

SERS EXPERIENCE STUDY

DRAFT REPORT

September 23, 1993

SECTION 1 - INTRODUCTION

Purpose of the report

This report presents the results of an investigation of recent actuarial experience of the Connecticut State Employees Retirement System (SERS). This study was undertaken at the direction of the Commission and is intended to comply with Section 5-156b of the General Statutes of the State of Connecticut, which provides in part:

At least once in each five-year period, the actuary shall make actuarial investigations into the mortality, service and compensation experience of the members and beneficiaries of the system.

If a retirement system is to operate on a sound actuarial basis, the funds on hand together with the value of expected future employee and state contributions must be adequate to cover the value of future promised benefit payments. Section 5-156b of the Statute requires that the actuary perform an evaluation of actual experience before recommending actuarial assumptions for use in the annual actuarial valuation.

The determination of the value of expected future contributions and the value of future promised benefit payments involves projections based on anticipated future rates of mortality, withdrawal, disability, and retirement as well as rates of investment income and salary growth. In these projections, it is assumed that a certain proportion of the members of SERS will terminate, die, retire, or become disabled at each age. Moreover, benefits are determined for each of these occurrences based on assumptions regarding the rate at which salaries will increase in the future. The value of these benefits are then calculated based on an assumed life expectancy for retirees and other beneficiaries and the assumed long-term yield on plan assets.

SECTION 1 - INTRODUCTION

Organization of Report

In addition to this Introduction, this report contains the following sections:

Section 2 of this report discusses the choice of assumed investment return.

Section 3 of this report discusses the choice of assumed rates of salary increase.

Section 4 of this report contains the recommended demographic assumptions for active members (rates of active mortality, retirement, disablement, and other terminations of employment).

Section 5 of this report shows the results of our study of inactive mortality, both for healthy and disabled retirees.

Throughout this report, we make reference to "old" and "new" actuarial assumptions. The "old" assumptions are those used for the SERS actuarial valuations for years 1987 through 1992. The "new" assumptions are those we recommend for use in the June 30, 1993 valuation and for subsequent valuations.

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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SECTION 1 - INTRODUCTION

Summary of Recommendations

As a result of our study, we recommend the following changes to the assumptions:

	<i>Current Assumption</i>	<i>New Assumption</i>
Interest Rate	8½%	
Salary Growth	Varies according to age, from 10.2% at age 20 to 6% at age 45	
Active Rate of Turnover	Varies by age, service, sex, hazardous duty	
Active Rate of Mortality	1983 Group Annuitant Mortality Table, with female ages set back 4 years	
Active Rate of Disablement	Varies according to age, from .075% at age 20 to 1.442% at age 60	
Active Rate of Retirement	Varies by age, years since became first eligible for retirement, hazardous duty	
Retired Mortality - Healthy	1983 Group Annuitant Mortality Table, with female ages set back 4 years	
Retired Mortality - Disabled	1965 Railroad Retirement Board Mortality Table	

SECTION 2 - INVESTMENT INCOME

Assumption Studied

In this section of the report, we examine the assumed long-term return on plan assets. Our assumed rate consists of two components - the assumed rate of inflation, and the assumed real rate of return on investment. The rate of inflation is a function of the economic climate of the entire country, while the real rate of return represents the reward for investing in instruments that bear some risk. The real rate of return therefore depends not only on external market and economic conditions, but also on the risk characteristics of the SERS investments.

Study Period

We used information on SERS investments from July 1, 1976 through June 30, 1992.

Methodology

This assumption is the most difficult one to study, for the following reasons:

- investment returns are volatile;
- the only aspect of the investment performance that is completely under the control of SERS is the decision of how to allocate the assets among different asset classes; and
- future investment returns are unrelated to past investment returns.

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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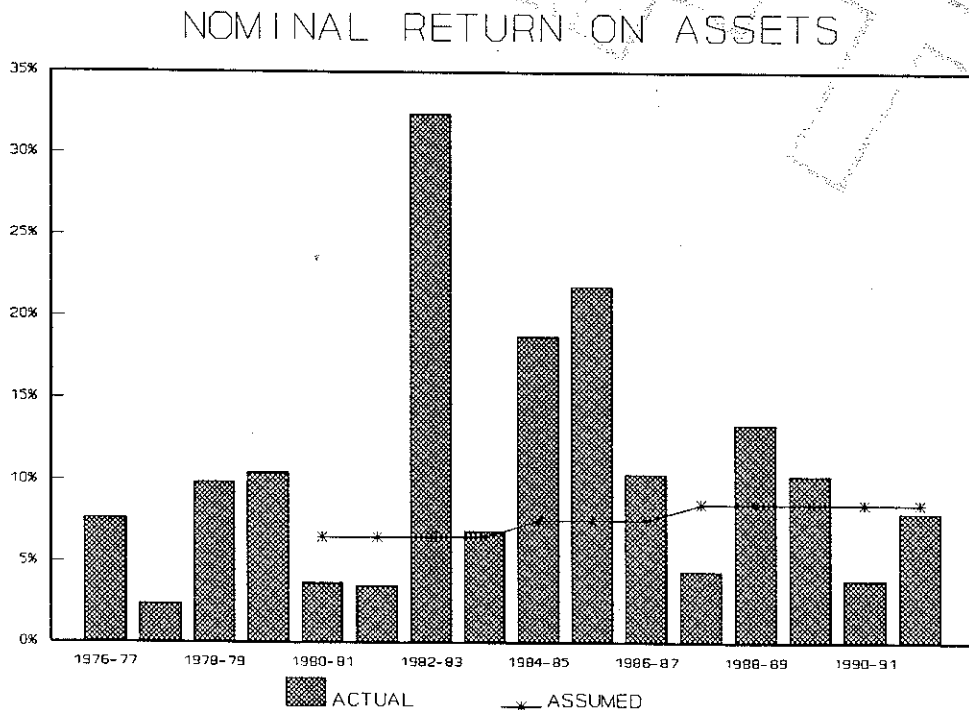
SECTION 2 - INVESTMENT INCOME

Study Results

Inflation was high in the 70s. The stock market boomed in the 80s. Real Estate is in trouble in the 90s.

It is tempting to look just at the most recent five or ten years when analyzing investment performance. The last ten years in particular are tempting, since the combined Connecticut investment funds earned 12.67%^(a). However, the past several years have seen much more modest returns - 7.15% for the last 3 years, and 7.72% for the last five years.

