STANDARDS FOR ACTUARIAL WORK

ESTABLISHED BY THE STATE OF MINNESOTA
LEGISLATIVE COMMISSION
ON PENSIONS AND RETIREMENT

Updated August 11, 2010

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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, August 20, 2007, and August 11, 2010. 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.

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I. Introduction

A. These standards have been promulgated by the Legislative Commission on Pensions 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, including the Minneapolis Employees Retirement Fund division, Minnesota Statutes, Chapter 353, and Minnesota Statutes 2008, Chapter 422A

(ii) Police and Fire - Minnesota Statutes, Chapter 353

(iii) Local Government Correctional Service Retirement Plan - Minnesota Statutes, Chapter 353 E

(iv) Privatized Public Employee Special Retirement Coverage - Minnesota Statutes, Chapter 353F.

(c) Teachers Retirement Association (TRA) - Minnesota Statutes, Chapter 354.

(d) St. Paul Teachers Retirement Fund Association - Minnesota Statutes, Chapter 354A.

(e) 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.

(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) The preretirement and postretirement interest rate actuarial assumptions are set by statute. Salary increase and payroll growth assumptions are set by statute through July 1, 2010. After July 1, 2010, salary increase, payroll growth, and demographic assumptions can be changed with the approval of the Commission or after a period of one year has elapsed since the date on which the proposed changes were received by the Commission without Commission action, as per Minnesota Statutes, Section 356.215, Subdivision 18.

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) 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 or disability. These patterns must be based on gender, age and/or 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 gender, age and/or years of service, or duration of eligibility 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 gender and age unless experience shows otherwise. Any use of gender-related rates are for funding purposes only and do not affect benefits.

(b) Other Demographic Assumptions

(i) Rates of Disablement - reflect patterns by which active members become disabled under the plan. These patterns must be based on gender, age and/or 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 gender 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 gender and age 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, or if insufficient data exists for a formal study, upon the recommendation of the Actuary of the Fund.

(a) Demographic assumptions are expected to be set in accordance with Actuarial Standard of Practice #35 – Demographic Assumptions (ASOP

35). In the event of a conflict between ASOP 35 and these standards, the Actuary for the Fund and the Commission's Actuary shall review the situation and reach agreement on the appropriate approach. If future expectations differ from actual past experience, the Actuary shall provide written justification of their recommendation.

(b) Demographic assumptions may be established by reference to a standard actuarial table so long as the Actuary can establish that such table, with appropriate age adjustments or projections, relates reasonably to expected experience.

(c) 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 preferred timing for the assumed occurrence of demographic assumptions is the middle of the valuation year (i.e. – six months after the valuation date), but for actuarial valuations in 2010, end of valuation year timing is an acceptable alternative. After the 2010 valuations, end of year timing may be acceptable, but such determination shall be made after the Commission's Actuary has had adequate time to perform their analysis to determine the impact of end of year versus middle of year decrement timing. The Actuary must disclose the assumed timing for the occurrence of demographic assumptions and provide a statement indicating the reasonableness of the assumption. For example, it may be more appropriate to assume retirements in teacher plans will occur at the end of the school year. Therefore, it is more appropriate for the timing of retirements for the teacher plans (Teachers Retirement Fund, the St. Paul Teachers Retirement Fund and the Duluth Teachers Retirement Fund) to be the valuation date nearest or next following the attainment of the retirement age or service requirement.

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 expenses of each retirement system must be estimated based on the assumption that such expenses will be a percentage of system payroll. That percentage must be approximately equal to the ratio of such expenses to total covered payroll under the plan in the fiscal year preceding 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 unless a different timing assumption is approved by the Commission. 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 Minnesota Statutes, Section 356.215, Subdivision 1, Paragraph (f), which is intended to smooth the fluctuations of Market Value, while tracking to Market Value over time.

(2) The Market Value of the assets of the fund must be determined by the Fund in accordance with generally accepted accounting principles as of the day preceding the valuation date. This amount should be the same as the amount reported in the Fund's Comprehensive Annual Financial Report (CAFR).

III. Actuarial Cost Methods

A. The Entry Age Actuarial Cost Method, applying the closed group technique, must be utilized for all actuarial valuations of each retirement plan.

(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 (as defined in III.C.) 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 compensation rate increases as in effect for the current valuation.

(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 individual compensation increase 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 for all members divided by the total estimated compensation

for all members for the year following the valuation date, and adjusted for interest, if appropriate, 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) Unless otherwise required in the law, any post retirement adjustment authorized by law that varies from year to year based on an index must be valued using the long term increase in benefits expected to be paid as a result of the provision. If the benefit adjustment is based on the Consumer Price Index, the assumption used to project future benefit payments shall be consistent with the inflation assumption used to develop the salary increase assumption and the investment return assumption. 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.

(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 age at the valuation date less years of service recognized for the purpose of calculating benefits under the plan. The procedures used to calculate age, service, and entry age shall be disclosed in the actuarial valuation report.

