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Part 2

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Laws and Regulations

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Summary

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General Retirement Plan for the Mayors and Councillors of Municipalities
— Partition and assignment of benefits accrued
— Amendments

Regulation to amend the Regulation respecting the partition and assignment of benefits accrued under the General Retirement Plan for the Mayors and Councillors of Municipalities

WHEREAS, under subparagraph *j* of the first paragraph of section 42 of the Act respecting retirement plans for the mayors and councillors of municipalities (R.S.Q., c. R-16), the Government may, for the purposes of section 41.5 of the Act, fix the rules which apply to the establishment of the benefits accrued under the General Retirement Plan for the Mayors and Councillors of Municipalities, which may differ from the rules otherwise applicable under the Act, and determine the actuarial rules, assumptions and methods which apply to the assessment of accrued benefits and which may vary according to the nature of the benefits;

WHEREAS, under subparagraph *k* of the first paragraph of section 42 of the Act respecting retirement plans for the mayors and councillors of municipalities, the Government may determine, for the purposes of section 41.6 of the Act, the rules and the terms and conditions of payment of the sums awarded to the spouse and, where applicable, the interest payable thereon;

WHEREAS, under subparagraph *l* of the first paragraph of section 42 of the Act respecting retirement plans for the mayors and councillors of municipalities, the Government may prescribe, for the purposes of section 41.8 of the Act, the actuarial rules, assumptions and methods for reducing any sum payable under the General Retirement Plan for the Mayors and Councillors of Municipalities, which may vary according to the nature of the benefit from which such sum is derived;

WHEREAS the Government made the Regulation respecting the partition and assignment of benefits accrued under the General Retirement Plan for the Mayors and Councillors of Municipalities made by Order in Council 1752-91 dated 18 December 1991;

WHEREAS it is expedient to amend the Regulation;

WHEREAS, in accordance with sections 10 and 11 of the Regulations Act (R.S.Q., c. R-18.1), a draft of the Regulation to amend the Regulation respecting the partition and assignment of benefits accrued under the General Retirement Plan for the Mayors and Councillors of Municipalities was published in Part 2 of the *Gazette officielle du Québec* of 22 September 2010 with a notice that it could be made by the Government on the expiry of 45 days following that publication;

WHEREAS it is expedient to make the Regulation without amendment;

IT IS ORDERED, therefore, on the recommendation of the Minister of Municipal Affairs, Regions and Land Occupancy:

THAT the Regulation to amend the Regulation respecting the partition and assignment of benefits accrued under the General Retirement Plan for the Mayors and Councillors of Municipalities, attached to this Order in Council, be made.

GÉRARD BIBEAU,
Clerk of the Conseil exécutif

Regulation to amend the Regulation respecting the partition and assignment of benefits accrued under the General Retirement Plan for the Mayors and Councillors of Municipalities[*]

An Act respecting retirement plans for the mayors and councillors of municipalities
(R.S.Q., c. R-16, s. 42, 1st par., subpars. *j*, *k* and *l*)

1. The Regulation respecting the partition and assignment of benefits accrued under the General Retirement Plan for the Mayors and Councillors of Municipalities is amended by replacing section 8 by the following:

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[*] The Regulation respecting the partition and assignment of benefits accrued under the General Retirement Plan for the Mayors and Councillors of Municipalities has not been amended since it was made by Order in Council 1752-91 dated 18 December 1991 (1992, *G.O.* 2, 3).

“**8.** In this section, “CIA Standards” refer to the standards of practice entitled “Practice-Specific Standards for Pension Plans — 3800 Pension Commuted Values” of the Canadian Institute of Actuaries, in force since 1 February 2005 and periodically revised.

The actuarial value of the benefits is determined by using the “distribution of benefits” method and corresponds to the sum of 95% of the actuarial value determined for a male and of 5% of the actuarial value determined for a female.

The actuarial value is also determined by using the following actuarial assumptions:

(1) mortality rates:

The mortality rates are those determined in accordance with the CIA Standards.

(2) interest rates:

The interest rates are those determined in accordance with the CIA Standards;

The result must be adjusted in accordance with the CIA Standards.

(3) Turnover rate: Nil

(4) Disability rate: Nil

(5) Proportion of married persons at death:

Age	Male	Female
18-64 years	85%	65%
65-79 years	80%	30%
80-109 years	60%	10%
110 years	0%	0%

(6) Age difference between spouses at death:

(a) the male spouse of the member is assumed to be 1 year older;

(b) the female spouse of the member is assumed to be 4 years younger.”.

2. Section 15 is replaced by the following:

“**15.** Interest compounded annually and accrued from the date of assessment up to the date of payment must be added to the sums awarded to the spouse at the rate provided for in section 1.1 of the Regulation respecting the application of the Act respecting the Pension Plan of Elected Municipal Officers, made by Order in Council 1742-89 dated 15 November 1989, in force on the date of assessment. However, where that date is prior to 1 June 2007, the applicable interest rate is 4.10%.”.

3. The following Division is added after section 18:

“**DIVISION V**
TRANSITIONAL

18.1. For the purposes of section 17, the amount of pension that would be obtained on the basis of the sums awarded to the spouse at the date of assessment is determined at that date according to the actuarial method and assumptions that were used for the assessment of accrued benefits.”.

4. This Regulation comes into force on 1 January 2011.

1198

Gouvernement du Québec

O.C. 1071-2010, 8 December 2010

An Act respecting the Pension Plan of Elected
Municipal Officers
(R.S.Q., c. R-9.3)

Pension Plan of Elected Municipal Officers — Partition and assignment of benefits accrued — Amendments

Regulation to amend the Regulation respecting the partition and assignment of benefits accrued under the Pension Plan of Elected Municipal Officers

WHEREAS, under subparagraph 4.3 of the first paragraph of section 75 of the Act respecting the Pension Plan of Elected Municipal Officers (R.S.Q., c. R-9.3), the Government may, for the purposes of section 63.2 of the Act, fix the rules which apply to the establishment of the benefits accrued under the Pension Plan of Elected Municipal Officers, which may differ from the rules otherwise applicable under the Act, and determine the actuarial rules, assumptions and methods which apply to the assessment of accrued benefits and which may vary according to the nature of the benefits;

WHEREAS, under subparagraph 4.4 of the first paragraph of section 75 of the Act respecting the Pension Plan of Elected Municipal Officers, the Government may determine, for the purposes of section 63.3 of the Act, the rules and the terms and conditions of payment of the sums awarded to the spouse and, where applicable, the interest payable thereon;

WHEREAS, under subparagraph 4.5 of the first paragraph of section 75 of the Act respecting the Pension Plan of Elected Municipal Officers, the Government may prescribe, for the purposes of section 63.5 of the Act, the actuarial rules, assumptions and methods for reducing any sum payable under the Pension Plan of Elected Municipal Officers, which may vary according to the nature of the benefit from which such sum is derived;

WHEREAS the Government made the Regulation respecting the partition and assignment of benefits accrued under the Pension Plan of Elected Municipal Officers by Order in Council 1753-91 dated 18 December 1991, last amended by the regulation made by Order in Council 1431-98 dated 27 November 1998;

WHEREAS it is expedient to again amend the Regulation;

WHEREAS, in accordance with sections 10 and 11 of the Regulations Act (R.S.Q., c. R-18.1), a draft of the Regulation to amend the Regulation respecting the partition and assignment of benefits accrued under the Pension Plan of Elected Municipal Officers was published in Part 2 of the *Gazette officielle du Québec* of 22 September 2010 with a notice that it could be made by the Government on the expiry of 45 days following that publication;

WHEREAS it is expedient to make the Regulation without amendment;

IT IS ORDERED, therefore, on the recommendation of the Minister of Municipal Affairs, Regions and Land Occupancy:

THAT the Regulation to amend the Regulation respecting the partition and assignment of benefits accrued under the Pension Plan of Elected Municipal Officers, attached to this Order in Council, be made.

GÉRARD BIBEAU,
Clerk of the Conseil exécutif

Regulation to amend the Regulation respecting the partition and assignment of benefits accrued under the Pension Plan of Elected Municipal Officers*

An Act respecting the Pension Plan of Elected Municipal Officers
(R.S.Q., c. R-9.3, s. 75, 1st par., subpars. 4.3, 4.4 and 4.5)

1. The Regulation respecting the partition and assignment of benefits accrued under the Pension Plan of Elected Municipal Officers is amended by replacing section 7 by the following:

"**7.** In this section, "CIA Standards" refer to the standards of practice entitled "Practice-Specific Standards for Pension Plans — 3800 Pension Commuted Values" of the Canadian Institute of Actuaries, in force since 1 February 2005 and periodically revised.

The actuarial value of the benefits is determined by using the "distribution of benefits" method and corresponds to the sum of 80% of the actuarial value determined for a male and of 20% of the actuarial value determined for a female.

The actuarial value is also determined by using the following actuarial assumptions:

(1) mortality rates:

The mortality rates are those determined in accordance with the CIA Standards.

(2) interest rates:

(a) the interest rates for fully-indexed benefits or non-indexed benefits are those determined in accordance with the CIA Standards;

(b) the interest rates for partially-indexed benefits are determined according to the following formula:

((1 + interest rate for a non-indexed benefit) / (1 + indexing rate for a partially-indexed benefit)) - 1

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* The Regulation respecting the partition and assignment of benefits accrued under the Pension Plan of Elected Municipal Officers, made by Order in Council 1753-91 dated 18 December 1991 (1992, *G.O.* 2, 7), was last amended by the regulation made by Order in Council 1431-98 dated 27 November 1998 (1998, *G.O.* 2, 4783). For previous amendments, refer to the *Tableau des modifications et Index sommaire*, Québec Official Publisher, 2010, updated to 1 October 2010.

The result must be adjusted in accordance with the CIA Standards.

(3) indexing rate:

(a) for a fully-indexed benefit according to the rate of increase in the Pension Index, the indexing rate is computed in the manner described in the CIA standards;

(b) for a benefit indexed according to the excess of the rate of increase in the Pension Index "PI" over 3%, the indexing rate corresponds to the excess of the indexing rate computed in the manner provided for in subparagraph *a* over 3%.

In order to take into account the inflation rate variations, the following additions are made to the results of effective indexing formulas for actuarial value computation purposes:

Inflation level	Addition to the result of the PI-3% formula	Adjusted indexing rate
0.5	0.1	0.1
1.0	0.1	0.1
1.5	0.3	0.3
2.0	0.5	0.5
2.5	0.7	0.7
3.0	1.0	1.0
3.5	0.8	1.3
4.0	0.6	1.6
4.5	0.5	2.0
5.0	0.4	2.4

(4) Turnover rate: Nil

(5) Disability rate: Nil

(6) Proportion of married persons at death:

Age	Male	Female
18-64 years	85%	65%
65-79 years	80%	30%
80-109 years	60%	10%
110 years	0%	0%

(7) Age difference between spouses at death:

(a) the male spouse of the member is assumed to be 1 year older;

(b) the female spouse of the member is assumed to be 4 years younger.".

2. Section 14 is replaced by the following:

"**14.** Interest compounded annually and accrued from the date of assessment up to the date of payment must be added to the sums awarded to the spouse at the rate provided for in section 1.1 of the Regulation respecting the application of the Act respecting the Pension Plan of Elected Municipal Officers, made by Order in Council 1742-89 dated 15 November 1989, in force on the date of assessment. However, where that date is prior to 1 June 2007, the applicable interest rate is 4.10%.".

3. The following Division is added after section 22:

"**DIVISION V**
TRANSITIONAL

22.1. For the purposes of sections 18, 19 and 20, the amount of pension that would be obtained on the basis of the sums awarded to the spouse at the date of assessment is determined at that date according to the actuarial method and assumptions that were used for the assessment of accrued benefits.".

4. This Regulation comes into force on 1 January 2011.

1199

Gouvernement du Québec

O.C. 1077-2010, 8 December 2010

An Act respecting the Government and Public Employees Retirement Plan
(R.S.Q., c. R-10)

Regulation
— Amendment

Regulation to amend the Regulation under the Act respecting the Government and Public Employees Retirement Plan

WHEREAS, under section 177 of the Act respecting the Government and Public Employees Retirement Plan (R.S.Q., c. R-10) and subparagraph 18 of the first paragraph of section 134 of the Act, the Government may, by regulation, revise the rate of contribution to the Government and Public Employees Retirement Plan; the rate is based on the result of the actuarial valuation of the plan and is adjusted from 1 January after receipt by the Minister of the report of the independent actuary;

WHEREAS the Minister received the report of the independent actuary on 8 November 2010;

WHEREAS, pursuant to the report, the rate of contribution should be increased;

WHEREAS, under the first paragraph of section 134 of the Act, the Regulation is made by the Government after the Commission administrative des régimes de retraite et d'assurances has consulted the pension committee referred to in section 163 of the Act;

WHEREAS the Government made the Regulation under the Act respecting the Government and Public Employees Retirement Plan by Order in Council 1845-88 dated 14 December 1988;

WHEREAS it is expedient to amend the Regulation;

WHEREAS the pension committee has been consulted;

IT IS ORDERED, therefore, on the recommendation of the Minister responsible for Government Administration and Chair of the Conseil du trésor:

THAT the Regulation to amend the Regulation under the Act respecting the Government and Public Employees Retirement Plan, attached hereto, be made.

GÉRARD BIBEAU,
Clerk of the Conseil exécutif

Regulation to amend the Regulation under the Act respecting the Government and Public Employees Retirement Plan[*]

An Act respecting the Government and Public Employees Retirement Plan
(R.S.Q., c. R-10, s. 134, 1st par., subpar. 18, and s. 177)

1. The Regulation under the Act respecting the Government and Public Employees Retirement Plan is amended in section 39

(1) by replacing "1 January 2008" by "1 January 2011";

(2) by replacing "8.19%" by "8.69%".

2. This Regulation comes into force on the day it is made.

1200

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[*] The Regulation under the Act respecting the Government and Public Employees Retirement Plan, made by Order in Council 1845-88 dated 14 December 1988 (1988, *G.O.* 2, 4154), was last amended by the regulation made by Conseil du trésor Decision 209326 dated 21 September 2010 (2010, *G.O.* 2, 2785). For previous amendments, refer to the *Tableau des modifications et Index sommaire,* Québec Official Publisher, 2010, updated to 1 October 2010.

Gouvernement du Québec

O.C. 1081-2010, 8 December 2010

Natural Heritage Conservation Act
(R.S.Q., c. C-61.01)

Amendment to the plan of the Réserve de biodiversité projetée Samuel-De-Champlain and approval of its conservation plan

WHEREAS, under the first paragraph of section 16 of the Act respecting the boundaries of the waters in the domain of the State and the protection of wetlands along part of the Richelieu River (2009, c. 31), the area in the zones marked "A" on the map reproduced in Schedule I to the Act is deemed to be a proposed biodiversity reserve on 19 June 2009, in accordance with Title III of the Natural Heritage Conservation Act (R.S.Q., c. C-61.01), for a period of four years beginning on that date and is provisionally called the "Réserve de biodiversité projetée Samuel-De-Champlain";

WHEREAS, under section 31 of the Natural Heritage Conservation Act, the Minister may amend, replace or revoke the plan of land set aside under the first paragraph of section 27 or the conservation plan established for that land, and no amendment to or replacement of a plan may affect the period of time for which the land has been set aside;

WHEREAS, to regulate some existing practices in the proposed biodiversity reserve, it is expedient to change the boundaries of the reserve so that the lands necessary for that regularization may be alienated;

WHEREAS, for the purpose of introducing these amendments and complying with the additional time granted by Order in Council number 1267-2009 dated 2 December 2009 to publish the conservation plan for the protected area, the Minister of Sustainable Development, Environment and Parks prepared the revised plan of the proposed biodiversity reserve and established its conservation plan, the plans being attached to this Order in Council;

WHEREAS it is advisable that the amended plans come into force on the date of their publication in the *Gazette officielle du Québec*;

IT IS ORDERED, therefore, on the recommendation of the Minister of Sustainable Development, Environment and Parks:

THAT the amended plan of the Réserve de biodiversité projetée Samuel-De-Champlain and its conservation plan, attached to this Order in Council, be approved;

THAT the plans take effect on the date of their publication with this Order in Council in the *Gazette officielle du Québec*.

GÉRARD BIBEAU,
Clerk of the Conseil exécutif

QUÉBEC STRATEGY FOR PROTECTED AREAS

Protected areas
in Québec:
A Lifelong Heritage

Réserve de biodiversité projetée Samuel-De Champlain

Conservation plan

November 2010

Québec

1.1.Protection Status and Toponym

The protection status of the territory described below is that of proposed biodiversity reserve under the *Natural Heritage Conservation Act* (R.S.Q. c. C-61.01).

The permanent protection status planned is that of “biodiversity reserve” under the *Natural Heritage Conservation Act*.

The provisional toponym is “Réserve de biodiversité projetée Samuel-De Champlain”. The official toponym will be determined when the territory is given permanent protection status.

The status sought for the proposed reserve will advance the following conservation objectives:

- conservation of exceptional wetland environments in the St. Lawrence Lowlands province;
- maintenance of biodiversity in wetland environments;
- increased protection of wildlife and plant habitats;
- acquisition of additional knowledge about the natural heritage.

2.1.Plan and Description

2.1. Geographical location, boundaries and dimensions

The location and boundaries of the proposed reserve appear in the map attached as Annexe 1.

Located in the administrative region of Montérégie, Réserve de biodiversité projetée Samuel-De Champlain is comprised of 18 sectors scattered between 45°0’36’’ and 45°12’12’’ north latitude and 73°14’32’’ and 73°21’38’’ west longitude. It lies approximately 11 km south of Saint-Jean-sur-Richelieu and 11 km west of Napierville, with the southernmost sector abutting the American border. The proposed reserve covers an area of 4.87 km^2 (487 ha) here and there in the municipalities of Sainte-Anne-de-Sabrevois, Henryville, Saint-Paul-de-l’Île-aux-Noix and Lacolle. All of the municipalities belong to the regional municipality of Haut-Richelieu in Montérégie. Five landlocked parcels with a total area of 10 050 m^2 are excluded from the boundaries of the proposed biodiversity reserve.

2.2. Ecological portrait

The réserve de biodiversité projetée Samuel-De Champlain lies in the natural region of the Upper St. Lawrence Plain, in the heart of the St. Lawrence Lowlands natural province. More precisely, most of it is in the Champlain Valley physiographic complex, while a small portion of the northern section is in the Plaine de St-Jean-Beauharnois physiographic complex. The réserve de biodiversité projetée Samuel-De Champlain is intended to protect the wetland environments along parts of the Rivière Richelieu.

2.2.1. Representative elements

***Climate*:** The territory is influenced by a continental climate of moderate average temperature (4.5°C to 6.6°C), sub-humid annual precipitation (800 to 1359 mm) and a long growing season (180 to 209 days).

***Geology and geomorphology*:** The territory of the proposed reserve is in the St. Lawrence Platform geological province. The geologic foundation consists primarily of metamorphosed Ordovician sedimentary rocks in the Stony Point formation (shale, slate, dolomite, mudstone, dolomitic siltstone and calcareous mudstone). In terms of geomorphology, the dominant feature is the presence of organic deposits typical of wetland environments in the flood plain. Clayey marine deposits from the ancient Champlain Sea are also found in the proposed reserve, along with river deposits from ancient meanders near the present-day river. There is little topographic relief, the altitude varying from 28 to 33 m.

***Hydrography*:** The proposed biodiversity reserve protects nearly 48 ha of shallow open water, 171 ha of marsh and 192 ha of swamp. The reserve will also protect 573 m of Ruisseau Paquette and more than 1.6 km of streams flowing into the major bed of the Rivière Richelieu. All of the protected area lies within the drainage basin of the Rivière Richelieu.

Flora: The bioclimatic domain of the area is that of maple-bitternut hickory stands in the deciduous forest subzone. On 29% (143 ha) of the proposed reserve the vegetation consists of deciduous wetland forest. These treed swamps are primarily composed of stands of silver maple (*Acer saccharinum*), together with black ash (*Fraxinus nigra*), bitternut hickory (*Carya cordiformis*), American elm (*Ulmus americana*) and swamp white oak (*Quercus bicolor*). As for age, 39% (55 ha) of the forest environment consists of old uneven-aged stands.

Fauna: The wetland environments found in the proposed biodiversity reserve are an important habitat for a wide variety of species of amphibians, birds and mammals. The protected areas contain designated wildlife habitats such as muskrat habitats, a heronry and wildfowl gathering areas. Several areas in the region are particularly exceptional in terms of wildlife, and are partially included in the proposed biodiversity reserve. Examples include Baie des Anglais, the marsh adjacent to the mouth of Rivière du Sud and the Ruisseau Bleury sector. The latter has been identified as a reproductive area for slow-water species and is a spawning ground for northern pike. A wildfowl gathering area and a muskrat habitat are also found here. The Ruisseau Bleury wildlife site presents a mosaic of wetland environments including aquatic plant communities, marshes, swamps, wet meadows and farmland. Also of interest for its reptiles and amphibians, the area is recognized as having a high potential to contain spiny softshell turtle. As well, the local flood plains and the aquatic plant communities in the major bed of the Richelieu are important spawning areas for warm-water fish. The mouth of Ruisseau Faddentown and the flood plain south of Pointe du Gouvernement are other sectors identified as fish reproduction areas. Fifty-six species of fish have been identified in the Rivière Richelieu.

2.2.2. Outstanding elements

***Flora*:** A number of rare or protected species of plants are found within the boundaries of the proposed biodiversity reserve. Some are considered likely to be designated as threatened or vulnerable in Québec, including yellow-fruited sedge (*Carex annectens*), swamp white oak (*Quercus bicolor*), lowland yellow loosestrife (*Lysimachia hybrida*), Virginia water-horehound (*Lycopus virginicus*), slender bulrush (*Scirpus heterochaetus*) and southern wild rice (*Zizania aquatica var. aquatica*). One plant designated as threatened in Québec, false hop sedge (*Carex lupuliformis*), is also found there.

Fauna: Turning to wildlife in the proposed reserve, there is one species of fish considered likely to be designated as threatened or vulnerable, the river redhorse (*Moxostoma carinatum*). Two species designated as vulnerable are also found, the northern map turtle (*Graptemys geographica*) and the least bittern (*Ixobrychus exilis*), while there is one species designated as threatened, the spiny softshell turtle (*Apalone spinifera*).

2.3. Land occupation and uses

Five parcels of land were excluded from the proposed reserve so as to regularize the situation of certain occupants pursuant to the *Loi concernant la délimitation du domaine hydrique de l'État et la protection de milieux humides le long d'une partie de la rivière Richelieu* (2009, c. 31).

Several communication routes permit access and circulation within and around the proposed reserve. Route 223 and connecting roads provide access to the western parts of the proposed reserve, while Chemin du Bord-de-l'eau and connecting roads provide access to the eastern parts. Though excluded from the proposed reserve, Route 202 crosses Île Ash and links the western and eastern sectors. Easements of passage and maintenance will be granted to allow ground access to a permanent residence and three cottages. The permanent residence and four cottages are served by Hydro-Québec electrical lines in the proposed reserve. If necessary, easements could also be granted to allow the passage and maintenance of private electrical lines connecting buildings to the Hydro-Québec network.

Since the Richelieu is a navigable waterway, numerous motor boats ply its waters, causing erosion and considerable disturbance to the plants and wildlife along its banks.

The wetland environments in the proposed reserve are used by many hunters, trappers and fishers. The swamps, marshes and aquatic plant communities lend themselves particularly well to the hunting of waterfowl and the trapping of fur-bearing animals such as common muskrat (*Ondatra zibethicus*) and American mink (*Mustela vison*). The territory lies in fur-bearing animal management unit 16 and hunting zone 8 west.

3. Activities framework

3.1. Activities governed by the Natural Heritage Conservation Act

Activities carried on within the proposed reserve are governed mainly by the provisions of the Natural Heritage Conservation Act.

As provided in the Natural Heritage Conservation Act, the main activities prohibited in an area to which status as a proposed biodiversity reserve has been assigned are

- mining, and gas or petroleum development;
- forest management within the meaning of section 3 of the Forest Act (R.S.Q., c. F-4.1); and
- the development of hydraulic resources and any production of energy on a commercial or industrial basis.

This conservation plan provides that the following activities are also prohibited in the proposed biodiversity reserve under the Minister's authorization and in compliance with the conditions the Minister determines:

- mining, gas and petroleum exploration, brine and underground reservoir exploration, prospecting, and digging or boring, if those activities are not already authorized by the Minister of Natural Resources and Wildlife on 19 June 2009, where those activities necessitate stripping, the digging of trenches, excavation or deforestation;
- any new allocation of a right to occupy land for vacation resort purposes; and
- earthwork or construction work.

All other activities are permitted.

The permitted and prohibited activities considered for the period that follows the assignment of a permanent status by the Government will be based, in general, on the provisions approved by the Government when Order in Council 136-2008 was made on 20 February 2008 regarding the Amendments to the conservation plans for the proposed biodiversity and aquatic reserves by making the necessary adjustments to take into account the special characteristics of that proposed biodiversity reserve entirely situated within the waters in the domain of the State and the application of section 46 of the Act.

3.2. Activities governed by other statutes

Certain activities likely to be carried on within the proposed reserve are also governed by other legislative and regulatory provisions, including provisions that require the issue of a permit or authorization or the payment of fees. Certain activities may also be prohibited or limited by other Acts or regulations that are applicable within the proposed reserve.

A special legal framework may govern permitted activities within the proposed biodiversity reserve in connection with the following matters:

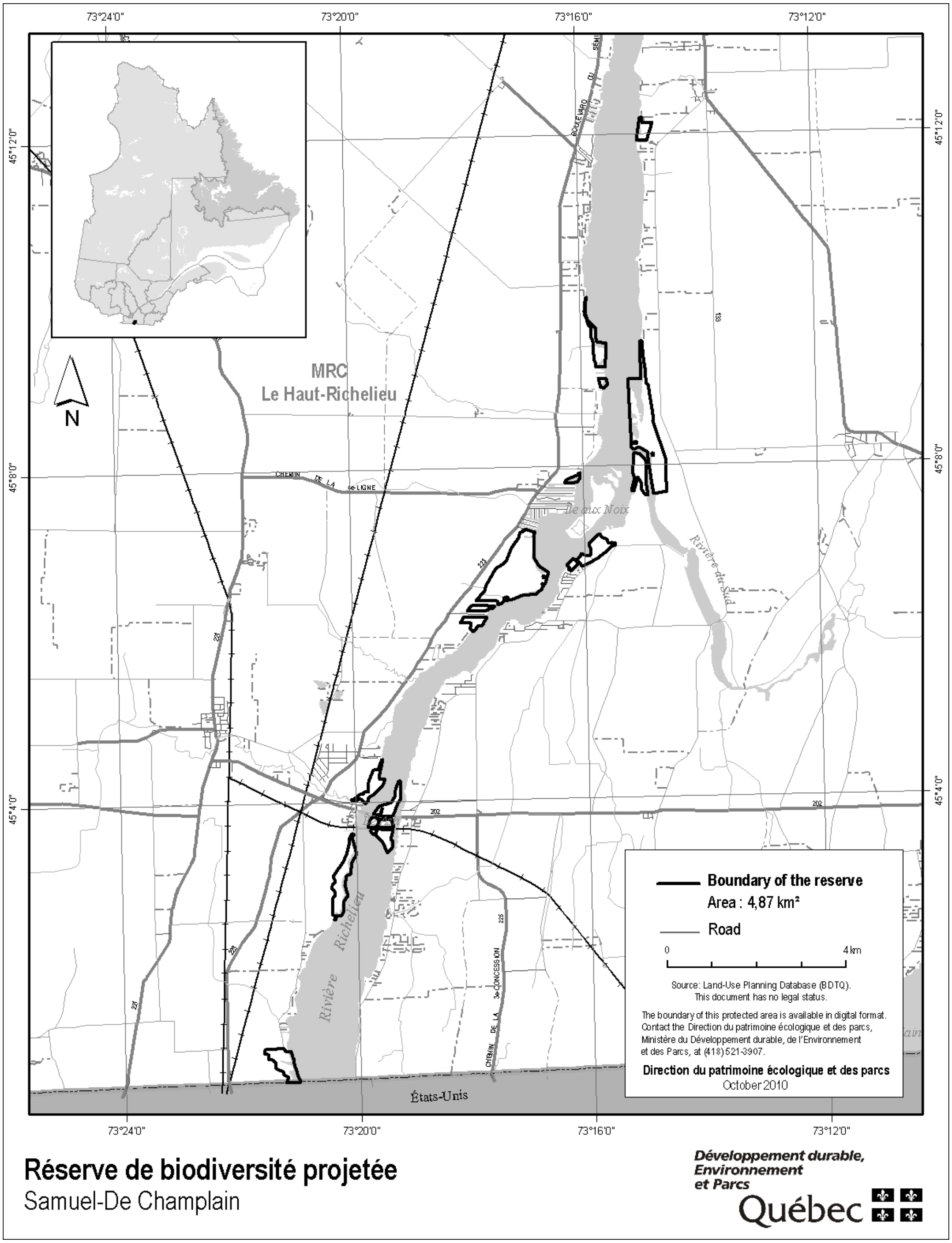
- Environmental protection: measures set out in particular in the Environment Quality Act (R.S.Q., c. Q-2) and its regulations;
- Species of flora designated as threatened or vulnerable: measures prohibiting the removal of such species under the Act respecting threatened or vulnerable species (R.S.Q., c. E-12.01);
- Development and conservation of wildlife resources: measures set out in the Act respecting the conservation and development of wildlife (R.S.Q., c. C-61.1), including the provisions pertaining to outfitting operations and beaver reserves and the measures contained in applicable federal legislation, in particular the fishery regulations;
- Archaeological research: measures set out in particular in the Cultural Property Act (R.S.Q., c. B-4);
- Access and land rights related to the waters in the domain of the State: measures set out in the Watercourses Act (R.S.Q., c. R-13) and in the Act respecting the lands in the domain of the State (R.S.Q., c. T-8.1);
- Construction and development standards: regulatory measures adopted by regional and local municipal authorities under the Acts applicable to them.

4. Responsibilities of the Minister of Sustainable Development, Environment and Parks

The Minister of Sustainable Development, Environment and Parks is responsible for the conservation and management of Réserve de biodiversité projetée Samuel-De Champlain. The Minister supervises and monitors the activities that may take place there. In managing the reserve the Minister enjoys the collaboration and participation of other government partners, such as the Minister of Natural Resources and Wildlife, who have specific responsibilities regarding this land or lands adjoining it. In the exercise of their powers the Ministers will take into consideration the protection sought for this natural environment and the protection status it has been granted. No additional conservation measure is envisaged at this stage.

SCHEDULE 1

MAP OF THE RÉSERVE DE BIODIVERSITÉ PROJETÉE
SAMUEL-DE CHAMPLAIN



Gouvernement du Québec

O.C. 1095-2010, 8 December 2010

Code of Civil Procedure
(R.S.Q., c. C-25)

Determination of child support payments — Amendment

Regulation to amend the Regulation respecting the determination of child support payments

WHEREAS, under article 825.8 of the Code of Civil Procedure (R.S.Q., c. C-25), the Government, by regulation, is to establish standards for the determination of the child support payments to be made by a parent, on the basis of the basic parental contribution determined in respect of the child, of the child care expenses, post-secondary education expenses and special expenses relating to the child and of the parents' custodial arrangement in respect of the child;

WHEREAS, under that article, the Government is to prescribe the use of a form and of a related table determining, on the basis of the parents' disposable income and the number of children, the basic parental contribution, as well as the production of evidentiary documents;

WHEREAS, in accordance with sections 10 and 11 of the Regulations Act (R.S.Q., c. R-18.1), a draft of the Regulation to amend the Regulation respecting the determination of child support payments was published in Part 2 of the *Gazette officielle du Québec* of 13 October 2010 with a notice that it could be made by the Government on the expiry of 45 days following that publication;

WHEREAS it is expedient to make the Regulation without amendments;

IT IS ORDERED, therefore, on the recommendation of the Minister of Justice:

THAT the Regulation to amend the Regulation respecting the determination of child support payments, attached to this Order in Council, be made.

