

Minneapolis
Fire Department Relief Association
Annual Actuarial Valuation
December 31, 1986

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May 22, 1987

Board of Trustees
Minneapolis Fire Department Relief Association
Minneapolis, Minnesota

Submitted in this report are the results of the December 31, 1986 actuarial valuation of the assets, actuarial values and contribution requirements associated with the benefits provided by the Minneapolis Fire Department Relief Association.

The valuation results contained in Section A provide the actuarial information needed to determine the employer's "minimum obligation" effective January 1, 1988. Section A also contains comments regarding the valuation results.

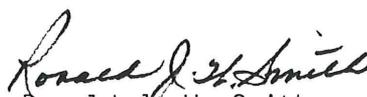
The valuation was based upon information furnished by the Association concerning benefits, financial transactions, active members, terminated members, retirants and beneficiaries. Data was checked for year to year consistency but was not otherwise audited by us. This information is summarized in Section B.

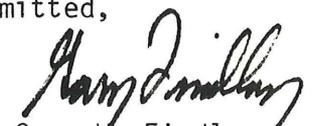
A description of the actuarial funding method and the risk experience assumptions used is contained in Section C. The economic risk experience assumptions, as well as the actuarial funding method to be used, are established by state law.

Information needed to comply with Statement No. 5 of the Governmental Accounting Standards Board is contained in Section D.

The actuarial valuation was prepared using generally accepted actuarial principles and practices based upon the methods, assumptions, summary of plan provisions and the member and financial data described in this report.

Respectfully submitted,


Ronald J. W. Smith


Gary V. Findlay

Section A

Valuation Results

COMMENTS

Economic Assumptions and Financing Method

The economic assumptions of 5% annual investment return and 3-1/2% annual salary increases are established by state law. State law also specifies that the annual minimum obligation of the municipality shall be determined by adding (i) the employer normal cost percent times covered payroll to (ii) the level dollar amount required to amortize the unfunded actuarial accrued liability by December 31, 2010.

It is worth noting that when the same assumptions and methods are applied to plans which differ in nature, the valuation results may not be comparable. Caution should be exercised when attempting to assess the financial condition of one Association relative to another on the basis of valuation results produced using the assumptions and methods mandated by state law.

Minneapolis Fire Department Relief Association

CONTRIBUTION RATE TO PROVIDE BENEFITS

Member portion & Employer portion
Effective January 1, 1988

Contributions for	If Paid Equally Throughout Year	
	Normal Cost % of Active Payroll for 1988	+ UAAL Dollars
Normal cost of annuities:		
Age & service: to members	18.22%	
Age & service: to survivors	3.76	
Disability	3.12	
Death before retirement	2.13	
Refunds of member contributions	0.00	
Total Normal Cost	27.23%	
Amortization of unfunded actuarial accrued liabilities (UAAL) (23 year level dollar payment)		
Retired lives		\$2,976,385
Active members		5,656,682
Total		8,633,067
 Total Cost of Benefits	 27.23%	 + \$8,633,067
 Member contributions	 8.00%	
 COMPUTED EMPLOYER RATE:		
(a) If Paid Equally Throughout Year	19.23%	+ \$8,633,067
(b) IF PAID AS OUTLINED BELOW	19.45%	+ \$8,731,484

The amounts in (b) were computed to adjust for interest according to the following payment pattern:

1. The state amortization aid of \$1,728,157 is received in 4 equal installments on 3/15, 7/15, 9/15 and 11/15.
2. The balance of the contribution is received as follows:
 - a. 16.0% of the balance is received from the State on 10/15.
 - b. 35.1% of the balance is received from the City on 7/5 and 12/5.
 - c. 2.3% of the balance is received from the City on 7/15, 8/15, 9/15, 10/15, 11/15 and 12/15.

Minneapolis Fire Department Relief Association
Present Actuarial Condition

The Association's accrued actuarial assets were in excess of \$67.3 million on December 31, 1986 -- a considerable sum of money if unencumbered and allocated among a small group of persons. This is not the case with the Association's assets.

The following schedule puts the \$67.3 million into perspective by showing the relationship between accrued actuarial assets, actuarial accrued liabilities, and the number of persons with actual and potential claims on the Association's assets.

