Actuarial and Benefits Consulting

# MINNESOTA STATE RETIREMENT SYSTEM

## REVIEW OF ACTUARIAL VALUATIONS AS OF JUNE 30, 1987

Touche Ross & Co.

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Board of Directors
Minnesota State Retirement System
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Ladies and Gentlemen:

We are pleased to present our report on the June 30, 1987 actuarial valuation of the Minnesota State Retirement System, General Employees' Retirement Fund.

Our report is divided into the following sections:



The report was completed on the basis of accepted actuarial methods and procedures in accordance with the provisions stipulated in the contract between the State of Minnesota and Touche Ross & Co.

We would be pleased to answer any questions you may have regarding this report.

Touche Ross & Co.

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James F. Verlautz

James F. Verlautz, F.S.A.

## I. INTRODUCTION AND PURPOSE

The Minnesota State Retirement System (MSRS) administers several retirement funds and plans. The plans administered are the: General State Employees' Plan, Unclassified Employees' Plan, Correctional Employees' Plan, State Troopers' Plan, Judges' Plan, Legislators' Plan, Elective Officers' Plan, Military Affairs Plan, Transportation Pilots' Plan, and a statewide Deferred Compensation Plan for public employees.

The plans administered by MSRS are among those subject to being overseen by the Legislative Commission on Pensions and Retirement (LCPR). The LCPR consists of members of the Minnesota State Senate and Minnesota House of Representatives. Its members are charged with the duties of, among other things:

- Reviewing investment performance.
- Establishing policy for public retirement plans.
- Recommending necessary changes to retirement plan provisions.
- Hiring an actuary to perform annual actuarial valuations and experience studies.
- Overseeing the work of the actuary.

Minnesota Statutes, Sections 356.20 and 356.215, require annual actuarial valuations and periodic experience studies. Of concern to the Board of Directors are the valuations and experience studies which must be performed for the following:

- The General State Employees' Plan;
- The Correctional Employees' Plan;
- The State Troopers' Plan; and
- The Judges' Plan

These valuations and experience studies are prepared by the Wyatt Co., the actuary retained by the LCPR. The Minnesota State Retirement System does not have an actuary on its staff and, therefore, has retained Touche Ross to review, analyze, and critique the actuarial valuations and experience studies.

The purpose of this report is to verify the accuracy of Wyatt's results, and to expand on any items of particular significance.

## II. COMPARISON OF VALUATION RESULTS

We attempted to duplicate the figures shown in Wyatt's June 30, 1987 valuation reports. To do so involved repeated discussions with the Wyatt personnel who prepared their reports. Where we were able to discover reasonable justification for Wyatt's approach, we adjusted our methods and assumptions to match theirs. (Descriptions of those adjustments are included in Section III.)

In this section of the report we compare the figures generated by Wyatt with our valuations. Three tables are included. Table A shows the derivation of the unfunded liability. Table B shows the annual contribution requirements under both Section 352 and Section 356. Table C shows the depth of plan funding based on liabilities incurred to date. These figures are also required for Government Accounting Standards Board (GASB) reporting.

TABLE A (000's Omitted)

| | Wyatt Co. | Touche Ross | Percentage Difference |
|---|---|---|---|
| Present Value of Benefits: | | | |
| Actives: | | | |
| Retirement | $1,344,758 | $1,370,657 | 1.9% |
| Death | 118,890 | 120,107 | 1.0 |
| Disability | 97,471 | 102,146 | 4.8 |
| Withdrawal | 388,290 | 377,163 | (2.9) |
| Total actives | $1,949,409 | $1,970,073 | 1.1 |
| Deferred annuitants | 16,174 | 22,088 | 36.6 |
| Former members without vested rights | 2,441 | 2,020 | (17.2) |
| Participants in MPRI Fund | 564,015 | 563,781 | 0.0 |
| Total | $2,532,039 | $2,557,962 | 1.0 |
| Portion allocated to future service | 637,897 | 625,741 | (1.9) |
| Accrued liability (reserves required) | $1,894,142 | $1,932,221 | 2.0 |
| Valuation assets | 1,518,483 | 1,518,483 | 0.0 |
| Unfunded accrued liability | $ 375,659 | $ 413,738 | 10.1 |
| Funded ratio | 80.2% | 78.6% | - |

## CONTRIBUTIONS

Chapters 352 and 356 set forth requirements as to the level of contributions. Chapter 352 prescribes the actual amount of contributions and Chapter 356 describes the methods used to determine the amount of contribution required to fully fund the Normal Cost and the Unfunded Accrued Liability. Together, the actual contribution and required contribution are used to determine the sufficiency of the actual contribution. These calculations are illustrated in Table B. Amounts shown in parenthesis are as a percent of payroll.*

TABLE B (000's omitted)

| Actuarially Determined Contribution | Wyatt Co. | Touche Ross |
|---|---|---|
| 1. Normal cost | $65,801 (5.45%) | $66,857 (5.53%) |
| 2. Assumed operating expense | $ 3,262 (.27%) | $ 3,262 (.27%) |
| 3. Amortization by June 30, 2011 of the unfunded accrued liability | $19,087 (1.58%) | $20,943 (1.73%) |
| 4. Total Chapter 356 requirement: (1) + (2) + (3) | $88,150 (7.30%) | $91,062 (7.53%) |
| **Prescribed Contributions** | | |
| 1. Employee contributions | $45,060 (3.73%) | $45,065 (3.73%) |
| 2. Employer contribution | $47,114 (3.90%) | $47,119 (3.90%) |
| 3. Total Chapter 352A prescribed contribution | $92,174 (7.63%) | $92,184 (7.63%) |
| **Contribution Sufficiency** | .33% | .10% |

* Assuming that contributions are paid during each payroll period throughout the year ending June 30, 1988. Expected annual payroll = $1,208,170,000.

The depth of funding is an indication of the extent to which the accrued benefits are funded and is measured by the ratio of valuation assets to the present value of accrued benefits. These measurements are made on the plan continuation basis (applying all ongoing actuarial assumptions, including assumed salary increases and turnover) and are illustrated as follows:

TABLE C (000's omitted)

Depth of Funding June 30, 1987

| | | Wyatt Co. | Touche Ross | Percentage Difference |
|---|---|---|---|---|
| 1. | Active members | $1,006,875 | $1,015,589 | .9% |
| 2. | Deferred annuitants | 16,174 | 22,088 | 36.6 |
| 3. | Former members without vested rights | 2,441 | 2,020 | (17.2) |
| 4. | Participation in MPRI Fund | 564,015 | 563,781 | 0.0 |
| 5. | Total present values of accrued benefits | $1,589,505 | $1,603,478 | .9 |
| 6. | Valuation assets | 1,518,483 | 1,518,483 | 0.0 |
| 7. | Depth of funding | 95.5% | 94.7% | |
| 8. | Depth of funding excluding MPRI members | 93.1% | 91.8% | |

## III. EXPLANATION OF DIFFERENCES

In this section of the report we present our best explanations for any differences between Wyatt's methods and assumptions and ours, the changes we made where appropriate to be consistent with Wyatt, and the effects of these changes.

Our calculations for the General Employees' Retirement Plan are very similar to those of Wyatt, and our valuation results in Table A of Section II are very close. Our total present value of benefits is 1% higher than Wyatt's, and our total accrued liability is only 2% higher than Wyatt's total. With a plan of this size and complexity, duplicating results this closely is unusual. One reason that the small difference exists is that in our valuation, we increased the liabilities by 1% to account for the additional cost of the cash refund annuity. Wyatt has indicated that they believe the load should be smaller than 1%.

When we subtracted the actuarial value of assets to derive the unfunded accrued liability, the percentage difference increased. This difference is misleading since it only occurs because the plan is well funded.

In prior year valuations, we assumed that retirement benefits would never exceed current IRS limits on benefits. During our discussions with Wyatt, they indicated that they expect the IRS limit to increase at the same rate as the salary scale. In effect, this assumes that the limits will never apply to individuals in this plan. We changed our valuation process this year so that these limits would not apply. This change increased the accrued liability by less than 1%.

In reviewing the retirees' benefit forms, we noticed that certain retirees had Certain and Life benefits with a certain period of 28 to 30 years. We changed those periods to 15 years, and do not believe Wyatt made the same change. The cost effect is negligible; however, you may wish to adjust your file.

## IV. CHANGES IN THE UNFUNDED LIABILITY

The General Plan currently has an unfunded liability. Having an unfunded liability is not necessarily bad for an ongoing plan, as long as some provision is made to pay off the liability over time. The unfunded liability becomes a problem when it is so large as to preclude benefit security, or when, like any debt, interest on the liability becomes unmanageable.

Generally, unfunded liabilities tend to decrease over time, although some year to year fluctuation is normal. One symptom of a troubled pension plan is a constantly increasing unfunded liability. Annual changes in the unfunded liability occur for the following reasons:

- Part of the contribution made each year goes to pay the normal costs (including expenses). The remaining contribution is called the Past Service Contribution. The unfunded liability is automatically increased each year by the interest requirement (8%). If the past service contribution is less than the interest requirement, there will be a net increase in the liability. When the past service contribution is greater than the interest requirement, part of the liability is "paid off," and the liability decreases.

- The unfunded liability is an actuarial projection of liabilities based on certain assumptions. To the extent actual experience differs from the assumptions, actuarial gains and losses may occur. An actuarial gain will decrease the unfunded liability; an actuarial loss will increase the unfunded liability.

- The assumptions and techniques used in calculating the unfunded liability are changed when circumstances warrant. These changes can produce increases or decreases in the unfunded liability.

- Changes in the legal, economic, and sociological environment often result in changes to retirement plans. These changes frequently result in improved benefits. When these changes result in higher retirement benefits, unfunded liabilities are increased. When the changes increase benefits paid in lieu of retirement benefits, unfunded liabilities can increase or decrease.

During the year ended June 30, 1987, the General Employees' Fund showed an increase in the unfunded liability. This increase was caused by the following reasons:

1. <u>Contribution Rate</u>

   The total contributions to the plan were approximately $79 million. However, normal cost, expenses and interest combined to equal $83 million. This resulted in a shortfall of $4 million, which increases the unfunded liability.

2. <u>Actuarial Gains</u>

   The Fund experienced actuarial gains of approximately $14 million because of salary increases which were smaller than anticipated and $57 million of investment gains that were greater than anticipated. The remaining sources of gain or loss, including MPRI fund mortality, combined to produce a small loss. Overall, there was a net gain (reduction in unfunded liability) from actuarial experience of $62 million.

3. <u>Changes in Assumptions and Plan Provisions</u>

   We had previously assumed that 40% of those eligible for a deferred annuity would select an annuity, while the remaining 60% would elect a return of contributions. This assumption was based on MSRS' experience. This year the Wyatt Co. assumed that any individual would select the benefit that had the largest present value. This obviously increases the present value of future benefits, although it may be overly conservative.

   In addition, the plan was changed this year to provide 100% vesting after five years of service. This change had very little effect, since those individuals with more than ten years are not affected, and those individuals who terminate with less than ten years are likely to elect a return of contributions.

Calculation of the change in unfunded liability for these items is very difficult, and depends heavily on technique. As a result, most actuaries would agree that there is a range of acceptable results. The Wyatt Co. calculated an increase in the unfunded liability of $90 million, while we calculated an increase of $70 million. Both numbers can be reasonably argued, although the Wyatt Company's calculation is certainly conservative.

Changes in Unfunded Actuarial Accrued Liability*

| | | |
|---|---|---|
| A. | Unfunded actuarial accrued liability at beginning of year | $343,705 |
| B. | Change due to interest requirement and current rate of funding | 4,154 |
| C. | Expected actuarial accrued liability at end of year: (A) + (B) | 347,859 |
| D. | Actuarial losses (gains) | (62,116) |
| E. | Changes in assumptions and plan provisions | 89,916 |
| F. | Unfunded actuarial accrued liability at end of year: (C) + (D) + (E) | $375,659 |

* Results prepared by the Wyatt Company.

## V. SENSITIVITY ANALYSIS

When performining an actuarial valuation, liabilities and contributions are developed under a single actuarial cost method and one set of actuarial assumptions. However, since it is unlikely that any given assumption will prove to be exactly correct, analyzing the impact of a variation in an assumption is generally enlightening. This analysis is called a sensitivity analysis.

We have analyzed the sensitivity to change three of these assumptions and methods mandated by state law. Each of these plays a major role in determining costs:

1. Interest is currently assumed to be 8% for all years until retirement, and 5% thereafter. We examined the effect of changing 8% to 7%.

2. Salaries are assumed to increase 6.5% each year. We examined the effect of a 6% salary increase assumption.

3. The unfunded liability is amortized as a level percent of future payroll. This approach is not permitted for a private sector plan. We examined the effect of amortizing the unfunded liability using a level dollar amount.

| | | Value After Change | | |
|---|---|---|---|---|
| | Current (Touche Ross) | Interest | Salary Increase | Amortization |
| Unfunded liability | $413,738 | $564,406 | $365,679 | $413,738 |
| Actuarially required contribution: | | | | |
| (Amount) | $ 91,062 | $107,337 | $ 85,718 | $107,932 |
| (Percent) | 7.53% | 8.88% | 7.09% | 8.93% |
| (Sufficiency) | .10% | (1.25%) | .54% | (1.30%) |
| Plan continuation liability | $1,603,478 | $1,729,155 | $1,566,899 | $1,603,478 |
| Depth of funding | 94.7% | 87.8% | 96.9% | 94.7% |

GENERAL EMPLOYEES

VI. SUMMARY OF HISTORICAL VALUATION RESULTS**

(000'S Omitted)

| Report as of June 30 | Accrued Liability | Valuation Assets | Unfunded Accrued Liability | Normal Cost | Actuarial Contribution | Prescribed Contribution | Sufficiency |
|---|---|---|---|---|---|---|---|
| 1980* | $ 737,996 | $ 546,988 | $191,008 | $46,831 (6.82%) | $60,682 (8.84%) | $68,667 (10.00%) | 1.16% |
| 1981 | 831,782 | 648,943 | 182,839 | 52,378 (6.73%) | 66,051 (8.49%) | 77,796 (10.00%) | 1.51 |
| 1982 | 1,004,388 | 753,249 | 251,139 | 54,668 (6.84%) | 72,646 (9.09%) | 67,898 (8.50%) | (.59) |
| 1983 | 1,127,574 | 866,439 | 261,135 | 59,653 (6.96%) | 78,600 (9.17%) | 79,964 (9.33%) | .16 |
| 1984 | 1,267,662 | 955,850 | 311,812 | 55,387 (6.13%) | 71,786 (7.95%) | 68,874 (7.63%) | (.32) |
| 1985 | 1,465,114 | 1,109,683 | 355,431 | 62,720 (6.11%) | 82,981 (8.08%) | 78,349 (7.63%) | (.45) |
| 1986 | 1,680,837 | 1,312,577 | 368,260 | 61,655 (5.43%) | 83,362 (7.34%) | 86,654 (7.63%) | .29 |
| 1987* | 1,894,142 | 1,518,483 | 375,659 | 65,801 (5.45%) | 88,150 (7.30%) | 92,174 (7.63%) | .33 |

* As prepared by the Wyatt Co.