GÉRARD BIBEAU,
Clerk of the Conseil exécutif

Regulation to amend the Regulation respecting the determination of child support payments[*]

Code of Civil Procedure
(R.S.Q., c. C-25, a. 825.8)

1. Schedule II to the Regulation respecting the determination of child support payments is replaced by Schedule II attached to this Regulation.

2. This Regulation comes into force on 1 January 2011.

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[*] The Regulation respecting the determination of child support payments, made by Order in Council 484-97 dated 9 April 1997 (1997, *G.O.* 2, 1651), was last amended by the regulation made by Order in Council 1291-2009 dated 2 December 2009 (2009, *G.O.* 2, 4090). For previous amendments, refer to the *Tableau des modifications et Index sommaire,* Québec Official Publisher, 2010, updated to 1 October 2010.

SCHEDULE II
(s.3)
BASIC PARENTAL CONTRIBUTION DETERMINATION TABLE
(Effective as of 1 January 2011)

Disposable Income of Parents ($)	Basic Annual Contribution ($) Number of Children					
	1 child	2 children	3 children	4 children	5 children	6 children(1)
1 - 1 000	500	500	500	500	500	500
1 001 - 2 000	1 000	1 000	1 000	1 000	1 000	1 000
2 001 - 3 000	1 500	1 500	1 500	1 500	1 500	1 500
3 001 - 4 000	2 000	2 000	2 000	2 000	2 000	2 000
4 001 - 5 000	2 500	2 500	2 500	2 500	2 500	2 500
5 001 - 6 000	2 620	3 000	3 000	3 000	3 000	3 000
6 001 - 7 000	2 690	3 500	3 500	3 500	3 500	3 500
7 001 - 8 000	2 760	4 000	4 000	4 000	4 000	4 000
8 001 - 9 000	2 820	4 410	4 500	4 500	4 500	4 500
9 001 - 10 000	2 890	4 530	5 000	5 000	5 000	5 000
10 001 - 12 000	3 050	4 730	5 600	6 000	6 000	6 000
12 001 - 14 000	3 200	4 980	5 900	6 850	7 000	7 000
14 001 - 16 000	3 400	5 240	6 260	7 280	8 000	8 000
16 001 - 18 000	3 590	5 530	6 650	7 760	8 890	9 000
18 001 - 20 000	3 800	5 840	7 060	8 300	9 520	10 000
20 001 - 22 000	4 080	6 250	7 600	8 930	10 260	11 000
22 001 - 24 000	4 300	6 610	8 050	9 470	10 920	12 000
24 001 - 26 000	4 530	6 970	8 500	10 030	11 580	13 000
26 001 - 28 000	4 750	7 260	8 950	10 600	12 290	13 950
28 001 - 30 000	4 970	7 560	9 320	11 110	12 890	14 680
30 001 - 32 000	5 160	7 820	9 720	11 630	13 510	15 410
32 001 - 34 000	5 340	8 070	10 110	12 100	14 110	16 130
34 001 - 36 000	5 550	8 340	10 470	12 590	14 710	16 840
36 001 - 38 000	5 710	8 620	10 770	12 940	15 110	17 270
38 001 - 40 000	5 930	8 870	11 090	13 320	15 560	17 770
40 001 - 42 000	6 130	9 130	11 440	13 710	16 000	18 290
42 001 - 44 000	6 340	9 410	11 750	14 070	16 410	18 740
44 001 - 46 000	6 540	9 650	12 060	14 470	16 860	19 280
46 001 - 48 000	6 730	9 960	12 420	14 910	17 390	19 870
48 001 - 50 000	6 930	10 190	12 770	15 330	17 900	20 460
50 001 - 52 000	7 130	10 460	13 120	15 790	18 430	21 100
52 001 - 54 000	7 330	10 750	13 470	16 190	18 930	21 660
54 001 - 56 000	7 510	11 000	13 820	16 670	19 490	22 310
56 001 - 58 000	7 720	11 270	14 170	17 060	19 980	22 880
58 001 - 60 000	7 910	11 520	14 510	17 490	20 490	23 470
60 001 - 62 000	8 100	11 780	14 840	17 910	20 970	24 020
62 001 - 64 000	8 280	12 020	15 190	18 340	21 500	24 660
64 001 - 66 000	8 460	12 290	15 530	18 760	21 990	25 220
66 001 - 68 000	8 660	12 510	15 820	19 150	22 470	25 800
68 001 - 70 000	8 800	12 730	16 130	19 560	22 980	26 390
70 001 - 72 000	8 950	12 940	16 430	19 900	23 400	26 880
72 001 - 74 000	9 090	13 130	16 700	20 270	23 850	27 410
74 001 - 76 000	9 260	13 320	16 970	20 630	24 300	27 950
76 001 - 78 000	9 360	13 460	17 170	20 890	24 600	28 310
78 001 - 80 000	9 480	13 630	17 410	21 170	24 940	28 710
80 001 - 82 000	9 590	13 780	17 600	21 430	25 250	29 080
82 001 - 84 000	9 700	13 930	17 820	21 700	25 590	29 470
84 001 - 86 000	9 870	14 080	18 030	21 950	25 900	29 830
86 001 - 88 000	9 950	14 210	18 190	22 190	26 180	30 170
88 001 - 90 000	10 030	14 330	18 340	22 370	26 390	30 420
90 001 - 92 000	10 110	14 440	18 540	22 600	26 700	30 770
92 001 - 94 000	10 210	14 570	18 690	22 800	26 900	31 020
94 001 - 96 000	10 310	14 690	18 860	23 020	27 200	31 350
96 001 - 98 000	10 380	14 800	18 990	23 210	27 420	31 640
98 001 - 100 000	10 480	14 900	19 150	23 370	27 620	31 870

BASIC PARENTAL CONTRIBUTION DETERMINATION TABLE
(Effective as of 1 January 2011)

Disposable Income of Parents ($)	Basic Annual Contribution ($) Number of Children					
	1 child	2 children	3 children	4 children	5 children	6 children(1)
100 001 - 102 000	10 560	15 010	19 300	23 580	27 870	32 160
102 001 - 104 000	10 630	15 100	19 450	23 740	28 100	32 410
104 001 - 106 000	10 720	15 210	19 580	23 950	28 320	32 680
106 001 - 108 000	10 790	15 330	19 750	24 140	28 570	32 950
108 001 - 110 000	10 860	15 420	19 910	24 330	28 790	33 210
110 001 - 112 000	10 960	15 520	20 050	24 490	29 030	33 490
112 001 - 114 000	11 040	15 620	20 210	24 690	29 280	33 750
114 001 - 116 000	11 130	15 730	20 350	24 880	29 500	34 020
116 001 - 118 000	11 220	15 840	20 510	25 050	29 740	34 300
118 001 - 120 000	11 290	15 930	20 650	25 260	29 950	34 530
120 001 - 122 000	11 360	16 020	20 770	25 410	30 160	34 780
122 001 - 124 000	11 420	16 130	20 920	25 590	30 380	35 020
124 001 - 126 000	11 500	16 220	21 050	25 740	30 600	35 280
126 001 - 128 000	11 590	16 310	21 210	25 920	30 810	35 540
128 001 - 130 000	11 650	16 410	21 340	26 090	31 010	35 780
130 001 - 132 000	11 730	16 520	21 490	26 260	31 240	36 020
132 001 - 134 000	11 800	16 600	21 620	26 450	31 460	36 270
134 001 - 136 000	11 870	16 700	21 750	26 620	31 660	36 520
136 001 - 138 000	11 960	16 780	21 910	26 770	31 890	36 770
138 001 - 140 000	12 030	16 890	22 040	26 960	32 110	37 030
140 001 - 142 000	12 100	16 970	22 170	27 130	32 320	37 270
142 001 - 144 000	12 180	17 090	22 320	27 300	32 540	37 520
144 001 - 146 000	12 260	17 170	22 450	27 450	32 760	37 770
146 001 - 148 000	12 340	17 270	22 610	27 670	32 970	38 030
148 001 - 150 000	12 410	17 380	22 740	27 820	33 200	38 280
150 001 - 152 000	12 490	17 470	22 880	27 990	33 400	38 520
152 001 - 154 000	12 560	17 560	23 020	28 170	33 630	38 750
154 001 - 156 000	12 650	17 660	23 180	28 340	33 860	39 030
156 001 - 158 000	12 710	17 770	23 310	28 510	34 060	39 280
158 001 - 160 000	12 790	17 860	23 430	28 680	34 290	39 530
160 001 - 162 000	12 860	17 940	23 590	28 870	34 510	39 780
162 001 - 164 000	12 950	18 040	23 730	29 040	34 710	40 010
164 001 - 166 000	13 010	18 160	23 880	29 210	34 930	40 280
166 001 - 168 000	13 080	18 250	24 020	29 380	35 170	40 530
168 001 - 170 000	13 160	18 340	24 140	29 560	35 370	40 770
170 001 - 172 000	13 250	18 430	24 300	29 730	35 600	41 040
172 001 - 174 000	13 330	18 540	24 430	29 910	35 800	41 270
174 001 - 176 000	13 400	18 630	24 580	30 090	36 040	41 540
176 001 - 178 000	13 470	18 740	24 710	30 260	36 250	41 790
178 001 - 180 000	13 550	18 840	24 880	30 440	36 470	42 040
180 001 - 182 000	13 640	18 930	25 010	30 600	36 690	42 300
182 001 - 184 000	13 710	19 040	25 150	30 780	36 910	42 530
184 001 - 186 000	13 770	19 120	25 290	30 950	37 110	42 800
186 001 - 188 000	13 860	19 210	25 440	31 140	37 350	43 050
188 001 - 190 000	13 930	19 310	25 580	31 300	37 570	43 310
190 001 - 192 000	14 010	19 420	25 710	31 490	37 780	43 550
192 001 - 194 000	14 090	19 520	25 850	31 670	38 010	43 820
194 001 - 196 000	14 170	19 610	26 020	31 840	38 230	44 060
196 001 - 198 000	14 230	19 720	26 160	32 010	38 430	44 320
198 001 - 200 000	14 310	19 810	26 290	32 190	38 680	44 560
Disposable income greater than $200,000 (2)	14 310	19 810	26 290	32 190	38 680	44 560
	plus 3.5% of excess amount	plus 4.5% of excess amount	plus 6.5% of excess amount	plus 8.0% of excess amount	plus 10.0% of excess amount	plus 11.5% of excess amount

(1) For situations involving 7 children or more, the basic parental contribution shall be established by multiplying the difference between the amounts prescribed for 5 and 6 children by the number of additional children and by adding the product thus obtained to the amount prescribed for 6 children (s.11).

(2) For the part of income exceeding $200,000, the percentage indicated is shown for information purposes only. The court may, if it deems it appropriate, fix for that part of the disposable income an amount different from the amount that would be obtained using that percentage (s.10).

Amount of the basic deduction for the purpose of calculating disposable income (line 301 on the Child Support Determination Form) effective as of 1 January 2011 : $10,100

Gouvernement du Québec

O.C. 1110-2010, 8 December 2010

Transport Act
(R.S.Q., c. T-12)

Brokerage of bulk trucking services — Amendments

Regulation to amend the Regulation respecting the brokerage of bulk trucking services

WHEREAS, under paragraphs *b*, *d*, *e*, *f*, *m*, *n*, *o*, *o*.1, *o*.2 and *q* of section 5 of the Transport Act (R.S.Q., c. T-12), the Government may, by regulation,

(1) authorize the Commission to establish and delimit territorial divisions in the cases and on the conditions it determines;

(2) prescribe the conditions on which a permit may be issued and those on which a person may hold a permit and provide for exceptions to those conditions;

(3) prescribe conditions for the maintaining, assignment or transfer of a permit where there is a transfer of ownership or change of control of a means of transport or a transport system;

(4) determine the minimum or maximum term of a permit, exempt a permit from the renewal procedure provided in section 37.1 and prescribe the conditions on which a permit may be renewed;

(5) fix the requirements applicable to contracts in the case of a carrier;

(6) determine the duties, powers, rights and obligations of holders of brokerage permits;

(7) prescribe standards of representativeness applicable to holders of brokerage permits

(8) prescribe administrative and management standards applicable to brokerage companies, the production of budget estimates and audited financial statements;

(9) prescribe the necessary forms for the administration of the Transport Act;

WHEREAS, in accordance with sections 10 and 11 of the Regulations Act (R.S.Q., c. R-18.1), a draft of the Regulation to amend the Regulation respecting the brokerage of bulk trucking services was published in Part 2 of the *Gazette officielle du Québec* of 8 October 2010 with a notice that it could be made by the Government on the expiry of 45 days following that publication;

WHEREAS it is expedient to make the Regulation with amendments;

IT IS ORDERED, therefore, on the recommendation of the Minister of Transport:

THAT the Regulation to amend the Regulation respecting the brokerage of bulk trucking services, attached to this Order in Council, be made.

GÉRARD BIBEAU,
Clerk of the Conseil exécutif

Regulation to amend the Regulation respecting the brokerage of bulk trucking services[*]

Transport Act
(R.S.Q., c. T-12, s. 5, pars. *b*, *d*, *e*, *f*, *m*, *n*, *o*, *o*.1, *o*.2 and *q*)

1. The Regulation respecting the brokerage of bulk trucking services is amended in section 4

(1) by replacing “that have their principal establishment in the zone for which the permit is applied for and that are interested in subscribing to a brokerage service” in the first paragraph by “and that have had their principal establishment in the zone for which the permit is applied for since 1 November of the preceding year”;

(2) by striking out the third sentence in the second paragraph;

(3) by inserting the following after the second paragraph:

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[*] The Regulation respecting the brokerage of bulk trucking services, made by Order in Council 1483-99 dated 17 December 1999 (1999, *G.O.* 2, 5079), was last amended by the regulation made by Order in Council 190-2010 dated 10 March 2010 (2010, *G.O.* 2, 721). For previous amendments, refer to the *Tableau des modifications et Index sommaire*, Québec Official Publisher, 2010, updated to 1 October 2010.

"A contract for brokerage services entered into by an operator of heavy vehicles further to intimidation, threats or reprisals cannot be taken into account for establishing the representativeness of a legal person.".

2. Section 5 is amended by replacing subparagraph 1 of the first paragraph by the following:

"(1) file with the Commission

(a) the application and the information that will establish its representativeness, using the appropriate forms;

(b) the originals of all brokerage contracts, upon request by the Commission;

(c) its revenue and expenditure forecasts with an application for the fixing of its brokerage fees;".

3. Section 9 is replaced by the following:

"**9.** In 2011, a brokerage permit is to be issued or renewed for a term of not more than 1 year, expiring on 31 March 2012.".

4. Section 12 is amended

(1) by replacing "no later than 1 March of each year" by ", upon request";

(2) by striking out "updated to 10 February".

5. Schedule 1 is amended by replacing the last paragraph of part 2 by the following:

"A copy of this contract must be filed in the transferor's record. The record must be kept by the broker throughout the term of his or her permit. A copy of this contract must be provided to the Commission upon request.".

6. The provisions of this Regulation come into force on 31 December 2010.

1202

Gouvernement du Québec

O.C. 1114-2010, 8 December 2010

An Act respecting labour relations, vocational training and manpower management in the construction industry
(R.S.Q., c. R-20)

Commission de la construction du Québec — Levy

Levy Regulation of the Commission de la construction du Québec

WHEREAS under subparagraph *c* of the 1st paragraph of section 82 of the Act respecting labour relations, vocational training and manpower management in the construction industry (R.S.Q., c. R-20), the Commission de la construction du Québec may, by way of a regulation approved by the Government and published in the *Gazette officielle du Québec*, levy upon the employer alone or upon both the employer and the employee or upon the employee alone or, as the case maybe, upon the independent contractor, the amounts required for its administration and fix a minimum amount which an employer is bound to pay per monthly period;

WHEREAS after consulting with the Joint Committee on Construction in accordance with section 123.3 of the Act, the Commission made the Levy Regulation for the year 2011;

WHEREAS in accordance with sections 10 and 11 of the Regulations Act (R.S.Q., c. R-18.1), the text of the Levy Regulation was published in Part 2 of the *Gazette officielle du Québec* of October 13th, 2010 with a notice that it could be approved by the Government upon the expiry of 45 days following that publication;

WHEREAS no comment was received following that publication and there is reason to approve the Regulation without amendment;

IT IS ORDERED, therefore, upon the recommendation of the Minister of Labour:

THAT the Levy Regulation of the Commission de la construction du Québec, attached to this Order in Council, be approved.

GÉRARD BIBEAU,
Clerk of the Conseil exécutif

Levy Regulation of the Commission de la construction du Québec

An Act respecting labour relations, vocational
training and manpower management in the
construction industry
(R.S.Q., c. R-20, s. 82, 1st par. subpar. *c*)

1. The levy imposed by the Commission de la construction du Québec for the year 2011 is:

(1) in the case of an employer, 0.75 of 1% of the total remuneration paid to his employees;

(2) in the case of an independent contractor, 0.75 of 1% of his remuneration as an independent contractor;

(3) in the case of an employee, 0.75 of 1% of his remuneration.

Notwithstanding the first paragraph, the minimum amount that an employer or an independent contractor is bound to pay the Commission per monthly period is $10.

2. The employer shall collect, on behalf of the Commission, the amount levied upon his employees by means of a weekly deduction on their wages.

3. The independent contractor shall deduct weekly, out of the remuneration he received as an independent contractor, the amount levied upon him.

4. The employer and the independent contractor shall remit to the Commission the amount levied for a monthly period in pursuance of this Regulation, not later than the 15th of the following month.

5. This Regulation comes into force on 1 January 2011.

1203

M.O., 2010

Environment Quality Act
(R.S.Q., c. Q-2)

Mandatory reporting of certain emissions of contaminants into the atmosphere — Amendments

Regulation to amend the Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere

THE MINISTER OF SUSTAINABLE DEVELOPMENT, ENVIRONMENT AND PARKS,

CONSIDERING section 2.2 of the Environment Quality Act (R.S.Q., c. Q-2), which provides that the Minister of Sustainable Development, Environment and Parks may make regulations determining what information a person or a municipality is required to provide regarding an enterprise, a facility or an establishment that the person or municipality operates;

CONSIDERING section 46.2 of the Act, which enables the Minister to determine, by regulation, the emitters that must report greenhouse gas emissions, and the information and documents that must be provided to the Minister;

CONSIDERING the publication in Part 2 of the *Gazette officielle du Québec* of 9 June 2010, in accordance with sections 10 and 11 of the Regulations Act (R.S.Q., c. R-18.1) and the fifth paragraph of section 2.2 and the second paragraph of section 46.2 of the Environment Quality Act, of a draft Regulation to amend the Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere, with a notice that it could be made by the Minister of Sustainable Development, Environment and Parks on the expiry of a 60-day period following that publication;

CONSIDERING that, having taken the comments made following the publication of the draft Regulation into consideration, it is expedient to make the Regulation with amendments;

ORDERS AS FOLLOWS:

The Regulation to amend the Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere, attached hereto, is hereby made.

December 6, 2010

PIERRE ARCAND,
Minister of Sustainable Development,
Environment and Parks

Regulation to amend the Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere[*]

Environment Quality Act
(R.S.Q., c. Q-2, ss. 2.2, 46.1 and 46.2)

1. The Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere is amended in section 1 by replacing "in Schedule A" in the first paragraph by "in Schedules A and A.1".

2. Section 2 is amended by inserting "and of drawing up an inventory of certain contaminants emitted into the atmosphere," after "toxic pollution,".

3. Section 3 is amended

(1) by inserting the following before paragraph 1:

"(0.1) "biomass fuels" means any fuel whose entire heat generating capacity is derived from biomass;

(0.2) "biomass" means a non-fossilized plant or part of a plant, an animal carcass or part of an animal, manure, a micro-organism and any other product derived from such matters;

(0.3) "standard conditions" means a temperature of 20°C and a pressure of 101.325 kPa;

(0.4) "flexigas" means a gaseous fuel with a low calorific value produced through the gasification of coke;";

(2) by inserting the following after paragraph 1:

"(1.1) "associated gas" means a natural gas which is found in association with crude oil, either dissolved in crude oil or as a cap of free gas above the crude oil;";

(3) by striking out "the Minister under the provisions of this Regulation, or to the Minister of the Environment of Canada under subsection 5 of section 46 of the Canadian Environmental Protection Act (1999) (S.C. 1999, c. 33)" in paragraph 4.

4. The heading of Division II is replaced by the following: "STANDARDS FOR THE MANDATORY REPORTING OF EMISSIONS OF CERTAIN CONTAMINANTS RESPONSIBLE FOR TOXIC POLLUTION, ACID RAIN AND SMOG INTO THE ATMOSPHERE".

5. Section 4 is amended

(1) by inserting "by electronic means" after "communicate to the Minister" in the first paragraph;

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[*] The Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere, approved by Minister's Order M.O. 2007 dated 26 September 2007 (2007, G.O. 2, 2833), has not been amended since its making.

(2) by replacing "each of them" in the last paragraph by "each establishment that exceeds the reporting threshold";

(3) by adding the following at the end:

"In addition, when an enterprise, a facility or an establishment changes operator during a year, the report must be made by the new operator. The previous operator must provide the new operator with all the data required for the report for the period of the year for which the enterprise, facility or establishment was under his or her responsibility.".

6. Section 5 is amended by inserting "by electronic means" after "transmit to the Minister" in the first paragraph.

7. Section 6 is amended by replacing subparagraphs 1 to 6 of the second paragraph by the following:

"(1) a continuous emission monitoring and recording system;

(2) a mass balance;

(3) a technical calculation using an emission factor published in scientific documents; or

(4) a technical calculation using an emission factor resulting from an emissions sampling.".

8. The following is inserted after section 6:

"DIVISION II.1

STANDARDS FOR THE MANDATORY REPORTING OF CERTAIN EMISSIONS OF GREENHOUSE GASES INTO THE ATMOSPHERE

6.1. Every person or municipality operating an enterprise, facility or establishment that, during a calendar year, emits into the atmosphere greenhouse gases mentioned in Schedule A.1 in a quantity equal to or greater than 10,000 metric tons CO_2 equivalent must report those emissions to the Minister in accordance with this Division until such time as the emissions have been below the reporting threshold for 3 consecutive years.

However, when an emitter referred to in the first paragraph is required to cover greenhouse gas emissions pursuant to section 46.6 of the Environment Quality Act (R.S.Q., c. Q-2) for a period determined pursuant to that section, and where the last year of the report referred to in the first paragraph occurs during that period, the emitter must report greenhouse gas emissions up to the end of that period.

If an enterprise has several establishments, a separate report must be made for each establishment that exceeds the reporting threshold. If an establishment has more than 1 facility, the data pertaining to each facility must be identified separately.

In addition, when an enterprise, a facility or an establishment changes operator during a year, the declaration must be made by the new operator. The previous operator must provide the new operator with all the data required for the report for the period of the year for which the enterprise, facility or establishment was under his or her responsibility.

For the purposes of this Regulation with respect to greenhouse gas emissions, the person or municipality operating an enterprise, a facility or an establishment that acquires electricity produced outside Québec for its own consumption or for sale in Québec is considered an emitter.

6.2. An emitter referred to in section 6.1 must, not later than 1 June each year, communicate electronically to the Minister a greenhouse gas emissions report for the preceding calendar year, including

(1) the total quantity of the emitter's CO_2 equivalent greenhouse gas emissions, calculated using the following equation:

$$CO_2e = \sum_{i=1}^{n} GHG_i \times GWP_i$$

Where:

CO_2e = Annual greenhouse gas emissions, in metric tons of carbon dioxide equivalent;

GHG_i = Annual emissions of each greenhouse gas emitted, in metric tons;

GWP_i = Global warming potential indicated in Schedule A.1 for each greenhouse gas emitted;

n = Number of greenhouse gases emitted;

i = Type of greenhouse gas emitted.

The total quantity of CO_2 equivalent calculated pursuant to this subparagraph must be rounded up to the next highest whole number;

(2) the quantity of emissions of each type of greenhouse gas referred to in Schedule A.1 attributable to the operation of each type of enterprise, facility and establishment and, where applicable, attributable to the pursuit of each type of activity or the use of each type of process or equipment, excluding CO_2 emissions attributable to the combustion of biomass or biomass fuels and those that have been captured, stored or eliminated;

(3) all information prescribed in Schedule A.2 concerning the type of the emitter's enterprise, facility or establishment and, where applicable, the type of activity pursued and the type of process or equipment used;

(4) the total quantity of CO_2 emissions attributable to the combustion of biomass and biofuels;

(5) the total quantity of CO_2 emissions that is captured, stored, re-used, eliminated or transferred out of the establishment, the quantity of emissions generated by each operation and the location of each operating or transfer site;

(6) the calculation methods used in accordance with section 6.3 and, where applicable, the quantity of greenhouse gas emissions in CO_2 equivalent and the emission sources for which a calculation method was used pursuant to the second paragraph of that section;

(7) the emission factors used.

The greenhouse gas emissions report referred to in the first paragraph must be signed by the person responsible for the report at the enterprise, facility or establishment, who must also attest to the veracity of the information communicated.

6.3. The quantities of greenhouse gas emissions reported under the first paragraph of section 6.2 must be calculated using one of the calculation methods prescribed in Schedule A.2 corresponding to the type of enterprise, facility or establishment operated and, where applicable, the type of activity pursued and the process or equipment used.

Notwithstanding the first paragraph, an emitter may use one of the calculation or assessment methods referred to in the second paragraph of section 6

(1) to calculate the greenhouse gas emissions from one or more sources of emissions when the emissions attributable to them represent no more than 3% of the emitter's total emissions in CO_2 equivalent, up to a maximum of 20,000 metric tons CO_2 equivalent; or

(2) if no calculation method is prescribed in Schedule A.2 for the type of enterprise, facility or establishment operated, for the type of activity pursued, for the type of process or equipment used or for the type of greenhouse gas emitted.

The emitter must use the same calculation methods for each annual report.

Notwithstanding the second and third paragraphs, when the emitter's enterprise, facility or establishment is equipped with a continuous emission monitoring and recording system to measure the parameters needed to calculate greenhouse gas emissions or when such a system is installed during their operation, the emitter must used use the calculation methods applicable to that system.

6.4. An emitter referred to in section 6.1 must submit, with the information communicated pursuant to section 6.2, the following information:

(1) the name and address of the enterprise, facility or establishment as well as the name of and contact information for its representative;

(2) the emitter's telephone and fax numbers and electronic address;

(3) the business number assigned to the emitter under the Act respecting the legal publicity of sole proprietorships, partnerships and legal persons (R.S.Q., c. P-45) as well as the ID number assigned under the National Pollutant Release Inventory of the Government of Canada;

(4) the type of enterprise, facility or establishment operated and, where applicable, the activities pursued and processes and equipment used as well as, where applicable, the six-digit code under the North American Industry Classification System (NAICS Canada);

(5) the name of and contact information for the person responsible for the greenhouse gas emissions report for the enterprise, facility or establishment.

6.5. An emitter whose annual greenhouse gas emissions report includes one or more errors or omissions must, as soon as possible, communicate a revised emissions report electronically to the Minister, along with a notice of correction detailing

(1) the difference between the initial report and revised report;

(2) the circumstances that led to the errors or omissions and, where applicable, the corrections made;

(3) the quantity of greenhouse gas emissions represented by the errors or omissions, calculated using the equation referred to in subparagraph 1 of the first paragraph of section 6.7.

6.6. An emitter who, in accordance with section 6.2, reports annual greenhouse gas emissions equal to or greater than 25,000 metric tons CO_2 equivalent, excluding CO_2 emissions attributable to the combustion of biomass and biofuels, must, not later than 1 September after sending an emissions report, send to the Minister a verification report on the emissions report, carried out by an organization accredited to ISO 14065 by a member of the International Accreditation Forum.

The emitter must have the annual report verified by a verifying organization that

(1) has not acted as a consultant to the emitter for the quantification or greenhouse gas emissions report during the 3 preceding years; and

(2) has not verified more than 6 of the emitter's consecutive annual reports, unless at least 3 years have elapsed since the last verification.

An emitter must have the emitter's annual report verified until such time as the emitter's greenhouse gas emissions fall below the verification threshold provided for in the first paragraph for 3 consecutive years.

Notwithstanding the third paragraph, where the emitter is required to cover greenhouse gas emissions pursuant to section 46.6 of the Environment Quality Act for a period determined pursuant to that section, and where the last year of verification referred to in the first paragraph occurs during that period, the emitter must have the greenhouse gas emissions reports verified up to the end of that period.

6.7. A revised emissions report referred to in section 6.5 must include a verification report completed in accordance with this Regulation where

(1) the emissions initially reported were equal to or greater than 25,000 metric tons CO_2 equivalent and where the errors or omissions represented over 5% of those emissions based on the following equation:

$$PE = \left(\frac{SEO}{TER} \times 100\right)$$

Where:

PE = Percentage of error;

SEO = Sum of CO_2 equivalent emissions erroneously calculated or omitted, in metric tons;

TER = Total CO_2 equivalent emissions initially reported, in metric tons; or

(2) after correction of the errors or omissions, the total greenhouse gas emissions are equal to or greater than 25,000 metric tons CO_2 equivalent.

In the case referred to in subparagraph 2 of the first paragraph, the verification report for the emissions report must also cover the initial emissions report.

6.8. The verification of an initial or revised greenhouse gas emissions report must

(1) be carried out in accordance with the ISO 14064-3 standard and using procedures that allow a reasonable level of assurance within the meaning of that standard;

(2) include at least 1 visit of the enterprise, facility or establishment covered by the report by the verifier designated by the verification organization.

6.9. In addition to the information prescribed by the standards ISO 14064-3 and ISO 14065, the verification report must include

(1) the name of and contact information for the verification organization as well as the name of and contact information for the verifier designated by the organization to carry out the verification;

(2) the name of and contact information for the member of the International Accreditation Forum that accredited the verification organization, and the date of the accreditation;

(3) the dates of the period during which the verification took place and the date of any visit to the enterprise, facility or establishment;

(4) a description of any error or omission observed in the emissions report or relating to the data, information or methods used;

(5) an assessment of the errors or omissions referred to in paragraph 4, calculated using the equation referred to in subparagraph 1 of the first paragraph of section 6.7;

(6) where applicable, the corrections made to the emissions report following the verification;

(7) the total quantity of the emitter's CO_2 equivalent emissions for the report year, as well as the total quantity of CO_2 emissions attributable to the combustion of biomass and biofuels; and

(8) the conclusions of the verification concerning the accuracy and reliability of the emissions report.

DIVISION II.2
RETENTION OF INFORMATION AND DATA".

9. Section 7 is amended by replacing "5 years" by "7 years".

10. The following is inserted after section 7:

"**7.1.** Any device, system or equipment required under this Regulation must be maintained in good working order and operate optimally during operating hours.".

11. Part II of Schedule A is amended by striking out the portion relating to the types of contaminants that cause increased greenhouse gas effect.