	<u>Accrued Actuarial Assets</u>	<u>Actuarial Accrued Liabilities</u>	<u>Unfunded Actuarial Accrued Liabilities</u>	<u>% Funded</u>
Retirants and Beneficiaries				
Retired Members (361)		\$ 89,249,052		
Surviving Spouses (194)		19,023,372		
Surviving Children (4)		<u>185,328</u>		
Total (559)		\$108,457,752		
 Deferred Members (0)				
 Active Members (401)		<u>78,192,582</u>		
 Total	\$67,315,048	\$186,650,334	\$119,335,286	36.1%

Actuarial accrued liabilities represent the value, computed as of December 31, 1986 of:

- (i) retirement allowances likely to be paid the 559 retirants and beneficiaries; and
- (ii) the contributions assumed to have been made for the 401 active members from entry into the plan until December 31, 1986.

The value of retirement allowances likely to be paid the 559 retirants and beneficiaries, discounted for investment earnings and mortality, was computed to be \$108,457,752 as of December 31, 1986. To put this amount in perspective, the \$108,457,752, together with investment earnings, will just be sufficient to pay the 559 retirants and beneficiaries their allowances for their remaining lifetimes. This assumes the 559 retirants and beneficiaries live and die according to the assumed mortality and the \$108,457,752 is invested to yield an average annual return of 5.0% over the remaining lifetimes of the retirants and beneficiaries.

With respect to the active members, the actuarial accrued liability of \$78,192,582 represents the amount that would have been accumulated by December 31, 1986. This assumes the normal cost (which is expressed as a level percentage of pay) had been contributed from the date of hire until December 31, 1986 for the 401 actives, and that these amounts had earned 5.0% interest. It also assumes that the members in the past had lived, died, withdrawn, retired and received salary increases according to the actuarial assumptions shown in this report.

Historical Funding Ratio Schedule
(\$ in thousands)

<u>Valuation Date December 31</u>	<u>Actuarial Accrued Liabilities</u>	<u>Accrued Actuarial Assets</u>	<u>Percent Funded</u>
1978	\$109,369	\$11,142	10.2%
1979	120,572	14,707	12.2
1980	130,136	16,731	12.9
1981	140,009	21,453	15.3
1982	149,066	30,989	20.8
1983	154,408	38,939	25.2
1983*	165,956	38,939	23.5
1984	171,333	42,973	25.1
1985	177,468	55,568	31.3
1985*	181,514	55,568	30.6
1986	186,650	67,315	36.1

* After change in assumptions.

Minneapolis Fire Department Relief Association
 Computed Contributions - Comparative Schedule

Year Ended December 31		Total Normal Cost as a Percent of Valuation Payroll*	Contribution For Unfunded Actuarial Accrued Liabilities
Valuation	Fiscal		\$ or %
1978	1980	22.94%	\$4,940,841
1979	1981	23.39	6,720,323
1980	1982	23.50	7,308,646
1981	1983	24.52	7,765,191
1982	1984	24.50	7,868,634
1983	1985	24.41	7,838,161
1983	1985**	26.83	8,622,036
1984	1986	26.75	8,887,100
1985	1987	25.91	8,620,459
1985	1987**	27.28	8,906,560
1986	1988	27.23	8,633,067

* Includes employee contributions.

** After change in assumptions.

Minneapolis Fire Department Relief Association
 CONTRIBUTION FOR CALENDAR YEAR EFFECTIVE JANUARY 1, 1988

For any period of time the percent-of-payroll contribution rate is converted to dollars. The amount of dollars for any calendar year depends upon the results of the last actuarial valuation, and the timing of contributions within the year. The later the contribution date, the greater the dollar amount will be.

The municipality's dollar contribution for the year may be determined as follows:

