



Actuarial Bulletin No. 1R1

July 2015

This bulletin cancels and replaces *Actuarial Bulletin No. 1*, dated May 2008.

In this bulletin, we outline:

- the method we accept to calculate the actuarial increase on delayed retirement when pension starts after age 65;
- our interpretation of paragraphs 8302(3)(n) and 8504(10)(b) of the Regulations on the adjustment to lifetime retirement benefits (LRBs) when retirement starts after age 65; and
- how paragraph 8504(10)(b) of the Regulations allows you to disregard certain additional LRBs that result from a pension starting after age 65 to determine whether LRBs comply with the conditions under subsection 8504(1).

We have been applying this interpretation to actuarial valuation reports that we have received after August 25, 2011, as announced on our website that day.

What's new?

Along with several wording changes throughout the document, we have made some changes in response to comments we received from the pension industry and the Canadian Institute of Actuaries. These changes lead to very similar results.

We have also modified example 2 for consistency when calculating the actuarial increase when LRBs are paid after age 65 regardless of when a member joins a pension plan. As a result, example 3 has been removed.

Actuarial increase on delayed retirement

General

When a member chooses to delay receiving his or her LRBs after age 65, the member can receive at that later retirement date benefits that will be adjusted to offset in whole or in part the decrease in the value of the LRBs due to the delayed retirement. Under paragraph 8504(10)(b) of the Regulations, the adjustment cannot be more favourable than what is actuarially equivalent. The decrease in the value of the LRBs is the difference between the present value of the unadjusted LRBs at age 65 with interest and survivorship to the postponed retirement date and the present value of the unadjusted LRBs at the postponed retirement date. For benefits that have accrued after age 65, replace “at age 65” by “at the age in the middle of the year of accrual”.

Unadjusted LRBs at age 65 means:



- the LRBs accrued and payable at age 65, limited by the maximum pension allowed under subsection 8504(1) of the Regulations.

Unadjusted LRBs at a retirement date after age 65 means:

- the LRBs accrued each year for service between ages 65 and 71. Each year's LRB accrual is limited by the maximum pension allowed under subsection 8504(1) of the Regulations during the year of accrual and is assumed to start at the middle of the year of accrual.

Adjusted LRBs means:

- the unadjusted LRBs increased on an actuarially equivalent basis to the later retirement date.

As the adjusted LRBs are actuarially equivalent to the unadjusted LRBs, the adjusted LRBs may be more than the maximum that can be paid under subsection 8504(1) of the Regulations in the year that the LRBs start (the postponement retirement date). These additional LRBs are allowed under paragraph 8504(10)(b) of the Regulations. This paragraph allows you to disregard certain additional LRBs that result from a pension starting after age 65 to determine whether LRBs comply with the conditions under subsection 8504(1) of the Regulations.

The illustration below will mathematically show how we define the decrease in the value, the adjusted LRBs, and the additional LRBs. For this illustration, we assume that the normal retirement age is 65. The member was born on January 1, is currently 71 years old, retires, and was accruing the maximum benefit under subsection 8504(1) of the Regulations for each year of pensionable service. Under the plan, LRBs are adjusted on an actuarially equivalent basis if the retirement date is after age 65. The normal form of payment is a life only.

In the formulae below and in the examples set out in Appendix 1, the following symbols will be used:

- i the interest rate;
- x the age of the member at a certain point in time;
- r the assumed retirement age;
- $\ddot{a}_r^{(12)}$ the present value of one unit of LRB payable monthly from age r ;
- v_i^{r-x} the discount factor from age x to age r at an interest rate of i ;
- ${}_{r-x}p_x$ the probability of survival from age x to age r ;
- B_x the annual unadjusted LRB payable from age x for the periods of service before age x ;
- $B_r^{Sve < x}$ the annual unadjusted LRB payable at age r and for the periods of service before age x ;



- $b_x^{x-1 < Svc < x}$ the annual unadjusted LRB payable from age x for the period of service between ages $x - 1$ and x ; and
- b_r the annual unadjusted LRB payable from age r and for one year of pensionable service.

