographic Assumptions
- (3) Any event which triggers or terminates a benefit should be reflected in the set of actuarial assumptions. However, such an event need not be reflected in the assumptions if the impact of that omission on the results of the actuarial valuation is reasonably deemed by the Actuary not to be material. Any omission must be disclosed in the actuarial valuation along with a statement of the rationale for the omission.
- (4) Actuarial assumptions that are not set by statute may be initially established or subsequently changed only with the approval of the Commission.
- (5) Special assumptions for the Relief Association Accounts are in Section VII.

### B. Economic Assumptions

- (1) The purpose of economic assumptions is to project the effect of economic forces on the retirement plan.
- (2) Primary economic assumptions are:
  - (a) Rates of annual investment return
  - (b) Rates of annual individual compensation increase
  - (c) Rates of annual payroll growth (if applicable)

- (3) Each of these primary assumptions may be reviewed as having a base component and a plan specific component. The base component is related to general economics and market conditions which apply to all plans in a similar manner. The statutes have established the following base economic assumptions:

	<b>First Class City Teachers Retirement Fund Associations</b>	<b><u>MERF</u></b>	<b><u>All Others</u></b>
Investment Return Rates			
Pre-retirement	8.50%*	6.00%	8.50%
Post-retirement	8.50%*	5.00%	6.00%
<i>* Adjusted as appropriate for plan specific post-retirement C-O-L-A provisions.</i>			
Individual Compensation			
Increase Rates	5.00%	4.00%	5.00%
Payroll Growth Rates	5.00%	N/A	5.00%

- (4) The following plan specific components have been adopted by statute as of July 31, 1995:

	<b><u>Individual Compensation Increase Rates</u></b>	<b><u>Payroll Growth Rates</u></b>
First Class City Teachers Retirement Fund Associations	*	0.00%
Teachers' Retirement Association	*	0.00
Public Employees' Retirement Association	*	1.00
State Employees' Retirement Fund	*	0.00
All Others	0.00%	0.00%

*\* Plan-specific, age-related merit and seniority scale as shown in Appendix G.*

For the Legislators Plan, the Judges Plan, and the Elective State Officers Plan, the Individual compensation increase and payroll growth rates must



be adjusted to the extent of known future salary levels as provided in statute or in the recommendations from the Compensation Council.

C. Demographic Assumptions

- (1) The purpose of demographic assumptions is to project the flow of members through and out of the retirement plan.
- (2) There are a number of demographic assumptions:
  - (a) Primary Demographic Assumptions
    - (i) Rates of Turnover - reflect patterns of member terminations from the retirement plan for reasons other than retirement, death and disability. These patterns must be based on sex, age and years of service unless experience shows otherwise.
    - (ii) Rates of Retirement - reflect patterns by which members retire under the service retirement provisions of the plan. These patterns must be based on sex, age and years of service unless experience shows otherwise.
    - (iii) Rates of Mortality (Post-Retirement) - reflect mortality patterns of retired members. This determines the expected period over which benefits are to be paid. These patterns must be based on sex and age unless experience shows otherwise. Any use of sex-related rates are for funding purposes only and do not affect benefits.
  - (b) Other Demographic Assumptions
    - (i) Rates of Disablement - reflect patterns by which members become disabled under the plan. These patterns must be based on sex, age and type of disability (i.e., occupational, non-occupational) unless experience shows otherwise.

- (ii) Rates of Mortality (Pre-Retirement) - reflect mortality patterns of active members prior to retirement. These patterns must be based on sex and age unless experience shows otherwise.
  - (iii) Rates of Survivor Mortality - reflect mortality patterns of survivors of deceased members. These patterns must be based on sex and age unless experience shows otherwise.
  - (iv) Rates of Termination of Disability - reflect mortality and recovery patterns of disabled members. These patterns must be based on age and sex unless experience shows otherwise.
- (3) No change in a demographic assumption may be made unless that change has been established by a formal study of experience of the plan.
- (i) Primary demographic assumptions must be set in close accordance with actual experience. The other assumptions should follow the patterns of actual experience but may deviate more from that experience than may the primary assumptions. Assumptions should reference the experience period on which they are based and the extent they deviate from actual experience. Assumptions should not be changed based on experience which may be distorted by temporary conditions such as an early retirement program.
  - (ii) Demographic assumptions may be established by reference to a standard table so long as the Actuary can establish that such table, with appropriate age adjustments or projections to reflect mortality changes, relates reasonably to actual experience.
  - (iii) Certain decrements are as much a function of years of service as of age. As trends are observed from the experience studies, these

assumptions may be established on a basis that takes into account years of service under the plan, as well as years of age.

(iv) Rates of Retirement - Based on trends observed from the experience studies, actuarial valuations must be completed using rates of retirement for various ages and, when appropriate, periods of service.

(4) The occurrence of demographic assumptions must be assumed to be mid-year, with an exception for the Rates of Retirement for certain teacher plans. The occurrence of retirements for the Teachers Retirement Fund, Minneapolis Teachers Retirement Fund, the St. Paul Teachers Retirement Fund and the Duluth Teachers Retirement Fund must be assumed to be on the valuation date nearest the attainment of the retirement age or service.

D. Miscellaneous Assumptions

(1) Social Security - Any Social Security benefit estimates required to estimate future benefit offsets of a plan must be calculated in accordance with the assumption that the Social Security laws in effect on the valuation date will remain unchanged. Economic factors used for such projected benefits will be consistent with the factors used to project plan benefits.

(2) Future Expense - The future administrative and investment expenses of each retirement system must be estimated based on the assumption that such expenses will be a percentage of system payroll. For all plans other than MERF, that percentage must be equal to the ratio of such expenses to total covered payroll under the plan in the fiscal year preceding the valuation date. For MERF, the expenses for the prior year must be increased 3-1/2% and must be expressed as a percentage of the total covered payroll projected for the fiscal year following the valuation date.

- (3) Family Characteristics, Remarriage, Etc. - These assumptions must be based on the best information available from the retirement plan.
- (4) Members Remaining Active Beyond the Age at Which the Retirement Rate becomes 100% - Each remaining active member must be assumed to retire one year following the valuation date. Remaining active members must be included in the valuation for all purposes.
- (5) Discretionary Post Retirement Adjustments - Unless there is a clear historical pattern which renders such an assumption inappropriate, any discretionary post retirement adjustment authorized by law must be assumed to be paid each year in the future. A post retirement assumption does not, however, constitute or reflect a contractual obligation or promise to pay a discretionary post retirement adjustment in any future year. A post retirement adjustment must be assumed to be paid at a level consistent with the economic assumptions used in the valuation.