** Figures shown in parenthesis are as a percentage of payroll under normal retirement age.

GENERAL EMPLOYEES

VI. SUMMARY OF HISTORICAL VALUATION RESULTS (Continued)

| Report as of June 30 | Active Members | | Retired Members** | | Deferred Annuitants | | Former Members Without Vested Rights |
|---|---|---|---|---|---|---|---|
| | Number | Valuation Payroll | Number | Avg. Annual Ben. | Number | Avg. Annual Ben. | |
| 1980* | 46,242 | $ 686,674,348 | 9,247 | $2,272 | 765 | $2,627 | 3,516 |
| 1981 | 46,669 | 777,961,014 | 9,642 | 2,432 | 793 | 2,944 | 4,752 |
| 1982 | 43,627 | 809,410,816 | 10,211 | 2,744 | 880 | 3,105 | 4,954 |
| 1983 | 43,191 | 868,528,661 | 10,477 | 2,987 | 983 | 3,194 | 4,881 |
| 1984 | 44,158 | 922,951,956 | 10,843 | 3,271 | 852 | 3,859 | 5,495 |
| 1985 | 44,412 | 1,048,639,187 | 11,367 | 3,651 | 901 | 3,944 | 4,881 |
| 1986 | 45,171 | 1,135,706,412 | 11,867 | 4,069 | 955 | 4,029 | 4,401 |
| 1987* | 45,707 | 1,208,043,000 | 12,341 | 4,589 | 1,014 | 4,271 | 4,496 |

* As prepared by the Wyatt Co.

** Including beneficiaries and disabled members.

## APPENDIX A

## SUMMARY OF EMPLOYEE DATA

The Executive Director furnished us with employee information pertaining to all active members, inactive members, and retired members of the Fund. The following tables summarize the changes in active, inactive, and retired membership during the year.

In order to reflect anticipated current year salary increases, all salaries provided were increased by 6.5%.

# MINNESOTA STATE RETIREMENT SYSTEM
# GENERAL EMPLOYEES' RETIREMENT FUND

## Covered General Employees' Census Data as of June 30, 1987

| | Number | Annual Payroll |
|---|---|---|
| General Actives at June 30, 1986 | 45,163 | $1,134,430,710 |
| New Entrants* | 5,325 | |
| Total | 50,488 | |
| Less Separations from Active Service: | | |
| Refund of Contributions* | 2,616 | 46,433,388 |
| Separation with a Deferred Annuity | 103 | 2,593,775 |
| Separation with Neither Refunds nor Right to a Deferred Annuity | 1,085 | 11,011,469 |
| Disability | 37 | 841,153 |
| Death; No Spouse's Benefits* | 65 | 1,484,024 |
| Service Retirement | 753 | 21,603,511 |
| Death Spouse's Benefits Payable | 10 | 247,659 |
| Total Separations | 4,669 | |
| Net Adjustments | 32 | 0 |
| Net Transfers To and From Other Plans | (151) | |
| General Actives at June 30, 1987 | 45,700 | 1,207,900,580 |
| Military Actives at June 30, 1987 | 7 | 269,254 |
| Total Actives at June 30, 1987 | 45,707 | $1,208,169,834 |

## Average Entry Age of New Employees

| For the Fiscal Year Ending | Male | Female | Average of Total |
|---|---|---|---|
| 6/30/83 | 28.7 | 27.4 | 27.9 |
| 6/30/84 | 29.7 | 29.4 | 29.6 |
| 6/30/85 | 31.6 | 31.0 | 31.2 |
| 6/30/86 | 32.0 | 31.2 | 31.5 |
| 6/30/87 | 32.4 | 31.9 | 32.1 |

* Includes those who entered the plan and terminated during the period July 1, 1986 to June 30, 1987.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

General Employees' Annuitant Census Data as of June 30, 1987

| | Number | Annual Annuity Benefit Payable |
|---|---|---|
| **A. Service Retirement Annuitants** | | |
| **Generals** | | |
| Receiving at June 30, 1986 | 10,591 | $44,297,403 |
| New | 838 | 5,165,173 |
| Deaths | (444) | (1,598,720) |
| Adjustments | (8) | 4,001,787 |
| Receiving at June 30, 1987 | 10,977 | $51,865,643 |
| **Military Affairs** | | |
| Receiving at June 30, 1986 | 3 | $ 37,520 |
| New | 0 | 0 |
| Deaths | 0 | 0 |
| Adjustments | | 3,674 |
| Receiving at June 30, 1987 | 3 | $ 41,194 |
| **Unclassified Plans** | | |
| Receiving at June 30, 1986 | 12 | $ 24,758 |
| New | 2 | 5,491 |
| Deaths | 0 | 0 |
| Adjustments | 0 | 2,204 |
| Receiving at June 30, 1987 | 14 | $ 32,453 |
| Total service annuitants Receiving at June 30, 1987 | 10,994 | $51,939,290 |

Appendix A (continued)

| | | Number | Annual Annuity Benefit Payable |
|---|---|---|---|
| B. | Disabled Employees | | |
| | Receiving at June 30, 1986 | 665 | $ 2,077,758 |
| | New | 48 | 184,874 |
| | Deaths | (38) | (121,833) |
| | Adjustments - Net Result | 1 | 168,159 |
| | Receiving at June 30, 1987 | 676 | $ 2,308,958 |
| C. | Widows Receiving an Annuity or Survivor Benefit | | |
| | Beneficiaries Receiving an Optional or Reversionary Annuity: | | |
| | Receiving at June 30, 1986 | 599 | $ 1,887,415 |
| | New | 86 | 357,989 |
| | Deaths | (19) | (65,914) |
| | Adjustments - Net Result | 5 | 205,392 |
| | Receiving at June 30, 1986 | 671 | $ 2,384,882 |
| D. | Deferred Annuitants | | |
| | Deferred as of June 30, 1986 | 955 | $ 3,847,855 |
| | New | 200 | 969,103 |
| | Began Receiving | (93) | (380,250) |
| | Adjustments - Net Result | (48) | (105,672) |
| | Deferred as of June 30, 1987 | 1,014 | $ 4,331,036 |

Average Age at Retirement of New Service Annuitants

| Fiscal Year Ending | Average Retirement Age |
|---|---|
| 6/30/82 | 63.2 |
| 6/30/83 | 63.3 |
| 6/30/84 | 64.0 |
| 6/30/85 | 64.0 |
| 6/30/86 | 62.6 |
| 6/30/87 | 62.7 |
| All Existing Service Annuitants | 64.1 |

# Appendix B

## MINNESOTA STATE RETIREMENT SYSTEM
## GENERAL EMPLOYEES' RETIREMENT FUND

### Summary of Principal Plan Provisions as of June 30, 1987

General Employees

1. Coverage: From first date of employment.

2. Service Credit: Service is credited from date of coverage.

3. Contributions:

   a. Employee: 3.73% of salary.

   b. State of Minnesota: 3.90% of salary.

4. Final Average Salary: Monthly average for the highest 5 successive years of salary.

5. Normal Retirement:

   a. Eligibility: Earlier of:

      o Attainment of age 65 and completion of 5 years of service. (Changed from age 65 and 10 years of service at June 30, 1987); or

      o Attainment of age 62 with 30 years of service.

   b. Benefit Amount: 1% of final average salary for each of the first 10 years of service plus 1-1/2% of final average salary for each year of service thereafter.

6. Early Retirement:

   a. Eligibility: Earlier of:

      o Attainment of age 55 and completion of 5 years of service. (Changed from age 55 and 10 years of service at June 30, 1987); or

      o Completion of 30 years of service.

Appendix B (continued)

| | | |
|---|---|---|
| | b. Benefit Amount: | Normal retirement benefit formula based on service and final average salary to date of early retirement, but actuarially reduced to reflect payment prior to age 65 (or age 62 if 30 years of service have been completed). |
| 7. | Form of Payment: | Life annuity with return on death of any balance of contributions over aggregate monthly payments. Actuarially equivalent options are also available. |
| 8. | Disability Retirement: | |
| | a. Eligibility: | Completion of 5 years of service. (Changed from earlier of age 50 with 5 years of service or completion of 10 years of service at June 30, 1987.) |
| | b. Benefit Amount: | Normal retirement benefit formula based on service and final average salary to date of disability retirement. |
| 9. | Deferred Service Retirement: | |
| | a. Eligibility: | Completion of 5 years of service and election to leave employee contributions on deposit. (Changed from 10 years of service at June 30, 1987.) |
| | b. Benefit Amount: | Retirement benefits payable at normal retirement date are determined according to the normal retirement benefit formula based on the member's final average salary and service at termination; such amount being subject to an increase of 5% for each year between termination and retirement for years prior to January 1, 1981 and 3% compounded annually thereafter. |

Appendix B (continued)

10. Return of Contributions: Upon termination of employment, a member may elect the return of contributions with 5% interest compounded annually in lieu of all other benefits under the plan.

11. Surviving Spouse Death Benefit:

a. Eligibility: Death of member in service at age 50 with at least 5 years of service or any age with 30 years of service. Between June 30, 1986 and June 30, 1987, the requirements were age 50 with 10 years of service. Between June 30, 1984 and June 30, 1986, the requirements were age 55 with 10 years of service.

b. Benefit Amount: The surviving spouse may elect one of the following:

- o Refund of member contributions with 5% interest. (Changed from 3-1/2% as of June 30, 1984); or
- o 100% of the annuity the member would have received had he retired early (if eligible) and elected a 100% joint and survivor annuity commencing on the later of age 55 or his date of death. Benefit will commence at the later of member age 55 or date of death.

Appendix B (continued)

12. Combined Service Provision:

| | | |
|---|---|---|
| a. | Eligible Members: | Members who have had coverage under two or more Minnesota Public Retirement Systems, with a total of at least 10 years of credited service. |
| b. | Benefit Provisions: | Benefits under both plans are based on the highest final average salary, including all years from both plans, and on the plans in effect on the member's last day in covered public employment. |

13. Proportionate Annuity: Any member who terminated after attaining age 65 and completing at least one year of service is entitled to a proportionate retirement annuity based on his allowable service credit.

# APPENDIX C

## ACTUARIAL METHODS AND ASSUMPTIONS

### ACTUARIAL METHODS

Chapter 356 of the Minnesota Statutes calls for the determination of normal cost and accrued liability in accordance with the entry age normal cost method, one of several available projected cost methods. For the June 30, 1987 valuation, we used the individual entry age normal method, with salary scale.

The unfunded liability is amortized by the level percent of payroll method. (Each amortization payment is calculated as if the following year's payment will increase by 6.5%.)

### ACTUARIAL ASSUMPTIONS

The tables on the following pages summarize the actuarial assumptions used for this valuation.

### CHANGES IN ACTUARIAL ASSUMPTIONS

Effective June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of: (a) their contributions accumulated with interest, or (b) the value of their deferred benefit. Prior to June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to leave their contribution on deposit and receive a deferred benefit. This assumption change was made in order to review the actuarial valuation results as calculated by the Wyatt Company, actuary for the Legislative Commission on Pensions and Retirement.

# APPENDIX C

## MINNESOTA STATE RETIREMENT SYSTEM
## GENERAL EMPLOYEES' RETIREMENT FUND

### Summary of Actuarial Assumptions and Methods

| | | |
|---|---|---|
| 1. | Mortality: | 1971 Group Annuity Mortality Table with ages set back 8 years for females. |
| 2. | Post-Disablement Mortality: | Combined Annuity Mortality Table. |
| 3. | Withdrawal: | Graded rates based on actual experience developed by the June 30, 1971 and subsequent experience analyses and set forth in the Separation from Active Service Table. |
| 4. | Expenses: | Prior year's expenses expressed as a percentage of prior year's payroll. |
| 5. | Interest Rate: | Pre-retirement - 8% per annum.<br>Post-retirement - 5% per annum. |
| 6. | Salary Scale: | 6-1/2% per annum. |
| 7. | Assumed Retirement Age: | Graded rates beginning at age 58 set forth in the Separation from Active Service Table. Fifty percent of those eligible to retire under the Rule of 85 are assumed to do so, and members age 65 or over are assumed to retire one year hence. |
| 8. | Actuarial Cost Method: | Entry age cost method, with normal cost determined as a level percentage of future covered payroll, on an individual basis. |
| 9. | Return of Contributions: | Effective June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of their contributions, accumulated with interest, or the value of their deferred benefit. Previously, 60% of employees withdrawing before retirement were assumed to elect return of contributions in lieu of a deferred benefit. |

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Male General Members
Probabilities of Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

| Age | Withdrawal | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|
| 20 | 2,400 | 5 | | |
| 21 | 2,250 | 5 | | |
| 22 | 2,080 | 5 | | |
| 23 | 1,920 | 6 | | |
| 24 | 1,760 | 6 | | |
| 25 | 1,600 | 6 | | |
| 26 | 1,470 | 7 | | |
| 27 | 1,340 | 7 | | |
| 28 | 1,230 | 7 | | |
| 29 | 1,130 | 8 | | |
| 30 | 1,040 | 8 | 2 | |
| 31 | 950 | 9 | 2 | |
| 32 | 890 | 9 | 2 | |
| 33 | 830 | 10 | 2 | |
| 34 | 770 | 10 | 2 | |
| 35 | 720 | 11 | 2 | |
| 36 | 680 | 12 | 2 | |
| 37 | 640 | 13 | 2 | |
| 38 | 600 | 14 | 2 | |
| 39 | 560 | 15 | 2 | |
| 40 | 530 | 16 | 2 | |
| 41 | 500 | 18 | 2 | |
| 42 | 480 | 20 | 2 | |
| 43 | 460 | 23 | 3 | |
| 44 | 430 | 26 | 3 | |
| 45 | 410 | 29 | 3 | |
| 46 | 390 | 33 | 5 | |
| 47 | 370 | 38 | 7 | |
| 48 | 350 | 42 | 9 | |
| 49 | 340 | 47 | 11 | |

Appendix C (continued)

| Age | Withdrawal | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|
| 50 | 320 | 53 | 14 | |
| 51 | 300 | 59 | 16 | |
| 52 | 280 | 65 | 20 | |
| 53 | 260 | 71 | 24 | |
| 54 | 240 | 78 | 28 | |
| 55 | 210 | 85 | 34 | |
| 56 | 170 | 93 | 40 | |
| 57 | 140 | 100 | 46 | |
| 58 | 90 | 109 | 56 | 30 |
| 59 | 40 | 119 | 66 | 30 |
| 60 | | 131 | 76 | 40 |
| 61 | | 144 | 90 | 150 |
| 62 | | 159 | 110 | 500 |
| 63 | | 174 | 136 | 500 |
| 64 | | 192 | 174 | 2,000 |
| 65 | | | | 10,000 |

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Female General Members
Probabilities of Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

| Age | Withdrawal | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|
| 20 | 3,700 | 4 | | |
| 21 | 3,550 | 4 | | |
| 22 | 3,390 | 4 | | |
| 23 | 3,230 | 4 | | |
| 24 | 3,070 | 4 | | |
| 25 | 2,910 | 5 | | |
| 26 | 2,750 | 5 | | |
| 27 | 2,600 | 5 | | |
| 28 | 2,430 | 5 | | |
| 29 | 2,270 | 5 | | |
| 30 | 2,120 | 5 | | |
| 31 | 1,970 | 6 | | |
| 32 | 1,820 | 6 | | |
| 33 | 1,680 | 6 | | |
| 34 | 1,540 | 7 | | |
| 35 | 1,410 | 7 | 1 | |
| 36 | 1,300 | 7 | 1 | |
| 37 | 1,190 | 8 | 1 | |
| 38 | 1,090 | 8 | 1 | |
| 39 | 1,000 | 9 | 2 | |
| 40 | 920 | 9 | 2 | |
| 41 | 850 | 10 | 2 | |
| 42 | 780 | 10 | 4 | |
| 43 | 720 | 11 | 4 | |
| 44 | 680 | 12 | 4 | |
| 45 | 630 | 13 | 5 | |
| 46 | 590 | 14 | 6 | |
| 47 | 560 | 15 | 7 | |
| 48 | 530 | 16 | 7 | |
| 49 | 500 | 18 | 10 | |

Appendix C (continued)

| Age | Withdrawal | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|
| 50 | 470 | 20 | 10 | |
| 51 | 440 | 23 | 12 | |
| 52 | 410 | 26 | 14 | |
| 53 | 390 | 29 | 16 | |
| 54 | 360 | 33 | 20 | |
| 55 | 330 | 38 | 24 | |
| 56 | 290 | 42 | 30 | |
| 57 | 230 | 47 | 36 | |
| 58 | 170 | 53 | 44 | 50 |
| 59 | 90 | 59 | 52 | 50 |
| 60 | | 65 | 62 | 150 |
| 61 | | 71 | 74 | 150 |
| 62 | | 78 | 88 | 200 |
| 63 | | 85 | 104 | 350 |
| 64 | | 93 | 122 | 1,100 |
| 65 | | | | 10,000 |

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Touche Ross

Board of Directors
Minnesota State Retirement System
529 Jackson at 10th Street
St. Paul, Minnesota

Ladies and Gentlemen:

We are pleased to present our report on the June 30, 1987 actuarial valuation of the Minnesota State Retirement System, Correctional Employees' Retirement Fund.

