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April 3, 1945

ACTURIAL SURVEY OF

CONNECTICUT STATE EMPLOYEES RETIREMENT PLAN

We are enclosing herewith for your perusal an actuarial survey of the Connecticut State Employees' Retirement Plan. Since the copies are limited, we suggest that you post the report at a convenient place where it may be made available to the employee.

Very truly yours,

State Employees' Retirement Commission

John M. Dowe, Secretary

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ACTUARIAL SURVEY OF

CONNECTICUT STATE EMPLOYEES RETIREMENT PLAN

Just before the new retirement law went into effect in 1939, the state was paying its retired employees:-

1939 . . . . . $153,000 per year

Five years later, the payments to retired employees (including the amounts payable after termination of active service to "retired" employees who have been continued in service by reason of the war emergency) are as follows:-

Old Law	$112,000	per year
New Law	582,000	" "
1944 Total	$694,000	" "

The estimates for the future, developed from past experience by methods explained in the appendix, are:-

Year	Total Pension Payments	% of Estimated Payroll
1949	$1,251,000 per year	5.3%
1954	1,948,000 " "	8.0
1959	2,874,000 " "	11.6
1964	3,893,000 " "	15.7
1969	4,715,000 " "	19.2
1974	5,180,000 " "	21.2
1979	5,348,000 " "	21.9

It will be impossible to get anything like one-half of the above payments from employee contributions, as seems to have been contemplated by the framers of the Law, even if the rate of employee contribution is immediately raised from the minimum of 2½% of earnings to the present statutory maximum of 5%. At this rate of contribution the Retirement Fund accumulated out of employee contributions will continue for several years both to grow and to provide half the pensions, as it has done in the past. However, within an estimated 18 years from now, the Retirement Fund will not only stop growing but even become completely exhausted. After that time there will be no Retirement Fund to represent past contributions of the then active employees, and the state will consequently have to pay the major share of the pensions. See Table 1.

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TABLE 1

(1) Period	(2) 5 Years' Estimated Pensions ¦	(3) 5 Years' Estimated Contributions at 5%* of Salaries	(4) Estimated Interest Earnings at 2½% per Annum	(5) 5 Years' Estimated Refunds on Withdrawal or Death	(6) Part of Pensions Paid from Retirement Fund	(7) Estimated Retirement Fund at End of Period	(8) Net Cost to State ≠	(9) Cost to State as Percent of Payroll
1939-44	$1,292,000	$2,350,000	$ 92,000	$ 336,000	$ 646,000	$1,460,000	$ 646,000	.7%
1944-49	4,410,000	5,284,000	324,000	1,113,000	2,205,000	3,750,000	2,205,000	1.9
1949-54	7,745,000	5,982,000	519,000	1,815,000	3,873,000	4,563,000	3,872,000	3.2
1954-59	11,943,000	6,141,000	472,000	2,222,000	5,971,000	2,983,000	5,972,000	4.9
1959-64	16,888,000	6,198,000	150,000	2,418,000	6,913,000	None	9,975,000	8.1
1964-69	21,520,000	6,165,000	None	2,508,000	3,657,000	None	17,863,000	14.5
1969-74	24,738,000	6,118,000	None	2,535,000	3,583,000	None	21,155,000	17.3
1974-79	26,320,000	6,100,000	None	2,545,000	3,555,000	None	22,765,000	18.7

¦ Excluding amounts payable under Old Law in effect prior to 1939.

* 2½% for 1939-44 period and for the first year of the 1944-49 period.

≠ This cost is divided between the Highway Fund and the General Fund.

Ultimately, it is estimated, each year's employee contributions will be about $1,200,000, of which about $500,000 will be used to pay refunds of past years' contributions to employees currently dying or terminating employment, leaving $700,000 to apply against pensions of about $5,200,000--that would make the state's share about $4,500,000 per year.