E. Asset Valuation

- (1) Actuarial Value of Assets for use in each actuarial valuation must be determined using the methodology described in the next paragraph which is intended to smooth the fluctuations of Market Value, while tracking to Market Value over time. For purposes of the actuarial valuation beginning with the July 1, 2007, valuation, assets allocated to the Minnesota Post-Retirement Investment Fund and to MERF's Retirement Benefit Fund must equal the Market Value of Assets on the valuation date.
- (2) The Actuarial Value of Assets on a Valuation Date must be determined as follows:
  - (a) The Market Value of Assets on the Valuation Date, less the following—

- (i) 80% of the Excess Return/(Return Shortfall) in the twelve month period ending on the Valuation Date;
  - (ii) 60% of the Excess Return/(Return Shortfall) in the twelve month period ending one year before the Valuation Date;
  - (iii) 40% of the Excess Return/(Return Shortfall) in the twelve month period ending two years before the Valuation Date; and
  - (iv) 20% of the Excess Return/(Return Shortfall) in the twelve month period ending three years before the Valuation Date.
- (b) The Market Value of the assets of the fund must be the published price at the close of the trading day preceding the valuation date net of amounts due and unpaid as of the valuation date. The Market Value of any investment for which trade prices are not generally available must be established by appraisal or by any other technique which is recognized by persons expert in such assets as producing reasonable results.
- (c) For purposes of this calculation, "Excess Return" is the amount by which actual return on the Market Value of assets not held in the Minnesota Post-Retirement Investment Fund exceeds the expected return on those assets based on the assumed rate of 8.5%.
- (d) For purposes of this calculation, "Return Shortfall" is the amount by which actual return on the Market Value of assets not held in the Minnesota Post-Retirement Investment fund is less than the expected return on those assets based on the assumed rate of 8.5%.
- (e) For financial reporting purposes, assets allocated to the Minnesota Post-Retirement Investment Fund and to MERF's Retirement

Benefit Fund must equal the Market Value of Assets on the valuation date.

### III. Actuarial Cost Methods

A. The Entry Age Actuarial Cost Method (defined in III.C.), applying the closed group technique, must be utilized for all actuarial valuations of each retirement plan except for the Relief Association Accounts. See Section VII for a description of the cost method.

(1) For each active member and for each separate benefit type provided under the plan, a Normal Cost is calculated as follows:

(a) The Actuarial Present Value ("APV") of the Projected Benefit (see Section X) for that member is calculated as of the Entry Age of that member.

(b) The Actuarial Present Value ("APV") of Future Compensation (see Section X) is calculated as of the Entry Age of that member. This calculation must be based on compensation for the year preceding the Valuation Date or the rate of annual compensation as of the Valuation Date. That compensation must be adjusted back to Entry Age reflecting assumed prior pay increases consistent with the combined base and plan specific individual compensation rate increases as in effect for the current valuation. Likewise, the projection of future compensation must assume pay increases which combine base and plan specific assumptions.

(c) The Normal Cost Rate for the member for that benefit is the ratio of (a) to (b).

(d) The dollar Normal Cost for the member for that benefit is the Normal Cost Rate multiplied by the estimated compensation for the year commencing on the valuation date. Estimated compensation must be the Actuary's best estimate of such compensation. Considerations in making this estimate are as follows:

- (i) If the actual compensation in the year preceding the valuation date is used as the base, the estimated compensation is equal to that base multiplied by the applicable combined base and plan specific individual compensation interest rate assumption in effect for the valuation (the known statutory compensation increases or the compensation increases recommended by the Compensation Council may be substituted for the Legislators' Plan, the Elective State Officers' Plan and the Judges' Plan).
- (ii) If a compensation rate at the Valuation Date is used as the base, the estimated compensation must be calculated by adjusting such compensation rates appropriately using the assumed rate of annual salary increase.
- (e) The total Normal Cost for each benefit type over the entire plan is the sum of Normal Costs for each member for that benefit type.
- (f) The total Normal Cost Rate for each benefit type is the Normal Cost for that benefit divided by the total estimated compensation for the year following the valuation date, and adjusted for interest, if necessary, to reflect the expected timing of employer contributions to the plan.
- (g) The total Normal Cost Rate for the plan is the total of Normal Cost Rates for each benefit type.
- (2) The Actuarial Accrued Liability ("AAL") for the plan must be calculated as of each valuation date as follows:
  - (a) The APV of a specific Projected Benefit is calculated for each individual (see Section X).



- (b) The APV of Future Compensation of each active member of the plan is calculated (see Section X).
- (c) The APV of Future Normal Costs for that specific Projected Benefit is determined by multiplying the member's Normal Cost Rate for that Benefit by the member's APV of Future Compensation.
- (d) The AAL for the plan is the amount, (a)-(c), summed for all individuals and all Projected Benefits.
- (e) The Unfunded Actuarial Accrued Liability ("UAAL") is the AAL less the Actuarial Value of Assets.

B. Benefits to be recognized.

- (1) The Actuarial Present Value of the Projected Benefit must be recognized in the actuarial valuation for each type of benefit which is provided under the plan at the level provided under the plan. For example, the Actuarial Present Value ("APV") of Projected Benefits in the event of termination should be recognized. For years prior to the member's vesting date, the APV of Projected Benefits is based on the member's contributions accumulated with interest. The proper technique for recognizing terminations that are expected following the member's vesting date is to assume that the member selects the benefit with the greater value. Thus, for each year after the member's vesting date, the APV of Projected Benefits will be based on the larger of the member's contributions accumulated with interest or the present value of the member's vested deferred benefit (augmented, if appropriate) which is determined by using the valuation actuarial assumptions.
- (2) A particular benefit type or benefit level must be deemed to be provided under a plan if it is authorized by law in effect on the valuation date. The recognition of a particular benefit type or level for actuarial purposes does

not, however, constitute or reflect a contractual obligation or promise to maintain the benefit type or level in the future.

- (3) Any discretionary post retirement adjustment authorized by law must be assumed to be paid in all future years unless there is a clear historical pattern which would render such an assumption inappropriate. A post retirement adjustment assumption does not, however, constitute or reflect a contractual obligation or promise by the State of Minnesota or by the applicable pension plan to pay a discretionary post retirement adjustment in any future year. The type of post retirement adjustment and its relation to future investment earnings must determine the technique for recognizing the benefit liability.

In the case of Minneapolis Teachers, St. Paul Teachers, and Duluth Teachers, the discretionary benefit is available only when the return on assets exceeds the assumed 8.5%. The return on assets must be measured over the most recent five-year fiscal period using the average time weighted total rate of return for the five-year period, which must be calculated using the formula established by the State Board of Investment. For example, if the average time weighted return over the five-year period (ending June 30, 2001) is 12.4%, then the maximum benefit increase (on January 1, 2002) is 3.9%, which is 12.4% minus 8.5%. Members and survivors who are currently receiving benefits, unless they commenced in the last twelve months, will be entitled to the benefit increase the following January 1 (2002). The appropriate technique for recognizing the discretionary benefit liability is to increase the reserves for benefits to be paid after January 1 (2002), for those who are eligible for the benefit increase, by 3.9% of their reserve value on the valuation date. In the following year valuation (July 1, 2002), the actual benefit being paid (which would include any increase

granted the prior January 1) would be used in determining the reserves. The extent to which the new five-year (ending June 30, 2002) average time weighted total rate of return exceeds 8.5% will establish a liability for the next January 1 (2003) benefit increase. It is not necessary to estimate benefit increases further than one year in advance since the time weighted total rates of return can be expected to fluctuate considerably due to market value changes, even though they are based on a rolling five-year average. Furthermore, if the assets earn more than the assumed statutory rate of 8.5% in future years, any excess above 8.5% will be used to provide additional benefits.