Although we have no way of knowing whether rates will continue to be at the present level, a long-term historical view would suggest that the higher rates of the 80s are anomalous. The following graph, which shows the actual SERS returns over the past 15 years, highlights this movement away from the high returns of the 80s:



CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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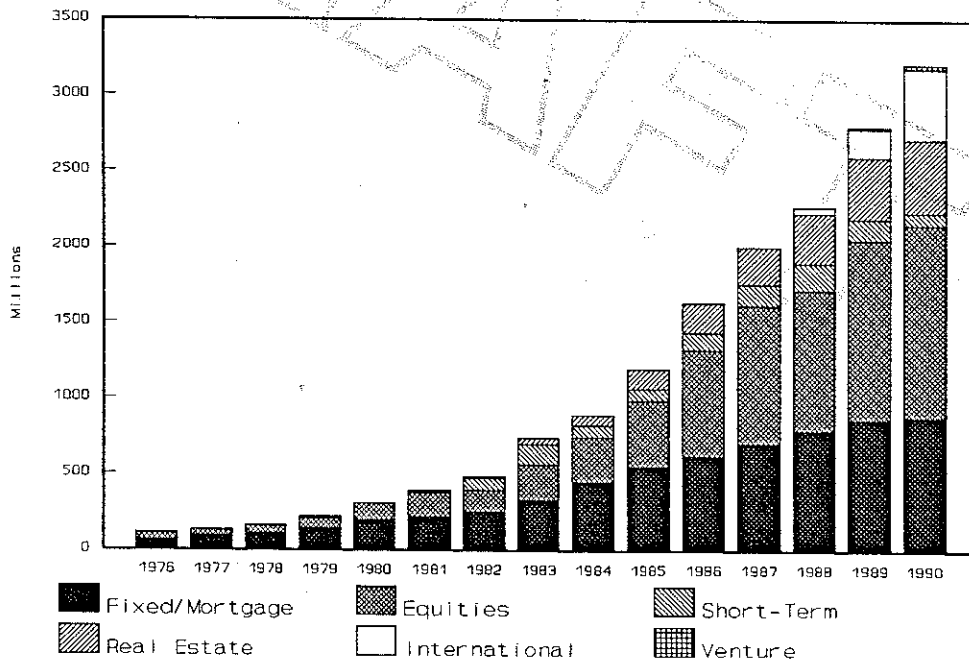
SECTION 2 - INVESTMENT INCOME

Study Results

These SERS investment results reflect two components: the movement of the market over the past 15 years, and changes in the allocation of SERS investments.

As the following chart shows, the SERS investments have been diversifying into real estate, venture capital, mortgages, and international bonds and equities. These investments have largely displaced the fixed income component of the investment portfolio - the equity component has remained a relatively constant proportion of the total portfolio.

HISTORICAL SERS ALLOCATION



CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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SECTION 2 - INVESTMENT INCOME

Study Results

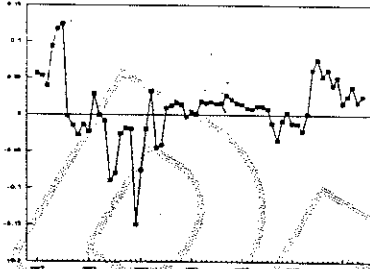
The asset allocation as of June 30, 1992 is fairly close to the current long range asset allocation policy^(a):

Asset Class	Percent
U.S. Equities, including venture capital	35%
International Equities	15
Commercial Equity Real Estate	13
U.S. Fixed Income, including bonds, mortgage-backed securities, and residential mortgages	29
International Bonds	6
Cash Reserves	2

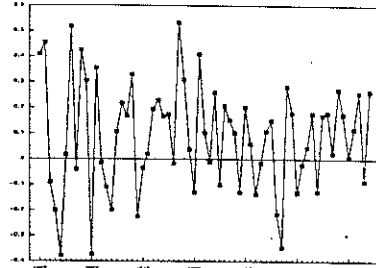
The following graphs show the historical real rates of return from 1927 to 1991, as tracked by standard Wall Street indices for seven classes of investments. Also shown is historical rates of inflation for the same period.

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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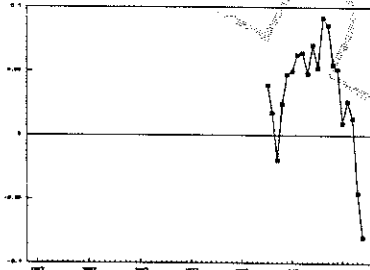
SECTION 2 - INVESTMENT INCOME



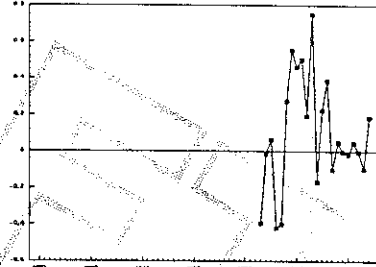
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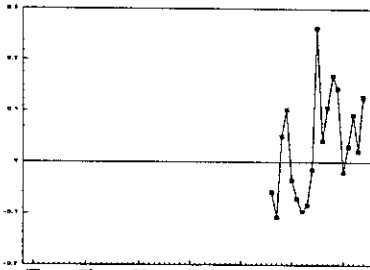
EQUITIES



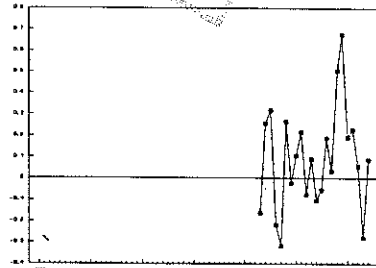
FIXED INCOME



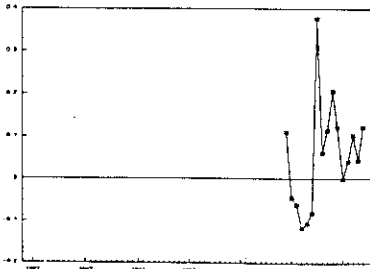
REAL ESTATE



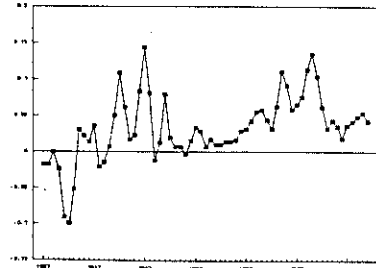
VENTURE CAPITAL



INTERNATIONAL



MORTGAGES



INFLATION

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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SECTION 2 - INVESTMENT INCOME

Study Results

We can combine the historical returns of the above market indices with the current SERS asset allocation to derive a hypothetical real rate of return for the SERS investments:

Asset Category	1926-91 Real Return	Percent of SERS assets in category
Riskless Investments	4.83%	0.74%
Equities	33.32	6.64
Fixed Income	25.16	3.23
Real Estate	10.57	5.03
Venture Capital	1.24	2.97
International	20.46	6.48
Mortgages	4.42	4.87
Hypothetical Real Return	5.17%	
Hypothetical Rate of Inflation	+ 3.19	
Hypothetical Nominal Return	8.36	

This result of 8.36% suggests that:

if the SERS investment allocation remains the same as shown above, and

if future real returns for the various investment classes follow the pattern of the last 65 years, and

if the actual SERS investments perform at the same level as the assets and markets tracked by the various indices, and

if inflation continues at 3.19%,

then the SERS assets will earn 8.36%.

Of course, this result is based on a 65 year period. Using different periods would result in different answers. For instance, using just the last 10 years would result in a figure of 13.32% (9.19% real return + 4.13% inflation). This result also has a lot of *ifs* associated with it. It is therefore not intended to be predictive. However, it illustrates that, based on historical return relationships, the current assumption of 8½% is not unreasonable.

SECTION 3 - SALARY GROWTH ASSUMPTION

Assumption Studied

In this section of the report, we study the expected salary increase for active members. As with the investment return assumption, salary growth contains an element of inflation. Salary growth also reflects the impact of merit raises, promotions, and longevity increases. While many actuarial valuations are performed using a single salary growth rate, such as 5%, we find that salary increases in fact are related to age and length of service. That is, salaries tend to increase more quickly in the early portion of careers, while promotions occur more quickly, and level off in later years.