Our report is divided into the following sections:

- Section I - Introduction and Purpose
- Section II - Comparison of Valuations
- Section III - Explanation of Differences
- Section IV - Changes in the Unfunded Liability
- Section V - Sensitivity Analysis
- Section VI - Summary of Historical Valuation Results
- Appendices
  - A. Summary of Employee Data
  - B. Description of Plan Provisions
  - C. Description of Assumptions and Methods

The report was completed on the basis of accepted actuarial methods and procedures in accordance with the provisions stipulated in the contract between the State of Minnesota and Touche Ross & Co.

We would be pleased to answer any questions you may have regarding this report.

Touche Ross & Co.

F. Jay Lingo

F. Jay Lingo, F.S.A.

James F. Verlautz

James F. Verlautz, F.S.A.

## I. INTRODUCTION AND PURPOSE

The Minnesota State Retirement System (MSRS) administers several retirement funds and plans. The plans administered are the: General State Employees' Plan, Unclassified Employees' Plan, Correctional Employees' Plan, State Troopers' Plan, Judges' Plan, Legislators' Plan, Elective Officers' Plan, Military Affairs Plan, Transportation Pilots' Plan, and a statewide Deferred Compensation Plan for public employees.

The plans administered by MSRS are among those subject to being overseen by the Legislative Commission on Pensions and Retirement (LCPR). The LCPR consists of members of the Minnesota State Senate and Minnesota House of Representatives. Its members are charged with the duties of, among other things:

- o Reviewing investment performance.
- o Establishing policy for public retirement plans.
- o Recommending necessary changes to retirement plan provisions.
- o Hiring an actuary to perform annual actuarial valuations and experience studies.
- o Overseeing the work of the actuary.

Minnesota Statutes, Sections 356.20 and 356.215, require annual actuarial valuations and periodic experience studies. Of concern to the Board of Directors are the valuations and experience studies which must be performed for the following:

- o The General State Employees' Plan;
- o The Correctional Employees' Plan;
- o The State Troopers' Plan; and
- o The Judges' Plan

These valuations and experience studies are prepared by the Wyatt Co., the actuary retained by the LCPR. The Minnesota State Retirement System does not have an actuary on its staff and, therefore, has retained Touche Ross to review, analyze, and critique the actuarial valuations and experience studies.

The purpose of this report is to verify the accuracy of Wyatt's results, and to expand on any items of particular significance.

## II. COMPARISON OF VALUATION RESULTS

We attempted to duplicate the figures shown in Wyatt's June 30, 1987 valuation reports. To do so involved repeated discussions with the Wyatt personnel who prepared their reports. Where we were able to discover reasonable justification for Wyatt's approach, we adjusted our methods and assumptions to match theirs. (Descriptions of those adjustments are included in Section III.)

In this section of the report we compare the figures generated by Wyatt with our valuations. Three tables are included. Table A shows the derivation of the unfunded liability. Table B shows the annual contribution requirements under both Section 352 and Section 356. Table C shows the depth of plan funding based on liabilities incurred to date. These figures are also required for Government Accounting Standards Board (GASB) reporting.

TABLE A (000's Omitted)

| | Wyatt Co. | Touche Ross | Percentage Difference |
|---|---|---|---|
| Present Value of Benefits: | | | |
| Actives: | | | |
| Retirement | $ 55,925 | $ 57,646 | 3.1% |
| Death | 1,954 | 1,979 | 1.3 |
| Disability | 1,441 | 1,434 | (.5) |
| Withdrawal | 17,171 | 17,304 | .8 |
| Total actives | $ 76,491 | $ 78,363 | 2.4 |
| Deferred annuitants | 2,444 | 2,932 | 20.0 |
| Former members without vested rights | 224 | 169 | (24.6) |
| Participants in MPRI Fund | 22,680 | 22,510 | (.7) |
| Total | $101,839 | $103,974 | 2.1 |
| Portion allocated to future service | 29,758 | 30,432 | 2.3 |
| Accrued liability (reserves required) | $ 72,081 | $ 73,542 | 2.0 |
| Valuation assets | 67,488 | 67,488 | 0.0 |
| Unfunded accrued liability | $ 4,593 | $ 6,054 | 31.8 |
| Funded ratio | 93.6% | 91.8% | - |

CONTRIBUTIONS

Chapters 352 and 356 set forth requirements about the level of contributions. Chapter 352 prescribes the actual amount of contributions, and Chapter 356 describes the methods used to determine the amount of contribution required to fully fund the normal cost and the unfunded accrued liability. Together, the actual contribution and required contribution are used to determine the sufficiency of the actual contribution. These calculations are illustrated in Table B. Amounts in parentheses show dollar amounts as a percent of payroll.*

TABLE B (000's omitted)

| Actuarially Determined Contribution | Wyatt Co. | Touche Ross |
|---|---|---|
| 1. Normal cost | $3,257 (9.26%) | $3,454 (9.82%) |
| 2. Assumed operating expense | $ 95 (.27%) | $ 95 (.27%) |
| 3. Amortization by June 30, 2017 of the unfunded accrued liability | $ 193 (.55%) | $ 255 (.72%) |
| 4. Total Chapter 356 requirement: (1) + (2) + (3) | $3,545 (10.08%) | $3,804 (10.81%) |
| **Prescribed Contributions** | | |
| 1. Employee contributions | $1,723 (4.90%) | $1,724 (4.90%) |
| 2. Employer contribution | $3,059 (8.70%) | $3,061 (8.70%) |
| 3. Total Chapter 352A prescribed contribution | $4,782 (13.60%) | $4,785 (13.60%) |
| **Contribution Sufficiency** | 3.52% | 2.79% |

* Assuming that contributions are paid during each payroll period throughout the year ending June 30, 1988. Expected annual payroll = $35,181,000.

The depth of funding is an indication of the extent to which the accrued benefits are funded and is measured by the ratio of valuation assets to the present value of accrued benefits. These measurements are made on the plan continuation basis (applying all ongoing actuarial assumptions, including assumed salary increases and turnover) and are illustrated as follows:

TABLE C (000's omitted)

Depth of Funding June 30, 1987

| | | Wyatt Co. | Touche Ross | Percentage Difference |
|---|---|---|---|---|
| 1. | Active members | $36,140 | $36,375 | .7% |
| 2. | Deferred annuitants | 2,444 | 2,932 | 20.0 |
| 3. | Former members without vested rights | 224 | 169 | (24.6) |
| 4. | Participation in MPRI Fund | 22,680 | 22,510 | (.7) |
| 5. | Total present values of accrued benefits | $61,488 | $61,986 | .8 |
| 6. | Valuation assets | 67,488 | 67,488 | 0.0 |
| 7. | Depth of funding | 109.8% | 108.9% | - |
| 8. | Depth of funding excluding MPRI members | 115.5% | 113.9% | - |

## III. EXPLANATION OF DIFFERENCES

In this section of the report we present our best explanations for any differences between Wyatt's methods and assumptions and ours, the changes we made where appropriate to be consistent with Wyatt, and the effects of these changes.

Our calculations for the Correctional Employees' Retirement Plan are very similar to those of the Wyatt Company, and our valuation results in Table A of Section II are very close. Our total present value of benefits is 2.1% higher than Wyatt's, while our total accrued liability is only 2% higher than Wyatt's total. One reason that a small difference exists is that in our valuation, we load the liabilities by 1% to account for the additional cost of the cash refund annuity. Wyatt has indicated that they believe the load should be smaller than 1%.

When we subtracted the actuarial value of assets to derive the unfunded accrued liability, the percentage difference increased to almost 32%. This difference is misleading since it only occurs because the plan is so well funded.

In prior year valuations, we assumed that retirement benefits would never exceed current IRS limits on benefits. During our discussions with Wyatt, they indicated that they expect the IRS limit to increase at the same rate as the salary scale. In effect, this assumes that the limits will never apply to individuals in this plan. We changed our valuation process this year so that these limits would not apply. This change increased the accrued liability by less than 1%.

In calculating the present value of disability benefits, Wyatt assumed that the benefit remained level until death. We assumed that the benefit reverted to the General Plan level just as a regular Correctional Plan benefit would do. The effect of this difference was an increase in the accrued liability of $200,000.

Wyatt excluded one individual from the calculations because the data indicated he was hired prior to age 16. We included the individual in our calculations, and estimate that our unfunded liability is approximately $100,000 higher as a result.

## IV. CHANGES IN THE UNFUNDED LIABILITY

The Correctional Plan currently has an unfunded liability. Having an unfunded liability is not necessarily bad for an ongoing plan, as long as some provision is made to pay off the liability over time. The unfunded liability becomes a problem when it is so large as to preclude benefit security, or when, like any debt, interest on the liability becomes unmanageable.

Generally, unfunded liabilities tend to decrease over time, although some year to year fluctuation is normal. One symptom of a troubled pension plan is a constantly increasing unfunded liability. Annual changes in the unfunded liability occur for the following reasons:

- Part of the contribution made each year goes to pay the normal costs (including expenses). The remaining contribution is called the Past Service Contribution. The unfunded liability is automatically increased each year by the interest requirement (8%). If the past service contribution is less than the interest requirement, there will be a net increase in the liability. When the past service contribution is greater than the interest requirement, part of the liability is "paid off," and the liability decreases.

- The unfunded liability is an actuarial projection of liabilities based on certain assumptions. To the extent actual experience differs from the assumptions, actuarial gains and losses may occur. An actuarial gain will decrease the unfunded liability; an actuarial loss will increase the unfunded liability.

- The assumptions and techniques used in calculating the unfunded liability are changed when circumstances warrant. These changes can produce increases or decreases in the unfunded liability.

- Changes in the legal, economic, and sociological environment often result in changes to retirement plans. These changes frequently result in improved benefits. When these changes result in higher retirement benefits, unfunded liabilities are increased. When the changes increase benefits paid in lieu of retirement benefits, unfunded liabilities can increase or decrease.

During the year ended June 30, 1987, the Correctional Employees' Fund showed an increase in the unfunded liability. This increase was caused by to the following reasons:

1. Contribution Rate

   The total contributions to the plan were approximately $4,300,000. Normal cost, expenses and interest combined to equal $2,706,000. This resulted in a reduction of $1,600,000 in the unfunded liability.

2. Actuarial Gains

   The Fund experienced actuarial gains of approximately $600,000 because of salary increases which were smaller than anticipated and $2,600,000 of investment gains that were greater than anticipated. In addition, there was a $1,200,000 loss from other sources, including MPRI fund mortality. Overall, there was a net gain (reduction in unfunded liability) from actuarial experience of $2 million.

3. Changes in Assumptions and Plan Provisions

   We had previously assumed that all participants separating from service prior to retirement (or disability) would take their contributions accumulated with interest. This year Wyatt assumed that those people who are eligible for the pre-retirement death benefit would take the death benefit. They also assumed that those people eligible for the deferred annuity would take either their contributions with interest or the deferred annuity, whichever had a larger present value.

   In addition, the plan was changed this year to provide 100% vesting after five years of service. This change had very little effect, since those individuals with more than ten years are not affected, and those individuals who terminate with less than ten years are likely to elect a return of contributions.

   The combined effect of these changes was a $6,100,000 increase in unfunded liability.

## Changes in Unfunded Actuarial Accrued Liability*
(000's omitted)

| | | |
|---|---|---|
| A. | Unfunded actuarial accrued liability at beginning of year | $2,148 |
| B. | Change due to interest requirement and current rate of funding | (1,599) |
| C. | Expected actuarial accrued liability at end of year: (A) + (B) | $ 549 |
| D. | Actuarial losses (gains) | (2,046) |
| E. | Changes in assumptions and plan provisions | 6,090 |
| F. | Unfunded actuarial accrued liability at end of year: (C) + (D) + (E) | $4,593 |

* Results prepared by the Wyatt Company.

## V. SENSITIVITY ANALYSIS

When performining an actuarial valuation, liabilities and contributions are developed under a single actuarial cost method and one set of actuarial assumptions. However, since it is unlikely that any given assumption will prove to be exactly correct, analyzing the impact of a variation in an assumption is generally enlightening. This analysis is called a sensitivity analysis.

We have analyzed the sensitivity to change of three of these assumptions and methods mandated by state law. Each of these plays a major role in determining costs:

1. Interest is currently assumed to be 8% for all years until retirement, and 5% thereafter. We examined the effect of changing 8% to 7%.