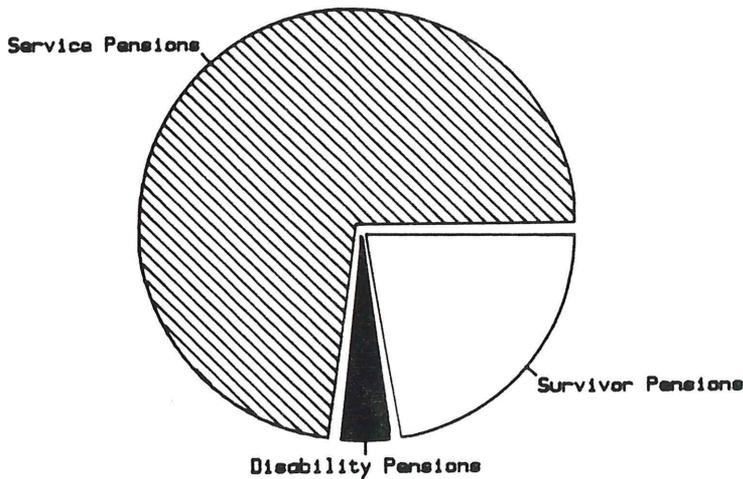
(1) Estimated covered payroll for 1988		\$ _____
(2) Total normal cost % from page A-2		27.23%
(3) Total normal cost (Line 1 times line 2)		\$ _____
(4) Amortization payment on UAAL from page A-2		8,633,067
(5) Total contributions required (Line 3 plus line 4)		_____
(6) Employee contributions (Line 1 times 8%)		\$ _____
(7) (a) State amortization aid based on 12/31/78 UAAL of \$101,257,108	\$1,523,919	
(b) State amortization aid based on 1984 legislation	<u>204,238</u>	
(c) Total State amortization aid		\$1,728,157
(8) Estimated insurance premium aid		_____
(9) Estimated total contributions from other sources (Line 6 plus line 7 plus line 8)		_____
(10) Employer's Minimum Obligation if payment is made in equal installments throughout the year (Line 5 minus line 9)		\$ _____
(11) EMPLOYER'S MINIMUM OBLIGATION IF PAYMENT IS MADE AT YEAR END (Line 10 times 1.0114)		\$ _____

Section B

**Valuation Data
and
Summary of Benefit Provisions**

Minneapolis Fire Department Relief Association
 Retirants and Beneficiaries December 31, 1986
 By Type of Annuity Being Paid

<u>Type of Annuity Being Paid</u>	<u>No.</u>	<u>Monthly Amounts</u>	<u>Computed Actuarial Accrued Liabilities</u>
Retirants receiving:			
Age & Service	340	\$490,639.88	\$ 80,771,040
Disability	<u>21</u>	<u>30,743.32</u>	<u>8,478,012</u>
Totals	361	521,383.20	89,249,052
Beneficiaries receiving:			
Spouse	194	150,177.83	19,023,372
Child	<u>4</u>	<u>1,179.60</u>	<u>185,328</u>
Totals	198	151,357.43	19,208,700
Totals	<u>559</u>	<u>\$672,740.63</u>	<u>\$108,457,752</u>



Monthly Amount Paid by Benefit

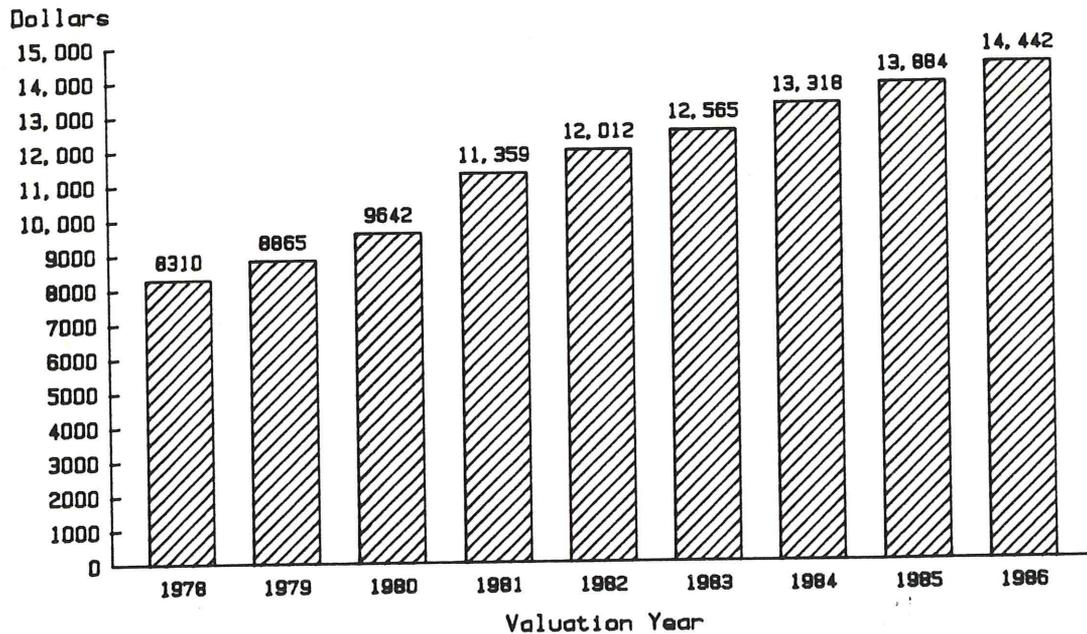
Minneapolis Fire Department Relief Association
 Retirants and Beneficiaries December 31, 1986
 By Attained Ages