(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 the MERF division of the Public Employees Retirement Association and the Elective State Officers Plan, must be determined as a level percent of payroll. If the statutes require the Legislators Plan contribution to be determined on a level percent of payroll basis, the Actuary will be required to determine the contribution rate on both a

level dollar and a level percent of payroll basis. The detail of the calculation 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.

(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 an assumed investment return rate of 8.5%. If a different assumed rate of return is used in the valuation, the factor shall be adjusted using that rate of return.

(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 the assumed pre-retirement interest rate) divided by (one plus the payroll growth rate) minus one. For example, if the assumed 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 the MERF division of the Public Employee Retirement Association and the Elective State Officers Plan, the additional annual contribution required to retire the Unfunded Actuarial Accrued Liability shall be calculated as a level dollar amount. If the statutes require the Legislators Plan contribution to be determined on a level percent of payroll basis, the Actuary will be required to determine the contribution rate on both a level dollar and a level percent of payroll basis. The details of that calculation follow:

(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 using the assumed investment return rate.

(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 assumed rate of return.

(c) The UAAL 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 11.

IV. Contents of an Actuarial Valuation Report

A. The Actuarial Valuation Report for each system must contain the actuarial balance sheet. The MERF division of the Public Employees Retirement Association (PERA) must report the information separately from the PERA General Employees valuation results. The following identifies the information to be included in the actuarial balance sheet:

(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, the 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 shown 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) APV of Credited Projected Benefits.

(4) The APV of Projected Benefits 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 must include:

(1) The Normal Cost Rates of the plan for each benefit type (death, disability, termination of employment and retirement) and the total Normal Cost Rate.

(2) Development of the UAAL for the system is as follows:

(a) APV of Projected Benefits by benefit type.

(b) APV of their associated Normal Costs by benefit type.

(c) AAL by benefit type ((a) - (b)) and in total

(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 Projected Benefits by benefit type.

(4) Development of Funding Ratio:

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

(b) 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 (Actuarial Present Value of Future Benefits).

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 and amortization period. A ratio under 100% indicates a deficiency in the contribution level's ability to amortize the UAAL by the end of the amortization period.

(5) In order to provide additional information regarding the funded status of the plans on a market value basis, the key valuation results, including the UAAL, Actuarial Liability Funding Ratio, and actuarial contribution rate, must be included in the valuation report using the market value of assets as well as the actuarial value of assets.

(6) 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 split into Normal Cost Rate, UAAL contribution rate and expense rate.

(ii) Funding Ratios
Actuarial Liability Funding Ratio
Projected Benefit Funding Ratio

(iii) UAAL

(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.

(7) 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) Mortality

(d) Other items

(e) Total

If item (d) accounts for a significant amount of the total gain or loss, an additional analysis must be performed to explain the major causes. Item (d) accounts for a significant amount of the total gain or loss if item (d) is greater than 1% of the Actuarial Accrued Liability on the valuation date. 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, adjustments, or loads used must be disclosed here. Decrement timing and the procedures used to calculate entry age must also be disclosed in the valuation report. 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.

(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) 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.

(7) 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. Valuation Projections

The valuation results provide information about the plan's funding on a single date, the valuation date, assuming all assumptions are met in future years. In order to provide a longer term perspective on the financial health of the plan and the potential variability of future valuation results, projections shall be prepared every two years by the Actuary for each Plan except for the Legislators Plan and the Elective State Officers Plan, unless this requirement is waived by the Commission.

The projections for MSRS-General, PERA-General and TRA will first be prepared in conjunction with the July 1, 2011 actuarial valuation. Projections for all other plans must first be prepared based on a valuation date not later than July 1, 2012. The projections must be provided to the LCPR executive director and the Commission's Actuary not later than the January 31 following the valuation date used for the projection model.

At a minimum the projections shall show the fixed statutory contribution rate and the actuarial contribution rate, UAAL, Actuarial Liability Funded Ratio, and cash flows (expected benefit payments and total contributions) for each year projected over the next 30 years. At a minimum, the projections provided to the Commission shall include (1) a baseline projection assuming all actuarial assumptions are met in future years including the assumed rate of return, (2) an alternative projection assuming all actuarial assumptions are met in future years other than the assumed rate of return, which shall be assumed to be equal to the assumed rate of return minus 1.5%, (3) a second alternative projection assuming all actuarial assumptions are met in the future other than the assumed rate of return, which shall be assumed to be equal to the assumed rate of return plus 1.5%.

The projections shall assume the number of active members in the Plan remains level during the 30 year projection period (stationary population), payroll increases at the applicable payroll increase assumption, and a constant normal cost percentage equal to the percentage developed in the most recent actuarial valuation unless these are not deemed to be reasonable assumptions by the Actuary. In that case, the projections shall be completed using the assumptions that are deemed to be the most reasonable by the Actuary and such assumptions shall be disclosed with the results of the projections. The projection models shall also permit the analysis by the Actuary of the impact of changing the amortization period and/or the statutory contribution rate.

