

Supplemental Pension Plans

Relief Measures Regarding the 2008 Financial Crisis Application Guide for Actuaries

Writers

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Introduction

In 2009, the Gouvernement du Québec adopted measures to alleviate the effects of the 2008 financial crisis¹. The measures are aimed at companies that offer their employees a defined benefit pension plan. They allow employers to temporarily reduce the amortization payments they are required to make into the pension fund, provided the payments are not below a minimum threshold.

This document is further to *Newsletter 25*, entitled *Implementation of measures aimed at reducing the effects of the financial crisis*, which the Régie des rentes du Québec published in November 2009. The *Newsletter* provides a detailed description of the anticipated use of the standards of practice adopted in April 2009 by the Canadian Institute of Actuaries (CIA) as well as the relief measures (assets smoothing on a solvency basis, the elimination of amortization payments for certain deficits, extending the amortization period for certain deficits). Please refer to the *Newsletter* for specific information on these measures.

This document is intended to serve as a guide for actuaries in applying the relief measures in question. It also includes a numerical example that shows how the measures are to be applied. However, the document does not discuss the measures' impact on the rules that apply where an employer withdraws from a multi-employer plan or where a pension plan is terminated.

The document also explains the method for determining amortization payments on a solvency basis during an actuarial valuation using the relief measures. It also describes the rules governing the application of the measures.

Unless otherwise indicated, the legal references are to sections of the *Regulation respecting measures to reduce the effects of the financial crisis on pensions plans covered by the Supplemental Pension Plans Act*.

This publication does not have force of law. In cases of conflicting interpretation, the *Supplemental Pension Plans Act* and its respective regulations, in particular the *Regulation respecting measures to reduce the effects of the financial crisis on pensions plans covered by the Supplemental Pension Plans Act*, prevail.

¹For the purposes of this document, the expression “measures to alleviate the effects of the 2008 financial crisis” refers to the funding rules established by the *Act to amend the Supplemental Pension Plans Act and other legislative provisions in order to reduce the effects of the financial crisis on plans covered by the Act* (commonly known as “Bill 1”) as well as the *Regulation respecting measures to reduce the effects of the financial crisis on pensions plans covered by the Supplemental Pension Plans Act*.

Method for Determining Amortization Payments

For the first complete actuarial valuation after 30 December 2008, the pension committee must tell the actuary which relief measures are to be applied in preparing the report and indicate whether the CIA’s April 2009 standards of practice apply. Here the pension committee relies on the instructions provided by the employer.²

For as long as the relief measures apply, actuarial valuations must be prepared in accordance with the method described below. The steps to follow vary according to whether the actuarial valuation is the first complete actuarial valuation after 30 December 2008 or a subsequent actuarial valuation. The decision to use relief measures requires that the funding rules that took effect on 1 January 2010³ be followed as of the first actuarial valuation after 30 December 2008.

Section A. First actuarial valuation after 30 December 2008

This section describes the method for determining amortization payments as part of the first actuarial valuation after 30 December 2008.

1. Conversion of deficiencies (section 9)

The deficiencies identified in an actuarial valuation prior to the first complete actuarial valuation after 30 December 2008 must be converted to be in conformity with the funding rules that took effect on 1 January 2010. Table 1 illustrates how the conversion has changed the terminology used for deficiencies identified in an actuarial valuation prior to the first complete actuarial valuation after 30 December 2008.

Table 1. Conversion of deficiencies

Previous term	New term
Technical deficiency	Technical deficiency
Solvency deficiency	
Initial unfunded liability	Improvement unfunded liability
Improvement unfunded liability	

Once the deficiencies are converted, not all existing amortization payments are recognized. The amortization payments **recognized** during the conversion are the amortization payments **considered** in the calculation of solvency deficiencies as part of the last complete actuarial valuation prior to the one in which the conversion was made.

Amortization payments for improvement unfunded liabilities determined in a partial actuarial valuation⁴ whose date falls between the date of the last complete actuarial valuation and the date of the first actuarial valuation to use the relief measures are not recognized during the conversion if the actuary certifies that none of the payments were necessary for the plan to be solvent or partially solvent as at the valuation date.

² “Employer” refers to both “the employer party to a pension plan” as well as “the person with the authority to amend the plan”, in the case of a multi-employer plan.

³ The funding rules that took effect on 1 January 2010 were introduced by the *Act to amend the Supplemental Pension Plans Act and other legislative provisions in order to reduce the effects of the financial crisis on plans covered by the Act* (commonly known as “Bill 30”) and the *Act to amend the Supplemental Pension Plans Act, the Act respecting the Québec Pension Plan and other legislative provisions* (commonly known as “Bill 68”).

⁴ According to section 130 of the *Supplemental Pension Plans Act* as it read before 1 January 2010.

If the actuary cannot certify that none of the amortization payments referred to in the paragraph above are necessary for the plan to be solvent or partially solvent, only the amortization payments for the 5 years following the date of the partial valuation are recognized during the conversion of deficiencies.

