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February 24, 2003

Mr. James Voytko, Director
Oregon Public Employees Retirement System

**Re: 2001 Actuarial Equivalency Factors
Based on the 2001 Experience Study of the System**

Dear Jim:

Oregon law requires that the elective forms of retirement allowances be of equivalent actuarial value. The Retirement System uses a set of Actuarial Equivalency Factors (Factors) to convert account balances to monthly allowances and to convert the standard form of monthly allowance to elective survivor benefits.

Purpose of the Report

After each Experience Study in which a mortality or interest assumption is revised, the Actuary is required to perform an Actuarial Equivalency Study. The Retirement Board adopted revised retired member mortality assumptions in the 2001 Experience Study, therefore, it is necessary to perform an Actuarial Equivalency Study at this time.

In 1996, after lengthy deliberations by a special Task Force of the Board and public hearings, the Board adopted a revised Oregon Administrative Rule (OAR 459-005-0055) which determines how the Factors are to be updated in the future. Until 1999, due to the prior Administrative Rule, the Factors had been improved when appropriate, but not reduced (Old Rule Factors). According to the Rule, the Factors could be reduced in the future for members joining the System after 1998 if necessary, but only for benefits earned after the effective date of the change. The Board then adopted new Factors (1999 Factors) for future new members.

The purpose of this report is to recommend a new set of factors (2001Factors) for implementation that represent the "true" actuarial equivalence based on the interest and mortality assumptions currently used to fund the System's benefits. The Retirement Board is currently contemplating major changes in the Administrative Rule. However, the ultimate method for implementing changes does not impact the underlying assumptions and methods used to develop these factors.

The remainder of this report describes the assumptions and methods used to develop each of the sets of factors that comprise the 2001 Actuarial Equivalency Factors.



Early Retirement

The Normal Retirement Date is defined as follows:

- For a Tier One general service member:
the earlier of age 58 or 30 years of service,
- For a Tier Two general service member:
the earlier of age 60 or 30 years of service,
- For a police & fire member:
the earlier of age 55 or age 50 and 25 years of service.

A member may elect a voluntary retirement earlier than the Normal Retirement Date, but will receive a reduced benefit. The earliest voluntary retirement ages are 55 for general service members and age 50 for police & fire members. The reduced monthly benefit should have the same actuarial value as of the voluntary retirement date as the monthly benefit payable at the Normal Retirement Age.

The actuarial factors to convert an account balance into a monthly benefit automatically adjust for the age at retirement. However, the formula pension must be adjusted by an Early Retirement Reduction Factor. The current Early Retirement Reduction Factors reduce the monthly benefit by 8% for each full year prior to the Normal Retirement Age.

Assumptions: The experience factors were developed with a blend of mortality by gender and class of membership based on the number of active members age 45 or older on the last valuation date. We used a separate blend for general service and police and fire to develop the factors that apply separately to each class. The following table documents the weighting used to develop the mortality table for the early retirement factors.

Mortality Group	Mortality Table	Weighting
State/Local General Service Males	RP-2000 Male (-1.5 years)	25.38%
School District Males	RP-2000 Male (-2 years)	12.44
State/Local General Service Females	RP-2000 Female (-1.5 years)	30.25
School District Females	RP-2000 Female (-3 years)	<u>31.93</u>
		100.00%
State/Local Police & Fire Males	RP-2000 Male (-1 year)	79.46%
State/Local Police & Females	RP-2000 Female (-1.5 years)	<u>20.54</u>
		100.00%

Factors: The following tables show the current Early Retirement Reduction Factors and those developed from the 2001 mortality tables and the weighting shown above.



Ret Age	<u>Tier One General Service</u>		<u>Tier Two General Service</u>		<u>Police & Fire</u>	
	Current Factor	2001 Experience	Current Factor	2001 Experience	Current Factor	2001 Experience
50					60.0%	63.9%
51					68.0	69.8
52					76.0	76.3
53					84.0	83.4
54					92.0	91.3
55	76.0%	76.0%	60.0%	62.9%	100.0	100.0
56	84.0	83.2	68.0	68.9		
57	92.0	91.2	76.0	75.5		
58	100.0	100.0	84.0	82.8		
59			92.0	90.9		
60			100.0	100.0		

Although each of the 2001 experience factors is slightly different than the ones in current use, the weighted value of each set is approximately equivalent to the value of the current set. For example, based on the probabilities of retiring at each voluntary retirement age, the value of benefits under the 2001 experience factors is between 99% and 102% of the value of the current factors.

Our conclusion is that it is reasonable to maintain the simplicity of the 8% per year factors currently in use as a set of actuarial equivalent factors for early retirement reductions.

Account Balance Conversions

There are certain benefit determinations that require a member account balance to be converted to a monthly benefit. The primary example is the determination of the monthly Money Match allowance. There are three forms of payment that provide a lifetime annuity to the member but not a lifetime guarantee to a beneficiary. One of these forms has no survivorship benefit, and the other two have survivorship benefits based on the account balance or a 15-year period as described below.

