Subpart Q - Iron and Steel Production

A printer-friendly version (pdf) (51 pp, 5,423K) of GHG reporting instructions for this subpart

Please select a help topic from the list below:

Additional Resources:

- Part 98 Terms and Definitions
- Frequently Asked Questions (FAQs)
- Webinar Slides

Using e-GGRT to Prepare Your Subpart Q Report

> If you previously reported for Reporting Year (RY) 2011, the Agency has carried some of your RY2011 data forward and entered it in your RY2012 forms to reduce the reporting burden. It is still your responsibility to review and ensure that all of the information in your submission is correct, but the Agency believes that most of the data which is carried forward is unlikely to change significantly from year to year. For more information about carry forward data, please see the Carry forward of data from previous submissions into RY2012 forms help content.

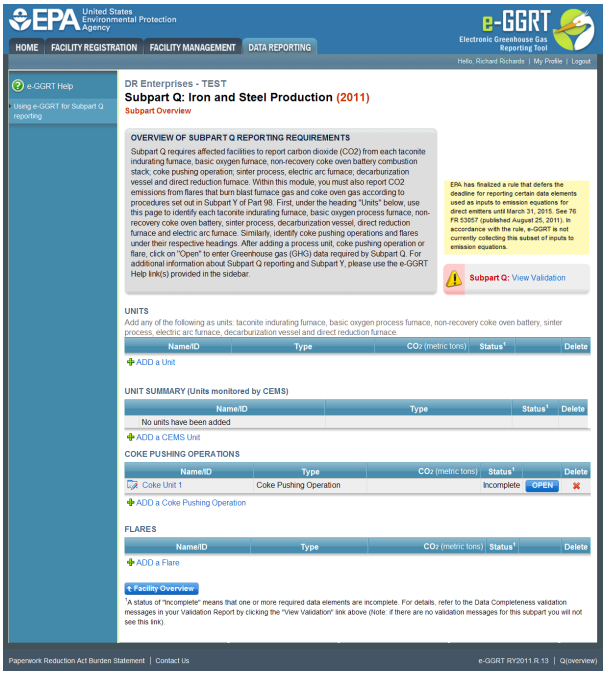
Subpart Q consists of facilities with any of the following processes: taconite iron ore processing, integrated iron and steel manufacturing, coke making not collocated with an integrated iron and steel manufacturing process, direct reduction not collocated with an integrated iron and steel manufacturing process and electric arc furnace (EAF) steelmaking not collocated with an integrated iron and steel manufacturing process. Note for by-product recovery coke oven battery combustion stacks, blast furnace stoves, boilers, process heaters, reheat furnaces, annealing furnaces, flame suppression, ladle reheaters, and other miscellaneous combustion sources you should review the reporting instructions for Subpart C.

This page provides an overview of subtopics that are central to Subpart Q reporting. This information is entered from the e-GGRT Subpart Q Overview web form shown below. Each topic represents a key web form(s) where you need to enter information:

- Subpart Q Unit Information
- Subpart Q Emissions Information
- Subpart Q Coke Pushing Operation Information
- Subpart Q Flares Information
- Subpart Q Validation Report

The end of the page provides links you can use for more detailed information and instructions on entering required information related to each of these topics.

Click image to expand



Subpart Q Unit Information

The required process unit information and the forms associated with required unit information entered into e-GGRT are different for units that are monitored by a Continuous Emissions Monitoring System (CEMS) and units that are NOT monitored by CEMS.

As a result, separate help content has been created in this subpart for entering process unit information for units monitored by CEMS and units NOT monitored by CEMS.

For each process unit that is NOT monitored by CEMS at your facility, the following unit information is required:

- An indication of the calculation methodology used to estimate quantities of CO_2 for this unit (Carbon mass balance method or Site-specific emission factor method)
- A unique name or identifier, plus optional description for this process unit
- The type of process unit
- The name and type of each input and output associated with the process unit (*Note: This requirement applies only if carbon mass balance method is used to estimate CO_2 process emissions for the unit. If you have a process input or output other than CO_2 in the exhaust gas that contains carbon that is not included in Equations Q~~-1 through Q~~*-7 of this section, you must account for the carbon and mass rate of that process input or output in your calculations according to the procedures in §98.174(b)(5). See also the exception in 98.174(b)(4).)

For each process unit that is monitored by CEMS at your facility, the following unit information is required:

- A unique name or identifier for the process unit, plus optional description of the unit
- The type of process unit, selected from the following:
  - Taconite indurating furnace
  - Basic oxygen process furnace
  - Non-recovery coke oven battery
  - Sinter process
  - Electric arc furnace (EAF)
  - Decarburization vessel (see note below)
  - Direct reduction furnace
- Annual production of taconite pellets (metric tons)
- Annual production of molten steel (metric tons)
- Annual production of coke (metric tons)
- Annual production of sinter (metric tons)
- Annual production of direct reduced iron (metric tons)

⚠ In 2010, the information required for decarburization vessels applies only to argon-oxygen decarburization vessels. However, for 2011 and subsequent calendar years, the reporting requirements apply to other decarburization vessels used to refine molten steel with the primary intent of removing carbon content of steel including, but not limited to, argon-oxygen decarburization vessels and vacuum oxygen decarburization vessels. This amendment was finalized in October 2010 (75 FR 66434).

Subpart Q Coke Pushing Operations Information

For each coke pushing operation at your facility, the following information is required:

- A unique name or identifier, plus optional description

Subpart Q Flares Information

For each flare at your facility, the following information is required:

- A unique name or identifier, plus optional description
- The type of flare
- The flare service type
- The method used to calculate the CO_2 emissions

Subpart Q Emissions Information

The required emissions information and the manner by which required emissions information is entered into e-GGRT is different for process units that are monitored by a Continuous Emissions Monitoring System (CEMS), process units that are NOT monitored by a CEMS, coke pushing operations, and flares.

As a result, separate help content has been created in this subpart for entering emissions information for each emissions source type.

For each process unit that is NOT monitored by CEMS at your facility, the following information is required:

- The annual CO_2 process emissions (e.g. the results from Equation Q-1, in metric tons)
- For each input and output assigned to a process unit for which emissions will be estimated using the carbon mass balance method, also enter the following substitute data information:
    - The annual mass or volume is based on one or more substitute monthly data values
    - The number of months that missing data procedures were followed, if applicable (*If not applicable, you must enter zero to avoid data completeness validation error messages on the validation report*)
    - The method used to develop the substitute data value(s), if applicable
    - The carbon content determination method

For each CEMS Monitoring Location, provide the following information:

- A unique unit name or identifier for the CML (see also About Unique Unit Names)
- An optional description or label for the CML
- The configuration of processes or process units that are monitored by the CML:
    - Single industrial process or process unit that exhausts to a dedicated stack
    - Multiple industrial processes or process units share a common stack
    - Industrial process or process unit shares a common stack with one or more stationary fuel combustion units
- The name of each fuel combusted in the unit(s) monitored by the CEMS
- The Tier 4/CEMS methodology start and end dates
- The cumulative total of hourly CO_2 mass emissions for each quarter of the reporting year (in metric tons) (*Do not cumulate emissions data between quarters*)
- The total annual CO2 mass emissions measured by the CEMS (in metric tons)
- An indication whether emissions reported for the CEMS include emissions calculated according to 98.33(a)(4)(viii) for a slipstream that bypassed the CEMS
- The total annual biogenic CO_2 emissions from the combustion of all biomass fuels combined (in metric tons) (*if applicable*)
- The total annual non-biogenic CO_2 emissions (includes fossil fuel, sorbent, and process CO_2 emissions, in metric tons)
- The total annual CH_4 and N_2O emissions associated with the combustion of all Table C-2 fuels combusted in all processes/process units monitored by the CEMS derived from application of Equation C-10 (in metric tons) (*if there are no combustion emissions in this CML, please enter zero*)
- The total number of source operating hours in the reporting year
- The total operating hours in which a substitute data value was used in the emissions calculations for the CO_2 concentration parameter
- The total operating hours in which a substitute data value was used in the emissions calculations for the stack gas flow rate parameter
- If moisture correction is required and a continuous moisture monitor is used, the total operating hours in which a substitute data value was used in the emissions calculations for the stack gas moisture content parameter
- An indication of the process units monitored by the CML

For each coke pushing operation at your facility, the following information is required:

- The annual CO_2 process emissions (in metric tons) [See 98.176(c)]

For each flare at your facility, the following information is required:

- The annual CO_2 emissions from flare unit operations (the output of Equation Y-1a, Y-1b, Y-2, or Y-3 depending on the calculation method used for this flare, in metric tons) [98.256(e)(4)]
- The annual CH_4 emissions from flare unit operations (the output of Equation C-9a, in metric tons) [98.33(c)(2) as required by 98.172(b)]
- The annual N_2O emissions from flare unit operations (the output of Equation C-9a, in metric tons) [98.33(c)(2) as required by 98.172(b)]

For each flare using the **Equation Y-1a** calculation method, Subpart Q requires you to enter the following supplemental emissions information:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(6)]
- The annual volume of flare gas combusted (in scf) [98.256(e)(6)]
- The specific consensus-based standard method number or description of the procedure specified by the flow meter manufacturer [98.256(q)]
- The number of days during the reporting year missing data procedures were used to determine the volume of flare gas combusted
- The annual average molecular weight (in kg/kg-mole) [98.256(e)(6)]
- The method used to measure molecular weight [98.256(q)]
    - Method 18 at 50 CFR part 60, appendix A-6
    - ASTM D1945-03
    - ASTM D1946-90 (Reapproved 2006)
    - GPA 2261-00
    - UOP539-97
    - ASTM D2503-92 (Reapproved 2007)
    - Chromatographic analysis: manufacturer's instructions
    - Other (specify)
        - Specify other method
- The number of days during the reporting year missing data procedures were used to determine molecular weight
- The annual average carbon content of the flare gas (kg carbon/kg flare gas) [98.256(e)(6)]
- The method used to measure carbon content [98.256(q)]
    - Method 18 at 50 CFR part 60, appendix A-6
    - ASTM D1945-03
    - ASTM D1946-90 (Reapproved 2006)
    - GPA 2261-00
    - UOP539-97
    - ASTM D2503-92 (Reapproved 2007)
    - Chromatographic analysis: manufacturer's instructions
    - Other (specify)
        - Specify other method
- The number of days during the reporting year missing data procedures were used to determine carbon content

For each flare using the **Equation Y-1b** calculation method, Subpart Q requires you to enter the following supplemental emissions information:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(7)]
- The annual volume of flare gas combusted (in scf) [98.256(e)(7)]
- The specific consensus-based standard method number or description of the procedure specified by the flow meter manufacturer [98.256(q)]
- The number of days during the reporting year missing data procedures were used to determine the volume of flare gas combusted
- The annual average CO_2 concentration (in percent by volume or mole) [98.256(e)(7)]
- The method used to measure CO_2 concentration [98.256(q)]
    - Method 18 at 50 CFR part 60, appendix A-6
    - ASTM D1945-03
    - ASTM D1946-90 (Reapproved 2006)
    - GPA 2261-00
    - UOP539-97
    - ASTM D2503-92 (Reapproved 2007)
    - Chromatographic analysis: manufacturer's instructions
    - Other (specify)
        - Specify other method
- The number of days during the reporting year missing data procedures were used to determine CO_2 concentration
- For each carbon containing compound other than CO_2 in the flare gas stream identified by the facility, and for each flare using the Equation Y-1b, the system shall require the facility to identify:
- The annual average concentration of the compound (in percent by volume or mole) [98.256(e)(7)(i)]
- The method used to measure concentration of the compound [98.256(q)]
    - Method 18 at 50 CFR part 60, appendix A-6
    - ASTM D1945-03
    - ASTM D1946-90 (Reapproved 2006)
    - GPA 2261-00
    - UOP539-97
    - ASTM D2503-92 (Reapproved 2007)
    - Chromatographic analysis: manufacturer's instructions
    - Other (specify)
        - Specify other method
- The number of days during the reporting year missing data procedures were used to determine the concentration of the compound

For each flare using the **Equation Y-2** calculation method, Subpart Q requires you to enter the following supplemental emissions information:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(8)]
- The annual volume of flare gas combusted (in MMscf) [98.256(e)(8)]
- The specific consensus-based standard method number or description of the procedure specified by the flow meter manufacturer [98.256(q)]
- The number of days during the reporting year missing data procedures were used to determine the volume of flare gas combusted
- The annual average higher heating value of the flare gas (MMBtu/MMscf) [98.256(e)(8)]
- The method used to measure higher heating value of the flare gas [98.256(q)]
    - ASTM D4809-06
    - ASTM D240-02 (Reapproved 2007)
    - ASTM D1826-94 (Reapproved 2003)
    - ASTM D3588-98 (Reapproved 2003)
    - ASTM D4891-89 (Reapproved 2006)
    - Chromatographic analysis: manufacturer's instructions
    - Other (specify)
        - Specify other method
- The number of days during the reporting year missing data procedures were used to determine the higher heating value of the flare gas
- An indication of whether the annual volume of flare gas combusted was determined using standard conditions of 68 ºF and 14.7 psia or 60 ºF and 14.7 psia [98.256(e)(8)]
- An indication of whether the annual average higher heating value of the flare gas was determined using standard conditions of 68 ºF and 14.7 psia or 60 ºF and 14.7 psia [98.256(e)(8)]

For each flare using the **Equation Y-3** calculation method, Subpart Q requires you to enter the following supplemental emissions information:

- The total number of start-up, shutdown, or malfunction (SSM) events exceeding 500,000 scf/day [98.256(e)(9)]

Subpart Q Validation Report

The Validation Report assists with the completeness and quality of your reporting data.