It must be borne in mind in reading this report that the long-distance estimates we have made are based on many assumptions that may prove to be unreliable. The figures developed by actual events may be much different from the figures herein estimated. Our estimates have, to the maximum extent possible, been based upon the actual results of the 5-year period from late 1939 to late 1944. In particular we have used the actual survival ratios developed by the 1939 to 1944 experience. There is much reason to anticipate that, in the future, rates of withdrawal from employment before pension age will be lower than in the past five years. If this turns out to be so, future amounts of pension, and future costs to the state, may turn out to be substantially higher than the forecasts in this report. Similar comments might be made on our assumptions as to the age distributions of new employees hired, future average salaries (particularly if the country experiences a degree of inflation), mortality rates among pensioners, et cetera.

Change in Employee Contribution Rate

The statute provides that not more than one-half of the pensions shall be paid from the fund created by the employees' contributions. One-half of the pensions granted under the new law has been paid out of that fund. There is a provision that pensions granted under the old law shall not be paid from the new retirement fund.

The present statute requires employees to contribute at the rate of $2\frac{1}{2}\%$ of salaries for the six years commencing September 1, 1939. Thereafter the rate is to be based "on the actuarial anticipated cost averaged yearly for a period of ten years, with a restudy to be made each six years", subject to a maximum rate of 5%.

It is our opinion that the foregoing provisions require the increase of the employee contribution rate to 4%, effective September 1, 1945. This opinion is based on the following actuarial estimate:-

Estimated pension payments for ten years beginning September 1, 1945	$13,490,000	
One-half thereof to be paid from employee contributions		$6,745,000
Estimated employee contributions at 4% of salaries for ten-year period	9,483,000	
Estimated contribution refunds for employees leaving service or dying during ten-year period	2,713,000	
Contribution collections available for application against pensions		$6,770,000

Respectfully submitted, this 31st day of March, 1945.

HENRY S. BEERS
Fellow Actuarial Society of America, Fellow American Institute of Actuaries, and Member of the Connecticut State Employees' Retirement Commission

JAMES E. HOSKINS
Fellow Actuarial Society of America, Fellow American Institute of Actuaries, and Member of the Connecticut State Employees' Retirement Commission

A P P E N D I X

1. Employee Distributions.

Table 2 shows the 1944 distribution of active employees (excluding "retired" employees continued in active service by reason of the war emergency) by five-year age groups and year-hired groups. Tables 3 through 9 show how it is estimated this distribution will look in 1949, and each five years to 1979. These tables were computed successively from the next preceding table, starting from table 2, by the use of the assumptions stated in the next three sections of this appendix.

2. Survival Ratios.

To determine how many in any particular age group and year-hired group will neither die nor leave service, nor be retired for disability, within the next 5 years, we need a "survival ratio". These ratios were determined by comparing the 1939 employee distribution with the 1944 distribution of the survivors of the 1939 employees, after excluding those who had died, left service, or retired for disability. These ratios are shown in table 10.

3. Retirement Rates.

In developing tables 3 through 9, it was assumed that all employees reaching the mandatory retirement age would retire immediately. It was assumed that of employees eligible for service retirement the following percentages of the employees who were active five years ago and are still alive now, will have by now retired.

Ages	Lengths of Service	Percent Retired
55 - 59 if male	25 or over	25%
60 - 64 if male	25 or over	50
65 - 69 if male	25 or over	75
50 - 54 if female	25 or over	25
55 - 59 if female	25 or over	50
60 - 64 if female	25 or over	75

4. New Employees Hired.

In 1944 there were 6274 male employees and 4103 female employees in active service not yet eligible to retire on pension. It was assumed that these numbers would be constant in the future. After applying the survival ratios and retirement ratios described above to one employee distribution to obtain the distribution five years later, the numbers of male and female employees were brought up to the foregoing totals by adding in just enough new employees to accomplish this result. The distribution of these new employees (in the 0-5 years of service groups) in each age group was assumed to be the same as in the 1939 distribution (in the 0-5 years of service groups). See table 11.

