Table of Contents

1.0 Stacks and Pipes

Table 1: Stack Pipe ID Prefixes

Prefix	Description
CS	Common Stack
CP	Common Pipe
MS	Multiple Stack or Duct
MP	Multiple Pipe

2.0 Monitoring Location Attributes

Table 2: Material Codes and Description

Code	Description
BRICK	Brick and mortar
OTHER	Any material other than brick and mortar

Table 3: Shape Codes and Descriptions

Code	Description
RECT	Rectangular
ROUND	Round

3.0 Unit Fuel

Table 4: Fuel Codes and Descriptions

Code	Description
C	Coal
CRF	Coal Refuse (culm or gob)
DSL	Diesel Oil*
LPG	Liquefied Petroleum Gas
NNG	Natural Gas
OGS	Other Gas
OIL	Residual Oil

Code	Description
OOL	Other Oil
OSF	Other Solid Fuel
PNG	Pipeline Natural Gas (as defined in §72.2)
PRG	Process Gas
PRS	Process Sludge
PTC	Petroleum Coke
R	Refuse
TDF	Tire Derived Fuel
W	Wood
WL	Waste Liquid

* Diesel oil is defined in §72.2 as low sulfur fuel oil of grades 1-D or 2-D, as defined by ASTM D-975-91, grades 1-GT or 2-GT, as defined by ASTM D2880-90a, or grades 1 or 2, as defined by ASTM D396-90. By those definitions (specifically ASTM D396-90), kerosene and ultra-low sulfur diesel fuel (ULSD) are considered subsets of diesel oil and therefore should be identified with the code DSL. If a fuel does not qualify as one of these types, the code DSL should not be used.

TABLE 5: FUEL INDICATOR CODES AND DESCRIPTIONS

Code	Description
E	Emergency
I	Ignition (startup)
P	Primary
S	Backup (secondary)

TABLE 6: DEMONSTRATION METHOD TO QUALIFY FOR MONTHLY FUEL SAMPLING FOR GROSS CALORIFIC VALUE (GCV) CODES AND DESCRIPTIONS

Code	Description
GHS	720 Hours of Data Using Hourly Sampling
GGC	720 Hours of Data Using an Online Gas Chromatograph
GOC	720 Hours of Data Using an Online Calorimeter

TABLE 7: DEMONSTRATION METHOD TO QUALIFY FOR DAILY OR ANNUAL FUEL SAMPLING FOR %S (ARP) CODES AND DESCRIPTIONS

Code	Description
SHS	720 Hours of Data Using Manual Hourly Sampling
SGC	720 Hours of Data Using Online Gas Chromatograph

4.0 UNIT CONTROLS

TABLE 8: PARAMETER CODES AND DESCRIPTIONS

Code	Description
NOX	Nitrogen Oxides
SO2	Sulfur Dioxide
PART	Particulates (opacity)

TABLE 9: CONTROL CODES AND DESCRIPTIONS

Parameter	Control Code	Description
NOX	CM	Combustion Modification/Fuel Reburning
	DLNB	Dry Low NO_x Premixed Technology (turbines only)
	H2O	Water Injection (turbines and cyclone boilers only)
	LNB	Low NO_x Burner Technology (dry bottom wall-fired boilers or process heaters only)
	LNBO	Low NO_x Burner Technology with Overfire Air (dry bottom wall-fired boilers, dry bottom turbo-fired boilers, or process heaters only)
	LNC1	Low NO_x Burner Technology with Close-Coupled Overfire Air (OFA) (tangentially fired units only)
	LNC2	Low NO_x Burner Technology with Separated OFA (tangentially fired units only)
	LNC3	Low NO_x Burner Technology with Close-Coupled and Separated OFA (tangentially fired units only)
	LNCB	Low NO_x Burner Technology for Cell Burners
	NH3	Ammonia Injection
	O	Other
	OFA	Overfire Air
	SCR	Selective Catalytic Reduction

Monitoring Plan XML File Codes

Parameter	Control Code	Description
	SNCR	Selective Non-Catalytic Reduction
	STM	Steam Injection
SO2	DA	Dual Alkali
	DL	Dry Lime FGD
	FBL	Fluidized Bed Limestone Injection
	MO	Magnesium Oxide
	O	Other
	SB	Sodium Based
	WL	Wet Lime FGD
	WLS	Wet Limestone
PART	B	Baghouse(s)
	ESP	Electrostatic Precipitator
	HESP	Hybrid Electrostatic Precipitator
	WESP	Wet Electrostatic Precipitator
	WS	Wet Scrubber
	O	Other
	C	Cyclone

5.0 MONITORING METHOD

TABLE 10: PARAMETER CODES AND DESCRIPTIONS FOR MONITORING METHODS

Code	Description (Units)
CO2	CO_2 Mass Emissions Rate (tons/hr)
CO2M	CO_2 Mass Emissions (tons)
H2O	Moisture (%H_2O)
HI	Heat Input Rate (mmBtu/hr)
HIT	Heat Input Total (mmBtu) (LME only)
NOX	NO_x Mass Emissions Rate (lb/hr)
NOXM	NO_x Mass Emissions (lb) (LME only)
NOXR	NO_x Emissions Rate (lb/mmBtu)
OP	Opacity (percent)
SO2	SO_2 Mass Emissions Rate (lb/hr)
SO2M	SO_2 Mass Emissions (lb) (LME only)

TABLE 11: MEASURED PARAMETERS AND APPLICABLE MONITORING METHODS

Parameter	Method Code	Description
CO2	AD	Appendix D Gas and/or Oil Flow System(s) (Formula G-4)
	AMS	Alternative Monitoring System*
	CEM	CO_2 Continuous Emission Monitor
CO2M	FSA	Fuel Sampling and Analysis (Formula G-1)
	LME	Low Mass Emissions (§75.19)
H2O	MMS	Continuous Moisture Sensor
	MDF	Moisture Default
	MTB	Moisture Lookup Table
	MWD	H_2O System with Wet and Dry O_2 Analyzers

Monitoring Plan XML File Codes

Parameter	Method Code	Description
HI	AD	Appendix D Gas and/or Oil Flow System(s)
	ADCALC	Appendix D Gas and/or Oil Flow System at location (unit) and different Oil or Gas Measured at Common Pipe. (Heat Input at the unit is determined by adding the appropriate value apportioned from the Common Pipe to the unit value)
	AMS	Alternative Monitoring System*
	CALC	Calculated from Values Measured at Other Locations. (Used for three situations: (1) this is the method at a unit when heat input is determined at a common stack or common pipe and then apportioned to the constituent units; or (2) this is the method at a unit when heat input is determined at multiple stacks and then summed to the unit; or (3) this is the method at a common stack if heat input is determined at the units and then summed to the common stack in order to calculate NO_x mass)
	CEM	Flow and O_2 or CO_2 Continuous Emission Monitors
	EXP	Exempt from Heat Input monitoring
HIT	LTFF	Long-Term Fuel Flow (Low Mass Emissions -- §75.19)
	LTFCALC	Long-Term Fuel Flow (Low Mass Emissions -- §75.19) at the unit and different Long Term Fuel Flow at the common pipe. (Heat Input at the unit is determined by adding the appropriate value apportioned from the Common Pipe to the unit value)
	MHHI	Maximum Rated Hourly Heat Input (Low Mass Emissions)
	CALC	Calculated from values measured at the common pipe. (This is the method at a unit when heat input is determined at a common pipe and apportioned to the constituent units)
NOX	AMS	Alternative Monitoring System*
	CEM	NO_x Concentration times Stack Flow rate
	CEMNOXR	NO_x Concentration times Stack Flow rate and NO_x Emission Rate times Heat Input Rate (one as a primary method and the other as secondary). ***This method is not permitted after December 31, 2007***
	NOXR	NO_x Emission Rate times Heat Input Rate
NOXM	LME	Low Mass Emissions (§75.19)
NOXR	AMS	Alternative Monitoring System*
	AE	Appendix E
	CEM	NO_x Emission Rate CEMS
	PEM	Predictive Emissions Monitoring System (as approved by petition)
OP	COM	Continuous Opacity or Particulate Matter Monitor
	EXP	Exempted