We strongly encourage you to use the Validation Report to check your work. The Validation Report performs two types of checks:

- Data Completeness: Data required for reporting that are missing or incomplete.
- Data Quality: Data that are outside of the expected range of values.

You may view the Validation Report at any time.

> Note that the Validation Report is intended to assist users in entering data, but it is not an indication that the reporter has entered all necessary information, nor is it an indication that the reporter is in compliance with part 98. Furthermore a negative finding on the validation report is not a guarantee that a data element was entered incorrectly.

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Subpart Q Process Unit Information for Units NOT Monitored by CEMS

This page provides step-by-step instructions on how to enter and edit Subpart Q Iron and Steel Production process unit information for units that are NOT monitored by CEMS.

Under Subpart Q, "process unit" types may include any of the following:

- Taconite indurating furnace
- Basic oxygen process furnace
- Non-recovery coke oven battery
- Sinter process
- Electric arc furnace (EAF)

- Decarburization vessel (see note below)
- Direct reduction furnace

> In 2010, the information required for decarburization vessels applied only to argon-oxygen decarburization vessels. However, for 2011 and subsequent calendar years, the reporting requirements apply to other decarburization vessels used to refine molten steel with the primary intent of removing carbon content of steel including, but not limited to, argon-oxygen decarburization vessels and vacuum oxygen decarburization vessels. This amendment was finalized in October 2010 (75 FR 66434).

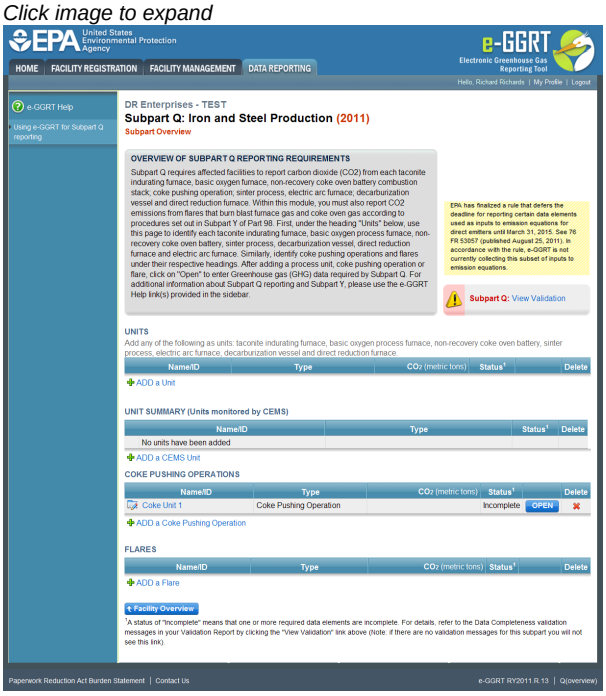
Step 1: Add a process unit

To add a process unit that is NOT monitored by a CEMS, find the UNITS table on the Subpart Overview page and click the link titled "ADD a Unit."

To later edit information you have entered to identify a process unit, click the edit icon or the Name/ID link located in the first column of the table.

To delete a process unit, click the delete icon or red “x” located in the last column of the table.

Click image to expand



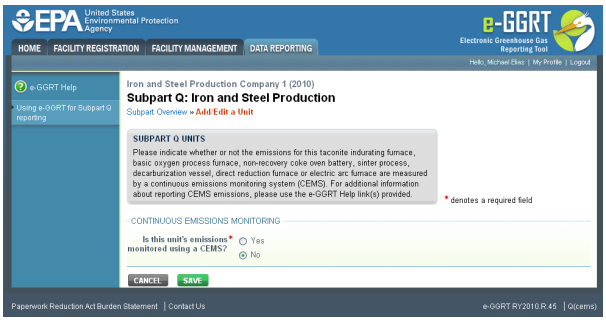
Step 2: Indicate CEMS utilization for the process unit

For each process unit, confirm whether or not the process unit utilizes CEMS.

> Note that when adding a new process unit you are prompted to answer the CEMS question immediately (the answer to this question will default to “No” for process unit added using the “ADD a Unit” link and will default to “Yes” for units added using the “ADD a CEMS Unit” link). The CEMS response may be changed here and the process unit information will be relocated to the appropriate table on the Subpart Overview page.

When finished, click SAVE.

Click image to expand

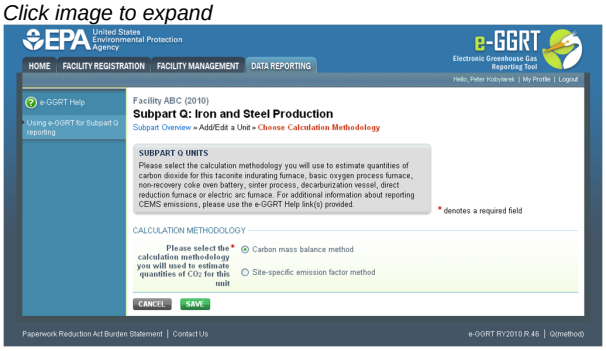


Step 3: Select calculation methodology

Use the radio buttons to indicate the calculation methodology used to estimate quantities of CO_2 for this unit (Carbon mass balance method or Site-specific emission factor method)

When finished, click SAVE.

Click image to expand



Step 4: Define the process unit

For each process unit, enter the following required information:

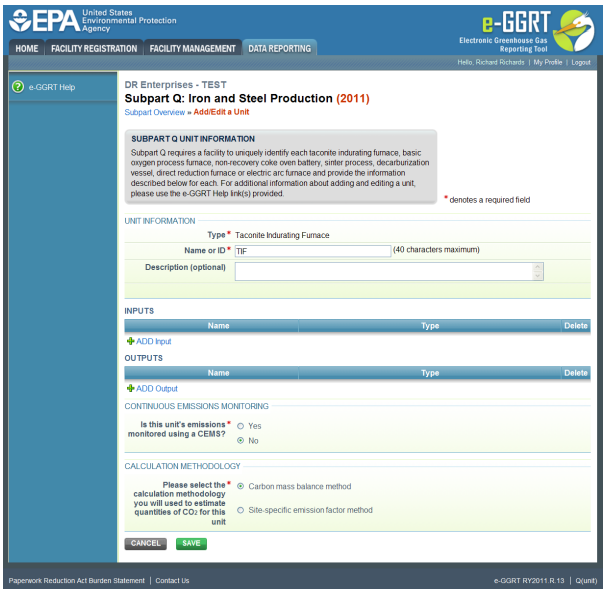
- The type of process unit, selected from the following:
  - Taconite indurating furnace
  - Basic oxygen process furnace
  - Non-recovery coke oven battery
  - Sinter process
  - Electric arc furnace (EAF)
  - Decarburization vessel
  - Direct reduction furnace
  - EAF/Decarburization Vessel Exhausting to Common Stack/Vent (applies ONLY if site-specific emission factor method is used to calculate CO_2 emissions)
- A unique name or identifier, plus optional description for this process unit

Step 5: Enter required input/output information for the process unit (if applicable)

> ⚠ Note that this step only applies if carbon mass balance method is used to estimate CO_2 process emissions for this unit. If CO_2 process emissions for this unit are estimated using the site-specific emission factor method, you may skip this step and proceed to Step 6.

To add an input or an output, click "Add an Input" or "Add an Output" below each respective table.

Click image to expand

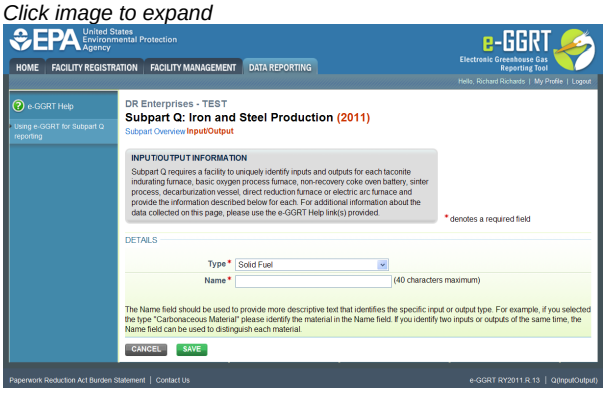


For each input or output associated with the process unit, Subpart Q requires you to report the following information:

- A unique name or identifier
- The type of input or output selected from the following list (*Note that the list will be customized in e-GGRT to reflect the key inputs and outputs identified in the rule equations for a given type of process unit*):
    - Input types:
        - Molten Iron
        - Ferrous Scrap
        - Flux Material
        - Carbonaceous Material
        - Other - Solid
        - Other - Liquid
        - Other - Gas
        - Direct Reduced Iron
        - Carbon Electrode Consumed
    - Output types:
        - Slag Produced
        - Molten Steel Produced
        - Air Pollution Control Residue
        - Other - Gas
        - Other - Liquid
        - Other - Solid

When you are finished entering the required information for an input or output, click SAVE. Note, if you are using the carbon mass balance method, you must identify inputs and outputs associated with each process. If you do not, you will see a data completeness validation message on the Validation report page as a reminder that you have not completed Unit-Level data entry.

Click image to expand



Repeat this step until all inputs and outputs associated with the process unit have been added and defined, then proceed to Step 6.

Step 6: Save all entered information for the process unit

When you are finished entering all required information for the process unit, click SAVE.

Click image to expand

Step 7: Repeat Steps 1-6

Repeat Steps 1-6 until all process units NOT monitored by CEMS have been added for your facility.

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Subpart Q Process Unit Information for Units Monitored by CEMS

This page provides step-by-step instructions on how to enter and edit Subpart Q Iron and Steel Production process unit information for units that are monitored by CEMS.

Under Subpart Q, "process units" may include any of the following:

- Taconite indurating furnace
- Basic oxygen process furnace
- Non-recovery coke oven battery
- Sinter process
- Electric arc furnace (EAF)
- Decarburization vessel
- Direct reduction furnace

Step 1: Add a process unit

To add a process unit that is monitored by CEMS, find the UNIT SUMMARY (Units Monitored by CEMS) table on the Subpart Overview page and click the link titled "ADD a CEMS Unit." When you report emissions information later you will have the opportunity to indicate or identify if a CEMS Monitoring Location (CML) is monitoring multiple units that may share a common stack.

To later edit information identifying a process unit, click the edit icon or the Name/ID link located in the first column of the table.

To delete a process unit, click the delete icon or red “x” located in the last column of the table.

Click image to expand

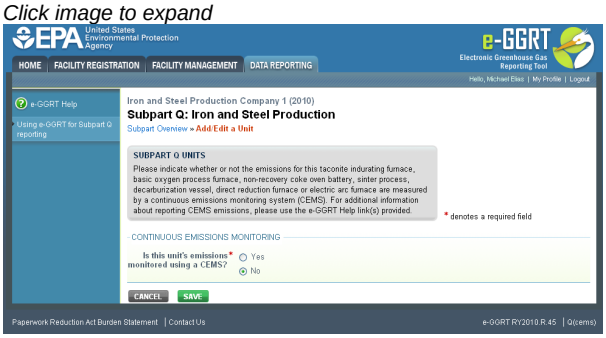
Step 2: Indicate CEMS utilization for the process unit

For each process unit, confirm whether or not the process unit utilizes CEMS.

> ⚠ Note that when adding a new process unit you are prompted to answer the CEMS question immediately (the answer to this question will default to “No” for process unit added using the “ADD a Unit” link and will default to “Yes” for units added using the “ADD a CEMS Unit” link). The CEMS response may be changed here and the process unit information will be relocated to the appropriate table on the Subpart Overview page.

When finished, click SAVE.

Click image to expand



Step 3: Enter required information for the process unit

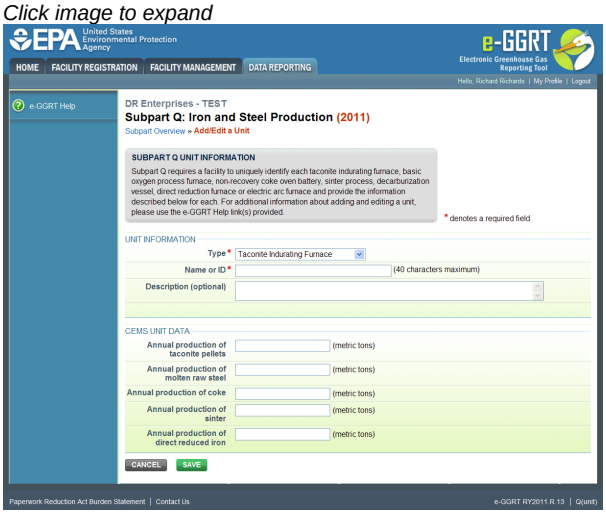
For each process unit monitored by CEMS at your facility, Subpart Q requires you to report the following information:

- The type of process unit, selected from the following:
  - Taconite indurating furnace
  - Basic oxygen process furnace
  - Non-recovery coke oven battery
  - Sinter process
  - Electric arc furnace (EAF)
  - Decarburization vessel
  - Direct reduction furnace
- A unique name or identifier for the process unit, plus optional description of the unit
- Annual production of taconite pellets (metric tons)
- Annual production of molten steel (metric tons)

- Annual production of coke (metric tons)
- Annual production of sinter (metric tons)
- Annual production of direct reduced iron (metric tons)

When you are finished entering all required information for the process unit, click SAVE.

Click image to expand



Step 4: Repeat Steps 1-3

Repeat Steps 1-3 until all process units monitored by CEMS have been added for your facility.