LRBs for the period of service before age 65

The decrease in the value of the unadjusted LRBs (B_{65}) for the deferral from age 65 to age 71 is the difference between the present value of the unadjusted LRBs at age 65 with interest and survivorship to age 71 and the present value of the unadjusted LRBs at the later retirement date. It equals:

$$\begin{aligned} \text{Decrease in the value} &= B_{65} x \ddot{a}_{65}^{(12)} x \frac{(1+i)^{71-65}}{{}_6P_{65}} - B_{65} x \ddot{a}_{71}^{(12)} \\ &= B_{65} x \ddot{a}_{65\overline{6}}^{(12)} x \frac{(1+i)^{71-65}}{{}_6P_{65}} \end{aligned}$$

This shows that the decrease in the value represents the accumulated value at age 71 of the B_{65} that was not paid between age 65 and age 71.

The benefit that results from the decrease in the value of B_{65} can be determined by converting this value to an LRB payable from age 71:

$$B_{65} x \ddot{a}_{65\overline{6}}^{(12)} x \frac{(1+i)^{71-65}}{{}_6P_{65}} / \ddot{a}_{71}^{(12)}$$

The sum of this amount and B_{65} equals the adjusted B_{65} .

$$\begin{aligned} \text{Adjusted } B_{65} &= B_{65} + B_{65} x \ddot{a}_{65\overline{6}}^{(12)} x \frac{(1+i)^{71-65}}{{}_6P_{65}} / \ddot{a}_{71}^{(12)} \\ &= B_{65} x \frac{\ddot{a}_{65}^{(12)}}{\ddot{a}_{71}^{(12)}} x \frac{(1+i)^{71-65}}{{}_6P_{65}} \end{aligned}$$

The additional LRB payable at age 71 under 8504(10)(b) of the Regulations equals the excess of the adjusted B_{65} over the maximum pension payable at age 71 ($B_{71}^{Svc < 65}$) under subsection 8504(1):

$$\text{Additional LRB} = \max(0; B_{65} x \frac{\ddot{a}_{65}^{(12)}}{\ddot{a}_{71}^{(12)}} x \frac{(1+i)^{71-65}}{{}_6P_{65}} - B_{71}^{Svc<65})$$

Therefore, the total amount of LRBs (for periods of service before age 65) that are payable from age 71 equals:

$$B_{71}^{Svc<65} + \max(0; B_{65} x \frac{\ddot{a}_{65}^{(12)}}{\ddot{a}_{71}^{(12)}} x \frac{(1+i)^{71-65}}{{}_6P_{65}} - B_{71}^{Svc<65})$$

This is equal to the adjusted B_{65} .

LRBs for a period of service after age 65

We assume that the LRBs are earned uniformly throughout the year. Therefore, the adjustment must not be more than a mid-year adjustment. For example, the LRB adjustment can be calculated at age 65.5 for service between ages 65 and 66.

This results in the following:

(i) Adjusted LRB for the period of service between ages 65 and 66

The decrease in the value of this LRB (the corresponding unadjusted LRB or $b_{66}^{65 \leq Svc < 66}$) for the deferral from age 65.5 to age 71 equals:

$$\text{Decrease in the value} \cong b_{66}^{65 \leq Svc < 66} x \frac{\ddot{a}_{65.5:5.5}^{(12)}}{\ddot{a}_{71}^{(12)}} x \frac{(1+i)^{71-65.5}}{{}_{5.5}P_{65.5}}$$

By following the same steps set out earlier, the total amount of LRB (earned for periods of service between ages 65 and 66) that is payable from age 71 equals:

$$b_{71} + \max(0; b_{66}^{65 \leq Svc < 66} x \frac{\ddot{a}_{65.5}^{(12)}}{\ddot{a}_{71}^{(12)}} x \frac{(1+i)^{71-65.5}}{{}_{5.5}P_{65.5}} - b_{71})$$

This is equal to the adjusted $b_{66}^{65 \leq Svc < 66}$.