2. Salaries are assumed to increase 6.5% each year. We examined the effect of a 6% salary increase assumption.

3. The unfunded liability is amortized as a level percent of future payroll. This approach is not permitted for a private sector plan. We examined the effect of amortizing the unfunded liability using a level dollar amount.

| | | Value After Change | | |
|---|---|---|---|---|
| | Current (Touche Ross) | Interest | Salary Increase | Amortization |
| Unfunded liability | $ 6,054 | $10,821 | $ 4,762 | $ 6,054 |
| Actuarially required Contribution: | | | | |
| (Amount) | 3,804 | 4,509 | 3,583 | 4,066 |
| (Percent) | 10.81% | 12.82% | 10.18% | 11.56% |
| (Sufficiency) | 2.79% | .78% | 3.42% | 2.04% |
| Plan continuation liability | $61,986 | $66,408 | $60,841 | $61,986 |
| Depth of funding: | 108.9% | 101.6% | 110.9% | 108.9% |

CORRECTIONAL EMPLOYEES

## VI. SUMMARY OF HISTORICAL VALUATION RESULTS**

(000'S Omitted)

| Report as of June 30 | Accrued Liability | Valuation Assets | Unfunded Accrued Liability | Normal Cost | Actuarial Contribution | Prescribed Contribution | Sufficiency |
|---|---|---|---|---|---|---|---|
| 1980* | $29,251 | $22,178 | $7,073 | $1,787 (10.64%) | $2,284 (13.60%) | $3,359 (20.00%) | 6.40% |
| 1981 | 29,876 | 26,284 | 3,592 | 2,027 (11.05%) | 2,301 (12.55%) | 3,667 (20.00%) | 7.45 |
| 1982 | 34,520 | 30,400 | 4,120 | 2,150 (10.52%) | 2,460 (12.04%) | 2,568 (12.57%) | .53 |
| 1983 | 39,550 | 36,068 | 3,482 | 2,603 (10.62%) | 2,879 (11.75%) | 3,998 (16.31%) | 4.56 |
| 1984 | 43,888 | 40,153 | 3,735 | 2,562 (9.49%) | 2,788 (10.33%) | 3,671 (13.60%) | 3.27 |
| 1985 | 53,825 | 48,700 | 5,125 | 2,931 (9.43%) | 3,269 (10.52%) | 4,226 (13.60%) | 3.08 |
| 1986 | 58,060 | 57,472 | 588 | 3,113 (9.28%) | 3,233 (9.64%) | 4,561 (13.60%) | 3.96 |
| 1987* | 72,081 | 67,488 | 4,593 | 3,257 (9.26%) | 3,545 (10.08%) | 4,782 (13.60%) | 3.52 |

* As prepared by the Wyatt Co.

** Figures shown in parenthesis are as a percentage of payroll under normal retirement age.

CORRECTIONAL EMPLOYEES

## VI. SUMMARY OF HISTORICAL VALUATION RESULTS (Continued)

| Report as of June 30 | Active Members Number | Active Members Valuation Payroll | Retired Members** Number | Retired Members** Avg. Annual Ben. | Deferred Annuitants Number | Deferred Annuitants Avg. Annual Ben. | Former Members Without Vested Rights |
|---|---|---|---|---|---|---|---|
| 1980* | 990 | $16,795,854 | 257 | $4,757 | 7 | $6,714 | 15 |
| 1981 | 965 | 18,336,416 | 275 | 4,938 | 5 | 6,722 | 38 |
| 1982 | 1,010 | 20,984,656 | 293 | 5,346 | 10 | 7,180 | 39 |
| 1983 | 1,124 | 25,186,035 | 295 | 5,410 | 12 | 7,210 | 27 |
| 1984 | 1,174 | 26,998,637 | 326 | 5,959 | 25 | 7,136 | 95 |
| 1985 | 1,192 | 31,075,810 | 329 | 6,403 | 29 | 9,032 | 79 |
| 1986 | 1,219 | 33,533,822 | 328 | 6,908 | 35 | 8,285 | 83 |
| 1987* | 1,232 | 35,155,000 | 333 | 7,383 | 43 | 7,928 | 84 |

* As prepared by the Wyatt Co.
** Including beneficiaries and disabled members.

# APPENDIX A

## SUMMARY OF EMPLOYEE DATA

The Executive Director furnished us with employee information pertaining to all active members, inactive members, and retired members of the Fund. The following tables summarize the changes in active, inactive, and retired membership during the year.

In order to reflect anticipated current year salary increases, all salaries provided were increased by 6.5%.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Covered Correctional Employees' Census Data as of June 30, 1987

| | Number | Annual Payroll |
|---|---|---|
| Actives at June 30, 1986 | 1,219 | $33,533,822 |
| New Entrants* | 106 | |
| Total | 1,325 | |
| Less Separations from Active Service: | | |
| Refund of Contributions* | 54 | 1,100,269 |
| Separation with a Deferred Annuity | 3 | 105,544 |
| Separation with Neither Refund nor Right to a Deferred Annuity | 12 | 172,625 |
| Death | 1 | 29,905 |
| Service Retirement | 13 | 396,755 |
| Disability | 0 | 0 |
| Total Separations | 83 | |
| Net Transfers to and from Other Plans | (9) | |
| Actives at June 30, 1987 | 1,233 | $35,181,294 |

Average Entry Age of New Employees

| For the Fiscal Year Ending | Male | Female | Average of Total |
|---|---|---|---|
| 6/30/83 | 26.5 | 28.3 | 26.7 |
| 6/30/84 | 28.7 | 32.4 | 29.4 |
| 6/30/85 | 29.2 | 28.6 | 29.0 |
| 6/30/86 | 29.8 | 32.1 | 30.4 |
| 6/30/87 | 30.0 | 30.1 | 30.0 |

* Includes those who entered the plan and terminated during the period from July 1, 1986 to June 30, 1987.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Correctional Employees' Annuitant Census Data as of June 30, 1987

| | | Number | Annual Annuity Benefit Payable |
|---|---|---|---|
| A. | Service Retirement Annuitants | | |
| | Receiving at June 30, 1986 | 309 | $2,139,003 |
| | New | 13 | 143,255 |
| | Deaths | (11) | (66,499) |
| | Adjustments - Net Result | 2 | 99,781 |
| | Receiving at June 30, 1987 | 313 | $2,315,540 |
| B. | Disabled Employees | | |
| | Receiving at June 30, 1986 | 11 | $ 71,322 |
| | New | 0 | 0 |
| | Deaths | 0 | 0 |
| | Adjustments - Net Result | — | 6,984 |
| | Receiving at June 30, 1987 | 11 | $ 78,306 |
| C. | Widows Receiving an Annuity or Survivor Benefit | | |
| | Beneficiaries Receiving an Optional or Reversionary Annuity: | | |
| | Receiving at June 30, 1986 | 8 | $ 55,409 |
| | New | 1 | 3,953 |
| | Adjustments - Net Result | 0 | 5,426 |
| | Receiving at June 30, 1987 | 9 | $ 64,788 |

Appendix A (continued)

| | | Number | Annual Annuity Benefit Payable |
|---|---|---|---|
| D. | Children Receiving a Survivor Benefit | 0 | $ 0 |
| E. | Deferred Annuitants | | |
| | Receiving at June 30, 1986 | 35 | 283,980 |
| | New | 10 | 76,737 |
| | Began Receiving | (2) | (19,824) |
| | Adjustments | 0 | 0 |
| | Receiving at June 30, 1987 | 43 | $ 340,893 |

Average Age at Retirement of New Service Annuitants

| Fiscal Year Ending | Average Retirement Age |
|---|---|
| 6/30/82 | 56.4 |
| 6/30/83 | 55.6 |
| 6/30/84 | 57.8 |
| 6/30/85 | 57.8 |
| 6/30/86 | 55.4 |
| 6/30/87 | 56.8 |
| All Existing Service Annuitants | 58.2 |

Appendix B

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Summary of Principal Plan Provisions as of June 30, 1987

Correctional Employees

| | |
|---|---|
| 1. Coverage: | From first date of employment. |
| 2. Service Credit: | Service is credited from date of coverage. |
| 3. Contributions: | |
| a. Employee: | 4.90% of salary. |
| b. State of Minnesota: | 8.70% of salary. |
| 4. Final Average Salary: | Monthly average for the highest 5 consecutive years of salary. |
| 5. Normal Retirement: | |
| a. Eligibility: | Attainment of age 55 and completion of 5 years of service. (Changed from 10 years of service at June 30, 1987.) |
| b. Retirement Benefit: | General Plan benefit plus an additional benefit defined below. |
| c. Additional Benefit: | Final average salary times the sum of:<br>o 1-1/2% for each of first 10 years of service; plus<br>o 1% for each of next 15 years of service; plus<br>o 1/2% for each year of service thereafter. |

Appendix B (continued

d. Limitation on Additional Benefit: That amount which, when added to the General Plan benefit, provides a retirement benefit of 75% of final average salary.

e. Additional Benefits Period: 84 months or until attainment of age 65, whichever comes first.

f. Minimum Benefit Following Additional Benefit Period: That amount which, when added to Social Security benefits, equals the benefit payable during the additional benefit period.

6. Disability Retirement:

a. Eligibility:

- In line of duty: None.
- Not in line of duty: Five years of service and less than age 55.

b. Benefit Amount:

- In line of duty: 50% of average monthly salary plus 2% for each year of service in excess of 20, offset by Workers' Compensation.
- Not in line of duty: 2-1/2% of average monthly salary for each year up to and including 20 years, plus 2% for each year in excess of 20, subject to a minimum of 25%.

c. Limitation: At age 62, General Plan benefit based on credited service is payable subject to a minimum benefit of 10% of pay.

Appendix B (continued

7. Deferred Service Retirement:

   a. Eligibility: Completion of 5 years of service and election to leave employee contributions on deposit. (Changed from 10 years of service at June 30, 1987.)

   b. Benefit Amount: Retirement benefits payable at normal retirement date are determined according to the normal retirement benefit formula based on the member's final average salary and service at termination; such amount being subject to an increase of 5% for each year between termination and retirement for years prior to January 1, 1981 and 3% compounded annually thereafter.

8. Return of Contributions: Upon termination of employment, a member may elect the return of contributions with 5% interest compounded annually in lieu of all other benefits under the plan.

9. Surviving Spouse Death Benefit:

   a. Eligibility: Death of member in service at age 50 at least with 5 years of service or at any age with 30 years of service. Between June 30, 1986 and June 30, 1987, the requirements were age 50 with 10 years of service. Between June 30, 1984 and June 30, 1986, the requirements were age 55 with 10 years of service.

Appendix B (continued

b. Benefit Amount: The surviving spouse may elect one of:

- o Refund of member contributions with 5% interest. (Changed from 3-1/2% as of June 30, 1984); or
- o 100% of the annuity the member would have received had he retired early (if eligible) and elected a 100% joint and survivor annuity commencing on the later of age 55 or his date of death. Benefit will commence later of member age 55 or date of death.

10. Combined Service Provision:

a. Eligible Members: Members who have had coverage under two or more Minnesota Public Retirement Systems, with a total of at least 10 years of credited service.

b. Benefit Provisions: Benefits under both plans are based on the highest final average salary, including all years from both plans, and on the plans in effect on the member's last day in covered public employment.

12. Proportionate Annuity: Any member who terminated after attaining age 65 and completing at least one year of service is entitled to a proportionate retirement annuity based on his allowable service credit.

# APPENDIX C

## ACTUARIAL METHODS AND ASSUMPTIONS

### ACTUARIAL METHODS

Chapter 356 of the Minnesota Statutes calls for the determination of normal cost and accrued liability in accordance with the entry age normal cost method, one of several available projected cost methods. For the June 30, 1987 valuation, we used the individual entry age normal method, with salary scale.

The unfunded liability is amortized by the level percent of payroll method. (Each amortization payment is calculated as if the following year's payment will increase by 6.5%.)

### ACTUARIAL ASSUMPTIONS

The tables on the following pages summarize the actuarial assumptions used for this valuation.

### CHANGES IN ACTUARIAL ASSUMPTIONS

Effective June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of: (a) their contributions accumulated with interest, or (b) the value of their deferred benefit. Prior to June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to leave their contribution on deposit and receive a deferred benefit. This assumption change was made in order to review the actuarial valuation results as calculated by the Wyatt Company, actuary for the Legislative Commission on Pensions and Retirement.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Summary of Actuarial Assumptions and Methods

| | | |
|---|---|---|
| 1. | Mortality: | 1971 Group Annuity Mortality Table with ages set back 8 years for females. |
| 2. | Post-Disablement Mortality: | Combined Annuity Mortality Table. |
| 3. | Withdrawal: | Graded rates based on actual experience developed by the June 30, 1971 and subsequent experience analyses and set forth in the Separation from Active Service Table. |
| 4. | Expenses: | Prior year's expenses expressed as a percentage of prior year's payroll. |
| 5. | Interest Rate: | Pre-retirement - 8% per annum.<br>Post-retirement - 5% per annum. |
| 6. | Salary Scale: | 6-1/2% per annum. |
| 7. | Assumed Retirement Age: | Graded rates beginning at age 58 set forth in the Separation from Active Service Table. Fifty percent of those eligible to retire under the Rule of 85 are assumed to do so, and members age 65 or over are assumed to retire in one year hence. |
| 8. | Actuarial Cost Method: | Entry age cost method, with normal cost determined as a level percentage of future covered payroll, on an individual basis. |
| 9. | Social Security: | Based on the present law and 6-1/2% salary scale applicable to current salaries. Future Social Security benefits replace the same proportion of salary as at present. |

Appendix C (continued)

10. Return of Contributions: Effective June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of their contributions, accumulated with interest, or the value of their deferred benefit. Previously, all employees withdrawing before retirement were assumed to elect return of contributions in lieu of a deferred benefit.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Male Correctional Members
Probabilities of Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

| Age | Withdrawal | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|
| 20 | 2,400 | 5 | | |
| 21 | 2,250 | 5 | | |
| 22 | 2,080 | 5 | | |
| 23 | 1,920 | 6 | | |
| 24 | 1,760 | 6 | | |
| 25 | 1,600 | 6 | | |
| 26 | 1,470 | 7 | | |
| 27 | 1,340 | 7 | | |
| 28 | 1,230 | 7 | | |
| 29 | 1,130 | 8 | | |
| 30 | 1,040 | 8 | 2 | |
| 31 | 950 | 9 | 2 | |
| 32 | 890 | 9 | 2 | |
| 33 | 830 | 10 | 2 | |
| 34 | 770 | 10 | 2 | |
| 35 | 720 | 11 | 2 | |
| 36 | 680 | 12 | 2 | |
| 37 | 640 | 13 | 2 | |
| 38 | 600 | 14 | 2 | |
| 39 | 560 | 15 | 2 | |
| 40 | 530 | 16 | 2 | |
| 41 | 500 | 18 | 2 | |
| 42 | 480 | 20 | 2 | |
| 43 | 460 | 23 | 3 | |
| 44 | 430 | 26 | 3 | |
| 45 | 410 | 29 | 3 | |
| 46 | 390 | 33 | 5 | |
| 47 | 370 | 38 | 7 | |
| 48 | 350 | 42 | 9 | |
| 49 | 340 | 47 | 11 | |

Appendix C (continued)

| Age | Withdrawal | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|
| 50 | 320 | 53 | 14 | |
| 51 | 300 | 59 | 16 | |
| 52 | 280 | 65 | 20 | |
| 53 | 260 | 71 | 24 | |
| 54 | 240 | 78 | 28 | |
| 55 | 210 | 85 | 34 | |
| 56 | 170 | 93 | 40 | |
| 57 | 140 | 100 | 46 | |
| 58 | | | | 10,000 |

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Female Correctional Members
Probabilities of Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

| Age | Withdrawal | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|
| 20 | 3,700 | 4 | | |
| 21 | 3,550 | 4 | | |
| 22 | 3,390 | 4 | | |
| 23 | 3,230 | 4 | | |
| 24 | 3,070 | 4 | | |
| 25 | 2,910 | 5 | | |
| 26 | 2,750 | 5 | | |
| 27 | 2,600 | 5 | | |
| 28 | 2,430 | 5 | | |
| 29 | 2,270 | 5 | | |
| 30 | 2,120 | 5 | | |
| 31 | 1,970 | 6 | | |
| 32 | 1,820 | 6 | | |
| 33 | 1,680 | 6 | | |
| 34 | 1,540 | 7 | | |
| 35 | 1,410 | 7 | 1 | |
| 36 | 1,300 | 7 | 1 | |
| 37 | 1,190 | 8 | 1 | |
| 38 | 1,090 | 8 | 1 | |
| 39 | 1,000 | 9 | 2 | |
| 40 | 920 | 9 | 2 | |
| 41 | 850 | 10 | 2 | |
| 42 | 780 | 10 | 4 | |
| 43 | 720 | 11 | 4 | |
| 44 | 680 | 12 | 4 | |
| 45 | 630 | 13 | 5 | |
| 46 | 590 | 14 | 6 | |
| 47 | 560 | 15 | 7 | |
| 48 | 530 | 16 | 7 | |
| 49 | 500 | 18 | 10 | |

Appendix C (continued)

| Age | Withdrawal | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|
| 50 | 470 | 20 | 10 | |
| 51 | 440 | 23 | 12 | |
| 52 | 410 | 26 | 14 | |
| 53 | 390 | 29 | 16 | |
| 54 | 360 | 33 | 20 | |
| 55 | 330 | 38 | 24 | |
| 56 | 290 | 42 | 30 | |
| 57 | 230 | 47 | 36 | |
| 58 | | | | 10,000 |

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Touche Ross

Board of Directors
Minnesota State Retirement System
529 Jackson at 10th Street
St. Paul, Minnesota

Ladies and Gentlemen:

We are pleased to present our report on the June 30, 1987 actuarial valuation of the Minnesota State Retirement System, State Patrol Employees' Retirement Fund.