2. Basic actuarial valuation

A basic actuarial valuation ensures that amortization payments are made and that they are not lower than those that would have been required had there been no financial crisis. For this purpose, the financial crisis deficiency must be determined. If necessary, a second technical deficiency must be created to amortize the portion of the deficiency not related to the financial crisis.

For a basic actuarial valuation, the actuary must apply the funding rules that took effect on 1 January 2010, without taking into account the relief measures chosen. The deficiencies must be converted. The amortization payments stemming from deficiencies determined before the date of the first valuation in which the relief measures are used cannot be eliminated. The new solvency deficiencies can be amortized over a maximum of 5 years and assets, on a solvency basis, cannot be smoothed.

Below are the steps to follow to determine the amortization payments to be taken into consideration, according to the basic actuarial valuation, for the first complete actuarial valuation after 30 December 2008.

a) Deficiencies (section 5; sections 130 and 133 of the Supplemental Pension Plans Act)

Once the existing deficiencies have been converted, the deficiencies identified in the basic actuarial valuation are established. If an improvement is identified for the first time during the first valuation using relief measures, an improvement unfunded liability can be determined according to the funding rules that took effect on 1 January 2010.

If necessary, a technical deficiency can be created by taking into account the amortization payments for deficiencies resulting from the deficiencies determined before the date of the first valuation using relief measures. Formula (1) on page 14 shows how to calculate a technical deficiency according to the basic actuarial valuation.

b) Financial crisis amount (section 10)

The financial crisis amount is used to determine the financial crisis deficiency. This amount is equal to the difference, which cannot be negative, between the expected market value of assets as at 31 December 2008 and their real market value as at 31 December 2008. The expected market value of assets as at 31 December 2008 corresponds to the market value of assets as at 31 December 2007, adjusted to 31 December 2008 at an interest rate of 4,75%. The adjustment of assets must also take into account cash inflows and outflows⁵ for 2008. Formula (2) on page 15 shows how to calculate the financial crisis amount.

If the first actuarial valuation using relief measures is after 31 December 2008, the financial crisis amount bears interest from 31 December 2008 to the actuarial valuation date, at the same rate (4,75%) used to project assets to 31 December 2008.

⁵ Outflows include the fees and benefits paid by the pension fund.

c) Financial crisis deficiency (section 11)

The technical deficiency determined on the date of the first complete actuarial valuation after 30 December 2008 (see **step a**) must, as applicable, be apportioned into two deficiencies: the financial crisis deficiency and the technical deficiency resulting from plan experience, without considering the financial crisis.

As a result, where the accumulated value of the financial crisis amount with interest is less than the technical deficiency determined in **step a**, the financial crisis deficiency is equal to the financial crisis amount, and a second technical deficiency is created. This second deficiency is equal to the amount by which the technical deficiency determined in **step a** exceeds the accumulated value of the financial crisis amount with interest

However, where the accumulated value of the financial crisis amount with interest is greater than or equal to the technical deficiency determined in **step a**, the financial crisis deficiency is equal to that deficiency and no other technical deficiency is created.

d) Amortization payments based on the basic actuarial valuation

The improvement unfunded liabilities and technical deficiencies (including the financial crisis deficiency) determined in the basic actuarial valuation must be amortized over a maximum of 5 years.

For all actuarial valuations made during the period during which the relief measures apply, the amortization payments considered in the basic actuarial valuation correspond to payments for the following deficiencies:

- improvement unfunded liabilities and technical deficiencies resulting from the deficiencies determined before the date of the first complete actuarial valuation after 30 December 2008;
- improvement unfunded liabilities and technical deficiencies (including the financial crisis deficiency) determined by applying the rules specific to the basic actuarial valuation (i.e., as at the date of the first complete actuarial valuation after 30 December 2008).

The amortization payments for the financial crisis deficiency **do not have to be paid but must still be indicated** in the actuarial valuation report.

e) Element "S" (sections 7 and 8)

The Act to amend the Supplemental Pension Plans Act and other legislative provisions in order to reduce the effects of the financial crisis on plans covered by the Act provides that, under certain circumstances, a member or beneficiary whose benefits are reduced following the termination of his or her pension plan can choose to receive a pension that is initially administered by the Régie and then guaranteed by an insurer. The pension cannot be less than the pension that would have been paid had the plan assets been increased, as at the termination date, by the amount referred to in the third paragraph of section 230.0.0.9 of the Supplemental Pension Plans Act (also called element "S" in the Regulation respecting measures to reduce the effects of the financial crisis on pensions plans covered by the Supplemental Pension Plans Act.)

Element "S" must be indicated in the report for each actuarial valuation that applies the relief measures. It is equal to zero on the date of the first of these valuations.