- (4) Any benefit type or benefit level which is authorized by or approved by Minnesota law which is in effect on the valuation date, to be provided as of a future date must be recognized in the valuation. The recognition of such a future benefit type or level for actuarial purposes does not, however, constitute or reflect a contractual obligation or promise by the State of Minnesota or by the applicable retirement plan to pay such a benefit at the time authorized. Of course, the deferred effect of that benefit type or benefit level must be recognized. For example, suppose a retirement plan has a retirement benefit level of 1% of final average salary per year of service. Legislation is enacted which is effective July 1, 1989, providing that for retirement on and after July 1, 1991 the benefit level is to be 1-1/2% of final average salary per year of service. In the valuation as of July 1, 1989 retirement benefits projected to commence prior to July 1, 1991 are calculated based on the 1% formula and benefits projected to commence on or after July 1, 1991 are calculated based on the 1-1/2% formula.

C. Special determinations.

- (1) Entry Age - For the purposes of the actuarial valuation, entry age for each member must be determined as the actual age at the valuation date less years of service recognized for the purpose of calculating benefits under the plan with the result rounded to the nearest whole year.
- (2) Amortizing the Unfunded Actuarial Accrued Liability - The Unfunded Actuarial Accrued Liability (UAAL) must be amortized over the Amortization Period. However, a surplus (i.e. a negative UAAL) is to be amortized over a thirty-year period. The additional annual contribution rate required to retire the UAAL for each retirement plan except MERF must be determined as follows:
  - (a) The total dollars paid in compensation to active members of the plan is determined for the year preceding the valuation date.
  - (b) The total payroll for the year following the valuation date is estimated. Generally, subsequent years salaries are estimated based on the prior year individual salary provided, increased with the assumed individual compensation increase assumption (base and plan specific). (See II.B.(3)).
  - (c) Assuming that compensation is paid at the end of each month, the present value at the valuation date of the payroll for the year following the valuation date is equal to the estimated payroll in (b) multiplied by .9570, based upon the assumed investment return rate of 8.5%.
  - (d) The Present Value of Future Payrolls must be calculated by multiplying the present value of payroll for the year following the valuation date (c, above) by a factor representing the present value of an annuity payable at the beginning of each year during the amortization period at the effective interest rate. The effective

interest rate is (one plus pre-retirement interest rate) divided by (one plus the payroll growth rate) minus one. For example if the pre-retirement interest is 8.5%, the payroll growth assumption is 5.0% and the Amortization Period is 25 years, the factor is 17.343.

- (e) The additional annual contribution rate must be calculated by dividing the UAAL as of the valuation date by the Present Value of Future Payrolls determined in (a) through (d), above.
- (3) For MERF, the additional annual contribution rate must be calculated as follows:
- (a) Assuming that contributions are made at the end of each month, the present value at the valuation date of \$1.00 paid in equal monthly payments during the year following the valuation date must be calculated, based upon the assumed investment return rate of 6%.
  - (b) The present value of future monthly contributions must be calculated by multiplying the present value of \$1.00 for the year following the valuation date (a, above) by a factor representing the present value of an annuity payable at the beginning of each year during the amortization period at the effective annual interest rate of 6.00%.
  - (c) The additional annual contribution must be calculated by dividing the UAAL as of the valuation date by the present value of future monthly contributions determined in (b), above.
  - (d) The additional annual contribution rate is the amount calculated in (c) expressed as a percentage of the Projected Annual Payroll.
- (4) Amortization Period - The amortization period at any valuation date is the period from the valuation date to the Amortization Date.

- (5) Amortization Date - The amortization date is the valuation date in the future calendar year that is determined under Minnesota Statutes, Section 356.215, Subdivision 4g. For example, suppose a plan, other than MERF, has a July 1 valuation date. Suppose further that for the valuation as of July 1, 1992 it is determined under Minnesota Statutes, Section 356.215, Subdivision 4g that amortization shall be complete in 2022. The resulting Amortization Date is July 1, 2022. The Amortization Date for MERF is June 30, 2017 and is not affected by changes in actuarial assumptions, benefits or actuarial cost method.

#### IV. Contents of an Actuarial Valuation Report

A. The Actuarial Valuation Report for each system (except for the Relief Association Accounts whose report is described in Section VII) must contain the actuarial balance sheet described in Minnesota Statutes, Section 356.215, Subdivision 4f. The following is to clarify certain of the concepts included:

- (1) "Current Assets" is the Actuarial Value of Assets developed under II.E. of these Standards.
- (2) "Expected Future Assets" must be based upon the statutory contribution rates and must be developed as follows:
  - (a) Contribution Rates - The Statutory Contribution Rate (expressed as a percentage of compensation) for the plan must be split as follows:
    - (i) Normal Cost Rate - The Normal Cost Rate developed in the current valuation of the plan.
    - (ii) Supplemental Contribution Rate - The total Statutory Contribution Rate less the Normal Cost Rate, and less the Expense Rate.
  - (b) Present Value of Expected Future Statutory Supplemental Contributions - The Supplemental Contribution Rate multiplied by the Present Value of Future Payrolls over the Amortization Period. The Present Value of Future Payrolls must be calculated in accordance with III.C.(2)(d). For MERF, Present Value of Supplemental Contributions is the balancing item needed so that Expected Future Assets equals Expected Benefit Obligations.
  - (c) Present Value of Future Normal Costs - The Normal Cost Rate multiplied by the APV of Future Compensation.
  - (d) Special Rules for Plans Where Normal Cost Rate Exceeds Statutory Contribution Rate - The amount of Expected Future Assets show as

Present Value of Future Normal Costs must be equal to the Statutory Contribution Rate, net of the Expense Rate, multiplied by the Present Value of Compensation. The Present Value of Supplemental Contributions will be zero.

- (3) Current Benefit Obligations is the APV of Credited Projected Benefits.
- (4) Benefit Obligation for Deferred Annuitants Benefits must include increases due to augmentation projected to the earliest age at which such benefits can commence without reduction for early commencement.

B. Additional Actuarial Disclosure - Each actuarial valuation report (except for the Relief Association Accounts whose report is described in Section VII) must include:

- (1) The Normal Cost Rates of the plan for each benefit type and the total Normal Cost Rate.
- (2) Development of the UAAL for the system as follows:
  - (a) APV of Projected Benefits.
  - (b) APV of their associated Normal Costs.
  - (c) AAL ((a) - (b)).
  - (d) Actuarial Value of Assets.
  - (e) UAAL ((c) - (d)).
  - (f) Present Value of Future Payrolls over the Amortization Period.
  - (g) Additional Annual Contribution Rate to Amortize the UAAL ((e)/(f)).
- (3) A breakdown of APV of Credited Projected Benefits and the APV of Projected Benefits by benefit type.
- (4) Development of several Funding Ratios:
  - (a) Accrued Benefit Funding Ratio - The ratio of Actuarial Value of Assets to APV of Credited Projected Benefit. This ratio is a



measure of current funding status, and when viewed over a period of years, presents a view of the progress of funding of the plan.

(b) Actuarial Liability Funding Ratio - The ratio of the Actuarial Value of Assets to the AAL (see III.A.(2), page 10). This is also a measure of funding status and funding progress. It is based upon the traditional measure of benefit obligations.

(c) Projected Benefit Funding Ratio - The ratio of the following items from the actuarial balance sheet:

(i) Total Current and Expected Future Assets to

(ii) Total Current and Expected Future Benefit Obligations.

This is a measure of adequacy or deficiency in the contribution level. A ratio of 100% or more means that contribution levels are adequate to cover the benefits provided in the plan based on current assumptions. A ratio under 100% indicates a deficiency in contribution levels.