5. Average Salaries.

It has been assumed that the pattern of average salaries according to age, length of employment, and sex, will remain about the same as in 1944. The averages, taken to the nearest hundred dollars, and smoothed slightly to avoid assuming that the salaries of any group of employees will decrease with increased duration of employment, are shown in table 12.

6. Disability Pensions.

So far about 24 men and 12 women have been granted disability pensions each year and it is assumed that approximately these rates will continue indefinitely. The death rates among disability pensioners have averaged about 8.6% per year in the case of men, and 4.7% per year in the case of women; it is assumed that these rates will apply up to the ages at which regular pensioners' mortality rates become higher. Table 13 shows the resulting estimated distributions of disability pensions each five years from 1944 to 1979.

7. Service and Mandatory Pensions.

The numbers of new pensioners come from the development of tables 3 through 9. The amounts of the pensions are determined from the percentage rules in the present law. Survival ratios for pensioners are based upon the 1937 Standard Annuity Table, modified in the case of male employees by rating ages up 2 years--these mortality assumptions would have produced 54.5 expected deaths during the 1939-44 period as compared with 55 actual deaths among service and mandatory pensioners. Table 14 shows the resulting assumed distributions of service and mandatory pensions each five years from 1944 to 1979.

TABLE 2

1944 Distribution of Active Employees
(excluding "retired" employees continued in active service for duration)

Age	Years of Service								
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44
MEN--Total 6385									
20 - 24	203	9							
25 - 29	323	116	5						
30 - 34	386	289	90	39					
35 - 39	303	272	191	165	16				
40 - 44	263	205	190	194	74	10			
45 - 49	263	192	165	173	97	15	2		
50 - 54	279	172	149	143	91	34	8	1	
55 - 59	201	95	87	84	63	28	19	4	
60 - 64	152	54	75	51	36	18	13	4	1
65 - 69	94	33	46	44	32	10	4	5	5
Total No.	2467	1437	998	893	409	115	46	14	6
WOMEN--Total 4088									
20 - 24	696	8							
25 - 29	364	151	10						
30 - 34	258	142	87	29	1				
35 - 39	214	124	93	81	24				
40 - 44	192	95	86	72	67	9			
45 - 49	185	74	76	63	40	22	2		
50 - 54	177	59	56	55	23	23	11	2	
55 - 59	125	31	30	29	13	8	10	4	1
60 - 64	77	16	23	15	19	9	4	1	2
Total No.	2288	700	461	344	187	71	27	7	3

TABLE 3

1949 Estimated Distribution of Active Employees

Age	Years of Service								
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44
MEN--Total 6434									
20 - 24	321								
25 - 29	481	65	3						
30 - 34	413	155	70	4					
35 - 39	276	208	208	69	30				
40 - 44	276	182	201	162	140	14			
45 - 49	230	147	158	165	169	64	9		
50 - 54	161	158	150	147	154	86	13	2	
55 - 59	92	142	122	130	124	64	24	6	
60 - 64	46	109	67	70	67	28	13	8	2
65 - 69		91	37	51	35	7	4	3	1
Total No.	2296	1257	1016	798	719	263	63	19	3
WOMEN--Total 4095									
20 - 24	589								
25 - 29	456	209	2						
30 - 34	285	127	68	6					
35 - 39	190	121	84	69	23	1			
40 - 44	171	120	86	83	72	21			
45 - 49	114	111	77	76	63	59	8		
50 - 54	57	109	56	67	55	29	16	1	
55 - 59	38	83	38	36	36	11	11	5	1
60 - 64		76	24	24	23	3	2	2	1
Total No.	1900	956	435	361	272	124	37	8	2

3	154	177	59	26			
5	140	175	141	122	12		
3	115	141	147	150	57	8	
2	112	131	128	108	60	9	1
0	99	98	104	56	29	11	2
8	74	46	48	14	6	3	2
76	845	824	630	476	164	31	5

WOMEN--Total 4169

77							
160	94	1					
134	75	54	5				
106	83	75	61	20	1		
99	97	76	73	63	18		
67	84	68	67	46	43	6	
27	70	36	44	26	14	7	
23	63	30	29	8	2	3	1
793	566	340	279	163	78	16	1