Our report is divided into the following sections:



The report was completed on the basis of accepted actuarial methods and procedures in accordance with the provisions stipulated in the contract between the State of Minnesota and Touche Ross & Co.

We would be pleased to answer any questions you may have regarding this report.

Touche Ross & Co.

F. Jay Lingo
F. Jay Lingo, F.S.A.

James F. Verlautz
James F. Verlautz, F.S.A.

## I. INTRODUCTION AND PURPOSE

The Minnesota State Retirement System (MSRS) administers several retirement funds and plans. The plans administered are the: General State Employees' Plan, Unclassified Employees' Plan, Correctional Employees' Plan, State Troopers' Plan, Judges' Plan, Legislators' Plan, Elective Officers' Plan, Military Affairs Plan, Transportation Pilots' Plan, and a statewide Deferred Compensation Plan for public employees.

The plans administered by MSRS are among those subject to being overseen by the Legislative Commission on Pensions and Retirement (LCPR). The LCPR consists of members of the Minnesota State Senate and Minnesota House of Representatives. Its members are charged with the duties of, among other things:

- Reviewing investment performance.
- Establishing policy for public retirement plans.
- Recommending necessary changes to retirement plan provisions.
- Hiring an actuary to perform annual actuarial valuations and experience studies.
- Overseeing the work of the actuary.

Minnesota Statutes, Sections 356.20 and 356.215, require annual actuarial valuations and periodic experience studies. Of concern to the Board of Directors are the valuations and experience studies which must be performed for the following:

- The General State Employees' Plan;
- The Correctional Employees' Plan;
- The State Troopers' Plan; and
- The Judges' Plan

These valuations and experience studies are prepared by the Wyatt Co., the actuary retained by the LCPR. The Minnesota State Retirement System does not have an actuary on its staff and, therefore, has retained Touche Ross to review, analyze, and critique the actuarial valuations and experience studies.

The purpose of this report is to verify the accuracy of Wyatt's results, and to expand on any items of particular significance.

## II. COMPARISON OF VALUATION RESULTS

We attempted to duplicate the figures shown in Wyatt's June 30, 1987 valuation reports. To do so involved repeated discussions with the Wyatt personnel who prepared their reports. Where we were able to discover reasonable justification for Wyatt's approach, we adjusted our methods and assumptions to match theirs. (Descriptions of those adjustments are included in Section III.)

In this section of the report we present a comparison of the figures generated by Wyatt and our valuations. Three tables are included. Table A shows the derivation of the unfunded liability. Table B shows the annual contribution requirements under both Section 352 and Section 356. Table C shows the depth of plan funding based on liabilities incurred to date. These figures are also required for Government Accounting Standards Board (GASB) reporting.

TABLE A (000's Omitted)

| | Wyatt Co. | Touche Ross | Percentage Difference |
|---|---|---|---|
| Present Value of Benefits: | | | |
| Actives: | | | |
| Retirement | $124,367 | $124,742 | .3% |
| Death | 4,836 | 4,759 | (1.6) |
| Disability | 12,327 | 11,547 | (6.3) |
| Withdrawal | 13,753 | 14,419 | 4.8 |
| Total actives | $155,283 | $155,467 | .1 |
| Deferred annuitants | 1,499 | 1,662 | 10.9 |
| Former members without Vested Rights | 46 | 35 | (23.9) |
| Participants in MPRI Fund | 60,771 | 60,820 | .1 |
| Participants not in MPRI Fund | 7,686 | 7,434 | (3.3) |
| Total | $225,285 | $225,418 | .1 |
| Portion allocated to future service | 64,657 | 65,290 | 1.0 |
| Accrued liability (reserves required) | $160,628 | $160,128 | (.3) |
| Valuation assets | 136,397 | 136,397 | 0.0% |
| Unfunded accrued liability | $ 24,231 | $ 23,731 | (2.1) |
| Funded ratio | 84.9% | 85.2% | - |

## CONTRIBUTIONS

Chapters 352 and 356 set forth requirements about the level of contributions. Chapter 352 prescribes the actual amount of contributions, and Chapter 356 describes the methods used to determine the amount of contribution required to fully fund the normal cost and the unfunded accrued liability. Together, the actual contribution and required contribution are used to determine the sufficiency of the actual contribution. These calculations are illustrated in Table B. Amounts in parentheses show dollar amounts as a percent of payroll.*

TABLE B (000's omitted)

| Actuarially Determined Contribution | Wyatt Co. | Touche Ross |
|---|---|---|
| 1. Normal cost | $5,173 (18.10%) | $5,452 (19.08%) |
| 2. Assumed operating expense | $ 189 (.66%) | $ 189 (.66%) |
| 3. Amortization by June 30, 2009 of the unfunded accrued liability | $1,323 (4.63%) | $1,293 (4.52%) |
| 4. Total Chapter 356 requirement: (1) + (2) + (3) | $6,685 (23.39%) | $6,934 (24.26%) |
| **Prescribed Contributions** | | |
| 1. Employee contributions | $2,430 (8.50%) | $2,430 (8.50%) |
| 2. Employer contribution | $5,402 (18.90%) | $5,402 (18.90%) |
| 3. Total Chapter 352B prescribed contribution | $7,832 (27.40%) | $7,832 (27.40%) |
| **Contribution Sufficiency** | 4.01% | 3.14% |

* Assuming that contributions are paid during each payroll period throughout the year ending June 30, 1988. Expected annual payroll = $28,583,000.

The depth of funding is an indication of the extent to which the accrued benefits are funded and is measured by the ratio of valuation assets to the present value of accrued benefits. These measurements are made on the plan continuation basis (applying all ongoing actuarial assumptions, including assumed salary increases and turnover) and are illustrated as follows:

TABLE C (000's omitted)

Depth of Funding June 30, 1987

| | | Wyatt Co. | Touche Ross | Percentage Difference |
|---|---|---|---|---|
| 1. | Active members | $ 83,105 | $ 83,681 | .7% |
| 2. | Deferred annuitants | 1,499 | 1,662 | 10.9 |
| 3. | Former members without vested rights | 46 | 35 | (23.9) |
| 4. | Participants in MPRI Fund | 60,771 | 60,820 | .1 |
| 5. | Participants not in MPRI Fund | 7,686 | 7,434 | (3.3) |
| 6. | Total present values of accrued benefits | $153,107 | $153,632 | .3 |
| 7. | Valuation assets | 136,397 | 136,397 | 0.0 |
| 8. | Depth of funding | 89.1% | 88.8% | - |
| 9. | Depth of funding excluding MPRI members | 81.9% | 81.4% | - |

## III. EXPLANATION OF DIFFERENCES

In this section of the report we present our best explanations for any differences between Wyatt's methods and assumptions and ours, the changes we made where appropriate to be consistent with Wyatt, and the effects of these changes.

Our calculations for the State Patrol Employees' Retirement Plan are very similar to those of the Wyatt Company, and our valuation results in Table A of Section II are very close. Our total present value of benefits is .1% higher than Wyatt's total, while our total accrued liability is only .3% lower.

The State Troopers' Plan does not have a cash deferred annuity. However, we believe that Wyatt adds a small amount to the liability (less than 1%) to cover that cost.

For valuations in previous years, we assumed that all disabilities would be non-occupational in nature. After talking to representatives from Wyatt, we found that they were assuming that 85% were occupational and 15% were non-occupational disabilities. This change in assumption increased the actuarial accrued liability by less than 1%.

We increased the withdrawal liability by 6% to account for the death benefit for future vested terminations. Wyatt has stated that they calculated this liability but are unable to give us the exact amount. We believe that a 6% load is a reasonable approximation for this ancillary benefit.

In this year's valuation, we included the present value of the annual 6% increase in the supplemental benefit for two disabled annuitants. This liability is roughly $300,000 at June 30, 1987. As explained to us by MSRS, this benefit is not a guaranteed benefit, and could potentially be excluded.

In prior year valuations, we assumed that retirement benefits would never exceed current IRS limits on benefits. During our discussions with Wyatt, they indicated that they expect the IRS limit to increase at the same rate as the salary scale. In effect, this assumes that the limits will never apply to individuals in this plan. We changed our valuation process this year so that these limits would not apply. This change increased the accrued liability by less than 1%.

The normal cost calculated by Wyatt is 5% less than ours. This is a more substantial difference than any of the others. We were unable to determine the cause of the difference.

## IV. CHANGES IN THE UNFUNDED LIABILITY

The State Patrol Plan currently has an unfunded liability. Having an unfunded liability is not necessarily bad for an ongoing plan, as long as some provision is made to pay off the liability over time. The unfunded liability becomes a problem when it is so large as to preclude benefit security, or when, like any debt, interest on the liability becomes unmanageable.

Generally, unfunded liabilities tend to decrease over time, although some year to year fluctuation is normal. One symptom of a troubled pension plan is a constantly increasing unfunded liability. Annual changes in the unfunded liability occur for the following reasons:

- Part of the contribution made each year goes to pay the normal costs (including expenses). The remaining contribution is called the Past Service Contribution. The unfunded liability is automatically increased each year by the interest requirement (8%). If the past service contribution is less than the interest requirement, there will be a net increase in the liability. When the past service contribution is greater than the interest requirement, part of the liability is "paid off," and the liability decreases.

- The unfunded liability is an actuarial projection of liabilities based on certain assumptions. To the extent actual experience differs from the assumptions, actuarial gains and losses may occur. An actuarial gain will decrease the unfunded liability; an actuarial loss will increase the unfunded liability.

- The assumptions and techniques used in calculating the unfunded liability are changed when circumstances warrant. These changes can produce increases or decreases in the unfunded liability.

- Changes in the legal, economic, and sociological environment often result in changes to retirement plans. These changes frequently result in improved benefits. When these changes result in higher retirement benefits, unfunded liabilities are increased. When the changes increase benefits paid in lieu of retirement benefits, unfunded liabilities can increase or decrease.

During the year ended June 30, 1987, the State Patrol Employees' Fund showed a decrease in the unfunded liability. This decrease was due to the following reasons:

1. Contribution Rate

   The total contributions to the plan were approximately $7 million. Normal cost, expenses and interest combined to equal $7.3 million. This resulted in a shortfall of $.3 million, which increased the unfunded liability.

2. Actuarial Gains

   The Fund experienced actuarial gains of approximately $3.4 million because of salary increases which were smaller than anticipated and $4.1 million of investment gains that were greater than anticipated. The remaining sources of gain or loss, including MPRI fund mortality, combined to produce a small loss. Overall, there was a net gain (reduction in unfunded liability) from actuarial experience of $6.8 million.

3. Changes in Assumptions and Plan Provisions

   We had previously assumed that those eligible for a deferred annuity would select an annuity in lieu of a refund of contribution. This year Wyatt assumed that any individual would select the benefit that had the largest present value.

   In addition, the plan was changed this year to provide 100% vesting after five years of service. This change had very little effect, since those individuals with more than ten years are not affected, and those few individuals who terminate between five and ten years have very small benefits. Together, these changes had a negligible effect on liabilities.

Changes in Unfunded Actuarial Accrued Liability*

| | | |
|---|---|---|
| A. | Unfunded actuarial accrued liability at beginning of year | $30,890 |
| B. | Change due to interest requirement and current rate of funding | 305 |
| C. | Expected actuarial accrued liability at end of year: (A) + (B) | $31,195 |
| D. | Actuarial losses (gains) | (6,816) |
| E. | Changes in assumptions and plan provisions | (148) |
| F. | Unfunded actuarial accrued liability at end of year: (C) + (D) + (E) | $24,231 |

* Results prepared by the Wyatt Company.

## V. SENSITIVITY ANALYSIS

When performining an actuarial valuation, liabilities and contributions are developed under a single actuarial cost method and one set of assumptions. However, since it is unlikely that any given assumption will prove to be exactly correct, analyzing the impact of a variation in an assumption is generally enlightening. This analysis is called a sensitivity analysis.

We have analyzed the sensitivity to change for three of these assumptions and methods mandated by state law. Each of these plays a major role in determining costs:

1. Interest is currently assumed to be 8% for all years until retirement, and 5% thereafter. We examined the effect of changing 8% to 7%.

2. Salaries are assumed to increase 6.5% each year. We examined the effect of a 6% salary increase assumption.

3. The unfunded liability is amortized as a level percent of future payroll. This approach is not permitted for a private sector plan. We examined the effect of amortizing the unfunded liability using a level dollar amount.

| | | Values After Change | | |
|---|---|---|---|---|
| | Current (Touche Ross) | Interest | Salary Increase | Amortization |
| Unfunded liability | $23,731 | $29,257 | $22,192 | $23,731 |
| Actuarially required contribution: | | | | |
| (Amount) | $6,934 | $7,954 | $6,585 | $7,880 |
| (Percent) | 24.26% | 27.83% | 23.04% | 27.57% |
| (Sufficiency) | 3.14% | (.43%) | 4.36% | (.17%) |
| Plan continuation liability | $153,632 | $162,398 | $150,998 | $153,632 |
| Depth of funding | 88.8% | 84.0% | 90.4% | 88.8% |

STATE PATROL

VI. SUMMARY OF HISTORICAL VALUATION RESULTS**

(000'S Omitted)

| Report as of June 30 | Accrued Liability | Valuation Assets | Unfunded Accrued Liability | Normal Cost | Actuarial Contribution | Prescribed Contribution | Sufficiency |
|---|---|---|---|---|---|---|---|
| 1980* | $ 85,830 | $ 49,620 | $36,210 | $2,791<br>(15.50%) | $5,214<br>(28.96%) | $5,041<br>(28.00%) | (.96%) |
| 1981 | 100,518 | 58,720 | 41,798 | 3,149<br>(15.77%) | 5,991<br>(30.00%) | 5,591<br>(28.00%) | (2.00) |
| 1982 | 111,456 | 68,183 | 43,273 | 3,323<br>(16.96%) | 6,243<br>(31.85%) | 5,488<br>(28.00%) | (3.85) |
| 1983 | 132,175 | 78,775 | 53,400 | 3,805<br>(17.65%) | 7,469<br>(34.64%) | 6,361<br>(29.50%) | (5.14) |
| 1984 | 119,682 | 86,785 | 32,897 | 4,300<br>(18.68%) | 5,973<br>(25.95%) | 6,306<br>(27.40%) | 1.45 |
| 1985 | 134,440 | 100,486 | 33,954 | 4,756<br>(18.38%) | 6,625<br>(25.60%) | 7,090<br>(27.40%) | 1.80 |
| 1986 | 148,524 | 118,175 | 30,349 | 5,080<br>(18.49%) | 6,840<br>(24.90%) | 7,528<br>(27.40%) | 2.50 |
| 1987* | 160,628 | 136,397 | 24,231 | 5,173<br>(18.10%) | 6,685<br>(23.39%) | 7,832<br>(27.40%) | 4.01 |

* As prepared by the Wyatt Co.