(5) If there have been changes in the provisions of the plan or in actuarial assumptions for this valuation, the existence of those changes must be noted, and if the changes are deemed by the Actuary to be material, the report must contain:

(a) The following items based upon the provisions of the plan and the actuarial assumptions in place in the prior actuarial valuation:

(i) Total Contribution Rate

(ii) Funding Ratios

Accrued Benefit Funding Ratio

Actuarial Liability Funding Ratio

Projected Benefit Funding Ratio

- (b) The items shown in (a) based upon the new provisions of the plan and the actuarial assumptions used in the prior actuarial valuation. If there have been no changes in the provisions of the plan this step may be omitted.
  - (c) The items shown in (a) based upon the current provisions of the plan and the current set of actuarial assumptions. If there has been no change in the actuarial assumptions, this step may be omitted.
- (6) A breakdown of actuarial gains and losses based upon the provisions of the plan in place and the actuarial assumptions used in the prior actuarial valuation. The gains and losses must be broken down by source. Gains or losses must be shown separately for at least the following:
- (a) Salary increases
  - (b) Investment return
  - (c) Minnesota Post-Retirement Investment Fund - Mortality
  - (d) Mortality of Other Benefit Recipients
  - (e) Other items
  - (f) Total

If item (e) accounts for a significant amount of the total gain or loss, an additional analysis must be performed to explain the major causes. Item (e) accounts for a significant amount of the total gain or loss if item (e) is greater than either 2% of the Actuarial Accrued Liability on the valuation date or \$50 million. The results of the additional analysis must be presented as part of the actuarial valuation commentary.

C. Additional information in each actuarial valuation report.

- (1) Description of the provisions of the plan. Any changes in the provisions of the plan since the last valuation must be highlighted.

- (2) Description of the actuarial basis for the valuation, the actuarial method and assumptions used in the actuarial valuation. The date of the experience analysis upon which the latest change in actuarial assumptions is based should be included. Any special techniques used must be disclosed here. Assumptions such as percent married, family composition, etc., must also be disclosed.
- (3) Description of the member data used including:
  - (a) The source of the data.
  - (b) Any material inconsistencies or other problems with the data and any steps taken to correct or compensate for such problems.
  - (c) Reconciliation of data with that used for the prior actuarial valuation.
  - (d) The number of active members and average annual compensation broken down by age and years of service in the plan.
  - (e) The number of persons receiving benefits and average amounts of monthly benefit by age and type of benefit (service retired, disability and survivor).
- (4) Description of the assets of the fund including:
  - (a) Market Value of assets by asset category.
  - (b) Development of Actuarial Assets from Market Value.
  - (c) A reconciliation of the Market Value of the assets of the plan as of the prior valuation date to the comparable Market Value as of the current valuation date.
  - (d) For reports on funds investing in the Minnesota Post-Retirement Investment Fund or MERF's Retirement Benefit Fund, a comparison of the following three asset values -

- (i) Actuarial Present Value of Projected Benefits based on the benefit amounts in force on the valuation date (i.e., the required reserves).
  - (ii) Adjusted Actuarial Asset Value (i.e., the required reserves plus the undistributed income which will be used for benefit increases the following January 1).
  - (iii) Market Value.
- (5) The valuation report must contain a statement signed by the Actuary responsible for the completion of the report, certifying that to the best of the knowledge and belief of the Actuary, the actuarial valuation was performed in accordance with the requirements of Minnesota Statutes, Section 356.215, and the requirements of these Standards.

D. Additional information for specific plans.

- (1) MSRS Military Affairs Department Special Coverage Program - a separate exhibit indicating the normal cost of this special program must be included in the MSRS General State Employees Valuation Report. This normal cost must be determined by assuming that members retire at the age at which they may receive unreduced benefits.
- (2) MSRS Transportation Department Pilot Special Coverage Program - a separate exhibit indicating the normal cost of this special program must be included in the MSRS General State Employees Valuation Report. This normal cost must be determined by assuming that members retire at the age they may receive unreduced benefits.
- (3) State Fire Marshal Division Employee Special Coverage Program – a separate exhibit indicating the normal cost of this special program must be included in the MSRS General State Employees Valuation Report. This

normal cost must be determined by assuming that members retire at the age at which they may receive unreduced benefits.

- (4) PERA - separate exhibits for the Basic and Coordinated Benefit plans must show a comparison of the normal cost to the employee and employer statutory contribution rates.
- (5) TRA - separate exhibits for the Basic and Coordinated Benefit plans must show a comparison of the normal cost to the employee and employer statutory contribution rates.
- (6) Minneapolis Teachers - separate exhibits for the Basic and Coordinated Benefit plans must show a comparison of the normal cost to the employee and employer statutory contribution rates.
- (7) St. Paul Teachers - separate exhibits for the Basic and Coordinated Benefit plans must show a comparison of the normal cost to the employee and employer statutory contribution rates.
- (8) Duluth Teachers - separate exhibits for the Old Law and New Law Benefit plans must show a comparison of the normal cost to the employee and employer statutory contribution rates.

V. Experience Study

A. In accordance with Minnesota Statutes, Section 356.215 Subdivision 2, an experience study must be performed for each plan, as appropriate, as provided under D(4) of this section. The experience study is an analysis of actual experience under the plan compared to the experience expected under the actuarial assumptions then in use. No change in an actuarial assumption may be recommended by the Actuary for approval by the Commission unless the need for change has been established by an experience study. A complete experience report accumulating a significant amount of annual experience study data must be presented to the Commission periodically.

B. Economic Experience

(1) The annual investment return on the assets available for benefits must be calculated on a market value basis and on a current asset basis using the dollar weighted calculation technique. Assets invested in MPRIF or MERF's Retirement Benefit Fund must be excluded from this analysis since earnings that deviate from the assumed percentage (6% for MPRIF and 5% for MERF's RBF) do not affect the Unfunded Actuarial Accrued Liability. All cash flows in and out of the fund must be assumed to occur in the middle of the year with the exception of transfers to MPRIF or MERF's Retirement Benefit Fund, where the month of transfer is to be recognized in the calculation.

(2) Individual compensation increases for the year must be measured by the percentage change in compensation for members active on both valuation dates. These percentage changes must be aggregated and averaged by five year age and service groups similar to those displayed in the actuarial valuation reports. Increases or decreases in excess of a specified

percentage may be discarded from the study in order to prevent unusual changes in compensation from influencing the results of the study.

- (3) Payroll growth is the percentage change in total active members' compensation from one valuation report to the next. For MSRS administered plans, compensation means the annual rate based on the last four pay periods of the fiscal year before the valuation date. For all other plans, compensation means the pay over the 12 months prior to the valuation date. Pay is annualized for any new hires during the 12 month period.
- (4) Economic experience must be displayed as the difference between the actual results and the expected results.

C. Demographic Experience

- (1) Based on data accumulated for the period covered by the experience study, demographic experience must be analyzed as follows:
  - (a) Each actual occurrence of each death, disablement, quit or other pertinent event must be classified by age nearest birthday on the valuation date preceding that event and, if pertinent, years of service at that valuation date. In the case of death, the classification must be made based upon the status at the date of death.
  - (b) For each age (X) and, if pertinent, years of service (S), an exposure is calculated by counting the number of persons who during the study period are age X on an age nearest birthday with service S rounded to the nearest integer value at the beginning of a year. In the case of counting exposures for death, appropriate adjustments must be made to reflect a change in status prior to death in the same year.