Our current assumption varies salary growth by age, starting with 10.2% at age 20 and leveling off to 6% for ages 45 and over.

Study Period

We used salary data provided to us for the valuations on July 1, 1989, 1990, 1991, and 1992.

Methodology

We matched the valuation data files against one another so that we could look at the compensation for each person as of two consecutive valuation dates. This resulted in three sets of salary increase data - 1989/1990, 1990/1991, and 1991/1992. Each of these three sets of data consisted of approximately 50,000 participants.

We then combined the three sets of data, and examined the patterns of salary increase by age and by length of service.

SECTION 3 - SALARY GROWTH ASSUMPTION

Study Results

There were consistently high salary increases during 1989/1990 and 1991/1992. This supports the conclusions of our valuations, that there have been salary losses in the last few years.

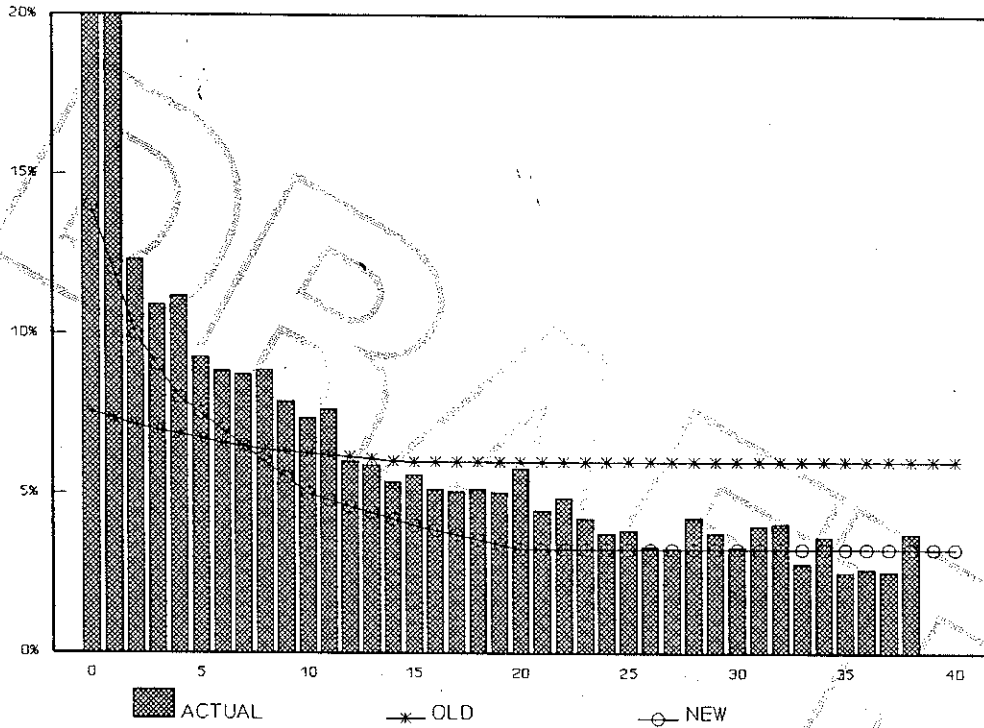
Editorial note - we have written up this section on the basis of changing to an assumption based on service instead of age, but we look forward to discussing this point with the Subcommittee on 9/23.

The results suggest that length of service is a more important influence on salary growth than age is. In addition, the investment return results conclude that the inflation rate will be 3% to 3¼%. Combining these two results, we have developed the following assumption:

Years of Service	Percent
0	14.00
1	12.00
2	10.00
3	9.00
4	8.00
5	7.50
6	7.00
7	6.50
8	6.00
9	5.50
10	5.00
15	4.00
20+	3.25

The following graph shows the actual salary growth rate by length of service and the expected salary growth rate under the current and new assumptions.

SECTION 3 - SALARY GROWTH ASSUMPTION



YEARS OF SERVICE
COMPOSITE RATE FOR GROUP: OLD - 6.54% NEW - 6.69%

Note that our new assumption understates the actual salary growth rates for the study period. We feel that the salary growth during the study period is not representative of what can be expected in future years. There have been unusual salary movements due to extra overtime and promotions in the wake of the Early Retirement Incentive Programs. We do not anticipate that these will continue in the future.

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

Assumptions Studied

In this section of the report, we are concerned with the patterns by which active members of the System leave active status. There are four paths, or "sources of decrement", by which an active member can leave: death, retirement, disability, and termination.

Study Period

The study period was from July 1, 1988 through June 30, 1992.

Methodology

The study of active decrements involves several steps:

First, we tabulate the observed number of active members who leave active status during the study period. We break down these observations by cause of decrement, age, length of service, sex, service group, and any other groupings that appear to affect the patterns of decrement.

Second, we determine the total number of participants who *could* have left active status. For example, a 25 year old is not eligible to retire, so he or she could not have left active status by retiring. However, that same employee *could* have left because of termination, death, or disability. In actuarial terms, we say that the employee was "exposed" to the risks of termination, mortality, and disability.

Third, we compare the observed number of members who leave with the total number of members "exposed" to the corresponding risk. The result is the observed, actual rates of death, retirement, disability, and turnover.

Fourth, we apply our current assumed rates of death, retirement, etc. to the number of members "exposed" to the corresponding risk to determine the number of members we *expected* to leave. When we compare the *actual* number to the *expected* number, we can determine how well the current assumptions match the actual patterns of decrement.

Finally, we establish new assumed rates of decrement that best reflect recent experience and anticipated patterns.

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

ACTIVE MORTALITY

Methodology

The number of observed deaths was significantly lower than expected, particularly for females:

	Male	Female	Total
Actual	159	55	214
Expected	300	219	519

We performed further investigation in order to verify the accuracy of the data. The Retirement Division reported that 382 active death claims were made through the State's group life insurance program during the study period. We have concluded that the Retirement Division database may not be able to adequately track active deaths that result in the return of employee contributions. This would account for the understatement of active deaths.

Study Results

Although the 382 insured deaths were higher than the 214 deaths reported for this study, it was also significantly lower than the 519 expected deaths. Despite this disparity, we nevertheless recommend continuing to assume that deaths among active members will occur according to the rates from the corresponding mortality table used for retired members of the same group. This leaves a margin to account for active member deaths that are not reported as terminations rather than as deaths.

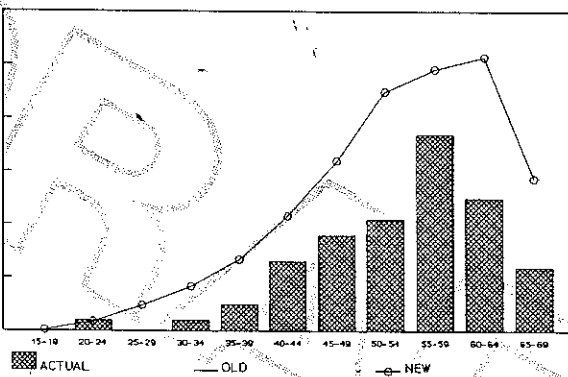
The graphs on the following pages show the number of actual reported deaths and the number of expected deaths. For clarity, we have shown the results in five year age groups.