12. The following is inserted after Schedule A:

"SCHEDULE A.1
(ss. 1, 6.1 and 6. 2)

Greenhouse gases and global warming potentials

Greenhouse gas identification	**CAS**[1]	**Global warming potential (GWP)**
- Carbon dioxide (CO_2)	124-38-9	1
- Methane (CH_4)	74-82-8	21
- Nitrous oxide (N_2O)	10024-97-2	310
- Sulphur hexafluoride (SF_6)	2551-62-4	23 900
- Hydrofluorocarbons (HFCs)		
• HFC-23 (CHF_3)	75-46-7	11 700
• HFC-32 (CH_2F_2)	75-10-5	650
• HFC-41 (CH_3F)	593-53-3	150
• HFC-43-10mee ($C_5H_2F_{10}$)	138495-42-8	1 300
• HFC-125 (C_2HF_5)	354-33-6	2 800
• HFC-134 (CHF_2CHF_2)	359-35-3	1 000
• HFC-134a (CH_2FCF_3)	811-97-2	1 300
• HFC-143 (CHF_2CH_2F)	430-66-0	300
• HFC-143a (CF_3CH_3)	420-46-2	3800
• HFC-152a (CH_3CHF_2)	75-37-6	43
• HFC-161 (C_2H_5F)	353-36-6	12
• HFC-227ea (C_3HF_7)	431-89-0	2 900
• HFC-236cb ($C_3H_2F_6$)	677-565	1 300
• HFC-236ea ($C_3H_2F_6$)	431-63-0	1 200
• HFC-236fa ($C_3H_2F_6$)	690-39-1	6 300
• HFC-245ca ($C_3H_3F_5$)	679-86-7	560
• HFC-245fa ($C_3H_3F_5$)	460-73-1	950
• HFC-365mfc ($C_4H_5F_5$)	406-58-6	890
- Perfluorocarbons (PFCs)		
• Perfluoromethane (CF_4)	75-73-0	6 500
• Perfluoroethane (C_2F_6)	76-16-4	9 200
• Perfluoropropane (C_3F_8)	76-19-7	7 000
• Perfluorobutane (C_4F_{10})	355-25-9	7 000
• Perfluorocyclobutane (c-C_4F_8)	115-25-3	8 700
• Perfluoropentane (C_5F_{12})	678-26-2	7 500
• Perfluorohexane (C_6F_{14})	355-42-0	7 400
- Nitrogen trifluoride (NF_3)	7783-54-2	17 200

1. The numbers entered in respect of the contaminants listed in this Schedule correspond to the identification code assigned by the Chemical Abstract Services division of the American Chemical Society.

SCHEDULE A.2
(ss. 1, 6.1 and 6.3)

Information to be communicated and methods to be used in calculating greenhouse gas emissions depending on the type of enterprise, facility or establishment operated, the type of activity pursued, and the type of process or equipment used

QC.1. STATIONARY COMBUSTION

QC.1.1. Covered sources

The covered sources are stationary combustion units such as boilers, combustion turbines, engines, incinerators, process heaters, acid gas scrubbing equipment and any other stationary combustion unit for which this Schedule prescribes no specific requirements.

However, emergency generators and other equipment used in an emergency are not covered.

QC.1.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual greenhouse gas emissions attributable to the combustion of fossil fuels and biomass fuels, in metric tons, indicating:

- (*a*) CO_2 emissions for each type of fuel or, when fossil fuels and biomass fuels are used in the same stationary unit, the CO_2 emissions for all the fossil fuels and for all the biomass fuels;
- (*b*) CH_4 emissions for each type of fuel; and
- (*c*) N_2O emissions for each type of fuel;

(2) the annual consumption of each type of fuel, expressed

- (*a*) in cubic metres at standard conditions, for gases;
- (*b*) in kilolitres, for liquids;
- (*c*) in metric tons, for solids other than biomass solid fuels; and
- (*d*) in bone dry metric tons, for biomass solid fuels;

(3) where carbon content is used to calculate CO_2 emissions, the average carbon content of each type of fuel, in kilograms of carbon per kilogram of fuel;

(4) where high heat value is used to calculate CO_2 emissions, the average high heat value of each type of fuel, expressed

(*a*) in gigajoules per metric ton, for solid fuels;

(*b*) in gigajoules per kilolitre, for liquid fuels; and

(*c*) in gigajoules per cubic metre, for gaseous fuels;

(5) for stationary combustion units that burn biomass fuels or municipal solid waste, the annual steam generation in kilograms, where it is used to calculate emissions;

(6) in the case of acid gas scrubbing equipment, the annual quantity of sorbent used, in metric tons.

QC.1.3. Calculation methods for CO_2 emissions

The annual CO_2 emissions attributable to the combustion of fuels in stationary units must be calculated, for each type of fuel, using one of the five calculation methods specified in QC.1.3.1 to QC.1.3.5. However, in the case of an emitter who uses acid gas scrubbing equipment, the CO_2 emissions attributable to that equipment must be calculated using the calculation method specified in QC.1.3.6.

QC.1.3.1. Calculation method using the fuel-specific default CO_2 emission factor, the default high heat value and the annual fuel consumption

The annual CO_2 emissions attributable to the combustion of fuels in stationary units may be calculated using equation 1-1

(1) with the exception of an emitter to whom section 6.6 of this Regulation applies, for any type of fuel for which an emission factor is specified in Table 1-3, 1-4, 1-5 or 1-6, as indicated in QC.1.7, and a high heat value is specified in Table 1-1 or 1-2;

(2) for natural gas with a high heat value that is greater than or equal to 36.3 MJ/m^3 but less than or equal to 40.98 MJ/m^3;

(3) for any fuel in Table 1-2;

(4) for municipal solid waste when no steam is generated.

However, this method cannot be used by an emitter who determines the high heat value of the fuels used using measurements carried out by the emitter in accordance with QC.1.5.4 or using data indicated by the fuel supplier, obtained at the frequency prescribed by QC.1.5.1.

Equation 1-1

$$CO_2 = Fuel \times HHV \times EF \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of each type of fuel, in metric tons;

Fuel = Mass or volume of the fuel combusted during the year, expressed

- as a mass in metric tons, for solid fuels;
- as a volume in cubic metres at standard conditions, for gaseous fuels;
- as a volume in kilolitres, for liquid fuels;

HHV = High heat value of the fuel specified in Tables 1-1 and 1-2, expressed

- in gigajoules per metric ton, for solid fuels;
- in gigajoules per kilolitre, for liquid fuels;
- in gigajoules per cubic metre, for gaseous fuels;

EF = CO_2 emission factor for the fuel specified in Table 1-2, 1-3, 1-4, 1-5 or 1-6, in kilograms of CO_2 per gigajoule;

0.001 = Conversion factor, kilograms to metric tons.

QC.1.3.2. Calculation method using the fuel-specific default CO_2 factor and the high heat value indicated by the fuel supplier or determined by the emitter

The annual CO_2 emissions attributable to the combustion of fuels in stationary units may be calculated

(1) using equation 1-2

(*a*) with the exception of an emitter to whom section 6.6 of this Regulation applies, for any type of fuel other than municipal solid waste, for which an emission factor is specified in Table 1-2, 1-3, 1-4, 1-5 or 1-6 in QC.1.7;

(*b*) for natural gas with a high heat value that is greater than or equal to 36.3 MJ/m^3 but less than or equal to 40.98 MJ/m^3;

(*c*) for a fuel specified in Table 1-2 or a biomass fuel.

Equation 1-2

$$CO_2 = \sum_{i=1}^{n} Fuel_i \times HHV_i \times EF \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of each type of fuel, in metric tons;

n = Number of measurements of high heat value required annually as specified in QC.1.5.1;

i = Measurement period;

$Fuel_i$ = Mass or volume of fuel combusted during measurement period *i*, expressed

- as a mass in metric tons, for solid fuels;
- as a volume in cubic metres at standard conditions, for gaseous fuels;
- as a volume in kilolitres, for liquid fuels;

HHV_i = High heat value of the fuel for the measurement period *i*, expressed

- in gigajoules per metric ton, for solid fuels;
- in gigajoules per kilolitre, for liquid fuels;
- in gigajoules per cubic metre, for gaseous fuels;

EF = CO_2 emission factor for the fuel specified in Table 1-2, 1-3, 1-4, 1-5 or 1-6, in kilograms of CO_2 per gigajoule;

0.001 = Conversion factor, kilograms to metric tons;

(2) using equation 1-3 for the use of municipal solid waste, except by an emitter to whom section 6.6 of this Regulation applies, and for any biomass solid fuel specified in Table 1-3 in QC.1.7, when the combustion of the fuels produces steam.

Equation 1-3

$$CO_2 = Steam \times B \times EF \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of each type of biomass solid fuel or municipal solid waste, in metric tons;

Steam = Total quantity of steam produced during the year by the combustion of biomass solid fuel or municipal solid waste, in metric tons;

B = Ratio of the boiler's design rated heat input capacity to its design rated steam output capacity, in gigajoules per metric ton of steam;

EF = CO_2 emission factor for biomass solid fuel or municipal solid waste specified in Table 1-3 or 1-6, in kilograms of CO_2 per gigajoule;

0.001 = Conversion factor, kilograms to metric tons.

QC.1.3.3. Calculation method using the quantity of fuel combusted and the carbon content indicated by the fuel supplier or measured by the emitter

The annual CO_2 emissions may be calculated using equations 1-4 to 1-7, depending on the type of fuel, by any emitter to whom section 6.6 applies who combusts fuels other than those specified in QC.1.3.2 (1) (*b*) and (*c*) and by any emitter using stationary units with a rated heat capacity above 264 GJ/h or 250 mmBtu/h that operated over 1,000 hours during at least 1 of the 3 preceding years:

(1) for solid fuels, other than municipal solid waste, the emitter must use equation 1-4 and, for biomass solid fuel if steam is generated, equation 1-4 or 1-5:

Equation 1-4

$$CO_2 = \sum_{i=1}^{n} Fuel_i \times CC_i \times 3.664$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of each type of solid fuel, in metric tons;

n = Number of measurements of carbon content required annually as specified in QC.1.5.1;

i = Measurement period;

$Fuel_i$ = Mass of solid fuel combusted during measurement period *i*, in metric tons;

CC_i = Average carbon content of the solid fuel, from the fuel analysis results for the measurement period *i* indicated by the fuel supplier or measured by the emitter in accordance with QC.1.5.5, in kilograms of carbon per kilogram of solid fuel;

3.664 = Ratio of molecular weights, CO_2 to carbon.

(2) for municipal solid waste if steam is generated, the emitter must use equation 1-5:

Equation 1-5

$$CO_2 = Steam \times B \times EF \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of each type of biomass solid fuel or municipal solid waste, in metric tons;

Steam = Total quantity of steam produced during the year by the combustion of biomass solid fuel or municipal solid waste, in metric tons;

B = Ratio of the boiler's design rated heat input capacity to its design rated steam output capacity, in gigajoules per metric ton of steam;

EF = CO_2 emission factor of biomass solid fuel or municipal solid waste indicated by the fuel supplier, established by the emitter in accordance with QC.1.5.3 or specified in Table 1-3 or 1-6 in QC.1.7, in kilograms of CO_2 per gigajoule;

0.001 = Conversion factor, kilograms to metric tons.

(3) for liquid fuels, the emitter must use equation 1-6:

Equation 1-6

$$CO_2 = \sum_{i=1}^{n} Fuel_i \times CC_i \times 3.664$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of each type of liquid fuel, in metric tons;

n = Number of measurements of carbon content required annually as specified in QC.1.5.1;

i = Measurement period;

$Fuel_i$ = Volume of liquid fuel combusted during the measurement period *i*, in kilolitres;

CC_i = Average carbon content of the liquid fuel, from the fuel analysis results for the measurement period *i* indicated by the fuel supplier or measured by the emitter in accordance with QC.1.5.5, in metric tons of carbon per kilolitre of fuel;

3.664 = Ratio of molecular weights, CO_2 to carbon.

(4) for gaseous fuels, the emitter must use equation 1-7:

Equation 1-7

$$CO_2 = \sum_{i=1}^{n} Fuel_i \times CC_i \times \frac{MW}{MVC} \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of each type of gaseous fuel, in metric tons;

n = Number of measurements of carbon content and molecular weight required annually, as specified in QC.1.5.1;

i = Measurement period;

$Fuel_i$ = Volume of gaseous fuel combusted during measurement period *i*, in cubic metres at standard conditions;

CC_i = Average carbon content of the gaseous fuel, from the fuel analysis results for the measurement period *i* indicated by the fuel supplier or measured by the emitter in accordance with QC.1.5.5, in kilograms of carbon per kilogram of fuel;

MW = Molecular weight of the gaseous fuel, established in accordance with QC.1.5.5 from the fuel analysis results, in kilograms per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole at standard conditions);

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

QC.1.3.4. Calculation method using data from a continuous emission monitoring and recording system

The annual CO_2 emissions attributable to the combustion any type of fuel used in stationary combustion units may be calculated using data from a continuous emission monitoring and recording system including a stack gas volumetric flow rate monitor and a CO_2 concentration monitor, in accordance with the EPS 1/PG/7 protocol entitled "Protocols and performance specifications for continuous monitoring of gaseous emissions from thermal power generation" published in November 2005 by Environment Canada.

An oxygen concentration monitor may, however, be used instead of a CO_2 concentration monitor if the following conditions are met:

(1) the continuous emission monitoring and recording system was installed before 1 January 2012;

(2) the gas effluent contains only the products of combustion;

(3) only the following fuels, that are not waste-derived fuels, are combusted: coal, petroleum coke, light or heavy oil, natural gas, propane, butane or wood waste.

When a continuous emission monitoring and recording system is used in connection with a stationary combustion unit, the CO_2 emissions of all the fuels combusted must be calculated using data from the system.

In addition, an emitter who uses such a system is relieved of the requirement to separately report process emissions from combustion emissions for that unit or to report emissions separately for different fossil fuels for that unit when only fossil fuels are combusted. In this circumstance, the emitter must still report fuel use by fuel type in accordance with QC.1.2.

The use of a continuous emission monitoring and recording system must take into account the particularities of each type of fuel used and meet the following requirements:

(1) for units that combust fossil fuels or biomass fuels, the emitter must

(*a*) use CO_2 or, if applicable, oxygen concentrations and stack gas flow rate measurements to determine hourly CO_2 emissions;

(*b*) report annual CO_2 emissions, in metric tons, based on the sum of hourly CO_2 emissions over the year;

(*c*) if the emitter combusts biomass fuels in the units and uses oxygen concentrations to calculate CO_2 concentrations, demonstrate that the CO_2 concentrations calculated correspond to the CO_2 concentrations measured after verification of their relative accuracy in accordance with the SPE 1/PG/7 protocol;

(2) for units that combust waste-derived fuels and units that combust both fossil fuels and biomass fuels or waste-derived fuels that are partly biomass, the emitter must

(*a*) use CO_2 concentrations and stack gas flow rate measurements to determine hourly CO_2 emissions;

(*b*) report annual CO_2 emissions, in metric tons, based on the sum of hourly CO_2 emissions over the year;

(*c*) determine separately the portion of total CO_2 emissions attributable to the combustion of biomass contained in the fuel using the calculation methods in QC.1.3.5.

QC.1.3.5. Calculation method for the CO_2 emissions attributable to the biomass portion of a fuel or mixture of fuels

An emitter who uses stationary combustion units that combust fuels or mixtures of fuels containing biomass must calculate the CO_2 emissions of the biomass portion as follows:

(1) when the biomass portion is known and the mixture does not contain waste-derived fuels that are partly biomass, an emitter who

(*a*) does not use a continuous emission monitoring and recording system to measure the concentration of CO_2, must use the applicable equations in QC.1.3.1 to QC.1.3.3 to calculate the CO_2 emissions attributable to the combustion of biomass;

(*b*) uses a continuous emission monitoring and recording system to measure the concentration of CO_2, must use the applicable equations in QC.1.3.1 to QC.1.3.3 to calculate the CO_2 emissions attributable to the combustion of fossil fuels, and subtract the portion of CO_2 emissions attributable to the combustion of fossil fuels from the total emissions in order to determine the emissions attributable to the combustion of biomass;

(2) when the biomass portion is not known, or when no emission factor is specified in Table 1-2 in QC.1.7, the emitter must:

(*a*) use the applicable equations in QC.1.3.1 to QC.1.3.4 to calculate the total CO_2 emissions;

(*b*) if the fuels contain over 5% of biomass by weight or if waste-derived fuels make up over 30% by weight of the fuels combusted during the year, calculate the emissions in accordance with ASTM D6866-10[1] "Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis";

(*c*) conduct, at least every 3 months, an analysis on a representative fuel or exhaust gas sample in accordance with ASTM D6866-10, the analysis being conducted on the exhaust gas stream when waste-derived fuels are combusted, and collect exhaust gas stream samples over a period of at least 24 consecutive hours in accordance with ASTM D7459-08 "Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil-Derived Carbon Dioxide Emitted from Stationary Emissions Sources";

(*d*) divide total CO_2 emissions between CO_2 emissions attributable to the combustion of biomass fuels and CO_2 emissions attributable to the combustion of non-biomass fuels using the average proportions of the samples analyzed during the year;

(*e*) make the measurements in accordance with ASTM D6866-10 on the stationary combustion unit of the emitter's choice if there is a common fuel source for multiple units;

(3) when equation 1-1 is used to calculate the CO_2 emissions attributable to the combustion of biomass solid fuels, equation 1-8 may be used to quantify the consumption of biomass solid fuels:

Equation 1-8

$$Biomass\ fuel_i = \frac{[H_i \times Steam_i] - E_i}{HHV \times Eff}$$

Where:

Biomass fuel_i = Quantity of biomass fuel combusted during measurement period *i*, in metric tons;

H_i = Average enthalpy of the boiler for measurement period *i*, in gigajoules per metric ton of steam;

Steam_i = Total quantity of steam produced during measurement period *i*, in metric tons;

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[1] The ASTM standards mentioned in this Schedule are published by the American Society of Testing and Materials (ASTM International).

E_i = Total energy input of all fuels other than biomass fuels combusted during measurement period *i*, in gigajoules;

HHV = High heat value of the biomass fuel specified in Table 1-1 or determined by the emitter, in gigajoules per metric ton;

Eff = Energy efficiency of the biomass fuel, expressed as a percentage.

QC.1.3.6. Calculation method for CO_2 emissions attributable to acid gas scrubbing equipment

The annual CO_2 emissions attributable to acid gas scrubbing equipment must be calculated using a continuous emission monitoring and recording system in accordance with QC.1.3.4 or using equation 1-9:

Equation 1-9

$$CO_2 = Q_S \times R \times \left(\frac{44}{MM_S} \right)$$

Where:

CO_2 = Annual CO_2 emissions attributable to the acid gas scrubbing equipment, in metric tons;

Q_S = Annual quantity of sorbent used, in metric tons;

R = Ratio of moles of CO_2 released upon capture of 1 mole of acid gas;

44 = Molecular weight of CO_2, in kilograms per kilomole;

MM_S = Molecular weight of sorbent, in kilograms per kilomole or, in the case of calcium carbonate, a value of 100.

QC.1.4. Calculation methods for CH_4 and N_2O emissions

The annual CH_4 and N_2O emissions attributable to the combustion of fuels in stationary units must be calculated, for each type of fuel, using the methods in QC.1.4.1 to QC.1.4.4.

QC.1.4.1. Calculation method using a default CH_4 and N_2O emission factor and the default high heat value for the fuel

The annual CH_4 and N_2O emissions attributable to the combustion of a fuel whose high heat value is not determined by the measurements made by the emitter or the data provided by the fuel supplier for the purpose of calculating CO_2 emissions may be calculated using equation 1-10 with respect to the use:

(1) with the exception of an emitter to whom section 6.6 of this Regulation applies, of any type of fuel for which an emission factor is specified in Table 1-3, 1-6, 1-7 or 1-8 in QC.1.7 and a high heat value is specified in Table 1-1 or 1-2, subject to the emissions attributable to the combustion of coal which must be calculated using equation 1-11;

(2) of natural gas with a high heat value greater than or equal to 36.3 MJ/m^3 but less than or equal to 40.98 MJ/m^3.

Equation 1-10

$$CH_4 \, or \, N_2O = Fuel \times HHV \times EF \times 0.000001$$

Where:

CH_4 or N_2O = Annual CH_4 or N_2O emissions attributable to the combustion of each type of fuel, in metric tons;

Fuel = Mass or volume of the fuel combusted during the year, expressed

- as a mass in metric tons, for solid fuels;

- as a volume in cubic metres at standard conditions, for gaseous fuels;

- as a volume in kilolitres, for liquid fuels;

HHV = High heat value of the fuel specified in Table 1-1 or 1-2, expressed

- in gigajoules per metric ton, for solid fuels;

- in gigajoules per kilolitre, for liquid fuels;

- in gigajoules per cubic metre, for gaseous fuels;

EF = CH_4 or N_2O emission factor for the fuel established by the emitter in accordance with QC.1.5.3 or emission factor for the fuel specified in Table 1-3, 1-6 or 1-7, in grams of CH_4 or N_2O per gigajoule;

0.000001 = Conversion factor, grams to metric tons.

Equation 1-11

$$CH_4 \, or \, N_2O = Fuel \times EF_c \times 0.000001$$

Where:

CH_4 or N_2O = Annual CH_4 or N_2O emissions attributable to the combustion of coal, in metric tons;

Fuel = Mass of the coal combusted during the year, in metric tons;

EF_c = CH_4 or N_2O emission factor for the coal established by the emitter in accordance with QC.1.5.3 or emission factor for the coal specified in Table 1-8, in grams of CH_4 or N_2O per metric ton of coal;

0.000001 = Conversion factor, grams to metric tons.

QC.1.4.2. Calculation method using a high heat value determined from data provided by the fuel supplier or measurements made by the emitter

When the high heat value of the fuel is determined from data provided by the fuel supplier or measurements made by the emitter in order to estimate CO_2, the annual CH_4 and N_2O emissions for the fuels must be calculated using equation 1-12, subject to the emissions attributable to the combustion of coal which must be calculated using equation 1-13:

Equation 1-12

$$CH_4\ or\ N_2O = \sum_{i=1}^{n} Fuel_i \times HHV_i \times EF \times 0.000001$$

Where:

CH_4 or N_2O = Annual CH_4 or N_2O emissions attributable to each type of fuel, in metric tons;

n = Number of measurements of high heat value required annually as specified in QC.1.5.1;

i = Measurement period;

$Fuel_i$ = Mass or volume of fuel combusted during measurement period *i*, expressed
- as a mass in metric tons, for solid fuels;

- as a volume in cubic metres at standard conditions, for gaseous fuels;

- as a volume in kilolitres, for liquid fuels;

HHV_i = High heat value determined from data provided by the fuel supplier or measurements made by the emitter for the measurement period *i* in accordance with QC.1.5.4, for each type of fuel, expressed
- in gigajoules per metric ton, for solid fuels;

- in gigajoules per kilolitre, for liquid fuels;

- in gigajoules per cubic metre, for gaseous fuels;

EF = CH_4 or N_2O emission factor for the fuel established by the emitter in accordance with QC.1.5.3 or emission factor for the fuel specified in Table 1-3 or 1-7 in QC.1.7, in grams of CH_4 or N_2O per gigajoule;

0.000001 = Conversion factor, grams to metric tons.

Equation 1-13

$$CH_4 \: or \: N_2O = \sum_{i=1}^{n} Fuel_i \times EF_c \times 0.000001$$

Where:

CH_4 or N_2O = Annual CH_4 or N_2O emissions attributable to the combustion of coal, in metric tons;

n = Number of measurements of high heat value required annually as specified in QC.1.5.1;

i = Measurement period;

$Fuel_i$ = Mass of the coal combusted during the measurement period *i*, in metric tons;

EF_c = CH_4 or N_2O emission factor for the coal, indicated by the fuel supplier or established by the emitter in accordance with QC.1.5.3, in grams of CH_4 or N_2O per metric ton of coal;

0.000001 = Conversion factor, grams to metric tons.

QC.1.4.3. Calculation method for emissions attributable to the combustion of biomass, biomass fuels or municipal solid waste

The annual CH_4 and N_2O emissions attributable to the combustion of biomass, biomass fuels or municipal solid waste must be calculated using equation 1-14 when CO_2 emissions are calculated using equations 1-3 and 1-5:

Equation 1-14

$$CH_4 \: or \: N_2O = Steam \times B \times EF \times 0.000001$$

Where:

CH_4 or N_2O = Annual CH_4 or N_2O emissions attributable to the combustion of biomass, biomass fuels or municipal solid waste, in metric tons;

Steam = Total quantity of steam produced during the year by the combustion of biomass, biomass fuels or municipal solid waste, in metric tons;

B = Ratio of the boiler's design rated heat input capacity to its design rated steam output capacity, in gigajoules per metric ton of steam;

EF = CH_4 or N_2O emission factor for the biomass, biomass fuel or municipal solid waste established by the emitter in accordance with QC.1.5.3 or emission factor for the fuel specified in Table 1-3, 1-6 or 1-7 specified in QC.1.7, in grams of CH_4 or N_2O per gigajoule;

0.000001 = Conversion factor, grams to metric tons.

QC.1.4.4. Calculation method using a default CH_4 and N_2O emission factor and the energy input of the fuel determined by the emitter

The annual CH_4 and de N_2O emissions attributable to the combustion of a fuel must be calculated using equation 1-15 when the CO_2 emissions for that fuel are calculated using a continuous emission monitoring and recording system in accordance with QC.1.3.4 and the energy input for the fuel is determined by the emitter using data from the system:

Equation 1-15

$$CH_4 \ or \ N_2O = E \times EF \times 0.000001$$

Where:

CH_4 or N_2O = Annual CH_4 or N_2O emissions attributable to the combustion of each fuel, in metric tons;

E = Energy input of each fuel determined using data from a continuous emission monitoring and recording system, in gigajoules;

EF = CH_4 or N_2O emission factor for the fuel specified in Table 1-3, 1-7 or 1-8 in QC.1.7, in grams of CH_4 or N_2O per gigajoule;

0.000001 = Conversion factor, grams to metric tons.

QC.1.5. Sampling, analysis and measurement requirements

QC.1.5.1. Frequency of fuel sampling

When a calculation method requires an emitter to determine the carbon content, high heat value or emission factor of a fuel, the emitter must sample the fuel or obtain sampling results from the supplier for the fuel

(1) annually, for biomass fuels and waste-derived fuels for which the CO_2 emissions are calculated using equation 1-4;

(2) semi-annually, for natural gas;

(3) quarterly, for fuels specified in Table 1-2 in QC.1.7, liquid fuels, gaseous fuels, gases derived from biomass and biogas produced from landfill gas or from wastewater treatment or agricultural processes;

(4) monthly, for solid fuels except coal, as specified below:

(*a*) the sample is a monthly composite of four weekly samples of equal mass, collected each week during the month of operation, which samples are taken after all fuel treatment operations but before fuel mixing to ensure that the samples are representative of the chemical and physical characteristics of the fuel immediately prior to combustion;

(*b*) the monthly composite sample is homogenised and well mixed prior to withdrawal and analysis;

(*c*) one in twelve monthly composite samples is randomly selected for additional analysis of its discrete constituent samples to ensure the homogeneity of the composite sample;

(5) at each delivery, for coal and any other fuel not referred to in paragraphs 1 to 4.

QC.1.5.2. Fuel consumption

An emitter who operates an enterprise, facility or establishment where a stationary combustion unit is used must

(1) calculate fuel consumption by fuel type

(*a*) by measuring it directly;

(*b*) using recorded fuel purchases or sales invoices for each type of combustible measuring any stock change, in megajoules, litres, millions of cubic metres at standard conditions, metric tons or bone dry metric tons, using the following equation:

Fuel Consumption in a given Report Year = Total Fuel Purchases – Total Fuel Sales + Amount Stored at Beginning of Year – Amount Stored at Year End

(*c*) for fuel oil, tank drop measurements may also be used;

(2) convert fuel consumption in megajoules into one of the measurement units given in subparagraph *b* of paragraph 1 using the high heat value of the fuel determined using measurements carried out in accordance with QC.1.5.4, the high heat value indicated by the supplier or the high heat value specified in Table 1-1 specified in QC.1.7;

(3) calibrate, before the first emissions report using the calculation methods in QC.1 and thereafter annually or at the minimum frequency specified by the manufacturer, all flowmeters for liquid and gaseous fuels, except those used to bill gas, using one of the flow meter tests listed in Table 1-9 or the calibration procedures specified by the flow meter manufacturer.

A flow meter measuring the mass flow of liquid fuels may be used when the mass flow can be used to determine the volume flow. The density must in such cases be measured at the same frequency as the carbon content using method ASTM D1298-99 (2005) "Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method". An emitter using one of the methods specified in QC.1.3.1 or QC.1.3.2 may, however, use the densities specified in Table 1-10.

QC.1.5.3. Fuel emission factors

The emitter must establish emission factors using the following methods:

(1) when CO_2 emissions are calculated using the method in QC.1.3.3 (2), the emission factor must be established in kilograms of CO_2 per megajoule and adjusted at least every 3 years through a stack test measurement of CO_2 and use of the applicable ASME Performance Test Code published by the American Society of Mechanical Engineers (ASME) to determine heat input from all heat outputs, including the steam, exhaust gas streams, ash and losses;

(2) when CH_4 or N_2O emissions are calculated using emission factors based on source tests, the source test procedures must be repeated in subsequent years to update the emissions factors for the stationary combustion unit.

QC.1.5.4. High heat value of the fuel

The emitter must determine the average annual high heat value using equation 1-16 :

Equation 1-16

$$HHV_a = \frac{\sum_{i=1}^{n}\left[HHV_i \times Fuel_i\right]}{\sum_{i=1}^{n} Fuel_i}$$

Where:

HHV_a = Average annual high heat value, either:

- in gigajoules per ton, for solid fuels;
- in gigajoules per kilolitre, for liquid fuels;
- in gigajoules per cubic metre, for gaseous fuels;

n = Number of measurements of high heat value;

i = Measurement;

HHV_i = High heat value for measurement period *i*, either:

- in gigajoules per ton, for solid fuels;
- in gigajoules per kilolitre, for liquid fuels;
- in gigajoules per cubic metre, for gaseous fuels;

$Fuel_i$ = Mass or volume of fuel combusted during measurement period *i*, either:

- as a mass in metric tons, for solid fuels;
- as a volume in kilolitres, for liquid fuels;
- as a volume in cubic metres at standard conditions, for gaseous fuels.

The emitter must determine high heat value using the sampling and analysis results indicated by the fuel supplier or the results of the sampling conducted by the emitter and using one of the following methods:

(1) for gases:

(*a*) in accordance with ASTM D1826-94 (2003) "Standard Test Method for Calorific (Heating) Value of Gases in Natural Gas Range by Continuous Recording Calorimeter", ASTM D3588-98 (2003) "Standard Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels", ASTM D4891-89 (2006) "Standard Test Method for Heating Value of Gases in Natural Gas Range by Stoichiometric Combustion" and GPA 2261-00 "Analysis for natural gas and similar gaseous mixtures by gas chromatography" published by the Gas Processors Association (GPA);

(*b*) by determining high heat value to within ± 5% using a continuous emission monitoring and recording system;

(*c*) when the continuous emission monitoring and recording system provides only low heat value, by converting the value to high heat value using equation 1-17:

Equation 1-17

$$HHV = LHV \times CF$$

Where:

HHV = High heat value of the fuel or fuel mixture, in megajoules per cubic metre at standard conditions;

LHV = Low heat value of the fuel or fuel mixture, in megajoules per cubic metre at standard conditions;

CF = Conversion factor for converting low heat value to high heat value, established as follows:

(*a*) for natural gas, the emitter must use a CF of 1.11;

(*b*) for refinery fuel gas, flexigas, associated gas or gas mixtures, the emitter must establish the weekly average FC as follows:

- using the low heat value measurements and the high heat value obtained by the continuous emission monitoring and recording system or by laboratory analysis as part of the daily carbon content determination;

- using the HHV/LHV ratio obtained from the laboratory analysis of the daily samples;

(2) for middle distillates, fuel oil and liquid waste-derived fuels, in accordance with ASTM D240-09 "Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter" or ASTM D4809-09a "Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Precision Method)";

(3) for biomass solid fuel, in accordance with ASTM D5865-07a "Standard Test Method for Gross Calorific Value of Coal and Coke";

(4) for waste-derived fuels, in accordance with ASTM D5865-07a or ASTM D5468-02 (2007) "Standard Test Method for Gross Calorific and Ash Value of Waste Materials" and, when the waste-derived fuels are not pure biomass fuels, by calculating the biomass fuel portion of CO_2 emissions in accordance with subparagraph 2 of the fifth paragraph of QC.1.3.4.