Parameter	Method Code	Description
SO2	AD	Appendix D Gas and/or Oil Flow System(s)
	AMS	Alternative Monitoring System*
	CEM	SO_2 Continuous Emission Monitor
	CEMF23	SO_2 Continuous Emission Monitor, and Use of F-23 Equation during hours when only very low sulfur fuel is burned per §§75.11(e) and 75.11(e)(4)
	F23	Use of F-23 Equation if only very low sulfur fuel is burned per §§75.11(e) and 75.11(e)(4)
SO2M	LME	Low Mass Emissions (§75.19)

* Use of this method requires EPA approval

TABLE 12: SUBSTITUTE DATA CODES AND DESCRIPTIONS

Code	Description	Appropriate For Parameter Codes
SPTS	Standard Part 75	NOXR, NOX, SO2, CO2, H2O, and HI
FSP75	Fuel-Specific Part 75	NOXR, NOX, SO2, CO2, H2O, and HI
FSP75C	Fuel-Specific Part 75 with separate co-fired database	NOXR, NOX, SO2, CO2, H2O, and HI
OZN75	Ozone vs. Non-Ozone Season	NOX, NOXR
NLB	Non-Load Based	NOXR, NOX, and HI
NLBOP	Non-Load Based with Operational Bins	NOXR, NOX, and HI
REV75	Reverse of Standard Part 75	H2O
MHHI	Maximum Rated Hourly Heat Input Rate for LME Units using Long Term Fuel Flow methodology	HIT

TABLE 13: BYPASS APPROACH CODES AND DESCRIPTIONS

Code	Description
BYMAX	MPC or MER for Highest Emitting Fuel
BYMAXFS	Fuel-Specific MPC or MER

6.0 MONITORING SYSTEMS

TABLE 14: SYSTEM TYPE CODES AND DESCRIPTIONS

Code	Description
CO2	CO_2 Concentration System
FLOW	Stack Flow System
GAS	Gas Fuel Flow System
H2O	Moisture System that uses wet and dry O_2 analyzers
H2OM	Moisture System that uses a continuous moisture sensor
H2OT	Moisture System that uses a temperature sensor and a table of lookup values
LTGS	Long Term Gas Fuel Flow System (LME)
LTOL	Long Term Oil Fuel Flow System (LME)
NOX	NO_x Emission Rate System
NOXE	Appendix E NO_x System
NOXC	NO_x Concentration System
NOXP	NO_x Emission Rate PEMS System
O2	O_2 Concentration System
OILV	Volumetric Oil Fuel Flow System
OILM	Mass of Oil Fuel Flow System
OP	Opacity (ARP only)
PM	Particulate Matter Monitoring System
SO2	SO_2 Concentration System

TABLE 15: SYSTEM DESIGNATION CODE AND DESCRIPTIONS

Code	Description
P	Primary.
PB	Primary Bypass. A primary bypass (PB) describes a monitoring system located on a bypass stack before a heat recovery steam generator (HRSG).[1]
RB	Redundant Backup. A redundant backup (RB) monitoring system is operated and maintained by meeting all of the same program QA/QC requirements as a primary system.
B	Non-Redundant Backup. A non-redundant backup system (B) is a "cold" backup or portable monitoring system, having its own probe, sample interface, and analytical components.
DB	Data Backup. A data backup system is comprised of the analytical components

Code	Description
	contained in the primary monitoring system (or in a redundant backup system), but includes a backup DAHS component.
RM	Reference Method Backup. A reference method (RM) monitoring system is a monitoring system that is operated as a reference method pursuant to the requirements of Appendix A to Part 60.
CI[2]	Certified Monitoring System at the Inlet to an Emission Control Device.

[1] "P" used for the monitoring system located on the main HRSG stack.

[2] "CI" only used for units with add-on SO_2 or NO_x emission controls. Specifically, the use of a "CI" monitoring system is limited to the following circumstances:

- If the unit has an exhaust configuration consisting of a monitored main stack and an unmonitored bypass stack, and the source elects to report SO_2 data from a certified monitoring system located at the control device inlet (in lieu of reporting maximum potential concentration) during hours in which the flue gases are routed through the bypass stack; or

- If the outlet SO_2 or NO_x monitor is unavailable and proper operation of the add-on emission controls is not verified, and the source elects to report data from a certified SO_2 or NO_x monitor at the control device inlet in lieu of reporting MPC or MER values. However, note that for the purposes of reporting NO_x emission rate, this option may only be used if the inlet NO_x monitor is paired with a diluent monitor and represented as a NO_x-diluent monitoring system in the Component record.

TABLE 16: FUEL CODES AND DESCRIPTIONS

Code	Description
BFG	Blast Furnace Gas
BUT	Butane Gas
CDG	Coal Derived Gas
COG	Coke Oven Gas
DGG	Digester Gas
DSL	Diesel Oil
LFG	Landfill Gas
LPG	Liquefied Petroleum Gas (if measured as a gas)
MIX	Mixture of oil/gas fuel types (for NOXE system for co-fired curve only)
NFS	Non-Fuel-Specific for CEM (including H_2O) and Opacity Systems
NNG	Natural Gas
OGS	Other Gas
OIL	Residual Oil
OOL	Other Oil

Code	Description
PDG	Producer Gas
PNG	Pipeline Natural Gas (as defined in §72.2)
PRG	Process Gas
PRP	Propane Gas
RFG	Refinery Gas
SRG	Unrefined Sour Gas

7.0 System Components

Table 17: Fuel Codes and Descriptions

Code	Description
BFG	Blast Furnace Gas
BUT	Butane Gas
CDG	Coal Derived Gas
COG	Coke Oven Gas
DGG	Digester Gas
DSL	Diesel Oil
LFG	Landfill Gas
LPG	Liquefied Petroleum Gas (if measured as a gas)
MIX	Mixture of oil/gas fuel types (for NOXE system for co-fired curve only)
NFS	Non-Fuel-Specific for CEM (including H_2O) and Opacity Systems
NNG	Natural Gas
OGS	Other Gas
OIL	Residual Oil
OOL	Other Oil
PDG	Producer Gas
PNG	Pipeline Natural Gas (as defined in §72.2)
PRG	Process Gas
PRP	Propane Gas
RFG	Refinery Gas
SRG	Unrefined Sour Gas