Graph	Description
4.1	Male Non-Hazardous Duty
4.2	Female Non-Hazardous Duty
4.3	Male Hazardous Duty
4.4	Female Hazardous Duty

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

ACTIVE MORTALITY

MALE NON-HAZARDOUS DUTY

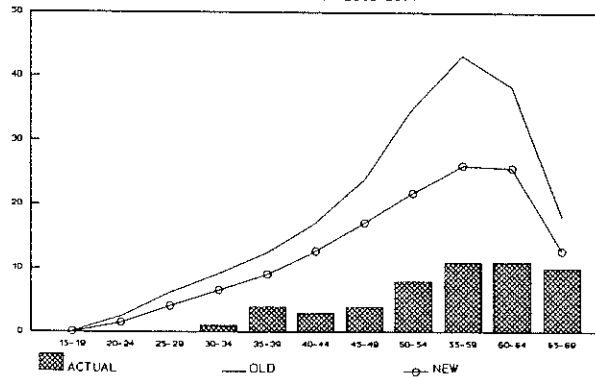


GRAPH 4.1

ACTUAL - 143 OLD - 271 NEW - 271

ACTIVE MORTALITY

FEMALE NON-HAZARDOUS DUTY



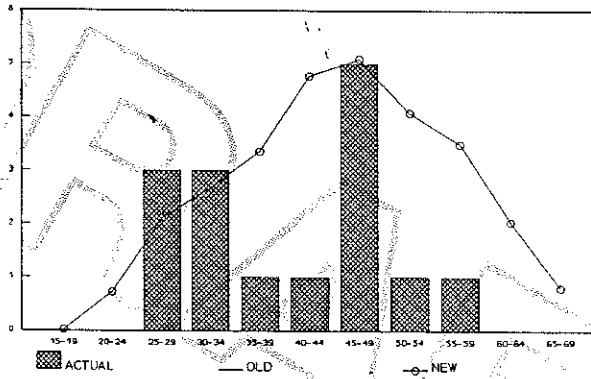
GRAPH 4.2

ACTUAL - 54 OLD - 213 NEW - 143

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

ACTIVE MORTALITY

MALE HAZARDOUS DUTY

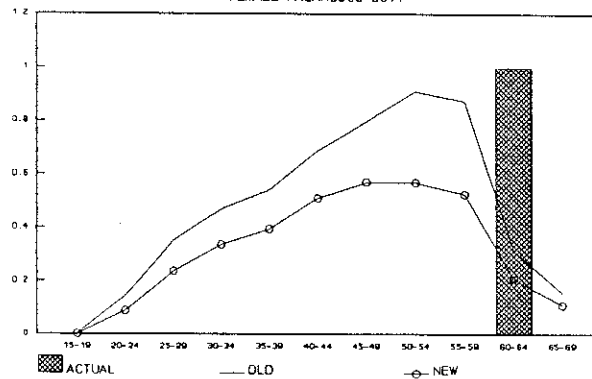


GRAPH 4.3

ACTUAL - 16 OLD - 29 NEW - 29

ACTIVE MORTALITY

FEMALE HAZARDOUS DUTY



GRAPH 4.4

ACTUAL - 1 OLD - 5 NEW - 4

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

RATES OF RETIREMENT

Methodology

It is often observed that a significant proportion of active members retire immediately upon meeting the eligibility requirements for retirement. The remaining members then tend to retire at certain key ages - age 62, when Social Security benefits are available, and age 65, a culturally defined "normal" retirement age.

Our retirement assumption is therefore structured in two pieces:

An assumption regarding the pattern of retirements among those who have just become eligible to retire - this is referred to in our analysis as the "Year 0" group.

An assumption regarding the pattern of retirements among those who do *not* retire when first eligible - this is referred to in our analysis as the "Year 1+" group.

In both cases, we have found from past studies that the patterns vary by age and by Hazardous Duty versus Non-Hazardous Duty members (because there are different retirement eligibility provisions for the two groups).

Study Results

Hazardous Duty: Male and female data were combined due to the small number of females in this group. The current "Year 0" rates generally match the experience at the young ages (under age 55), but understate the number of retirements beyond age 55. The current "Year 1+" rates understate the actual experience for most ages. This is in large part due to the two early retirement incentive programs that were offered during the study period.

Non-Hazardous Duty: The actual number of retirements in "Year 0" was greater than expected for males and less than expected for females. For "Year 1+", the actual number of retirements was much larger than the expected number. Again, the reason for this is the effect of the two retirement incentive programs.

Generally, our proposed "new" rates are a fine-tuning of the current assumptions to reflect the most recent experience (other than the effect of the retirement incentive programs).

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

RATES OF RETIREMENT

The two early retirement incentive programs complicate the study of retirement rates. The most obvious complication is that the actual number of retirements is presumably higher than we would have observed had the incentive programs not been offered. More subtle, however, is that the incentive programs will continue to have an impact on retirement patterns for several years in two ways. First, the two programs have raised expectations that there will be a third program, so retirements may be delayed in anticipation of the next program. And second, the two programs have depleted the pool of members eligible for retirement. This suggests that there will be lower rates of retirement in the future.

Because of these issues, we should continue to carefully monitor the retirement rates. We believe that less weight should be put on the observed rates of the recent past and more weight should be placed on the actuary's judgment as to probable future rates. As a result, we do not recommend a significant departure from the current assumption.

The graphs on the following pages show the number of actual retirements separately for "Year 0" and "Year 1+" and the number of expected retirements for the corresponding group:

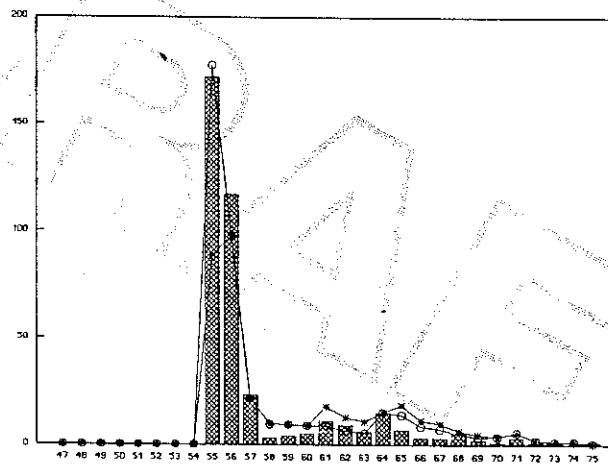
Graph	Description
4.5	Male Non-Hazardous Duty
4.6	Female Non-Hazardous Duty
4.7	Male Hazardous Duty
4.8	Female Hazardous Duty