(ii) Adjusted LRB for the period of service between ages 66 and 67

The decrease in the value of this LRB (the corresponding unadjusted LRB or $b_{67}^{66 \leq Svc < 67}$) for the deferral from age 66.5 to age 71 equals:

$$\text{Decrease in the value} \cong b_{67}^{66 \leq Svc < 67} x \frac{\ddot{a}_{66.5:4.5}^{(12)}}{\ddot{a}_{71}^{(12)}} x \frac{(1+i)^{71-66.5}}{{}_{4.5}P_{66.5}}$$



The total amount of LRB (earned for periods of service between ages 66 and 67) payable from age 71 equals:

$$b_{71} + \max(0; b_{67}^{66 \leq Svc < 67} \times \frac{\ddot{a}_{66.5}^{(12)}}{\ddot{a}_{71}^{(12)}} \times \frac{(1+i)^{71-66.5}}{4.5 P_{66.5}} - b_{71})$$

This is equal to the adjusted $b_{67}^{66 \leq Svc < 67}$.

- (iii) Adjusted LRBs for the periods of service between ages 67 and 68, ages 68 and 69, ages 69 and 70, and between ages 70 and 71

The same process is followed as described in (i) and (ii).

Because of the different periods of adjustment in each case, the formulas in (i) and (ii) show that the actuarial adjustment results in different LRB amounts payable from age 71 for:

- (a) the period of service before age 65;
- (b) the period of service between ages 65 and 66;
- (c) the period of service between ages 66 and 67;
- (d) the period of service between ages 67 and 68;
- (e) the period of service between ages 68 and 69;
- (f) the period of service between ages 69 and 70; and
- (g) the period of service between ages 70 and 71.

In this case, the member retires at age 71. Under subsection 8502(e)(i) of the Regulations, this retired member's LRB must start by the end of the year in which the member reaches age 71. Under clause 8502(e)(i)(A), the Minister may accept a later start date, only if the delay does not cause the LRB to be more than what would have been payable if the payment started at the end of the calendar year in which the member reached age 71. You cannot use the defined benefit limit in the next year (at age 72) when calculating this member's LRB.

The adjusted LRBs are equal whether benefits were accrued on a current service basis or they were bought back after the member reached age 65. Whether a member joins a pension plan before or after his or her 65th birthday does not make any difference.

For career average and final average earnings plans, the adjusted LRBs for delayed retirement must not be calculated using earnings during the deferral period. Similarly, earnings must not be indexed after the calendar year in which the deferral period starts. Otherwise a form of double counting is introduced. This is not acceptable to us.



Pension credits

To determine the pension credits under subsection 8301(6) of the Regulations, and the re-determined benefit entitlement under subsection 8303(4), paragraphs 8302(3)(n) and 8303(5)(d) allow the LRB increases for delayed retirement to be disregarded, as long as the increases would not be more than those calculated on an actuarially equivalent basis.

When the increase in the LRB is more than the actuarial increase that we would accept, the normalized pension for the year for which the pension credit is calculated will be correspondingly higher. These increases will be a past service event that will give rise to a past service pension adjustment (PSPA). The PSPA will be based on the part of the LRB increase that is more than the amount we would accept. For example, if the acceptable actuarial increase was 7% and a 10% increase in the LRB is given, the PSPA would be based on the extra 3% increase in LRB.

When a member's benefit entitlement is limited by the maximum pension under subsection 8504(1) of the Regulations, the adjustment for delayed retirement must not be more than an adjustment calculated on an actuarially equivalent basis. An adjustment that is more than the acceptable actuarial increase could result in a pension adjustment over the pension adjustment limit under subsection 147.1(8) of the *Income Tax Act*, and the plan would become a revocable plan.

How to contact us

If you have questions about this bulletin, contact us at the Registered Plans Directorate. Our telephone enquiries service is available Monday to Friday from 8:00 a.m. to 5:00 p.m., Eastern time. A voice mailbox system takes messages outside those hours. Calls will be returned on the next business day.

In the Ottawa area

- For service in English, call 613-954-0419.
- For service in French, call 613-954-0930.