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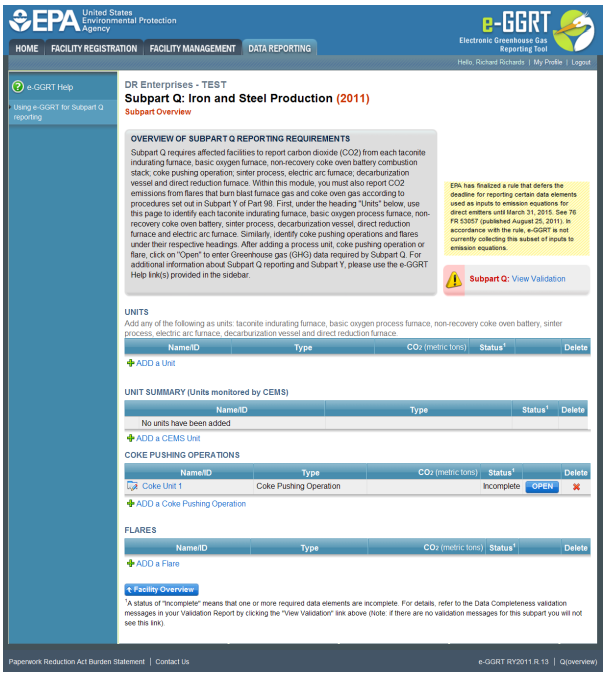
Subpart Q Coke Pushing Operations Information

This page provides step-by-step instructions on how to enter and edit Subpart Q Iron and Steel Production coke pushing operations information. Operations identified should include coke pushing occurring (coal charged) at both byproduct and non-recovery coke oven combustion battery stacks.

Step 1: Add a coke pushing operation

To add a coke pushing operation, find the COKE PUSHING OPERATIONS table on the Subpart Overview page and click the link titled "ADD a Coke Pushing Operation."

Click image to expand



To later edit information identifying a coke pushing operation, click the edit icon or the Name/ID link located in the first column of the table.

To delete a coke pushing operation, click the delete icon located in the last column of the table.

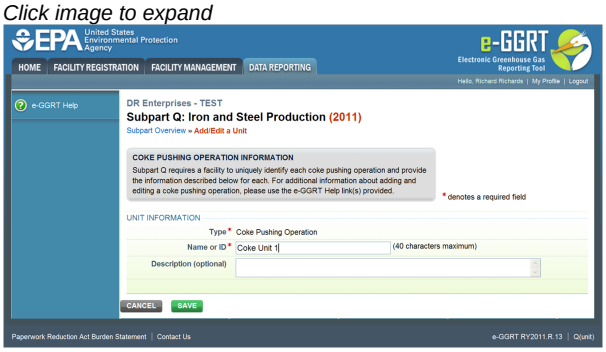
Step 2: Enter required information for the coke pushing operation

For each coke pushing operation at your facility, Subpart Q requires you to report the following information:

- A unique name or identifier, plus optional description

When you are finished, click SAVE.

Click image to expand



Step 3: Repeat Steps 1-2

Repeat Steps 1-2 until all coke pushing operations have been added for your facility.

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Subpart Q Flares Information

This page provides step-by-step instructions on how to enter and edit Subpart Q Iron and Steel Production flare information.

Step 1: Add a flare

To add a flare, find the FLARES table on the Subpart Overview page and click the link titled "ADD a Flare."

To edit flare identification information for , click the edit icon or the Name/ID link located in the first column of the table.

To delete a flare, click the delete icon or red “x” located in the last column of the table.

Click image to expand

Step 2: Enter required information for the flare

For each flare at your facility, Subpart Q requires you to report the following information:

- A unique name or identifier, plus optional description
- The type of flare, selected from the following:
  - Steam assisted
  - Air-assisted
  - Unassisted
  - Other (specify)
- The flare service type, selected from the following:
  - General facility flare
  - Unit flare
  - Emergency only flare
  - Back-up flare
  - Other (specify)
- The method used to calculate the CO_2 emissions, selected from the following (*Note that certain methods must be used if certain criteria are met*):
  - 98.253(b)(1)(ii)(A) – Equation Y-1a Gas Composition Monitored (*Equation Y-1a or Y-1b must be used if you have a continuous gas composition monitor on the flare or if you measure it at least weekly*)
  - 98.253(b)(1)(ii)(A) – Equation Y-1b Gas Composition Monitored (*Equation Y-1a or Y-1b must be used if you have a continuous gas composition monitor on the flare or if you measure it at least weekly*)
  - 98.253(b)(1)(ii)(B) – Equation Y-2 Heat Content Monitored (*Equation Y-2 must be used if you have a continuous higher heating value monitor or measure it at least weekly and the heating value monitor or measurement is not based on compositional analyses; if compositional analyses are used, you must use Equations 1a or 1b*)
  - 98.253(b)(1)(iii) – Equation Y-3 Start-up, Shutdown, Malfunction (*Equation Y-3 must be used if you do not measure gas*

composition or heating value at least weekly)

When finished entering information for the flare, click SAVE.

Click image to expand

Step 3: Repeat Steps 1-2

Repeat Steps 1-2 until all flares have been added for your facility.

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Subpart Q Emissions Information for Units NOT Monitored by CEMS

This page provides step-by-step instructions on how to enter and edit Subpart Q Iron and Steel Production emissions information for process units that are NOT monitored by a Continuous Emissions Monitoring System (CEMS).

Step 1. Select a process unit

To select a process unit NOT monitored by CEMS for which to enter emissions data, find the unit in the UNITS table and click OPEN.

If the CO_2 process emissions from the selected unit will be estimated using the **carbon mass balance method**, proceed to Section A - Carbon Mass Balance Method and execute **steps A1-A4** for each type of process unit.

If the CO_2 process emissions from the selected unit will be estimated using the **site-specific emission factor method**, proceed to Section B - Site-specific Emission Factor Method and execute **steps B1-B2** for each process unit.

Click image to expand

Section A - Carbon Mass Balance Method

Step A1: Equation Summary and Result

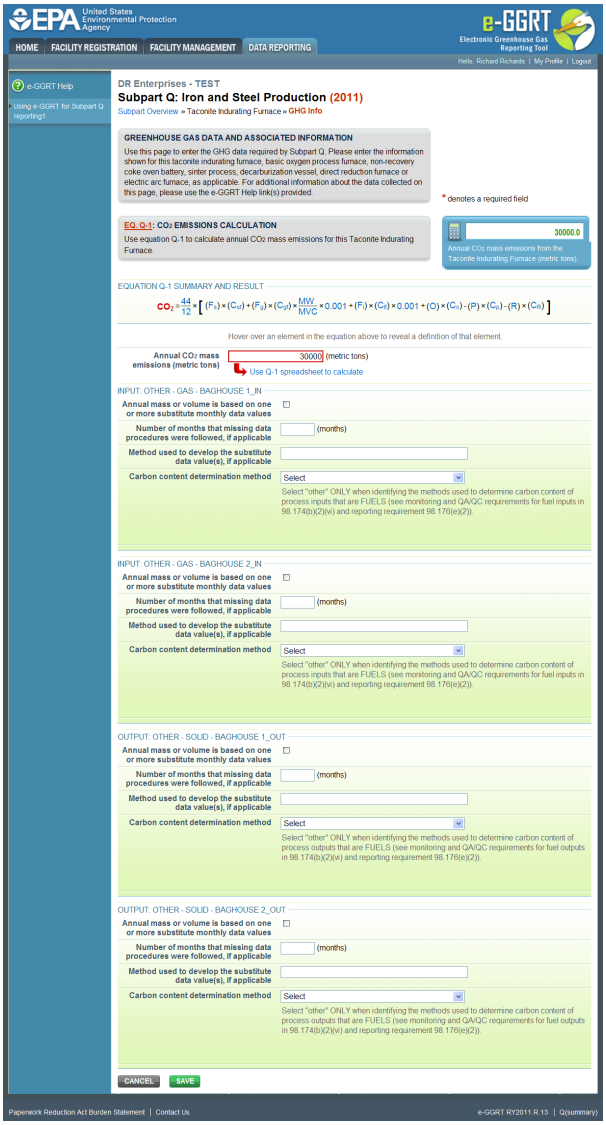
For each process unit that is NOT monitored by CEMS at your facility and for which CO_2 process emissions will be estimated using the carbon mass balance method, Subpart Q requires the following emissions information:

- The annual CO_2 process emissions (the results from Equation Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, or Q-7 in metric tons)

For assistance in calculating CO_2 process emissions for a process unit, access the calculation spreadsheets for this subpart by clicking the link titled "Use Q-1 spreadsheet to calculate," located below the red emissions data entry box, then follow the provided instructions. Similar spreadsheets are provided for applying mass balance equations (e.g. Q-2, Q-3, Q-4, Q-5, Q-6, or Q-7, etc) for all relevant types of process units per the table below:

Process Unit Type	Applicable Subpart Q Equation
Taconite indurating furnace	Equation Q-1
Basic oxygen process furnace	Equation Q-2
Non-recovery coke oven battery	Equation Q-3
Sinter process	Equation Q-4
Electric arc furnace (EAF)	Equation Q-5
Decarburization vessel	Equation Q-6
Direct reduction furnace	Equation Q-7

Click image to expand



Step A2: Input and output substitute data

For each input and output assigned to the process unit, enter the following substitute data information:

- Annual mass or volume is based on one or more substitute monthly data values. If this is not selected or is not applicable, you must enter zero, “0” in the box for the number of months with missing data. If you do not remember, you will receive a UNIT level validation message indicating that you have not completed entering data on this form in the validation report.
- Number of months that missing data procedures were followed, if applicable
- Method used to develop the substitute data value(s), if applicable. Enter information only if you applied missing data procedures, otherwise leave blank.
- Carbon content determination method, selected from the following, be sure the method selected is appropriate to the material being tested:
    - Supplier
    - ASTM C25-06
    - ASTM D5373-08
    - ASTM E1915-07a
    - ASTM E1019-08
    - ASM CS-104 UNS No. G10460
    - ISO/TR 15349-3:1998
    - Other (specify)

Step A3: Save Your Data

When you have finished entering annual emissions, inputs and outputs and identifying whether substitute data were used to determine mass or volume of input/outputs, click SAVE. You will then return to the Subpart Overview page and you should see the status of data entry for the unit change to “Complete” in the Status column in the UNITS table.

After you save the data on this page, the next time you open the page, the calculator on the top of the page will display the CO_2 process emissions, rounded to the nearest 0.1 of a metric ton. The value displayed is for informational purposes only.

Step A4: Repeat steps A1-A3

Repeat Steps A1-A3 until data have been entered for all process units NOT monitored by CEMS for which emissions were estimated using the carbon mass balance methods provide in the rule.

Section B - Site-specific Emission Factor Method

Step B1. Equation Q-8 (EF Approach) Summary and Result

For each process unit that is NOT monitored by CEMS at your facility and for which CO_2 process emissions will be estimated using the site-specific emission factor method, Subpart Q requires the following emissions information:

- The annual CO_2 process emissions (the results from Equation Q-8 and associated procedures in 98.73(b)(2)(i)-(iv) multiplied by the total amount of feed or production, as applicable, for the reporting period, in metric tons)
- The number of times that missing data procedures were followed and the performance test was repeated to determine the site-specific emission factor

For assistance in calculating CO_2 process emissions for a process unit, access the calculation spreadsheets for this subpart by clicking the link titled "Use Q EF spreadsheet to calculate," located below the red emissions data entry box, then follow the provided instructions (*Note that the Equation Q-8 EF Approach Calculation Spreadsheet executes the additional step of multiplying the result of Equation Q-8 by the total amount of feed or production, as applicable and required by the rule, for the reporting period to calculate annual CO_2 process emissions for the process unit*).

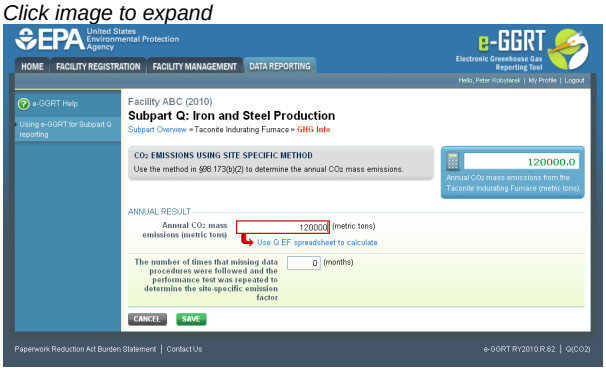
When you have finished entering the required emissions data, click SAVE.

After you save the data on this page, the next time you open the page, the calculator on the top of the page will display the CO_2 process emissions, rounded to the nearest 0.1 of a metric ton. The value displayed is for informational purposes only.

Step B2: Repeat step B1

Repeat Steps B1 until data has been entered for all process units for which emissions were estimated using the site-specific emission factor method.

Click image to expand



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Subpart Q Emissions Information for Units Monitored by CEMS

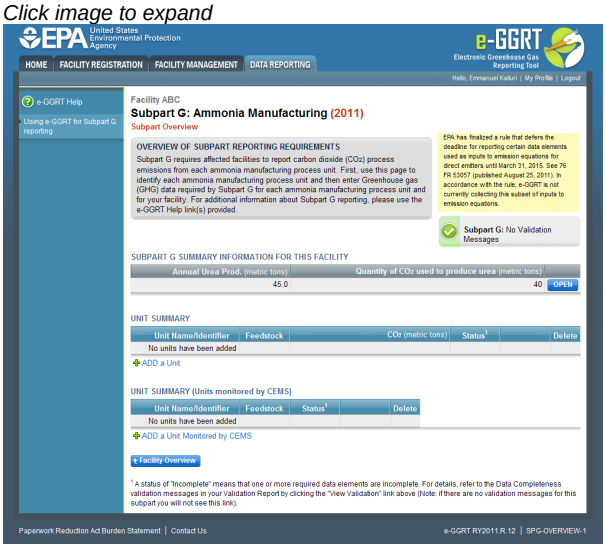
This page provides step-by-step instructions on how to enter and edit Subpart Q Iron and Steel Production emissions information for process units that are monitored by a Continuous Emissions Monitoring System (CEMS).