3. Relief measures

The amortization payments considered on a relief measures basis depend on which measures are chosen by the employer.

a) Deficiencies (sections 14, 17 and 19; section 130 of the Act)

The formula for determining the technical deficiency on the basis of the relief measures is similar to the one used to determine the technical deficiency on the basis of the basic actuarial valuation. The main difference between the two approaches is that **no improvement unfunded liability can be determined on the basis of the relief measures**. Consequently, to determine a technical deficiency based on the relief measures, the assets are increased by the value of the amortization payments for certain improvement unfunded liabilities determined in the basic actuarial valuation. The liabilities in question vary according to whether instructions to eliminate amortization payments for certain deficiencies have been given.

- If the employer has given instructions, the liabilities determined before the valuation date and for which an amendment was made after 30 December 2008 are concerned.
- If the employer has not given instructions, all liabilities determined before the valuation date are concerned.

Furthermore, the technical deficiency determined on the basis of the relief measures must be amortized over a period provided for in the employer's instructions, in conformity with the regulations.

b) Amortization payments considered on a relief measures basis (section 21, paragraph 2)

For all actuarial valuations produced during the period in which the relief measures apply, the amortization payments considered on a relief measures basis are for the following deficiencies.

- In the event that the instructions given include the elimination of amortization payments for certain deficiencies:
 - a. improvement unfunded liabilities determined by applying the rules for a basic actuarial valuation, for an amendment made after 30 December 2008;
 - b. technical deficiencies determined by applying the relief measures (i.e., determined on the date of a complete actuarial valuation after 30 December 2008).
- In the event that the instructions given **do not include** the elimination of the amortization payments for certain deficiencies:
 - a. improvement unfunded liabilities determined by applying the rules for a basic actuarial valuation (i.e., determined on the date of a complete actuarial valuation after 30 December 2008);
 - b. technical deficiencies determined by applying the relief measures (i.e., determined on the date of a complete actuarial valuation after 30 December 2008);
 - c. improvement unfunded liabilities and technical deficiencies resulting from deficiencies determined before the date of the first complete actuarial valuation after 30 December 2008.

4. Amortization payments on a solvency basis (section 21)

The amortization payments on a solvency basis are the higher of those determined based on the basic actuarial valuation (excluding those related to the financial crisis deficiency) and those determined based on the relief measures. Moreover, this comparison must be made for any fiscal year or any part thereof, as the case may be. Though the *Supplemental Pension Plans Act* does not require it, the result of this comparison must be given in the actuarial valuation for the three fiscal years following the valuation date.

5. Amortization payments to be made (section 6; sections 39 and 41 of the Act)

The rules for funding on a solvency basis and on an on-going basis are influenced by the measures to alleviate the effects of the 2008 financial crisis. However, on an on-going basis, this influence is limited in two ways. First, the actuarial valuation must be done in accordance with the funding rules that took effect on 1 January 2010. Second, the value of the assets on an on-going basis cannot be greater than the value that would have been determined with the asset valuation method used during the last complete actuarial valuation before 31 December 2008.

According to the funding rules that took effect on 1 January 2010, the amortization payments to be paid into the pension fund are the higher of those determined on a solvency basis, increased by the value of special amortization payments, and those determined on an on-going basis. Any schedule for amortization payments, regardless of the approach used to establish it (on-going basis, basic actuarial valuation or relief measures) must be given in the actuarial valuation report. The special amortization payments must also be given in the report.

Though the *Supplemental Pension Plans Act* does not require it, the actuarial valuation report must indicate the amortization payments payable for the three fiscal years following the valuation date. For an actuarial valuation done during the fiscal year, in addition to indicating the amortization payments payable for the portion of the fiscal year following the valuation date, the report must also indicate the payments for the two subsequent fiscal years. The Régie requests this information since it is necessary to complete the Actuarial Information Summary⁶ form, which must now be sent with the report.

Section B. Subsequent actuarial valuations

The method for determining amortization payments according to the basic actuarial valuation and according to the relief measures during a subsequent actuarial valuation differs from the method used during the first complete actuarial valuation after 30 December 2008. This section describes the method in question. After following steps 1 and 2 below, steps 4 and 5 in Section A above must also be followed.

1. Basic actuarial valuation

For a basic actuarial valuation done as part of subsequent actuarial valuations, the financial crisis deficiency and its amount do not have to be determined again.

In addition, element “S” must be calculated. This element is necessary for the calculation of actuarial gains and the technical deficiency according to the basic actuarial valuation.