<u>Attained Ages</u>	<u>Number</u>		
	<u>Age & Service</u>	<u>Disability</u>	<u>Death Before Retirement</u>
Under 20			4
30-34			1
35-39		3	
40-44		2	1
45-49		6	3
50-54	18	6	3
55-59	55	7	4
60-64	79	3	2
65-69	59	7	1
70-74	105	15	10
75-79	57	10	4
80-84	34	11	1
85-89	23	5	
90-94	12	3	
95-99	4		
100	<u>1</u>	<u>—</u>	<u>—</u>
Totals	447	78	34

Minneapolis Fire Department Relief Association
 Retirants and Beneficiaries Added to and Removed from Rolls
 Comparative Statement

Valuation Date December 31	No. Added to Rolls	No. Removed from Rolls	Rolls End of Year		Discounted Value of Total Allowances
			No.	Annual Allowances	
1978			565	\$4,695,370	\$ 67,376,125
1979	N/A	N/A	587	5,203,641	74,537,933
1980	20	38	569	5,486,328	78,062,142
1981	48	54	563	6,395,262	82,918,406
1982	24	30	557	6,690,894	85,895,330
1983	35	34	558	7,011,344	98,013,148
1984	27	37	548	7,298,189	99,824,604
1985	35	28	555	7,705,364	104,997,624
1986	25	21	559	8,072,888	108,457,752

Average Annual Allowances



Minneapolis Fire Department Relief Association

Active Members December 31, 1986

By Attained Age and Years of Service

Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
25-29		2						2	\$ 70,776
30-34		18	6					24	849,312
35-39		16	67	1				84	2,972,592
40-44		6	42	35				83	2,937,204
45-49			15	41	24	2		82	2,901,816
50-54				12	20	22	1	55	1,946,340
55-59					20	20	8	48	1,698,624
60						2	3	5	176,940
61						1	3	4	141,552
62						1	4	5	176,940
63					1		4	5	176,940
64							3	3	106,164
67							1	1	35,388
Totals		42	130	89	65	48	27	401	\$14,190,588

While not used in the financial computations, the following group averages are computed and shown because of their general interest.

Age: 45.8 years.

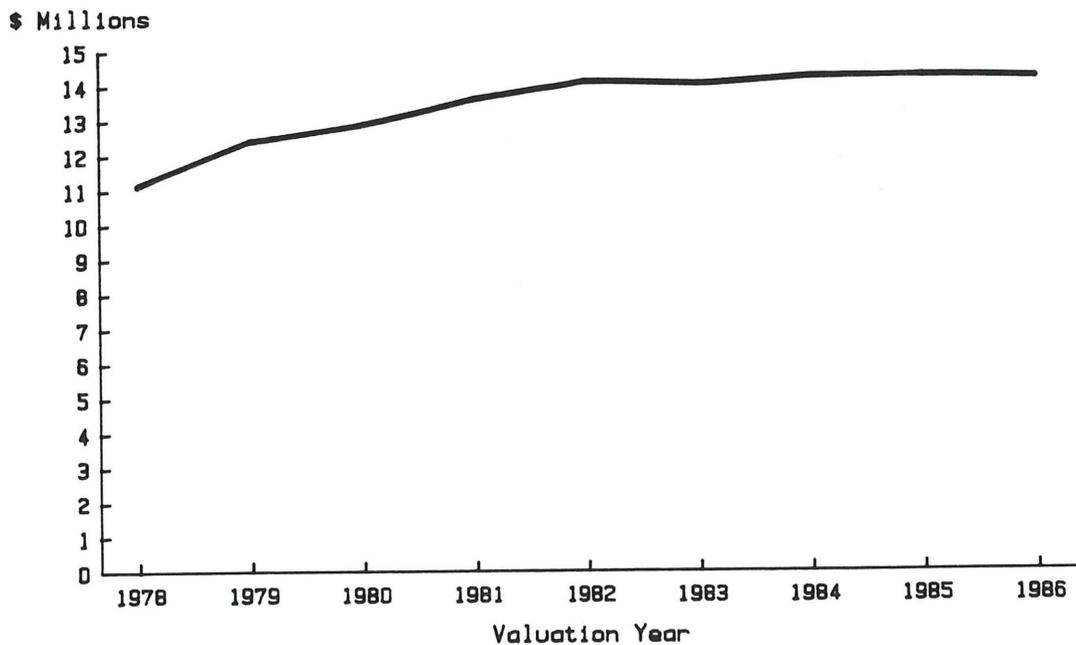
Service: 18.3 years.

