

Duluth  
Police Pension Association  
Annual Actuarial Valuation  
December 31, 1986

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April 10, 1987

Board of Trustees  
Duluth Police Pension Association  
Duluth, 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 Duluth Police Pension Association.

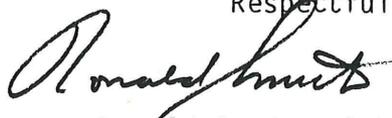
The valuation results contained in Section A provide the actuarial information needed to determine the employer's "minimum obligation" effective January 1, 1988. Section A also contains comments regarding the valuation results.

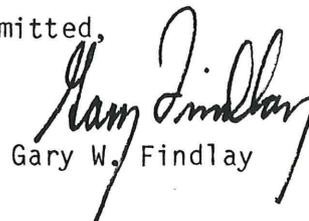
The valuation was based upon information furnished by the Association concerning benefits, financial transactions, active members, terminated members, retirants and beneficiaries. Data was checked for year to year consistency but was not otherwise audited by us. This information is summarized in Section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

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 W. Findlay

**Section A**

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**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.

Duluth Police Pension Association  
 CONTRIBUTION RATE TO PROVIDE BENEFITS

Member portion & Employer portion  
 Effective January 1, 1988

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Contributions for	If Paid Equally Throughout Year Normal Cost % of Active Payroll for 1988	+	UAAL Dollars
Normal cost of annuities:			
Age & service: to members	15.44%		
Age & service: to survivors	2.78		
Disability	2.94		
Death before retirement	2.00		
Refunds of member contributions	0.00		
Total Normal Cost	23.16%		
Amortization of unfunded actuarial accrued liabilities (UAAL) (23 year level dollar payment)			
Retired lives			\$ 88,486
Active members			1,006,510
Total			\$1,094,996
Total Cost of Benefits	23.16%	+	\$1,094,996
Member contributions	8.00%		
COMPUTED EMPLOYER RATE:			
(a) If Paid Equally Throughout Year	15.16%	+	\$1,094,996
(b) IF PAID AT CALENDAR YEAR END	15.53%	+	\$1,122,037

Duluth Police Pension Association  
 Present Actuarial Condition

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The Association's accrued actuarial assets were in excess of \$18.4 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 \$18.4 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>Percent Funded</u>
Retirants and Beneficiaries				
Retired Members (80)		\$16,343,328		
Surviving Spouses (38)		3,065,292		
Surviving Children (3)		<u>53,724</u>		
Total (121)	\$18,489,474	\$19,462,344	\$ 972,870	95.0%
Deferred Members (1)	0	250,272	250,272	0.0
Active Members (102)	<u>0</u>	<u>13,913,034</u>	<u>13,913,034</u>	0.0
Total	\$18,489,474	\$33,625,650	\$15,136,176	55.0%

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

- (i) retirement allowances likely to be paid the 121 retirants and beneficiaries; and
- (ii) the contributions assumed to have been made for the 102 active members from entry into the plan until December 31, 1986.

The value of retirement allowances likely to be paid the 121 retirants and beneficiaries, discounted for investment earnings and mortality, was computed to be \$19,462,344 as of December 31, 1986. To put this amount in perspective, the \$19,462,344, together with investment earnings, will just be sufficient to pay the 121 retirants and beneficiaries their allowances for their remaining lifetimes. This assumes the 121 retirants and beneficiaries live and die according to the assumed mortality and the \$19,462,344 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 \$13,913,034 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 102 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	\$18,464	\$ 4,116	22.3%
1979	N/A	N/A	N/A
1980	23,412	5,182	22.1
1981	25,724	6,712	26.1
1982	26,465	8,862	33.5
1983	28,415	10,265	36.1
1983*	30,519	10,265	33.6
1984	31,280	12,793	40.9
1985	32,632	15,697	48.1
1986	33,625	18,489	55.0

\* After change in assumptions.

Duluth Police Pension Association  
 Computed Contributions - Comparative Schedule

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Year Ended December 31		Total Normal Cost as a Percent of Valuation Payroll*	Contribution For Unfunded Actuarial Accrued Liabilities
Valuation	Fiscal		\$ or %
1978	1980	19.66%	\$ 700,109
1979	1981	N/A	N/A
1980	1982	22.08	1,174,851
1981	1983	N/A	N/A
1982	1984	22.16	1,173,070
1983	1985	22.09	1,232,004
1983	1985**	24.44	1,374,863
1984	1986	24.35	1,279,964
1985	1987	23.18	1,197,626
1986	1988	23.16	1,094,996

\* Includes employee contributions.

\*\* After change in assumptions.