⁶ In accordance with the relief measures, any actuarial valuation report after 30 December 2008 that is sent to the Régie must be accompanied by a duly completed Actuarial Information Summary form (T1200). This form is provided by the Canada Revenue Agency and is available on the Régie’s Web site in the “Forms” section.

a) Element “S” (section 7)

Use the following formula to calculate element “S”:

$$S = A + B - C$$

Where $A =$ the accumulated value⁷ on the valuation date of element “S”, determined on the date of the last actuarial valuation;

$B =$ the accumulated value⁷ on the valuation date of the amortization payments related to the financial crisis deficiency since the date of the last actuarial valuation;

$C = \max \{0 ; AV(C_{\text{paid}}^{\text{employer}}) - AV(C_{\text{basic}}^{\text{employer}})\};$

$AV(C_{\text{paid}}^{\text{employer}}) =$ the accumulated value⁷ on the valuation date of the employer contributions paid⁸ since the date of the last actuarial valuation;

$AV(C_{\text{basic}}^{\text{employer}}) =$ the accumulated value⁷ on the valuation date of the employer contributions⁹ that would have been required since the date of the last actuarial valuation if the amortization payments established on a solvency basis, on the date of the last actuarial valuation, had been those considered in the basic actuarial valuation (excluding amortization payments related to the financial crisis deficiency).

b) Deficiencies (section 12; section 130 of the Act)

An actuarial valuation reveals actuarial gains or losses. Where a basic actuarial valuation reveals losses, a new technical deficiency is determined. Two adjustments must therefore be made with respect to the funding rules that took effect on 1 January 2010.

- The value of the assets must be increased by the maximum amount between 0 and element “S”;
- The value of the assets must be increased by the value of the amortization payments according to the basic actuarial valuation (including those related to the financial crisis deficiency).

In addition, as with the first actuarial valuation after 30 December 2008, if a plan amendment is considered for the first time in the actuarial valuation, an improvement unfunded liability can be determined in accordance with the funding rules that took effect on 1 January 2010.

c) Actuarial gains (sections 12 and 13; section 128 of the Act)

For the period during which the relief measures apply, the same adjustments are required for calculating actuarial gains determined in the basic actuarial valuation and for the technical deficiency [see formula (4) on page 19].

In accordance with the basic actuarial valuation, the actuarial gains **must** be used to proportionally reduce the amortization payments related to the financial crisis deficiency (for which payments need not be made during the period in which the relief measures apply).

⁷ According to the pension fund’s rate of return, without being negative.

⁸ Including the amount of any letter of credit provided since the date of the last actuarial valuation under section 42.1 of the *Supplemental Pension Plans Act*.

⁹ Including the employer contributions paid into the pension fund to reimburse the administration fees paid by the plan if the previous actuarial valuation recommended that the employer reimburse an amount for those fees, as well as make current service contributions and amortization payments.

2. Relief measures

As with the first actuarial valuation after 30 December 2008, even though the basic actuarial valuation and the relief measures approach are complementary, the gains and losses must be calculated separately for each. The following two subsections describe how to treat gains and losses using the relief measures.

a) Deficiencies (section 17; section 130 of the Act)

Where the plan records a loss on a relief measures basis, a technical deficiency must be created. The formula used for the first complete actuarial valuation after 30 December 2008 to determine the deficiency requires an adjustment for subsequent actuarial valuations. Not only must assets be increased by the value of the amortization payments for certain improvement unfunded liabilities considered in a basic actuarial valuation for a previous actuarial valuation, assets must also be increased by the value of the amortization payments for certain technical deficiencies determined by applying the relief measures (i.e., determined on the date of a complete actuarial valuation after 30 December 2008).

b) Actuarial gains (section 18; section 128 of the Act)

On a relief measures basis, actuarial gains can be used to reduce the amortization payments for certain deficiencies. If the employer's instructions include assets smoothing, the amortization payments for all technical deficiencies determined using the relief measures can be reduced. The reduction must be made beginning with the oldest deficiency and ending with the most recent deficiency.

If assets smoothing is not included in the employer's instructions, only the amortization payments for the technical deficiency determined using the relief measures at the first complete actuarial valuation after 30 December 2008 can be reduced.

In all cases, the reduction of amortization payments related to a deficiency must be proportional.

End of the Application of the Relief Measures

Section A. End date (section 32)

Application of the relief measures ends on the earliest of the following three dates:

- that of the first actuarial valuation showing the plan to be solvent;
- at the end of the first fiscal year beginning after 31 December 2010;
- the date set by the employer in a written notice sent to the pension committee. This date **must coincide with the fiscal year end.**

Section B. Elimination of amortization payments (section 33)

At the end of the period during which the relief measures apply, the following deficiencies and related amortization payments are eliminated:

- the technical deficiencies (including the financial crisis deficiency) determined according to the basic actuarial valuation and the relief measures;
- the improvement unfunded liabilities for which amendments were made before 31 December 2008;
- the deficiencies determined before the date of the first actuarial valuation in which the relief measures are used.

Section C. Funding rules in effect

Once the relief measures cease to apply, actuarial valuations must conform to the funding rules that took effect on 1 January 2010.

APPENDIX – Numerical Example

The following example shows how to determine amortization payments for actuarial valuations using the relief measures. It follows a defined benefit plan for Company ABC from 31 December 2007 to 31 December 2009. As a result, the example covers three complete and consecutive actuarial valuations. It first gives the plan's financial situation as at 31 December 2007. It then shows how to determine amortization payments for the actuarial valuations as at 31 December 2008 and 31 December 2009. The plan itself is non-contributory, and Company ABC pays all administration costs. In the event that the plan is terminated, the company would also pay all related fees. In addition, the plan has no guaranteed pension, no additional voluntary member contributions, no defined contribution benefits and no sums received following a transfer.