Step 1: Add a CEMS Monitoring Location (CML)

To add a CML, click the “Add a CEMS Monitoring Location” link below the CEMS MONITORING LOCATION (CML) SUMMARY table on the Subpart Overview page

> ⚠ The screenshot below is from Subpart G and is displayed as an example. The screen for other subparts may differ slightly.

Click image to expand



Step 2: Define a CML and report emissions information

For each CEMS Monitoring Location, provide the following information:

- A unique unit name or identifier for the CML (see also About Unique Unit Names)
- An optional description or label for the CML
- The configuration of processes or process units that are monitored by the CML:
  - Single process or process unit that exhausts to a dedicated stack
  - Multiple processes or process units that share a common stack
  - Process or process unit that shares a common stack with one or more stationary fuel combustion units
- The types of fuel combusted in the unit(s) monitored by the CEMS
- The Tier 4/CEMS methodology start and end dates
- The quarter total of hourly CO_2 mass emissions for each quarter of the reporting year (metric tons) (*Do not cumulate emissions data between quarters*)
- The total annual CO_2 mass emissions measured by the CEMS (metric tons)
- An indication whether emissions reported for the CEMS include emissions calculated according to 98.33(a)(4)(viii) for a slipstream that bypassed the CEMS
- The total annual biogenic CO_2 emissions from the combustion of all biomass fuels combined (metric tons) (*if not applicable, enter '0'*)
- The total annual non-biogenic CO_2 emissions which includes fossil fuel, sorbent, and process CO_2 emissions (metric tons)
- The total annual CH_4 and N_2O emissions associated with the combustion of all Table C-2 fuels combusted in all processes/process units monitored by the CEMS derived from application of Equation C-10 (metric tons) (*if there are no combustion emissions in this CML, please enter '0'*)
- The total number of source operating hours in the reporting year
- The total operating hours in which a substitute data value was used in the emissions calculations for the CO_2 concentration parameter
- The total operating hours in which a substitute data value was used in the emissions calculations for the stack gas flow rate parameter
- If moisture correction is required and a continuous moisture monitor is used, the total operating hours in which a substitute data value was used in the emissions calculations for the stack gas moisture content parameter
- The total annual CO2 emissions from the CEMS Monitoring Location (CML) Summary attributable to combustion (metric tons)

Do not leave any of these fields blank. If, for example, your facility has no biogenic CO_2 emissions, enter '0'.

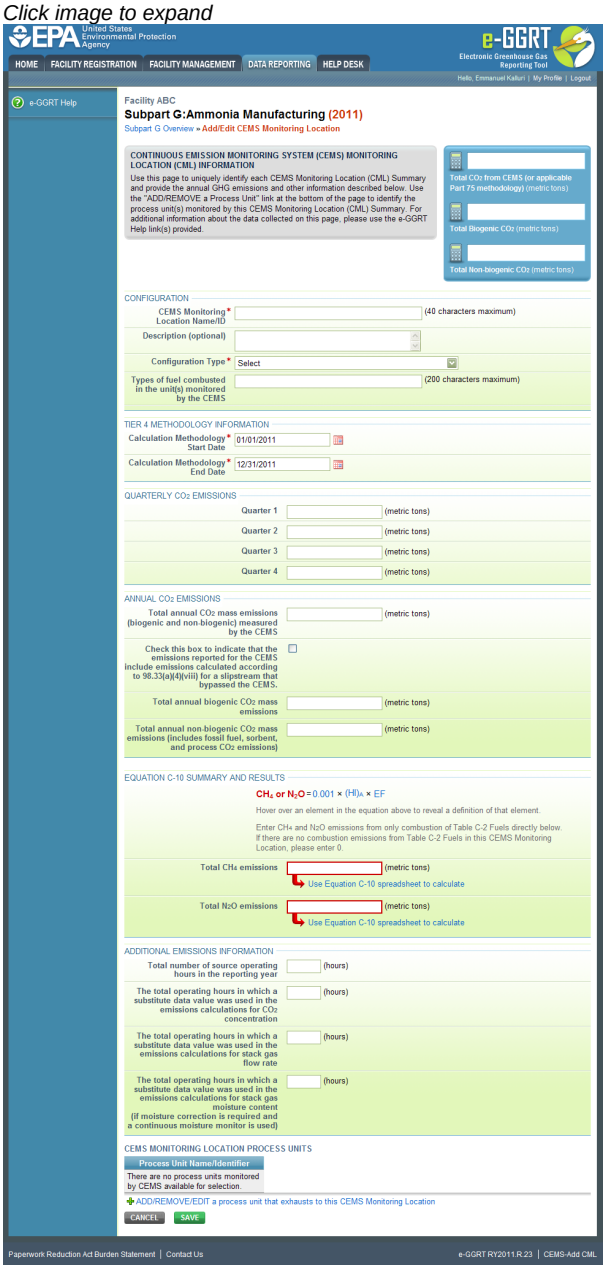
For assistance in calculating annual CH_4 and N_2O emissions using Equation C-10, access the optional calculation spreadsheet by clicking one of the links titled "Use Equation C-10 spreadsheet to calculate" located below each of the red emissions information data entry boxes and follow the provided instructions

Step 3: Identify process units monitored at a CML

To identify the process units monitored at a CML, first click the link titled "ADD/REMOVE a process unit that exhausts to this CEMS Monitoring Location" at the bottom of the page

> ⚠ The screenshot below is from Subpart G and is displayed as an example. The screen for other subparts may differ slightly.

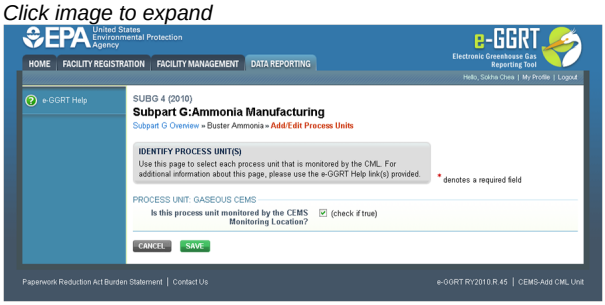
Click image to expand



On the CML Process Units Selection page, use the check boxes to select the process unit(s) monitored at this CML. This will indicate that the unit(s) selected vent emission through the stack monitored by this CML.

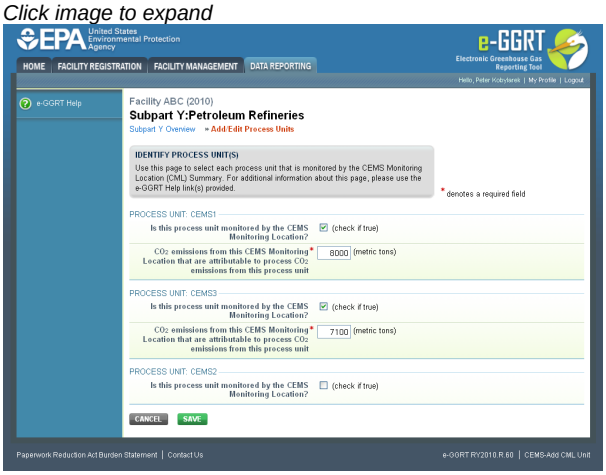
> ⚠ The screenshot below is from Subpart G and is displayed as an example. The screen for other will differ slightly depending on the number of units with emissions monitored by a single CML at your facility.

Click image to expand



Subpart Y also collects the CO_2 emissions from this CEMS Monitoring Location that are attributable to process CO_2 emissions from this process unit (metric tons).

Click image to expand



When finished selecting process unit for the CML and entering additional required information (if applicable), click SAVE. You should then be directed back to the Add/Edit a CML Location form and see the units you selected listed in the CEMS MONITORING LOCATION (CML) PROCESS UNITS table.

Step 4: Save entered data for a CML

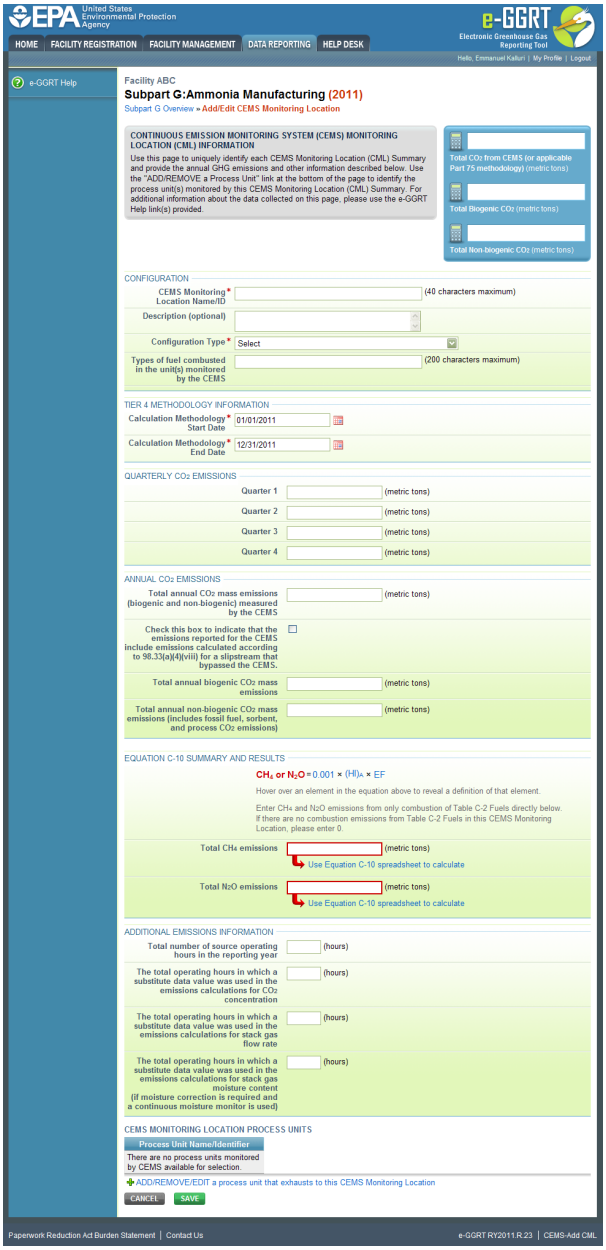
When you have finished entering data for a CML, click SAVE. You will then return to the Subpart Overview page. You will see the status of data entry for the CML updated to “Complete” in the Status column in the CEMS MONITORING LOCATION (CML) SUMMARY table.

If you don't have all the data, you can enter some now, save it, and finish later by clicking on the hyperlinked name of the CML in the CEMS MONITORING LOCATION (CML) SUMMARY table.

After you save the data on this page, the next time you open the page, the calculator on the top of the page will display the CO_2 process emissions for the CML, rounded to the nearest 0.1 of a metric ton. The value displayed is for informational purposes only.

> Note: the screenshot below is from Subpart G and is displayed as an example. The screen for other subparts will differ slightly.

Click image to expand



Step 5: Repeat Steps 1-4

Repeat Steps 1-4 until emissions information has been entered for all CMLs. If you have missed something, the validation report messages will help you identify any incomplete entries.

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Subpart Q Emissions Information for Coke Pushing Operations

This page provides step-by-step instructions on how to enter and edit Subpart Q Iron and Steel Production emissions information for coke pushing operations. Emissions from coke pushing should include coke pushed at both byproduct and non-recovery coke pushing operations.

Step 1: Select a coke pushing operation

To select a coke pushing operation for which to enter emissions data, find the operation in the COKE PUSHING OPERATIONS table and click OPEN.

Click image to expand

Step 2: Enter emissions information

For each coke pushing operation at your facility, Subpart Q requires the following emissions information:

- The annual CO_2 equivalent process emissions (in metric tons CO_2e)

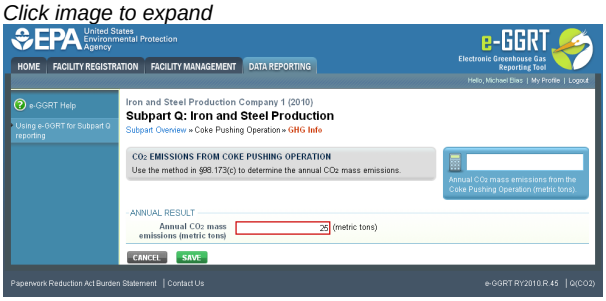
To calculate emissions from a coke pushing operation in metric tons CO_2e, multiply the metric tons of coal charged to the coke ovens during the reporting period by 0.008 (*Note that there is NOT a calculation spreadsheet that does this*).

Step 3: Save Your Data

When you have finished entering the required emissions information, click SAVE.

After you save the data on this page, the next time you open the page, the calculator on the top of the page will display the CO_2 emissions, rounded to the nearest 0.1 of a metric ton. The value displayed is for informational purposes only.

Click image to expand



Step 4: Repeat steps 1-3

Repeat Steps 1-3 until emissions information has been entered for all coke pushing operations at your facility.