QC.1.5.5. Carbon content, molecular weight and molar fraction of fuel

The emitter must determine the average annual carbon content using equation 1-18:

Equation 1-18

$$CC_a = \frac{\sum_{i=1}^{n} [CC_i \times Fuel_i]}{\sum_{i=1}^{n} Fuel_i}$$

Where:

CC_a = Average annual carbon content, either:

- in metric tons of carbon per ton, for solid fuels;
- in metric tons of carbon per kilolitre, for liquid fuels;
- in kilograms of carbon per kilogram, for gaseous fuels;

n = Number of measurements of carbon content;

i = Measurement;

CC_i = Carbon content of the fuel for measurement period *i*, either:

- in metric tons of carbon per ton, for solid fuels;
- in metric tons of carbon par kilolitre, for liquid fuels;
- in kilograms of carbon per kilogram, for gaseous fuels;

$Fuel_i$ = Mass or volume of fuel combusted during measurement period *i*, either:

- as a mass in metric tons, for solid fuels;
- as a volume in cubic metres at standard conditions, for gaseous fuels;
- as a volume in kilolitres, for liquid fuels.

The carbon content and molecular weight or molar fraction of gaseous fuels must be determined using the sampling and analysis results indicated by the fuel supplier or the results of the sampling conducted by the emitter using one of the following methods:

(1) for solid fuels, namely coal, coke, biomass solid fuels and waste-derived fuels, in accordance with ASTM D5373-08 "Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Laboratory Samples of Coal";

(2) for petroleum-based liquid fuels and liquid waste-derived fuels, in one of the following ways:

(*a*) in accordance with ASTM D5291-02 (2007) "Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants";

(*b*) by applying the elementary analysis method;

(*c*) in accordance with ASTM D3238-95 (2005) "Standard Test Method for Calculation of Carbon Distribution and Structural Group Analysis of Petroleum Oils by n-d-M Method" and either ASTM D2502-04 "Standard Test Method for Estimation of Molecular Weight (Relative Molecular Mass) of Petroleum Oils from Viscosity Measurements" or ASTM D2503-92 (2007) "Standard Test Method for Relative Molecular Mass (Molecular Weight) of Hydrocarbons by Thermoelectric Measurements of Vapor Pressure";

(3) for gaseous fuels, by applying ASTM D1945-03 "Standard Test Method for Analysis of Natural Gas by Gas Chromatography" or ASTM D1946-90 (2006) "Standard Practice for Analysis of Reformed Gas by Gas Chromatography" or by measuring the carbon content of the fuel to within ± 5% using data from a continuous emission monitoring and recording system, at the following frequency:

(*a*) weekly, for natural gas and biogas;

(*b*) daily, for all other types of gaseous fuel.

QC.1.5.6. Measurements and data collection for fuel sampling

When the emission calculation methods require the periodic measurement or collection of data for an emissions source, the emitter must obtain a measurement and data collection rate of 100% for each report year, subject to the following:

(1) when, in sampling fuels, the emitter is unable to obtain fuel analytical data covering at least 80% of the emitter's emissions, the emissions from that source must be considered unverifiable for the report year;

(2) when, in sampling fuels, the emitter's fuel analytical data capture rate is at least 80% but less than 100% for any emissions source to which this Schedule applies, the emitter must use the methods specified in QC.1.6 to substitute the missing values for the period of missing data.

QC.1.5.7. Interim method for fuel sampling

When an emission calculation method requires the continuous measurement of emissions or periodic fuel sampling, and when the necessary equipment is not operational, the emitter may use an interim method for fuel sampling until the equipment is repaired or replaced, if

(1) the breakdown may result in a loss of more than 20% of the source's fuel data, such that emissions for the affected source cannot be verified pursuant to section 6.6 of this Regulation;

(2) the fuel sampling equipment cannot be promptly repaired or replaced without shutting down the stationary combustion unit concerned, or without significantly affecting facility operations;

(3) the interim method is the most reliable sampling method that can be used.

An emitter who uses an interim method must advise the Minister that the equipment is not operational within 30 days of the event and provide the following information:

(1) a description of the interim method used and the start and end dates for its use;

(2) a detailed description of the data affected by the non-operability;

(3) an analysis of the reliability of the data gathered using the interim method compared to the normally-gathered data;

(4) proof that the conditions in subparagraph 1 to 3 of the first paragraph have been met.

QC.1.6. Estimation methods for missing data

When sampling or measurement data required by this Regulation for the calculation of emissions is missing, replacement data must be used, determined as follows:

(1) an emitter who uses one of the calculation methods specified in QC.1.3.1 to QC.1.3.3 and QC.1.4.2 must

(*a*) when the missing data concerns the high heat value, carbon content or molecular mass of a fuel, replace that data by the arithmetic mean of the sampling or measurement data from immediately before and after the period for which the data is missing. However,

(i) if the data from after that period cannot be obtained in time to calculate the greenhouse gas emissions, the emitter may use only the data from before that period or an estimate based on all the data relating to the processes used;

(ii) if no data is available from before that period, the emitter must use the data from the first sampling or measurement after the period for which the data is missing;

(*b*) when the missing data concerns CO_2 concentration, stack gas flow rate, water content, fuel consumption or the quantity of sorbent used, replace that data by an estimate based on all the data relating to the processes used;

(2) an emitter who uses one of the calculation methods specified in QC.1.3.4 and QC.1.4.4 must determine the replacement data for the high heat value of the fuel, carbon content, CO_2 concentration, exhaust gas stream flow, volume flow or energy input of the fuel using the procedure in the SPE 1/PG/7 protocol entitled "Protocols and performance specifications for continuous monitoring of gaseous emissions from thermal power generation" published in November 2005 by Environment Canada.

QC.1.7. Tables

Table 1-1. High heat value by fuel type

(QC.1.3.1(1), QC.1.4.1(1), QC.1.5.2(2), QC.17.3.1(2))

Liquid fuels	**High heat value (GJ/kL)**
Asphalt & Road Oil	44.46
Aviation Gasoline	33.52
Diesel	38.30
Aviation Turbo Fuel	37.40
Kerosene	37.68
Propane	25.31
Ethane	17.22
Butane	28.44
Lubricants	39.16
Motor Gasoline - Off-Road	35.00
Light Fuel Oil	38.80
Residual Fuel Oil (#5 & 6)	42.50
Crude Oil	38.32
Naphtha	35.17
Petrochemical Feedstocks	35.17
Petroleum Coke - Refinery Use	46.35
Petroleum Coke - Upgrader Use	40.57

Solid fuels	**High heat value (GJ/metric ton)**
Anthracite Coal	27.70
Bituminous Coal	26.33
Foreign Bituminous Coal	29.82
Sub-Bituminous Coal	19.15
Lignite	15.00
Coal Coke	28.83
Solid Wood Waste	18.00
Spent Puling Liquor	14.00
Municipal solid waste	11.57
Gaseous fuels	**High heat value (GJ/m^3)**
Natural Gas	0.03832
Coke Oven Gas	0.01914
Still Gas - Refineries	0.03608
Still Gas - Upgraders	0.04324
Landfill Gas (captured methane)	0.03590

Table 1-2. Emission factor and high heat factor by fuel type

(QC.1.3.1, QC.1.3.2, QC.1.3.5(2), QC.1.4.1(1), QC.1.5.1(3))

Fuels	**CO_2 emission factor (kg CO_2/GJ)**	**High heat value (GJ/kL)**
Light fuel oil no. 1	69.37	38.78
Light fuel oil no. 2	70.05	38.50
Heavy fuel oil no. 4	71.07	40.73
Kerosene	67.25	37.68
Liquefied petroleum gas (LPG)	59.65	25.66
Pure propane	59.66	25.31
Propylene	62.46	25.39
Ethane	56.68	17.22
Ethylene	63.86	27.90
Isobutane	61.48	27.06
Isobutylene	64.16	28.73
Butane	60.83	28.44
Butene	64.15	28.73
Natural gasoline	63.29	30.69
Gasoline	65.40	34.87
Aviation gasoline	69.87	33.52
Aviation-type kerosene	68.40	37.66

Table 1-3. Emission factors by fuel type

(QC.1.3.1(1), QC.1.3.2, QC.1.4.1(1), QC.1.4.4, QC.17.3.1(2)

Liquid fuels	**CO_2 (kg/L)**	**CO_2 (kg/ GJ)**	**CH_4 (g/L)**	**CH_4 (g/GJ)**	**N_2O (g/L)**	**N_2O (g/GJ)**
Aviation Gasoline	2.342	69.87	2.200	65.630	0.230	6.862
Diesel	2.663	69.53	0.133	3.473	0.400	10.44
Aviation Turbo Fuel	2.534	67.75	0.080	2.139	0.230	6.150
Kerosene						
- Electric Utilities	2.534	67.25	0.006	0.159	0.031	0.823
- Industrial	2.534	67.25	0.006	0.159	0.031	0.823
- Producer Consumption	2.534	67.25	0.006	0.159	0.031	0.823
- Forestry, Construction, and Commercial/Institutional	2.534	67.25	0.026	0.690	0.031	0.823
Propane						
- Residential	1.510	59.66	0.027	1.067	0.108	4.267
- All other uses	1.510	59.66	0.024	0.948	0.108	4.267
Ethane	0.976	56.68	N/A	N/A	N/A	N/A
Butane	1.730	60.83	0.024	0.844	0.108	3.797
Lubricants	1.410	36.01	N/A	N/A	N/A	N/A
Motor Gasoline - Off-Road Vehicles	2.289	65.40	2.700	77.140	0.050	1.429
Light Fuel Oil						
- Electric Utilities	2.725	70.23	0.180	4.639	0.031	0.799
- Industrial	2.725	70.23	0.006	0.155	0.031	0.799
- Producer Consumption	2.643	68.12	0.006	0.155	0.031	0.799
- Forestry, Construction, and Commercial/Institutional	2.725	70.23	0.026	0.670	0.031	0.799
Residual Fuel Oil (#5 & 6)						
- Electric Utilities	3.124	73.51	0.034	0.800	0.064	1.506
- Industrial	3.124	73.51	0.12	2.824	0.064	1.506
- Producer Consumption	3.158	74.31	0.12	2.824	0.064	1.506
- Forestry, Construction, and Commercial/Institutional	3.124	73.51	0.057	1.341	0.064	1.820
Naphtha	0.625	17.77	N/A	N/A	N/A	N/A
Petrochemical Feedstocks	0.500	14.22	N/A	N/A	N/A	N/A
Petroleum Coke - Refinery Use	3.826	82.55	0.12	2.589	0.0265	0.572
Petroleum Coke - Upgrader Use	3.494	86.12	0.12	2.958	0.0231	0.569

Biomass and other solid fuels	**CO_2 (kg/kg)**	**CO_2 (kg/GJ)**	**CH_4 (g/kg)**	**CH_4 (g/GJ)**	**N_2O (g/kg)**	**N_2O (g/GJ)**
Landfill gas	2.989	83.3	0.60	16.700	0.06	1.671
Wood Waste with 50% H_2O content	0.950	52.8	0.05	2.778	0.02	1.111
Wood Waste with 12% H_2O content	1.59	88.9	0.51	28.4	0.068	3.79
Spent Pulping Liquor	1.428	102.0	0.05	3.571	0.02	1.429
Coal Coke	2.480	86.02	0.03	1.041	0.02	0.694
Tires	N/A	85.0	N/A	N/A	N/A	N/A
Gaseous fuels	**CO_2 (kg/m^3)**	**CO_2 (kg/GJ)**	**CO_2 (g/m^3)**	**CH_4 (g/GJ)**	**N_2O (g/m^3)**	**N_2O (g/GJ)**
Coke Oven Gas	1.60	83.60	0.037	1.933	0.0350	1.829
Still Gas - Refineries	1.75	48.50	N/A	N/A	0.0222	0.615
Still Gas - Upgraders	2.14	49.49	N/A	N/A	0.0222	0.513

Table 1-4. CO_2 emission factors for natural gas

(QC.1.3.1(1), QC.1.3.2(1), QC.17.3.1(2))

Marketable gas (kg CO_2/m^3)	**Marketable gas (kg CO_2/GJ)**
1.878	49.01

Table 1-5. CO_2 emission factors for coal

(QC.1.3.1(1), QC.1.3.2(1), QC.17.3.1(2))

Source	**Emission factor (kg CO_2/kg)**	**Emission factor (kg CO_2/GJ)**
- Canadian bituminous	2.25	85.5
- U.S. bituminous	2.34	88.9
- Anthracite	2.39	86.3

Table 1-6. Other emission factors

(QC.1.3.1(1), QC.1.3.2(1), QC.17.3.1(2))

Source	**CO_2 emission factor (kg/GJ)**	**CH_4 emission factor (g/GJ)**	**N_2O emission factor (g/GJ)**
Municipal Solid Waste	85.6	30	4.0
Peat	103.0	1	1.5

Table 1-7. CH_4 and N_2O emission factors for natural gas by use

(QC.1.4.1(1), QC.1.4.4)

Uses	CH_4 (g/m^3)	CH_4 (g/GJ)	N_2O (g/m^3)	N_2O (g/GJ)
Electric Utilities	0.490	12.790	0.049	1.279
Industrial	0.037	0.966	0.033	0.861
Producer Consumption (Non-marketable)	6.500	169.600	0.060	1.566
Pipelines	1.900	49.580	0.050	1.305
Cement	0.037	0.966	0.034	0.887
Manufacturing Industries	0.037	0.966	0.033	0.861
Residential, Construction, Commercial/Institutional, Agriculture	0.037	0.966	0.035	0.913

Table 1-8. CH_4 and N_2O emission factors for coal by use

(QC.1.4.1(1))

Uses	Emission factor (g CH_4/kg coal)	Emission factor (g N_2O/kg coal)
- Electric Utilities	0.022	0.032
- Industry and Heat and Steam Plants	0.030	0.020
- Residential, Public Administration	4.000	0.020

Table 1-9. Flow meter tests

(QC.1.5.1(3))

Standardization organization	Method	
	Number	**Title**
American Society of Mechanical Engineers (ASME)	ASME MFC-3M-2004	Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi
	ASME MFC-4M-1986 (Reaffirmed 2008)	Measurement of Gas Flow by Turbine Meters
	ASME MFC-5M-1985 (Reaffirmed 2006)	Measurement of Liquid Flow in Closed Conduits Using Transit-Time Ultrasonic Flowmeters
	ASME MFC-6M-1998 (Reaffirmed 2005)	Measurement of Fluid Flow in Pipes Using Vortex Flowmeters
	ASME MFC-7M-1987 (Reaffirmed 2006)	Measurement of Gas Flow by Means of Critical Flow Venturi Nozzles
	ASME MFC-9M-1988 (Reaffirmed 2006)	Measurement of Liquid Flow in Closed Conduits by Weighing Method
International Organization for Standardization (ISO)	ISO 8316: 1987	Measurement of Liquid Flow in Closed Conduits - Method by Collection of the Liquid in a Volumetric Tank

American Gas Association (AGA)	AGA Report No. 3	Orifice Metering of Natural Gas Part 1: General Equations & Uncertainty Guidelines (1990)
	AGA Report No. 3	Orifice Metering of Natural Gas Part 2: Specification and Installation Requirements (2000)
	AGA Report No. 7	Measurement of Natural Gas by Turbine Meter (2006)
American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)	ASHRAE 41.8-1989	Standard Methods of Measurement of Flow of Liquids in Pipes Using Orifice Flowmeters

Tableau 1-10. Density

(QC.1.5.2)

Fuel	**Density (kg/L)**
Light fuel oil no. 1	0.81
Light fuel oil no. 2	0.86
Heavy fuel oil no. 6	0.97

QC.2. REFINERY FUEL GAS COMBUSTION

QC.2.1. Covered sources

The covered sources are stationary combustion units located at a petroleum refinery that combust gaseous fuels such as refinery fuel gas, flexigas or associated gas.

QC.2.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information for each type of gaseous fuel (refinery fuel gas, flexigas and associated gas):

(1) the annual CO_2, CH_4 and N_2O emissions, in metric tons;

(2) the annual consumption of gaseous fuel, in millions of cubic metres at standard conditions;

(3) the average carbon content of each gaseous fuel when used to calculate CO_2 emissions, in kilograms of carbon per kilogram of gaseous fuel;

(4) the average high heat value of each gaseous fuel when used to calculate CO_2 emissions, in megajoules per cubic metre of gaseous fuel at standard conditions;

(5) the daily molecular weight of refinery fuel gas and flexigas when used to calculate CO_2 emissions, in kilograms per kilomole.

Subparagraphs 3, 4 and 5 of the first paragraph do not apply to the CO_2 emissions of an emitter who calculates emissions using data from a continuous emission monitoring and recording system.

QC.2.3. Calculation methods for CO_2, CH_4 and N_2O emissions

The annual CO_2 emissions attributable to stationary combustion units located at a petroleum refinery must be calculated by adding together the daily CO_2 emissions for each supply system for refinery fuel gas, flexigas and associated gas, which emissions must be calculated using one of the calculation methods in QC.2.3.1 to QC.2.3.4.

The annual CH_4 and N_2O emissions attributable to stationary combustion units located at a petroleum refinery that uses refinery fuel gas, flexigaz and associated gas must be calculated using the calculation method in QC.2.3.5.

QC.2.3.1. Use of a continuous emission monitoring and recording system

The annual CO_2 emissions attributable to the combustion of gaseous fuels may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.2.3.2. Calculation of CO_2 emissions for each supply system for refinery fuel gas and flexigas

The annual CO_2 emissions for each supply system for refinery fuel gas and flexigas must be calculated in accordance with one of the following methods:

(1) based on the carbon content and molecular weight of the refinery fuel gas or flexigas, using equation 2-1:

Equation 2-1

$$CO_2 = \sum_{i=1}^{n} \sum_{j=1}^{m} \left(Fuel_{ij} \times CC_{ij} \times \frac{MW_{ij}}{MVC} \right) \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of refinery fuel gas or flexigas, in metric tons;

n = Number of days of operation in the year;

m = Number of supply systems;

i = Day;

j = Supply system;

$Fuel_{ij}$ = Consumption of refinery fuel gas or flexigas in supply system *j* for day *i*, in cubic metres at standard conditions;

CC_{ij} = Carbon content of the sample of refinery fuel gas or flexigas in supply system *j* for day *i*, measured in accordance with QC.2.4.2, in kilograms of carbon per kilogram of fuel;

MW_{ij} = Molecular weight of the sample of refinery fuel gas or flexigas in supply system *j* for day *i*, in kilograms per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole at standard conditions);

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons;

(2) based on the daily average high heat value of the refinery fuel gas or flexigas, determined with data from a continuous emission monitoring and recording system, using equations 2-2 and 2-3:

Equation 2-2

$$CO_2 = \sum_{i=1}^{n} \sum_{j=1}^{m} \left(HHV_{ij} \times Fuel_{ij} \times EF_{CO2,ij} \right)$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of refinery fuel gas or flexigas in supply system *j*, in metric tons;

n = Number of days of operation in the year;

m = Number of supply systems;

i = Day;

j = Supply system;

HHV_{ij} = Average high heat value of the refinery fuel gas or flexigas in supply system *j* for day *i*, determined by a continuous emission monitoring and recording system, in megajoules per cubic metre at standard conditions;

$Fuel_{ij}$ = Consumption of refinery fuel gas and flexigas in supply system *j* for day *i*, in cubic metres at standard conditions;

$EF_{CO2,ij}$ = CO_2 emission factor for the refinery fuel gas or flexigas in supply system *j* for day *i*, calculated using equation 2-3, in metric tons of CO_2 per megajoule.

Equation 2-3

$$EF_{CO2,ij} = \frac{CC_{ij}}{HHV_{ij}} \times \frac{MW_{ij}}{MVC} \times 3.664 \times 0.001$$

Where:

$EF_{CO2,ij}$ = CO_2 emission factor for the refinery fuel gas and flexigas in supply system *j* for day *i*, in metric tons of CO_2 per megajoule;

CC_{ij} = Carbon content of the sample of refinery fuel gas and flexigas in supply system *j* for day *i*, measured in accordance with QC.2.4.2, in kilograms of carbon per kilogram of refinery fuel gas and flexigas;

HHV_{ij} = High heat value of the sample of refinery fuel gas and flexigas in supply system *j* for day *i*, determined in accordance with QC.2.4.3, in megajoules per cubic metre at standard conditions;

MW_{ij} = Molecular weight (molecular mass) of the refinery fuel gas or flexigas in supply system *j* for day *i,* in kilograms per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole at standard conditions);

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

QC.2.3.3. Calculation of CO_2 emissions for associated gas

The annual CO_2 emissions for associated gas may be calculated using the calculation method in QC.1.3.2, with the exception of an emitter to whom section 6.6 of this Regulation applies, or using the method in QC.1.3.3.

QC.2.3.4. Calculation of CO_2 emissions for gases mixed prior to combustion

In addition to the methods in QC.2.3.1 and QC.2.3.2, for gases mixed prior to combustion, the emitter may calculate the annual CO_2 emissions for each gas before mixing. In this case, the emitter must

(1) measure the flow rate of each fuel stream;

(2) determine the carbon content and the high heat value of each fuel stream before mixing;

(3) calculate the CO_2 emissions for each fuel stream using the following methods:

(*a*) for low heat content gas and associated gas, in accordance with QC.1.3.2, with the exception of an emitter to whom section 6.6 of this Regulation applies, or in accordance with QC.1.3.3;

(*b*) for flexigas and refinery fuel gas, in accordance with QC.2.3.2;

(4) add together the CO_2 emissions for each stream to determine the total emissions for the mixture.

QC.2.3.5. Calculation of CH_4 and N_2O emissions attributable to the combustion of gaseous fuels

The annual CH_4 and N_2O emissions attributable to the combustion of gaseous fuels must be calculated in accordance with QC.1.4.

QC.2.4. Sampling, analysis and measurement requirements

QC.2.4.1. Consumption of gaseous fuels

The consumption of gaseous fuels must be calculated daily using the methods in QC.1.5.2.

QC.2.4.2. Carbon content of gaseous fuels

The carbon content of gaseous fuels must be measured, in accordance with QC.1.5.5,

(1) once every 8 hours using continuous measuring equipment or discrete laboratory analysis, for refinery fuel gas;

(2) once per day, for flexigas;

(3) once per month, for associated gas.

QC.2.4.3. High heat value of gaseous fuels

The high heat value of gaseous fuels must be determined in accordance with QC.1.5.4 and using one of the following methods:

(1) from the same sample used to conduct the carbon content analysis;

(2) using a continuous emission monitoring and recording system and the hourly average value that coincides with the same hour in which the carbon content was determined.

QC.2.4.4. Refinery with a daily crude oil throughput capacity equal to or less than 8,744 kl

An emitter who operates an enterprise, facility or establishment with a daily crude oil throughput capacity equal to or less than 8,744 kl may conduct on a weekly basis the measurements prescribed in QC.2.4.1 to QC.2.4.3 that are necessary to calculate emissions in accordance with equations 2-2 and 2-3.

QC.3. ALUMINUM PRODUCTION

QC.3.1. Covered sources

The covered sources are all the processes used for primary aluminum production.

QC.3.2. Reporting requirements for greenhouse gas emissions

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2 emissions attributable to anode consumption from prebaked and Søderberg electrolysis cells, in metric tons;

(2) the annual CO_2 emissions attributable to anode and cathode baking, in metric tons;

(3) the annual CF_4 and C_2F_6 emissions attributable to anode effects, in metric tons;

(4) the annual CO_2 emissions attributable to green coke calcination, in metric tons;

(5) the annual SF_6 emissions attributable to cover gas consumption, in metric tons;

(6) the annual CO_2, CH_4 and N_2O emissions attributable to the use of stationary combustion units, calculated in accordance with QC.1, in metric tons;

(7) the monthly aluminum production, in metric tons;

(8) for the use of the prebaked anodes process:

(*a*) the monthly net prebaked anode consumption for aluminum production, in metric tons of anodes per metric ton of aluminum;

(*b*) the monthly net sulphur content in prebaked anodes, in kilograms of sulphur per kilogram of prebaked anodes;

(*c*) the monthly ash content in prebaked anodes, in kilograms of ash per kilogram of prebaked anodes;

(*d*) the monthly content of impurities, other than sulphur and ash, in the prebaked anodes, in kilograms of impurities per kilogram of prebaked anodes;

(9) for the use of the Søderberg anodes process:

(*a*) the monthly anode paste consumption, in metric tons of paste per metric ton of aluminum;

(*b*) the monthly emissions of benzene-soluble matter (BSM), in kilograms of BSM per metric ton of aluminum;

(*c*) the monthly average pitch content in paste, in kilograms of pitch per kilogram of paste;

(*d*) the monthly sulphur content in the pitch, in kilograms of sulphur per kilogram of pitch;

(*e*) the monthly ash content in the pitch, in kilograms of ash per kilogram of pitch;

(*f*) the monthly hydrogen content in the pitch, in kilograms of hydrogen per kilogram of pitch;

(*g*) the monthly sulphur content of the calcinated coke, in kilograms of sulphur per kilogram of calcinated coke;

(*h*) the monthly ash content of the calcinated coke, in kilograms of ash per kilogram of calcinated coke;

(*i*) the monthly reported carbon present in the dust from Søderberg electrolysis cells, in kilograms of carbon per kilogram of aluminum produced;

(10) for the use of the baking process for prebaked anodes or cathodes:

(*a*) the monthly consumption of packing material, in metric tons of packing material per metric ton of baked anodes or cathodes;

(*b*) the monthly production of baked anodes or cathodes, in metric tons;

(*c*) the monthly ash content in the packing material, in kilograms of ash per kilogram of packing material;

(*d*) the monthly sulphur content in the packing material, in kilograms of sulphur per kilogram of packing material;

(*e*) the monthly content of impurities, other than sulphur and ash, in the packing material, in kilograms of impurities per kilogram of packing material;

(*f*) the monthly consumption of green anodes or cathodes, in metric tons;

(*g*) the monthly pitch content of green anodes or cathodes, in kilograms of pitch per kilogram of green anodes or cathodes;

(*h*) the monthly quantity of tar recovered from the baking of anodes or cathodes, in metric tons;

(11) for the use of the coke calcination process:

(*a*) the monthly consumption of green coke, in metric tons;

(*b*) the monthly humidity content in the green coke, in kilograms of water per kilogram of green coke;

(*c*) the monthly volatiles content of the green coke, in kilograms of volatiles per kilogram of green coke;

(*d*) the monthly sulphur content of the green coke, in kilograms of sulphur per kilogram of green coke;

(*e*) the monthly sulphur content of the calcinated coke, in kilograms of sulphur per kilogram of calcinated coke;

(*f*) the monthly quantity of calcinated coke produced, in metric tons;

(*g*) the monthly quantity of under-calcinated coke produced, in metric tons;

(*h*) the monthly emissions of coke dust, in metric tons;

(12) for CF_4 or C_2F_6 emissions attributable to anode effects:

(*a*) the slope determined in accordance with the method in QC.3.4.2, in metric tons of CF_4 or C_2F_6 per metric ton of aluminium, per anode effect minute, per pot and per day for each series of pots;

(*b*) the anode effect frequency, in other words the number of anode effects per pot per day for each series of pots;

(*c*) the anode effect duration, in minutes per anode effect for each series of pots;

(*d*) the aluminum production per day, in metric tons for each series of pots;

(*e*) the number of operating days per year for each series of pots;

(*f*) the overvoltage coefficient determined in accordance with the method in QC.3.6.1, in metric tons of CF_4 or C_2F_6 per metric ton of aluminium, per millivolt for each series of pots;

(*g*) the daily anode effect overvoltages, in millivolts per pot for each series of pots;

(*h*) the current efficiency of the aluminum production process, expressed as a fraction for each series of pots;

(13) for emissions of SF_6 used as a cover gas:

(*a*) the annual quantity of SF_6 purchased, in metric tons;

(*b*) the quantity of SF_6 shipped out of the establishment during the year, in metric tons;

(*c*) the quantity of SF_6 in storage at the beginning of the year, in metric tons;

(*d*) the quantity of SF_6 in storage at the end of the year, in metric tons;

(*e*) the monthly quantity of cover gas input to electrolysis cells, in metric tons;

(*f*) the monthly SF_6 concentration in the gas input to the electrolysis cells, in metric tons;

(*g*) the monthly quantity of gas containing SF_6 collected and shipped out of the establishment, in metric tons;

(*h*) the monthly concentration of SF_6 in the gas collected and shipped out of the establishment, in metric tons.

Subparagraph 12 of the first paragraph does not apply to the CF_4 or C_2F_6 emissions of an emitter who calculates emissions using data from a continuous emission monitoring and recording system.