8.0 Monitoring System Fuel Flow

Table 18: Fuel Codes and Descriptions

Code	Description
BFG	Blast Furnace Gas
BUT	Butane Gas
CDG	Coal Derived Gas
COG	Coke Oven Gas
DGG	Digester Gas
DSL	Diesel Oil
LFG	Landfill Gas
LPG	Liquefied Petroleum Gas (if measured as a gas)
MIX	Mixture of oil/gas fuel types (for NOXE system for co-fired curve only)
NFS	Non-Fuel-Specific for CEM (including H_2O) and Opacity Systems
NNG	Natural Gas
OGS	Other Gas
OIL	Residual Oil
OOL	Other Oil
PDG	Producer Gas
PNG	Pipeline Natural Gas (as defined in §72.2)
PRG	Process Gas
PRP	Propane Gas
RFG	Refinery Gas
SRG	Unrefined Sour Gas

TABLE 19: UNITS OF MEASURE FOR MAXIMUM FUEL FLOW RATE CODES AND DESCRIPTIONS

Parameter	Code	Description
Volumetric Flow of Oil	SCFH	Standard cubic feet per hour
	GALHR	Gallons per hour
	BBLHR	Barrels per hour
	M3HR	Cubic meters per hour
Mass of Oil	LBHR	Pounds per hour
Gas Flow	HSCF	100 standard cubic feet per hour

TABLE 20: MAXIMUM FUEL FLOW RATE SOURCE CODE

Code	Description
URV	Maximum rate based on the upper range value of the unit
UMX	Maximum rate based on the rate at which the unit can combust fuel

9.0 COMPONENT DATA

TABLE 21: COMPONENT TYPE CODES AND DESCRIPTIONS

Code	Description
BGFF	Billing Gas Fuel Flowmeter
BOFF	Billing Oil Fuel Flowmeter
CALR	Calorimeter
CO2	Carbon Dioxide Concentration Analyzer
DAHS	Data Acquisition and Handling System
DL	Data Logger or Recorder
DP	Differential Pressure Transmitter/Transducer
FLC	Flow Computer
FLOW	Stack Flow Monitor
GCH	Gas Chromatograph
GFFM	Gas Fuel Flowmeter
H2O	Percent Moisture (Continuous Moisture System only)

Code	Description
NOX	Nitrogen Oxide Concentration Analyzer
O2	Oxygen Concentration Analyzer
OFFM	Oil Fuel Flowmeter
OP	Opacity Measurement
PLC	Programmable Logic Controller
PM	Particulate Matter Measurement
PRB	Probe
PRES	Pressure Transmitter/Transducer
SO2	Sulfur Dioxide Concentration Analyzer
TANK	Oil Supply Tank
TEMP	Temperature Transmitter/Transducer

TABLE 22: SAMPLE ACQUISITION METHOD (SAM) CODES

Component	Code	Description
For CEMS	DIL	Dilution
	DIN	Dilution In-Stack
	DOD	Dry Out-of-Stack Dilution
	DOU	Dilution Out-of-Stack
	EXT	Dry Extractive
	IS	In Situ
	ISP	Point/Path in Situ
	ISC	Cross Stack in Situ
	O	Other
	WXT	Wet Extractive
For Volumetric Stack Flow Monitor	DP	Differential Pressure
	O	Other
	T	Thermal
	U	Ultrasonic

For Fuel Flowmeter Types	COR	Coriolis
	DP	Differential Pressure (e.g., Annubar)
	NOZ	Nozzle
	O	Other
	ORF	Orifice
	PDP	Positive Displacement
	T	Thermal Mass Flowmeter
	TUR	Turbine
	U	Ultrasonic
	VCON	V-Cone
	VEN	Venturi
	VTX	Vortex

TABLE 23: BASIS CODES (BAS) AND DESCRIPTIONS

Code	Description
W	Wet
D	Dry
B	Both wet and dry (O_2 only)

10.0 ANALYZER RANGE DATA

TABLE 24: ANALYZER RANGE CODES AND DESCRIPTIONS

Code	Description
H	High Range
L	Low Range
A	Auto Ranging

11.0 EMISSIONS FORMULAS

TABLE 25: PARAMETER CODES AND DESCRIPTIONS FOR MONITORING FORMULA

Code	Description
CO2	CO_2 Hourly Mass Emission Rate (tons/hr)
CO2C	CO_2 Concentration (%CO_2)
CO2M	CO_2 Daily Mass (tons)
FC	F-Factor Carbon-Based
FD	F-Factor Dry-Basis
FGAS	Gas Hourly Flow Rate (hscf)
FLOW	Net Stack Gas Volumetric Flow Rate
FOIL	Net Oil Flow Rate to Unit/Pipe
FW	F-Factor Wet-Basis
H2O	Moisture (%H_2O)
HI	Heat Input Rate (mmBtu/hr)
HIT	Heat Input Total (mmBtu)
NOX	NO_x Hourly Mass Emission Rate (lb/hr)
NOXR	NO_x Emission Rate (lb/mmBtu)
OILM	Oil Mass Flow Rate (lb/hr)
SO2	SO_2 Hourly Mass Emission Rate (lb/hr)
SO2R	SO_2 Emission Rate (lb/mmBtu) When Equation D-1h Is Used

TABLE 26: F-FACTOR* REFERENCE TABLE

Option 1: Fuel-Based Constants

Fuel		F-Factor (dscf/ mmBtu)	F_c-Factor (scf CO_2/ mmBtu)	F_w-Factor (wscf/mmBtu)
Coal	Anthracite	10,100	1,970	10,540
	Bituminous	9,780	1,800	10,640
	Sub-bituminous	9,820	1,840	------
	Lignite	9,860	1,910	11,950
	Petroleum Coke	9,830	1,850	------
	Tire-Derived Fuel	10,260	1,800	------
Gas	Natural Gas	8,710	1,040	10,610
	Propane	8,710	1,190	10,200
	Butane	8,710	1,250	10,390
Oil	Oil	9,190	1,420	10,320
Waste	Municipal Solid Waste	9,570	1,820	------
Wood	Bark	9,600	1,920	------
	Wood Residue	9,240	1,830	------

Option 2: Calculated F-Factors

Code	Para-meter	Formula	Where:
F-7A	FD	$F = \frac{3.64(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O)}{GCV} \times 10^6$	F = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) F_w = Wet-basis F-factor (wscf/mmBtu) %H,%N, %S, %C, %O,%H_2O = Content of element, percent by weight, as determined on the same basis as the gross calorific value by ultimate analysis of the fuel combusted using ASTM D3176-89 for solid fuels, ASTM D1945-91 or ASTM D1946-90 for gaseous fuels, as applicable GCV = Gross calorific value (Btu/lb) of fuel combusted determined by ASTM D2015-91 for solid and liquid fuels or ASTM
F-7B	FC	$F_c = \frac{321 \times 10^3 \times (\%C)}{GCV}$	
19-14	FW	$F_w = \frac{5.57(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O) + 0.21(\%H_2O)}{GCV_w} \times 10^6$	

			D1826-88 for gaseous fuels, as applicable GCV_w = Calorific value (Btu/lb) of fuel combusted, wet basis
F-8**	FD, FC, or FW	$F = \sum_{i=1}^{n} X_i F_i$	F = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) n = Number of fuels being combusted F_i,$(F_c)_i$, $(F_w)_i$ = Applicable F, F_c, or F_w factor for each fuel type X_i = Fraction of total heat input derived from each type of fossil fuel
		$F_c = \sum_{i=1}^{n} X_i (F_c)_i$	
		$F_w = \sum_{i=1}^{n} X_i (F_w)_i$	

* F-factor is the ratio of the gas volume of all the products of combustion (less water) to the heat content of the fuel. F_c-factor is the ratio of the gas volume of the CO_2 generated to the heat content of the fuel (see Part 75, Appendix F, Section 3.3). F-factor is the ratio of the quantity of wet effluent gas generated by the combustion to the heat content of the fuel including free water in the fuel.