- (c) Expected occurrences for each decrement at age X and service S are then calculated by multiplying the exposure at age X and service S by the assumed probability of occurrence of the event.
  - (d) The ratio of actual to expected events is the basic analytic tool in an experience study. For each decrement and each combination of sex, age and if pertinent, service, the ratio is the actual number of occurrences of the decrement (see (a), above) divided by the expected number of occurrences (see (c), above). The ratios may be reported in five year age and service groups, whenever it is a more feasible approach.
  - (e) If all assumptions precisely predict events, these ratios are 100%. If estimated events overstate actual events, these ratios are less than 100%. If they are understated, the ratios are over 100%.
  - (f) In lieu of using number of member-years of exposure and numbers of events, the Actuary may develop the experience analysis based upon salaries, actuarial values, or any other reasonable and consistent measure. The measure used in calculating any alternative must be described in the experience study and the rationale of any alternative must also be clearly reported.
- (2) Based on ratios of actual to expected decrements new assumptions may be established.
  - (3) There may be information available to the Actuary which would indicate that actual past experience should not be the only basis on which to establish actuarial assumptions. If any recommended new assumptions do not follow directly from past experience, the additional reasons for the recommended new assumptions must be clearly explained in the report of the experience study.



D. Report

- (1) The report of each experience study must set out the conclusions and recommendations of the Actuary relative to the actuarial assumptions.
- (2) The report must include sufficient statistics (such as ratios of actual to expected experience) so that a pension professional, whether an actuary or not, could assess the viability of the conclusions of the Actuary.
- (3) The analysis of retirement ages for new retirees and their average age at retirement, required in Minnesota Statutes, Section 356.215, Subdivision 5, must be performed and presented in the report.
- (4) An experience report on the Legislators Plan, Elective State Officers Plan, Local Government Correctional Service Plan and the consolidation accounts of the Public Employees Police and Fire Fund are inappropriate because of their small size. While not anticipated on a regular basis, periodically, an experience report may be appropriate for the Minneapolis Employees Retirement Fund, the Minneapolis Teachers Retirement Fund, the St. Paul Teachers Retirement Fund, the Duluth Teachers Retirement Fund and the Public Employees Police and Fire Fund. Such an experience study could be recommended by the Actuary or by the respective Plan Administrator, but must be approved by the Commission before preparation.
- (5) Experience of funds whose members have similar employment characteristics (e.g. teaching or public safety) may be combined for further analysis and recommendations.
- (6) Each experience report must show the results by each year and also must be combined for all of the years included.
- (7) If an assumption is changed, the experience report for the following year must reflect expected occurrences based on the new assumption for those

years following the change. Also, the expected occurrences for the prior years must be restated to estimate the expected values as if the new assumption had been in effect in the prior years.

VI. Cost Estimates of Legislative Proposals

- A. A statement of fiscal impact must be completed for each legislative proposal which would affect the amounts of or the eligibility for benefits in a retirement plan.
- B. The fiscal impact statement must contain the following:
  - (1) A brief statement describing the proposal accompanied by a detailed description of current provisions and the changes in those provisions which the proposal would affect.
  - (2) A table showing the current statutory contribution rate and the following items before the change, after the change and the difference resulting from the change:
    - (a) Total Actuarially Determined Contribution Rate
    - (b) That part of the Total Actuarially Determined Contribution Rate not provided by the Employee.
    - (c) Funding Ratios.
      - (i) Accrued Benefit Funding Ratio
      - (ii) Actuarial Liability Funding Ratio
      - (iii) Projected Benefit Funding Ratio
  - (3) Actuarially determined required contributions, as well as statutory contributions and the difference, must be shown in dollars for the next fiscal year. If the impact of the proposed change is spread over more than one fiscal year (such as a delayed change in the statutory rate), then the disclosure must contain all fiscal years until the impact is fully recognized.
  - (4) A statement of the actuarial basis of the estimate.
    - (a) If the estimate is based upon the latest actuarial valuation report, reference to the actuarial basis used in that report is sufficient.
    - (b) The Actuary must state whether or not the proposal would affect the experience of the plan (e.g., a change in normal retirement

eligibility could affect the assumed rates of retirement) and, if so, the changes in assumptions from the assumptions used in the latest valuation must be described.

(c) Any additional assumptions (e.g., the percentage eligible for a new option who would be assumed to elect such option) must be disclosed. In such situations, multiple cost estimates setting out a range of costs may be appropriate.

C. The statement of fiscal impact must contain a statement signed by the Actuary for the Commission certifying that, to the best of the Actuary's knowledge and belief, the statement was completed in accordance with the requirements of Minnesota Statutes, Section 356.215, and the requirements of these Standards.

VII. Actuarial Calculations for Local Relief Association Consolidation Accounts

A. Minnesota Statutes, Chapter 353A, describes the process for the voluntary consolidation of local relief associations with PERA Police and Fire. Appendix E provides a sample report showing the preliminary calculations and Appendix F contains a sample valuation report. The Actuary for the Commission is charged with performing certain calculations preliminary to consolidation and on an ongoing basis following consolidation. The actuarial calculations reported in the most recent relief association valuation report may not be utilized for this purpose, but must be compared to calculations by the Actuary for the Commission in order to illustrate the effect of different actuarial assumptions. The cost of the calculations performed preliminary to consolidation must be borne by the special fund of the relief association.

B. Preliminary Calculations

(1) The purpose of the calculation preliminary to consolidation is to determine the initial additional municipal contribution to be paid annually until December 31, 2010. The initial amount of additional municipal contribution must be calculated by assuming each member elects the pension program (i.e., their current Relief Association benefits or PERA Police and Fire benefits) with the greater Actuarial Present Value of Projected Benefits based on the total benefit plan. In addition, these preliminary calculations must determine the amount of funds that would be required to be transferred to the Minnesota Post-Retirement Investment Fund (MPRIF) if all current annuitants selected the PERA Police and Fire benefits. If the amount of funds to be transferred to MPRIF exceeds the available assets, the municipality is assumed to contribute the additional amount needed and the initial additional municipal contribution is revised

downward to demonstrate the impact of all members electing PERA Police and Fire benefits.

- (2) The member data used in the calculations must conform with the requirements of Section IX.C of these Standards unless a data item is inappropriate for the specific relief association plan benefits. The rate of annual compensation must be reported on two bases - the amount used to determine the member's contribution to the relief association and the amount used to determine the member's contribution to PERA Police and Fire. All data must be current. The Executive Director of the Commission is to coordinate the collection of the required demographic and financial data and of the required benefit plan information. Appropriate data and information supplied by the actuary who performed the most recent prior actuarial valuation may be used in making the preliminary calculations and may be relied upon by the Actuary for the Commission. A hard copy of the data or information submitted by the actuary performing that prior actuarial valuation must be supplied to the chief administrative officer of the relief association who must update the data and verify its accuracy.
- (3) The financial data provided for the calculations must include the market value of the fund assets of the relief association. If both a special and a general fund exist, only the special fund assets will be used. If the relief association includes volunteer firefighters as members of the relief association, the assets of the special fund must be allocated between the paid firefighters and the volunteer firefighters on the basis of their relative accrued actuarial liability using the most recent actuarial valuation prepared by an approved actuary.
- (4) The relief association benefits described in Minnesota Statutes, Chapter 353B, may be relied upon unless there are discrepancies with the benefits

described in the most recent actuarial valuation report of the relief association's plan. In the event of any discrepancies, or if more detailed information be required, the Actuary for the Commission must rely on the original documents describing the pension plan.