Annual Pay: \$35,388.

Minneapolis Fire Department Relief Association
 Comparative Schedule
 Of Active Members

Valuation Date December 31	Active Members	Valuation Payroll	Average			
			Age	Service	Pay	% Incr.
1978	497	\$11,168,664	42.4 yrs.	14.9 yrs.	\$22,472	- %
1979	515	12,440,340	41.8	14.3	24,156	7.5
1980	496	12,906,912	42.4	14.8	26,022	7.7
1981	485	13,645,960	42.8	14.9	28,136	8.1
1982	474	14,152,692	43.6	15.8	29,858	6.1
1983	451	14,042,787	44.0	16.2	31,137	4.3
1984	438	14,278,362	44.6	16.9	32,599	4.7
1985	418	14,291,838	45.3	17.7	34,191	4.9
1986	401	14,190,588	45.8	18.3	35,388	3.5

Valuation Payroll



Minneapolis Fire Department Relief Association

Brief Summary (12/31/86) of Benefit Provisions Evaluated and/or Considered

Age & Service Retirement

Eligibility. 20 years of service and 50 years of age.

Amount. For first 20 years of service, 33/80 of base pay. For service in excess of 20 years, an additional 1/80 is provided for each of the first 4 years and 4/80 is added for the 25th year to a maximum of 41/80 of base pay for 25 or more years of service.

Pay Used for Plan Purposes. "Base pay" means the maximum monthly salary of a first grade firefighter.

Disability Retirement

Eligibility.

First Class Disability. Disabled to the extent that no longer able to perform duties of firefighter or any manual labor.

Second Class Disability. Disabled to the extent that no longer able to perform duties of a firefighter but able to perform light manual labor or office work.

Third Class Disability. Disabled to the extent that no longer able to perform duties of a firefighter but able to perform other manual labor.

Amount.

First Class Disability. 41/80 of base pay.

Second Class Disability. 33/80 of base pay.

Third Class Disability. 25/80 of base pay.

Member's Death While Active, Or in Deferred Status, Or Retired

Eligibility.

Spouse. Married to member at separation from service and residing with member at time of death. (For service or deferred retirement, must have been married

at least one year before separation from service.) Benefits terminate upon remarriage but may be reinstated if marriage terminates.

Child. Younger than age 18 or, if full-time student, younger than age 22.

Amount.

Spouse. 21/80 of base pay.

Child. 8/80 of base pay per child. Children's maximum is 20/80 if spouse is receiving or 41/80 if no spouse is receiving.

Vested Deferred. 20 years of service and separated before age 50. Payment beginning is deferred to attainment of age 50.

Post-Retirement Adjustments ("Escalator"). Each time base pay is changed, payments to all benefit recipients are changed simultaneously by the same percent that base pay is changed.

Member Contributions. 8% of base pay. Member contributions are non-refundable.

Section C

Valuation Methods and Assumptions

Minneapolis Fire Department Relief Association

Valuation Methods and Assumptions

The Entry Age Normal Cost method was used to determine the normal cost of all benefits. The rate of investment return (interest) as required by state law used in making the valuation was 5.0 percent per annum, compounded annually. Age & service retirement was assumed to occur at age 57, or attained age if older. It was further assumed that 85% of the members would have eligible beneficiaries.