QC.3.3. Calculation methods for CO_2 emissions

QC.3.3.1. Calculation of CO_2 emissions attributable to the consumption of prebaked anodes

The annual CO_2 emissions attributable to the consumption of prebaked anodes must be calculated using equation 3-1:

Equation 3-1

$$CO_2 = \sum_{i=1}^{12} [NCC \times MP \times \frac{(100 - S_a - Ash_a - Imp_a)}{100} \times 3.664]_i$$

Where:

CO_2 = Annual CO_2 emissions attributable to the consumption of prebaked anodes, in metric tons;

i = Month;

NCC = Net anode consumption for aluminum production for month *i*, in metric tons of anodes per metric ton of aluminum;

MP = Production of aluminum for month *i*, in metric tons;

S_a = Sulphur content in the prebaked anodes for month *i*, in kilograms of sulphur per kilogram of prebaked anodes;

Ash_a = Ash content in the prebaked anodes for month *i*, in kilograms of ash per kilogram of prebaked anodes;

Imp_a = Content of impurities, other than sulphur and ash, in the prebaked anodes for month *i*, in kilograms of impurities per kilogram of prebaked anodes. When this element is not measured, the value is zero;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.3.3.2. Calculation of CO_2 emissions attributable to anode consumption from Søderberg electrolysis cells

The annual CO_2 emissions attributable to anode consumption from Søderberg electrolysis cells must be calculated using equation 3-2:

Equation 3-2

$$CO_2 = \sum_{i=1}^{12} \left[\begin{array}{l} (PC \times MP) - \left(BSM \times \dfrac{MP}{1000}\right) - \left(\dfrac{BC}{100} \times PC \times MP \times \left(\dfrac{S_b + Ash_p + H_b}{100}\right)\right) \\ - \left(\dfrac{100 - BC}{100} \times PC \times MP \times \dfrac{S_c + Ash_c}{100}\right) - (MP \times CP) \end{array} \right]_i \times 3.664$$

Where:

CO_2 = Annual CO_2 emissions attributable to anode consumption from Søderberg electrolysis cells, in metric tons;

i = Month;

PC = Anode paste consumption for month *i*, in metric tons of paste per metric ton of aluminum;

MP = Production of aluminum for month *i*, in metric tons;

BSM = Emissions of benzene-soluble matter (BSM), in kilograms of BSM per metric ton of aluminum;

BC = Average pitch content in paste for month *i*, in kilograms of pitch per kilogram of paste;

S_b = Sulphur content in pitch for month *i*, in kilograms of sulphur per kilogram of pitch;

Ash_p = Ash content in pitch, in kilograms of ash per kilogram of pitch;

H_b = Hydrogen content in pitch, in kilograms of hydrogen per kilogram of pitch;

S_c = Sulphur content in calcinated coke, in kilograms of sulphur per kilogram of calcinated coke;

Ash_c = Ash content in calcinated coke, in kilograms of ash per kilogram of calcinated coke;

CP = Monthly reported carbon present in the dust from Søderberg electrolysis cells, in kilograms of carbon per kilogram of aluminum produced;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.3.3.3. Calculation of CO_2 emissions attributable to anode and cathode baking

The annual CO_2 emissions attributable to anode and cathode baking must be calculated using the following calculation methods:

(1) for annual CO_2 emissions, using equation 3-3:

Equation 3-3

$$CO_2 = CO_{2\ PM} + CO_{2\ P}$$

Where:

CO_2 = Annual CO_2 emissions attributable to anode and cathode baking, in metric tons;

$CO_{2\ PM}$ = Annual CO_2 emissions attributable to packing material calculated in accordance with equation 3-4, in metric tons;

$CO_{2\ P}$ = Annual CO_2 emissions attributable to pitch coking calculated in accordance with equation 3-5, in metric tons;

(2) for emissions of CO_2 attributable to packing material, using equation 3-4:

Equation 3-4

$$CO_{2\ PM} = \sum_{i=1}^{12} \left(PM \times BAC \times \frac{100 - Ash_{pm} - S_{pm} - Imp_{pm}}{100} \right)_i \times 3.664$$

Where:

$CO_{2\ PM}$ = Annual CO_2 emissions attributable to packing material, in metric tons;

i = Month;

PM = Consumption of packing material for month *i*, in metric tons of packing material per metric ton of baked anodes or cathodes;

BAC = Production of baked anodes or cathodes for month *i*, in metric tons;

Ash_{pm} = Ash content of packing material for month *i*, in kilograms of ash per kilogram of packing material;

S_{pm} = Sulphur content of packing material for month *i*, in kilograms of sulphur per kilogram of packing material;

Imp_{pm} = Content of impurities, other than sulphur and ash, of the packing material for month *i*, in kilograms of impurities per kilogram of packing material. When this element is not measured, the value is zero;

3.664 = Ratio of molecular weights, CO_2 to carbon;

(3) for emissions of CO_2 attributable to pitch coking, using equation 3-5:

Equation 3-5

$$CO_{2P} = \sum_{i=1}^{12} \left(GAW - BAC - \left(\frac{H_p}{100} \times \frac{PC}{100} \times GAW \right) - RT \right)_i \times 3.664$$

Where:

$CO_{2\,P}$ = Annual CO_2 emissions attributable to pitch coking, in metric tons;

i = Month;

GAW = Consumption of green anodes or cathodes for month *i*, in metric tons;

BAC = Production of baked anodes or cathodes for month *i*, in metric tons;

H_p = Hydrogen content in pitch for month *i*, in kilograms of hydrogen per kilogram of pitch;

PC = Pitch content of green anodes or cathodes for month *i*, in kilograms of pitch per kilogram of green anodes or cathodes;

RT = Recovered tar for month *i*, in metric tons;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.3.3.4. Calculation of CO_2 emissions attributable to green coke calcination

The annual CO_2 emissions attributable to green coke calcination must be calculated using equation 3-6:

Equation 3-6

$$CO_2 = \sum_{i=1}^{12} \left[\begin{aligned} & \left[GC \times \frac{(100 - H_2O_{GC} - V_{GC} - S_{GC})}{100} - (CC + UCC + DE) \times \frac{(100 - S_{CC})}{100} \right] \times 3.664 \\ & + (CCV \times 0.035 \times 2.75) \end{aligned} \right]_i$$

Where:

CO_2 = Annual CO_2 emissions attributable to green coke calcination, in metric tons;

i = Month;

GC = Consumption of green coke for month *i*, in metric tons;

H_2O_{gc} = Humidity content of green coke for month *i*, in kilograms of water per kilogram of green coke;

V_{gc} = Volatiles content of green coke for month *i*, in kilograms of volatiles per kilogram of green coke;

S_{gc} = Sulphur content of green coke for month *i*, in kilograms of sulphur per kilogram of green coke;

CC = Calcinated coke produced for month *i*, in metric tons;

UCC = Under-calcinated coke produced for month *i*, in metric tons;

DE = Emissions of coke dust for month *i*, in metric tons;

S_{cc} = Sulphur in calcinated coke, in kilograms of sulphur per kilogram of calcinated coke;

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.035 = CH_4 and tar content in coke volatiles contributing to CO_2 emissions;

2.75 = Conversion factor, CH_4 to CO_2.

QC.3.4. Calculation methods for CF_4 and C_2F_6 emissions attributable to anode effects

The annual CF_4 and C_2F_6 emissions attributable to anode effects must be calculated using one of the calculation methods in QC.3.4.1 to QC.3.4.3.

QC.3.4.1. Use of a continuous emission monitoring and recording system

The annual CF_4 and C_2F_6 emissions may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.3.6.1.

QC.3.4.2. Slope method

The annual CF_4 and C_2F_6 emissions attributable to anode effects may be calculated for each series of pots using the slope method in equation 3-7:

Equation 3-7

$$E_{CF4,C2F6} = \sum_{j=1}^{m} \left[\sum_{i=1}^{n} [slope_{CF4,C2F6} \times AEF \times AED \times MP]_i \right]_j$$

Where:

$E_{CF4,\,C2F6}$ = Annual CF_4 or C_2F_6 emissions attributable to anode effects, in metric tons;

m = Number of series of pots;

j = One series of pots;

n = Number of operating days per year;

i = Day;

$slope_{CF4,\ C2F6}$ = Slope determined in accordance with the method in QC.3.6.1, in metric tons of CF_4 or C_2F_6 per metric ton of aluminium, per anode effect minute, per pot and per day;

AEF = Anode effect frequency, in other words the number of anode effects per pot per day;

AED = Anode effect duration, in minutes per anode effect;

MP = Aluminum production per day, in metric tons.

QC.3.4.3. Péchiney method

The annual CF_4 and C_2F_6 emissions attributable to anode effects may be calculated for each series of pots using the Péchiney method in equation 3-8:

Equation 3-8

$$E_{CF4,C2F6} = \sum_{j=1}^{m} \left[\sum_{i=1}^{n} \left[OVC_{CF4,C2F6} \times \frac{AEO}{CE} \times MP \right]_i \right]_j$$

Where:

$E_{CF4,\ C2F6}$ = Annual CF_4 or C_2F_6 emissions attributable to anode effects, in metric tons;

m = Number of series of pots;

j = One series of pots;

n = Number of operating days per year;

i = Day;

$OVC_{CF4,\ C2F6}$ = Overvoltage coefficient determined in accordance with the method in QC.3.6.1, in metric tons of CF_4 or C_2F_6 per metric ton of aluminium per millivolt;

AEO = Anode effect overvoltages for a given day, in millivolts per pot;

CE = Current efficiency of the aluminum production process, expressed as a fraction;

MP = Aluminum production per day, in metric tons.

QC.3.5. Calculation method for emissions of SF_6 used as a cover gas

The annual emissions of SF_6 used as a cover gas must be calculated using one of the calculation methods in QC.3.5.1 and QC.3.5.2.

QC.3.5.1. Calculation based on change in inventory

The annual SF_6 emissions may be calculated based on the change in inventory using equation 3-9:

Equation 3-9

$$SF_6 = S_{Inv-Begin} - S_{Inv-End} + S_{Purchased} - S_{Shipped}$$

Where:

SF_6 = Annual emissions of SF_6 used as a cover gas, in metric tons;

$S_{Inv-Begin}$ = Quantity of SF_6 in storage at the beginning of the year, in metric tons;

$S_{Inv-End}$ = Quantity of SF_6 in storage at the end of the year, in metric tons;

$S_{Purchased}$ = Quantity of SF_6 purchases for the year, in metric tons;

$S_{Shipped}$ = Quantity of SF_6 shipped out of the establishment during the year, in metric tons.

QC.3.5.2. Calculation based on direct measurement

The annual SF_6 emissions may be calculated based on direct measurement using equation 3-10:

Equation 3-10

$$SF_6 = \sum_{i=1}^{12} [(Q_{Input} \times C_{Input}) - (Q_{Output} \times C_{Output})]_i$$

Where:

SF_6 = Annual emissions of SF_6 used as a cover gas, in metric tons;

i = Month;

Q_{Input} = Quantity of cover gas entering the electrolysis cells for month *i*, in metric tons;

C_{Input} = Concentration de SF_6 in the cover gas entering the electrolysis cells for month *i*, in metric tons;

Q_{Output} = Quantity of gas containing SF_6 collected and shipped out of the establishment for month *i*, in metric tons;

C_{Output} = Concentration of SF_6 in the gas collected and shipped out of the establishment for month *i*, in metric tons.

QC.3.6. Sampling, analysis and measurement requirements

An emitter who operates an enterprise, facility or establishment that produces aluminum must measure all parameters monthly, with the exception of the parameters concerning CF_4 and C_2F_6 emissions from anode effects in QC.3.4 and the parameters concerning SF_6 use in QC.3.5, which must be measured in accordance with QC.3.6.1 and QC.3.6.2.

QC.3.6.1. CF_4 and C_2F_6 emissions from anode effects

An emitter who uses a continuous emission monitoring and recording system for CF_4 and C_2F_6 emissions attributable to anode effects must comply with the guidelines in the document "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories" published by the Intergovernmental Panel on Climate Change.

An emitter who uses the slope method specified in QC.3.4.2 or the Péchiney method specified in QC.3.4.3 must conduct performance tests to calculate the slope or overvoltage coefficients for each series of pots using the *Protocol for Measurement of Tetrafluoromethane and Hexafluoroethane Emissions from Primary Aluminum Production* published in April 2008 by the U.S. Environmental Protection Agency (USEPA) and the International Aluminum Institute.

The tests must be conducted again whenever

(1) 36 months have passed since the last tests;

(2) a change occurs in the control algorithm that affects the intensity or duration of the anode effects or the nature of the anode effect termination routine; or

(3) changes occur in the distribution or duration of anode effects, for example when the percentage of manual kills changes or when, over time, the number of anode effects decreases and results in anode effects of shorter duration, or when the algorithm for bridge movements and anode effect overvoltage accounting changes.

QC.3.6.2. Emissions of SF_6 used as a cover gas

An emitter who uses the direct measurement method in QC.3.5.2 to calculate SF_6 emissions attributable to the consumption of cover gas must measure monthly the quantity of SF_6 entering the electrolysis cells and the quantity and SF_6 concentration of any residual gas collected and shipped out of the establishment.

4. CEMENT PRODUCTION

QC.4.1. Covered sources

The covered sources are all the processes used to produce Portland, natural, masonry, pozzolanic, or other hydraulic cements.

QC.4.2. Greenhouse gas emissions reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2, CH_4 and N_2O emissions, in metric tons;

(2) the annual CO_2 emissions attributable to the calcination process, in metric tons;

(3) for each cement kiln:

(*a*) the monthly CO_2 emission factors, in metric tons of CO_2 per metric ton of clinker;

(*b*) the monthly quantity of clinker produced, in metric tons;

(*c*) the monthly content of calcium oxide in the clinker, in metric tons of calcium oxide per metric ton of clinker;

(*d*) the monthly content of magnesium oxide in the clinker, in metric tons of magnesium oxide per metric ton of clinker;

(*e*) the monthly quantity of non-carbonate raw material, in metric tons;

(*f*) the monthly content of calcium oxide in the non-carbonate raw material, in metric tons of calcium oxide per metric ton of non-carbonate raw material;

(*g*) the monthly content of magnesium oxide in the non-carbonate raw material, in metric tons of magnesium oxide per metric ton of non-carbonate raw material;

(*h*) the monthly CO_2 emission factors for the dust discarded that is not recycled to the cement kiln, in metric tons of CO_2 per metric ton of dust;

(*i*) the monthly quantity of the dust discarded that is not recycled to the cement kiln, in metric tons;

(4) the degree of calcination of the dust discarded that is not recycled to the cement kiln;

(5) the annual CO_2 emissions attributable to the oxidation of organic carbon, in metric tons;

(6) for each type of raw material:

(*a*) the quantity of raw material consumed during the year, in metric tons;

(*b*) the total organic carbon content of the raw material, in metric tons of organic carbon per metric ton of raw material;

(7) the annual CO_2, CH_4 and N_2O emissions attributable to fuel combustion in all cement kilns, calculated in accordance with QC.4.3.2(2), in metric tons;

(8) the annual CO_2, CH_4 and N_2O emissions attributable to the use of stationary combustion units, with the exception of cement kilns, calculated in accordance with QC.1, in metric tons.

Subparagraphs 2, 3, 4 and 6 of the first paragraph do not apply to the CO_2 emissions of an emitter who calculates emissions using data from a continuous emission monitoring and recording system. The emitter must, however, report the quantity of each fuel used in each cement kiln.

QC.4.3. Calculation method for CO_2 emissions from the use of cement kilns

The annual CO_2 emissions attributable from the use of cement kilns must be calculated using one of the two calculation methods in QC.4.3.1 and QC.4.3.2.

QC.4.3.1. Use of a continuous emission monitoring and recording system

The annual CO_2 emissions may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.4.3.2. Calculation by mass balance

The annual CO_2 emissions may be calculated using the following calculation methods:

(1) the CO_2 emissions from cement kilns must be calculated by adding together the CO_2 emissions attributable to calcination and the CO_2 emissions attributable to the oxidation of the organic carbon present in the raw material, calculated in accordance with the following methods:

(a) CO_2 emissions attributable to calcination must be calculated using equations 4-1 to 4-4:

Equation 4-1

$$CO_{2-C} = \sum_{i=1}^{12} \left[\left(Cli \times EF_{Cli} \right) + \left(Q_{CKD} \times EF_{CKD} \right) \right]_i$$

Where:

CO_{2-C} = CO_2 emissions attributable to calcination, in metric tons;

i = Month;

Cli = Production of clinker, in metric tons;

EF_{Cli} = Monthly CO_2 emission factor for the clinker, established using equation 4-2, in metric tons of CO_2 per metric ton of clinker;

Q_{CKD} = Monthly quantity of dust discarded that is not recycled to the cement kiln, in metric tons;

EF_{CKD} = Monthly CO_2 emission factor for the dust discarded that is not recycled to the cement kiln, established using equation 4-3, in metric tons of CO_2 per metric ton of dust discarded and not recycled.

Equation 4-2

$$EF_{Cli} = \left[CaO_{Cli} - \left(\frac{CaO_{NCRM} \times NCRM}{Cli} \right) \right] \times 0.785 + \left[MgO_{Cli} - \left(\frac{MgO_{NCRM} \times NCRM}{Cli} \right) \right] \times 1.092$$

Where:

EF_{Cli} = Monthly CO_2 emission factor for the clinker, established on the basis of the complete calcination of all the carbonates present in the raw material, in metric tons of CO_2 per metric ton of clinker;

CaO_{Cli} = Monthly content of calcium oxide in the clinker, in metric tons of calcium oxide per metric ton of clinker;

CaO_{NCRM} = Monthly content of calcium oxide in the non-carbonate raw material, in metric tons of calcium oxide per metric ton of non-carbonate raw material;

NCRM = Monthly quantity of non-carbonate raw material, in metric tons;

Cli = Monthly production of clinker, in metric tons;

0.785 = Ratio of molecular weights, CO_2 to calcium oxide;

MgO_{Cli} = Monthly content of magnesium oxide in the clinker, in metric tons of magnesium oxide per metric ton of clinker;

MgO_{NCRM} = Monthly content of magnesium oxide in the non-carbonate raw material, in metric tons of magnesium oxide per metric ton of non-carbonate raw material;

1.092 = Ratio of molecular weights, CO_2 to magnesium oxide.

Equation 4-3

$$EF_{CKD} = \frac{\dfrac{EF_{Cli}}{1 + EF_{Cli}} \times d}{1 - \left(\dfrac{EF_{Cli}}{1 + EF_{Cli}} \times d \right)}$$

Where:

EF_{CKD} = Monthly CO_2 emission factor for the dust discarded that is not recycled to the cement kiln, in metric tons of CO_2 per metric ton of dust discarded and not recycled;

EF_{Cli} = Monthly CO_2 emission factor for the clinker, established using equation 4-2, in metric tons of CO_2 per metric ton of clinker;

d = Degree of calcination of the dust discarded that is not recycled to the cement kiln, determined using equation 4-4.

Equation 4-4

$$d = 1 - \frac{TCO_{2,CKD} \times (1 - TCO_{2,RM})}{(1 - TCO_{2,CKD}) \times TCO_{2,RM}}$$

Where:

d = Degree of calcination of the dust discarded that is not recycled to the cement kiln;

$TCO_{2,CKD}$ = Carbonated CO_2 content of the dust discarded and not recycled to the cement kiln, in metric tons of carbonated CO_2 per metric ton of the dust discarded that is not recycled to the cement kiln;

$TCO_{2,RM}$ = Carbonated CO_2 content of the raw material, in metric tons of carbonated CO_2 per metric ton of raw material.

(*b*) the CO_2 emissions attributable to the oxidation of the organic carbon present in the raw material must be calculated using equation 4-5:

Equation 4-5

$$CO_{2,RM} = TOC_{RM} \times RM \times 3.664$$

Where:

$CO_{2,RM}$ = CO_2 emissions resulting from the oxidation of the raw material, in metric tons;

TOC_{RM} = Total organic carbon content in raw material, measured using the method in QC.4.4 (3), or using a default value of 0.02 metric tons of total organic carbon content per metric ton of raw material;

RM = Quantity of raw material in metric tons;

3.664 = Ratio of molecular weights, CO_2 to carbon.

(2) the CO_2, CH_4 and N_2O emissions from fuel combustion in cement kilns must be calculated using the calculation methods in QC.1. When pure biomass fuels, in other words fuels constituted of the same substance for at least 97% of their total weight, are combusted only during start-up, shut-down, or malfunction operating periods for the apparatus or units, the emitter may calculate CO_2 emissions using the calculation method in QC.1.3.1.

QC.4.4. Sampling, analysis and measurement requirements

An emitter who operates an enterprise, facility or establishment that produces cement must

(1) calculate the monthly content of calcium oxide and magnesium oxide for the clinker and the non-carbonate raw material in accordance with standard ASTM C114-10 "Standard Test Methods for Chemical Analysis of Hydraulic Cement";

(2) calculate the carbonate CO_2 content of the dust discarded and not recycled to the cement kiln and in the raw material in accordance with ASTM C114-10;

(3) take samples for each category of raw material in bulk storage and determine the total organic carbon content in the raw material in accordance with ASTM C114-10;

(4) calculate the quantity of clinker produced, the quantity of dust discarded and not recycled to the cement kiln, and the quantity of raw material consumed by direct weight measurement using the same plant instruments used for inventory purposes, such as weigh hoppers or belt weigh feeders.

QC.5. COAL STORAGE

QC.5.1. Covered sources

The covered sources are all activities involving coal storage, in other words all post-mining activities such as preparation, handling, processing, transportation and storage.

QC.5.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CH_4 emissions in metric tons;

(2) the annual coal purchases, in metric tons;

(3) the source of coal purchases:

(*a*) name of coal basin;

(*b*) source province or state;

(*c*) coal mine type (surface or underground).

QC.5.3. Calculation methods for CH_4 emissions

The annual CH_4 emissions from coal storage must be calculated in accordance with the following calculation methods:

(1) CH_4 emissions from coal storage must be calculated using equation 5-1:

Equation 5-1

$$CH_4 = \sum_i (PC_i \times EF_i) \times 0.6772 \times 0.001$$

Where:

CH_4 = Annual fugitive emissions from coal storage, for each type of coal *i*, in metric tons;

i = Type of coal;

PC_i = Annual purchases of each type of coal *i*, in metric tons;

EF_i = CH_4 emission factor for type of coal *i*, established in accordance with paragraph 2, in cubic metres of CH_4 per metric ton of coal for each type of coal;

0.6772 = Conversion factor, cubic metres to kilograms of CH_4;

0.001 = Conversion factor, kilograms to metric tons;

(2) the CH_4 emission factor (EF_i) must be based on the location and mine type where the coal was mined, in accordance with the following requirements:

(*a*) when the coal comes from a location in the United States, the emission factor is provided in Table 5-1 in QC.5.5;

(*b*) when the coal comes from a location in Canada, the emission factor is provided in Table 5-2 in QC.5.5;

(*c*) when the coal comes from a location outside Canada and the United States, the emitter must select an emission factor from Table 5-1 or 5-2 that corresponds to the type of coal used.

QC.5.4. Sampling, analysis and measurement requirements

An emitter who operates an enterprise, facility or establishment that stores coal must determine the total quantity of coal purchased

(1) by using invoices for coal purchases; or

(2) by weighing the coal using the same plant instruments used for inventory purposes, such as weigh hoppers or belt weigh feeders.

QC.5.5. Tables

Table 5-1. CH_4 emission factors for post-mining activities involving the storage or handling of coal from the United States

(QC.5.3(2)(*a*)(*b*))

Coal origin		**CH_4 emission factor by coal mine type (cubic metres /metric ton)**	
State	**Coal basin**	**Surface mine**	**Underground mine**
Maryland, Ohio, Pennsylvania, West Virginia North	Northern Appalachia	0.6025	1.4048
Tennessee, West Virginia South	Central Appalachia (WV)	0.2529	1.3892
Virginia	Central Appalachia (VA)	0.2529	4.0490
East Kentucky	Central Appalachia (E KY)	0.2529	0.6244
Alabama, Mississippi	Warrior	0.3122	2.7066
Illinois, Indiana, Kentucky West	Illinois	0.3465	0.6525
Arizona, California, Colorado, New Mexico, Utah	Rockies (Piceance Basin)	0.3372	1.9917
	Rockies (Uinta Basin)	0.1623	1.0083
	Rockies (San Juan Basin)	0.0749	1.0645
	Rockies (Green River Basin)	0.3372	2.5068
	Rockies (Raton Basin)	0.3372	1.2987
Montana, North Dakota, Wyoming	N. Great Plains	0.0562	0.1592
Arkansas, Iowa, Kansas, Louisiana, Missouri, Oklahoma, Texas	West Interior (Forest City, Cherokee Basins)	0.3465	0.6525
	West Interior (Arkoma Basin)	0.7555	3.3591
	West Interior (Gulf Coast Basin)	0.3372	1.2987
Alaska	Northwest (AK)	0.0562	1.6233
Washington	Northwest (WA)	0.0562	0.5900

Table 5-2. CH_4 emission factors for post-mining activities involving the storage or handling of coal from Canada

(QC.5.3(2)(*b*)(*c*))

Coal origin		**CH_4 emission factor by mine type (cubic metres/ metric ton)**	
Province	**Coal basin**	**Surface mine**	**Underground mine**
British Colombia	Comox	0.500	N/A
	Crowness	0.169	N/A
	Elk Valley	0.900	N/A
	Peace River	0.361	N/A
	Province average	0.521	N/A
Alberta	Battle River	0.067	N/A
	Cadomin-Luscar	0.709	N/A
	Coalspur	0.314	N/A
	Obed Mountain	0.238	N/A
	Sheerness	0.048	N/A
	Smokey River	0.125	0.067
	Wabamun	0.176	N/A
	Province average	0.263	0.067
Saskatchewan	Estavan	0.055	N/A
	Willow Bunch	0.053	N/A
	Province average	0.054	N/A
New Brunswick	Province average	0.060	N/A
Nova Scotia	Province average	N/A	2.923

QC.6. HYDROGEN PRODUCTION

QC.6.1. Covered sources

The covered sources are all the processes used to produce hydrogen.

QC.6.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2 emissions attributable to hydrogen production processes, in metric tons;

(2) the annual feedstock consumption by feedstock type, including petroleum coke, expressed

(*a*) in millions of cubic metres at standard conditions, for gases;

(*b*) in kilolitres, for liquids;

(*c*) in metric tons for non-biomass solids;

(*d*) in bone dry metric tons, for biomass-derived solid fuels;

(3) the annual hydrogen produced, in millions of cubic metres at standard conditions;

(4) the carbon content of each feedstock type;

(5) the annual CO_2, CH_4 and N_2O emissions attributable to combustion, calculated in accordance with QC.1, in metric tons.

Subparagraph 4 of the first paragraph does not apply to the CO_2 emissions of an emitter who calculates emissions using data from a continuous emission monitoring and recording system.

QC.6.3. Calculation methods for CO_2 emissions

CO_2 emissions from the production of hydrogen must be calculated using one of the calculation methods in QC.6.3.1 and QC.6.3.2.

QC.6.3.1. Use of a continuous emission monitoring and recording system

The annual CO_2 emissions from the production of hydrogen may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.6.3.2. Calculation by feedstock material balance

The annual CO_2 emissions from the production of hydrogen may be calculated by feedstock material balance using equation 6-1:

Equation 6-1

$$CO_2 = \sum_{i=1}^{n} \sum_{j=1}^{m} \left[\left(FS_j \times CF_j \right) - S_j \right] \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions from the production of hydrogen, in metric tons;

n = Number of operating days per year;

i = Day;

m = Total number of feedstocks;

j = Type of feedstock;

FS_j = Quantity of feedstock *j* consumed daily, in cubic metres at standard conditions;

CF_j = Carbon content of feedstock *j*, in kilograms of carbon per cubic metre of feedstock at standard conditions;

S_j = Daily emissions of carbon from sources other than hydrogen production, in kilograms of carbon;

This coefficient must be used only for CO_2 or CH_4 emissions that are calculated and reported in accordance with this Regulation. For example, carbon species in unconverted feedstock contained in PSA off-gas and hydrogen plant product that is diverted to fuel gas systems, fed to downstream units, or diverted to flare may be included provided the related CO_2 or CH_4 emissions are calculated and reported in accordance with this Regulation.

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

QC.6.4. Sampling, analysis and measurement requirements

An emitter who uses the calculation method in QC.6.3.2 must

(1) measure the feedstock consumption rate daily;

(2) collect samples of each type of feedstock consumed and analyze each sample for carbon content using the methods specified in QC.1.5.5,

(*a*) daily, for all feedstocks except natural gas, by collecting the sample from a location that provides samples representative of the feedstock consumed in the hydrogen production process;

(*b*) monthly, when natural gas is used as a feedstock and not mixed with another feedstock prior to consumption;

(3) measure hydrogen produced daily.

QC.7. IRON AND STEEL PRODUCTION

QC.7.1. Covered sources

The covered sources are primary processes to produce both iron and steel, secondary steelmaking processes, iron production processes, and metallurgical coke production processes.

QC.7.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) for all types of facility:

(*a*) the annual CO_2 and CH_4 emissions calculated for each facility, in metric tons;

(*b*) the annual CO_2, CH_4 and N_2O emissions attributable to the use of stationary combustion units, calculated in accordance with QC.1, in metric tons;

(2) for metallurgical coke production:

(*a*) the annual CO_2 and CH_4 emissions attributable to the production of metallurgical coke, in metric tons;

(*b*) the annual consumption of coking coal used in the production of metallurgical coke, in metric tons;

(*c*) the annual consumption of process materials other than coking coal used in the production of metallurgical coke, in metric tons;

(*d*) the annual consumption of blast furnace gas used in the production of metallurgical coke, in metric tons;

(*e*) the annual production of metallurgical coke, in metric tons;

(*f*) the quantity of coke oven gas transferred out of the establishment during the year, in metric tons;

(*g*) the quantity of other coke oven by-products, such as coal tar, light oil and coke breeze, transferred out of the establishment during the year, in metric tons;

(*h*) the carbon content of the material inputs for the production of metallurgical coke listed in subparagraphs *b* to *g* and of the material outputs, in metric tons of carbon per metric ton of material;

(3) for iron and steel production:

(*a*) the annual CO_2 and CH_4 emissions attributable to the production of iron and steel, in metric tons;

(*b*) the annual consumption of coke used in the production of iron and steel, excluding sinter production, in metric tons;

(*c*) the annual consumption of on-site coke oven by-products, such as coal tar, light oil or coke breeze, consumed in the blast furnace, in metric tons;

(*d*) the annual quantity of coal injected directly into the blast furnace, in metric tons;

(*e*) the annual quantity of limestone injected directly into the blast furnace, in metric tons;

(*f*) the annual quantity of dolomite injected directly into the blast furnace, in metric tons;

(*g*) the annual consumption of carbon electrodes consumed in the electric arc furnace, in metric tons;

(*h*) the annual quantity of direct reduced iron introduced to an electric arc furnace or basic oxygen furnace, in metric tons;

(*i*) the annual consumption of materials, other than those expressly mentioned in this paragraph, consumed in iron and steel production, in metric tons;

(*j*) the annual consumption of coke oven gas in a blast furnace, in metric tons;

(*k*) the annual quantity of steel produced, in metric tons;

(*l*) the annual quantity of iron produced and not transformed into steel, in metric tons;

(*m*) the quantity of blast furnace gas transferred out of the establishment during the year, in metric tons;

(*n*) the carbon content of the material inputs for iron and steel production listed in subparagraphs *b* to *m* and of the material outputs, in metric tons of carbon per metric ton of material;

(4) for sinter production:

(*a*) the annual CO_2 and CH_4 emissions from sinter production, in metric tons;

(*b*) the annual quantity of coke breeze consumed in sinter production, in metric tons;

(*c*) the annual quantity of coke oven gas consumed in a blast furnace in sinter production, in metric tons;

(*d*) the annual quantity of gases other than the gas referred to in subparagraph *c* consumed in sinter production, in metric tons;

(*e*) the annual quantity of process materials other than those expressly mentioned in this paragraph consumed in sinter production, in metric tons;

(*f*) the quantity of sinter off gas transferred out of the establishment during the year, in metric tons;

(*g*) the carbon content of the material inputs for sinter production listed in subparagraphs *b* to *f* and of the material outputs, in metric tons of carbon per metric ton of material;

(5) for direct reduced iron production:

(*a*) the annual CO_2 and CH_4 emissions attributable to direct reduced iron production, in metric tons;

(*b*) the annual energy from natural gas used in direct reduced iron production, in gigajoules;

(*c*) the annual energy from coke breeze used in direct reduced iron production, in gigajoules;

(*d*) the annual energy from metallurgical coke used in direct reduced iron production, in gigajoules;

(*e*) the annual quantity of direct reduced iron produced, in metric tons;

(*f*) the carbon content of the material inputs for direct reduced iron production listed in subparagraphs *b* to *d*, in metric tons of carbon per gigajoule;

(*g*) the carbon content of the direct reduced iron production referred to in subparagraph *e*, in metric tons of carbon per metric ton of material.

Subparagraph *h* of subparagraph 2, subparagraph *n* of subparagraph 3, subparagraph *g* of subparagraph 4 and subparagraphs *f* and *g* of subparagraph 5 of the first paragraph do not apply to the CO_2 emissions of an emitter who calculates emissions using data from a continuous emission monitoring and recording system.

QC.7.3. Calculation methods for CO_2 and CH_4 emissions

An emitter must calculate the annual CO_2 and CH_4 emissions attributable to primary processes to produce both iron and steel, secondary steelmaking processes, iron production processes and metallurgical coke production processes using one of the calculation methods in QC.7.3.1 and QC.7.3.2.

QC.7.3.1. Use of a continuous emission monitoring and recording system

The annual CO_2 and CH_4 emissions attributable to primary processes to produce both iron and steel, secondary steelmaking processes, iron production processes and metallurgical coke production processes may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.7.3.2. Calculation by mass balance

The annual CO_2 emissions attributable to primary processes to produce both iron and steel, secondary steelmaking processes, iron production processes and metallurgical coke production processes must be calculated using the methods in subparagraphs 1 to 5 depending on the process used and the type of production, expressed

(1) for primary processes to produce both iron and steel, secondary steelmaking processes, iron production processes and metallurgical coke production processes, using equation 7-1:

Equation 7-1

$$CO_2 = CO_{2,COKE} + CO_{2,IRON,STEEL} + CO_{2\,SINTER} + CO_{2,DRI}$$

Where:

CO_2 = Annual CO_2 emissions attributable to primary processes to produce both iron and steel, secondary steelmaking processes, iron production processes and metallurgical coke production processes, in metric tons;

$CO_{2,\ COKE}$ = Annual emissions attributable to the production of metallurgical coke, calculated in accordance with equation 7-2, in metric tons;

$CO_{2,\ IRON,\ STEEL}$ = Annual emissions attributable to the production of iron and steel, calculated in accordance with equation 7-3, in metric tons;

$CO_{2,\ SINTER}$ = Annual emissions attributable to sinter production, calculated in accordance with equation 7-4, in metric tons;

$CO_{2,\ DRI}$ = Annual emissions attributable to direct reduced iron production, in metric tons.