236	166	30	1				
175	165	95	46	3			
163	128	134	154	51	23		
145	121	125	156	125	109	11	
87	98	100	123	103	105	40	5
52	57	90	105	58	49	27	4
29	34	67	67	22	12	6	2
1239	831	641	652	362	298	84	11

WOMEN--Total 4235

178							
162	80						
136	94	74	1				
108	92	67	48	4			
101	86	73	66	54	18	1	
68	75	85	67	53	46	13	
27	43	55	44	32	22	20	3
24	21	56	29	10	6	3	2
804	491	410	255	153	92	49	5

2	176	48						
7	175	141	26	1				
4	135	144	83	40	3			
5	127	114	119	137	45	20		
2	103	105	109	109	88	76	8	
6	61	78	80	55	46	47	18	2
1	35	39	61	22	12	10	6	1
4	877	669	478	364	194	153	32	3

WOMEN--Total 4226

84								
66	80							
39	96	63						
11	94	84	66	1				
03	87	81	59	42	4			
70	77	76	64	48	39	13		
28	44	49	55	32	25	22	6	
24	21	34	44	10	8	5	4	1
25	499	387	288	133	76	40	10	1

TABLE 7

1969 Estimated Distribution of Active Employees

Age	Years of Service 0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49
MEN--Total 6726										
20 - 24	363									
25 - 29	545	120								
30 - 34	468	270	70							
35 - 39	312	260	188	50						
40 - 44	312	193	186	150	41					
45 - 49	260	180	144	152	123	23	1			
50 - 54	182	161	136	120	128	74	36	3		
55 - 59	104	96	110	110	99	83	95	32	14	
60 - 64	52	58	64	82	84	49	49	40	34	3
65 - 69		32	38	41	53	17	12	10	10	4
Total No.	2598	1370	936	705	528	246	193	85	58	7
WOMEN--Total 4198										
20 - 24	601									
25 - 29	465	183								
30 - 34	291	166	83							
35 - 39	194	139	98	63						
40 - 44	174	110	96	85	56					
45 - 49	116	103	90	83	74	58	1			
50 - 54	58	70	78	77	71	43	31	1		
55 - 59	39	28	45	50	49	30	23	18	6	
60 - 64		24	21	35	39	13	8	6	5	1
Total No.	1938	823	511	393	289	144	63	25	11	1

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TABLE 8

1974 Estimated Distribution of Active Employees

Age	Years of Service									
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49
MEN--Total 6637										
20 - 24	350									
25 - 29	523	116								
30 - 34	450	262	72							
35 - 39	300	253	194	54						
40 - 44	300	187	192	160	43					
45 - 49	250	175	149	162	131	36				
50 - 54	175	156	140	128	135	109	20			
55 - 59	100	93	114	118	104	90	52	25	2	
60 - 64	50	56	67	88	88	45	37	43	14	6
65 - 69		31	39	44	56	18	10	10	8	7
Total No.	2498	1329	967	754	557	298	119	78	24	13
WOMEN--Total 4206										
20 - 24	605									
25 - 29	468	180								
30 - 34	292	163	82							
35 - 39	195	137	98	66						
40 - 44	175	109	96	87	56					
45 - 49	117	101	89	84	75	49				
50 - 54	58	68	78	79	73	54	42	1		
55 - 59	39	27	45	51	50	34	20	14		
60 - 64		24	21	36	40	11	7	5	4	1
Total No.	1949	809	509	403	294	148	69	20	4	1