Mortality Table*

Sample Ages	Single Life Values: Present Value of \$1 Monthly				Future Life Expectancy (Years)	
	Level For Life		Increasing 3.5% Yearly		Men	Women
	Men	Women	Men	Women		
45	\$177.21	\$189.58	\$280.82	\$314.75	29.50	34.00
50	163.12	177.21	246.55	280.82	25.20	29.50
55	147.50	163.12	212.60	246.55	21.16	25.20
60	130.52	147.50	179.49	212.60	17.42	21.16
65	112.87	130.52	148.28	179.49	14.05	17.42
70	95.20	112.87	119.70	148.28	11.09	14.05
75	77.77	95.20	93.83	119.70	8.52	11.09
80	61.71	77.77	71.69	93.83	6.39	8.52

* UP-1984 Table set forward 2 years for males and set back 3 years for females.

Sample Rates of Separation from Active Employment
Before Retirement, Death or Disability

Sample Ages	% of Active Members Separating within Next Year
20	1.50%
25	1.25
30	1.00
35	0.75
40	0.50
45	0.25
50+	0.00

Pay Adjustment Factor Used To Project Current Pays

<u>Sample Ages</u>	<u>Present Pay Resulting in Pay of \$1,000 at Age 60</u>	<u>Present Increase in Pay During Next Year</u>
20	\$ 253	3.5%
25	300	3.5
30	356	3.5
35	423	3.5
40	503	3.5
45	597	3.5
50	709	3.5
55	842	3.5
60	1,000	3.5

Use of the pay adjustment factor illustrated above is required by state law.

Anticipated Disability Retirements

<u>Sample Ages</u>	<u>% of Active Members Becoming Disabled within Next Year</u>
20	0.08%
25	0.08
30	0.08
35	0.08
40	0.20
45	0.26
50	0.49
55	0.89

Section D

**The Pension Benefit Obligation
and Certain Other Disclosures
Required by Statement No. 5 of the
Governmental Accounting Standards Board**

PENSION BENEFIT OBLIGATION

The amount shown below as the "pension benefit obligation" is a standardized disclosure measure of the present value of pension benefits, adjusted for the effects of projected salary increases, estimated to be payable in the future as a result of employee service to date. The measure is the actuarial present value of credited projected benefits and is intended to (i) help users assess the plan's funding status on a going-concern basis, (ii) assess progress being made in accumulating sufficient assets to pay benefits when due, and (iii) allow for comparisons among public employee retirement plans. The measure is independent of the actuarial funding method used to determine contributions to the plan.

The pension benefit obligation was determined as part of an actuarial valuation of the plan as of December 31, 1986. Significant actuarial assumptions used in determining the pension benefit obligation include (a) a rate of return on the investment of present and future assets of 5.0% per year compounded annually, (b) projected salary increases of 3.5% per year compounded annually, attributable to inflation, and (c) the assumption that benefits will increase 3.5% per year after retirement.

At December 31, 1986, the unfunded pension benefit obligation was \$118,562,671, determined as follows:

Pension Benefit Obligation:

Retirees and beneficiaries currently receiving benefits and terminated employees not yet receiving benefits	\$108,457,752
Current employees --	
Accumulated employee contributions including allocated investment income	0
Employer financed	<u>74,471,766</u>
Total Pension Benefit Obligation	\$182,929,518
Net assets available for benefits, at cost (market value was \$73,211,451)	<u>64,366,847</u>
Unfunded Pension Benefit Obligation	\$118,562,671

Appendices

APPENDIX I

FINANCIAL PRINCIPLES AND OPERATIONAL TECHNIQUES

Promises Made, and Eventually Paid. As each year is completed, the plan in effect hands an "IOU" to each member then acquiring a year of service credit -- the "IOU" says: "The Pension Plan owes you a portion of your retirement benefits, payments to be made in cash, commencing when you qualify for retirement."

The related key financial questions are: Which generation of taxpayers contributes the money to cover the IOU? The present taxpayers, who receive the benefit of the member's present year of service? Or the future taxpayers, who happen to be in town paying taxes at the later time when the IOU becomes a cash demand?

A sound principle of sound retirement plan financing is to have this year's taxpayers contribute the money to cover the IOUs being handed out this year. By following this principle, THE CONTRIBUTION RATE WILL REMAIN APPROXIMATELY LEVEL FROM GENERATION TO GENERATION -- our children and grandchildren will contribute the same percents of active payroll we contribute now.