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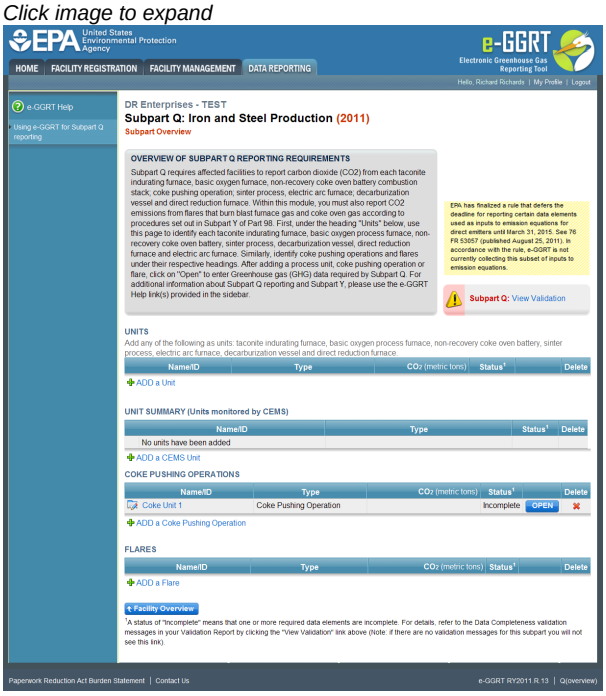
Subpart Q Emissions Information for Flares

This page provides a step-by-step description of how to enter Subpart Q Flares unit emissions information.

Step 1: Select a flare

To add or update flare emissions information, locate the FLARES table on the Subpart Q Overview page, and click OPEN.

Click image to expand



Step 2: Equation Summary and Results

The Equation Summary is presented on this page. You can hover over an element in the equation to reveal a definition of that element.

For each flare at your facility, Subpart Q requires you to enter the following emissions information:

- The annual CO_2 emissions from flare unit operations (the output of Equation Y-1a, Y-1b, Y-2, or Y-3 depending on the calculation method used for this flare, in metric tons) [98.256(e)(4)]
- The annual CH_4 emissions from flare unit operations (the output of Equation C-9a, in metric tons) [98.256(e)(4)]
- The basis for the fraction of carbon in the flare gas contributed by methane value:
    - Method 18 at 40 CFR part 60, appendix A-6

    - ASTM D1945-03
    - ASTM D1946-90-Reapproved 2006
    - GPA 2261-00
    - UOP539-97
    - ASTM D2503-92-Reapproved 2007
    - Chromatographic analysis: manufacturer's instructions
    - Engineering calculations
    - Other (specify)
- The annual N_2O emissions from flare unit operations (the output of Equation C-9a, in metric tons) [98.256(e)(4)]

To calculate annual CO_2 emissions, download the calculation spreadsheet by clicking the link titled "Use Y-x spreadsheet to calculate" (where 'x' represents 1a, 1b, 2, or 3 depending on the CO_2 calculation method used for this flare). Fill in the spreadsheet using the instructions in the spreadsheet. After completing the spreadsheet, copy the value of CO_2 calculated by the spreadsheet to this page in the red box next to "Annual CO_2 emission from this flare (metric tons)."

> ⚠ Per §98.172(b), you must report CO_2 emissions from flares that burn blast furnace gas or coke oven gas according to the procedures in §98.253(b)(1) of subpart Y (Petroleum Refineries). When using the alternatives set forth in §98.253(b)(1)(ii)(B) and §98.253(b)(1)(iii)(C), you must use the default CO_2 emission factors for coke oven gas (46.85 kg CO_2/MMBtu) and blast furnace gas (274.32 kg CO_2/MMBtu) from Table C-1 to subpart C in Equations Y-2 and Y-3 of subpart Y.

To calculate annual CH_4 and N_2O emissions, download the calculation spreadsheets by clicking the link "Use C-9a spreadsheet to calculate." Fill in the spreadsheets using the instructions in each spreadsheet. After completing the spreadsheets, copy the values of CH_4 and N_2O calculated by the spreadsheets to this page in the red box next to "Annual CH_4 emission from this flare (metric tons)" and "Annual N_2O emission from this flare (metric tons)," respectively.

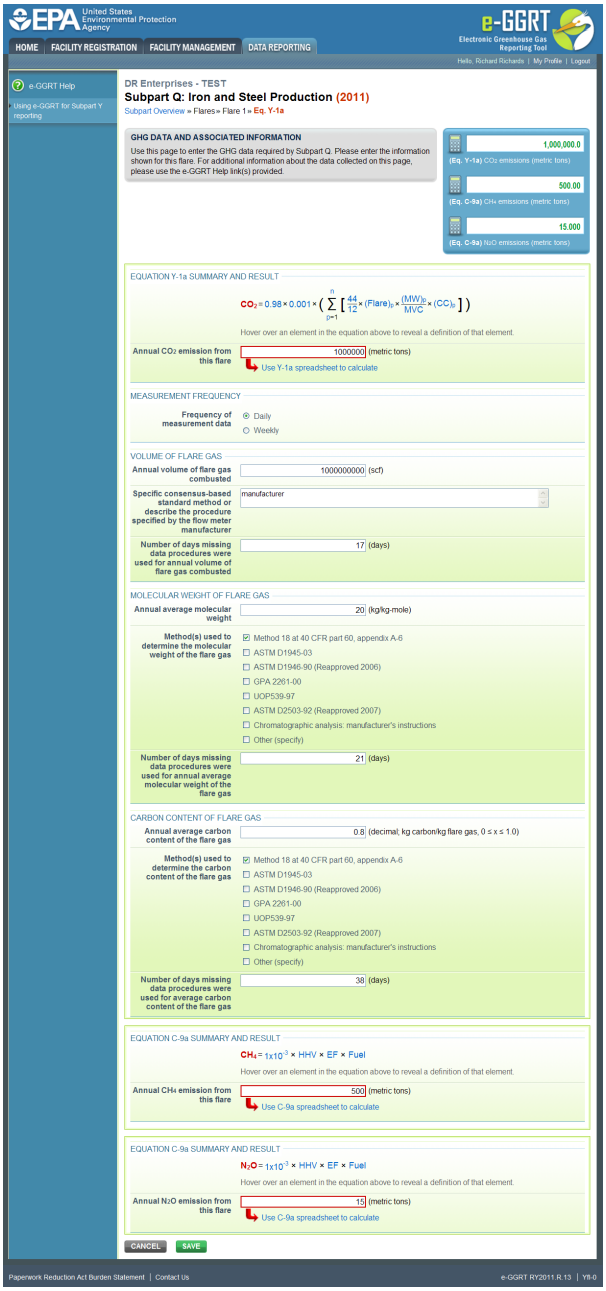
> ⚠ Per §98.172(b), you must report CH_4 and N_2O emissions from flares under subpart Q according to the requirements in §98.33(c)(2) using the emission factors for coke oven gas and blast furnace gas in Table C--2 to subpart C.

Step 3: Enter supplemental emissions information

For each flare using the **Equation Y-1a** calculation method, Subpart Q requires you to enter the following supplemental emissions information:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(6)]
- The annual volume of flare gas combusted (in scf) [98.256(e)(6)]
- The specific consensus-based standard method number or description of the procedure specified by the flow meter manufacturer [98.256(q)]
- The number of days during the reporting year missing data procedures were used to determine the volume of flare gas combusted
- The annual average molecular weight (in kg/kg-mole) [98.256(e)(6)]
- The method used to measure molecular weight [98.256(q)]
    - Method 18 at 50 CFR part 60, appendix A-6
    - ASTM D1945-03
    - ASTM D1946-90 (Reapproved 2006)
    - GPA 2261-00
    - UOP539-97
    - ASTM D2503-92 (Reapproved 2007)
    - Chromatographic analysis: manufacturer's instructions
    - Other (specify)
- The number of days during the reporting year missing data procedures were used to determine molecular weight
- The annual average carbon content of the flare gas (kg carbon/kg flare gas) [98.256(e)(6)]
- The method used to measure carbon content [98.256(q)]
    - Method 18 at 50 CFR part 60, appendix A-6
    - ASTM D1945-03
    - ASTM D1946-90 (Reapproved 2006)
    - GPA 2261-00
    - UOP539-97
    - ASTM D2503-92 (Reapproved 2007)
    - Chromatographic analysis: manufacturer's instructions
- The number of days during the reporting year missing data procedures were used to determine carbon content

Click image to expand



For each flare using the **Equation Y-1b** calculation method, Subpart Q requires you to enter the following supplemental emissions information:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(7)]
- The annual volume of flare gas combusted (in scf) [98.256(e)(7)]
- The specific consensus-based standard method number or description of the procedure specified by the flow meter manufacturer [98.256(q)]
- The number of days during the reporting year missing data procedures were used to determine the volume of flare gas combusted
- The annual average CO_2 concentration in the flare gas stream (in percent by volume or mole) [98.256(e)(7)]
- The method used to measure CO_2 concentration [98.256(q)]
    - Method 18 at 50 CFR part 60, appendix A-6
    - ASTM D1945-03
    - ASTM D1946-90 (Reapproved 2006)
    - GPA 2261-00
    - UOP539-97
    - ASTM D2503-92 (Reapproved 2007)
    - Chromatographic analysis: manufacturer's instructions
    - Other (specify)
- The number of days during the reporting year missing data procedures were used to determine CO_2 concentration
- For each carbon containing compound other than CO_2 in the flare gas stream identified by the facility, and for each flare using the Equation Y-1b, the system shall require the facility to identify:

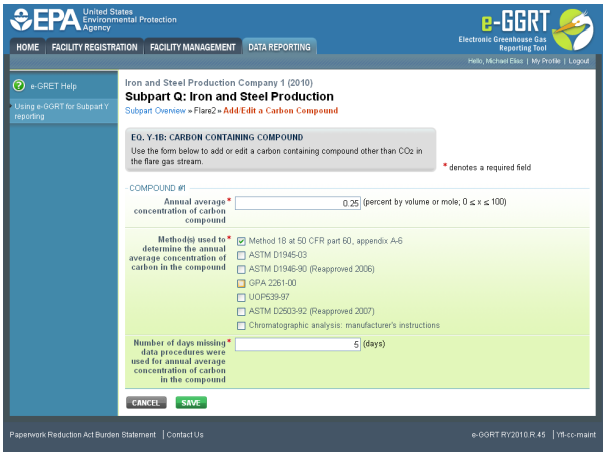
- The annual average concentration of the compound (in percent by volume or mole) [98.256(e)(7)(i)]
- The method used to measure concentration of the compound [98.256(q)]
  - Method 18 at 50 CFR part 60, appendix A-6
  - ASTM D1945-03
  - ASTM D1946-90 (Reapproved 2006)
  - GPA 2261-00
  - UOP539-97
  - ASTM D2503-92 (Reapproved 2007)
  - Chromatographic analysis: manufacturer's instructions
- The number of days during the reporting year missing data procedures were used to determine the concentration of the compound

Click image to expand

To add a non-CO_2 carbon-contain compound for the flare, click the "ADD a Compound" link in the CARBON CONTAINING COMPOUNDS (OTHER THAN CO2) IN THE FLARE GAS STREAM section on the Equation Summary and Result page and enter the required information.

When finished entering the required compound information, click SAVE.

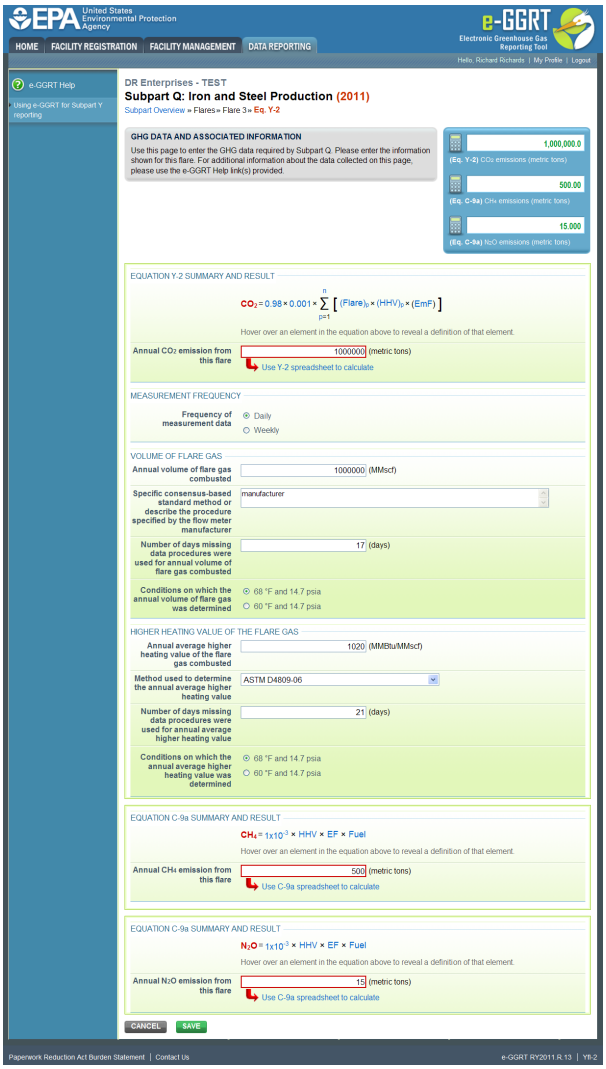
Click image to expand



For each flare using the **Equation Y-2** calculation method, Subpart Q requires you to enter the following supplemental emissions information:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(8)]
- The annual volume of flare gas combusted (in MMscf) [98.256(e)(8)]
- The specific consensus-based standard method number or description of the procedure specified by the flow meter manufacturer [98.256(q)]
- The number of days during the reporting year missing data procedures were used to determine the volume of flare gas combusted
- An indication of whether the annual average higher heating value of the flare gas was determined using standard conditions of 68 ºF and 14.7 psia or 60 ºF and 14.7 psia [98.256(e)(8)]
- The annual average higher heating value of the flare gas (Btu/scf) [98.256(e)(8)]
- The method used to measure higher heating value of the flare gas [98.256(q)]
    - ASTM D4809-06
    - ASTM D240-02 (Reapproved 2007)
    - ASTM D1826-94 (Reapproved 2003)
    - ASTM D3588-98 (Reapproved 2003)
    - ASTM D4891-89 (Reapproved 2006)
    - Chromatographic analysis: manufacturer's instructions
    - Other (specify)
- The number of days during the reporting year missing data procedures were used to determine the higher heating value of the flare gas
- An indication of whether the annual volume of flare gas combusted was determined using standard conditions of 68 ºF and 14.7 psia or 60 ºF and 14.7 psia [98.256(e)(8)]