VI. 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 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. A change in an actuarial assumption typically will be recommended by the Actuary for approval by the Commission based on an experience study or, for smaller plans, by a review of the actuarial assumptions, including written documentation of the findings and recommendations. 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 an actuarial value basis using the dollar weighted calculation technique. All cash flows in and out of the fund must be assumed to occur in the middle of the year.

The recommendation for the investment return assumption shall be based on analysis of the expected return in future years based on the target asset allocation and the capital market assumptions for each of those asset classes. The analysis and ultimate recommendation must comply with any applicable Actuarial Standards of Practice, as published by the Actuarial Standards Board. The experience study report shall include capital market assumptions and expected return information provided by the State Board of Investment as well as other assumptions deemed appropriate by the Actuary. The recommendation for the investment return assumption shall disclose the underlying inflation assumption used to develop the investment return assumption.

(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. They may be 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. Compensation means the pay over the 12 months prior to the valuation date (effective July 1, 2011, for MSRS administered plans). Pay is annualized for any new hires during the 12 month period.

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 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 (A/E ratio) is the basic analytic tool in an experience study. For each decrement and each combination of gender, 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 preferred approach is to include the ratios for each age or year of service, but the ratios may be reported in five year age and service groups, if the volume of data points makes it 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 and the Actuary's professional judgment regarding future experience, new assumptions may be recommended.

(3) There may be reasons for the Actuary to believe 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 each of the actuarial assumptions.

(2) The report must comply with Actuarial Standard of Practice #41—Actuarial Communications. Furthermore, it is expected to 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) Where appropriate in the Actuary's judgment, the expected and actual rates for each assumption shall be presented in graphical format in the report. For purposes of the graphs included in the report, it is preferred that there be no age or service grouping unless the Actuary can support that such groupings are appropriate. The expected number of occurrences shall be presented on both the current and recommended assumptions.

(4) The analysis of retirement ages for new retirees and their average age at retirement, required in Minnesota Statutes, Section 356.215, Subdivision 16, must be performed and presented in the report.

(5) A comprehensive experience study report on the Legislators Plan, Elective State Officers Plan, the St. Paul Teachers Retirement Fund and the Duluth Teachers Retirement Fund may be inappropriate because of their smaller size. However, the assumptions used in the valuations should be reviewed after the experience studies are completed for the larger systems to determine if any of the findings in those reports indicates a need to make adjustments to the valuation assumptions used by the smaller plans. The Actuary for the Legislators Plan, Elective State Officers Plan, the St. Paul Teachers Retirement Fund and, the Duluth Teachers Retirement Fund shall report in writing that a review of all actuarial assumptions was performed and identify any changes in assumptions recommended and the reason for the recommended change. An experience study can be recommended by the Actuary or by the respective Plan Administrator of any plan, but must be approved by the Commission before preparation.

(6) Experience of funds whose members have similar employment characteristics (e.g., teaching or public safety) may be combined for further analysis and recommendations.

(7) Each experience report must show the actual and expected occurrences for each plan year and also for all of the plan years combined. 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. Such information on the revised A/E ratio must be included in the experience report.

E. For any assumption change adopted by the Fund and presented to the Commission for review, the cost impact shall be quantified for each change in assumption by showing the change in the dollar amount of the UAAL, the change in the Actuarial Liability Funded Ratio, the change in the normal cost rate and the change in the UAAL contribution rate. The cost impact of the assumption changes shall be reported in the following order:

(1) Mortality

(2) Retirement

(3) Termination of employment

(4) Disability

(5) Salary increases

(6) Rate of return

(7) Other

(8) Payroll growth

VII. 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 for each decrement:

(a) Total Actuarially Determined Contribution Rate with normal cost rate and UAAL contribution rate shown separately.

(b) That part of the Total Actuarially Determined Contribution Rate not provided by the Employee.

(c) Funding Ratio on both an actuarial and market value basis.

(i) Actuarial Liability Funding Ratio

(ii) 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. The cost impact of the change must be expressed as a total dollar amount for all years remaining in the amortization period, determined by applying the cost as a percent of pay to the assumed future payroll.

(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 is assumed to 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 and if used in the cost estimate, that must be disclosed.

(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 more appropriate than a single estimate.

C. Supplementary Information

Recognizing that the true cost of any benefit enhancement is dependent on the actual experience in future years while the cost shown in the fiscal impact statement is dependent on the assumptions used in the calculation, it is prudent to consider the potential cost of any benefit enhancement if less favorable experience occurs than assumed. The assumption with the greatest impact on the cost is generally the assumed rate of return. In order to quantify the downside risk related to the proposed benefit change, the fiscal impact statement shall include the cost using an assumed rate of return 1.5% less than the investment return assumption used in the valuation. For example, if the valuation assumption is 8.5% the cost of the benefit change shall also be shown assuming a long term rate of return of 7.0% (liabilities shall be determined before and after the change using a 7.0% discount rate).

D. 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.

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.

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 reasonable expectations of future 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

Data retention policies must be in compliance with the data retention policies in the State's contract with the Actuary.

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., 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 at the assumed rate of return 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 nth 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 at the assumed rate of 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.