** Figures shown in parenthesis are as a percentage of payroll under normal retirement age.

STATE PATROL

## VI. SUMMARY OF HISTORICAL VALUATION RESULTS (Continued)

| Report as of June 30 | Active Members Number | Active Members Valuation Payroll | Retired Members** Number | Retired Members** Avg. Annual Ben. | Deferred Annuitants Number | Deferred Annuitants Avg. Annual Ben. | Former Members Without Vested Rights |
|---|---|---|---|---|---|---|---|
| 1980* | 782 | $18,003,587 | 302 | $5,030 | 23 | $7,303 | 13 |
| 1981 | 793 | 19,967,408 | 312 | 5,699 | 25 | 8,503 | 10 |
| 1982 | 763 | 20,922,575 | 339 | 6,614 | 28 | 8,636 | 10 |
| 1983 | 774 | 23,066,558 | 359 | 7,736 | 22 | 8,858 | 10 |
| 1984 | 741 | 23,016,272 | 397 | 8,907 | 21 | 8,005 | 10 |
| 1985 | 765 | 25,875,980 | 407 | 9,749 | 20 | 10,507 | 9 |
| 1986 | 769 | 27,474,215 | 425 | 11,183 | 17 | 10,478 | 10 |
| 1987* | 771 | 28,583,000 | 430 | 12,619 | 16 | 10,009 | 8 |

* As prepared by the Wyatt Co.
** Including beneficiaries and disabled members.

## APPENDIX A

## SUMMARY OF EMPLOYEE DATA

The Executive Director furnished us with employee information pertaining to all active members, inactive members, and retired members of the Fund. The following tables summarize the changes in active, inactive, and retired membership during the year.

In order to reflect anticipated current year salary increases, all salaries provided were increased by 6.5%.

## Appendix A

### MINNESOTA STATE RETIREMENT SYSTEM
### STATE PATROL RETIREMENT FUND

### State Patrol Census Data as of June 30, 1987

| | Number | Annual Payroll |
|---|---|---|
| Actives at June 30, 1986 | 769 | $27,474,215 |
| New Entrants* | 29 | |
| Total | 798 | |
| Less Separations from Active Service: | | |
| Refund of Contributions* | 8 | 189,494 |
| Separation with a Vested Right to a Deferred Annuity | 1 | 37,282 |
| Separation with Neither Refund nor Right to a Deferred Annuity | 0 | 0 |
| Death While Eligible; Surviving Spouse Receiving Annuity | 0 | 0 |
| Service Retirement | 17 | 620,577 |
| Death | 0 | 0 |
| Total Separations | 26 | |
| Adjustments | (1) | 0 |
| Actives at June 30, 1987 | 771 | $28,582,892 |

### Average Entry Age of New Employees

| For the Fiscal Year Ending | Male | Female | Average of Total |
|---|---|---|---|
| 6/30/83 | 26.4 | 23.0 | 26.2 |
| 6/30/84 | 28.0 | 31.7 | 28.3 |
| 6/30/85 | 27.8 | 23.5 | 27.4 |
| 6/30/86 | 26.5 | 22.8 | 26.4 |
| 6/30/87 | 26.0 | 36.7 | 26.4 |

* Includes those who entered the plan and terminated during the period from July 1, 1986 to June 30, 1987.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND

State Troopers' Annuitant Census Data as of June 30, 1987

| | | Number | Annual Annuity Benefit Payable |
|---|---|---|---|
| A. | **Service Retirement Annuitants** | | |
| | Receiving at June 30, 1986 | 306 | $4,079,704 |
| | New | 21 | 367,205 |
| | Deaths | (8) | (120,985) |
| | Adjustments | (1) | 325,227 |
| | Receiving at June 30, 1987 | 318 | $4,651,151 |
| B. | **Disabled Employees** | | |
| | Receiving at June 30, 1986 | | |
| | MPRIF 10 | | |
| | Non-MPRIF 3 | | |
| | | 13 | $ 143,255 |
| | New | 0 | 0 |
| | Deaths | 0 | 0 |
| | Adjustments | | 11,707 |
| | Receiving at June 30, 1987 | 13 | $ 154,962 |
| C. | **Widows Receiving an Annuity or Survivor Benefit** | | |
| | Beneficiaries Receiving an Optional or Reversionary Annuity: | | |
| | Receiving at June 30, 1986 | 97 | $ 509,127 |
| | New | 2 | 29,841 |
| | Deaths | (8) | (28,607) |
| | Adjustments - Net Result | 2 | 95,273 |
| | Receiving at June 30, 1987 | 93 | $ 605,634 |

Appendix A (continued)

| | | Number | Annual Annuity Benefit Payable |
|---|---|---|---|
| D. | Children Receiving a Survivor Benefit | | |
| | Receiving at June 30, 1986 | 9 | $ 20,550 |
| | New | 0 | 0 |
| | Reinstated | 0 | 0 |
| | No Longer Eligible | (3) | (7,593) |
| | Adjustments - Net Result | 0 | 1,330 |
| | Receiving at June 30, 1987 | 6 | $ 14,287 |
| E. | Deferred Annuitants | | |
| | Deferred as of June 30, 1986 | 17 | $178,127 |
| | New | 2 | 12,516 |
| | Began Receiving | (3) | (30,504) |
| | Adjustments - Net Result | 0 | 0 |
| | Deferred as of June 30, 1987 | 16 | $160,139 |

Average Age at Retirement of New Service Annuitants

| Fiscal Year Ending | Average Retirement Age |
|---|---|
| 6/30/82 | 58.6 |
| 6/30/83 | 59.8 |
| 6/30/84 | 58.6 |
| 6/30/85 | 58.3 |
| 6/30/86 | 58.2 |
| 6/30/87 | 57.2 |
| All Existing Service Annuitants | 58.1 |

## APPENDIX B

## MINNESOTA STATE RETIREMENT SYSTEM
## STATE PATROL RETIREMENT FUND

### Summary of Principal Plan Provisions as of June 30, 1987

| | |
|---|---|
| 1. Coverage: | From first date of employment. |
| 2. Service Credit: | Service is credited from date of coverage. For State Police Officers hired after July 1, 1961, no service is credited after age 60. |
| 3. Contributions: | |
| a. Employee: | 8.5% of salary. |
| b. State of Minnesota: | 18.9% of salary. |
| 4. Final Average Salary: | Monthly average for the highest 5 successive years of salary. |
| 5. Normal Retirement: | |
| a. Eligibility: | Attainment of age 55 and completion of 5 years of service. (Changed from 10 years of service at June 30, 1987.) |
| b. Benefit Amount: | 2-1/2% of final average salary for each of the first 25 years of service plus 2% of final average salary for each year of service thereafter. |
| 6. Form of Payment: | Life annuity with actuarially equivalent options also available. |
| 7. Disability Retirement: | |
| a. Eligibility: | Earlier of:<br>o In line of duty: None.<br>o Not in line of duty: Five years of service and less than age 55. |

Appendix B (continued)

| | |
|---|---|
| b. Benefit Amount: | o In line of duty: 50% of average monthly salary plus 2% for each year of service in excess of 20, offset by Workers' Compensation. |
| | o Not in line of duty: 2-1/2% of average monthly salary for each year up to and including 25 years, plus 2% for each year in excess of 25, subject to a minimum of 25% of average monthly salary. |
| c. Death Benefits: | If a member dies while receiving a work related disability benefit, 20% of his final average salary is payable to the surviving spouse for life. |
| 8. Deferred Service Retirement: | |
| a. Eligibility: | Completion of 5 years of service. (Changed from 10 years of service at June 30, 1987.) |
| b. Benefit Amount: | Retirement benefits payable at normal retirement date are determined according to the normal retirement benefit formula based on the member's final average salary and service at termination; such amount being subject to an increase of 5% for each year between termination and retirement for years prior to January 1, 1981 and 3% compounded annually thereafter. |
| 9. Return of Contributions: | If a member terminates before becoming eligible for any other benefits under the plan, his employee contributions are returned with interest at 5%. |

Appendix B (continued)

10. Surviving Spouse Death Benefit:

| | |
|---|---|
| a. Eligibility: | Death of member in service. |
| b. Benefit Amount: | 20% of final average salary. With 10 or more years of service, changes to a 100% joint and survivor annuity amount as of the date the employee would have attained age 55. |

11. Children's Death Benefits:

| | |
|---|---|
| a. Eligibility: | Death benefits are payable to children (below age 18, or 22 if a student) of members who die in active service. |
| b. Amount: | 10% of final average salary, plus $20 per month prorated equally to such children. |
| c. Maximum: | Total benefit to all children may not exceed 40% of final average salary. |

12. Repayment of Contributions:

| | |
|---|---|
| a. Eligible Members: | Rehired members. |
| b. Repayment Provision: | Such rehired member may repay all refunds made to him, including interest at 5% compounded annually. In such case, service previously credited during the prior period of membership is restored. |

13. Combined Service Provision:

| | |
|---|---|
| a. Eligible Members: | Members who have had coverage under two or more Minnesota Public Retirement Systems, with a total of at least 10 years of credited service. |

Appendix B (continued)

b. Benefit Provisions: Benefits under both plans are based on the highest final average salary including all years from both plans, and on the plans in effect on the member's last day in covered public employment.

14. Proportionate Annuity: Any member who terminated after attaining age 65 and completing at least one year of service is entitled to a proportionate retirement annuity based on his allowable service credit.

15. Pre-1973 Annuitants: State Troopers who retired prior to 1973 are entitled to an annual 6% increase in benefits.

# APPENDIX C

## ACTUARIAL METHODS AND ASSUMPTIONS

### Actuarial Methods

Chapter 356 of the Minnesota Statutes calls for the determination of normal cost and accrued liability in accordance with the entry age normal cost method, one of several available projected cost methods. For the June 30, 1987 valuation, we used the traditional individual entry age normal method, with normal costs determined as a percentage of salary.

The normal cost as a percentage of payroll for disability, refund, survivor and vested termination benefits is determined by dividing the present value at entry of the applicable benefit by the present value at entry of future compensation.

The unfunded liability is amortized by the level percent of payroll method. (Each amortization payment is calculated as if the following year's payment will increase by 6.5%.)

### ACTUARIAL ASSUMPTIONS

The tables on the following pages summarize the actuarial assumptions used for this valuation.

### CHANGE IN ACTUARIAL ASSUMPTIONS

Effective June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of: (a) their contributions accumulated with interest, or (b) the value of their deferred benefit. Prior to June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to leave their contribution on deposit and receive a deferred benefit. This assumption change was made in order to review the actuarial valuation results as calculated by the Wyatt Company, actuary for the Legislative Commission on Pensions and Retirement.

Appendix C (continued)

## MINNESOTA STATE RETIREMENT SYSTEM
## STATE PATROL RETIREMENT FUND

### Summary of Actuarial Assumptions and Methods

| | | |
|---|---|---|
| 1. | Mortality: | 1971 Group Annuity Mortality Table with ages set back 8 years for females. |
| 2. | Withdrawal: | Rates starting at .03 per 10,000 at age 20 and decreasing to zero at age 55, as set forth in the Separation From Active Service Table. |
| 3. | Disability: | The rates of disability were adapted from experience of the New York State Employees' Retirement System, as set forth in the Separation From Active Service Table. |
| 4. | Expenses: | Prior year's expenses expressed as a percentage of prior year's payroll. |
| 5. | Interest Rate: | Pre-retirement - 8% per annum.<br>Post-retirement - 5% per annum. |
| 6. | Salary Scale: | 6-1/2% per annum, disregarding actual salary history. Benefits in excess of IRC Sec. 415 limits caused by salary increases are disregarded. |
| 7. | Assumed Retirement Age: | Later of age 58 for State Troopers and for State Police Officers hired after June 30, 1961, or age 63 for State Police Officers hired before July 1, 1961, and one year hence. |
| 8. | Actuarial Cost Method: | Individual level percent entry age cost method. |
| 9. | Assumed Survivor Status: | 100% assumed married, female spouse 3 years younger. Fifteen percent load on spouse benefits for children's benefits. |

Appendix C (continued)

10. Contribution Refund: All employees withdrawing after becoming eligible for a deferred benefit were assumed to leave their contributions on deposit and receive a deferred annuitant benefit. Effective June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND

Probabilities of Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

| | Death* | | | |
|---|---|---|---|---|
| Age | Males | Females | Withdrawal** | Disability** |
| 20 | 5 | 4 | 300 | 4 |
| 21 | 5 | 4 | 290 | 4 |
| 22 | 5 | 4 | 280 | 5 |
| 23 | 6 | 4 | 270 | 5 |
| 24 | 6 | 4 | 260 | 6 |
| 25 | 6 | 5 | 250 | 6 |
| 26 | 7 | 5 | 240 | 6 |
| 27 | 7 | 5 | 230 | 7 |
| 28 | 7 | 5 | 220 | 7 |
| 29 | 8 | 5 | 210 | 8 |
| 30 | 8 | 5 | 200 | 8 |
| 31 | 9 | 6 | 190 | 9 |
| 32 | 9 | 6 | 180 | 9 |
| 33 | 10 | 6 | 170 | 10 |
| 34 | 10 | 7 | 160 | 10 |
| 35 | 11 | 7 | 150 | 11 |
| 36 | 12 | 7 | 140 | 12 |
| 37 | 13 | 8 | 130 | 13 |
| 38 | 14 | 8 | 120 | 15 |
| 39 | 15 | 9 | 110 | 16 |
| 40 | 16 | 9 | 100 | 18 |
| 41 | 18 | 10 | 90 | 20 |
| 42 | 20 | 10 | 80 | 22 |
| 43 | 23 | 11 | 70 | 24 |
| 44 | 26 | 12 | 60 | 26 |
| 45 | 29 | 13 | 50 | 29 |
| 46 | 33 | 14 | 50 | 32 |
| 47 | 38 | 15 | 50 | 36 |
| 48 | 42 | 16 | 50 | 41 |
| 49 | 47 | 18 | 50 | 46 |

Appendix C (continued)

| Age | Death* Males | Death* Females | Withdrawal** | Disability** |
|---|---|---|---|---|
| 50 | 53 | 20 | 200 | 50 |
| 51 | 59 | 23 | 200 | 57 |
| 52 | 65 | 26 | 200 | 64 |
| 53 | 71 | 29 | 200 | 72 |
| 54 | 78 | 33 | 200 | 80 |
| 55 | 85 | 38 | | 88 |
| 56 | 93 | 42 | | 98 |
| 57 | 100 | 47 | | 108 |
| 58 | 109 | 53 | | 118 |
| 59 | 119 | 59 | | 129 |
| 60 | 131 | 65 | | 141 |
| 61 | 144 | 71 | | 154 |
| 62 | 159 | 78 | | 167 |

* 1971 Group Annuity Mortality Table, with age set back 8 years for females.