TABLE 9

1979 Estimated Distribution of Active Employees

Age	Years of Service										
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54
MEN--Total 6630											
20 - 24	350										
25 - 29	524	112									
30 - 34	450	251	70								
35 - 39	300	243	189	55							
40 - 44	300	180	187	165	46						
45 - 49	249	168	144	167	139	37					
50 - 54	175	150	137	133	144	116	32				
55 - 59	100	89	111	122	111	95	76	14			
60 - 64	50	54	65	91	94	47	40	23	11	1	
65 - 69		30	38	46	60	19	9	8	9	3	1
Total No.	2498	1277	941	779	594	314	157	45	20	4	1
WOMEN--Total 4211											
20 - 24	603										
25 - 29	466	182									
30 - 34	292	164	81								
35 - 39	195	137	96	65							
40 - 44	175	109	95	87	59						
45 - 49	117	102	88	84	77	49					
50 - 54	58	69	77	78	74	55	36				
55 - 59	39	27	44	51	51	35	25	20			
60 - 64		24	21	36	41	11	8	5	3		
Total No.	1945	814	502	401	302	150	69	25	3		

TABLE 10

5-Year Survival Ratios

Based on 1939-1944 Experience

	Years of Service					
	0 - 4		5 - 9		10 and over	
Age	Male	Female	Male	Female	Male	Female
20 - 24	.32	.30	.36	.30		
25 - 29	.48	.35	.60	.45	.77	.60
30 - 34	.54	.47	.72	.59	.77	.79
35 - 39	.60	.56	.74	.69	.85	.89
40 - 44	.56	.58	.77	.81	.87	.88
45 - 49	.60	.59	.78	.76	.89	.88
50 - 54	.51	.47	.71	.64	.87	.65
55 - 59	.54	.61	.70	.76	.80	.80
60 - 64	.60		.68		.68	

TABLE 11

Distribution by Age of Employees with less than 5 Years of Service

Based on 1939 Employees

Age	Male	Female
20 - 24	14%	31%
25 - 29	21	24
30 - 34	18	15
35 - 39	12	10
40 - 44	12	9
45 - 49	10	6
50 - 54	7	3
55 - 59	4	2
60 - 64	2	-
	100%	100%

TABLE 12

Average Salaries

Based on 1944 Salaries

Years of Service

Age	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54
MEN											
20 - 24	1400	1500									
25 - 29	1700	1800	1800								
30 - 34	2100	2200	2200	2200							
35 - 39	2400	2500	2600	2600	2500						
40 - 44	2300	2700	2800	2900	3000	2900					
45 - 49	2200	2600	2900	3000	3200	3400	3000				
50 - 54	2100	2500	2800	3000	3200	3500	3700	3000			
55 - 59	1900	2300	2600	2900	3100	3300	3600	3800	3000		
60 - 64	1800	2200	2500	2700	3000	3200	3400	3700	3900	3000	
65 - 69	1500	2000	2400	2500	2800	3100	3300	3500	3800	3900	3000
WOMEN											
20 - 24	1400	1600									
25 - 29	1600	1700	1700								
30 - 34	1800	1800	1800	1800	1400						
35 - 39	1800	2000	2100	2100	2000	1500					
40 - 44	1700	2100	2200	2300	2300	2200	1500				
45 - 49	1600	2000	2200	2300	2500	2500	2400	1500			
50 - 54	1500	1900	2200	2400	2400	2600	2600	2500	1500		
55 - 59	1500	1800	2100	2300	2600	2500	2700	2700	2600	1500	
60 - 64	1400	1800	1900	2300	2400	2600	2600	2800	2800	2700	1500

TABLE 13

Estimated Disability Pensions (New Law)

Period	Male	Female
1944-49	$552,000	$248,000
1949-54	737,000	340,000
1954-59	845,000	390,000
1959-64	908,000	442,000
1964-69	943,000	492,000
1969-74	957,000	518,000
1974-79	960,000	538,000

TABLE 14

Estimated Service and Mandatory Pensions (New Law)

Period	Male	Female
1944-49	$2,460,000	$1,150,000
1949-54	4,408,000	2,260,000
1954-59	7,000,000	3,708,000
1959-64	10,173,000	5,365,000
1964-69	13,145,000	6,940,000
1969-74	15,085,000	8,178,000
1974-79	15,792,000	9,030,000