A PENSION PLAN BECOMES CLOSED

The diagram in this appendix shows two important activities which occur after a plan has been closed to employees hired in the future.

Cash benefits paid continue to increase for decades, while active member payroll begins to decrease to zero.

Funding Method. A funding method is the long-term, planned pattern for employer contributions.

For an open plan (a plan covering future employees), the level-percent-of-active-member payroll funding method is the basic funding method.

The level-percent funding method can also be applied to a closed plan. However, the resulting contribution percent usually jumps to a high rate, because the number of covered active members is decreasing.

A preferred funding method for a closed plan consists of: level-percent funding for normal cost (the cost of members' service now being rendered); plus a level dollar contribution for unfunded actuarial accrued liabilities over a limited period of years. The period of years must be limited so that plan assets don't become zero while benefits are still payable.

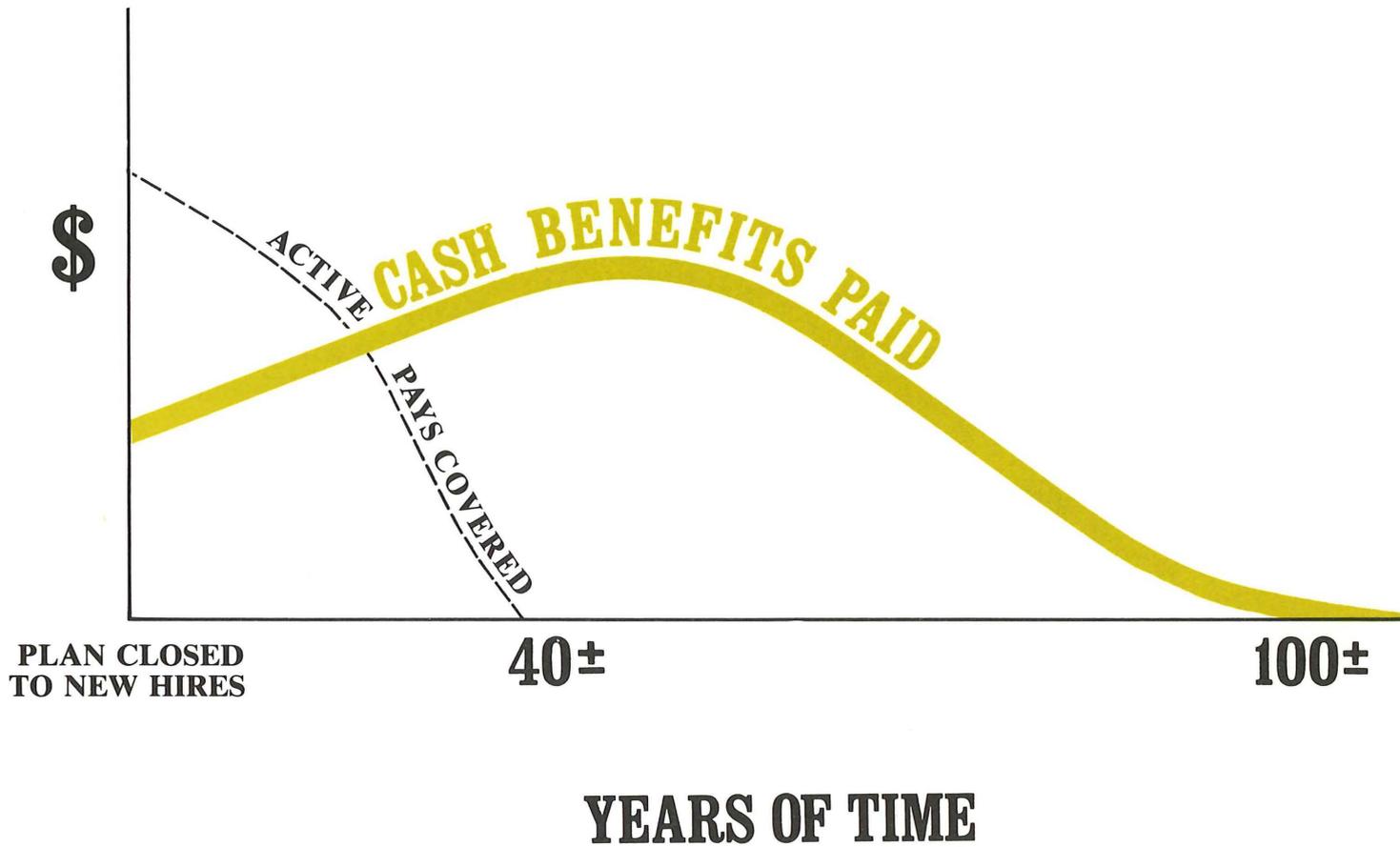
Computing Contributions To Support Plan Benefits. From a given schedule of benefits and from the employee data and asset data furnished him, the actuary determines the contribution rates to support the benefits by means of an actuarial valuation and a funding method.