** This formula is used for affected units that combust combinations of fossil fuels or fossil fuels and wood residue. For affected units that combust a combination of fossil and non-fossil fuels, the selected F-factor must receive state or EPA approval.

TABLE 27: SO2 FORMULA REFERENCES

Usage	Moisture Basis	Appropriate Hourly Formulas (Part 75, Appendices D&F)
SO2 CEMS	WET	F-1
	DRY	F-2
Default SO_2 emission rate when low sulfur fuels are burned (e.g., natural gas)		F-23 (and D-1H)
Oil Fuel Flowmeter		D-2
Gas Fuel Flowmeter		D-4 or D-5 (and D-1H)
Overall values for multiple fuel flowmeter systems		D-12

TABLE 28: SO2 EMISSION FORMULAS

Code	Parameters	Formula	Where:
F-1	SO2	$E_h = K \times C_h \times Q_h$	E_h = Hourly SO_2 mass emission rate (lb/hr) K = 1.660 x 10^{-7} for SO_2 ((lb/scf)/ppm) C_{hp} = Hourly average SO_2 concentration (ppm (dry)) C_h = Hourly average SO_2 concentration (ppm (stack moisture basis)) Q_h and Q_{hs} = Hourly average volumetric flow rate (scfh (stack moisture basis)) $\%H_2O$ = Hourly average stack moisture content (percent by volume)
F-2	SO2	$E_h = K \times C_{hp} \times Q_{hs} \times \frac{100 - \%H_2O}{100}$	
D-1H	SO2R	$ER = \frac{2.0}{7000} \times 10^6 \times \frac{S_{total}}{GCV}$	ER = Default SO_2 emission rate for natural gas (or "other" gaseous fuel) combustion (lb/mmBtu) S_{total} = Total sulfur content of gaseous fuel (grains/100 scf) GCV = Gross calorific value of the gas (Btu/100 scf) 2.0 = Ratio of lb SO_2/lb S 7000 = Conversion of grains/100 scf to lb/ 100 scf 10^6 = Conversion of Btu to mmBtu
D-2	SO2	$SO2_{rate-oil} = 2.0 \times OIL_{rate} \times \frac{\%S_{oil}}{100.0}$	$SO_{2rate-oil}$ = Hourly mass emission rate of SO_2 emitted from combustion of oil (lb/hr) OIL_{rate} = Mass rate of oil consumed per hour during combustion (lb/hr) $\%S_{oil}$ = Percent sulfur by weight measured in oil sample 2.0 = Ratio of lb SO_2 to lb S
D-4	SO2	$SO2_{rate} = (2.0 / 7000) \times GAS_{rate} \times S_{gas}$	SO_{2rate} = Hourly mass rate of SO_2 from combustion of gaseous fuel (lb/hr) GAS_{rate} = Hourly metered flow rate of gaseous fuel combusted (100 scf/hr) S_{gas} = Sulfur content of gaseous fuel (grains/100 scf) 2.0 = Ratio of lb SO_2/lb S 7000 = Conversion of grains/100 scf to lb/ 100 scf
D-5	SO2	$SO2_{rate} = ER \times HI_{rate}$	SO_{2rate} = Hourly mass emission rate of SO_2 from combustion of gaseous fuel (lb/hr) ER = SO_2 emission rate from Appendix D, Section 2.3.1.1 or Appendix D, Section 2.3.2.1.1 to Part 75 (lb/mmBtu) HI_{rate} = Hourly heat input rate of a gaseous fuel, calculated using procedures in Appendix D, Section 3.4.1 to Part 75 (mmBtu/hr)

Code	Parameters	Formula	Where:
F-23	SO2	$E_h = ER \times HI$	E_h = Hourly SO_2 mass emission rate (lb/hr) ER = Applicable SO_2 default emission rate from Appendix D, Section 2.3.1.1, or Appendix D, Section 2.3.2.1.1 to Part 75 (lb/mmBtu) HI = Hourly heat input rate, determined using a certified flow monitor and diluent monitor, according to Appendix F, Section 5.2 (mmBtu/hr)
D-12*	SO2	$SO2_{rate} = \frac{\sum_{all\text{-}fuels} SO_{2rate\text{-}i}\, t_i}{t_u}$	SO_{2rate} = Hourly mass emission rate of SO_2 from combustion of all fuels (lb/hr) $SO_{2rate\text{-}i}$ = SO_2 mass emission rate for each type of gas or oil fuel combusted during the hour (lb/hr) t_i = Time each gas or oil fuel was combusted for the hour (fraction of an hour) t_u = Operating time of the unit

* This equation is a modified form of Equation D-12 as described in Appendix D, Section 3.5.1, and must be used when reporting in XML format.

TABLE 29: NOX EMISSION RATE FORMULA REFERENCE TABLE

Usage	Moisture Basis			Appropriate Hourly Formulas
	NO_x	CO_2	O_2	
NO_x CEMS (CO_2 Diluent)	DRY	DRY		19-6
	DRY	WET		19-9
	WET	DRY		19-8
	WET	WET		19-7 or F-6
NO_x CEMS (O_2 Diluent)	DRY		DRY	19-1 or F-5
	DRY		WET	19-5 or 19-5D
	WET		DRY	19-4
	WET		WET	19-2, 19-3, or 19-3D
Overall Value from Multiple Appendix E Systems				E-2

TABLE 30: NOX EMISSION RATE FORMULAS (LB/MMBTU)