For the sake of simplicity, some values have been rounded and **the results obtained on an on-going basis are not shown.**

Section A. Actuarial valuation as at 31 December 2007

As at 31 December 2007, the market value of the plan's assets is 750 000 \$, while plan liabilities are 900 000 \$. Consequently, the plan has a deficiency of assets of 150 000 \$. Table 2 shows the plan's financial situation as at 31 December 2007.

Table 2. Plan's financial situation as at 31 December 2007

Assets	750 000 \$
Liabilities	900 000 \$
Deficiency of assets	150 000 \$

For 2008, Company ABC must make the amortization payments recommended in the actuarial valuation as at 31 December 2007. The payments are shown in Table 3.

Table 3. Amortization payments as at 31 December 2007

Type of deficiency	Date determined	Expiry	Monthly payment	Commuted value ¹⁰
Improvement unfunded	2005-05-31	2010-05-31	500 \$	13 700 \$
Technical	2000-12-31	2015-12-31	450 \$	24 000 \$
Solvency	2007-12-31	2012-12-31	2 100 \$	112 300 \$
Total			3 050 \$	150 000 \$

Section B. Actuarial valuation as at 31 December 2008 (1st actuarial valuation after 30 December 2008)

For 2008, Company ABC pays 5 250 \$ in current service contributions and 3 050 \$ in amortization payments each month. The plan pays 8 300 \$ in benefits each month. Cash inflows and outflows occur at the end of the month. However, as at 31 December 2008, following poor returns related to the financial crisis, the market value of plan assets is 600 000 \$, with liabilities of 935 000 \$.

The following subsections outline the steps to follow to determine the amortization payments to be made further to the actuarial valuation as at 31 December 2008. Company ABC has given instructions to the pension committee to apply the three relief measures listed on page 3.

¹⁰ Determined based on a maximum 5 year payment schedule at a 4,75% annual interest rate.

1. Conversion of deficiencies

The deficiencies determined in the actuarial valuation as at 31 December 2007 must be converted to be in conformity with the new funding rules that took effect on 1 January 2010. On a solvency basis, the conversion creates two types of deficiencies: technical deficiencies and improvement unfunded liabilities. In addition, only the amortization payments **considered** in the calculation of the solvency deficiency during the actuarial valuation as at 31 December 2007 must be **recognized** as at 31 December 2008. As a result, after the conversion, only the amortization payments for the next four years are recognized.

Tables 4 and 5 show the amortization payments as at 31 December 2008 before and after the conversion.

Table 4. Amortization payments as at 31 December 2008 before the conversion

Type of deficiency	Date determined	Expiry	Monthly payment	Commuted value ¹¹
Improvement unfunded	2005-05-31	2010-05-31	500 \$	8 200 \$
Technical	2000-12-31	2015-12-31	450 \$	24 400 \$
Solvency	2007-12-31	2012-12-31	2 100 \$	92 800 \$
Total			3 050 \$	125 400 \$

Table 5. Amortization payments as at 31 December 2008 after the conversion

Type of deficiency	Date determined	Expiry	Monthly payment	Commuted value ¹¹
Improvement unfunded	2005-05-31	2010-05-31	500 \$	8 200 \$
Technical	2000-12-31	2012-12-31	450 \$	19 900 \$
Technical	2007-12-31	2012-12-31	2 100 \$	92 800 \$
Total			3 050 \$	120 900 \$

2. Basic actuarial valuation

The basic actuarial valuation serves to determine the minimum amortization payments to be made to avoid a situation, after the relief measures are applied, whereby the employer makes smaller payments than it would have made had there been no financial crisis. Thus, once the existing deficiencies are converted, the deficiencies according to the basic actuarial valuation are then determined.

a) Deficiencies

In the example, no improvement unfunded liability has been determined as at 31 December 2008. As the following formula shows, the technical deficiency as at the same date is 214 100 \$.

$$\text{Technical deficiency} = \text{Liabilities}^* - (\text{Assets}_{\text{basic}} + \text{CV}(C_{\text{previous}})) \quad (1)$$

$$\text{Technical deficiency} = 935\,000 - (600\,000 + 120\,900)$$

$$\text{Technical deficiency} = 214\,100$$

Where Liabilities^* = the liabilities reduced by the value of the additional obligations resulting from amendments to the plan considered for the first time on the valuation date

$\text{Assets}_{\text{basic}}$ = the assets as at the valuation date according to the basic actuarial valuation

¹¹ Determined based on a maximum 5 year payment schedule at a 4,20% annual interest rate.