(2) for the production of coke, using equation 7-2:

Equation 7-2

$$CO_{2,COKE} = \left[(CC \times C_{CC}) + \sum_{i=1}^{n} (PM_i \times C_{PMi}) + (COG \times C_{COG}) - (MC \times C_{MC}) - (BFG \times C_{BFG}) - \sum_{j=1}^{m} (COB_j \times C_{COB\,j}) \right] \times 3.664$$

Where:

$CO_{2,\,COKE}$ = Annual CO_2 emissions attributable to the production of metallurgical coke, in metric tons;

CC = Annual consumption of coking coal, in metric tons;

C_{CC} = Carbon content of coking coal used in the production of metallurgical coke or other by-products, in metric tons of carbon per metric ton of coking coal;

n = Number of process materials;

i = Type of process material, other than coking coal, used in metallurgical coke production, such as natural gas or fuel oil;

PM_i = Annual consumption of process material *i*, other than coking coal, used in metallurgical coke production, such as natural gas or fuel oil, in metric tons;

C_{PMi} = Carbon content of process material *i*, other than coking coal, used in metallurgical coke production, such as natural gas or fuel oil, in metric tons of carbon per metric ton of process material *i*;

COG = Quantity of coke oven gas transferred out of the establishment during the year, in metric tons;

C_{COG} = Carbon content of the coke oven gas transferred out of the establishment during the year, in metric tons of carbon per metric ton of coke oven gas;

MC = Annual production of metallurgical coke, in metric tons;

C_{MC} = Carbon content of the metallurgical coke produced, in metric tons of carbon per metric ton of metallurgical coke;

BFG = Annual consumption of blast furnace gas, in metric tons;

C_{BFG} = Carbon content of blast furnace gas, in metric tons of carbon per metric ton of blast furnace gas;

COB_j = Quantity of coke oven by-product *j* transferred out of the establishment during the year, in metric tons;

C_{COBj}= Carbon content of coke oven by-product *j* transferred out of the establishment during the year, in metric tons of carbon per metric ton of by-product *j*;

m = Number of coke oven by-products transferred out of the establishment during the year;

j = Type of by-product;

3.664 = Ratio of molecular weights, CO_2 to carbon.

(3) for the production of iron and steel, using equation 7-3:

Equation 7-3

$$CO_{2\ IRON,STEEL} = \Big[(MC \times C_{MC}) + \sum_{i=1}^{n} (COB_i \times C_{COBi}) + (CI \times C_{CI}) + (L \times C_L) + (D \times C_D) + (CE \times C_{CE}) + (DRI \times C_{DRI}) + \sum_{j=1}^{m} (O_j \times C_{Oj}) + (COG \times C_{COG}) - (S \times C_S) - (IP \times C_{IP}) - (BFG \times C_{BFG}) \Big] \times 3.664$$

Where:

$CO_{2\ IRON,\ STEEL}$ = Annual CO_2 emissions attributable to the production of iron and steel, in metric tons;

CO = Annual consumption of metallurgical coke, excluding sinter, in metric tons;

MC_{MG} = Carbon content of metallurgical coke, excluding sinter, in metric tons of carbon per metric ton of metallurgical coke;

n = Number of coke oven by-products consumed in the blast furnace;

i = Type of by-product;

COB_i = Annual consumption of by-product *i* of coke oven consumed in the blast furnace, in metric tons;

C_{COBi} = Carbon content of coke oven by-product *i* consumed in the blast furnace, in metric tons of carbon per metric ton of by-product *i*;

CI = Annual quantity of coal injected directly into the blast furnace, in metric tons;

C_{CI} = Carbon content of coal injected directly into the blast furnace, in metric tons of carbon per metric ton of coal;

L = Annual consumption of limestone, in metric tons;

C_L = Carbon content of limestone, in metric tons of carbon per metric ton of limestone;

D = Annual consumption of dolomite, in metric tons;

C_D = Carbon content of dolomite, in metric tons of carbon per metric ton of dolomite;

CE = Annual consumption of carbon electrodes in the electric arc furnace, in metric tons;

C_{CE} = Carbon content of carbon electrodes consumed in the electric arc furnace, in metric tons of carbon per metric ton of carbon electrodes;

DRI = Annual quantity of direct reduced iron introduced to an electric arc furnace or basic oxygen furnace, in metric tons;

C_{DRI} = Carbon content of direct reduced iron introduced to an electric arc furnace or basic oxygen furnace, in metric tons of carbon per metric ton of direct reduced iron;

m = Number of process materials, other than those expressly mentioned in the equation, used in production, such as sinter or waste plastic;

j = Type of process material;

O_j = Annual quantity of process material *j*, other than the materials expressly mentioned in the equation, used in production, such as sinter or waste plastic, in metric tons;

C_{Oj} = Carbon content of process material *j*, other than the materials specified in the equation, used in production, in metric tons of carbon per metric ton of process material *j*;

COG = Annual consumption of coke oven gas consumed in the blast furnace, in metric tons;

C_{COG} = Carbon content of coke oven gas consumed in the blast furnace, in metric tons of carbon per metric ton of coke oven gas;

S = Annual production of steel, in metric tons;

C_S = Carbon content of the steel produced, in metric tons of carbon per metric ton of steel;

IP = Annual quantity of iron produced but not transformed into steel, in metric tons;

C_{IP} = Carbon content of iron produced but not transformed into steel, in metric tons of carbon per metric ton of iron;

BFG = Quantity of blast furnace gas transferred out of the establishment during the year, in metric tons;

C_{BFG} = Carbon content of blast furnace gas transferred out of the establishment during the year, in metric tons of carbon per metric ton of blast furnace gas;

3.664 = Ratio of molecular weights, CO_2 to carbon.

(4) for sinter production, using equation 7-4:

Equation 7-4

$$CO_{2\ SINTER} = \left[(CBR \times C_{CBR}) + (BG \times C_{BG}) + (COG \times C_{COG}) + \sum_{i=1}^{n} (PM_i \times C_{PM\ i}) - (SOG \times C_{SOG}) \right] \times 3.664$$

Where:

$CO_{2\ SINTER}$ = Annual CO_2 emissions attributable to sinter production, in metric tons;

CBR = Annual quantity of coke breeze used in sinter production, in metric tons;

C_{CBR} = Carbon content of the coke breeze used in sinter production, in metric tons of carbon per metric ton of coke breeze;

BG = Annual consumption of the blast furnace gas used in sinter production, in metric tons;

C_{BG} = Carbon content of the blast furnace gas used in sinter production, in metric tons of carbon per metric ton of blast furnace gas;

COG = Annual consumption of coke oven gas consumed in the blast furnace for sinter production, in metric tons;

C_{COG} = Carbon content of the coke oven gas consumed in the blast furnace for sinter production, in metric tons of carbon per metric ton of coke oven gas;

n = Number of process materials other than those expressly mentioned in the equation;

i = Type of process material, other than the materials expressly mentioned in the equation, used in sinter production, such as natural gas or fuel oil;

PM_i = Annual consumption of process material *i*, other than the materials expressly mentioned in the equation, used in sinter production, such as natural gas or fuel oil, in metric tons;

C_{PMi} = Carbon content of process material *i*, other than the materials expressly mentioned in the equation, used in sinter production, in metric tons of carbon per metric ton of process material *i*;

SOG = Quantity of sinter off gas transferred out of the establishment during the year, in metric tons;

C_{SOG} = Carbon content of sinter off gas transferred out of the establishment during the year, in metric tons of carbon per metric ton of sinter off gas;

3.664 = Ratio of molecular weights, CO_2 to carbon.

(5) for direct reduced iron production, using equation 7-5:

Equation 7-5

$$CO_{2DRI} = \left[\left(DRI_{NG} \times C_{NG}\right) + \left(DRI_{BZ} \times C_{BZ}\right) + \left(DRI_{CK} \times C_{CK}\right) - \left(DRI \times C_{DRI}\right)\right] \times 3.664$$

Where:

$CO_{2\,DRI}$ = Annual CO_2 emissions attributable to direct reduced iron production, in metric tons;

DRI_{NG} = Annual energy from natural gas used in direct reduced iron production, in gigajoules;

C_{NG} = Carbon content of natural gas, in metric tons of carbon per gigajoule;

DRI_{BZ} = Annual energy from coke breeze used in direct reduced iron production, in gigajoules;

C_{BZ} = Carbon content of coke breeze, in metric tons of carbon per gigajoule;

DRI_{CK} = Annual energy from metallurgical coke in direct reduced iron production, in gigajoules;

C_{CK} = Carbon content of the metallurgical coke used in direct reduced iron production, in metric tons of carbon per gigajoule;

DRI = Annual direct reduced iron production, in metric tons;

C_{DRI} = Carbon content of direct reduced iron produced, in metric tons of carbon per metric ton of direct reduced iron produced;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.7.4. Sampling, analysis and measurement requirements

QC.7.4.1. Carbon content

An emitter who operates an enterprise, facility or establishment that produces steel or ferrous metals must measure the carbon content

(1) of fossil fuels, in accordance with QC.1.5.5;

(2) of by-products consumed in iron and steel production, such as blast furnace gas, coke oven gas, coal tar, light oil, coke breeze and sinter off gas, using the appropriate method for each by-product;

(3) of the limestone and dolomite consumed in iron and steel production, in accordance with ASTM C25-06 “Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime”;

(4) of carbon electrodes used in electric arc furnaces, using the data provided by the supplier of carbon electrodes;

(5) of finished products from all iron and steel production processes, such as steel, iron not transformed into steel and direct reduced iron, in accordance with ASTM E1019-08 "Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques" or ASTM E351-93 (2006) "Standard Test Methods for Chemical Analysis of Cast Iron-All Types".

QC.7.4.2. Consumption of process materials

The emitter must determine the quantity of solid, liquid and gaseous process inputs and outputs and the quantity of by-products used in the production of iron and steel using the same plant instruments used for inventory purposes, such as weigh hoppers or belt weigh feeders.

QC.8. LIME PRODUCTION

QC.8.1. Covered sources

The covered sources are all the processes used in the production of quick lime.

QC.8.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2, CH_4 and N_2O emissions, in metric tons;

(2) the annual CO_2 emissions attributable to the quick lime production process, in metric tons;

(3) for each type of lime produced:

  (*a*) the monthly CO_2 emission factor, in metric tons of CO_2 per metric ton of lime;

  (*b*) the monthly production, in metric tons;

(*c*) the monthly content of calcium oxide in the lime, in metric tons of calcium oxide per metric ton of lime;

(*d*) the monthly content of magnesium oxide in the lime, in metric tons of magnesium oxide per metric ton of lime;

(4) for each type of calcined by-product or waste:

(*a*) the quarterly emission factors, in metric tons of CO_2 per metric ton of calcined by-products or wastes;

(*b*) the quarterly production of calcined by-products or wastes, in metric tons;

(*c*) the quarterly content of calcium oxide in calcined by-products and wastes, in metric tons of calcium oxide per metric ton of calcined by-products or wastes;

(*d*) the quarterly content of magnesium oxide in calcined by-products and wastes, in metric tons of magnesium oxide per metric ton of calcined by-products or wastes;

(5) the annual CO_2, CH_4 and N_2O emissions attributable to fuel combustion in all kilns, calculated in accordance with QC.8.3.2, (2), in metric tons;

(6) the annual CO_2, CH_4 and N_2O emissions attributable to the use of stationary combustion units, with the exception of lime kilns, calculated in accordance with QC.1, in metric tons;

Subparagraphs 2, 3, 4 and 5 of the first paragraph do not apply to the CO_2 emissions of an emitter who calculates kiln emissions using data from a continuous emission monitoring and recording system. The emitter must, however, report the quantity of each fuel used for each kiln.

QC.8.3. Calculation methods for CO_2 emissions from kilns

The annual CO_2 emissions from kilns must be calculated in according with one of the two calculation methods specified in QC.8.3.1 and QC.8.3.2.

QC.8.3.1. Use of a continuous emission monitoring and recording system

The annual CO_2 emissions may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.8.3.2. Calculation by mass balance

The annual CO_2 emissions may be calculated using the following methods:

(1) The CO_2 emissions from kilns must be calculated, for each type of quick lime, using equation 8-1:

Equation 8-1

$$CO_2 = \sum_{i}^{12}\sum_{j}^{y}\left[QL_{ij} \times EF_{QL_{ij}}\right] + \sum_{k}^{4}\sum_{l}^{z}\left[CBP_{kl} \times EF_{CBP_{kl}}\right]$$

Where:

CO_2 = Emissions of CO_2 from kilns, in metric tons;

i = Month;

y = Number of types of lime;

j = Type of lime;

QL_{ij} = Production of quick lime *j* for month *i*, in metric tons;

EF_{QLij} = CO_2 emission factor of quick lime *j* for month *i*, calculated in accordance with equation 8-2, in metric tons of CO_2 per metric ton of quick lime;

k = Quarter

z = Number of types of calcined by-products and wastes;

l = Type of calcined by-products or wastes;

CBP_{kl} = Production of calcined by-products and wastes *l* in quarter *k*, including lime kiln dust, scrubber sludge and other calcined wastes, in metric tons;

EF_{CBRkl} = CO_2 emission factor for calcined by-products or wastes *l* for quarter *k*, calculated in accordance with equation 8-3, in metric tons of CO_2 per metric ton of calcined by-products or wastes.

(*a*) the monthly CO_2 emission factor for quick lime (EF_{QL}) must be calculated, for each type of quick lime, using equation 8-2:

Equation 8-2

$$EF_{QL} = (CaO_{QL} \times 0.785) + (MgO_{QL} \times 1.092)$$

Where:

EF_{QL} = Monthly CO_2 emission factor for quick lime, in metric tons of CO_2 per metric ton of quick lime;

CaO_{QL} = Monthly content of calcium oxide in the quick lime, in metric tons of calcium oxide per metric ton of quick lime;

0.785 = Ratio of molecular weights, CO_2 to calcium oxide;

MgO_{QL} = Monthly content of magnesium oxide in the quick lime, in metric tons of magnesium oxide per metric ton of quick lime;

1.092 = Ratio of molecular weights, CO_2 to magnesium oxide;

(*b*) the quarterly CO_2 emission factor for calcined by-products and wastes (EF_{CBP}) must be calculated, for each type of calcined by-products and wastes, using equation 8-3:

Equation 8-3

$$EF_{CBP} = (CaO_{CBP} \times 0.785) + (MgO_{CBP} \times 1.092)$$

Where:

EF_{CBP} = Quarterly CO_2 emission factor for calcined by-products and wastes, in metric tons of CO_2 per metric ton of calcined by-products and wastes;

CaO_{CBP} = Quarterly content of calcium oxide in calcined by-products and wastes, in metric tons of calcium oxide per metric ton of calcined by-products and wastes;

0.785 = Ratio of molecular weights, CO_2 to calcium oxide;

MgO_{CBP} = Quarterly content of magnesium oxide in calcined by-products and wastes, in metric tons of magnesium oxide per metric ton of calcined by-products and wastes;

1.092 = Ratio of molecular weights, CO_2 to magnesium oxide.

(2) The CO_2, CH_4 and N_2O emissions attributable to the combustion of fuels in kilns must be calculated in accordance with the calculation methods in QC.1. When pure biomass fuels, in other words fuels constituted of the same substance for at least 97% of their total weight, are consumed only during start-up, shut-down, or malfunction operating periods for the apparatus or units, the emitter may calculate CO_2 emissions using the calculation method in QC.1.3.1.

QC.8.4. Sampling, analysis and measurement requirements

An emitter who operates an enterprise, facility or establishment that produces lime must:

(1) collect at least one sample each month for each type of lime produced during the month and determine the monthly content of calcium oxide and of magnesium oxide in each type of lime using ASTM C25-06 "Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime", ASTM C1301-95 (2009) e1 "Standard Test Method for Major and Trace Elements in Limestone and Lime by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP) and Atomic Absorption (AA)" or ASTM C1271-99 (2006) "Standard Test Method for X-ray Spectrometric Analysis of Lime and Limestone";

(2) collect at least one sample each quarter for each type of calcined by-products or wastes produced during the quarter and determine the quarterly content of calcium oxide and of magnesium oxide in each type of calcined by-products or wastes in accordance with the standards in subparagraph 1;

(3) complete a monthly estimate of the quantity of lime produced and sold using the data on lime sales for each type of lime; the quantity must be adjusted to take into account the difference in beginning and end-of-period inventories of each type of lime;

(4) complete a quarterly estimate of the quantity of calcined by-products and wastes sold, using the data on sales for each type of calcined by-products or wastes; the quantity must be adjusted to take into account the difference in beginning- and end-of-period inventories, over a maximum period of one year, for each type of calcined by-products and wastes;

(5) determine, at least quarterly, the quantity of calcined by-products and wastes not sold for each type of calcined by-products and wastes, using the sales data or the production rate for calcined by-products and wastes compared to lime production.

QC.9. PETROLEUM REFINERIES

QC.9.1. Covered sources

The covered sources are all the processes used to produce gasoline, aromatics, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt, or other products through distillation of petroleum or through redistillation, cracking, rearrangement or reforming of unfinished petroleum derivatives.

QC.9.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2, CH_4 and N_2O emissions attributable to the combustion of refinery fuel gas, flexigas or associated gas, calculated in accordance with QC.2, in metric tons;

(2) the annual CO_2 emissions attributable to catalyst regeneration, calculated in accordance with QC.9.3.1, in metric tons;

(3) the annual CO_2, CH_4 and N_2O emissions from process vents, calculated in accordance with QC.9.3.2, in metric tons;

(4) the annual CO_2 and CH_4 emissions attributable to asphalt production, calculated in accordance with QC.9.3.3, in metric tons;

(5) the annual CO_2 emissions from sulphur recovery units, calculated in accordance with QC.9.3.4, in metric tons;

(6) the annual CO_2, CH_4 and N_2O emissions attributable to the use of stationary combustion units other than flares and antipollution devices, calculated in accordance with QC.1.3 and QC.1.4, in metric tons;

(7) the annual CO_2, CH_4 and N_2O emissions from flares and antipollution devices, calculated in accordance with QC.9.3.5, in metric tons;

(8) the annual CH_4 emissions from above-ground storage tanks, calculated in accordance with QC.9.3.6, in metric tons;

(9) the annual CH_4 and N_2O emissions attributable to wastewater treatment, calculated in accordance with QC.9.3.7, in metric tons;

(10) the annual CH_4 emissions from oil-water separators, calculated in accordance with QC.9.3.8, in metric tons;

(11) the annual CH_4 emissions from equipment leaks, calculated in accordance with QC.9.3.9, in metric tons;

(12) the annual consumption of each type of feedstock that emits CO_2, CH_4 or N_2O, including petroleum coke, expressed

(*a*) in millions of cubic metres at standard conditions, for gases;

(*b*) in kilolitres, for liquids;

(*c*) in metric tons for non-biomass solids;

(*d*) in bone dry metric tons, for biomass-derived solid fuels;

(13) the annual consumption of each type of fuel that emits CO_2, CH_4 or N_2O, expressed

(*a*) in millions of cubic metres at standard conditions, for gases;

(*b*) in kilolitres, for liquids;

(*c*) in metric tons for non-biomass solids;

(*d*) in bone dry metric tons, for biomass-derived solid fuels.

QC.9.3. Calculation methods for CO_2, CH_4 and N_2O emissions

The annual CO_2, CH_4 and N_2O emissions attributable to the operation of a petroleum refinery must be calculated in accordance with the calculation methods in QC.9.3.1 to QC.9.3.9.

QC.9.3.1. Calculation of CO_2 emissions attributable to catalyst regeneration

The annual CO_2 emissions attributable to catalyst regeneration for a unit equipped with a continuous emission monitoring and recording system must be calculated in accordance with QC.1.3.4 or, in the absence of such a system, in accordance with the following methods, depending on the process involved:

(1) for the continuous regeneration of catalyst material in fluid catalytic cracking units and fluid cokers, using equations 9-1, 9-2 and 9-3:

Equation 9-1

$$CO_2 = \sum_{j=1}^{n} CR_j \times CF \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the continuous regeneration of catalyst material in fluid catalytic cracking units and fluid cokers, in metric tons;

n = Number of days of operation during the year;

j = Day;

CR_j = Daily average coke burn for day *j*, calculated in accordance with equation 9-2, in kilograms;

CF = Carbon faction in coke burned, in kilograms of carbon per kilogram of coke burned;

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

Equation 9-2

$$CR_j = \frac{1}{n}\left[\sum_{i=1}^{n}[K_1 Q_r \times \left(\%CO_2 + \%CO\right) + K_2 Q_a - K_3 Q_r \times \left[\%CO/2 + \%CO_2 + \%O_2\right] + K_3 Q_{oxy} \times (\%O_{2\,Qoxy})]_i\right]$$

Where:

CR_j = Daily average coke burn rate, in kilograms;

n = Number of hours of operation per day;

i = Hour;

K_1, K_2, K_3 = Material balance and conversion factors (K_1, K_2, and K_3) from Table 9-1 in QC.9.5;

Q_r = Volumetric flow of exhaust gas before entering the antipollution system, calculated in accordance with equation 9-3, in cubic metres per minute, at standard conditions and on a dry basis;

$\%CO_2$ = CO_2 concentration in regenerator exhaust, in cubic metres of CO_2 per cubic metre of exhaust gas on a dry basis, expressed as a percentage;

$\%CO$ = Concentration of carbon monoxide in regenerator exhaust, in cubic metres of carbon monoxide per cubic metre of exhaust gas on a dry basis, expressed as a percentage;

Q_a = Volumetric flow of air to regenerator, in cubic metres per minute, at standard conditions and on a dry basis;

$\%O_2$ = Concentration of oxygen in regenerator exhaust, in cubic metres of oxygen per cubic metre of exhaust gas on a dry basis, expressed as a percentage;

Q_{oxy} = Volumetric flow of oxygen to regenerator, in cubic metres per minute, at standard conditions and on a dry basis;

$\%O_{2Qoxy}$ = Concentration of oxygen in enriched air stream inlet to regenerator, percentage by volume on a dry basis.

Equation 9-3

$$Q_r = \frac{\left[79 \times Q_a + (100 - \%O_{2\,Qoxy}) \times Q_{oxy}\right]}{\left[100 - \%CO_2 - \%CO - \%O_2\right]}$$

Where:

Q_r = Volumetric flow of exhaust gas from regenerator before entering the antipollution system, in cubic metres per minute, at standard conditions and on a dry basis;

79 = Nitrogen concentration in air, expressed as a percentage;

Q_a = Volumetric flow of air to regenerator, in cubic metres per minute, at standard conditions and on a dry basis;

$\%O_{2Qoxy}$ = Concentration of oxygen at O_2 enriched air stream inlet, in cubic metres of oxygen per cubic metre of air stream on a dry basis, expressed as a percentage;

Q_{oxy} = Volumetric flow of oxygen in O_2 enriched air stream inlet, in cubic metres per minute, at standard conditions and on a dry basis;

$\%CO_2$ = Concentration of CO_2 in regenerator exhaust, in cubic metres of CO_2 per cubic metre of exhaust gas on a dry basis, expressed as a percentage;

$\%CO$ = Concentration of carbon monoxide in regenerator exhaust, in cubic metres of carbon monoxide per cubic metre of exhaust gas on a dry basis, expressed as a percentage.

When no auxiliary fuel is burned and the emitter does not use a continuous CO monitoring and recording system, the percentage is zero;

$\%O_2$ = Concentration of oxygen in regenerator exhaust, in cubic metres of oxygen per cubic metre of exhaust gas on a dry basis, expressed as a percentage.

(2) for periodic catalyst regeneration processes, using equation 9-4:

Equation 9-4

$$CO_2 = \sum_{i=1}^{n} CRR \times \left(CF_{spent} - CF_{regen}\right)_i \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to periodic catalyst regeneration processes, in metric tons;

n = Number of regeneration cycles during the year;

i = Regeneration cycle;

CRR = Mass of catalyst regenerated, in kilograms per regeneration cycle;

CF_{spent} = Carbon content of spent catalyst, in kilograms of carbon per kilogram of spent catalyst;

CF_{regen} = Carbon content of regenerated catalyst, in kilograms of carbon per kilogram of regenerated catalyst.

If no carbon content in the regenerated catalyst is detected, the carbon content of the catalyst is zero;

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

(3) for continuous catalyst regeneration material in catalysers used for operations other than fluid catalytic cracking and fluid coking, using equation 9-5:

Equation 9-5

$$CO_2 = CC \times (CF_{spent} - CF_{regen}) \times H \times 3.664$$

Where:

CO_2 = Annual CO_2 emissions attributable to continuous catalyst regeneration in catalysers used for operations other than fluid catalytic cracking and fluid coking, in metric tons;

CC = Average catalyst regeneration rate, in metric tons per hour;

CF_{spent} = Carbon content of spent catalyst, in kilograms of carbon per kilogram of spent catalyst;

CF_{regen} = Carbon content of regenerated catalyst, in kilograms of carbon per kilogram of regenerated catalyst.

If no carbon content in the regenerated catalyst is detected, the carbon content of the catalyst is zero;

H = Number of hours of operation of regenerator during the year;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.9.3.2. Calculation of CO_2, CH_4 and N_2O emissions from process vents

The annual CO_2, CH_4 and N_2O emissions from process vents, other than emissions required for the process, must be calculated using equation 9-6:

Equation 9-6

$$E_x = \sum_{i=1}^{n} VR_i \times F_{xi} \times \frac{MX_x}{MVC} \times VT_i \times 0.001$$

Where:

E_x = Annual emissions of *x*, where x = CO_2, CH_4 or N_2O, from process vents, in metric tons;

n = Number of venting events during the year;

i = Venting event;

VR_i = Vent rate for venting event *i*, in cubic metres per unit of time at standard conditions;

F_{xi} = Molar fraction of *x* in vent gas stream during venting event *i*, in kilomoles of *x* per kilomole of gas;

MW_x = Molecular weight (molecular mass) of *x* in kilograms per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole, at standard conditions);

VT_i = Duration of venting event *i*, using the same units of time as for VR_i;

0.001 = Conversion factor, kilograms to metric tons.

QC.9.3.3. Calculation of CO_2 and CH_4 emissions attributable to asphalt blowing activities

The annual CO_2 and CH_4 emissions attributable to asphalt production must be calculated using equations 9-7 and 9-8:

Equation 9-7

$$CO_2 = M_A \times EF \times \frac{MW_{CH4}}{MVC} \times DE \times 2.743 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to asphalt production, in metric tons;

M_A = Quantity of asphalt blown during the year, in thousands of barrels;

EF = Emission factor of 72.35 m^3 of CH_4 per thousand barrels at standard conditions;

MW_{CH4} = Molecular weight (molecular mass) of CH_4, 16.04 kg per kilomole;

MVC = Molar volume conversion factor of 24.06 m^3 per kilomole, at standard conditions;

DE = Control measure destruction efficiency of 98 %, expressed as a decimal, 0.98;

2.743 = Ratio of molecular weights, CO_2 to CH_4;

0.001 = Conversion factor, kilograms to metric tons.

Equation 9-8

$$CH_4 = M_A \times EF \times \frac{MW_{CH4}}{MVC} \times (1 - DE) \times 0.001$$

Where:

CH_4 = Annual CH_4 emissions CH_4 attributable to asphalt production, in metric tons;

M_A = Quantity of asphalt blown during the year, in thousands of barrels;

EF = Emission factor of 72.35 m^3 of CH_4 per thousand barrels at standard conditions;

MW_{CH4} = Molecular weight of CH_4 of 16.04 kg per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole at standard conditions);

DE = Control measure destruction efficiency of 98%, expressed as a decimal, 0.98;

0.001 = Conversion factor, kilograms to metric tons.

QC.9.3.4. Calculation of CO_2 emissions from sulphur recovery units

The annual CO_2 emissions from ??sulphur recovery units must be calculated using equation 9-9:

Equation 9-9

$$CO_2 = FR \times \frac{MW_{CO2}}{MVC} \times MF \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions from sulphur recovery units, in metric tons;

FR = Annual volumetric flow of gas to sulphur recovery units, in cubic metres at standard conditions;

MW_{CO2} = Molecular weight of CO_2 of 44 kg per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole at standard conditions);

MF = Molecular fraction of CO_2 in hydrogen sulphide obtained by sampling at source and analyzing annually, in a percentage expressed as a decimal, or as a factor of 20% or 0.20;

0.001 = Conversion factor, kilograms to metric tons.

QC.9.3.5. Calculation methods for CO_2, CH_4 and N_2O emissions attributable to combustion in flares and antipollution devices

The annual CO_2, CH_4 and N_2O emissions attributable to combustion in flares and antipollution devices must be calculated in accordance with the calculation methods in QC.1.

The CO_2 emissions attributable to the combustion of hydrocarbons in flares must be calculated based on the type of equipment used in accordance with the following methods:

(1) for a flare equipped with a continuous monitoring and recording system to measure the flow and the parameters used to determine the high heat value of the gas, using equation 9-10:

Equation 9-10

$$CO_2 = Flare_n \times HHV \times EmF \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of hydrocarbons in flares, in metric tons;

$Flare_n$ = Annual volume of gas at flare *n*, in cubic metres at standard conditions;

HHV = High heat value for flare gas *n*, in gigajoules per cubic metre;

EmF = CO_2 emission factor of 57.6 kg per gigajoule.

0.001 = Conversion factor, kilograms to metric tons;

(2) for a flare equipped with a continuous monitoring and recording system to measure the flow and the parameters used to determine the carbon content, using equation 9-11:

Equation 9-11

$$CO_2 = Flare_n \times CC_n \times \frac{MW_n}{MVC} \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of hydrocarbons in flares, in metric tons;

$Flare_n$ = Annual volume of gas at flare *n*, in cubic metres at standard conditions;

CC_n = Carbon content of gas at flare *n*, in kilograms of carbon per kilogram of fuel;

MW_n = Molecular weight of gas at flare *n*, in kilograms per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole at standard conditions);

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

(3) for a flare that is not equipped with a continuous monitoring and recording system to measure the flow and the parameters used to determine the high heat value or carbon content, using equation 9-12:

Equation 9-12

$$CO_2 = RFT \times EF_{NMHC} \times CF_{NMHC} \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of hydrocarbons in flares, in metric tons;

RFT = Annual input of refinery fuel gas in cubic metres;

EF_{NMHC} = Emission factor for hydrocarbons other than CH_4, namely 0.002 kg per cubic metre at standard conditions;

CF_{NMHC} = Conversion factor, hydrocarbons other than CH_4 to carbon, namely 0.6;

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

(4) for the use of devices other than flares to destroy gases with a low calorific value, using equation 9-13:

Equation 9-13

$$CO_2 = \sum_{i=1}^{n} \left[GV_i \times CC_i \times \frac{MW_i}{MVC} \right] \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to the combustion of hydrocarbons by devices other than a flare, in metric tons;

n = Number of gases with a low calorific value;

i = Type of gas;

GV_i = Volume of gas *i* destroyed annually, in cubic metres at standard conditions;

CC_i = Average annual carbon content of gas *i*, measured using quarterly data obtained in accordance with QC.1.5.5, in kilograms of carbon per kilogram of fuel;

MW_i = Average annual molecular weight of gas *i*, in kilograms per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole, at standard conditions);

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

QC.9.3.6. Calculation of CH_4 emissions from above-ground storage tanks

The annual CH_4 emissions from above-ground storage tanks containing crude oil, asphalt, naphtha or distillate oils that are not equipped with vapour recovery technology, must be calculated using version 4.09D of the *TANKS* model published by the United States Environmental Protection Agency (USEPA). For the purposes of the calculation, the emitter must

(1) for crude oil, fuel oil and distillate oils, use RVP 5 data for crude oil, No. 2 data for fuel oil, and JP4 data for naphtha-type fuels;

(2) for asphalt, use the data from Table 9-2 in QC.9.5;

(3) the annual throughput for each storage tank must be distributed equally across the twelve months of the year and the single-component liquid option selected;

(4) the total volatile organic compound (VOC) emission values generated by the model must be converted to methane emissions using:

(*a*) a VOC to CH_4 conversion factor of 0.6; or

(*b*) a species specific conversion factor determined by storage tank headspace vapour analysis.