** Same withdrawal and disability rates pertain to males and females.

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Touche Ross

Board of Directors
Minnesota State Retirement System
529 Jackson at 10th Street
St. Paul, Minnesota

Ladies and Gentlemen:

We are pleased to present our report on the June 30, 1987 actuarial valuation of the Minnesota State Retirement System, Judges' Retirement Fund.

Our report is divided into the following sections:



The report was completed on the basis of accepted actuarial methods and procedures in accordance with the provisions stipulated in the contract between the State of Minnesota and Touche Ross & Co.

We would be pleased to answer any questions you may have regarding this report.

Touche Ross & Co.

F. Jay Lingo

F. Jay Lingo, F.S.A.

James F. Verlautz

James F. Verlautz, F.S.A.

## I. INTRODUCTION AND PURPOSE

The Minnesota State Retirement System (MSRS) administers several retirement funds and plans. The plans administered are the: General State Employees' Plan, Unclassified Employees' Plan, Correctional Employees' Plan, State Troopers' Plan, Judges' Plan, Legislators' Plan, Elective Officers' Plan, Military Affairs Plan, Transportation Pilots' Plan, and a statewide Deferred Compensation Plan for public employees.

The plans administered by MSRS are among those subject to being overseen by the Legislative Commission on Pensions and Retirement (LCPR). The LCPR consists of members of the Minnesota State Senate and Minnesota House of Representatives. Its members are charged with the duties of, among other things:

- o Reviewing investment performance.
- o Establishing policy for public retirement plans.
- o Recommending necessary changes to retirement plan provisions.
- o Hiring an actuary to perform annual actuarial valuations and experience studies.
- o Overseeing the work of the actuary.

Minnesota Statutes, Sections 356.20 and 356.215, require annual actuarial valuations and periodic experience studies. Of concern to the Board of Directors are the valuations and experience studies which must be performed for the following:

- o The General State Employees' Plan;
- o The Correctional Employees' Plan;
- o The State Troopers' Plan; and
- o The Judges' Plan

These valuations and experience studies are prepared by the Wyatt Co., the actuary retained by the LCPR. The Minnesota State Retirement System does not have an actuary on its staff and, therefore, has retained Touche Ross to review, analyze, and critique the actuarial valuations and experience studies.

The purpose of this report is to verify the accuracy of Wyatt's results, and to expand on any items of particular significance.

## II. COMPARISON OF VALUATION RESULTS

We attempted to duplicate the figures shown in Wyatt's June 30, 1987 valuation reports. To do so involved repeated discussions with the Wyatt personnel who prepared their reports. Where we were able to discover reasonable justification for Wyatt's approach, we adjusted our methods and assumptions to match theirs. (Descriptions of those adjustments are included in Section III.)

In this section of the report we present the figures generated by Wyatt compared with our valuations. Three tables are included. Table A shows the derivation of the unfunded liability. Table B shows the annual contribution requirements under both Chapter 490 and Chapter 356. Table C shows the depth of plan funding based on liabilities incurred to date. These figures are also required for Government Accounting Standards Board (GASB) reporting.

TABLE A (000's Omitted)

| | Wyatt Co. | Touche Ross | Percentage Difference |
|---|---|---|---|
| Present Value of Benefits: | | | |
| Actives: | | | |
| Retirement | $40,983 | $42,599 | 3.9% |
| Death | 7,022 | 6,480 | (7.7) |
| Disability | 2,995 | 3,055 | 2.0 |
| Withdrawal | - | - | - |
| Total actives | $51,000 | $52,134 | 2.2 |
| Deferred annuitants | 846 | 730 | (13.7) |
| Former members without vested rights | 5 | 5 | 0.0 |
| Participants in MPRI Fund | 14,327 | 14,347 | .1 |
| Retirement and survivor benefits from Judges' Fund | 12,268 | 12,189 | (.6) |
| Total | $78,446 | $79,405 | 1.2 |
| Portion allocated to future service | 24,412 | 24,930 | 2.1 |
| Accrued liability (reserves required) | $54,034 | $54,475 | .8 |
| Valuation assets | 18,781 | 18,781 | 0.0 |
| Unfunded accrued liability | $35,253 | $35,694 | 1.3 |
| Funded ratio | 34.8% | 34.5% | - |

## CONTRIBUTIONS

Chapters 490 and 356 set forth requirements for the level of contributions. Chapter 490 prescribes the actual amount of contributions, and Chapter 356 describes the methods used to determine the amount of contribution required to fully fund the normal cost and the unfunded accrued liability. Together, the actual contribution and required contribution are used to determine the sufficiency of the actual contribution. These calculations are illustrated in Table B. Amounts shown in parenthesis are the dollar amount as a percent of payroll.*

TABLE B (000's omitted)

| Actuarially Determined Contribution | Wyatt Co. | Touche Ross |
|---|---|---|
| 1. Normal cost | $2,180 (13.63%) | $2,303 (14.39%) |
| 2. Assumed operating expense | $ 46 (.29%) | $ 46 (.29%) |
| 3. Amortization by June 30, 2009 of the unfunded accrued liability | $1,926 (12.04%) | $1,945 (12.16%) |
| 4. Total Chapter 356 requirement: (1) + (2) + (3) | $4,152 (25.95%) | $4,294 (26.84%) |
| **Prescribed Contributions** | | |
| 1. Employee contributions | $ 601 (3.76%) | $ 601 (3.76%) |
| 2. Employer contribution | $ 0 (0.0%) | $ 0 (0.0%) |
| 3. Total Chapter 490 prescribed contribution | $ 601 (3.76%) | $ 601 (3.76%) |
| **Contribution Sufficiency** | (22.19%) | (23.08%) |

* Assuming that contributions are paid during each payroll period throughout the year ending June 30, 1988. Expected annual payroll = $15,999,000.

The depth of funding is an indication of the extent to which the accrued benefits are funded and is measured by the ratio of valuation assets to the present value of accrued benefits. These measurements are made on the plan continuation basis (applying all ongoing actuarial assumptions, including assumed salary increases and turnover) and are illustrated as follows:

TABLE C (000's omitted)

Depth of Funding June 30, 1987

| | | Wyatt Co. | Touche Ross | Percentage Difference |
|---|---|---|---|---|
| 1. | Active members | $26,231 | $26,529 | 1.1% |
| 2. | Deferred annuitants | 846 | 730 | (13.7) |
| 3. | Former members without vested rights | 5 | 5 | 0.0 |
| 4. | Participation in MPRI Fund | 14,327 | 14,347 | .1 |
| 5. | Participants not in MPRIF | 12,268 | 12,189 | (.6) |
| 6. | Total present values of accrued benefits | $53,677 | $53,800 | .2% |
| 7. | Valuation assets | 18,781 | 18,781 | 0.0 |
| 8. | Depth of funding | 35.0% | 34.9% | - |
| 9. | Depth of funding excluding MPRI members | 11.3% | 11.2% | |

## III. EXPLANATION OF DIFFERENCES

In this section of the report we present our best explanations for any differences between Wyatt's methods and assumptions and ours, the changes we made where appropriate to be consistent with Wyatt, and the effects of these changes.

Our calculations for the Judges' Retirement Plan are similar to those of Wyatt, and our valuation results in Table A of Section II are close. Our total present value of benefits is 1.2% higher than Wyatt's. Our total accrued liability is only .8% higher than Wyatt's total. With a plan of this complexity, duplicating results this closely is unusual.

In prior year valuations, we assumed that retirement benefits would never exceed current IRS limits on benefits. During our discussions with Wyatt, they indicated that they expect the IRS limit to increase at the same rate as the salary scale. In effect, this assumes that the limits will never apply to individuals in this plan. We changed our valuation process this year so that these limits would not apply.

When comparing our results with those reported by Wyatt, we found that our payroll was significantly different from theirs. After we questioned this fact, Wyatt found that the payroll figures they used were wrong and subsequently issued a revised report with total payroll that matched ours.

## IV. CHANGES IN THE UNFUNDED LIABILITY

The Judges' Plan currently has an unfunded liability. Having an unfunded liability is not necessarily bad for an ongoing plan, as long as some provision is made to pay off the liability over time. The unfunded liability becomes a problem when it is so large as to preclude benefit security, or when, like any debt, interest on the liability becomes unmanageable.

Generally, unfunded liabilities tend to decrease over time, although some year to year fluctuation is normal. One symptom of a troubled pension plan is a constantly increasing unfunded liability. Annual changes in the unfunded liability occur for the following reasons:

- Part of the contribution made each year goes to pay the normal costs (including expenses). The remaining contribution is called the Past Service Contribution. The unfunded liability is automatically increased each year by the interest requirement (8%). If the past service contribution is less than the interest requirement, there will be a net increase in the liability. When the past service contribution is greater than the interest requirement, part of the liability is "paid off," and the liability decreases.

- The unfunded liability is an actuarial projection of liabilities based on certain assumptions. To the extent actual experience differs from the assumptions, actuarial gains and losses may occur. An actuarial gain will decrease the unfunded liability; an actuarial loss will increase the unfunded liability.

- The assumptions and techniques used in calculating the unfunded liability are changed when circumstances warrant. These changes can produce increases or decreases in the unfunded liability.

- Changes in the legal, economic, and sociological environment often result in changes to retirement plans. These changes frequently result in improved benefits. When these changes result in higher retirement benefits, unfunded liabilities are increased. When the changes increase benefits paid in lieu of retirement benefits, unfunded liabilities can increase or decrease.

During the year ended June 30, 1987, the Judges' Fund showed a small decrease in the unfunded liability. This decrease was caused by the following reasons:

1. <u>Contribution Rate</u>

   The total contributions to the plan were $2,970,000. However, normal cost, expenses and interest combined to equal $4,730,000. This resulted in a shortfall of $1,760,000, which increased the unfunded liability.

2. <u>Actuarial Gains</u>

   The Fund experienced actuarial gains of approximately $2,750,000 because of salary increases which were smaller than anticipated and $660,000 of investment gains that were greater than anticipated. The remaining sources of gain or loss, including MPRI fund mortality, combined to produce a small loss. Overall, there was a net gain (reduction in unfunded liability) from actuarial experience of $1,890,000.

3. <u>Changes in Assumptions and Plan Provisions</u>

   No changes to the plan or to the actuarial assumptions occurred during 1987.

<u>Changes in Unfunded Actuarial Accrued Liability</u>*

| | | |
|---|---|---|
| A. | Unfunded actuarial accrued liability at beginning of year | $35,380 |
| B. | Change due to interest requirement and current rate of funding | 1,760 |
| C. | Expected actuarial accrued liability at end of year: (A) + (B) | 37,140 |
| D. | Actuarial losses (gains) | (1,890) |
| E. | Changes in assumptions and plan provisions | 0 |
| F. | Unfunded actuarial accrued liability at end of year: (C) + (D) + (E) | $35,250 |

* Results prepared by the Wyatt Company.

## V. SENSITIVITY ANALYSIS

When performing an actuarial valuation, liabilities and contributions are developed under a single actuarial cost method and one set of actuarial assumptions. However, since it is unlikely that any given assumption will prove to be exactly correct, analyzing the impact of a variation in an assumption is generally enlightening. This analysis is called a sensitivity analysis.

We have analyzed the sensitivity to change of three of these assumptions and methods mandated by state law. Each of these plays a major role in determining costs:

1. Interest is currently assumed to be 8% for all years until retirement, and 5% thereafter. We examined the effect of changing 8% to 7%.

2. Salaries are assumed to increase 6.5% each year. We examined the effect of a 6% salary increase assumption.

3. The unfunded liability is amortized as a level percent of future payroll. This approach is not permitted for a private sector plan. We examined the effect of amortizing the unfunded liability using a level dollar amount.

| | | Value After Change | | |
|---|---|---|---|---|
| | Current (Touche Ross) | Interest | Salary Increase | Amortization |
| Unfunded Liability: | $35,694 | $36,951 | $35,539 | $35,694 |
| Actuarially required contribution: | | | | |
| (Amount) | 4,294 | 4,439 | 4,287 | 5,716 |
| (Percent) | 26.84% | 27.75% | 26.80% | 35.73% |
| (Sufficiency) | (23.08%) | (23.99%) | (23.04%) | (31.97%) |
| Plan continuation liability | $53,800 | $55,984 | $53,242 | $53,800 |
| Depth of funding: | 34.9% | 33.6% | 35.3% | 34.9% |

JUDGES
VI. SUMMARY OF HISTORICAL VALUATION RESULTS**
(000'S Omitted)

| Report as of June 30 | Accrued Liability | Valuation Assets | Unfunded Accrued Liability | Normal Cost | Actuarial Contribution | Prescribed Contribution |
|---|---|---|---|---|---|---|
| 1980* | $ 31,367 | $ 7,641 | $23,726 | $1,610 (15.16%) | $3,194 (30.08%) | $504 (4.74%) |
| 1981 | 32,615 | 8,514 | 24,101 | 1,564 (14.73%) | 3,198 (30.12%) | 496 (4.67%) |
| 1982 | 35,217 | 8,740 | 26,477 | 1,537 (15.17%) | 3,318 (32.74%) | 460 (4.54%) |
| 1983 | 40,556 | 11,049 | 29,507 | 1,807 (15.09%) | 3,830 (31.99%) | 543 (4.54%) |
| 1984 | 42,378 | 11,792 | 30,586 | 1,950 (13.84%) | 3,484 (24.73%) | 589 (4.18%) |
| 1985 | 46,843 | 13,784 | 33,059 | 2,041 (13.47%) | 3,752 (24.77%) | 611 (4.04%) |
| 1986 | 51,102 | 15,983 | 35,119 | 2,225 (13.39%) | 4,110 (24.73%) | 675 (4.06%) |
| 1987* | 54,034 | 18,781 | 35,253 | 2,180 (13.63%) | 4,152 (25.96%) | 601 (3.76%) |

* As prepared by the Wyatt Co.
** Figures shown in parentheses are as a percentage of payroll under normal retirement age.