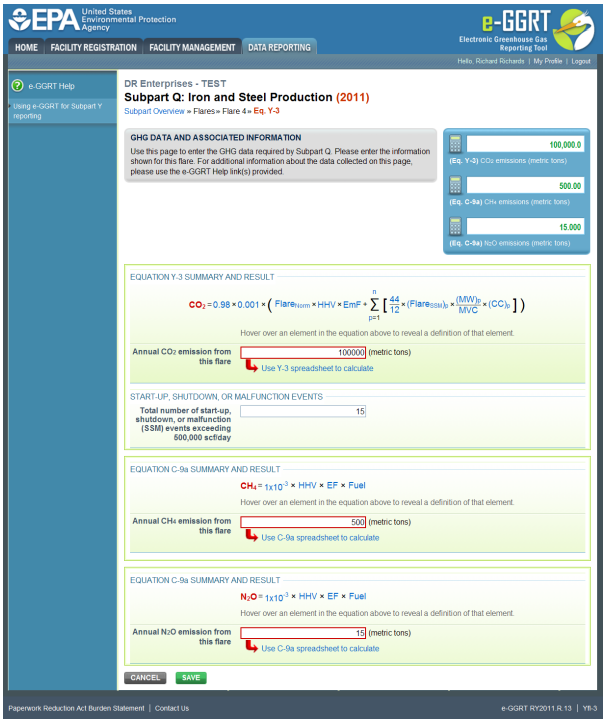
Click image to expand



For each flare using the **Equation Y-3** calculation method, Subpart Q requires you to enter the following supplemental emissions information:

- The total number of start-up, shutdown, or malfunction (SSM) events exceeding 500,000 scf/day [98.256(e)(9)]

Click image to expand



Step 4: Save Your Data

When you have finished entering emission results, click SAVE.

After you save the data on this page, the next time you open the page, the calculator on the top of the page will display the CO_2, CH_4, and N_2O emissions, rounded to the nearest 0.1, 0.01, and 0.001 of a metric ton, respectively. The value displayed is for informational purposes only.

Step 5. Repeat Steps 1-4

Repeat Steps 1-4 until you have entered emissions information for all flares at your facility.

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See Also

Screen Errors
Using e-GGRT to Prepare Your Subpart Q Report
Subpart Q Process Unit Information for Units NOT Monitored by CEMS
Subpart Q Process Unit Information for Units Monitored by CEMS
Subpart Q Coke Pushing Operations Information
Subpart Q Flares Information
Subpart Q Emissions Information for Units NOT Monitored by CEMS
Subpart Q Emissions Information for Units Monitored by CEMS
Subpart Q Emissions Information for Coke Pushing Operations
Subpart Q Emissions Information for Flares
Subpart Validation Report

Using Subpart Q Calculation Spreadsheets

These optional spreadsheets are provided to assist reporters in calculating emissions and in keeping records of these calculations.

Reporters are required to keep records of these calculations under 40 CFR 98.3(g) and additional subpart-specific provisions, but are not required to use these spreadsheets or to submit any spreadsheets to EPA.

Spreadsheets may include inputs to emission equations, reporting some of which EPA deferred until 2015.
(See 76 FR 53057, published August 25, 2011, http://www.gpo.gov/fdsys/pkg/FR-2011-08-25/pdf/2011-21727.pdf).

Overview

This help page provides guidance for working with the supplemental Subpart Q calculation spreadsheets. The guidance provides step-by-step instructions for the following tasks:

Specific information on each of the spreadsheets is provided below:

Calculation Spreadsheet (click to download)	Calculation Method	Selection Criteria: Emissions Source	Instructions (click to view)
Equation Q-1 Calculation Spreadsheet.xls	Carbon Mass Balance	Taconite indurating furnace	Q-1 Help
Equation Q-2 Calculation Spreadsheet.xls	Carbon Mass Balance	Basic oxygen process furnace	Q-2 Help
Equation Q-3 Calculation Spreadsheet.xls	Carbon Mass Balance	Non-recovery coke oven battery	Q-3 Help
Equation Q-4 Calculation Spreadsheet.xls	Carbon Mass Balance	Sinter process	Q-4 Help
Equation Q-5 Calculation Spreadsheet.xls	Carbon Mass Balance	Electric arc furnace (EAF)	Q-5 Help
Equation Q-6 Calculation Spreadsheet.xls	Carbon Mass Balance	Decarburization vessel	Q-6 Help
Equation Q-7 Calculation Spreadsheet.xls	Carbon Mass Balance	Direct reduction furnace	Q-7 Help
Equation Q-8 EF Approach Calculation Spreadsheet.xls	Site-specific emission factor approach	Exhaust Stack	Q-8 EF Approach Help

Selecting the Appropriate Calculation Spreadsheet

Subpart Q requires facilities to report annual carbon dioxide (CO_2) process emissions from each taconite indurating furnace, basic oxygen furnace, non-recovery coke oven battery, coke pushing process sinter process, electric arc furnace, decarburization vessel, and direct reduction furnace or each exhaust stack used for iron and steel production. To calculate emissions, you may use the carbon mass balance method for each unit (furnace, oven battery, vessel, etc.) or process, or the site-specific emission factor approach for each exhaust stack used for iron and steel production.

Carbon Mass Balance Method

Carbon mass balance method calculations are based on the annual mass of inputs and outputs to the process and an annual analysis of the respective weight fraction of carbon. Each unit type and process type has a unique Spreadsheet Tool for calculating emissions using the carbon mass balance method.

Equation Q--1 Calculation Spreadsheet. Use this spreadsheet to calculate annual CO_2 emissions from a taconite indurating furnace used in iron and steel production. This spreadsheet performs the calculation using Equation Q-1, provided below:

(Equation Q-1)	$$CO_2 = \frac{44}{12} * \left[(F_s) * (C_{sf}) + (F_g) * (C_{gf}) * \frac{MW}{MVC} * 0.001 + (F_l) * (C_{lf}) * 0.001 + (O) * (C_o) - (P) * (C_p) - (R) * (C_R) \right]$$

Equation Q--2 Calculation Spreadsheet. Use this spreadsheet to calculate annual CO_2 emissions from a basic oxygen process furnace used in iron and steel production. This spreadsheet performs the calculation using Equation Q-2, provided below:

(Equation Q-2)

$$CO_2 = \frac{44}{12} * \left[(Iron) * (C_{Iron}) + (Scrap) * (C_{Scrap}) + (Flux) * (C_{Flux}) + (Carbon) * (C_{Carbon}) - (Steel) * (C_{Steel}) - (Slag) * (C_{Slag}) - (R) * (C_R) \right]$$

Equation Q--3 Calculation Spreadsheet. Use this spreadsheet to calculate annual CO_2 emissions from a non-recovery coke oven battery used in iron and steel production. This spreadsheet performs the calculation using Equation Q-3, provided below:

(Equation Q-3)

$$CO_2 = \frac{44}{12} * \left[(Coal) * (C_{Coal}) - (Coke) * (C_{Coke}) - (R) * (C_R) \right]$$

Equation Q--4 Calculation Spreadsheet. Use this spreadsheet to calculate annual CO_2 emissions from a sinter process used in iron and steel production. This spreadsheet performs the calculation using Equation Q-4, provided below:

(Equation Q-4)

$$CO_2 = \frac{44}{12} * \left[(F_g) * (C_{gf}) * \frac{MW}{MVC} * 0.001 + (Feed) * (C_{Feed}) - (\text{Sinter}) * (C_{Sinter}) - (R) * (C_R) \right]$$

Equation Q--5 Calculation Spreadsheet. Use this spreadsheet to calculate annual CO_2 emissions from an electric arc furnace used in iron and steel production. This spreadsheet performs the calculation using Equation Q-5, provided below:

(Equation Q-5)

$$CO_2 = \frac{44}{12} * \left[(Iron) * (C_{Iron}) + (Scrap) * (C_{Scrap}) + (Flux) * (C_f) + (Electrode) * (C_{Electrode}) + (Carbon) * (C_c) - (Steel) * (C_{Steel}) - (Slag) * (C_{Slag}) - (R) * (C_R) \right]$$

Equation Q--6 Calculation Spreadsheet. Use this spreadsheet to calculate annual CO_2 emissions from a decarburization vessel used in iron and steel production. This spreadsheet performs the calculation using Equation Q-6, provided below:

(Equation Q-6)

$$CO_2 = \frac{44}{12} * \left\{ (Steel) * \left[(C_{Steelin}) - (C_{Steelout}) \right] - (R) * (C_R) \right\}$$

Equation Q--7 Calculation Spreadsheet. Use this spreadsheet to calculate annual CO_2 emissions from a direct reduction furnace used in iron and steel production. This spreadsheet performs the calculation using Equation Q-7, provided below:

(Equation Q-7)	$$CO_2 = \frac{44}{12} * \left[\left(F_g\right) * \left(C_{gf}\right) * \frac{MW}{MVC} * 0.001 + \left(Ore\right) * \left(C_{Ore}\right) + \left(Carbon\right) * \left(C_{Carbon}\right) + \left(Other\right) * \left(C_{Other}\right) - \left(Iron\right)\ \left(C_{Iron}\right) - \left(NM\right) * \left(C_{NM}\right) - \left(R\right) * \left(C_R\right) \right]$$

Site-Specific Emission Factor Approach

Site-specific emission factor approach calculations are based on emission factors and feed rates derived from performance testing. Performance tests must measure CO_2 emissions from all exhaust stacks for the process and measure the feed rate of materials into the process during the test.

Equation Q-8 EF Approach Calculation Spreadsheet. Use this spreadsheet to calculate annual CO_2 emissions from each exhaust stack used in iron and steel production. This spreadsheet performs the calculation using the methodology described in 98.173(b)(2)(iii) and (iv) including the equations below:

(Equation Q-8 EF Approach - EF)	$$EF = \frac{Hourly\ CO_2}{Hourly\ Feed}$$
(Equation Q-8 EF Approach - CO_2)	$$Annual\,CO_2 = EF \times Annual\ Feed$$

Downloading a Calculation Spreadsheet

Calculation spreadsheets for Subpart Q may be downloaded by clicking one of the links in the first column of the table below. Users may also jump to instructions for each spreadsheet by clicking one of the links in the fourth column.

Calculation Spreadsheet (click to download)	Calculation Method	Selection Criteria: Emissions Source	Instructions (click to view)
Equation Q-1 Calculation Spreadsheet.xls	Carbon Mass Balance	Taconite indurating furnace	Q-1 Help
Equation Q-2 Calculation Spreadsheet.xls	Carbon Mass Balance	Basic oxygen process furnace	Q-2 Help
Equation Q-3 Calculation Spreadsheet.xls	Carbon Mass Balance	Non-recovery coke oven battery	Q-3 Help
Equation Q-4 Calculation Spreadsheet.xls	Carbon Mass Balance	Sinter process	Q-4 Help
Equation Q-5 Calculation Spreadsheet.xls	Carbon Mass Balance	Electric arc furnace (EAF)	Q-5 Help
Equation Q-6 Calculation Spreadsheet.xls	Carbon Mass Balance	Decarburization vessel	Q-6 Help
Equation Q-7 Calculation Spreadsheet.xls	Carbon Mass Balance	Direct reduction furnace	Q-7 Help
Equation Q-8 EF Approach Calculation Spreadsheet.xls	Site-specific emission factor approach	Exhaust Stack	Q-8 EF Approach Help

Using a Spreadsheet to Make Calculations

The guidance provided in this section applies to each of the calculation spreadsheet for Subpart Q. Additional guidance is provided for each individual spreadsheet in the sections below.

Color coding

The calculation spreadsheets contain green input cells, gray informational cells, and red-bordered results cells filled with yellow or white. Users should use green input cells to enter all data specific to their facility, unit, or process. Gray informational cells contain parameter names, column and row headings, equation constants and subtotals. Calculation results are displayed in red-bordered results cells filled with yellow or white. For red-bordered, yellow-filled results cells, the values in these cells should be entered in the appropriate and separate calculation spreadsheet (as directed below cell) where additional calculations will be made. For red-bordered, white filled results cells, the values in these cells should be entered in e-GGRT for the appropriate process units. All cells that are not green input cells are locked and cannot be modified.

	Green input cell (data entry)
	Gray informational cells (locked)
	Red-bordered, yellow-filled results cells (enter in appropriate and separate calculation spreadsheet)
	Red-bordered, white filled results cells (enter in e-GGRT)

Stop and Warning Messages

The calculation spreadsheets will display a stop message if the user enters a value that is invalid or a warning message if the user enters a value outside the EPA estimated range for a particular data element. For invalid data entries, the stop messages will not allow a user to proceed and the user must reenter valid data before moving forward. For data entries that are outside the EPA estimated range for a particular data element, the warning messages will allow a user to proceed if the user deems the entered value to be accurate.