Toll free elsewhere in Canada

- For service in English, call 1-800-267-3100.
- For service in French, call 1-800-267-5565.

Actuaries and plan administrators who need guidance on issues related to a specific plan can write to us at the Registered Plans Directorate, Canada Revenue Agency, Ottawa ON K1A 0L5, or fax us at 613-952-0199.

We welcome feedback on this bulletin. Email your comments to rpd/dre@cra-arc.gc.ca.



Appendix 1

Example 1

An individual participates in a single-employer defined benefit (DB) registered pension plan (RPP). The individual's pensionable earnings have been historically lower than what is needed to yield the maximum lifetime retirement benefits (LRBs) that can be paid from the plan under subsection 8504(1) of the *Income Tax Regulations*.

The individual became a member of the plan on January 1, 2005, turned 65 years old on January 1, 2013, and has decided to delay his retirement. A valuation is being prepared with an effective date of January 1, 2015.

Plan provisions

Plan effective date:	January 1, 1991
Benefit formula:	Minimum of 1.5% of final average earnings over 3 years (FAE3), or the maximum pension limit times the years of credited service
Normal retirement age:	65
Normal form of pension:	Life only
Post-retirement indexing:	Fully indexed to the consumer price index (CPI)
Provision of DB limit projection:	Yes
Actuarial equivalence for delayed retirement:	Yes

Employee data

Shareholder (Y/N):	No (non-connected person)
Sex:	Male
Date of birth:	January 1, 1948
Date of hire:	January 1, 2005
Attained age:	67
Pensionable service:	10 years

	Earnings	FAE3 (at January 1)
2005-2012	\$50,000	
2013	\$55,000	\$50,000
2014	\$60,000	\$51,667
2015 (expected)	\$62,400*	\$55,000
2016 (expected)	\$64,896*	\$59,133
2017 (expected)	\$67,492*	\$62,432
2018		\$64,929

* based on assumed salary increase rate



Actuarial assumptions

Valuation date:	January 1, 2015
Valuation rate (before retirement):	$i = 6\%$
Salary increase:	$s = 4\%$
Inflation rate (that is CPI):	2.50%
Indexation of pension:	CPI %
Valuation rate (after retirement):	$i' = 3.41\% (1.06/1.025 - 1)$
DB limit projection rate:	3% per year
Mortality table:	CPM2014 with mortality improvement scale CPM-B (post-retirement only)
Retirement date:	January 1, 2018
Retirement age:	70
Funding method:	Projected Accrued Benefit
Payment mode of retirement benefits:	Monthly, in advance
Mode of payment of normal cost (NC):	Lump sum at the beginning of the year

Review

B_{65} payable as of January 1, 2013	= $1.5\% \times \$50,000 \times 8$ = \$6,000
$b_{66}^{65 \leq Svc < 66}$ payable as of January 1, 2014	= $1.5\% \times \$51,667 \times 1$ = \$775
$b_{67}^{66 \leq Svc < 67}$ payable as of January 1, 2015	= $1.5\% \times \$55,000 \times 1$ = \$825
$b_{68}^{67 \leq Svc < 68}$ payable as of January 1, 2016	= $1.5\% \times \$59,133 \times 1$ = \$887
$b_{69}^{68 \leq Svc < 69}$ payable as of January 1, 2017	= $1.5\% \times \$62,432 \times 1$ = \$936
$b_{70}^{69 \leq Svc < 70}$ payable as of January 1, 2018	= $1.5\% \times \$64,929 \times 1$ = \$974
b_{70} payable as of January 1, 2018	= $1.5\% \times \$64,929 \times 1$ = \$974
$B_{70}^{Svc < 65}$	= $1.5\% \times \$64,929 \times 8$ = \$7,791



The actuarial liability (AL) as at the valuation date is determined as follows:

AL_{@1/1/2015} =

$$((\$7,791 + \max(0; \$6,000 \times \frac{(1+i)^{70-65}}{5P_{65}} \times \frac{\ddot{a}_{65@i}^{(12)}}{\ddot{a}_{70@i}^{(12)}} - \$7,791)) + (\$974 + \max(0; \$775 \times \frac{(1+i)^{70-65.5}}{4.5P_{65.5}} \times \frac{\ddot{a}_{65.5@i}^{(12)}}{\ddot{a}_{70@i}^{(12)}} - \$974)) + (\$974 + \max(0; \$825 \times \frac{(1+i)^{70-66.5}}{3.5P_{66.5}} \times \frac{\ddot{a}_{66.5@i}^{(12)}}{\ddot{a}_{70@i}^{(12)}} - \$974))) \times \ddot{a}_{70@i}^{(12)} \times v_i^{70-67}$$

This can be simplified to:

$$(\max(\$7,791; \$6,000 \times \frac{(1+i)^{70-65}}{5P_{65}} \times \frac{\ddot{a}_{65@i}^{(12)}}{\ddot{a}_{70@i}^{(12)}}) + \max(\$974; \$775 \times \frac{(1+i)^{70-65.5}}{4.5P_{65.5}} \times \frac{\ddot{a}_{65.5@i}^{(12)}}{\ddot{a}_{70@i}^{(12)}}) + \max(\$974; \$825 \times \frac{(1+i)^{70-66.5}}{3.5P_{66.5}} \times \frac{\ddot{a}_{66.5@i}^{(12)}}{\ddot{a}_{70@i}^{(12)}})) \times \ddot{a}_{70@i}^{(12)} \times v_i^{70-67}$$

The NCs are computed as follows:

$$\mathbf{NC}_{\text{for year 2015}} = (\$974 + \max(0; \$887 \times \frac{(1+i)^{70-67.5}}{2.5P_{67.5}} \times \frac{\ddot{a}_{67.5@i}^{(12)}}{\ddot{a}_{70@i}^{(12)}} - \$974)) \times \ddot{a}_{70@i}^{(12)} \times v_i^{70-67}$$

This can be simplified to:

$$= \max(\$974 \times \ddot{a}_{70@i}^{(12)} \times v_i^3; \$887 \times \frac{v_i^{0.5}}{2.5P_{67.5}} \times \ddot{a}_{67.5@i}^{(12)})$$

$$\mathbf{NC}_{\text{for year 2016}} = \max(\$974 \times \ddot{a}_{70@i}^{(12)} \times v_i^2; \$936 \times \frac{v_i^{0.5}}{1.5P_{68.5}} \times \ddot{a}_{68.5@i}^{(12)})$$

$$\mathbf{NC}_{\text{for year 2017}} = \max(\$974 \times \ddot{a}_{70@i}^{(12)} \times v_i; \$974 \times \frac{v_i^{0.5}}{0.5P_{69.5}} \times \ddot{a}_{69.5@i}^{(12)})$$



Example 2

An individual participates in a single-employer DB RPP. The member has high pensionable earnings. His LRB is limited by the maximum under subsection 8504(1) of the Regulations. The calculation method is the same whether the member joins the plan **before** or **after** age 65.

Plan provisions

Plan effective date:	January 1, 2005
Benefit formula:	2% of indexed earnings for each calendar year
Normal retirement age:	65
Normal form of pension:	Joint and survivor with $66\frac{2}{3}\%$ survivor pension and guaranteed for 5 years
Post retirement indexing:	Fully indexed to CPI
Provision of DB limit projection:	Yes
Actuarial equivalence for delayed retirement:	Yes

Employee data

Shareholder (Y/N):	Yes; (connected person)
Sex:	Male
Date of birth:	October 1, 1948
Date of hire:	January 1, 2005
Normal retirement date:	October 1, 2013
Attained age:	66.25
Pensionable service:	10 years
Pensionable earnings:	Maximum for all years

Actuarial assumptions

Purpose of the valuation:	Maximum funding valuation under subsections 8515(6) and (7) of the Regulations
Valuation date:	January 1, 2015
Valuation rate (before retirement):	$i = 7.5\%$
Salary increase:	$s = 5.5\%$
Inflation rate (that is CPI):	4.0%
Indexation of pension:	CPI-1 %
Valuation rate (after retirement):	$i' = 4.37\% (1.075/1.03 - 1)$
DB limit projection rate:	5.5% per annum after 2015
Mortality table:	GAM83 Unisex 50% males and 50% females, 80% mortality rates (post-retirement only)