Code	Parameter	Formula	Where:
19-1 (F-5)	NOXR	$E = K \times C_d \times F_d \times \frac{20.9}{20.9 - \%O_{2_d}}$	Formulas should be multiplied by the conversion factor "K" (if C_d or C_w is in ppm) FROM TO MULTIPLY BY "K" ppm NO_x lb/scf **K = 1.194 X 10^{-7}** E = Emission rate (lb/mmBtu) C_d = Pollutant concentration (ppm, dry basis) C_w = (Pollutant concentration ppm, wet basis) F_d = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) F_w = Wet-basis F-factor (wscf/mmBtu) B_{wa} = Moisture fraction of ambient air (default value 0.027) $\%H_2O$ = Moisture content of effluent gas O_{2_d} = Oxygen diluent concentration (percent of effluent gas, dry basis) O_{2_w} = Oxygen diluent concentration (percent of effluent gas, wet basis) $O_{2_{def}}$ = Default diluent cap O_2 value (14.0 percent for boilers, 19.0 percent for combustion turbines) CO_{2_d} = Carbon dioxide diluent concentration (percent of effluent gas, dry basis) CO_{2_w} = Carbon dioxide diluent concentration (percent of effluent gas, wet basis) E_f = NO_x emission rate for the unit for a given fuel at heat input rate HI_f, lb/mmBtu HI_f = Heat input rate for the hour for a given fuel, during the fuel usage time, as determined using Equation F-19 or F-20 in Section 5.5 of Appendix F to this part, mmBtu/hr H_T = Total heat input for all fuels for the hour from Equation E-1 t_f = Fuel usage time for each fuel (rounded to the nearest fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator))
19-2	NOXR	$E = K \times C_w \times F_w \times \frac{20.9}{20.9(1 - B_{wa}) - \%O_{2_w}}$	
19-3*	NOXR	$E = K \times C_w \times F_d \times \frac{20.9}{20.9 \times \left[\frac{100 - \%H_2O}{100}\right] - \%O_{2_w}}$	
19-3D*	NOXR	$E = K \times C_w \times F_d \times \frac{20.9}{20.9 \times \left[\frac{100 - \%H_2O}{100}\right] - \%O_{2_{def}} \times \left[\frac{100 - \%H_2O}{100}\right]}$	
19-4*	NOXR	$E = K \times \frac{(C_w \times F_d)}{(100 - \%H_2O) \div 100} \times \frac{20.9}{(20.9 - \%O_{2_d})}$	
19-5*	NOXR	$E = \frac{20.9 \times K \times C_d \times F_d}{20.9 - \left[\%O_{2_w} \div \left(\frac{100 - \%H_2O}{100}\right)\right]}$	
19-5D	NOXR	$E = K \times C_d \times F_d \times \frac{20.9}{20.9 - \%O_{2_{def}}}$	
19-6	NOXR	$E = K \times C_d \times F_c \times \frac{100}{\%CO_{2_d}}$	
19-7 (F-6)	NOXR	$E = K \times C_w \times F_c \times \frac{100}{\%CO_{2_w}}$	
19-8*	NOXR	$E = K \times \frac{(C_w \times F_c)}{(100 - \%H_2O) \div 100} \times \frac{100}{\%CO_{2_d}}$	
19-9*	NOXR	$E = K \times C_d \times \left[\frac{100 - \%H_2O}{100}\right] \times F_c \times \frac{100}{\%CO_{2_w}}$	
E-2	NOXR	$E_h = \frac{\sum_{f=1}^{all\ fuels} (E_f \times HI_f\ t_f)}{H_T}$	

* Note that [(100 - $\%H_2O$/100] may also represented as (1 - B_{ws}), where B_{ws} is the proportion by volume of water vapor in the stack gas stream.

TABLE 31: MOISTURE FORMULAS

Code	Parameter	Formula	Where:
F-31	H2O	$\%H_2O = \frac{(O_{2d} - O_{2w})}{O_{2d}} x\,100$	$\%H_2O$ = Percent moisture O_{2_d} = Oxygen diluent concentration (percent of effluent gas, dry basis) O_{2_w} = Oxygen diluent concentration (percent of effluent gas, wet basis)
M-1K	H2O	$\%H_2O = \frac{(O_{2d} - O_{2w})}{O_{2d}} \times 100$, as adjusted[1]	

[1] Using a K-factor or other mathematical algorithm, per Appendix A, Section 6.5.7(a).

TABLE 32: CO2 FORMULA REFERENCE TABLE

Usage	Moisture Basis	Appropriate Formulas (Part 75, Appendices F, G)
CO_2 CEMS (O_2 Analyzer)	WET	F-14B and F-11
	DRY	F-14A and F-2
CO_2 CEM (CO_2 Analyzer)	WET	F-11
	DRY	F-2
Fuel Sampling		G-1 (and possibly G-2, G-3, G-5, G-6 and G-8)
Gas or Oil Flowmeter		G-4
Overall Value from Multiple Flowmeter Systems		G-4A

TABLE 33: CO2 CONCENTRATION AND MASS EMISSION RATE FORMULAS

Code	Parameter	Formula	Where:
F-2	CO2	$E_h = K \times C_{hp} \times Q_{hs} \times \frac{100 - \%H_2O}{100}$	E_h = Hourly CO_2 mass emissions (tons/hr) K = 5.7×10^{-7} for CO_2 ((tons/scf)/percent CO_2) C_{hp} = Hourly average, CO_2 concentration (percent CO_2, dry basis) Q_{hs} = Hourly average volumetric flow rate (scfh, wet basis) $\%H_2O$ = Hourly average stack moisture content (percent by volume)

Code	Parameter	Formula	Where:
F-11	CO2	$E_h = K \times C_h \times Q_h$	E_h = Hourly CO_2 mass emission rate (tons/hr) K = 5.7×10^{-7} for CO_2 ((tons/scf)/percent CO_2) C_h = Hourly average CO_2 concentration (percent CO_2, wet basis) Q_h = Hourly average volumetric flow rate (scfh, wet basis)
F-14A	CO2C	$CO_{2d} = 100 \times \frac{F_c}{F} \times \frac{20.9 - O_{2d}}{20.9}$	CO_{2d} = Hourly average CO_2 concentration (percent by volume, dry basis) F = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) 20.9 = Percentage of O_2 in ambient air O_{2d} = Hourly average O_2 concentration (percent by volume, dry basis)
F-14B	CO2C	$CO_{2w} = \frac{100}{20.9} \times \frac{F_c}{F} \times \left[20.9\left(\frac{100 - \%H_2O}{100}\right) - O_{2W} \right]$	CO_{2w} = Hourly average CO_2 concentration (percent by volume, wet basis) F = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) 20.9 = Percentage of O_2 in ambient air O_{2W} = Hourly average O_2 concentration (percent by volume, wet basis) $\%H_2O$ = Moisture content of gas in the stack (percent)
G-1	CO2M	$W_{CO_2} = \frac{\left(MW_c + MW_{O_2}\right) \times W_c}{2000 MW_c}$	W_{CO_2} = CO_2 emitted from combustion (tons/day) MW_c = Molecular weight of carbon (12.0) MW_{O_2} = Molecular weight of oxygen (32.0) W_c = Carbon burned (lb/day) determined using fuel sampling and analysis and fuel feed rates*
G-2	CO2M	$W_{NCO2} = W_{CO2} - \frac{MW_{CO2}}{MW_c} \times \left(\frac{A\%}{100}\right) \times \left(\frac{C\%}{100}\right) \times W_{COAL}$	W_{NCO2} = Net CO_2 mass emissions discharged to the atmosphere (tons/day) W_{CO2} = Daily CO_2 mass emissions calculated by Equation G-1 (tons/day) MW_{CO2} = Molecular weight of carbon dioxide (44.0) MW_c = Molecular weight of carbon (12.0) A% = Ash content of the coal sample (percent by weight) C% = Carbon content of ash (percent by weight) W_{COAL} = Feed rate of coal from company records (tons/day)