Duluth Police Pension Association  
 CONTRIBUTION FOR CALENDAR YEAR EFFECTIVE JANUARY 1, 1988

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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	23.16%	
(3) Total normal cost (Line 1 times line 2)		\$ _____
(4) Amortization payment on UAAL from page A-2		1,094,996
(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 \$14,347,966	\$215,937	
(b) State amortization aid based on 1984 legislation	<u>32,568</u>	
(c) Total State amortization aid	\$248,505	
(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 1.0247)		\$ _____

**Section B**

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**Valuation Data  
and  
Summary of Benefit Provisions**

Duluth Police Pension Association  
Retirants and Beneficiaries December 31, 1986  
By Type of Annuity Being Paid

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<u>Type of Annuity Being Paid</u>	<u>No.</u>	<u>Monthly Amounts</u>	<u>Computed Actuarial Accrued Liabilities</u>
Retirants receiving:			
Age & Service	79	\$ 96,390.05	\$16,044,156
Disability	<u>1</u>	<u>996.14</u>	<u>299,172</u>
Totals	80	97,386.19	16,343,328
Beneficiaries receiving:			
Spouse	38	23,807.00	3,065,292
Child	<u>3</u>	<u>751.80</u>	<u>53,724</u>
Totals	41	24,558.80	3,119,016
Totals	<u>121</u>	<u>\$121,944.99</u>	<u>\$19,462,344</u>

Inactive Members Eligible for Deferred Benefits  
December 31, 1986

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<u>No.</u>	<u>Monthly Amount</u>	<u>Computed Actuarial Accrued Liabilities</u>
1	\$996.14	\$250,272

Duluth Police Pension Association  
 Retirants and Beneficiaries December 31, 1986  
 By Attained Ages

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<u>Attained Ages</u>	<u>Number</u>		
	<u>Age &amp; Service</u>	<u>Disability</u>	<u>Death Before Retirement</u>
Under 20			3
45-49		1	1
50-54	6		
55-59	15		
60-64	15		4
65-69	25		
70-74	21		1
75-79	7		1
80-84	8		1
85-89	9		
90-94	2		
95-99	1		
Totals	109	1	11

Duluth Police Pension Association  
 Retirants and Beneficiaries Added to and Removed from Rolls  
 Comparative Statement

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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			112	\$ 758,658	\$10,508,859
1979	6	5	113	894,700	11,573,872
1980	7	7	113	984,432	12,489,174
1981	7	10	110	1,055,190	13,361,680
1982	7	5	112	1,092,499	13,554,353
1983	8	2	118	1,218,472	16,208,468
1984	9	10	117	1,249,902	16,281,584
1985	13	5	125	1,439,463	19,523,760
1986	2	6	121	1,463,340	19,462,344

Duluth Police Pension Association  
Active Members December 31, 1986  
By Attained Age and Years of Service

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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
30-34		10						10	\$ 300,720
35-39		10	11	5				26	781,872
40-44			3	22	3			28	842,016
45-49				8	15			23	691,656
50-54				2		5	1	8	240,576
55-59						1	2	3	90,216
60							1	1	30,072
61							1	1	30,072
63							2	2	60,144
<b>Totals</b>		20	14	37	18	6	7	102	\$3,067,344

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

Age: 43.1 years.

Service: 17.7 years.

Annual Pay: \$30,072.

Duluth Police Pension Association  
 Comparative Schedule  
 Of Active Members

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Valuation Date December 31	Active Members	Valuation Payroll	Average			
			Age	Service	Pay	% Incr.
1978	123	\$2,318,796	40.4 yrs.	14.6 yrs.	\$18,852	- %
1979	135	2,775,060	39.3	13.6	20,556	9.0
1980	133	2,986,116	39.8	14.0	22,452	9.2
1981	132	3,229,776	40.6	14.8	24,468	9.0
1982	129	3,219,840	41.2	15.4	24,960	2.0
1983	121	3,210,372	41.9	16.2	26,532	6.3
1984	117	3,236,220	42.5	16.9	27,660	4.3
1985	103	2,966,400	42.0	16.6	28,800	4.1
1986	102	3,067,344	43.1	17.7	30,072	4.4

Duluth Police Pension Association

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

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

Amount. For first 20 years of service, 31.8/80 of base pay. For the 21st year, an additional 1/80 is added and for each year in excess of 21 an additional 2/80 is added up to a maximum of 40.8/80 of base pay for 25 or more years of service.

Pay Used For Plan Purposes. "Base pay" means the salary of a first class patrolman with 16 years of service.

Disability Retirement

Eligibility. Permanently disabled to the extent that no longer able to perform the duties of a police officer before being eligible for age & service retirement.

Amount. Determined by Board. No less than 1.5/80 of base pay for each year of service and no more than 40.8/80 of base pay.

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

Eligibility.

Spouse. Legally married to member at least 1 year before separation from service and residing with member at time of death. Benefits terminate upon remarriage but may be reinstated upon termination of a subsequent marriage.