$CV(C_{\text{previous}})$ = the commuted value of the amortization payments for solvency deficiencies resulting from deficiencies determined before the date of the first complete actuarial valuation after 30 December 2008 (Table 5)

b) Financial crisis amount

Once the plan's new technical deficiency has been determined, the portion of the deficiency related to the financial crisis must then be established. For that purpose, the financial crisis amount (Z) must first be calculated. This amount corresponds to the difference, which may not be negative, between the following two elements.

D : the market value of assets as at 31 December 2007, adjusted to 31 December 2008 at a rate of return¹² of 4,75% and taking into account cash inflows and outflows for 2008

E : the market value of assets as at 31 December 2008

Since the fund pays no fees, the only cash outflows from the plan are the benefits it pays. The financial crisis amount is therefore calculated as follows.

$$\begin{aligned} Z &= \max \{0 ; D - E\} && (2) \\ &= \max \left\{ 0 ; \left(MV \left(Assets_{31-12-2007} \right) * (1,0475) + \left(AV(C_{2008}) - AV(P_{2008}) \right) \right) - MV \left(Assets_{31-12-2008} \right) \right\} \\ &= \max \left\{ 0 ; \left(750\,000 * 1,0475 + \left((64\,360 + 37\,390) - 101\,750 \right) \right) - 600\,000 \right\} \\ &= 185\,600 \end{aligned}$$

Where $MV(Assets_t)$ = the market value of the assets on date t

$AV(C_{2008})$ = the accumulated value, as at 31 December 2008, of the contributions paid into the pension fund in 2008, at an annual interest rate of 4,75%

$AV(P_{2008})$ = the accumulated value, as at 31 December 2008, of cash outflows in 2008, at an annual interest rate of 4,75%

c) Financial crisis deficiency

To determine the financial crisis deficiency, the technical deficiency determined in **step a** (214 100 \$) is compared with the financial crisis amount determined in **step b** (185 600 \$). In the example, the deficiency is greater than the financial crisis amount. Consequently, the financial crisis deficiency is 185 600 \$, and a second technical deficiency in the amount of 28 500 \$ is created.

d) Amortization payments considered in the basic actuarial valuation

Table 6 shows the amortization payments considered in the basic actuarial valuation as at 31 December 2008, as described on page 7.

¹² Rate used to determine, on a solvency basis, as at 31 December 2007, the liabilities of the members whose pension is not in payment.

Table 6. Amortization payments considered in the basic actuarial valuation as at 31 December 2008

Type of deficiency	Date determined	Expiry	Monthly payment	Commuted value ¹³
Improvement unfunded	2005-05-31	2010-05-31	500 \$	8 200 \$
Technical	2000-12-31	2012-12-31	450 \$	19 900 \$
Technical	2007-12-31	2012-12-31	2 100 \$	92 800 \$
Technical	2008-12-31	2013-12-31	530 \$	28 500 \$
Total required			3 580 \$	149 400 \$
Technical (financial crisis)	2008-12-31	2013-12-31	3 400 \$	185 600 \$
Total			6 980 \$	335 000 \$

The amortization payments to amortize the financial crisis deficiency **do not have to be paid but must nonetheless be shown** in the actuarial valuation report.

3. Relief measures

The amortization payments on a relief measures basis are determined after the amortization payments identified in the basic actuarial valuation.

a) Deficiencies

Since Company ABC gave instructions to use the three relief measures listed on page 3, the actuary smoothes all assets and eliminates the amortization payments for technical deficiencies and improvement unfunded liabilities¹⁴ determined before 31 December 2008. The smoothed value of the plan's assets is 700 000 \$ as at 31 December 2008. Therefore, on a relief measures basis, the plan has a technical deficiency of 235 000 \$, as the following formula shows.

$$\text{Technical deficiency} = \text{Liabilities}^* + W - \left(\text{Assets}_{\text{relief}} + CV(C_{\text{relief}}) + CV(C_{\text{basic}}^{\text{imp.}}) \right) \quad (3)$$

$$\text{Technical deficiency} = 935\,000 + 0 - (700\,000 + 0 + 0)$$

$$\text{Technical deficiency} = 235\,000$$

Where Liabilities^* = the liabilities reduced by the value of the additional obligations resulting from amendments to the plan considered for the first time on the valuation date

W = the additional obligations resulting from amendments made before 31 December 2008 and considered for the first time on the date of the first complete actuarial valuation after 30 December 2008

$\text{Assets}_{\text{relief}}$ = the assets on the valuation date determined using the relief measures

$CV(C_{\text{relief}})$ = the commuted value of the amortization payments for technical deficiencies determined using the relief measures

$CV(C_{\text{basic}}^{\text{imp.}})$ = the commuted value of the amortization payments for improvement unfunded liabilities determined before the valuation date, according to the basic actuarial valuation, for an amendment made after 30 December 2008

If instructions to eliminate the amortization payment for certain deficiencies had not been given, a different formula would have been used to calculate the technical deficiency.

¹³ Determined using an annual interest rate of 4,20%.