- (5) Three sets of actuarial calculations are prepared for each active member, a set for each deferred former member, a set for each retired member, and a set for each current beneficiary. Each set of calculations must contain the Actuarial Present Value (APV) of Projected Benefits, and the Normal Cost and Actuarial Accrued Liability determined using the Entry Age Actuarial Cost Method. The three sets of calculations are:
  - (a) Relief association plan benefits.
  - (b) PERA Police and Fire plan benefits.
  - (c) The above plan benefits, (a) or (b), which produced the larger APV of Projected Benefits based on the total benefit plan. The individual calculations must be totaled and reported for categories (a), (b) and (c) as shown in Appendix E.
- (6) The liabilities for the relief association plan benefits must be based on 8.5% interest (both pre- and post-retirement), and the salary increase assumption (base and plan specific) used for the most recent valuation by the PERA Police and Fire plan. Furthermore, post-retirement benefit increases must be assumed at the same rate as the base salary increase assumption. Furthermore, the assumed age and service for retirement must be identical to those assumed in the most recent actuarial valuation of the relief association prepared by an approved actuary. All other assumptions must be identical to those used in the most recent actuarial valuation by PERA Police and Fire. When performing the calculations for the relief association plan benefits, any automatic survivor benefits must be included.

The liabilities must also include the refund of any excess member contributions that may be made prior to the election of Relief Association benefits because a different definition of compensation is used to produce a higher member contribution.

- (7) The liabilities for the PERA Police and Fire plan benefits must be calculated in the same manner as those calculated for the PERA Police and Fire valuation, including the use of the compensation rate that is applicable for member contributions to PERA Police and Fire. The highest five successive years' average salary for those active members assumed to retire during the next five years must be based on the current total compensation rate that is applicable for member contributions to PERA Police and Fire projected the appropriate number of years forward and on the current compensation rate that is used to determine benefits under the relief association projected backward using the salary increase assumption (base and plan specific) used for the most recent valuation by PERA Police and Fire plan. When performing the calculations for the PERA Police and Fire plan benefits, the reserve factors for transferring assets to MPRIF must be the same factors that are currently used by PERA Police and Fire. All reserves transferred to MPRIF and any future mortality gains and losses must be determined for each relief association account. All future benefit increases paid to benefit recipients will be determined by MPRIF and not by the relief association. An initial MPRIF increase must be estimated for the following January 1 as though assets had been transferred to MPRIF at the time of the member's retirement (i.e. the eighteen month requirement for eligibility for a full increase and seven month requirement for eligibility for a partial increase will apply). The State Board of Investment will provide an estimate of the initial increase, or if the State Board of



Investment is unable to provide that estimate, the Actuary for the Commission will project an estimate based on the latest investment information available from the State Board. The same estimate of the initial MPRIF increase must be used in determining the distribution for annuitants who are not paid from MPRIF, but who would be eligible for an increase on the following January 1. The Actuary for the Commission must determine the MPRIF transfer required at the time of consolidation. The extent to which that required transfer amount exceeds assets must be reported as an immediate contribution to be paid by the municipality at the time of consolidation.

- (8) The initial additional municipal contribution also must be calculated and included in the preliminary report. This additional contribution is the fixed level dollar amortization payment required each year until December 31, 2010 which will pay for the portion of the APV of Projected Benefits that is not anticipated to be funded by future regular statutory contributions required from each active member and the municipality nor by current assets. Appendix E details the calculations and provides a report format.
- (9) The amount of any necessary transfer of reserves to MPRIF in the event that all current benefit recipients choose the PERA Police and Fire plan must be calculated. The amount by which those reserves exceed the market value of the assets of the relief association, if any, must be disclosed and the impact of that initial additional asset transfer on the initial additional municipal contribution must also be disclosed.

C. Ongoing Actuarial Work for Individual Consolidation Accounts

- (1) For any Relief Association consolidation account that did not merge into the PERA Police and Fire Fund effective July 1, 1999, an actuarial valuation should be performed annually on July 1. The purpose of the

valuation is to measure the ability of the current assets and future contributions to meet the liabilities of the future benefits determined by the election of the members. The valuation will produce an annual gain (loss) which must be amortized over 15 years. This annual amortization payment will increase (decrease) the previous years' additional municipal contribution.

- (2) The actuarial valuation must compare assets to liabilities. If assets exceed liabilities, the result is an actuarial gain. If assets are less than liabilities, the result is an actuarial loss. Assets are defined as current and expected future assets where expected future assets is made up of the present value of employee contributions, the present value of regular municipal contributions and the present value of additional municipal contributions. The liabilities are the Actuarial Present Value of Projected Benefits based on each member's election or, in the event of no election, the greater of the Relief Association benefits and the PERA Police and Fire benefits.
- (3) In the event that the valuation shows that assets exceed liabilities, the amount of the excess is an actuarial gain and the amount of gain is funded over 15 years from the valuation date as a reduction in the additional municipal contributions. Similarly, if liabilities exceed assets, there will be an actuarial loss. The amortization payment over 15 years for this loss will be an increase to the additional municipal contribution. The gain (loss) must be analyzed by determining the portion due to MPRIF mortality, the portion due to the election by members of the PERA Police and Fire benefits and the remaining sources of gain (loss).
- (4) The valuation report for each Relief Association consolidation account must contain the following information:
  - (a) determination of the additional municipal contribution.

- (b) the actuarial gain or loss.
- (c) Entry Age calculations of the Normal Cost, Actuarial Accrued Liability, Current Assets, and the Unfunded Actuarial Accrued Liability.

The information for the Relief Association consolidation accounts must be aggregated in the valuation report. The report also must contain aggregated information on membership data and assets as well as a description of the plan provisions and the actuarial basis for the valuation, all of which must be reported as described in Section IV C.

## VIII. Actuarial Factors

- A. Actuarial factors are required in the administration of a Fund. Each Fund requires optional annuity factors in order to translate the formula benefits from a life annuity to other optional forms such as a joint and 50% survivor, a joint and 100% survivor, a joint and 50% survivor with bounce back, a joint and 100% survivor with bounce back, a level Social Security and a term certain and life. Factors are also required by those Funds that calculate an early retirement reduction on an actuarial equivalent basis or that transfer money at the time of retirement to a post retirement fund such as MPRIF or MERF Retirement Benefit Fund. With consolidating local relief associations, automatic survivor benefit coverage also will require actuarial factors.
- B. Duties of the Actuary Retained by the Commission
- (1) Actuarial factors adopted on or after July 1, 1987 must be reviewed by and receive a written recommendation from the Actuary retained by the Commission. If the Fund retains an approved actuary as an actuarial advisor, the actuarial factors must be developed as a proposal by that actuarial advisor. If the Fund does not retain an approved actuary as an actuarial advisor, the actuarial factors must be developed by the Actuary retained by the Commission, with the cost of the development to be borne by the Fund. If the actuarial factors are developed by a Fund actuarial advisor, the recommendation from the Actuary retained by the Commission must be based on a review of the proposed actuarial factors. If the actuarial factors are developed by the Actuary retained by the Commission, no additional review by the Actuary retained by the Commission is required and the recommendation must be based on the developmental work on the proposed actuarial factors.