Retirement date:	January 1, 2018
Retirement age:	69.25
Spouse's age:	Same as member
Funding method:	Projected Accrued Benefit
Payment mode of retirement benefits:	Monthly, in advance
Mode of payment of NC:	Lump sum at the beginning of the year

Review

$$\begin{aligned}
 B_{65} &= \$2,697 \times 8.75 \\
 &= \$23,599 \\
 b_{65.25}^{65 \leq Svc < 65.25} \text{ accrued in 2013} &= \$2,697 \times 0.25 \\
 &= \$674 \\
 b_{66.25}^{65.25 \leq Svc < 66.25} \text{ accrued in 2014} &= \$2,770 \times 1 \\
 &= \$2,770 \\
 b_{67.25}^{66.25 \leq Svc < 67.25} \text{ accrued in 2015} &= \$2,819 \times 1 \\
 &= \$2,819 \\
 b_{68.25}^{67.25 \leq Svc < 68.25} \text{ accrued in 2016} &= \$2,819 \times 1.055 \times 1 \\
 &= \$2,974 \\
 b_{69.25}^{68.25 \leq Svc < 69.25} \text{ accrued in 2017} &= \$2,819 \times 1.055^2 \times 1 \\
 &= \$3,138 \\
 b_{69.25} \text{ payable as of January 1, 2018} &= \$2,819 \times 1.055^3 \times 1 \\
 &= \$3,310 \\
 B_{69.25}^{Svc < 65} &= \$2,819 \times 1.055^3 \times 8.75 \\
 &= \$28,964
 \end{aligned}$$

We have used the member's age in the middle of the year of accrual for the adjustment factors and the maximum pension allowed under subsection 8504(1) of the Regulations during the year of accrual for periods of service after 65. You cannot use the DB limit in the next year (as at January 1) for periods of service after age 65 when calculating this member's LRB.



AL_{@1/1/2015} =

$$\begin{aligned}
 &(((\$28,964 + \max(0; \$23,599 \times (1+i)^{69.25-65}) \times \frac{\ddot{a}_{65.655|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} - \$28,964)) + \\
 &(\$3,310 \times 0.25 + \max(0; \$674 \times (1+i)^{69.25-65.125}) \times \frac{\ddot{a}_{65.125;65.1255|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} - \$3,310 \times 0.25)) + \\
 &(\$3,310 + \max(0; \$2,770 \times (1+i)^{69.25-65.75}) \times \frac{\ddot{a}_{65.75;65.755|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} - \$3,310)) \times \frac{\ddot{a}_{69.25;69.255|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} \times v_i^{69.25-66.25}
 \end{aligned}$$

NC for year 2015 =

$$(\$3,310 + \max(0; \$2,819 \times (1+i)^{69.25-66.75}) \times \frac{\ddot{a}_{66.75;66.755|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} - \$3,310) \times \frac{\ddot{a}_{69.25;69.255|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} \times v_i^{69.25-66.25}$$

NC for year 2016 =

$$(\$3,310 + \max(0; \$2,974 \times (1+i)^{69.25-67.75}) \times \frac{\ddot{a}_{67.75;67.755|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} - \$3,310) \times \frac{\ddot{a}_{69.25;69.255|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} \times v_i^{69.25-67.25}$$

NC for year 2017 =

$$(\$3,310 + \max(0; \$3,138 \times (1+i)^{69.25-68.75}) \times \frac{\ddot{a}_{68.75;68.755|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} - \$3,310) \times \frac{\ddot{a}_{69.25;69.255|}^{(12)}@i}{\ddot{a}_{69.25;69.255|}^{(12)}@i} \times v_i^{69.25-68.25}$$

We have assumed that the member and spouse will survive to the time when the member's LRBs start to be paid.

These calculations would be the same for a member who joins the plan at age 66.25 on January 1, 2015, and buys 10 years of past service.