Child. Younger than age 18, or younger than age 22 if enrolled in an accredited college or vocational school.

Amount.

Spouse. 20/80 of base pay.

Child. 8/80 of base pay per child. Children's maximum is 20/80 if spouse is receiving or 40/80 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 simultaneously changed by the same percent that base pay is changed.

Member Contributions. 8% of base pay. Non-refundable.

## **Section C**

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### **Valuation Methods and Assumptions**

## Valuation Method and Assumptions

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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 58, or attained age if older.

### Mortality Table\*

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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

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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

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<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

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<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

## **Appendices**

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## APPENDIX I

### FINANCIAL PRINCIPLES AND OPERATIONAL TECHNIQUES

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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.

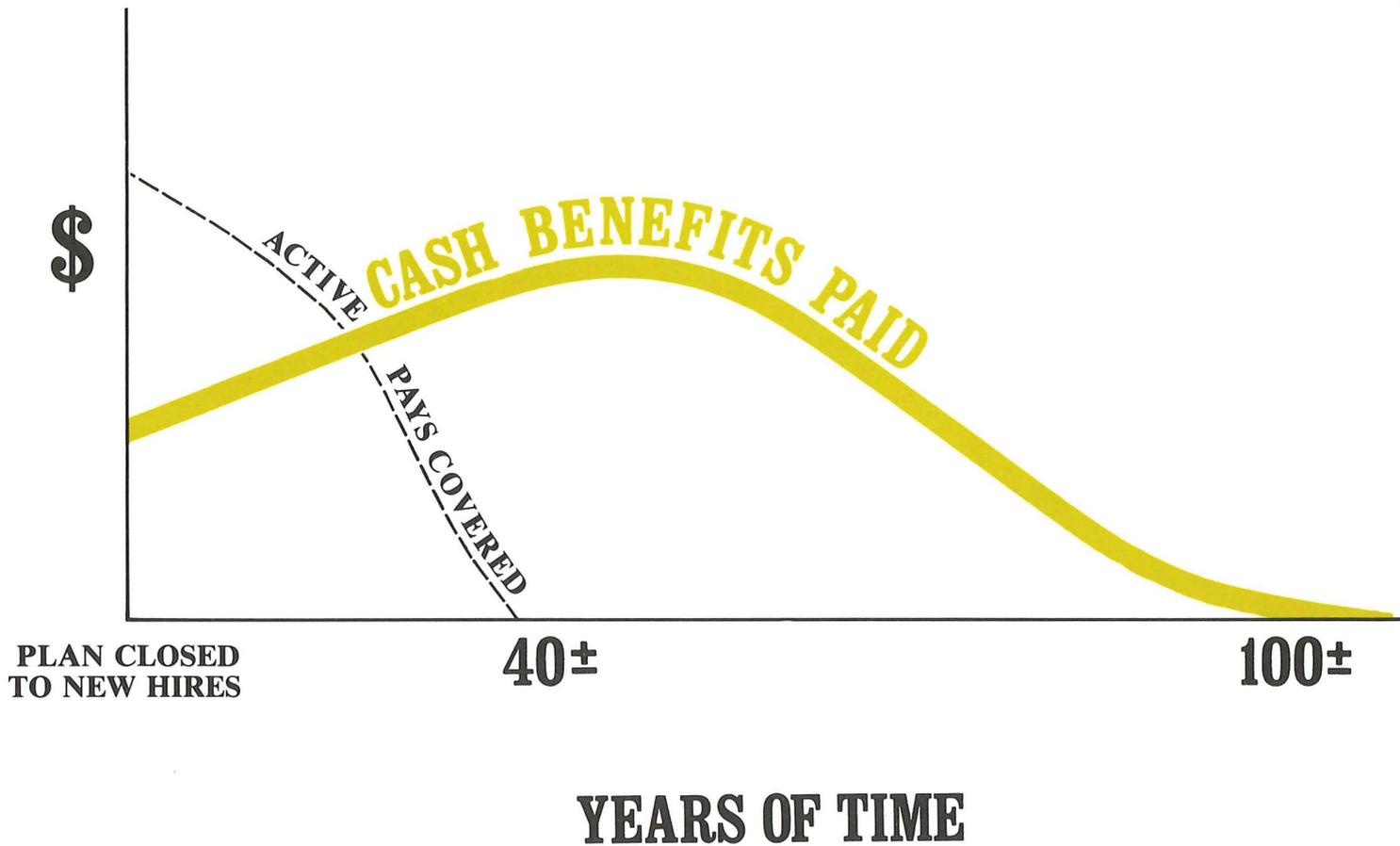
Computing Contributions To Support Plan Benefits. From a given schedule of benefits and from the employee data and asset data furnished him, the actuary determines the contribution rates to support the benefits by means of an actuarial valuation and a funding method.

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

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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.