- (2) Whenever a fund wishes to adopt new factors or change existing factors, it must notify the Actuary retained by the Commission and the Executive Director of the Commission and supply the relevant information requested by the Actuary retained by the Commission.
- (3) If the actuarial factors are developed by the actuarial advisor of the Fund, the written recommendation of the Actuary retained by the Commission must be based on the following criteria:
  - (a) The mortality table used in generating the factors is appropriate and is based on the experience of the Fund. This must be accomplished by relating the mortality table to the experience of the Fund disclosed in the most recent experience study or studies of the Fund and any other relevant information, which must be disclosed by the Actuary retained by the Commission.
  - (b) The mathematical formulas that are used for producing the factors must result in actuarial equivalence to single life annuities. This must be accomplished by independently deriving the mathematical formulas and comparing the independent results with the proposed formulas.
  - (c) The actual factors derived are based on the stated formula and assumptions. This must be accomplished by random testing of the factors.
  - (d) The procedures for applying the factors are clearly documented in writing and are deemed appropriate. In those cases where the procedures are computerized, sample illustrations verified by computer output will suffice.

If the actuarial factors are developed by the Actuary retained by the Commission, the written recommendation of the Actuary retained by the

Commission must be based on the developmental work on the actuarial factors and a reasonable expectation that the actuarial factors result in actuarial equivalence to single life annuities.

IX. Data

- A. Each retirement plan must provide the Actuary with all financial and member data required to perform the annual actuarial valuation within eight weeks after the valuation date.
- B. Financial Information Required
- (1) A balance sheet of the Fund developed on an accrual basis as of June 30 immediately preceding the valuation date showing:
    - (a) Cash balances.
    - (b) Receivables such as employee contributions receivable, employer contributions receivable, investment return receivable, etc.
    - (c) Investments by investment category at both market value and cost value.
    - (d) Current amounts due and unpaid from the Fund.
    - (e) Assets available for benefits ((a) + (b) + (c) - (d)).
  - (2) A statement of revenue and disbursements of the fund on an accrual basis for the year ending immediately prior to the valuation date including sufficient detail regarding expenses to allow the separate identification of investment related expenses and other administrative expenses.
  - (3) Such other financial information as may be required by the Actuary to comply with Minnesota Statutes, Section 356.215, and these standards.
  - (4) If audited financial information is available, the audited financial information must be provided. If no audited financial information is available in a timely fashion, but financial information which is determined by the fund administrator to be reasonably accurate and reliable is available, that financial information must be provided and must be supplemented by audited financial information when the audited financial information is available.

- C. Member Data - The following are general lists of data items required.
- (1) For each active member, the following data must be provided:
    - (a) Social Security Number or Member Number.
    - (b) Sex.
    - (c) Birthdate.
    - (d) Hire Date (most recent).
    - (e) Years of Service for determining eligibility.
    - (f) Years of Credited Service for calculation of benefits.
    - (g) Credited Service for calculation of benefits earned in the 12-month period ending on the valuation date.
    - (h) Actual plan compensation for the 12 month period ending on the valuation date.
    - (i) Rate of annual compensation as of the valuation date.
    - (j) Total employee contributions to the valuation date.
    - (k) Interest on employee contributions to the valuation date.
    - (l) Any additional information required in order that the Actuary comply with Minnesota Statutes, Section 356.215, and generally acceptable actuarial practices and procedures.
  - (2) In addition, the following data must be provided for each person who was active as of the prior valuation date and is no longer active:
    - (a) All data set out in (1)(a) through (1)(l).
    - (b) Date of status change.
    - (c) Status as of valuation date.
  - (3) For each person receiving benefits, the following data must be provided:
    - (a) Social Security Number or Member Number.
    - (b) Sex.
    - (c) Birthdate.



- (d) Date benefit commenced - original date of benefit commencement.  
For example, if a survivor after the death of the retiree under a joint and survivor form, this should be date of retirement of the retiree.
  - (e) Date of latest status change. For example, in the case above, date of death of retiree.
  - (f) Type of Benefit (retirement, disability, survivor, post retirement death, etc.)
  - (g) Form of Benefit (life only, 100% J&S, etc.)
  - (h) Current monthly benefit amount.
  - (i) Original monthly benefit amount - if a survivor is receiving benefit of a deceased former retiree, include the original benefit of the retiree.
  - (j) Years of Credited Service used in calculating the original monthly benefit.
  - (k) Final average compensation used in calculating the original monthly benefit.
  - (l) Joint Annuitant sex, if applicable.
  - (m) Joint Annuitant birthdate, if applicable.
  - (n) Retired under Rule of 85 or under Rule of 90.
  - (o) Benefit received under the Combined Service Annuity, the Combined Service Disability Benefit or the Combined Service Survivor Benefit.
- (4) In addition, the following data must be provided for each person who was receiving a monthly benefit as of the prior valuation date and has changed status as of the current valuation date:
- (a) All data set out in (2)(a) through (2)(n).
  - (b) Date of status change.

- (c) Status as of valuation date.
- (5) For each inactive member who has retained a right to a benefit from the system (including non-vested members who have not yet received refunds) the following data must be provided:
  - (a) Social Security Number or Member Number.
  - (b) Sex.
  - (c) Birthdate.
  - (d) Years of Service for determining eligibility at termination.
  - (e) Years of Credited Service at termination for calculation of benefit.
  - (f) Final Average Compensation at termination.
  - (g) Vested monthly benefit under normal form at date of termination.
  - (h) Vested monthly benefit including augmentation (if applicable) to the date specified in (l) below.
  - (i) Employee contributions to date of termination.
  - (j) Interest on employee contributions to valuation date.
  - (k) Date of termination.
  - (l) Earliest date on which benefit could commence without reduction for early commencement.
- (6) If addition, the following data must be provided with the data on vested terminated members for each person who was vested terminated as of the prior valuation date and has changed status as of the current valuation date:
  - (a) All data set out in (5)(a) through (5)(l).
  - (b) Date of status change.
  - (c) Status as of the valuation date.
- (7) The member data must be provided in the format provided for in Appendix A.

D. Member Data Reconciliation

- (1) Using the member data provided in C(1) through C(6), the actuary shall reconcile the data provided with that utilized in the prior valuation.
  - (a) Active Members on the last valuation date, plus new entrants and transfers to active status, less retirements during the period since the last valuation, less deaths during the period since the last valuation, less disabilities during the period since the last valuation, less other terminations since the last valuation must equal Active Members on this valuation date.
  - (b) Similar analyses must be made of retirees, preferably by types of retirement, and vested terminateds.
- (2) If the member reconciliation reveals material imbalances in that data, the retirement plan shall provide the Actuary with any assistance needed to correct that imbalance.
- (3) The Actuary may request additional collateral information from the plan to verify the reasonableness of the data.

E. Data Retention - Valuations as of July 1, 1985 and later

- (1) The data provided to the Actuary retained by the Commission for development of the actuarial valuations must be retained by the Actuary retained by the Commission for a period not less than five years from the valuation date for which it is provided. Prior to the destruction of any valuation data, the Actuary retained by the Commission shall consult with and obtain the approval of the Executive Director of the Commission.
- (2) The Actuary retained by the Commission shall use this data for the periodic experience studies as well as for actuarial valuation purposes. However, the Actuary retained by the Commission may request additional information to supplement the data accumulated in accordance with this section for experience study purposes.