Code	Parameter	Formula	Where:
G-3	CO2M	$W_{NCO2} = .99 \times W_{CO2}$	W_{NCO2} = Net CO_2 mass emissions from the combustion of coal discharged to the atmosphere (tons/day) .99 = Average fraction of coal converted into CO_2 upon combustion W_{CO2} = Daily CO_2 mass emissions from the combustion of coal calculated by Equation G-1 (tons/day)
G-4	CO2	$W_{CO_2} = \frac{F_c \times H \times U_f \times MW_{CO_2}}{2000}$	W_{CO_2} = CO_2 emitted from combustion (tons/hr) F_c = Carbon-based F-factor, 1,040 scf/mmBtu for natural gas; 1,420 scf/mmBtu for crude, residual, or distillate oil and calculated according to the procedures in Section 3.3.5 of Appendix F to Part 75 for other gaseous fuels H = Hourly heat input rate (mmBtu/hr) U_f = 1/385 scf CO_2/lb-mole at 14.7 psi and 68°F MW_{CO_2} = Molecular weight of carbon dioxide (44.0)
G-4A	CO2	$CO2_{unit} = \frac{\sum_{all-fuels} CO2_{fuel} t_{fuel}}{t_{unit}}$	$CO2_{unit}$ = Unit CO_2 mass emission rate (tons/hr) $CO2_{fuel}$ = CO_2 mass emission rate calculated using Equation G-4 for a single fuel (tons/hr) t_{fuel} = Fuel usage time t_{unit} = Unit operating time
G-5	CO2M	$SE_{CO_2} = W_{CaCO_3} \times F_u \times \frac{MW_{CO_2}}{MW_{CaCO_3}}$	SE_{CO_2} = CO_2 emitted from sorbent (tons/day) W_{CaCO_3} = Calcium carbonate used (tons/day) F_u = 1.00, the calcium to sulfur stoichiometric ratio MW_{CO_2} = Molecular weight of carbon dioxide (44.0) MW_{CaCO_3} = Molecular weight of calcium carbonate (100.0)
G-6	CO2M	$SE_{CO_2} = F_u \frac{W_{SO_2}}{2000} \frac{MW_{CO2}}{MW_{SO_2}}$	SE_{CO_2} = CO_2 emitted from sorbent (tons/day) MW_{CO_2} = Molecular weight of carbon dioxide (44.0) MW_{SO_2} = Molecular weight of sulfur dioxide (64.0) W_{SO_2} = Sulfur dioxide removed (lb/day) based on applicable procedures, methods, and equations in § 75.15 F_u = 1.00, the calcium to sulfur stoichiometric ratio

Code	Parameter	Formula	Where:
G-8	CO2M	$W_t = W_{CO_2} + SE_{CO_2}$	W_t = Estimated total CO_2 mass emissions (tons/day) W_{CO_2} = CO_2 emitted from fuel combustion (tons/day) SE_{CO_2} = CO_2 emitted from sorbent (tons/day)

* See Appendix G, sections 2.1.1 through 2.1.3
** For a unit linked to a common pipe with one additional fuel flowmeter system defined at the unit, a G-4A formula is reported to calculate the unit hourly CO2 rate, even though there is only a single fuel flowmeter defined at the unit. Because the fuel usage time may not be equal to the unit operating time, the hourly CO2 rate for the fuel may be different from the hourly CO2 rate for the unit. Formula G-4A is used to calculate the unit hourly CO2 rate.

TABLE 34: HEAT INPUT FORMULA REFERENCE TABLE

Usage	Moisture Basis	Appropriate Hourly Formulas (Part 75, Appendices D and F)
CEMS (O_2 Analyzer)	WET	F-17
	DRY	F-18
CEMS (CO_2 Analyzer)	WET	F-15
	DRY	F-16
Gas Fuel Flowmeter System		D-6 (F-20)
Oil Fuel Flowmeter System (Mass)		D-8 (F-19)
Oil Fuel Flowmeter System (Volumetric)		D-3 and D-8 (F-19) or F-19V
Overall Value from Multiple Fuel Flowmeter Systems		D-15A
Apportioned Value from Common Stack or Common Pipe		F-21A, F-21B, or F-21
Summed Value from Multiple Stacks		F-21C
Summed Value from Unit		F-25

TABLE 35: HEAT INPUT FORMULAS

Code	Parameter	Formula	Where:
D-15A	HI	$HI_{rate\text{-}hr} = \frac{\sum_{all\text{-}fuels} HI_{rate\text{-}i}\, t_i}{t_u}$	$HI_{rate\text{-}hr}$ = Heat input rate from all fuels combusted during the hour (mmBtu/hr) $HI_{rate\text{-}i}$ = Heat input rate for each type of gas or oil combusted during the hour (mmBtu/hr) t_i = Time each gas or oil fuel was combusted for the hour (fuel usage time) (fraction of an hour) t_u = Operating time of the unit
F-15	HI	$HI = Q_w \times \frac{1}{F_c} \times \frac{\%CO_{2w}}{100}$	HI = Hourly heat input rate (mmBtu/hr) Q_w, Q_h = Hourly average volumetric flow rate (scfh, wet basis) F_c = Carbon-based F-factor (scf/mmBtu) F = Dry basis F-factor (dscf/mmBtu) $\%CO_{2w}$ = Hourly concentration of CO_2 (percent CO_2, wet basis) $\%CO_{2d}$ = Hourly concentration of CO_2 (percent CO_2 , dry basis) $\%O_{2w}$ = Hourly concentration of O_2 (percent O_2, wet basis) $\%O_{2d}$ = Hourly concentration of O_2 (percent O_2, dry basis) $\%H_2O$ = Hourly average moisture of gas in the stack (percent)
F-16	HI	$HI = Q_h \times \left[\frac{100 - \%H_2O}{100 F_c}\right]\left[\frac{\%CO_{2d}}{100}\right]$	
F-17	HI	$HI = Q_W \times \frac{1}{F} \times \frac{[(20.9/100)(100 - \%H_2O) - \%O_{2w}]}{20.9}$	
F-18	HI	$HI = Q_w \times \left[\frac{(100 - \%H_2O)}{100F}\right]\left[\frac{(20.9 - \%O_{2d})}{20.9}\right]$	
D-3	OILM	$OIL_{rate} = V_{oil\text{-}rate} \times D_{oil}$	OIL_{rate} = Mass rate of oil consumed per hr (lb/hr) $V_{oil\text{-}rate}$ = Volume rate of oil consumed per hr, measured (scf/hr, gal/hr, barrels/hr, or m^3/hr) D_{oil} = Density of oil, measured (lb/scf, lb/gal, lb/barrel, or lb/m^3)
D-8** (F-19V)	HI	$HI_{rate\text{-}oil} = OIL_{rate} \times \frac{GCV_{oil}}{10^6}$	$HI_{rate\text{-}oil}$ = Hourly heat input rate from combustion of oil (mmBtu/hr) OIL_{rate} = Rate of oil consumed (lb/hr for Equation D-8 or gal/hr for Equation F-19V) GCV_{oil} = Gross calorific value of oil (Btu/lb for Equation D-8 or Btu/gal for Equation F-19V) 10^6 = Conversion of Btu to mmBtu

Code	Parameter	Formula	Where:
F-19	HI	$HI_o = M_o \, x \, \frac{GCV_o}{10^6}$	HI_o = Hourly heat input rate from combustion of oil (mmBtu/hr) M_o = Mass rate of oil consumed per hour (lb/hr) GCV_o = Gross calorific value of oil (Btu/lb) 10^6 = Conversion of Btu to mmBtu
D-6	HI	$HI_{rate\text{-}gas} = \frac{GAS_{rate} \, x \, GCV_{gas}}{10^6}$	$HI_{rate\text{-}gas}$, HI_g = Hourly heat input rate from combustion of gaseous fuel (mmBtu/hr) GAS_{rate}, Q_g = Average volumetric flow rate of fuel (100 scfh) GCV_{gas}, GCV_g = Gross calorific value of gaseous fuel (Btu/100 scf) 10^6 = Conversion of Btu to mmBtu
F-20	HI	$HI_g = \frac{(Q_g \, x \, GCV_g)}{10^6}$	

** For units required to monitor NO_x mass emissions but <u>not</u> SO_2 mass emissions, if there is a volumetric oil flowmeter, it is possible to use Equation D-8 on a volumetric basis, rather than a mass basis. If this option is used, it is represented as Equation F-19V in the monitoring plan.