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
STUDY OF EXPERIENCE

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

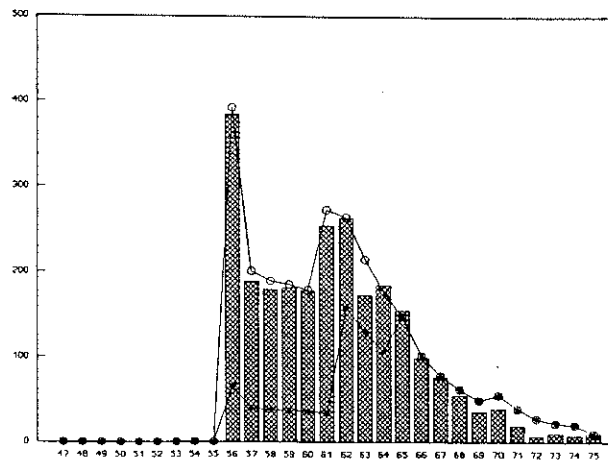
RATES OF RETIREMENT

GRAPH 4.5 - MALE NON-HAZARDOUS DUTY



YEAR 0

ACTUAL - 392 OLD - 358 NEW - 414



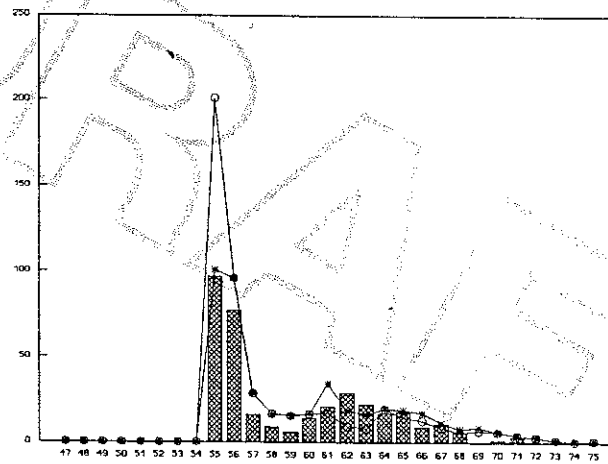
YEAR 1+

ACTUAL - 2,514 OLD - 1,284 NEW - 2,719

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

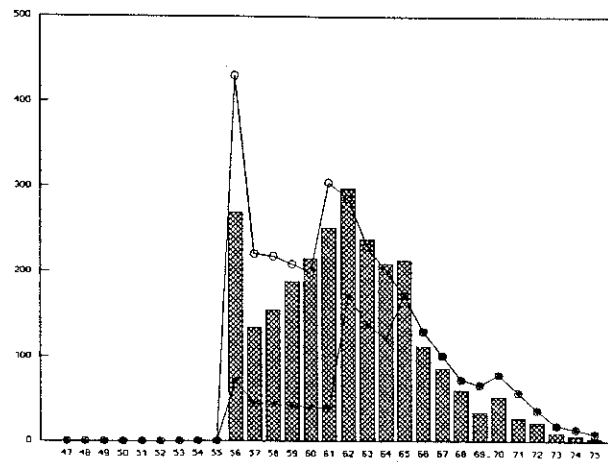
RATES OF RETIREMENT

GRAPH 4.6 - FEMALE NON-HAZARDOUS DUTY



YEAR 0

ACTUAL - 356 OLD - 439 NEW - 489



YEAR 1+

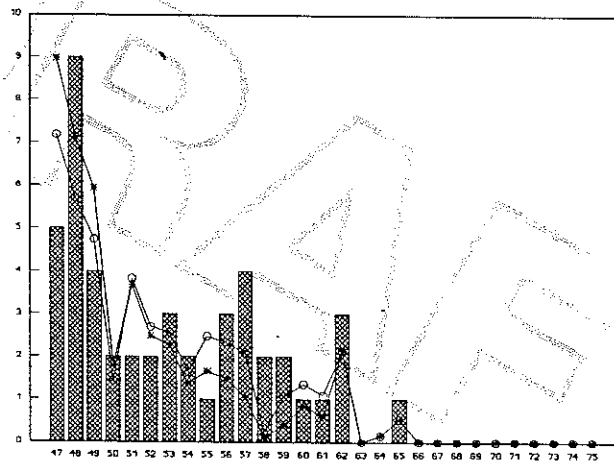
ACTUAL - 2,589 OLD - 1,478 NEW - 3,066

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

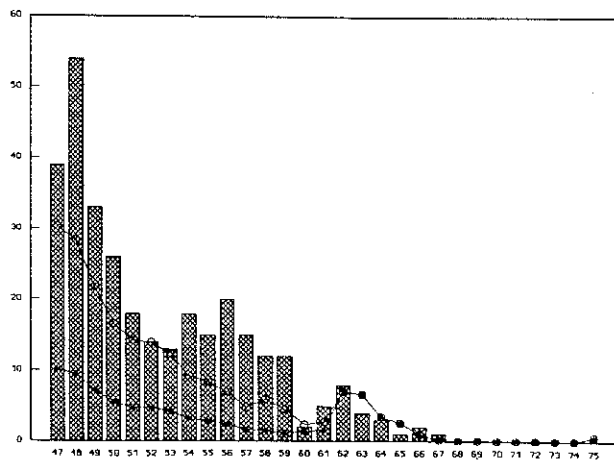
RATES OF RETIREMENT

GRAPH 4.7 - MALE HAZARDOUS DUTY



YEAR 0

ACTUAL - 47 OLD - 43 NEW - 43



YEAR 1+

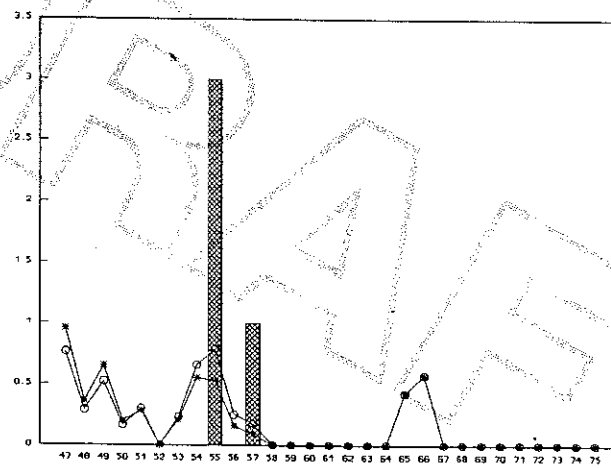
ACTUAL - 316 OLD - 83 NEW - 204

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
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SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

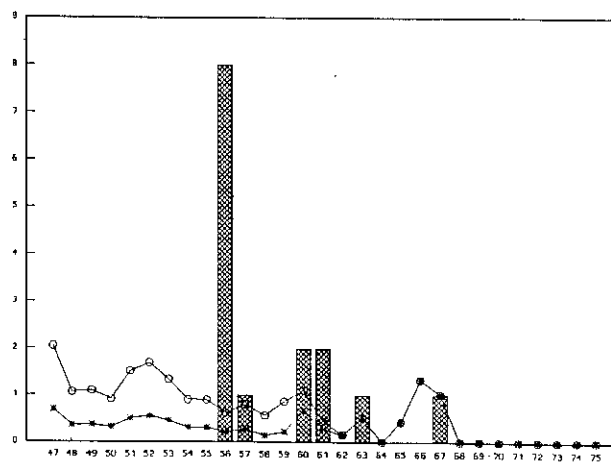
RATES OF RETIREMENT

GRAPH 4.8 - FEMALE HAZARDOUS DUTY



YEAR 0

ACTUAL - 4 OLD - 5 NEW - 5



YEAR 1+

ACTUAL - 15 OLD - 9 NEW - 19

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
STUDY OF EXPERIENCE

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

ACTIVE DISABLEMENT

Methodology

We studied the rates of disablement for all groups. For all ages combined, the following table summarizes our results:

	Haz. Male	Haz. Female	Non-Haz. Male	Non-Haz. Female	Total
Actual	59	6	158	213	436
Expected	41	11	339	403	794
Actual/Expected	144%	55%	47%	53%	55%

Study Results

We recommend continuing to use unisex disability rates. The Hazardous Duty - Females group is too small to be considered independently and the differences by sex for the Non-Hazardous Duty group are minor.