Multiple Units, Processes, or Exhaust Stacks

Users with multiple unit or group configuration types and multiple fuels should use separate Spreadsheet Tools for each configuration type and for each fuel. Users should not aggregate data for multiple configuration types or fuels when using these Spreadsheet Tools.

Using the Equation Q-1 Calculation Spreadsheet

Use the Equation Q-1 Calculation Spreadsheet to calculate annual CO_2 emissions from a taconite indurating furnace using the carbon mass balance method. Use a separate spreadsheet for each furnace. The Equation Q-1 Calculation Spreadsheet performs the calculations using Equation Q-1 provided below.

(Equation Q-1)

$$CO_2 = \frac{44}{12} * \left[(F_s) * (C_{sf}) + (F_g) * (C_{gf}) * \frac{MW}{MVC} * 0.001 + (F_l) * (C_{lf}) * 0.001 + (O) * (C_o) - (P) * (C_p) - (R) * (C_R) \right]$$

Begin by entering the facility name, your name, the unit name or identifier, reporting period, and any additional comments in the green input cells of the general information table located immediately below the equation in the spreadsheet. This is for your records.

Facility Name:	
Reporter Name:	
Unit Name/ ID:	
Reporting Period:	
Comments:	
Unit Type:	Taconite Indurating Furnace

Next, enter the requested information in the green input cells in the Input Data table.

Input Data

[F_s] = Annual mass of the solid fuel combusted (metric tons)	
[C_{sf}] = Carbon content of the solid fuel, from the fuel analysis (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[F_g] = Annual volume of the gaseous fuel combusted (scf)	
[C_{gf}] = Average carbon content of the gaseous fuel, from the fuel analysis results (kg C per kg of	
[MW] = Molecular weight of the gaseous fuel (kg/kg-mole)	
[F_l] = Annual volume of the liquid fuel combusted (gallons)	
[C_{lf}] = Carbon content of the liquid fuel, from the fuel analysis results (kg C per gallon of fuel)	
[O] = Annual mass of the greenball (taconite) pellets fed to the furnace (metric tons)	
[C_o] = Carbon content of the greenball (taconite) pellets, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[P] = Annual mass of fired pellets produced by the furnace (metric tons)	
[C_p] = Carbon content of the fired pellets, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[R] = Annual mass of air pollution control residue collected (metric tons)	
[C_R] = Carbon content of the air pollution control residue, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	

If you have a process input or output other than CO_2 in the exhaust gas that contains carbon that is not included in Equations Q--1, enter the carbon and mass rate of each additional process input or output in the provided additional green input cells.

Inputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–1 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition inputs. For additional inputs, use additional copies of this workbook and sum results before entering in e-GGRT.

$[IM_i]$ = Additional annual input mass (i) other than CO2 in the exhaust gas (metric tons)	
$[IC_i]$ = Carbon content of the additional annual input mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
$[IM_j]$ = Additional annual input mass (j) other than CO2 in the exhaust gas (metric tons)	
$[IC_j]$ = Carbon content of the additional annual input mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
$[IM_k]$ = Additional annual input mass (k) other than CO2 in the exhaust gas (metric tons)	
$[IC_k]$ = Carbon content of the additional annual input mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

Outputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–1 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition outputs. For additional outputs, use additional copies of this workbook and sum results before entering in e-GGRT.

$[OM_i]$ = Additional annual output mass (i) other than CO2 in the exhaust gas (metric tons)	
$[OC_i]$ = Carbon content of the additional annual output mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
$[OM_j]$ = Additional annual output mass (j) other than CO2 in the exhaust gas (metric tons)	
$[OC_j]$ = Carbon content of the additional annual output mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
$[OM_k]$ = Additional annual output mass (k) other than CO2 in the exhaust gas (metric tons)	
$[OC_k]$ = Carbon content of the additional annual output mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

The spreadsheet will calculate the annual CO_2 emissions from this taconite indurating furnace. The calculated value will be displayed in the red-bordered cell at the bottom of the spreadsheet. This value should be entered in e-GGRT for this furnace.

Annual CO_2 Emissions (metric tons) from Equation Q-1

$[CO_2]$ = Annual CO_2 mass emissions from the taconite indurating furnace (metric tons)	

Enter this value in e-GGRT

Using the Equation Q-2 Calculation Spreadsheet

Use the Equation Q-2 Calculation Spreadsheet to calculate annual CO_2 emissions from a basic oxygen process furnace using the carbon mass balance method. Use a separate spreadsheet for each furnace. The Equation Q-2 Calculation Spreadsheet performs the calculations using Equation Q-2 provided below.

(Equation Q-2)

$$CO_2 = \frac{44}{12} * \left[(Iron) * (C_{Iron}) + (Scrap) * (C_{Scrap}) + (Flux) * (C_{Flux}) + (Carbon) * (C_{Carbon}) - (Steel) * (C_{Steel}) - (Slag) * (C_{Slag}) - (R) * (C_R) \right]$$

Begin by entering the facility name, your name, the unit name or identifier, reporting period, and any additional comments in the green input cells of the general information table located immediately below the equation in the spreadsheet. This is for your records.

Facility Name:	
Reporter Name:	
Unit Name/ ID:	
Reporting Period:	
Comments:	
Unit Type:	Basic Oxygen Process Furnace

Next, enter the requested information in the green input cells in the Input Data table.

Input Data

[Iron] = Annual mass of molten iron charged to the furnace (metric tons)	
[C_{Iron}] = Carbon content of the molten iron, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Scrap] = Annual mass of ferrous scrap charged to the furnace (metric tons)	
[C_{Scrap}] = Carbon content of the ferrous scrap, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Flux] = Annual mass of flux materials (e.g., limestone, dolomite) charged to the furnace	
[C_{Flux}] = Carbon content of the flux materials, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Carbon] = Annual mass of carbonaceous materials (e.g., coal, coke) charged to the furnace (metric tons)	
[C_{Carbon}] = Carbon content of the carbonaceous materials, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Steel] = Annual mass of molten raw steel produced by the furnace (metric tons)	
[C_{Steel}] = Carbon content of the steel, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Slag] = Annual mass of slag produced by the furnace (metric tons)	
[C_{Slag}] = Carbon content of the slag, from the carbon analysis (percent by weight, expressed as a decimal fraction)	
[R] = Annual mass of air pollution control residue collected (metric tons)	
[C_R] = Carbon content of the air pollution control residue, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	

If you have a process input or output other than CO_2 in the exhaust gas that contains carbon that is not included in Equations Q--2, enter the carbon and mass rate of each additional process input or output in the provided additional green input cells.

Inputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–2 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition inputs. For additional inputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[IM_i] = Additional annual input mass (i) other than CO2 in the exhaust gas (metric tons)	
[IC_i] = Carbon content of the additional annual input mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_j] = Additional annual input mass (j) other than CO2 in the exhaust gas (metric tons)	
[IC_j] = Carbon content of the additional annual input mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_k] = Additional annual input mass (k) other than CO2 in the exhaust gas (metric tons)	
[IC_k] = Carbon content of the additional annual input mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

Outputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–2 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition outputs. For additional outputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[OM_i] = Additional annual output mass (i) other than CO2 in the exhaust gas (metric tons)	
[OC_i] = Carbon content of the additional annual output mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_j] = Additional annual output mass (j) other than CO2 in the exhaust gas (metric tons)	
[OC_j] = Carbon content of the additional annual output mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_k] = Additional annual output mass (k) other than CO2 in the exhaust gas (metric tons)	
[OC_k] = Carbon content of the additional annual output mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

The spreadsheet will calculate the annual CO_2 emissions from this basic oxygen process furnace. The calculated value will be displayed in the red-bordered cell at the bottom of the spreadsheet. This value should be entered in e-GGRT for this furnace.

Annual CO_2 Emissions (metric tons) from Equation Q-2

[CO_2] = Annual CO_2 mass emissions from the basic oxygen furnace (metric tons)	

Enter this value in e-GGRT

Using the Equation Q-3 Calculation Spreadsheet

Use the Equation Q-3 Calculation Spreadsheet to calculate annual CO_2 emissions from a non-recovery coke oven battery using the carbon mass balance method. Use a separate spreadsheet for each furnace. The Equation Q-3 Calculation Spreadsheet performs the calculations using Equation Q-3 provided below.

(Equation Q-3)	$$CO_2 = \frac{44}{12} * \left[(Coal) * (C_{Coal}) - (Coke) * (C_{Coke}) - (R) * (C_R) \right]$$

Begin by entering the facility name, your name, the unit name or identifier, reporting period, and any additional comments in the green input cells of the general information table located immediately below the equation in the spreadsheet. This is for your records.

Facility Name:	
Reporter Name:	
Unit Name/ ID:	
Reporting Period:	
Comments:	
Unit Type:	Non-Recovery Coke Oven Battery

Next, enter the requested information in the green input cells in the Input Data table.

Input Data

[Coal] = Annual mass of coal charged to the battery (metric tons)	
[C_{Coal}] = Carbon content of the coal, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Coke] = Annual mass of coke produced by the battery (metric tons)	
[C_{Coke}] = Carbon content of the coke, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[R] = Annual mass of air pollution control residue collected (metric tons)	
[C_R] = Carbon content of the air pollution control residue, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	

If you have a process input or output other than CO_2 in the exhaust gas that contains carbon that is not included in Equations Q--3, enter the carbon and mass rate of each additional process input or output in the provided additional green input cells.

Inputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–3 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition inputs. For additional inputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[IM_i] = Additional annual input mass (i) other than CO2 in the exhaust gas (metric tons)	
[IC_i] = Carbon content of the additional annual input mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_j] = Additional annual input mass (j) other than CO2 in the exhaust gas (metric tons)	
[IC_j] = Carbon content of the additional annual input mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_k] = Additional annual input mass (k) other than CO2 in the exhaust gas (metric tons)	
[IC_k] = Carbon content of the additional annual input mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

Outputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–3 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition outputs. For additional outputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[OM_i] = Additional annual output mass (i) other than CO2 in the exhaust gas (metric tons)	
[OC_i] = Carbon content of the additional annual output mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_j] = Additional annual output mass (j) other than CO2 in the exhaust gas (metric tons)	
[OC_j] = Carbon content of the additional annual output mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_k] = Additional annual output mass (k) other than CO2 in the exhaust gas (metric tons)	
[OC_k] = Carbon content of the additional annual output mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

The spreadsheet will calculate the annual CO_2 emissions from this non-recovery coke oven battery. The calculated value will be displayed in the red-bordered cell at the bottom of the spreadsheet. This value should be entered in e-GGRT for this oven battery.

Annual CO_2 Emissions (metric tons) from Equation Q-3

[CO_2] = Annual CO_2 mass emissions from the non-recovery coke oven battery (metric tons)	

Enter this value in e-GGRT

Using the Equation Q-4 Calculation Spreadsheet

Use the Equation Q-4 Calculation Spreadsheet to calculate annual CO_2 emissions from a sinter process using the carbon mass balance method. Use a separate spreadsheet for each furnace. The Equation Q-4 Calculation Spreadsheet performs the calculations using Equation Q-4 provided below.

(Equation Q-4)	$$CO_2 = \frac{44}{12} * \left[\left(F_g\right) * \left(C_{gf}\right) * \frac{MW}{MVC} * 0.001 + \left(Feed\right) * \left(C_{Feed}\right) - \left(\text{Sinter}\right) * \left(C_{Sinter}\right) - \left(R\right) * \left(C_R\right) \right]$$

Begin by entering the facility name, your name, the unit name or identifier, reporting period, and any additional comments in the green input cells of the general information table located immediately below the equation in the spreadsheet. This is for your records.

Facility Name:	
Reporter Name:	
Unit Name/ ID:	
Reporting Period:	
Comments:	
Unit Type:	Sinter Process

Next, enter the requested information in the green input cells in the Input Data table.

Input Data

[F_g] = Annual volume of the gaseous fuel combusted (scf)	
[C_{gf}] = Carbon content of the gaseous fuel, from the fuel analysis results (kg C per kg of	
[MW] = Molecular weight of the gaseous fuel (kg/kg-mole)	
[Feed] = Annual mass of sinter feed material (metric tons)	
[C_{Feed}] = Carbon content of the mixed sinter feed materials that form the bed entering the sintering machine, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Sinter] = Annual mass of sinter produced (metric tons)	
[C_{sinter}] = Carbon content of the sinter pellets, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[R] = Annual mass of air pollution control residue collected (metric tons)	
[C_R] = Carbon content of the air pollution control residue, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	

If you have a process input or output other than CO_2 in the exhaust gas that contains carbon that is not included in Equations Q--4, enter the carbon and mass rate of each additional process input or output in the provided additional green input cells.

Inputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–4 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition inputs. For additional inputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[IM_i] = Additional annual input mass (i) other than CO2 in the exhaust gas (metric tons)	
[IC_i] = Carbon content of the additional annual input mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_j] = Additional annual input mass (j) other than CO2 in the exhaust gas (metric tons)	
[IC_j] = Carbon content of the additional annual input mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_k] = Additional annual input mass (k) other than CO2 in the exhaust gas (metric tons)	
[IC_k] = Carbon content of the additional annual input mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

Outputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–4 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition outputs. For additional outputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[OM_i] = Additional annual output mass (i) other than CO2 in the exhaust gas (metric tons)	
[OC_i] = Carbon content of the additional annual output mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_j] = Additional annual output mass (j) other than CO2 in the exhaust gas (metric tons)	
[OC_j] = Carbon content of the additional annual output mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_k] = Additional annual output mass (k) other than CO2 in the exhaust gas (metric tons)	
[OC_k] = Carbon content of the additional annual output mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

The spreadsheet will calculate the annual CO_2 emissions from this sinter process. The calculated value will be displayed in the red-bordered cell at the bottom of the spreadsheet. This value should be entered in e-GGRT for this sinter process.