¹⁴ The amendment related to the Improvement unfunded liability determined on 31 May 2005 was made before 31 December 2008. Therefore, the amortization payments for this deficiency can be eliminated.

b) Amortization payments considered on a relief measures basis

With regard to the plan, only the amortization payments for the technical deficiency of 235 000 \$ determined as at 31 December 2008 are taken into consideration. Using the third relief measure, the actuary can amortize this deficiency over a period ending no later than 31 December 2018. As a result, the 235 000 \$ deficiency is amortized over 10 years using monthly amortization payments of 2 390 \$. Table 7 shows the amortization payments considered on a relief measures basis as at 31 December 2008.

Table 7. Amortization payments considered on a relief measures basis as at 31 December 2008

Type of deficiency	Date determined	Expiry	Monthly payment	Commuted value ¹⁵
Technical	2008-12-31	2018-12-31	2 390 \$	235 000 \$
Total			2 390 \$	235 000 \$

4. Amortization payments established on a solvency basis

The amortization payments established on a solvency basis are the higher of those considered in the basic actuarial valuation (excluding payments for the financial crisis deficiency) and those considered on a relief measures basis. As a result, for 2009, the amortization payments determined on a solvency basis are as follows:

$$C_{\text{solvency}} = \max\{42\,960 ; 28\,680\} = 42\,960$$

Table 8 shows the amortization payments determined as at 31 December 2008 on a solvency basis for the three fiscal years after 31 December 2008.

Table 8. Amortization payments on a solvency basis as at 31 December 2008

Fiscal year	Annual amortization payment
2009	42 960 \$
2010	39 460 \$
2011	36 960 \$

5. Amortization payments to be made

In the example, there are no special amortization payments and the amortization payments determined on an on-going basis are lower than those determined on a solvency basis. Consequently, the amortization payments for 2009, 2010 and 2011 are those given in Table 8.

**Section C. Actuarial valuation as at 31 December 2009
(1st subsequent valuation)**

At the end of 2009, the current service contributions and amortization payments accumulated at the pension fund’s rate of return total 82 200 \$ and 45 800 \$, respectively. The additional contributions made by Company ABC, at the pension fund’s rate of return, total 10 600 \$. These additional contributions include the sums that the company paid into the pension fund so that the plan is able to pay all the benefits of members who ceased active membership. The plan pays monthly benefits whose accumulated value, at the pension fund’s rate of return, is 117 400 \$ as at 31 December 2009.

Because of positive returns in 2009, the market value of plan assets is now 711 300 \$. In addition, the pension fund’s annual rate of return for 2009 is 15%. Liabilities have increased slightly to 975 000 \$.

¹⁵ Determined using an annual interest rate of 4,20%.

The following subsections give the steps for determining the amortization payments that must be made following the actuarial valuation as at 31 December 2009.

1. Basic actuarial valuation

Below is the methodology to be used in the basic actuarial valuation as at 31 December 2009 for the pension plan for Company ABC.

a) Element "S"

Element "S" is calculated using the formula given on page 8. In the example, for each fiscal year, the amortization payments determined on an on-going basis are lower than those determined on a solvency basis.

For the plan as at 31 December 2009:

$$A = 0$$

$$B = 43\,500$$

$$\begin{aligned} C &= \max \{0; AV(C_{\text{paid}}^{\text{employer}}) - AV(C_{\text{basic}}^{\text{employer}})\} \\ &= \max \{0; (82\,200 + 45\,800 + 10\,600) - (82\,200 + 45\,800)\} \\ &= 10\,600 \end{aligned}$$

Therefore, as at 31 December 2009, element "S" for the pension plan for Company ABC is:

$$\begin{aligned} S &= 0 + 43\,500 - 10\,600 \\ S &= 32\,900 \end{aligned}$$

In the event that the plan was to be terminated as at 31 December 2009 following the employer's bankruptcy, plan assets would be increased by 32 900 \$ to establish the benefits of members who choose to have their pension administered by the Régie.

b) Deficiencies

In the example, no technical deficiency has been determined according to the basic actuarial valuation as at 31 December 2009 because actuarial gains have been recorded as at that date. No improvement unfunded liability has been determined either. Table 9 shows the amortization payments considered in the basic actuarial valuation as at 31 December 2009, before any actuarial gains are taken into account.