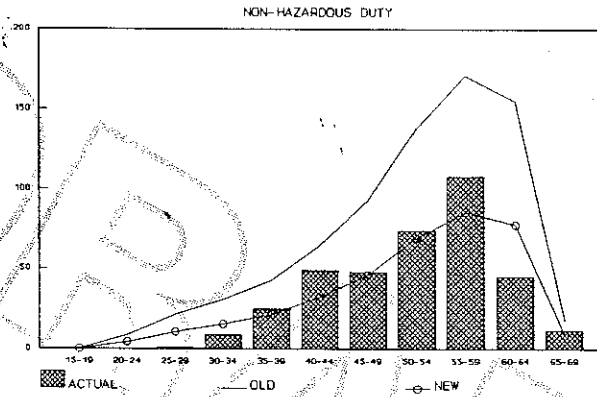
With a total of 436 reported active disabilities, the data is not sufficiently large to enable us to draw firm conclusions from the study alone. We therefore recommend using new rates of disablement based on the current rates, adjusted by **120%** for Hazardous Duty members and by **50%** for Non-Hazardous Duty members.

The graphs on the following pages show, in five year age groups, the number of actual reported disablements and the number of expected disablements by employee group:

Graph	Description
4.9	Non-Hazardous Duty
4.10	Hazardous Duty

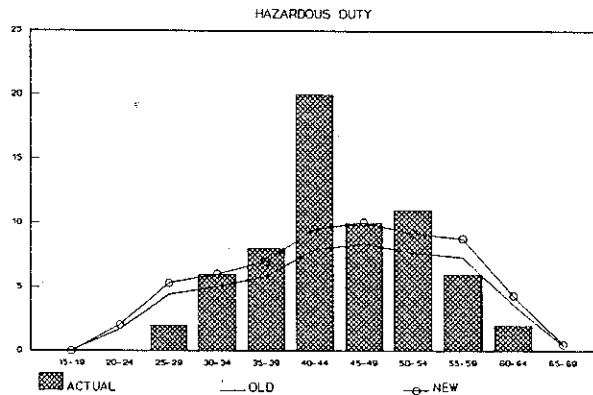
SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

ACTIVE DISABILITY



GRAPH 4.9
ACTUAL - 371 OLD - 742 NEW - 371

ACTIVE DISABILITY



GRAPH 4.10
ACTUAL - 65 OLD - 52 NEW - 63

CONNECTICUT STATE EMPLOYEES RETIREMENT SYSTEM
STUDY OF EXPERIENCE

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

TURNOVER

Methodology

The current "old" assumption is that turnover experience during the first five years is affected by length of service, with the highest turnover rates in the earliest years. This five year period is termed the "select period". Beyond the first five years, it is assumed that length of service no longer has an impact on the rate of turnover - this is the "ultimate period".

Study Results

We did not find a significant difference in the pattern of turnover for members with 3 or 4 years of service versus those with five or more years of service. We therefore recommend shortening the select period from five years to three years.

The current turnover rates understate turnover for Hazardous Duty and overstate turnover for Non-Hazardous Duty members.

The recommended turnover assumption is similar to the current approach in that we have developed a table of turnover rates for male, Non-Hazardous Duty members. The rates for all other groups are by reference to this table, with adjustments to the rates for female members and for Hazardous Duty members.

The recommended table is shown below:

Male Non-Hazardous Rates are in Table

Increase for Females - 10%

Decrease for Hazardous Duty - 60%

Age	Yr 0	Yr 1	Yr 2	Yrs 3+
20	30%	30%	20%	10%
25	17%	15%	10%	8%
30	15%	11%	8%	5%
35	13%	10%	8%	3%
40	10%	9%	7%	3%
45	5%	8%	6%	2%
50	3%	6%	4%	2%
55	2%	4%	2%	0%
60	0%	0%	0%	0%

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

TURNOVER

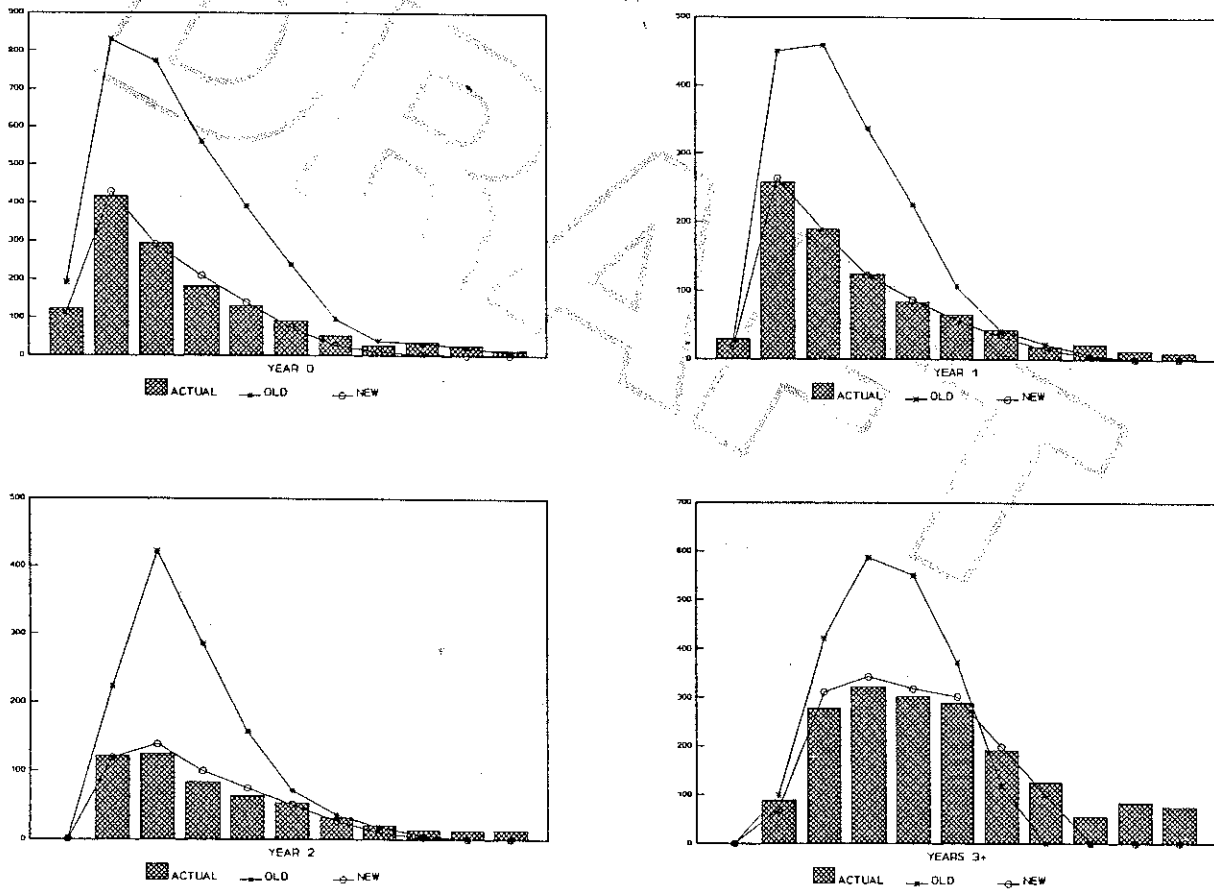
The graphs on the following pages show, by group, the actual number terminating during the study period, along with the "old" expected number and the "new" expected number. Results are shown separately for each year in the select period.