Option 1 - Non-Refund Life Annuity: A lifetime monthly allowance with no survivorship benefit is called a Non-Refund Life Annuity. All benefit obligations stop with the death of the retired member. This is the largest monthly allowance.

Option 0 - Refund Life Annuity: A lifetime monthly allowance including a guaranteed survivorship benefit of any unpaid member account balance at the time of the member's death is called a Refund Life Annuity. The monthly allowance that can be converted from a \$1,000 account balance is less than under Option 1 because the member is paying for the potential survivorship benefit through a reduction in the initial monthly allowance.



Option 4 - 15-Year Certain and Life Annuity: A lifetime monthly allowance that guarantees at least 180 monthly payments will be made is called a 15-Year Certain and Life Annuity. There is a survivorship benefit if the member dies within the first 15 years of retirement. The monthly allowance that can be converted from a \$1,000 account balance is less under Option 4 than under Option 0 because a 15-year payment guarantee is more valuable than a guarantee the size of the member account balance.

Assumptions: The 2001 Factors were developed using a method similar to that used to develop the 1999 Factors, but with the new mortality assumptions adopted with the 2001 Experience Study. A small change was made to the algorithm used to weight the distinct mortality tables. The mortality tables and weightings used to produce an average mortality rate at each age are shown below.

Mortality Group	Mortality Table	Weighting
State/Local General Service Males	RP-2000 Male (-1.5 years)	28.47%
State/Local Police & Fire Males	RP-2000 Male (-1 year)	8.64
School District Males	RP-2000 Male (-2 years)	<u>15.88</u>
Subtotal Males		52.99%
State/Local General Service Females	RP-2000 Female (-1.5 years)	21.04
State/Local Police & Fire Females	RP-2000 Female (-1.5 years)	1.22
School District Females	RP-2000 Female (-3 years)	<u>24.75</u>
Subtotal Females		47.01%
Total		100.00%

The weightings of the six groups are based on the sum of all Member Account Balances of active members over the age of 45 (40 for Police & Fire members) as of December 31, 2001. These weightings above are more heavily male than those used to produce the 1999 Factors, which resulted in some increases in the conversion factors at certain ages, even though the revised mortality tables assume longer average life expectancies.

We also studied the impact of disabled mortality on these factors. The mortality rates of young disabled members are relatively high, and the mortality rates of disabled members at retirement age and beyond are set forward several years. Based on the weighting shown above of the disabled mortality rates, we recommend a five-year set forward for all account conversion factors for disabled members. This is the same assumption that was used for the current factors.

Factors: The following table illustrates the difference between the Old Rule Factors, the 1999 Factors, and the 2001 Factors for a selection of retirement ages.



Age at Retirement	Monthly Allowance per \$1,000 Account Balance				
	Annuity Conversion Factors			2001 Factor Comparison	
	Old Rule	1999 Factor	2001 Factor	To Old Rule	To 1999 Factor
Option 0 - Refund Annuity					
50	\$ 7.32	\$ 7.16	\$ 7.15	\$ -0.17	\$ -0.01
55	7.66	7.45	7.45	-0.21	0.00
60	8.09	7.86	7.86	-0.23	0.00
65	8.76	8.44	8.42	-0.34	-0.02
Option 1 - Non-Refund Annuity					
50	\$ 7.43	\$ 7.23	\$ 7.21	\$ -0.22	\$ -0.02
55	7.86	7.57	7.56	-0.30	-0.01
60	8.67	8.04	8.06	-0.61	0.02
65	9.79	8.72	8.79	-1.00	0.07
Option 4 - 15-Year Certain and Life Annuity					
50	\$ 7.24	\$ 7.11	\$ 7.13	\$ -0.11	\$ 0.02
55	7.51	7.36	7.39	-0.12	0.03
60	7.84	7.68	7.73	-0.11	0.05
65	8.22	8.06	8.13	-0.09	0.07

Commutation of Option 4 Death Benefit

If a retired member dies with an Option 4 benefit before 180 payments have been made, the beneficiary may elect to commute the remaining payments into a lump sum distribution. This set of factors is based on interest only without any adjustments for mortality. The factors are based on an assumed interest rate of 8.00%. These factors are not changing as a result of this study.

Joint and Survivor Annuities

Members have the right to elect optional forms of monthly benefits that provide continuing payments over the lifetime of a named beneficiary under certain circumstances and in accordance with Internal Revenue Code provisions. The value of the expected payments under an elected option must be the actuarial equivalent of the stream of monthly payments under the single life form. All of the following are monthly benefits payable for the life of the member, with certain additional guarantees as described, and have the equivalent value of Option 1.

Option 2: After the retired member's death, 100% of the monthly benefit continues to be paid for the lifetime of the beneficiary.



Option 2A: This is the same as Option 2, except that if the beneficiary dies first, the monthly benefit to the retired member increases to the Option 1 level (“pop-up”).

Option 3: After the retired member's death, 50% of the monthly benefit continues to be paid for the lifetime of the beneficiary.

Option 3A: This is the same as Option 3, except that if the beneficiary dies first, the monthly benefit to the retired member increases to the Option 1 level (“pop-up”).