Annual CO_2 Emissions (metric tons) from Equation Q-4

[CO_2] = Annual CO_2 mass emissions from the sinter process (metric tons)	

Enter this value in e-GGRT

Using the Equation Q-5 Calculation Spreadsheet

Use the Equation Q-5 Calculation Spreadsheet to calculate annual CO_2 emissions from an electric arc furnace using the carbon mass balance method. Use a separate spreadsheet for each furnace. The Equation Q-5 Calculation Spreadsheet performs the calculations using Equation Q-5 provided below.

(Equation Q-5)

$$CO_2 = \frac{44}{12} * [\ (Iron) * (C_{Iron}) + (Scrap) * (C_{Scrap}) + (Flux) * (C_f) + (Electrode) * (C_{Electrode}) + (Carbon) * (C_c) - (Steel) * (C_{Steel}) - (Slag) * (C_{Slag}) - (R) * (C_R)\ ]$$

Begin by entering the facility name, your name, the unit name or identifier, reporting period, and any additional comments in the green input cells of the general information table located immediately below the equation in the spreadsheet. This is for your records.

Facility Name:	
Reporter Name:	
Unit Name/ ID:	
Reporting Period:	
Comments:	
Unit Type:	Electric Arc Furnace

Next, enter the requested information in the green input cells in the Input Data table.

Input Data

[Iron] = Annual mass of direct reduced iron (if any) charged to the furnace (metric tons)	
[C_{Iron}] = Carbon content of the direct reduced iron, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Scrap] = Annual mass of ferrous scrap charged to the furnace (metric tons)	
[C_{Scrap}] = Carbon content of the ferrous scrap, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Flux] = Annual mass of flux materials (e.g., limestone, dolomite) charged to the furnace	
[C_{Flux}] = Carbon content of the flux materials, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Electrode] = Annual mass of carbon electrode consumed (metric tons)	
[$C_{Electrode}$] = Carbon content of the carbon electrode, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Carbon] = Annual mass of carbonaceous materials (e.g., coal, coke) charged to the furnace (metric tons)	
[C_{Carbon}] = Carbon content of the carbonaceous materials, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Steel] = Annual mass of molten raw steel produced by the furnace (metric tons)	
[C_{Steel}] = Carbon content of the steel, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Slag] = Annual mass of slag produced by the furnace (metric tons)	
[C_{Slag}] = Carbon content of the slag, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[R] = Annual mass of air pollution control residue collected (metric tons)	
[C_R] = Carbon content of the air pollution control residue, from the carbon analysis results (percent by weight, expressed as a decimal	

If you have a process input or output other than CO_2 in the exhaust gas that contains carbon that is not included in Equations Q--5, enter the carbon and mass rate of each additional process input or output in the provided additional green input cells.

Inputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–5 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition inputs. For additional inputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[IM_i] = Additional annual input mass (i) other than CO2 in the exhaust gas (metric tons)	
[IC_i] = Carbon content of the additional annual input mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_j] = Additional annual input mass (j) other than CO2 in the exhaust gas (metric tons)	
[IC_j] = Carbon content of the additional annual input mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_k] = Additional annual input mass (k) other than CO2 in the exhaust gas (metric tons)	
[IC_k] = Carbon content of the additional annual input mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

Outputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–5 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition outputs. For additional outputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[OM_i] = Additional annual output mass (i) other than CO2 in the exhaust gas (metric tons)	
[OC_i] = Carbon content of the additional annual output mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_j] = Additional annual output mass (j) other than CO2 in the exhaust gas (metric tons)	
[OC_j] = Carbon content of the additional annual output mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_k] = Additional annual output mass (k) other than CO2 in the exhaust gas (metric tons)	
[OC_k] = Carbon content of the additional annual output mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

The spreadsheet will calculate the annual CO_2 emissions from this electric arc furnace. The calculated value will be displayed in the red-bordered cell at the bottom of the spreadsheet. This value should be entered in e-GGRT for this furnace.

Annual CO_2 Emissions (metric tons) from Equation Q-5

[CO_2] = Annual CO_2 mass emissions from the EAF (metric tons)	

Enter this value in e-GGRT

Using the Equation Q-6 Calculation Spreadsheet

Use the Equation Q-6 Calculation Spreadsheet to calculate annual CO_2 emissions from a decarburization vessel using the carbon mass balance method. Use a separate spreadsheet for each furnace. The Equation Q-6 Calculation Spreadsheet performs the calculations using Equation Q-6 provided below.

(Equation Q-6)	$$CO_2 = \frac{44}{12} * \{ (Steel) * [(C_{Steelin}) - (C_{Steelout})] - (R) * (C_R) \}$$

Begin by entering the facility name, your name, the unit name or identifier, reporting period, and any additional comments in the green input cells of the general information table located immediately below the equation in the spreadsheet. This is for your records.

Facility Name:	
Reporter Name:	
Unit Name/ ID:	
Reporting Period:	
Comments:	
Unit Type:	Decarburization Vessel

Next, enter the requested information in the green input cells in the Input Data table.

Input Data

[Steel] = Annual mass of molten steel charged to the vessel (metric tons)	
[$C_{Steelin}$] = Carbon content of the molten steel before decarburization, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[$C_{Steelout}$] = Carbon content of the molten steel after decarburization, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[R] = Annual mass of air pollution control residue collected (metric tons)	
[C_R] = Carbon content of the air pollution control residue, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	

If you have a process input or output other than CO_2 in the exhaust gas that contains carbon that is not included in Equations Q--6, enter the carbon and mass rate of each additional process input or output in the provided additional green input cells.

Inputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–6 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition inputs. For additional inputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[IM_i] = Additional annual input mass (i) other than CO2 in the exhaust gas (metric tons)	
[IC_i] = Carbon content of the additional annual input mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_j] = Additional annual input mass (j) other than CO2 in the exhaust gas (metric tons)	
[IC_j] = Carbon content of the additional annual input mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_k] = Additional annual input mass (k) other than CO2 in the exhaust gas (metric tons)	
[IC_k] = Carbon content of the additional annual input mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

Outputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–6 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition outputs. For additional outputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[OM_i] = Additional annual output mass (i) other than CO2 in the exhaust gas (metric tons)	
[OC_i] = Carbon content of the additional annual output mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_j] = Additional annual output mass (j) other than CO2 in the exhaust gas (metric tons)	
[OC_j] = Carbon content of the additional annual output mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_k] = Additional annual output mass (k) other than CO2 in the exhaust gas (metric tons)	
[OC_k] = Carbon content of the additional annual output mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

The spreadsheet will calculate the annual CO_2 emissions from this decarburization vessel. The calculated value will be displayed in the red-bordered cell at the bottom of the spreadsheet. This value should be entered in e-GGRT for this decarburization vessel.

Annual CO_2 Emissions (metric tons) from Equation Q-6

[CO_2] = Annual CO_2 mass emissions from the decarburization vessel (metric tons)	

Enter this value in e-GGRT

Using the Equation Q-7 Calculation Spreadsheet

Use the Equation Q-7 Calculation Spreadsheet to calculate annual CO_2 emissions from a direct reduction furnace using the carbon mass balance method. Use a separate spreadsheet for each furnace. The Equation Q-7 Calculation Spreadsheet performs the calculations using Equation Q-7 provided below.

(Equation Q-7)

$$CO_2 = \frac{44}{12} * \left[\left(F_g\right) * \left(C_{gf}\right) * \frac{MW}{MVC} * 0.001 + \left(Ore\right) * \left(C_{Ore}\right) \right.$$

$$+ \left(Carbon\right) * \left(C_{Carbon}\right) + \left(Other\right) * \left(C_{Other}\right)$$

$$\left. - \left(Iron\right) \left(C_{Iron}\right) - \left(NM\right) * \left(C_{NM}\right) - \left(R\right) * \left(C_R\right) \right]$$

Begin by entering the facility name, your name, the unit name or identifier, reporting period, and any additional comments in the green input cells of the general information table located immediately below the equation in the spreadsheet. This is for your records.

Facility Name:	
Reporter Name:	
Unit Name/ ID:	
Reporting Period:	
Comments:	
Unit Type:	Direct Reduction Furnace

Next, enter the requested information in the green input cells in the Input Data table.

Input Data

[F_g] = Annual volume of the gaseous fuel combusted (scf)	
[C_{gf}] = Carbon content of the gaseous fuel, from the fuel analysis results (kg C per kg of	
[MW] = Molecular weight of the gaseous fuel (kg/kg-mole)	
[Ore] = Annual mass of iron ore or iron ore pellets fed to the furnace (metric tons)	
[C_{Ore}] = Carbon content of the iron ore or iron ore pellets, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Carbon] = Annual mass of carbonaceous materials (e.g., coal, coke) charged to the furnace (metric tons)	
[C_{Carbon}] = Carbon content of the carbonaceous materials, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Other] = Annual mass of other materials charged to the furnace (metric tons)	
[C_{Other}] = Average carbon content of the other materials charged to the furnace, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[Iron] = Annual mass of iron produced (metric tons)	
[C_{Iron}] = Carbon content of the iron, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[NM] = Annual mass of non-metallic materials produced by the furnace (metric tons)	
[C_{NM}] = Carbon content of the non-metallic materials, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	
[R] = Annual mass of air pollution control residue collected (metric tons)	
[C_R] = Carbon content of the air pollution control residue, from the carbon analysis results (percent by weight, expressed as a decimal fraction)	

If you have a process input or output other than CO_2 in the exhaust gas that contains carbon that is not included in Equations Q--7, enter the carbon and mass rate of each additional process input or output in the provided additional green input cells.

Inputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–7 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition inputs. For additional inputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[IM_i] = Additional annual input mass (i) other than CO2 in the exhaust gas (metric tons)	
[IC_i] = Carbon content of the additional annual input mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_j] = Additional annual input mass (j) other than CO2 in the exhaust gas (metric tons)	
[IC_j] = Carbon content of the additional annual input mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[IM_k] = Additional annual input mass (k) other than CO2 in the exhaust gas (metric tons)	
[IC_k] = Carbon content of the additional annual input mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

Outputs other than CO_2 in the exhaust gas that contain carbon that are not included in Equations Q–7 (if applicable per 98.173(b)(1))

Space provided for up to 3 addition outputs. For additional outputs, use additional copies of this workbook and sum results before entering in e-GGRT.

[OM_i] = Additional annual output mass (i) other than CO2 in the exhaust gas (metric tons)	
[OC_i] = Carbon content of the additional annual output mass (i) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_j] = Additional annual output mass (j) other than CO2 in the exhaust gas (metric tons)	
[OC_j] = Carbon content of the additional annual output mass (j) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	
[OM_k] = Additional annual output mass (k) other than CO2 in the exhaust gas (metric tons)	
[OC_k] = Carbon content of the additional annual output mass (k) (percent by weight, expressed as a decimal fraction, e.g., 95% = 0.95)	

The calculation spreadsheet will calculate the annual CO_2 emissions from this direct reduction furnace. The calculated value will be displayed in the red-bordered cell at the bottom of the spreadsheet. This value should be entered in e-GGRT for this furnace.

Annual CO_2 Emissions (metric tons) from Equation Q-7

[CO_2] = Annual CO_2 mass emissions from the direct reduction furnace (metric tons)	

Enter this value in e-GGRT

Using the Equation Q-8 EF Approach Calculation Spreadsheet

Use the Equation Q-8 EF Approach Calculation Spreadsheet to calculate annual CO_2 emissions from an exhaust stack using the carbon mass balance method. Use a separate spreadsheet for each furnace. The Equation Q-8 EF Approach Calculation Spreadsheet performs the calculations using an equation to solve for the site-specific emission factor and an equation to calculate CO_2 emissions. These equations are provided below.

(Equation Q-8 EF Approach - EF)	$$EF = \frac{Hourly\ CO_2}{Hourly\ Feed}$$

(Equation Q-8 EF Approach - CO_2)	$Annual\,CO_2 = EF \times Annual\,Feed$

Begin by entering the facility name, your name, the unit name or identifier, reporting period, and any additional comments in the green input cells of the general information table located immediately below the equation in the spreadsheet. This is for your records.

Facility Name:	
Reporter Name:	
Unit Name/ ID:	
Reporting Period:	
Comments:	
Unit Type:	Exhaust Stack

Next, enter the requested information in the green input cells in the Input Data table.

Input Data

[C_{CO2}] = Hourly CO_2 concentration, dry basis (% CO_2)	
[Q] = Hourly stack gas volumetric flow rate (scfh)	
[%H_2O] = Hourly moisture percentage in the stack gas	
[Hourly Feed] = Average hourly feed or production rate (as applicable) during the test (in metric tons per hour)	
[Annual Feed] = Annual feed or production rate (as applicable) used to estimate annual CO_2 emissions (in metric tons)	

The spreadsheet will first calculate the site-specific emission factor for this stack and then use that value to calculate annual CO_2 emissions from this exhaust stack. The calculated values will be displayed in the red-bordered cells at the bottom of the spreadsheet. These values should be entered in e-GGRT for this stack.

Annual CO_2 Emissions (metric tons) from Site-Specific Emission Factor Approach

[Annual CO_2] = CO_2 emissions for the process (metric tons)	

Enter this value in e-GGRT

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