TABLE 36: APPORTIONMENT AND SUMMATION FORMULAS

Code	Parameter	Formula	Where:
F-21A	HI	$HI_i = HI_{CS} \left(\frac{t_{CS}}{t_i} \right) \left[\frac{MW_i \, t_i}{\sum_{i=1}^{n} MW_i \, t_i} \right]$	HI_i = Heat input rate for a unit (mmBtu/hr) HI_{CS} = Heat input rate at the common stack or pipe (mmBtu/hr) MW_i = Gross electrical output (MWe) t_i = Operating time at a particular unit t_{CS} = Operating time at common stack or pipe n = Total number of units using the common stack or pipe i = Designation of a particular unit
F-21B	HI	$HI_i = HI_{CS} \left(\frac{t_{CS}}{t_i} \right) \left[\frac{SF_i \, t_i}{\sum_{i=1}^{n} SF_i \, t_i} \right]$	HI_i = Heat input rate for a unit (mmBtu/hr) HI_{CS} = Heat input rate at the common stack or pipe (mmBtu/hr) n = Number of stacks or pipes SF_i = Gross steam load (flow) (lb/hr) t_i = Operating time at a particular unit t_{CS} = Operating time at common stack or pipe n = Total number of units using the common stack or pipe i = Designation of a particular unit

Code	Parameter	Formula	Where:
F-21C	HI	$$HI_{Unit} = \frac{\sum_{s=1}^{n} HI_s \; t_s}{t_{Unit}}$$	HI_{Unit} = Heat input rate for a unit (mmBtu/hr) HI_s = Heat input rate for each stack or duct (mmBtu/hr) t_{Unit} = Operating time for the unit t_s = Operating time for a particular stack or duct s = Designation of a particular stack or duct n = Total number stacks, ducts
F-21D	HI	$$HI_i = HI_{CP}\left(\frac{t_{CP}}{t_i}\right)\left[\frac{FF_i \, t_i}{\sum_{i=1}^{n} FF_i \; t_i}\right]$$	HI_i = Heat input rate for a unit (mmBtu/hr) HI_{CP} = Heat input rate at the common pipe (mmBtu/hr) FF_i = Fuel flow rate to a particular unit (appropriate units) t_i = Operating time at a particular unit (hr) t_{CP} = Operating time at common pipe (hr) n = Total number of units using the common pipe i = Designation of a particular unit
F-25	HI	$$HI_{CS} = \frac{\sum_{u=1}^{p} HI_u \; t_u}{t_{CS}}$$	HI_{CS} = Hourly average heat input rate at the common stack (mmBtu/hr) HI_u = Hourly average heat input rate for a unit (mmBtu/hr) p = Number of units t_u = Operating time at a particular unit t_{CS} = Operating time at common stack u = Designation of a particular unit

TABLE 37: NOX MASS EMISSIONS FORMULAS (LBS/HR)

Code	Parameter	Formula	Where:
F-24A	NOX	$E_{(NOx)h} = ER_{(NOx)h} \times HI_h$	$E_{(NOx)h}$ = Hourly NO_x mass emissions rate in lb/hr K = 1.194×10^{-7} for NO_x ((lb/scf)/ppm) C_{h_d} = Hourly average, NO_x concentration (ppm (dry)) C_{h_w} = Hourly average, NO_x concentration, stack moisture basis (ppm (wet)) Q_h = Hourly average volumetric flow rate (scfh) $\%H_2O$ = Hourly average stack moisture content (percent by volume) HI_h = Hourly average heat input rate (mmBtu/hr) $ER_{(NOx)_h}$ = Hourly average NO_x emission rate (lb/mmBtu)
F-26A	NOX	$E_{(NOx)h} = K \times C_{hw} \times Q_h$	
F-26B	NOX	$E_{(NOx)h} = K \times C_{h_d} \times Q_h \times \frac{(100 - \% H_2O)}{100}$	

TABLE 38: MISCELLANEOUS FORMULA CODES

Code	Parameter	Description
N-GAS	FGAS	Net or total gas fuel flow rate (100 scfh)
N-OIL	FOIL	Net or total oil fuel flow rate (scf/hr, gal/hr, barrels/hr, m^3/hr, or lb/hr)
X-FL	FLOW	Average hourly stack flow rate (scfh). (To calculate the average of two or more primary flow monitors, for example, two ultrasonic monitors in an X-pattern)
T-FL	FLOW	Total stack flow rate (scfh)
SS-1A	SO2	Total hourly SO_2 mass emissions from the affected unit(s) in a subtractive stack configuration (lb/hr)
SS-1B	SO2	Hourly SO_2 mass emissions from a particular affected unit in a subtractive stack configuration (lb/hr)
SS-2A	NOX	Total hourly NO_x mass emissions from the affected unit(s) in a subtractive stack configuration (lb/hr)
SS-2B	NOX	Hourly NO_x mass emissions from a particular affected unit in a subtractive stack configuration (lb/hr). (Apportioned by gross load)
SS-2C	NOX	Hourly NO_x mass emissions from a particular affected unit in a subtractive stack configuration (lb/hr). (Apportioned by steam load)
SS-3A	HIT	Total hourly heat input for the affected unit(s) in a subtractive stack configuration (mmBtu)
SS-3B	HI	Hourly heat input rate for a particular affected unit in a subtractive stack configuration (mmBtu/hr)

Code	Parameter	Description
NS-1	NOXR	Hourly NO_x apportionment for NO_x affected units in a subtractive stack configuration (lb/mmBtu)
NS-2	NOXR	Hourly NO_x apportionment for NO_x affected units using simple NO_x apportionment (lb/mmBtu)

TABLE 39: REPRESENTATIONS FOR ELECTRONIC REPORTING

Operation	Recommended Representation	Example
Addition	+	MW_1 + MW_2
Subtraction	-	(100 - $\%H_2O$)
Multiplication	*	C_d * F_d
Division	/	$\%CO_2/100$
Exponential Power	**	1.66×10^{-7} = 1.66 * 10 ** -7
Subscript	Underscore	MW_1 = MW_1
Fraction of Heat Input from Fuel	X_<fuel>	X_oil
Gross Electrical Output	MW_<unit>	MW_1
Gross Steam Load (Flow)	SF_<unit>	SF_1
Hourly Emissions	E_h	E_h
Operating Time	T_<unit/stack>	T_CS1

12.0 SPAN VALUES

TABLE 40: COMPONENT TYPE CODES AND DESCRIPTIONS FOR MONITOR SPAN

Code	Description
CO2	CO_2 Concentration (percent)
FLOW	Stack Flow
NOX	NO_x Concentration (ppm)
O2	O_2 Concentration (percent)
SO2	SO_2 Concentration (ppm)

TABLE 41: PROVISION FOR CALCULATING MAXIMUM POTENTIAL CONCENTRATIONS (MPC)/ MAXIMUM EXPECTED CONCENTRATION (MEC)/ MAXIMUM POTENTIAL FLOW RATE (MPF) CODES AND DESCRIPTIONS