QC.9.3.7. Calculation of CH_4 and N_2O emissions attributable to wastewater treatment

The annual emissions attributable to wastewater treatment must be calculated

(1) for emissions of CH_4, using equation 9-14:

Equation 9-14

$$CH_4 = [(Q \times COD_{qave}) - S] \times B \times MFC \times 0.001$$

Where:

CH_4 = Annual CH_4 emissions attributable to wastewater treatment, in metric tons;

Q = Quantity of wastewater treated annually, in cubic metres;

COD_{qave} = Average quarterly chemical oxygen demand of the wastewater, in kilograms per cubic metre;

S = Quantity of organic components removed annually as sludge, in kilograms of chemical oxygen demand;

B = CH_4 generation capacity, namely 0.25 kg of CH_4 per kilogram of chemical oxygen demand;

MFC = CH_4 conversion factor, specified in Table 9-3 in QC.9.5 by process;

0.001 = Conversion factor, kilograms to metric tons.

(2) for emissions of N_2O, using equation 9-15:

Equation 9-15

$$N_2O = Q \times N_{qave} \times EF_{N2O} \times 1.571 \times 0.001$$

Where:

N_2O = Annual emissions of N_2O attributable to wastewater treatment, in metric tons;

Q = Quantity of wastewater treated annually, in cubic metres;

N_{qave} = Average of quarterly determinations of nitrogen in effluent, in kilograms per cubic metre;

EF_{N2O} = N_2O emission factor for wastewater, 0.005 kg of nitrogen produced by the decomposition of nitrous oxide (N_2O-N) per kilogram of total nitrogen;

1.571 = Conversion factor, kilograms of N_2O-N to kilograms of N_2O;

0.001 = Conversion factor, kilograms to metric tons.

QC.9.3.8. Calculation of CH_4 emissions from oil-water separators

The annual CH_4 emissions from oil-water separators must be calculated using equation 9-16:

Equation 9-16

$$CH_4 = EF_{sep} \times Q_{water} \times CF_{NMHC} \times 0.001$$

Where:

CH_4 = Annual emissions of CH_4 from oil-water separators, in metric tons;

EF_{sep} = Emission factor for hydrocarbons other than CH_4 as specified in Table 9-4 in QC.9.5, in kilograms per cubic metre;

Q_{water} = Quantity of wastewater treated annually by the separator, in cubic metres;

CF_{NMHC} = Conversion factor, CH_4 to hydrocarbons other than CH_4, obtained by sampling and analysis at each separator or, if no representative data is available, using the factor 0.6;

0.001 = Conversion factor, kilograms to metric tons.

QC.9.3.9. Calculation methods for CH_4 leaks from equipment components

The annual fugitive emissions of CH_4 from all components in natural gas, refinery gas and pressure swing adsorption (PSA) systems must be calculated using the VOC measurements made in accordance with QC.9.4.9 and using the following methods:

(1) the annual CH_4 emissions must be calculated using equation 9-17:

Equation 9-17

$$CH_4 = \sum_{1}^{n} \left(E_{VOC-0} + E_{VOC-LC} + E_{VOCP} \right)_n \times CF_{VOC} \times 0.001$$

Where:

CH_4 = Annual CH_4 emissions attributable to leaks from system components, in metric tons;

n = Number of detections per year;

E_{VOC-0} = VOC emissions from components with a screening value of zero, calculated using equation 9-18, in kilograms per screening period;

E_{VOC-LC} = VOC emissions from components with a screening value between the average concentrations present in the atmosphere and 9,999 ppmv, calculated using equation 9-19, in kilograms per screening period;

E_{VOCP} = VOC emissions from components with a screening value greater than 9,999 ppmv, calculated using equation 9-20, in kilograms per screening period;

CF_{VOC} = Specific VOC to CH_4 conversion factor obtained by sampling and analysis at source or, if no representative data is available, a factor of 0.6;

0.001 = Conversion factor, kilograms to metric tons.

(2) COV emissions from components with a screening value of zero when corrected for the average concentrations present in the atmosphere must be calculated using equation 9-18:

Equation 9-18

$$E_{VOC-0} = \sum_{i=1}^{6} CC_i \times ZF_{zi} \times t$$

Where:

E_{VOC-0} = Emissions from components with a VOC screening value of zero, in kilograms per screening period;

i = Component type (1 = valve, 2 = pump seal, 3 = other component, 4 = connector, 5 = flange, 6 = open-ended line);

CC_i = Number of components of type *i* where the screening value is zero;

ZF_{zi} = Zero VOC emission factor specified in Table 9-5 in QC.9.5 for components *i*, in kilograms per hour;

t = Time since last screening, in hours per screening period.

(3) VOC emissions from components with a screening value between the average concentrations present in the atmosphere and 9,999 ppmv must be calculated using equation 9-19:

Equation 9-19

$$E_{VOCL-C} = \sum_{i=1}^{6}\sum_{j=1}^{n}\left(\sigma_i \times SV_{i,j}{}^{\beta i} \times t_{i,j}\right)$$

Where:

E_{VOCL-C} = VOC emissions from components with a screening value between the average concentrations present in the atmosphere and 9 999 ppmv, in kilograms per screening period;

i = Type of component (1 = valve, 2 = pump seal, 3 = other component, 4 = connector, 5 = flange, 6 = open-ended line);

n = Number of components of type *i*;

j = Component of type *i*;

σ_i = Correlation equation coefficient specified in Table 9-5 in QC.9.5 for components of type *i*, in kilograms per hour;

$SV_{i,j}$ = Screening value for component *j* of type *i*;

βi = Correlation equation exponent specified in Table 9-5 in QC.9.5 for components of type *i*, in kilograms per hour;

$t_{i,j}$ = Time component *j* of type *i* has been leaking in hours or, if the time when the leak began is unknown, the time since the last screening, in hours.

(4) VOC emissions from components with a screening value greater than 9,999 ppmv must be calculated using equation 9-20:

Equation 9-20

$$E_{VOCP} = \sum_{i=1}^{6} CC_i \times PF_i \times t$$

Where:

E_{VOCP} = VOC emissions from components with a screening value greater than 9,999 ppmv, in kilograms per screening period;

i = Type of component (1 = valve, 2 = pump seal, 3 = other component, 4 = connector, 5 = flange, 6 = open-ended line);

CC_i = Number of components of type *i* with a screening value greater than 9,999 ppmv;

PF_i = VOC emission factor for components of type *i* as specified in Table 9-5 with a screening value greater than 9,999 ppmv, in kilograms of VOC per hour;

t = Time since the last screening, in hours.

QC.9.4. Sampling, analysis and measurement requirements

QC.9.4.1. Catalyst regeneration

For catalyst regeneration, the emitter must:

(1) for fluid catalytic cracking units and fluid cokers:

(*a*) measure the daily concentration of oxygen in the oxygen-enriched air stream inlet to the regenerator;

(*b*) measure the volumetric flow of air and oxygen-enriched air to the regenerator, on a continuous basis;

(*c*) measure the CO_2, carbon monoxide and oxygen concentrations in the exhaust gas from the regenerator, on a continuous basis or weekly;

(*d*) measure the daily carbon content of the coke combusted;

(*e*) measure the number of days of operation;

(2) for periodic catalyst regeneration:

(*a*) measure the quantity of catalyst regenerated in each regeneration cycle;

(*b*) measure the carbon content of the catalyst prior to and after regeneration;

(3) for continuous catalyst regeneration in operations other than fluid catalytic cracking and fluid coking:

(*a*) measure the hourly catalyst regeneration rate;

(*b*) measure the carbon content of the catalyst, prior to and after regeneration;

(*c*) measure the number of hours of operation.

QC.9.4.2. Process vents

For process vents, the emitter must, for each process venting event, measure the following parameters:

(1) the flow rate for each venting event;

(2) the molar fraction of CO_2, CH_4 and N_2O in the vent gas stream during each venting event;

(3) the duration of each venting event.

QC.9.4.3. Asphalt production

For asphalt production, the emitter must measure the quantity of asphalt blown.

QC.9.4.4.Sulphur recovery

For sulphur recovery, the emitter must measure the volumetric flow rate of acid gas to the sulphur recovery units.

If using a source specific molecular faction value instead of the default factor, the emitter must conduct an annual test of the CO_2 content in the hydrogen sulphide.

QC.9.4.5. Flares and other antipollution devices

For flares and other antipollution devices, the emitter must:

(1) if using the method specified in QC.9.3.5 (1), continuously monitor the flow rate and the parameters used to determine the high heat value of the flare gas;

(2) if using the method specified in QC.9.3.5 (2), continuously monitor the flow rate and the parameters used to determine the carbon content of the flare gas;

(3) if using the method specified in QC.9.3.5 (3), measure the volume of gas destroyed annually (determine to an accuracy of ± 7.5%), and the carbon content.

QC.9.4.6. Above-ground storage tanks

For above-ground storage tanks, the emitter must measure the annual throughput of all types of products in each tank using flowmeters.

QC.9.4.7. Wastewater treatment

For wastewater treatment, the emitter must measure the following parameters:

(1) the daily volume of wastewater treated;

(2) the quarterly chemical oxygen demand of the wastewater;

(3) the quantity of sludge removed annually and the organic content of the sludge;

(4) the quarterly nitrogen content of the wastewater.

QC.9.4.8. Oil-water separators

For oil-water separators, the emitter must measure the daily volume of wastewater treated by the oil-water separators.

QC.9.4.9. Leaks from system components

For leaks from system components, the emitter must:

(1) classify components by type: valve, pump seal, connector, flange, open-ended line, other;

(2) screen for leaks using the methods to identify and count components and the screening methods in CCME-EPC-73F "Environmental Code of Practice for the Measurement and Control of Fugitive Volatile Organic Compounds (VOC) Emissions from Equipment Leaks" published in October 1993 by the Canadian Council of Ministers of the Environment;

(3) screen for leaks at least once per year and measure emissions using instruments able to detect CH_4.

QC.9.5. Tables

Table 9-1. Coke burn rate material balance and conversion factors

(QC.9.3.1(1))

Conversion factor	(kg min)/(h m^3 (dry base) %)
K_1	0.2982
K_2	2.0880
K_3	0.0994

Table 9-2. Data for calculating emissions from above-ground storage tanks containing asphalt using the TANKS model

(QC.9.3.6(2))

Parameter	Data to be entered
Liquid Molecular Weight	1000
Vapor Molecular Weight	105
Liquid Density (lb/gal. at 60 oF)	8.0925
Antoine's Equation Constants (using K)	A = 75350.06
	B = 9.00346

Table 9-3. CH_4 conversion factors by type of industrial wastewater treatment process

(QC.9.3.7(1))

Type of treatment and discharge pathway or system	Comments	Conversion factor (MCF)	Range
Untreated			
Sea, river and lake discharge[1]	Rivers with high organic loading may turn anaerobic, however this is not considered here	0.1	0 - 0.2
Treated			
Aerobic treatment plant	Well maintained, some CH_4 may be emitted from settling basins	0	0 – 0.1
Aerobic treatment plant	Not well maintained, overloaded	0.3	0.2 – 0.4
Anaerobic digester for sludge[2]	CH_4 recovery not considered here	0.8	0.8 – 1.0
Anaerobic reactor[2]	CH_4 recovery not considered here	0.8	0.8 – 1.0
Anaerobic shallow lagoon	Depth less than 2 meters	0.2	0 – 0.3
Anaerobic deep lagoon	Depth more than 2 meters	0.8	0.8 – 1.0

For CH_4 generation capacity (B) in kilograms of CH_4 per kilogram of chemical oxygen demand (COD), the emitter must use the default emission factor of 0.25 kg CH_4 per kilogram COD.

The emission factor for N_2O from discharged wastewater (EF_{N2O}) is 0.005 kg N_2O-N per kg-N.

MCF = CH_4 conversion factor (the fraction of waste treated anaerobically).

(1) The fact that rivers with high organic loading may turn anaerobic is not taken into account.
(2) CH_4 recovery is not taken into account.

Table 9-4. Emission factors for oil-water separators

(QC.9.3.8)

Type of separator	Emission factor (EF_{sep})[a] kg NMHC/m^3 wastewater treated
Gravity type - uncovered	1.11e-01
Gravity type - covered	3.30e-03
Gravity type – covered and connected to destruction device	0
DAF[b] of IAF[c] - uncovered	4.00e-03[d]
DAF or IAF - covered	1.20e-04[d]
DAF or IAF – covered and connected to a destruction device	0

[a] EFs do not include ethane

[b] DAF = dissolved air flotation type
[c] IAF = induced air flotation device

[d] EFs for these types of separators apply where they are installed as secondary treatment systems.

Table 9-5. Gas service components fugitive emissions

(QC.9.3.9(2(, (3) and (4))

Component type / Service type	Default zero factor (kg/h)	Correlation equation (kg/h)	Correlation equation (kg/h)	Factor (kg/h)
				10 000 ppmv
	ZF_{zi}	σ_i	β_i	(SV > 9 999) PF_i
Valves (1)	7.8×10^{-6}	2.27×10^{-6}	0.747	0.064
Pump seals (2)	1.9×10^{-5}	5.07×10^{-5}	0.622	0.089
Other (3)	4.0×10^{-6}	8.69×10^{-6}	0.642	0.082
Connectors (4)	7.5×10^{-6}	1.53×10^{-6}	0.736	0.030
Flanges (5)	3.1×10^{-7}	4.53×10^{-6}	0.706	0.095
Open-ended lines (6)	2.0×10^{-6}	1.90×10^{-6}	0.724	0.033

QC.10. PULP AND PAPER MANUFACTURING

QC.10.1. Covered sources

The covered sources are all the processes used to manufacture pulp and paper products.

QC.10.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2 emissions attributable to the combustion of biomass in recovery furnaces and kilns, calculated in accordance with QC.10.3.1, in metric tons;

(2) the annual CO_2 emissions attributable to the combustion of fossil fuels in recovery furnaces and kilns, calculated in accordance with QC.1, in metric tons;

(3) the annual CO_2 emissions attributable to the combustion of carbonate materials in recovery furnaces and kilns, calculated in accordance with QC.10.3.2, in metric tons;

(4) the annual CO_2, CH_4 and N_2O emissions attributable to the use of stationary combustion units, calculated in accordance with QC.1, in metric tons;

(5) the annual consumption of carbonate materials, in metric tons;

(6) the annual production of black liquor, in metric tons;

(7) the annual CH_4 and N_2O emissions from onsite wastewater treatment plants, calculated in accordance with QC.9.3.7, in metric tons.

QC.10.3. Calculation methods for CO_2 emissions

The annual CO_2 emissions attributable to the manufacture of pulp and paper products must be calculated using the calculation methods in QC.10.3.1 and QC.10.3.2.

QC.10.3.1. Calculation of CO_2 emissions from the combustion of biomass

The annual CO_2 emissions attributable to the combustion of biomass in recovery furnaces and kilns must be calculated using equation 10-1:

Equation 10-1

$$CO_{2,biomass} = \sum_{i=1}^{12} (BL_i \times CC_i \times 3.664)$$

Where:

$CO_{2,\ biomass}$ = Annual CO_2 emissions attributable to the combustion of biomass in recovery furnaces and kilns, in metric tons;

i = Month;

BL_i = Black liquor produced during month *i*, in metric tons;

CC_i = Carbon content of the black liquor produced during month *i*, in kilograms of carbon per kilogram of black liquor;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.10.3.2. Calculation of CO_2 emissions attributable to the combustion of carbonate materials

The annual CO_2 emissions attributable to the combustion of carbonate materials in recovery furnaces and kilns must be calculated using equation 10-2:

Equation 10-2

$$CO_{2,carb} = \sum_{i=1}^{12} (\sum_{j=1}^{n} RM_j \times EF_j)_i$$

Where:

$CO_{2,\ carb}$ = Annual CO_2 emissions from the combustion of carbonate materials in recovery furnaces and kilns, in metric tons;

i = Month;

n = Number of carbonate materials;

j = Carbonate material;

RM_j = Quantity of carbonate material *j* consumed during month *i*, in metric tons;

EF_j = CO_2 emission factor for carbonate material *j* specified in Table 10-1 in QC.10.5 for month *i*, in metric tons of CO_2 per metric tons of carbonate material.

QC.10.4. Sampling, analysis and measurement requirements

An emitter who manufactures pulp and paper must:

(1) measure the quantity of black liquor produced each year;

(2) measure the monthly carbon content of the black liquor in accordance with ASTM D5373-08 "Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Laboratory Samples of Coal";

(3) to determine carbonate material consumption, either use records provided by the material supplier or monitor carbonate material consumption using the same plant instruments used for inventory purposes, such as weigh hoppers or belt weigh feeders;

(4) measure the carbonate content of each carbonate material by

(*a*) using the carbonate content data provided by the material supplier;

(*b*) using the emission factor specified in Table 10-1 in QC.10.5; or

(*c*) collecting monthly samples of each carbonate material consumed in accordance with ASTM C25-06 "Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime", ASTM C1301-95 (2009) e1 "Standard Test Method for Major and Trace Elements in Limestone and Lime by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP) and Atomic Absorption (AA)" or ASTM C1271-99 (2006) "Standard Test Method for X-ray Spectrometric Analysis of Lime and Limestone".

QC.10.5. Table

Table 10-1. CO_2 emission factors for common carbonate species

(QC.10.3.2, QC.10.4(4)(*b*))

Carbonate	**Mineral name**	**Emission factor (t eq. CO_2/t carbonate)**
$CaCO_3$	Calcite	0.4397
$CaMg(CO_3)_2$	Dolomite	0.4773
Na_2CO_3	Soda ash (sodium carbonate)	0.4149

QC.11. SODIUM CARBONATE PRODUCTION

QC.11.1. Covered sources

The covered sources are all the processes used in the production of sodium carbonate by calcining sodium carbonate bearing ore or brine.

QC.11.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2 emissions from all soda ash calcining kilns, calculated in accordance with QC.11.3, in metric tons;

(2) the annual CO_2, CH_4 and N_2O emissions attributable to fuel combustion in calcining kilns, calculated in accordance with QC.1, in metric tons;

(3) the monthly consumption of trona ore or sodium carbonate-rich brine, in metric tons;

(4) the monthly production of sodium carbonate, in metric tons;

(5) the monthly quantity of kiln dust discarded and not recycled to the calcining kilns, in metric tons;

(6) the monthly carbon content of the trona ore or brine at the kiln input, in kilograms of carbon per kilogram of trona ore or brine;

(7) the monthly carbon content of sodium carbonate produced, in kilograms of carbon per kilogram of sodium carbonate;

(8) the monthly carbon content of the kiln dust not recycled by regulating devices and not combined with the soda ash product, in kilograms of carbon per kilogram of kiln dust recovered;

(9) in a facility that recycles the CO_2 generated from calcination for use in carbonation towers:

(*a*) the annual CO_2 emissions recycled, in metric tons;

(*b*) the monthly quantity of pre-treated brine consumed, in metric tons;

(*c*) the monthly carbon content of the pre-treated brine at the kiln input, in kilograms of carbon per kilogram of pre-treated brine;

(*d*) the monthly quantity of untreated brine consumed in pre-treatment, in metric tons;

(*e*) the monthly carbon content of the brine before pre-treatment, in kilograms of carbon per kilogram of untreated brine.

QC.11.3. Calculation methods for CO_2 emissions

QC.11.3.1. Calculation of CO_2 emissions from calcining kilns

The annual CO_2 emissions from calcining kilns must be calculated using one of the two following calculation methods:

(1) using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4;

(2) using equation 11-1:

Equation 11-1

$$CO_2 = \sum_{j=1}^{12} [(C_{ij} \times T_{ij}) - (C_{Sj} \times T_{Sj}) - (C_{Wj} \times T_{wj})] \times 3.664$$

Where:

CO_2 = Annual CO_2 emissions attributable to sodium carbonate production processes, in metric tons;

j = Month;

C_{ij} = Carbon content of trona ore or brine input at the kiln for month *j*, in kilograms of carbon per kilogram of trona ore or brine;

T_{ij} = Quantity of trona ore or brine input during month *j*, in metric tons;

C_{Sj} = Carbon content of sodium carbonate produced during month *j*, in kilograms of carbon per kilogram of sodium carbonate;

Ts_j = Quantity of sodium carbonate produced during month *j*, in metric tons;

C_{Wj} = Carbon content of kiln dust discarded and not recycled by regulating devices and not combined with the soda ash product during month *j*, in kilograms of carbon per kilogram of kiln dust recovered;

T_{Wj} = Quantity of kiln dust discarded and not recycled by regulating devices and not combined with the soda ash product during month *j*, in metric tons;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.11.3.2. Calculation of annual emissions of CO_2 from calcining kilns used in carbonation towers for brine pre-treatment

For a facility where CO_2 emissions from the calcining kilns are used in carbonation towers for brine pre-treatment, the annual emissions of recycled CO_2 must be calculated using equation 11-2:

Equation 11-2

$$CO_2 = \sum_{j=1}^{12} [(C_{I\,j} \times T_{I\,j}) - (Cb_j \times Tb_j)] \times 3.664$$

Where:

CO_2 = Annual recycled CO_2 emissions from calcining kilns for pre-treatment, in metric tons;

j = Month;

C_{Ij} = Carbon content of pre-treated brine kiln input for month *j*, in kilograms of carbon per kilogram of pre-treated brine;

T_{Ij} = Monthly quantity of pre-treated brine consumed during month *j*, in metric tons;

Cb_j = Carbon content of the brine prior to pre-treatment for month *j*, in kilograms of carbon per kilogram of untreated brine;

Tb_j = Monthly quantity of untreated brine consumed in pre-treatment during month *j*, in metric tons;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.11.4. Sampling, analysis and measurement requirements

An emitter who uses one of the calculation methods in QC.11.3.1(2) and QC.11.3.2 must

(1) measure the quantity of trona ore, sodium carbonate, dust and brine using the same plant instruments used for inventory purposes, such as weigh hoppers or belt weigh feeders;

(2) collect monthly samples of trona ore, sodium carbonate, kiln dust and brine and measure the carbon content of each sample as follows:

(*a*) for brine, using total organic carbon analyzer in accordance with ASTM D4839-03 "Standard Test Methods for Instrumental Determination of Carbon in Water by Ultraviolet, or Persulfate Oxidation, or Both, and Infrared Detection";

(*b*) for trona ore, sodium carbonate and kiln dust, in accordance with ASTM E359-00 (2005) e1 "Standard Test Methods for Analysis of Soda Ash (Sodium Carbonate)".

QC.12. MANUFACTURING OF PETROCHEMICAL PRODUCTS

QC.12.1. Covered sources

The covered sources are all the processes used in the production of petrochemical products from feedstocks derived from petroleum, or petroleum and natural gas liquids.

QC.12.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include

(1) the annual CO_2, CH_4 and N_2O emissions attributable to the use of stationary combustion units, calculated in accordance with QC.1, in metric tons;

(2) the annual CO_2, CH_4 and N_2O emissions attributable to the combustion of refinery fuel gas, flexigas or associated gas, calculated in accordance with QC.2, in metric tons;

(3) the annual CO_2, CH_4 and N_2O emissions attributable to each chemical process, calculated in accordance with QC.12.3.1, in metric tons;

(4) the annual CO_2 emissions attributable to catalyst regeneration, calculated in accordance with QC.12.3.2, in metric tons;

(5) the annual CO_2, CH_4 and N_2O emissions attributable to flares and antipollution devices, calculated in accordance with QC.12.3.3, in metric tons;

(6) the annual CO_2, CH_4 and N_2O emissions from process vents, calculated in accordance with QC.12.3.4, in metric tons;

(7) the annual CH_4 emissions from leaks from equipment components, calculated in accordance with QC.12.3.5, in metric tons;

(8) the annual CH_4 emissions from above-ground storage tanks, calculated in accordance with QC.12.3.6, in metric tons;

(9) the annual CH_4 and N_2O emissions from wastewater treatment, calculated in accordance with QC.12.3.7, in metric tons;

(10) the annual CH_4 emissions attributable to oil-water separators, calculated in accordance with QC.12.3.8, in metric tons;

(11) the annual consumption of each type of feedstock that emits CO_2, CH_4 or N_2O, expressed

(*a*) in millions of cubic metres at standard conditions, for gases;

(*b*) in kilolitres, for liquids;

(*c*) in metric tons for non-biomass solids;

(*d*) in bone dry metric tons, for biomass-derived solid fuels;

(12) the average monthly carbon content of the feedstock materials consumed or materials produced, in kilograms of carbon per kilogram of feedstock gas or kilograms of carbon per kilogram of materials produced;

(13) the average monthly molecular mass of the feedstock consumed or materials produced, in kilograms per kilomole.

QC.12.3. Calculation methods for CO_2, CH_4 and N_2O emissions

The annual CO_2, CH_4 and N_2O emissions attributable to the production of petrochemical products must be calculated in accordance with the calculation methods in QC.12.3.1 to QC.12.3.8.

QC.12.3.1. Calculation of CO_2 emissions attributable to each petrochemical process

The annual CO_2 emissions attributable to each petrochemical process must be calculated in accordance with the following methods:

(1) where the feedstock and product are gases, using equation 12-1:

Equation 12-1

$$CO_2 = \sum_{n=1}^{12} \left\lfloor \sum_{i=1}^{j\ or\ k} \left\{ \left[(V_{GI})_{i,n} \times (C_{GI})_{i,n} \times \frac{(MM_{GI})_i}{MVC} \right] - \left[(V_{GP})_{i,n} \times (C_{GP})_{i,n} \times \frac{(MM_{GP})_i}{MVC} \right] \right\} \right\rfloor \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to each petrochemical process, in metric tons;

n = Month;

j = Number of feedstock materials;

k = Number of products;

i = Type of gas;

$(V_{GI})_{i,n}$ = Volume of gas *i* input for month *n*, in cubic metres at standard conditions;

$(C_{GI})_{i,n}$= Average carbon content of gas *i* input for month *n*, in kilograms of carbon per kilogram of gas input;

$(MM_{GI})_i$ = Monthly average molecular mass of gas *i*, in kilograms per kilomole;

MVC = Molar volume conversion factor (24.06 m^3 per kilomole at standard conditions);

$(V_{GP})_{i,n}$ = Volume of gas *i* produced in month *n*, in cubic metres at standard conditions;

$(C_{GP})_{i,n}$= Average carbon content of gas *i* produced in month *n*, in kilograms of carbon per kilogram of gas produced;

$(MM_{GP})_i$ = Monthly average molecular mass of gas *i*, in kilograms per kilomole;

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

(2) where the feedstock and the product are liquids or solids, using equation 12-2:

Equation 12-2

$$CO_2 = \sum_{n=1}^{12} \left[\sum_{i=1}^{j or k} \left\{ \left[(Q_F)_{i,n} \times (C_F)_{i,n} \right] - \left[(Q_P)_{i,n} \times (C_P)_{i,n} \right] \right\} \right] \times 3.664 \times 0.001$$

Where:

CO_2 = Annual CO_2 emissions attributable to each petrochemical process, in metric tons;

n = Month;

j = Number of feedstock materials;

k = Number of products;

i = Type of feedstock material;

$(Q_F)_{i,n}$ = Quantity of feedstock *i* consumed in month *n*, in kilograms;

$(C_F)_{i,n}$= Average carbon content of feedstock *i* for month *n*, in kilograms of carbon per kilogram of feedstock;

$(Q_P)_{i,n}$ = Quantity of product *i* for month *n*, in kilograms;

$(C_P)_{i,n}$= Average carbon content of product *i* for month *n*, in kilograms of carbon per kilogram of product;

3.664 = Ratio of molecular weights, CO_2 to carbon;

0.001 = Conversion factor, kilograms to metric tons.

QC.12.3.2. Calculation of CO_2 emissions attributable to catalyst regeneration

The annual CO_2 emissions attributable to catalyst regeneration at a facility equipped with a continuous emission monitoring and recording system must be calculated in accordance with QC.1.3.4 or, in the absence of such a system, in accordance with QC.9.3.1 according to the type of process.

QC.12.3.3. Calculation of CO_2, CH_4 and N_2O emissions attributable to combustion in flares and antipollution devices

The annual CO_2, CH_4 and N_2O emissions attributable to combustion in flares and antipollution devices must be calculated in accordance with the calculation methods in QC.1.

The annual CO_2 emissions attributable to the combustion of hydrocarbons in flares must be calculated in accordance with QC.9.3.5 according to the type of equipment used.

QC.12.3.4. Calculation of CO_2, CH_4 and N_2O emissions from process vents

The annual CO_2, CH_4 and N_2O emissions from process vents, other than emissions required for the process, must be calculated in accordance with QC.9.3.2.

QC.12.3.5. Calculation of fugitive CH_4 emissions from equipment components

The annual fugitive emissions of CH_4 from all components in the natural gas or refinery gas supply system and from pressure swing adsorption (PSA) systems must be calculated in accordance with QC.9.3.9.

QC.12.3.6. Calculation of CH_4 emissions from above-ground storage tanks

The annual CH_4 emissions from above-ground storage tanks containing petroleum-derived products that are not equipped with pressure swing adsorption (PSA) systems must be calculated in accordance with QC.9.3.6.

QC.12.3.7. Calculation of CH_4 and N_2O emissions attributable to wastewater treatment

The annual CH_4 and N_2O emissions attributable to wastewater treatment must be calculated in accordance with QC.9.3.7.

QC.12.3.8. Calculation of CH_4 emissions attributable to oil-water separators

The annual CH_4 emissions attributable to oil-water separators must be calculated in accordance with QC.9.3.8.

QC.12.4. Sampling, analysis and measurement requirements

QC.12.4.1. Catalyst regeneration

For catalyst regeneration, the emitter must measure the parameters in accordance with QC.9.4.1.

QC.12.4.2. Flares and other antipollution devices

For flares and antipollution devices, the emitter must measure the parameters in accordance with QC.9.4.5.

QC.12.4.3. Process vents

For process vents, the emitter must, for each process vent event, measure the parameters in accordance with QC.9.4.2.

QC.12.4.4. Fugitive emissions from system components

For fugitive emissions from system components, the emitter must measure the parameters in accordance with QC.9.4.9.

QC.12.4.5. Above-ground storage tanks

For above-ground storage tanks, the emitter must measure the annual throughput of crude oil, naphtha, distillate oils and gasoil using flowmeters.

QC.12.4.6. Wastewater treatment

For wastewater treatment, the emitter must measure the parameters in accordance with QC.9.4.7.

QC.12.4.7. Oil-water separators

For oil-water separators, the emitter must measure the daily volume of wastewater treated in the oil-water separators.

QC.12.4.8. Consumption of feedstock

The emitter must determine the quantity of feedstock consumed using the same instruments used for inventory purposes, such as weigh hoppers or belt weigh feeders.

QC.13. ADIPIC ACID PRODUCTION

QC.13.1. Covered sources

The covered sources are all the processes used for the production of adipic acid ($HOOC(CH_2)_4COOH$) by the oxidation of mixture of cyclohexanone ($(CH_2)_5CO$) and cyclohexanol ($(CH_2)_5CHOH$) with nitric acid in the presence of a catalyst.

QC.13.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual N_2O emissions in metric tons;

(2) the annual production of adipic acid, in metric tons;

(3) the N_2O emission factor in metric tons of N_2O per metric ton of adipic acid;

(4) the destruction factor for the facility’s antipollution equipment;

(5) the utilization factor for the facility’s antipollution equipment.

Subparagraphs 3, 4 and 5 of the first paragraph do not apply to the N_2O emissions of an emitter who calculates emissions using data from a continuous emission monitoring and recording system.

QC.13.3. Calculation methods for N_2O emissions attributable to the oxidation process

The annual N_2O emissions attributable to the oxidation process must be calculated in accordance with one of the two calculation methods in QC.13.3.1 and QC.13.3.2.