Graph	Description
4.11	Male Non-Hazardous Duty
4.12	Female Non-Hazardous Duty
4.13	Male Hazardous Duty
4.14	Female Hazardous Duty

SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

GRAPH 4.11

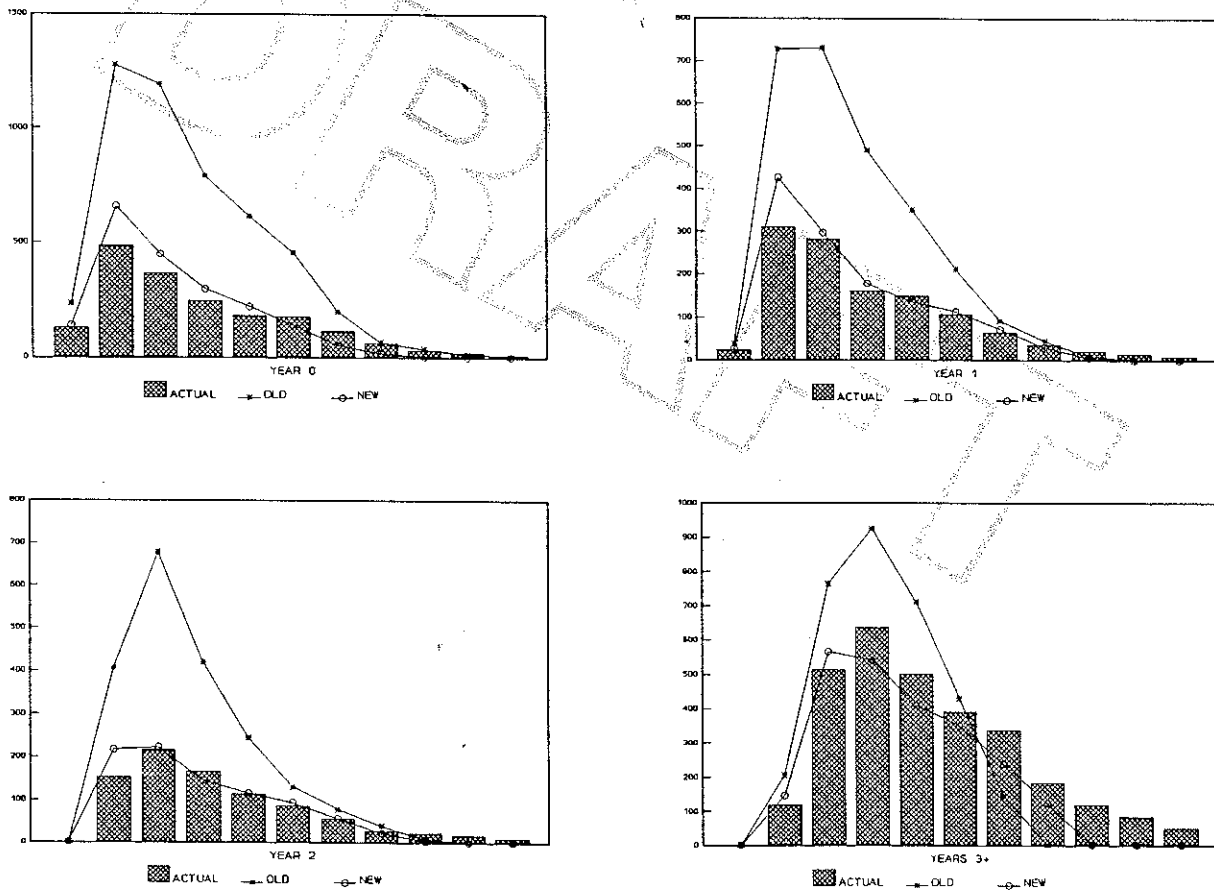
ACTIVE TURNOVER
 MALE NON-HAZARDOUS DUTY



SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

GRAPH 4.12

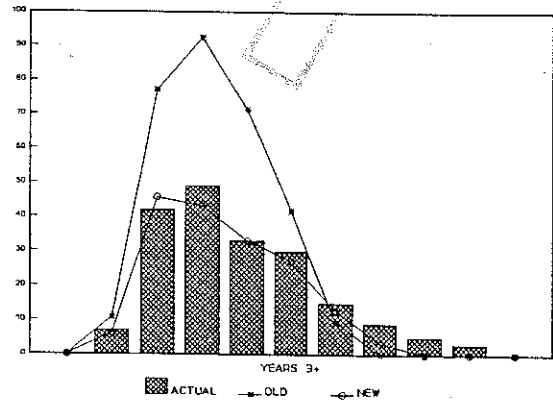
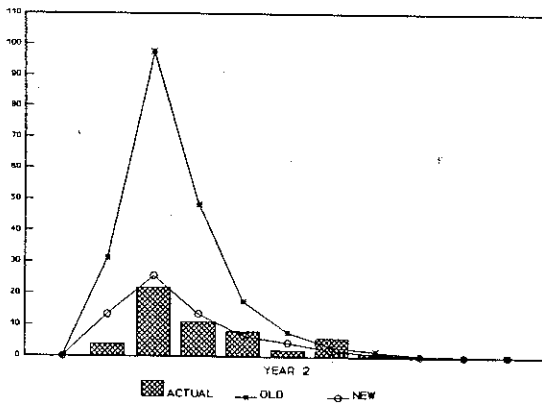
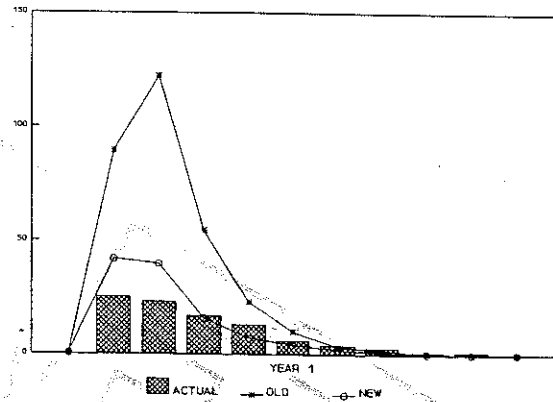
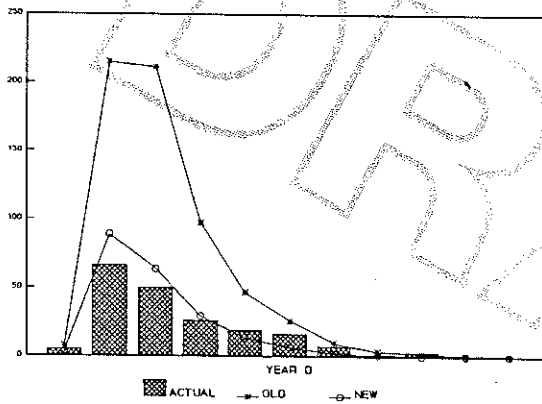
ACTIVE TURNOVER
 FEMALE NON-HAZARDOUS DUTY



SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

GRAPH 4.13

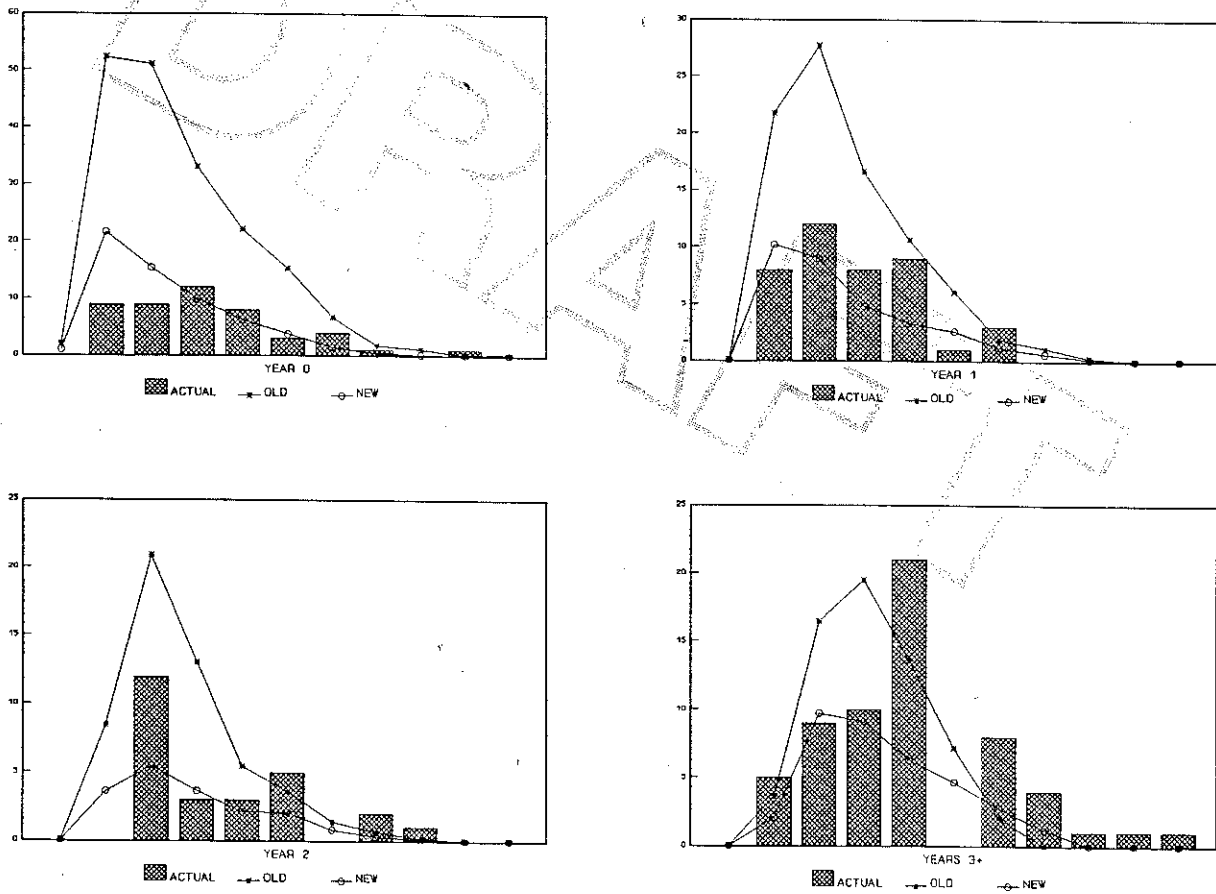
ACTIVE TURNOVER
MALE HAZARDOUS DUTY



SECTION 4 - DEMOGRAPHIC ASSUMPTIONS FOR ACTIVE MEMBERS

GRAPH 4.14

ACTIVE TURNOVER
 FEMALE HAZARDOUS DUTY



SECTION 5 - RETIRED MORTALITY

Assumptions Studied

In this section of the report, we are concerned with the patterns of mortality experienced by retired members of the System. We separate the mortality into that assumed to apply to healthy retirees and that assumed to apply to members who retired with a disability benefit.

Study Period

The study period was from July 1, 1988 through June 30, 1992.

Methodology

The study of retired decrements involves the same steps and the study of active decrements: observation of the actual number of deaths, determination of the "exposed" population, calculation of the expected number of deaths, and comparison of the expected number of deaths under the current assumption with that under alternative assumptions.

Study Results - Healthy Retirees

There were fewer deaths than expected at ages below 70, and more deaths than expected at ages above 70. The results were sufficiently consistent with our current assumption, however, that the only change we recommend is for females. The current female assumption is the 1983 GAM male table with ages setback 4 years. We recommend changing to the 1983 GAM female table.

Study Results - Disabled Retirees

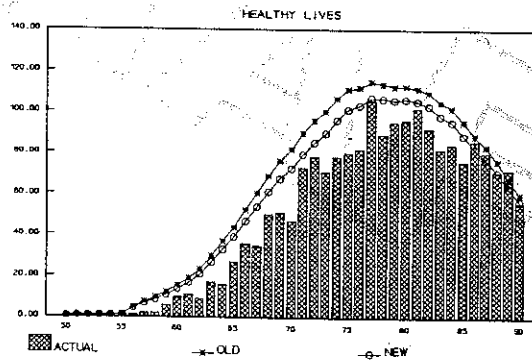
Actual deaths among disabled retirees were substantially less than the number expected under the current assumption. The data for this portion of our study is not sufficiently large to enable us to draw firm conclusions from the study alone. We therefore recommend using new rates of disabled mortality of 50% of the current rate.

SECTION 5 - RETIRED MORTALITY

The following graphs show the number of actual reported deaths and the number of expected deaths among retirees:

Graph	Description
5.1	Healthy Retirees
5.2	Disabled Retirees

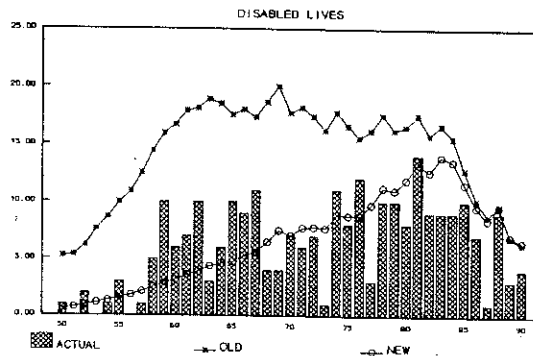
RETIRED MORTALITY



GRAPH 5.1

ACTUAL - 2,167 OLD - 2,758 NEW - 2,551

RETIRED MORTALITY



GRAPH 5.2

ACTUAL - 263 OLD - 611 NEW - 305