In making an actuarial valuation, assumptions must be made regarding anticipated financial experiences for the next year and for decades in the future. Only the subsequent actual experience of the plan can indicate the degree of accuracy of the assumptions.

Reconciling Differences Between Assumed Experience and Actual Experience. Once actual experience has occurred and been observed, it will not coincide exactly with assumed experience, regardless of the wisdom of the assumptions or the skill of the actuary and the millions of calculations he made. The future can be predicted with considerable but not 100% precision, except for inflation which seems to defy reliable prediction.

A well-managed plan copes with these continually changing differences by having periodic actuarial valuations. Each actuarial valuation is a complete recalculation of assumed future experience, taking into account all past differences between assumed and actual experience. The result is continuing adjustment in financial position.

A CLOSED PENSION PLAN



A plan becomes closed when no new hires are admitted to active membership. The persons covered by the plan at the time of closing continue their normal activities and continue to be covered by the plan, until the last survivor dies.

CASH BENEFITS LINE. After a pension plan becomes closed, the usual pattern is for cash benefits to continue to increase for decades of time. Eventually the cash benefits will peak, and then gradually decrease over more decades of time, ultimately to zero. The last cash benefit is likely to occur a century after the time the plan is closed.

The precise amounts of cash benefits cannot be known now, and must be estimated by assumptions of future experiences in a variety of financial risk areas.

APPENDIX II

MEANING OF UNFUNDED ACCRUED LIABILITIES

Almost every pension plan (public or private) has "unfunded accrued liabilities", so whatever they are, they aren't rare. Since the term is not part of everyday conversation, it needs some definition.

"Accrued liabilities" are the present value \$ of plan promises to pay benefits in the future based upon service already rendered - - - a liability has been established ("accrued") because the service has been rendered, but the resulting monthly cash benefit may not be payable until years in the future. Accrued liabilities \$ are the result of complex mathematical calculations, which are made by the plan's actuary (which is the name given to the specialist who makes such calculations).

If "accrued liabilities" at any time exceed the plan's accrued assets (cash & investments), the difference is "unfunded accrued liabilities". This is the common condition. If the plan's assets equalled the plan's "accrued liabilities", the plan would be termed "fully funded". This is a rare condition.

Each time a plan adds a new benefit which applies to service already rendered, an "accrued liability" is created, which is also an "unfunded accrued liability" because the plan can't print instant cash to cover the accrued liability. Payment for such unfunded accrued liabilities is spread over a period of years, commonly in the 20-40 year range.

Unfunded accrued liabilities can occur in another way: If actual financial experience is less favorable than assumed financial experience, the difference is added to unfunded accrued liabilities. In plans where plan benefits are directly related to an employee's pay near time of retirement (a common plan provision) rather than his average pay throughout his working career, unfunded accrued liabilities have been increasing in recent years because unexpected rates of pay increase have created additional accrued liabilities which could not be matched by reasonable investment results. Some of these unexpected pay increases are the direct result of inflation, which is a very destructive force on financial stability.

The existence of unfunded accrued liabilities is not bad, then (any more than a mortgage on your house is "bad"), but the changes from year to year in amount of unfunded accrued liabilities are important - - - "bad" or "good" or somewhere in between.

Nor are unfunded accrued liabilities a bill payable immediately (your food costs are payable immediately), but it is important that policy-makers prevent the amount from becoming unreasonably high and it is vital that your plan have a sound method for making payments toward them so that they are controlled.

The existence of large amounts of unfunded accrued liabilities indicates that total contributions in past years were less than level - - - an almost certain history if retired life liabilities are not fully funded now.