QC.13.3.1. Use of a continuous emission monitoring and recording system

The annual N_2O emissions may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.13.3.2. Calculation method using the N_2O emission factor and the destruction and use factors for antipollution equipment

The annual N_2O emissions must be calculated using equation 13-1:

Equation 13-1

$$N_2O = EF_{N2O} \times AAP \times (1 - F_D \times F_U)$$

Where:

N_2O = Emissions of N_2O attributable to the oxidation process, in metric tons;

EF_{N2O} = N_2O emission factor, in metric tons of N_2O per metric ton of adipic acid produced;

AAP = Adipic acid production, in metric tons;

F_D = Destruction factor for the facility's antipollution equipment;

F_U = Utilization factor for the facility's antipollution equipment.

QC.13.4. Sampling, analysis and measurement requirements

An emitter who operates an enterprise, facility or establishment that produces adipic acid must:

(1) determine the N_2O emission factor for the facility annually using:

(*a*) method 320 in Appendix A of Part 63 of Title 40 of the Code of Federal Regulations, "Measurement of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy", published by the United States Environmental Protection Agency (USEPA);

(*b*) standard ASTM D6348-03 "Standard Test Method for Determination of Gaseous Compounds by Extractive Direct Interface Fourier Transform Infrared (FTIR) Spectroscopy";

(*c*) a continuous emission monitoring and recording system to determine either the N_2O emissions when the antipollution equipment is not operational (creating an emission factor for use with the destruction factor for the equipment), or the quantity of N_2O emissions destroyed by the equipment;

(2) determine the quantity of adipic acid produced annually by

(a) using annual sales data; or

(b) using measurements from flowmeters or weigh scales.

QC.14. LEAD PRODUCTION

QC.14.1. Covered sources

The covered sources are all processes used in primary and secondary lead production.

QC.14.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2 emissions, in metric tons;

(2) the annual CO_2 emissions attributable to the use in the furnace of each material containing carbon, in metric tons;

(3) the annual quantity of each material containing carbon used in the furnace, in metric tons;

(4) the carbon content of each material containing carbon used in the furnace.

QC.14.3. Calculation methods for CO_2 emissions attributable to primary and secondary lead production processes

The annual CO_2 emissions attributable to use in the furnace of each material containing carbon must be calculated in accordance with one of the two calculation methods in QC.14.3.1 and QC.14.3.2.

QC.14.3.1. Use of a continuous emission monitoring and recording system

The annual CO_2 emissions may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.14.3.2. Calculation by mass balance

The annual CO_2 emissions may be calculated using equation 14-1:

Equation 14-1

$$CO_2 = \sum_{i}^{n} \left(M_i \times CC_i\right) \times 3.664$$

Where:

CO_2 = Emissions of CO_2 attributable to the use in the furnace of materials containing carbon, in metric tons;

n = Number of types of material;

i = Type of material;

M_i = Annual quantity of material *i* used, in metric tons;

CC_i = Carbon content of material *i* used, in kilograms of carbon per kilogram of material;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.14.4. Sampling, analysis and measurement requirements

An emitter who operates an enterprise, facility or establishment that produces lead must:

(1) obtain annually the carbon content of each material containing carbon used in the furnace, either by using the data provided by the material supplier, or by using the following methods:

(*a*) for metal ores and alloys, ASTM E1941-04 "Standard Test Method for Determination of Carbon in Refractory and Reactive Metals and Their Alloys";

(*b*) for carbonaceous reducing agents and carbon electrodes, ASTM D5373-08 "Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Laboratory Samples of Coal";

(*c*) for flux materials, ASTM C25-06 "Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime";

(2) calculate the annual quantity of each material containing carbon used in the furnace by direct weight measurement using the same plant instruments used for inventory purposes, such as weigh hoppers or belt weigh feeders.

QC.15. ZINC PRODUCTION

QC.15.1. Covered sources

The covered sources are all the processes used for primary and secondary zinc production.

QC.15.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual CO_2 emissions, in metric tons;

(2) the annual CO_2 emissions attributable to use in the furnace of each material containing carbon, in metric tons;

(3) the annual quantity of each material containing carbon used in the furnace, in metric tons;

(4) the carbon content of each material containing carbon used in the furnace.

QC.15.3. Calculation methods for CO_2 emissions attributable to primary and secondary zinc production processes

The annual CO_2 emissions attributable to use in the furnace of each material containing carbon must be calculated in accordance with one of the two calculation methods in QC.15.3.1 and QC.15.3.2.

QC.15.3.1. Use of a continuous emission monitoring and recording system

The annual CO_2 emissions may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.15.3.2. Calculation by mass balance

The annual CO_2 emissions may be calculated using equation 15-1:

Equation 15-1

$$CO_2 = \sum_{i}^{n} (M_i \times CC_i) \times 3.664$$

Where:

CO_2 = Annual CO_2 emissions attributable to the use in the furnace of materials containing carbon, in metric tons;

n = Number of types of material;

i = Type of material;

M_i = Annual quantity of material *i* used, in metric tons;

CC_i = Carbon content of material *i* used, in kilograms of carbon per kilogram of material;

3.664 = Ratio of molecular weights, CO_2 to carbon.

QC.15.4. Sampling, analysis and measurement requirements

An emitter who operates an enterprise, facility or establishment that produces zinc must:

(1) obtain annually the carbon content of each material containing carbon used in the furnace, either by using the data provided by the supplier, or by using the following methods:

(*a*) for ores containing zinc, ASTM E1941-04 "Standard Test Method for Determination of Carbon in Refractory and Reactive Metals and Their Alloys";

(*b*) for carbonaceous reducing agents and carbon electrodes, ASTM D5373-08 "Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Laboratory Samples of Coal";

(*c*) for flux materials, ASTM C25-06 "Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime";

(2) calculate the annual quantity of each material containing carbon entering the furnace by direct weight measurement using the same plant instruments used for inventory purposes, such as weigh hoppers or belt weigh feeders.

QC.16. ELECTRICITY GENERATION

QC.16.1. Covered sources

The covered sources are stationary combustion units that combust solid, liquid or gaseous fuel for the purpose of producing electricity either for sale or for use at the facility or establishment, as well as cogeneration facilities where steam and electricity are produced.

QC.16.2. Greenhouse gas reporting requirements

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) the annual greenhouse gas emissions attributable to the combustion of fossil fuels, biomass fuels, biomass and municipal solid waste, in metric tons, indicating for each type of fuel:

(*a*) the CO_2 emissions;

(*b*) the CH_4 emissions;

(*c*) the N_2O emissions;

(2) the annual consumption of fuel, expressed

(*a*) in cubic metres at standard conditions, for gases;

(*b*) in kilolitres, for liquids;

(*c*) in metric tons, for solids other than biomass solid fuels;

(*d*) in bone dry metric tons, for biomass solid fuels;

(3) where carbon content is used to calculate CO_2 emissions, the average carbon content of each type of fuel, in kilograms of carbon per kilogram of fuel;

(4) where high heat value is used to calculate CO_2 emissions, the average high heat value of each type of fuel, expressed:

(*a*) in gigajoules per metric ton, for solid fuels;

(*b*) in gigajoules per kilolitre, for liquid fuels;

(*c*) in gigajoules per cubic metre, for gaseous fuels;

(5) the nameplate generating capacity of each electricity generating unit, in megawatts;

(6) the annual electricity production, in megawatt-hours;

(7) for each cogeneration unit, the type of cycle, whether a topping or bottoming cycle, and the useful thermal output, as applicable, in megajoules;

(8) the annual CO_2 emissions attributable to acid gas scrubbers and acid gas reagent, in metric tons;

(9) the annual fugitive emissions of HFC from cooling units, in metric tons;

(10) the annual fugitive emissions of CO_2 from geothermal facilities, in metric tons;

(11) the annual fugitive emissions of CO_2 from coal storage calculated in accordance with QC.5, in metric tons;

(12) the annual quantity of sorbent used in acid gas scrubbing equipment, in metric tons;

(13) the annual energy transferred from the steam or geothermal fluid in geothermal facilities, in gigajoules;

(14) where steam or heat is acquired from another facility or establishment for electricity generation, the name of the steam or heat supplier and the quantity supplied, in megajoules;

(15) where additional fuels are used to support electricity generation or industrial production, the annual consumption of fuel by fuel type.

Subparagraphs 3 and 4 of the first paragraph do not apply to the CO_2 emissions of an emitter who calculates emissions using data from a continuous emission monitoring and recording system.

QC.16.3. Calculation methods for CO_2 emissions

The annual CO_2 emissions attributable to stationary combustion units that produce electricity, acid gas scrubbers and geothermal facilities must be calculated in accordance with one of the calculation methods in QC.16.3.1 to QC.16.3.4.

QC.16.3.1. Use of a continuous emission monitoring and recording system

The annual CO_2 emissions attributable to stationary combustion units producing electricity may be calculated using data from a continuous emission monitoring and recording system in accordance with QC.1.3.4.

QC.16.3.2. Calculation of CO_2 emissions attributable to stationary combustion units producing electricity

The annual CO_2 emissions attributable to stationary combustion units producing electricity may be calculated using the following calculation methods:

(1) for units that use natural gas as a fuel:

(*a*) when the high heat value of the gas is greater than or equal to 36.3 MJ/m^3 and less than or equal to 40.98 MJ/m^3 at standard conditions, in accordance with QC.1.3.3 or, for an emitter to whom section 6.6 of this Regulation does not apply, in accordance with QC.1.3.2;

(*b*) when the high heat value of the gas is less than 36.3 MJ/m^3 or greater than 40.98 MJ/m^3 at standard conditions, in accordance with QC.1.3.3;

(2) for units that use coal or petroleum coke as a fuel, in accordance with QC.1.3.3(1);

(3) for units that use middle distillates as a fuel, such as diesel, fuel oil or kerosene, gasoline, residual oil or liquefied petroleum such as ethane, propane, isobutene or n-butane, in accordance with QC.1.3.3 or, for an emitter to whom section 6.6 of this Regulation does not apply, in accordance with QC.1.3.2;

(4) for units that use refinery fuel gas, flexigas or associated gas as a fuel, in accordance with QC.2;

(5) for units that use biogas or biomass as a fuel, the calculations must be completed in accordance with QC.1.3.3 or, for an emitter to whom section 6.6 of this Regulation does not apply, in accordance with QC.1.3.2;

(6) for units that use municipal solid waste as a fuel, in accordance with QC.1.3.3 or, for an emitter to whom section 6.6 of this Regulation does not apply, in accordance with QC.1.3.2;

(7) for units that use biogas or biomass as a fuel but that, during start-up, shut-down, or malfunction operating periods only use fossil fuels or fuel gas, the CO_2 emissions attributable to those fuels must be calculated:

(*a*) for fossil fuels, in accordance with QC.1.3.1, QC.1.3.2 and QC.1.3.3;

(*b*) for fuel gas, in accordance with QC.2.

(8) for units that use only fossil fuels, in accordance with QC.16.3.2(1) to (4), for each type of fuel;

(9) for units that use fossil fuels and biogas or biomass:

(*a*) when the emissions are calculated using data from a continuous emission monitoring and recording system, the portion of CO_2 emissions attributable to the biomass or biogas must be calculated in accordance with subparagraph 2 of the fifth paragraph of QC.1.3.4;

(*b*) when the emissions are not calculated using data from a continuous emission monitoring and recording system, in accordance with QC.16.3.2(1) to (7), for each type of fuel.

QC.16.3.3. Calculation of CO_2 emissions from acid gas scrubbing

The annual CO_2 emissions from acid gas scrubbing must be calculated in accordance with QC.1.3.6.

QC.16.3.4. Calculation of fugitive CO_2 emissions from geothermal facilities

The annual fugitive CO_2 emissions from geothermal facilities must be calculated using equation 16-1:

Equation 16-1

$$CO_2 = 7.14 \times Q_E \times 0.001$$

Where:

CO_2 = Annual fugitive emissions of CO_2 from geothermal facilities, in metric tons per year;

7.14 = Default fugitive CO_2 emission factor for geothermal facilities, in kilograms per gigajoule;

Q_E = Quantity of energy transferred from geothermal steam or fluid, in gigajoules per year;

0.001 = Conversion factor, kilograms to metric tons.

QC.16.4. Calculation methods for CH_4 and N_2O emissions

The annual CH_4 and N_2O emissions attributable to stationary combustion units producing electricity must be calculated in accordance with QC.1.4.

QC.16.5. Calculation methods for fugitive HFC emissions

The annual fugitive HFC emissions attributable to cooling units used in electricity production must be calculated in accordance with one of the calculation methods in QC.16.5.1 and QC.16.5.2.

QC.16.5.1. Calculation of fugitive HFC emissions based on change in inventory

The annual fugitive HFC emissions attributable to cooling units used in electricity production may be calculated based on the change in inventory using equation 16-2:

Equation 16-2

$$HFC = INV_{begin} - INV_{end} + PURCHASES - SALES + \Delta CAP$$

Where:

HFC = Annual fugitive emissions of HFC attributable to cooling units used in electricity production, in metric tons;

INV_{begin} = Quantity of HFC in storage at the beginning of the year, in metric tons;

INV_{end} = Quantity of HFC in storage at the end of the year, in metric tons;

PURCHASES = Quantity of HFC purchased from other facilities or establishments during the year, in metric tons;

SALES =Quantity of HFC sold or otherwise transferred offsite to other facilities or establishments during the year, in metric tons;

ΔCAP = The net change in the total nameplate capacity (i.e. the full and proper charge) of the cooling equipment, in metric tons. The net change in capacity will be negative if the total nameplate capacity at the end of the year is less than the total nameplate capacity at the beginning of the year.

QC.16.5.2. Calculation of fugitives HFC emissions based on service logs

The annual fugitive HFC emissions attributable to cooling units used in electricity production may be calculated on the basis of entries in equipment service logs using equation 16-3:

Equation 16-3

$$HFC = \left[\sum_{i-1}^{n} \left(Q\ NEW_i - NC\ NEW_i \right) + \sum_{j=1}^{m} \left(Q\ RECH_j - Q\ RECO_j \right) + \sum_{k=1}^{p} \left(NC\ RET_k - Q\ RET_k \right) \right] \times 0.001$$

Where:

HFC = Annual fugitive emissions of HFC attributable to cooling units used in electricity production in metric tons;

n = Number of new cooling units brought into operation during the year;

i = Unit brought into operation;

Q NEW_i = Quantity of HFC used to fill unit *i*, in kilograms;

NC NEW_i = Nameplate capacity of unit *i*, in kilograms;

m = Number of maintenance operations, either to recharge or recover, completed during the year;

j = Unit maintained;

Q $RECH_j$ = Quantity of HFC used to recharge the unit *j* during maintenance, in kilograms;

Q $RECO_j$ = Quantity of HFC recovered from unit *j*, in kilograms;

p = Number of cooling units retired during the year;

k = Unit retired;

NC RET_k = Nameplate generating capacity of unit *k*, in kilograms;

Q RET_k = Quantity of HFC recovered from unit *k*, in kilograms;

0.001 = Conversion factor, kilograms to metric tons.

, QC.16.6. Sampling, analysis and measurement requirements

QC.16.6.1. Solid, liquid and gaseous fuels

For all fuels except refinery fuel gas, flexigas and associated gas, sampling, consumption measurements, carbon content measurements, and measurements to calculate high heat value and emission factors must be completed in accordance with QC.1.5.

QC.16.6.2. Refinery fuel gas, flexigas and associated gas

For refinery fuel gas, flexigas and associated gas, sampling, consumption measurements, carbon content measurements, and measurements to calculate high heat value and emission factors must be completed in accordance with QC.2.4.

QC.16.6.3. Acid gas scrubbing

The emitter must measure the quantity of sorbent used annually.

QC.16.6.4. Geothermal facility

The emitter must measure the quantity of energy transferred annually from geothermal steam or fluid.

QC.17. CONSUMPTION AND SALE OF ELECTRICITY PRODUCED OUTSIDE QUÉBEC, AND EXPORTATION OF ELECTRICITY

QC.17.1. Covered sources

The covered sources are the activities of persons and municipalities that operate an enterprise, a facility or en establishment that purchases electricity produced outside Québec for their own consumption or for sale in Québec, or that exports electricity.

QC.17.2. Specific information to be reported concerning greenhouse gas emissions

The greenhouse gas emissions report referred to in section 6.2 must include the following information:

(1) for the acquisition of electricity produced outside Québec for the consumption of the enterprise, facility or establishment or for sale within Québec:

(*a*) the total quantity of electricity produced outside Québec that was acquired during the year for consumption or sale in Québec, in megawatt-hours;

(*b*) the total annual CO_2 emissions attributable to the production of electricity referred to in subparagraph *a*, calculated in accordance with QC.17.3.1, in metric tons;

(*c*) for each identifiable facility covered by a CO_2 emissions report made to Environment Canada under section 71 of the Canadian Environmental Protection Act (1999) (1999, c.33), to the U.S. Environmental Protection Agency (USEPA) under Part 75 of Title 40 of the Code of Federal Regulations, or to the organization The Climate Registry:

(i) the name and address of the facility, the identification number assigned to it by the National Pollutant Release Inventory of Environment Canada, the U.S. Environmental Protection Agency (USEPA) or the organization The Climate Registry;

(ii) the total quantity of electricity acquired, in megawatt-hours;

(iii) the transmission losses, in megawatt-hours;

(iv) the facility's net annual electricity production, in megawatt-hours;

(v) the annual CO_2 emissions attributable to the production of electricity acquired from the facility, in metric tons;

(vi) the annual CO_2 emissions of the facility, in metric tons;

(*d)* for each identifiable facility not covered by a CO_2 emissions report made to one of the organizations referred to in subparagraph *c*:

(i) the information specified in subparagraphs *i* to *v* of subparagraph *c*, the identification number being required only if assigned;

(ii) each type of fuel used to produce electricity and its high heat value, expressed

- in gigajoules per metric ton, for solid fuels;

- in gigajoules per kilolitre, for liquid fuels;

- in gigajoules per cubic metre, for gaseous fuels;

(*e)* for each identifiable facility for which the information needed to calculate CO_2 emissions using equation 17-1 or 17-2 is not available, and for each unspecified facility:

(i) the province or state from which the electricity is acquired;

(ii) the total quantity of electricity acquired, in megawatt-hours, for each province or state,;

(iii) the annual CO_2 emissions attributable to the electricity acquired, in metric tons, from each province or state;

(2) for the exportation of electricity:

(*a)* the total quantity of electricity exported annually by the enterprise, facility or establishment, in megawatt-hours;

(*b)* the total annual CO_2 emissions caused or avoided by the exportation of the electricity, calculated in accordance with QC.17.3.2, in metric tons;

(c) for each identifiable facility covered by a CO_2 emissions report in accordance with this Regulation, for each destination province or state:

(i) the annual CO_2 emissions caused or avoided by the exportation of the electricity produced by the facility, in metric tons;

(ii) the total quantity of electricity produced by the facility and exported annually, in megawatt-hours;

(*d*) for each identifiable facility not covered by a CO_2 emissions report in accordance with this Regulation, and for each unidentifiable facility, by destination province or state:

(i) the annual CO_2 emissions caused or avoided by the exportation of the electricity produced by the specified or unspecified facility, in metric tons;

(ii) the quantity of electricity produced by the facility that is exported annually, in megawatt-hours.

Where, with regard to an identifiable facility, the information referred to in subparagraphs iii to vi of subparagraph *c* of paragraph 1 of QC.17.3.2 is not available for a report year, the emitter may provide and use for calculating the emissions of the facility, in accordance with QC.17.3.1, the information of the most recent year that does not precede the report year by more than 3 years.

QC.17.3. Calculation methods for CO_2 emissions

The annual CO_2 emissions attributable to the production of electricity acquired outside Québec and acquired by an enterprise, a facility or an establishment for its own consumption or for sale within Québec must be calculated in accordance with one of the calculation methods in QC.17.3.1. The annual CO_2 emissions caused or avoided by the exportation of the electricity must be calculated in accordance with one of the calculation methods in QC.17.3.2.

QC.17.3.1. Calculation of CO_2 emissions attributable to the production of electricity acquired outside Québec and sold or consumed within Québec

The annual CO_2 emissions attributable to electricity produced outside Québec and sold or consumed within Québec must be calculated by adding the CO_2 emissions attributable to electricity acquired outside Québec and produced by identifiable and unidentifiable facilities which emissions are calculated in accordance with the following methods:

(1) for an identifable facility covered by a CO_2 emissions report made to Environment Canada under section 71 of the Canadian Environmental Protection Act (1999) (1999, c. 33), the U.S. Environmental Protection Agency (USEPA) under Part 75 of Title 40 of the Code of Federal Regulations, or the organization The Climate Registry, using equation 17-1:

Equation 17-1

$$CO_2 = CO_{2,i} \times \frac{MWh_{imp}}{MWh_n}$$

Where:

CO_2 = Annual CO_2 emissions attributable to the production of electricity acquired outside Québec and produced by the identifiable facility, in metric tons;

$CO_{2,\,i}$ = Annual CO_2 emissions attributable to the identifiable facility, in metric tons;

MWh_{imp} = Total quantity of electricity acquired from the identifiable facility and consumed or sold annually in Québec, including an estimate of transmission losses, from the facility's busbar, in megawatt-hours;

MWh_n = Net annual production of electricity at the identifiable facility, in megawatt-hours;

(2) for a specified facility not covered by a CO_2 emissions report made to one of the organizations referred to in paragraph (1), using equation 17-2:

Equation 17-2

Where:

$$CO_2 = \sum_{j=1}^{n} \left(Q_j \times HHV_j \times EF_j\right) \times \frac{MWh_{imp}}{MWh_n} \times 0.001$$

CO_2 = Annual CO_2 emissions attributable to the production of electricity acquired outside Québec and produced by the identifiable facility, in metric tons;

n = Number of fuels used annually by the facility;

j = Type of fuel;

Q_j+ Quantity of fuel *j*, expressed

- in metric tons, for solid fuels;
- in kilolitres, for liquid fuels;
- in cubic metres, for gaseous fuels;

HHV_j = High heat value of fuel *j* consumed for electricity production, as indicated in Table 1-1 or 1-2 specified in QC.1.7, expressed

- in gigajoules per metric ton, for solid fuels;
- in gigajoules per kilolitre, for liquid fuels;
- in gigajoules per cubic metre, for gaseous fuels;

EF_j = CO_2 emission factor for fuel *j* as indicated in Table 1-2, 1-3, 1-4, 1-5 or 1-6 specified in QC.1.7, in kilograms of CO_2 per gigajoule;

MWh_{imp} = Quantity of electricity acquired from the identifiable facility and consumed or sold annually in Québec, including an estimate of transmission losses, from the facility's busbar, in megawatt-hours;

MWh_n = Net annual production of electricity at the identifiable facility, in megawatt-hours;

0.001 = Conversion factor, kilograms to metric tons

(3) for an identifiable facility for which the information needed to calculate CO_2 emissions using equation 17-1 or 17-2 is not available, and for an unidentifiable facility, using equation 17-3:

Equation 17-3

$$CO_2 = MWh_{imp} \times EF_D$$

Where:

CO_2 = Annual CO_2 emissions attributable to the production of electricity acquired outside Québec and produced by the identifiable or unidentifiable facility, in metric tons;

MWh_{imp} = Quantity of electricity acquired from the identifiable or unidentifiable facility and consumed or sold annually in Québec, in megawatt-hours;

EF_D = CO_2 emission factor for the province or North American market from which the electricity comes, as indicated in Table 17-1 for QC.17.4, in metric tons of CO_2 per megawatt-hour, or, where the electricity comes from an identifiable nuclear, hydroelectric, sea current, wind, solar or tidal power facility, a factor of 0.

QC.17.3.2. Calculation of CO_2 emissions caused or avoided by the exportation of the electricity

The annual CO_2 emissions caused or avoided by the exportation of the electricity must be calculated by adding the CO_2 emissions attributable to the exportation of electricity produced by identifiable facilities to the CO_2 emissions attributable to the exportation of electricity produced by unidentifiable facilities, using one of the following methods:

(1) for an identifiable facility covered by a CO_2 emissions report in accordance with QC.16, using equation 17-4:

Equation 17-4

$$CO_2 = \left(CO_{2,t} \times \frac{MWh_{\exp}}{MWh_n}\right) - \left(MWh_{\exp} \times EF_D\right)$$

Where:

CO_2 = Annual CO_2 emissions caused or avoided by the exportation of the electricity produced by the specified facility, in metric tons;

CO_{2t} = Total annual CO_2 emissions attributable to the identifiable facility, in metric tons;

MWh_{exp} = Total quantity of electricity produced by the identifiable facility and exported annually, including an estimate of transmission losses, from the facility's busbar, in megawatt-hours;

MWh_n = Net annual production of electricity at the identifiable facility, in megawatt-hours;

EF_D = CO_2 emission factor for the province or North American market where the electricity is delivered, as indicated in Table 17-1 for QC.17.4, in metric tons of CO_2 per megawatt-hour;

(2) for an identifiable facility not covered by a CO_2 emissions report made in accordance with QC.16 and for an unspecified facility, using equation 17-5:

Equation 17-5

$$CO_2 = MWh_{\exp} \times \left(EF_{QC} - EF_D\right)$$

Where:

CO_2 = Annual CO_2 emissions caused or avoided by the exportation of the electricity produced by the identifiable or unidentifiable facility, in metric tons;

MWh_{exp} = Quantity of electricity produced by the identifiable or unidentifiable facility and exported annually, in megawatt-hours;

EF_{QC} = CO_2 emission factor for Québec, as indicated in Table 17-1 for QC.17.4, in metric tons of CO_2 per megawatt-hour;

EF_D = CO_2 emission factor for the province or North American market where the electricity is delivered, as indicated in Table 17-1 for QC.17.4, in metric tons of CO_2 per megawatt-hour, or, where the electricity comes from an identifiable nuclear, hydroelectric, sea current, wind, solar or tidal power facility, a factor of 0.

QC.17.4. Table

Table 17-1. Default CO_2 emission factors for Canadian provinces and certain North American markets, in metric tons of CO_2 per megawatt-hour

(QC.17.3.1, (3), QC.17.3.2, (1) and (2))

Canadian province and north American market	**Default emission factor (t/MWh)**
Newfoundland and Labrador	0.025
Nova Scotia	0.803
New Brunswick	0.424
Québec	0.011
Ontario	0.220
New England Independent System Operator (NE-ISO), including all or part of the following states: - Connecticut - Massachusetts - Maine - Rhode Island - Vermont - New Hampshire	0.462
New York Independent System Operator (NY-ISO)	0.650
Pennsylvania Jersey Maryland Interconnection Regional Transmission Organization (PJM-RTO), including all or part of the following states: - Delaware - Illinois - Kentucky - Maryland - Michigan - North Carolina - New Jersey - Ohio - Pennsylvania - Tennessee - Virginia - West Virginia - District of Columbia	0.924

Midwest Independent Transmission System Operator (MISO-RTO), including all or part of the following province and states: - Manitoba - Wyoming - North Dakota - South Dakota - Minnesota - Iowa - Missouri - Wisconsin - Illinois - Michigan - Indiana - Ohio - Pennsylvania	0.946

.".

13. Schedule B is amended by replacing Tables B and C of Part III by the following:

"Table B

Identification of product	% Sulphur	Volume of production	Unit of measure

Table C

Identification of raw material	% Sulphur	Quantity	Unit of measure

.".

14. For report year 2010, emitters must report their greenhouse gas emissions in accordance with the Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere as it read on 29 December 2010.

15. From report year 2011,

(1) despite the first paragraph of section 6.3 of the Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere, introduced by section 8 of this Regulation, emitters are not required to use the calculation methods prescribed in QC.2 to QC.17 of Schedule A.2;

(2) sections 6.6 to 6.9 of the Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere, introduced by section 8 of this Regulation, do not apply.

16. This Regulation comes into force on the fifteenth day following the date of its publication in the *Gazette officielle du Québec*.

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Draft Regulations

Draft Regulation

An Act respecting the Ministère de l'Agriculture,
des Pêcheries et de l'Alimentation
(R.S.Q., c. M-14)

Registration of agricultural operations and the payment of property taxes and compensations — Amendments

Notice is hereby given, in accordance with sections 10 to 13 of the Regulations Act (R.S.Q., c. R-18.1), that the Regulation to amend the Regulation respecting the registration of agricultural operations and the payment of property taxes and compensations, appearing below, may be made by the Gouvernement du Québec on the expiry of 30 days following this publication.

The draft Regulation introduces a new condition for the payment of property taxes and compensations of agricultural operations related to the compliance with sections 20, 20.1 and 35 of the Agricultural Operations Regulation (O.C. 695-2002 dated 12 June 2002) made under the Environment Quality Act (R.S.Q., c. Q-2).

The urgency of the situation imposes a shorter period than that in section 11 of the Regulations Act (R.S.Q., c. R-18.1), as permitted under section 12 of that Act. The new condition for the payment of property taxes and compensations is the result of amendments to the Agricultural Operations Regulation which came into force on 5 August 2010 and will apply as soon as the annual growing season begins in 2011. For consistency purposes in respect of sustainable development, this draft Regulation must apply for the municipal and school fiscal years starting on 1 January 2011.

Study of the draft Regulation reveals no financial impact especially negative on small and medium-sized businesses since the provisions of the Agricultural Operations Regulation related to the new condition imposed for the payment of property taxes and compensations provided for in this draft Regulation concern mainly agricultural operations having large areas or a substantial number of animals. In addition, the refusal by the Minister of Agriculture, Fisheries and Food to pay the taxes and compensations following the non-compliance with the new condition is non-recurrent. An operator may, for subsequent municipal and school fiscal years, receive a payment for property taxes and compensations by taking the appropriate measures to have available the areas required provided for in the related provisions of the Agricultural Operations Regulation.

Further information may be obtained by contacting Jean-François Leclerc, Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 200, chemin Sainte-Foy, 1er étage, Québec (Québec) G1R 4X6; telephone: 418 380-2100, extension 3901; fax: 418 380-2172.

Any person wishing to comment on the draft Regulation is requested to submit written comments within the 30-day period to Jean-François Leclerc, at the above-mentioned address.

LAURENT LESSARD,
Minister of Agriculture,
Fisheries and Food

Regulation to amend the Regulation respecting the registration of agricultural operations and the payment of property taxes and compensations

An Act respecting the Ministère de l'Agriculture,
des Pêcheries et de l'Alimentation
(R.S.Q., c. M-14, s. 36.12)

1. The Regulation respecting the registration of agricultural operations and the payment of property taxes and compensations (c. M-14, r. 1) is amended in section 12 by replacing the second paragraph by the following:

"For the purposes of subparagraph 5 of the first paragraph of section 36.2 of the Act, an operator who does not operate a raising or spreading site within the meaning of the Agricultural Operations Regulation (O.C. 695-2002 dated 12 June 2002) must state that fact in the application. An operator who operates such a site but who is not required, under section 35 of that Regulation, to have a yearly phosphorus report drawn up for the fiscal year for which the application is made, must state it in the application. Lastly, the operator who is required to have a yearly phosphorus report drawn up for the fiscal year for which the application is made, must state, if applicable, that

(1) the operator sent, within the time period provided for in the eighth paragraph of section 35 of the Agricultural Operations Regulation, the yearly phosphorus report required for every raising or spreading site to which that Regulation applies, and that is part of the operator's agricultural operation;

(2) any yearly phosphorus report or any update shows that, on 15 May, the operator owns, for those sites, cultivated parcels that correspond to the total area required for spreading purposes, in accordance with section 20 or 20.1 of the Agricultural Operations Regulation.”.

2. Section 13 is amended by replacing the third paragraph by the following:

“The statement by the operator required by the second paragraph of section 12 must be corroborated by the Minister of Sustainable Development, Environment and Parks.”.

3. This Regulation comes into force on the fifteenth day following the date of its publication in the *Gazette officielle du Québec*.

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Abbreviations: **A**: Abrogated, **N**: New, **M**: Modified