JUDGES

## VI. SUMMARY OF HISTORICAL VALUATION RESULTS (Continued)

| Report as of June 30 | Active Members | | Retired Members** | | Deferred Annuitants | | Former Members Without Vested Rights |
|---|---|---|---|---|---|---|---|
| | Number | Valuation Payroll | Number | Avg. Annual Ben. | Number | Avg. Annual Ben. | |
| 1980* | 221 | $10,617,000 | 121 | $11,089 | 4 | $ 7,048 | 3 |
| 1981 | 220 | 10,618,500 | 126 | 11,715 | 4 | 7,048 | 3 |
| 1982 | 220 | 10,616,226 | 128 | 12,703 | 5 | 10,105 | 1 |
| 1983 | 229 | 12,685,000 | 135 | 13,906 | 5 | 10,105 | 0 |
| 1984 | 244 | 14,083,111 | 136 | 14,873 | 4 | 9,334 | 2 |
| 1985 | 239 | 15,145,615 | 139 | 16,136 | 8 | 18,810 | 0 |
| 1986 | 242 | 16,616,138 | 138 | 17,594 | 8 | 19,276 | 0 |
| 1987* | 238 | 15,999,000 | 152 | 19,047 | 7 | 18,137 | 1 |

* As prepared by the Wyatt Co.
** Including beneficiaries and disabled members.

# APPENDIX A

## SUMMARY OF EMPLOYEE DATA

The Executive Director furnished us with employee information pertaining to all active members, inactive members, and retired members of the Fund. The tables on the following pages summarize the changes in active, inactive, and retired membership during the year.

Appendix A

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Covered Judges' Retirement Fund Employee Census Data as of June 30, 1987

| | Number | Annual Payroll |
|---|---|---|
| **Judges' Retirement Fund** | | |
| Actives at June 30, 1986 | 240 | $16,160,334 |
| New Entrants | 14 | |
| Total | 254 | |
| Less Separations from Active Service: | | |
| Inactive Nonvested | 1 | 56,611 |
| Inactive Vested | 0 | 62,920 |
| Service Retirement | 16 | 998,506 |
| Death While Eligible; Spouse Receiving Annuity | 1 | 56,611 |
| Total Separations | 18 | |
| Actives at June 30, 1987 | 236 | $15,847,534 |
| **Supreme Court Justices** | | |
| Actives at June 30, 1987 | 2 | 150,921 |
| Total Active Judges at June 30, 1987 | 238 | $15,998,455 |

Average Entry Age of New Employees

| For Fiscal Year Ending | Average Age at Entry |
|---|---|
| 6/30/86 | 47.2 |
| 6/30/87 | 46.4 |

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Judges' Retirement Fund Annuitant Census Data
as of June 30,1987

| | Number | Annual Annuity Benefit Payable |
|---|---|---|
| **A. Service Retirement Annuitants** | | |
| Receiving at June 30, 1986 | 83 | $1,788,307 |
| New | 12 | 252,615 |
| Deaths | (9) | (177,831) |
| Adjustments - Net Result | 1 | 174,172 |
| Receiving at June 30, 1987 | 87 | $2,037,263 |
| Non-MPRIF | 25 | 632,032 |
| MPRIF | 62 | 1,405,231 |
| | 87 | 2,037,263 |
| **B. Disabled Employees** | | |
| Receiving at June 30, 1986 | 5 | $ 101,746 |
| New | 0 | 0 |
| Adjustments - Net Result | 0 | 9,963 |
| Receiving at June 30, 1987 | 5 | $ 111,709 |
| Non-MPRIF | 1 | 19,680 |
| MPRIF | 4 | 92,029 |
| | 5 | 111,709 |
| **C. Widows Receiving an Annuity or Survivor Benefit & Children** | | |
| Receiving at June 30, 1986 | 50 | $ 537,885 |
| New | 12 | 182,393 |
| Deaths | (2) | (24,444) |
| Adjustments - Net Result | 0 | 50,276 |
| Receiving at June 30, 1987 | 60 | $ 746,110 |
| Non-MPRIF | 55 | 664,970 |
| MPRIF | 5 | 81,140 |
| | 60 | 746,110 |

Appendix A (continued)

| | | Number | Annual Annuity Benefit Payable |
|---|---|---|---|
| D. | Deferred Annuitants | | |
| | Deferred as of June 30, 1986 | 8 | 154,208 |
| | New | 0 | 0 |
| | Began Receiving | (1) | (27,252) |
| | Adjustments | 0 | 0 |
| | Deferred at June 30, 1987 | 7 | $ 126,956 |
| | Judges | 6 | 91,046 |
| | Supreme Court Judges | 1 | 35,910 |
| | | 7 | $ 126,956 |

Average Age at Retirement of New Service Annuitants*

| Fiscal Year Ending | Average Retirement Age |
|---|---|
| 6/30/83 | 67.7 |
| 6/30/84 | 69.2 |
| 6/30/85 | 68.0 |
| 6/30/86 | 69.1 |
| 6/30/87 | 67.3 |
| All Existing Service Annuitants | 68.9 |

* Not including District or Supreme Court, or County Paid Judges or Widows

Appendix B

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Summary of Principal Plan Provisions as of June 30, 1987

JUDGES'S PLAN

1. Coverage: From first date as a Judge.

2. Types of Coverage:

   a. Including Social Security: All Judges except those excluded by Item 2(b) are covered by Social Security.

   b. Not Including Social Security: Judges prior to January 1, 1974 were given the opportunity to elect not to be covered under Social Security.

3. Contributions:

   a. From Judges: Judges pay the Social Security Tax Rate applied to the entire salary, plus an additional 1/2% of salary. For those Judges with Social Security coverage, the appropriate portion of this contribution is forwarded to Social Security.

   b. From the State: The State provides any additional funds necessary to meet obligations as Judges retire.

4. Final Average Salary: Monthly average for the highest 5 years of salary within the last 10 years.

5. Normal Retirement:

   a. Eligibility: Earlier of:

      - Attainment of age 65 and completion of 10 years of service; or
      - Attainment of age 70.

Appendix B (continued)

| | | |
|---|---|---|
| b. | Benefit Amount: | 2-1/2% of final average salary for each year of service prior to June 30, 1980, plus 3% of final average salary for each year thereafter. |
| c. | Maximum Benefit: | 65% of annual salary in the year immediately preceding retirement. |

6. Early Retirement:

| | | |
|---|---|---|
| a. | Eligibility: | Attainment of age 62 and completion of 10 years of service. |
| b. | Benefit Amount: | Normal retirement benefit formula based on service and final average salary to date of early retirement, but reduced 1/2% for each month that actual retirement precedes age 65. |

7. Form of Payment: Life annuity with no guarantees upon death. Joint and survivor options are available.

8. Disability Retirement:

| | | |
|---|---|---|
| a. | Eligibility: | None other than disablement while in office. |
| b. | Benefit Amount: | o Full salary for the first two years of disability paid outside the plan.<br>o After two years of disability, an annuity computed in the same manner as the full benefit amount for service retirement, subject to a minimum of 25% of final average salary. |

Appendix B (continued)

| | | |
|---|---|---|
| 9. | Deferred Service Retirement: | Any annuity benefit described above may be deferred until the early or normal retirement date. |
| 10. | Return of Contributions: | Upon termination of employment, if a Judge qualifies for no other benefits under this plan, he will receive his contributions, accumulated with interest, at a rate of 5% compounded annually. |
| 11. | Pre-Retirement Survivor's Annuity: | 60% of the annuity determined in the same manner as normal service retirement benefits, assuming the Judge retired on his date of death. Subject to minimum of 25% of final average salary. |
| 12. | Post-Retirement Survivor's Annuity: | |
| | a. Joint and Survivor Election: | In lieu of receiving benefits in the standard life annuity form of payment, a retiring Judge may elect actuarially reduced benefits in the joint and survivor annuity form. |
| | b. Prior Survivor's Benefits: | Judges who were in office prior to January 1, 1974 and who continue to make additional contributions of 4% of salary receive benefits in the 50% joint and survivor form, with no actuarial reduction. |
| 13. | Social Security Offset: | For Judges participating in Social Security, Judge's Plan benefits are reduced by 75% of the primary Social Security benefit payable. |

Appendix B (continued)

SUPREME COURT JUSTICES' PLAN

| | |
|---|---|
| 1. Coverage: | Supreme Court Justices as of December 31, 1973 who elected coverage under Chapter 490.025 in lieu of coverage under Chapters 490.121 through 490.132. |
| 2. Retirement With Continuation of Compensation: | |
| a. Eligibility: | Attainment of age 70 and completion of 12 years of Supreme Court service, or 15 years of service as Supreme Court Judge and Judge of District Court. |
| b. Benefit Amount: | Continuation of final compensation until the end of the term to which the Supreme Court Justice was elected.<br><br>50% of final salary plus an additional 2-1/2% of final salary for each year of Supreme Court service in excess of 12, except for service after age 73; payable after the continuation of compensation ceases. The maximum benefit is 75% of final salary. |
| 3. Retirement Without Continuation of Compensation: | |
| a. Eligibility: | Earlier of:<br><br>o Attainment of age 65 and completion of 12 years of Supreme Court service; or<br><br>o Attainment of age 70 and completion of two full terms. |

Appendix B (continued)

b. Benefit Amount: 50% of final salary plus an additional 2-1/2% of final salary for each year of Supreme Court service in excess of 12.

4. Disability Benefits:

a. Eligibility: Disablement after completion of two full terms.

b. Benefit Amount: 50% of final salary plus an additional 2-1/2% of final salary for each year of Supreme Court service in excess of 12.

5. Contributions from Judges: 4% of salary to provide a 50% joint and survivor benefit with no actuarial reduction.

# APPENDIX C

## ACTUARIAL METHODS AND ASSUMPTIONS

### ACTUARIAL METHODS

Chapter 356 of the Minnesota Statutes calls for the determination of normal cost and accrued liability in accordance with the entry age normal cost method, one of several available projected cost methods. For the June 30, 1987 valuation, we used the individual entry age normal method, with salary scale.

The unfunded liability is amortized by the level percent of payroll method. (Each amortization payment is calculated as if the following year's payment will increase by 6.5%.)

### ACTUARIAL ASSUMPTIONS

The tables on the following pages summarize the actuarial assumptions used for this valuation.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Summary of Actuarial Assumptions and Methods

JUDGES' RETIREMENT FUND

| | | |
|---|---|---|
| 1. | Mortality: | 1971 Group Annuity Mortality Table for Males with ages set back 8 years for females. |
| 2. | Withdrawal: | None. |
| 3. | Disability: | Graded rates on actual experience, as adjusted by the June 30, 1979 experience analysis and as set forth in the Separation From Active Service Table. |
| 4. | Expenses: | Prior year's expenses expressed as a percentage of prior year's payroll. |
| 5. | Interest Rate: | 8% per annum pre-retirement, 5% per annum post-retirement. |
| 6. | Salary Scale: | 5% annually for the next 2 years and 6-1/2% per annum for each future year, disregarding actuarial salary history. Benefits in excess of IRC Sec. 415 limits caused by salary increases are disregarded. |
| 7. | Assumed Retirement Age: | Later of age 68 or one year hence. |
| 8. | Actuarial Cost Method: | Entry age cost method, with normal cost determined as a level percentage of future payroll on an individual basis. |

Appendix C (continued)

9. Social Security:

   a. Primary Amount: Maximum current primary amount ($789.00 per month for 1987), increasing with salary scale.

   b. Level Contribution Rate: 7.15% assumed for all future years.

   c. Covered Annual Wages: Current annual wage base ($43,800 for 1987), increasing with salary scale.

SUPREME COURT JUSTICES

1. Mortality (Pre- and Post-Retirement): 1971 Group Annuity Mortality Table for Males with ages set back 8 years for females.

2. Withdrawal: None.

3. Interest Rate: 8% pre-retirement, 5% post-retirement.

4. Salary Scale: 6-1/2% per annum, disregarding actual salary history. Benefits in excess of IRC Sec. 415 limits caused by salary increases are disregarded.

5. Expenses: Prior year expenses expressed as a percentage of prior year's payroll.

6. Retirement Age: Latest of:

   - Attainment of age 70;
   - Completion of 12 years of service; or
   - One year from valuation date.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Male Judges
Probabilities of Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

| Age | Death | Disability | Age and Service Retirement | Age | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|---|---|---|
| 20 | 5 | | | 45 | 29 | 3 | |
| 21 | 5 | | | 46 | 33 | 5 | |
| 22 | 5 | | | 47 | 38 | 7 | |
| 23 | 6 | | | 48 | 42 | 9 | |
| 24 | 6 | | | 49 | 47 | 11 | |
| 25 | 6 | | | 50 | 53 | 14 | |
| 26 | 7 | | | 51 | 59 | 16 | |
| 27 | 7 | | | 52 | 65 | 20 | |
| 28 | 7 | | | 53 | 71 | 24 | |
| 29 | 8 | | | 54 | 78 | 28 | |
| 30 | 8 | 2 | | 55 | 85 | 34 | |
| 31 | 9 | 2 | | 56 | 93 | 40 | |
| 32 | 9 | 2 | | 57 | 100 | 46 | |
| 33 | 10 | 2 | | 58 | 109 | 56 | |
| 34 | 10 | 2 | | 59 | 119 | 66 | |
| 35 | 11 | 2 | | 60 | 131 | 76 | |
| 36 | 12 | 2 | | 61 | 144 | 90 | |
| 37 | 13 | 2 | | 62 | 159 | 110 | |
| 38 | 14 | 2 | | 63 | 174 | 136 | |
| 39 | 15 | 2 | | 64 | 192 | 174 | |
| 40 | 16 | 2 | | 65 | 213 | | |
| 41 | 18 | 2 | | 66 | 236 | | |
| 42 | 20 | 2 | | 67 | 263 | | |
| 43 | 23 | 3 | | 68 | | | 10,000 |
| 44 | 26 | 3 | | | | | |

Appendix C (Continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Female Judges
Probabilities of Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

| Age | Death | Disability | Age and Service Retirement | Age | Death | Disability | Age and Service Retirement |
|---|---|---|---|---|---|---|---|
| 20 | 4 | | | 45 | 13 | 5 | |
| 21 | 4 | | | 46 | 14 | 6 | |
| 22 | 4 | | | 47 | 15 | 7 | |
| 23 | 4 | | | 48 | 16 | 7 | |
| 24 | 4 | | | 49 | 18 | 10 | |
| 25 | 5 | | | 50 | 20 | 10 | |
| 26 | 5 | | | 51 | 23 | 12 | |
| 27 | 5 | | | 52 | 26 | 14 | |
| 28 | 5 | | | 53 | 29 | 16 | |
| 29 | 5 | | | 54 | 33 | 20 | |
| 30 | 5 | | | 55 | 38 | 24 | |
| 31 | 6 | | | 56 | 42 | 30 | |
| 32 | 6 | | | 57 | 47 | 36 | |
| 33 | 6 | | | 58 | 53 | 44 | |
| 34 | 7 | | | 59 | 59 | 52 | |
| 35 | 7 | 1 | | 60 | 65 | 62 | |
| 36 | 7 | 1 | | 61 | 71 | 74 | |
| 37 | 8 | 1 | | 62 | 78 | 88 | |
| 38 | 8 | 1 | | 63 | 85 | 104 | |
| 39 | 9 | 2 | | 64 | 93 | 122 | |
| 40 | 9 | 2 | | 65 | 100 | | |
| 41 | 10 | 2 | | 66 | 109 | | |
| 42 | 10 | 4 | | 67 | 119 | | |
| 43 | 11 | 4 | | 68 | | | 10,000 |
| 44 | 12 | 4 | | | | | |