Assumptions: The 2001 Factors were developed using a different method than had been used before. We studied the proportion of males and females by membership class that elected the joint and survivor options. It is interesting to note that a higher portion of males elected Options 2 and 2A than option 3 and 3A. Also, the portion of males that elected option options 3 and 3A was similar to the portion of account balances for active male members close to retirement (see conversion factor assumptions).

The weightings of the six groups are based on the number of retirees who retired in 1999, 2000, and 2001 who were surviving at the end of 2001. The mortality tables and weightings used to produce an average mortality rate at each age are shown below.

Mortality Group	Mortality Table	Weighting	
		2 & 2A	3 & 3A
State/Local General Service Males	RP-2000 Male (-1.5 years)	37%	26%
State/Local Police & Fire Males	RP-2000 Male (-1 year)	6	15
School District Males	RP-2000 Male (-2 years)	<u>19</u>	<u>11</u>
Subtotal Male		62%	52%
State/Local General Service Females	RP-2000 Female (-1.5 years)	18	25
State/Local Police & Females	RP-2000 Female (-1.5 years)	1	1
School District Females	RP-2000 Female (-3 years)	<u>19</u>	<u>22</u>
Subtotal Female		38%	48%
Total		100%	100%
Male Beneficiaries	RP-2000 Male (-1.5 years)	38%	48%
Female Beneficiaries	RP-2000 Female (-1.5 years)	<u>62</u>	<u>52%</u>
Total Beneficiaries		100%	100%

These weightings above, particularly for Options 2 and 2A, are more heavily male than those used to produce the 1999 Factors, which resulted in some increases in these option factors.



Factors: The following table illustrates the difference between the Old Rule Factors, the 1999 Factors, and the 2001 Factors for a selection of retirement ages and beneficiary ages. In order to provide a more smooth transition from one age to the next, and a clearer distinction for the cost of the pop-up feature, we are recommending that one more significant digit be added to these factors.

Member Age Difference	Proportion of Option 1 Monthly Allowance at Selected Retirement Ages								
	Old Rule			1999 Factor			2001 Factor		
	55	60	65	55	60	65	55	60	65
Option 2 – 100% J&S									
+10	90%	87%	85%	89%	86%	83%	86.4%	82.6%	78.3%
+5	91	89	88	91	88	85	88.5	85.4	81.9
Same Age	93	91	91	92	90	88	90.8	88.4	85.7
-5	94	93	93	94	92	91	93.0	91.3	89.4
-10	95	95	95	95	94	94	94.9	93.8	92.7
Option 2A – 100% J&S with Pop-Up Feature									
+10	89%	85%	84%	89%	86%	82%	85.9%	81.9%	77.2%
+5	90	87	86	90	87	84	87.8	84.4	80.3
Same Age	92	89	89	92	89	86	89.9	87.0	83.5
-5	93	91	90	93	91	89	91.8	89.5	86.6
-10	94	93	92	94	93	91	93.6	91.8	89.5
Option 3 – 50% J&S									
+10	95%	93%	92%	94%	93%	90%	92.9%	90.8%	88.2%
+5	95	94	93	95	94	92	94.1	92.4	90.4
Same Age	96	95	95	96	95	94	95.3	94.1	92.6
-5	97	96	96	97	96	95	96.5	95.6	94.7
-10	98	97	97	98	97	97	97.5	97.0	96.4
Option 3A – 50% J&S with Pop-Up Feature									
+10	94%	92%	91%	94%	92%	90%	92.6%	90.3%	87.5%
+5	94	93	92	95	93	91	93.7	91.8	89.4
Same Age	95	94	93	96	94	93	94.8	93.2	91.3
-5	96	95	94	96	95	94	95.9	94.6	93.1
-10	97	96	95	97	96	95	96.8	95.9	94.7

The primary reason that the 2001 Factors are less than the 1999 Factors is the heavier weighting of males, particularly for Options 2 and 2A. The greatest reductions occur at the older retirement ages with the younger beneficiaries.



Police & Fire Additional Units

The P&F Units factors are based only on an interest function. Therefore, since we are still using an 8% interest assumption, none of these factors have changed.

Full Cost Factors for Purchasing Service

Due to the passage of several pieces of legislation in 1997, we developed a set of actuarial equivalency factors that is used to determine the “full cost” of purchasing additional service. We have not modified any of the methods, but the factors that include mortality have been revised to reflect the current mortality assumptions.

Projected Value of Account Balances

This table shows two factors that are strictly based on an 8% interest function compounded annually. One factor is the accumulated value of \$1 per year with 8% interest. The other factor is the accumulation of a \$1 account balance with 8% interest.

Average Life Expectancy of Retired Members

The final table in the set shows the average life expectancy of a retired member based on the current age of the member, the gender, and the class of membership. The weighted average life expectancies were developed from the blended mortality developed for the account conversion factors.



Mr. James Voytko
February 24, 2003
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If you have any questions, or need any additional information, please let me know.

Sincerely,

Mark C. Johnson, F.S.A.
Consulting Actuary

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