F. Data Retention - Valuations as of dates prior to June 30, 1985

- (1) The Actuary for each retirement plan or the chief administrator officer of the retirement plan, whichever applies, shall retain all data which was provided by the plan for the purpose of developing actuarial valuations of the plan as of dates prior to June 30, 1985, which is in existence on June 30, 1987. Prior to the destruction of any actuarial valuation data for actuarial valuations prepared prior to June 30, 1985 in existence on June 30, 1987, the Actuary for the retirement plan or the chief administrative officer of the retirement plan, whichever applies, shall consult with and obtain the approval of the Executive Director of the Commission.
- (2) Upon request by the Actuary retained by the Commission or by the Executive Director of the Commission, the Actuary for the Plan shall provide the data described in paragraph (1) to the Actuary retained by the Commission or to the Executive Director of the Commission, whichever applies.
- (3) To the extent that the Actuary for the Plan has not retained the data required by paragraph (1), the Actuary retained by the Commission may request the required data from the plan. The plan shall provide such data within three months of the date of such request.

X. Important Definitions

- A. Actuary - Any person who shall satisfy the requirements of an "approved actuary" under Minnesota Statutes, Section 356.215, Subdivision 1, Paragraph (c).
- B. Actuary retained by the Commission - The Actuary or the firm of Actuaries retained by the Legislative Commission on Pensions and Retirement.
- C. Actuary for the Plan - The Actuary or the firm of Actuaries retained by a Retirement Plan.
- D. Actuarial Value of Assets - The asset value determined in accordance with Section II.E. hereof and Minnesota Statutes, Section 356.215, Subdivision 1, Paragraph (f), as of the valuation date. Such asset value is used for the purposes of determining the Unfunded Actuarial Accrued Liability and the Funding Ratios of the retirement plan.
- E. Projected Benefit - A benefit estimated from a valuation date to a future payment commencement date based upon the provisions of the retirement plan for calculating such benefits, estimated future increases in compensation, estimated increases in service, and such other assumptions as may be required.
- F. Credited Projected Benefit - A benefit estimated from a valuation date to a future payment commencement date based upon the provisions of the retirement plan for calculating such benefits, estimated future increases in compensation, service to the valuation date, and such other assumptions as may be required.
- G. Actuarial Present Value ("APV") of Projected Benefits - The number of dollars required as of a valuation date such that those dollars plus investment returns on those dollars must equal all expected future benefit payments under the plan to current members. For each active member, and for each benefit type provided in the plan this value must be calculated as follows:
  - (1) A Projected Benefit must be calculated for each year in the future assuming that benefits would become payable in that year.

- (2) If the benefit is paid as a series of periodic payments (e.g., service retirement), an appropriate annuity factor is calculated for each year's Projected Benefit. The product of the annuity factor and the Projected Benefit for a particular year in the future is the single sum value of the benefit assuming the event which causes that benefit to commence occurs in that year. If the benefit is in the nature of a single sum benefit (e.g., withdrawal of employee contributions with interest), this step is foregone.
- (3) Using all of the demographic assumptions, the probabilities that an active member at the valuation date remains continuously active to each future year for which values from (2) exist must be calculated.
- (4) The probability of the occurrence of the event which causes the benefit to commence (i.e., retirement, disability, death, termination, etc.) for each successive year must be determined.
- (5) Using the assumed rates of investment return, the present value at the valuation date of \$1 paid at the point in each such year at which events are assumed to occur must be calculated. For an assumed rate of investment return of  $i$  the present value for the  $n$ th year from the valuation date is  $V^{n+f}$  where:
  - (a) 
$$V = \frac{1}{1+i}$$
  - (b)  $f$  is a fraction, reflecting the point during the year at which events are deemed to occur. This fraction will often be  $1/2$ , reflecting occurrence of events at mid-year.
- (6) The product of corresponding values of (2), (3), (4) and (5) is the APV of the Projected Benefit for year  $n$ .
- (7) The sum of (6) for all years is the APV of Projected Benefit for a specific benefit type and for a specific member.

- (8) The sum of all such actuarial present values of the specific Projected Benefit for all active members is the APV of Projected Benefit for the specific benefit type for the plan.
- (9) The sum of actuarial present values over all benefit types is the Total APV of Projected Benefits for active members of the plan.

The APV of Projected Benefits for persons receiving benefits at the valuation date must be equal to (i) the amount of the monthly benefit currently being paid, multiplied by (ii) an appropriate annuity value taking into account the form of the benefit being paid (e.g., life annuity, 100% Joint and Survivor) the type of benefit being paid (e.g., disability, surviving spouse, child, etc.) and the sex and age of the payee.

The APV of Projected Benefits for vested terminated members must be calculated as the greater of (1) the benefit calculated for persons receiving benefits, except that (i) the vested benefit recognized must be that benefit, calculated under the law in effect at the date of termination, determined under the normal annuity form under the system with augmentation to the earliest age at which the benefit could commence without reduction for early commencement and (ii) the annuity value must be calculated assuming commencement of the benefit at such age, or (2) the balance of employee contributions with interest to the valuation date.

The APV of Projected Benefits for non-vested inactive members must be the balance of employee contributions with interest to the valuation date.

- H. Actuarial Present Value ("APV") of Credited Projected Benefits - A calculation which is identical to that described in F, above, except that for active members the benefits used at each future year must be the Credited Projected Benefits rather than the Projected Benefits.
- I. Actuarial Present Value ("APV") of Future Compensation - The estimated number of dollars required today such that those dollars plus investment return on those

dollars are sufficient to pay estimated compensation for each active member of the system from the valuation date to termination from active status. The APV of Future Compensation must be calculated as follows for each active member:

- (1) Compensation levels must be estimated for each year in the future using the individual compensation increase assumption.
- (2) Using all of the demographic assumptions, the probability that the member will remain active in the group to the beginning of each year must be determined.
- (3) If events terminating active status are deemed to occur during the year (e.g., at the middle of the year), weighted averages of those probabilities must be calculated reflecting such timing, using acceptable actuarial methodology.
- (4) Using assumed rates of investment return, the present value at the valuation date of \$1 paid at the mid-point of each future year must be calculated. For an assumed rate of investment of  $i$  the present value for year  $n$  is  $V^n + .5$  where  $V = \frac{1}{1+i}$
- (5) The product of (1), (3) and (4) is the APV of the estimated compensation in year  $n$  for an active member.
- (6) The sum of such Actuarial Present Values for each future year is the Actuarial Present Value of Future Compensation for that member.
- (7) The sum of such Actuarial Present Values of Future Compensation over all active members is the Actuarial Present Value of Future Compensation for the plan.

The Calculation of Actuarial Present Values of Compensation from entry-age must be calculated as above using estimated compensation at entry-age determined by adjusting current compensation with the current individual compensation increase assumption.



- J. Funding Ratios - The ratios described and defined in IV.B.(4).
- K. Valuation Date - The date as of which all financial and member data is provided for an actuarial valuation and the date as of which all actuarial present values are calculated in that valuation.
- L. Present Value of Future Payroll - The value developed for use in amortizing the UAAL over the Amortization Period. It represents the present value of total payrolls over the amortization period. It must be based upon the assumed rates of investment return and payroll growth. The decrements for active lives must not be used.