Table 9. Amortization payments considered in the basic actuarial valuation as at 31 December 2009, before actuarial gains are taken into account

Type of deficiency	Date determined	Expiry	Monthly payment	Commuted value ¹⁶
Improvement unfunded	2005-05-31	2010-05-31	500 \$	2 500 \$
Technical	2000-12-31	2012-12-31	450 \$	15 300 \$
Technical	2007-12-31	2012-12-31	2 100 \$	71 300 \$
Technical	2008-12-31	2013-12-31	530 \$	23 600 \$
Total required			3 580 \$	112 700 \$
Technical (financial crisis)	2008-12-31	2013-12-31	3 400 \$	151 100 \$
Total			6 980 \$	263 800 \$

¹⁶ Determined using an annual interest rate of 3,90%.

c) Actuarial gains

Actuarial gains must be calculated using the following formula:

$$\text{Gain} = \max \{0 ; \text{Assets}_{\text{basic}} + \max \{0 ; S\} + CV(C_{\text{basic}}) - \text{Liabilities}^*\} \quad (4)$$

Where $\text{Assets}_{\text{basic}}$ = the assets on the valuation date, according to the basic actuarial valuation

S = element “S” on the valuation date

$CV(C_{\text{basic}})$ = the commuted value of the amortization payments considered in the basic actuarial valuation before the valuation date (Table 9)

Liabilities^* = the liabilities reduced by the value of the additional obligations resulting from amendments to the plan considered for the first time on the valuation date

According to the basic actuarial valuation, the plan recorded an actuarial gain of 33 000 \$ in 2009, calculated as follows:

$$\text{Gain} = \max \{0 ; 711\,300 + \max\{0 ; 32\,900\} + 263\,800 - 975\,000\} = 33\,000$$

In accordance with the basic actuarial valuation, the actuarial gains are used only to reduce the amortization payments for the financial crisis deficiency. This reduces the payments to 2 658 \$, while their commuted value decreases from 151 100 \$ to 118 100 \$. Table 10 shows the amortization payments considered in the basic actuarial valuation as at 31 December 2009, once the actuarial gains are taken into account.

Table 10. Amortization payments considered in the basic actuarial valuation as at 31 December 2009, once actuarial gains are taken into account

Type of deficiency	Date determined	Expiry	Monthly payment	Commuted value ¹⁷
Improvement unfunded	2005-05-31	2010-05-31	500 \$	2 500 \$
Technical	2000-12-31	2012-12-31	450 \$	15 300 \$
Technical	2007-12-31	2012-12-31	2 100 \$	71 300 \$
Technical	2008-12-31	2013-12-31	530 \$	23 600 \$
Total required			3 580 \$	112 700 \$
Technical (financial crisis)	2008-12-31	2013-12-31	2 658 \$	118 100 \$
Total			6 238 \$	230 800 \$

As at 31 December 2009, once the actuarial gains are used to reduce the amortization payments for the financial crisis deficiency, the commuted value of all amortization payments considered in the basic actuarial valuation is 230 800 \$. This amount is different from the deficiency of assets of 263 700 \$ as at 31 December 2009. The 32 900 \$ difference is element “S”.

2. Relief measures

In the example, the smoothed value of the assets as at 31 December 2009 is 725 000 \$, and the commuted value of the amortization payments considered on a relief measures basis is 218 900 \$ (Table 11). As the formula below shows, a technical deficiency of 31 100 \$ is created as at 31 December 2009 on a relief measures basis. If the plan had recorded an actuarial gain with the relief measures, the gain could have been used to reduce the amortization payments for certain deficiencies.

¹⁷ Determined using an annual interest rate of 3,90%.

$$\text{Technical deficiency} = \text{Liabilities}^* - \left(\text{Assets}_{\text{relief}} + CV(C_{\text{relief}}) + CV(C_{\text{basic}}^{\text{imp.}}) \right) \quad (5)$$

$$\text{Technical deficiency} = 975\,000 - (725\,000 + 218\,900 + 0)$$

$$\text{Technical deficiency} = 31\,100$$

The new technical deficiency is amortized up to the end of the plan's first fiscal year starting after 31 December 2017 (i.e., up to 31 December 2018). As a result, the amortization payments considered on a relief measures basis as at 31 December 2009 total 2 730 \$ a month. Table 11 shows the amortization payments in question.

Table 11. Amortization payments considered on a relief measures basis as at 31 December 2009

Type of deficiency	Date determined	Expiry	Monthly payment	Commuted value ¹⁸
Technical	2008-12-31	2018-12-31	2 390 \$	218 900 \$
Technical	2009-12-31	2018-12-31	340 \$	31 100 \$
Total			2 730 \$	250 000 \$

3. Amortization payments on a solvency basis

On a solvency basis, the amortization payments for 2010 are determined using the formula given on page 15.

$$C_{\text{solvency}} = \max\{39\,460 ; 32\,760\} = 39\,460$$

For 2011 and 2012, the amortization payments determined on a solvency basis are:

$$C_{\text{solvency}} = \max\{36\,960 ; 32\,760\} = 36\,960$$

4. Amortization payments to be made

Table 12 shows the annual amortization payments to be made for the three fiscal years after the one ending on 31 December 2009. In the example, the amortization payments determined on an on-going basis are lower than those determined on a solvency basis.

Table 12. Amortization payments to be made from 2010 to 2012

Fiscal year	Annual amortization payment
2010	39 460 \$
2011	36 960 \$
2012	36 960 \$

¹⁸ Determined using an annual interest rate of 3,90%.