Code	Description
F	Formula (low and high-scale SO_2, flow rate, and low-scale NO_x only)
HD	Historical Data
TR	Test Results
TB	Table of Constants from Part 75 or Default Values from Part 75 (e.g., 800 ppm NO_x for coal-firing)
OL	Other Limit
GS	Low Scale Default for SO_2 for Gas Units
PL	NO_x MEC Based on Permit Limit
ME	NO_x MPC Based on Manufacturer's Estimate of Uncontrolled Emissions

TABLE 42: FLOW SPAN CALIBRATION UNITS OF MEASURE

Code	Description
ACFH	Actual Cubic Feet of Stack Flow per Hour
ACFM	Actual Cubic Feet of Stack Flow per Minute
AFPM	Actual Feet of Stack Flow per Minute
AMSEC	Actual Meters of Stack Flow per Second
AFSEC	Actual Feet of Stack Flow per Second
INH2O	Inches of Water
KACFH	Thousand Actual Cubic Feet of Stack Flow per Hour
KACFM	Thousand Actual Cubic Feet of Stack Flow per Minute
KAFPM	Thousand Actual Feet of Stack Flow per Minute
KSCFH	Thousand Standard Cubic Feet of Stack Flow per Hour
KSCFM	Thousand Standard Cubic Feet of Stack Flow per Minute
KSFPM	Thousand Standard Feet of Stack Flow per Minute
MACFH	Million Actual Cubic Feet of Stack Flow per Hour
MSCFH	Million Standard Cubic Feet of Stack Flow per Hour

Code	Description
SCFH	Standard Cubic Feet of Stack Flow per Hour
SCFM	Standard Cubic Feet of Stack Flow per Minute
SFPM	Standard Feet of Stack Flow per Minute
SMSEC	Standard Meters of Stack Flow per Second

13. Rectangular Duct WAF

Table 43: WAF Method Code and Descriptions

Code	Description
FT	Full Test (CTM-041 §§8.1 and 8.2)
AT	Abbreviated Test (CTM-041 §8.4.1)
DF	Default Value (CTM-041 §8.4.2)

14. Unit/Stack/Pipe Load or Operating Level Information

Table 44: Maximum Load Value Codes and Descriptions

Code	Description
MW	Electrical Capacity (in megawatts)
KLBHR	Steam (load) Mass Rate (in units of 1000 lbs/hr)
MMBTUHR	BTUs of Steam Produced (in mmBtu/hr)

Note: This field is left blank for units that do not produce electrical or steam load.

15. MONITORING DEFAULTS

TABLE 45: PARAMETER CODES AND DESCRIPTIONS FOR MONITORING DEFAULT

Category	Parameter Code	Description
Diluent Cap	CO2N	CO_2 Diluent Cap.
	O2X	O_2 Diluent Cap.
Low Mass Emissions Parameters (§§75.19 and 75.81(b))	CO2R	CO_2 Default Emission Factor, from Table 45 or Fuel and Unit-Specific CO_2 Default Emission Factor, for Combustion of "Other" Gaseous Fuel (tons/mmBtu).
	NOXR	NO_x Default Emission Factor, from Table 42 or Fuel and Unit-Specific NO_x Emission Rate[1] (lb/mmBtu).
	SO2R	SO_2 Default Emission Factor, from Table 43 or Fuel and Unit-Specific SO_2 Default Emission Factor Calculated Using Equation D-1h, either (1) for combustion of "other" gaseous fuel; or (2) for fuel oil combustion, based on the maximum weight percent sulfur in the operating permit (lb/mmBtu).
	MHHI	Maximum Rated Hourly Heat Input Rate (mmBtu/hr).
Missing Data Values or Maximum Values for Unmonitored Bypass Stack and Emergency Fuels	H2ON	Minimum Potential Percent Moisture.
	H2OX	Maximum Potential Percent Moisture.
	CO2X	Maximum Percent CO_2.
	O2N	Minimum Potential Percent Oxygen.
	SO2X	Fuel-Specific Maximum Potential SO_2 Concentration (ppm).
	NOCX	Fuel-Specific Maximum Potential (MPC) or Maximum Expected NO_x Concentration (ppm) for all hours or controlled hours. For Appendix E missing data purposes, report the MPC used to calculate the Maximum NO_x Emission Rate for each fuel curve and, if applicable, for Emergency fuel.
	NORX	Maximum NO_x Emission Rate (MER) and Fuel-Specific Maximum Potential or Maximum Expected NO_x Emission Rate (lb/mmBtu) for all hours or controlled hours. For Appendix E missing data purposes, an MER must be determined for each fuel curve and, if applicable, for Emergency fuel.
	FLOX	Fuel-Specific Maximum Potential Flow Rate (scfh).
Moisture Default Parameter	H2O	Hourly Percent Moisture Content (%H_2O).
	BWA	Moisture Fraction in Ambient Air.

Category	Parameter Code	Description
SO_2 Emission Rate Parameter for Use in Formula F-23	SO2R	SO_2 Generic Default Emission Factor for Pipeline Natural Gas; or Fuel and Unit-Specific Default Emission Factor Calculated Using Equation D-1h for combustion of "other" gaseous fuel; or Emission Factor approved by petition for a very low sulfur solid or liquid fuel (or combination of fuels) per §75.11 (e).
Other Parameters (subject to EPA approval of petition)	MNHI	Minimum Heat Input Rate (mmBtu/hr).
	MNNX	Minimum NO_x Emission Rate (lb/mmBtu).
Other Parameters (not subject to EPA approval of petition)	MNOF	Minimum Oil Flow Rate.
	MNGF	Minimum Gas Flow Rate.

[1] "NOXR" is reported in the following cases: (1) for fuel-and-unit specific NO_x emission rates obtained by testing; and (2) for the maximum potential NO_x emission rate, if that value is reported in the interval from the first hour of use of the LME methodology until the hour of completion of fuel-and-unit specific NO_x emission rate testing (see §75.19 (a)(4)).

TABLE 46: FUEL-SPECIFIC MINIMUM DEFAULT MOISTURE VALUES FOR SO2, NOX, CO2, AND HEAT INPUT RATE CALCULATIONS

Fuel	Minimum Moisture Default Value
Anthracite Coal	3.0%
Bituminous Coal	6.0%
Sub-bituminous Coal	8.0%
Lignite Coal	11.0%
Wood	13.0%
Natural Gas (boilers only)	14.0%

TABLE 47: FUEL-SPECIFIC MAXIMUM DEFAULT MOISTURE VALUES FOR NOX EMISSION RATE CALCULATIONS

Fuel	Maximum Moisture Default Value
Anthracite Coal	5.0%
Bituminous Coal	8.0%
Sub-bituminous Coal	12.0%
Lignite Coal	13.0%
Wood	15.0%
Natural Gas (boilers only)	18.0%

TABLE 48: NOX EMISSION FACTORS (LB/MMBTU) FOR LOW MASS EMISSIONS UNITS

Boiler Type	Fuel Type	NO_x Emission Factors
Turbine	Natural Gas	0.7
	Oil	1.2
Boiler	Natural Gas	1.5
	Oil	2.0

TABLE 49: SO2 EMISSION FACTORS (LB/MMBTU) FOR LOW MASS EMISSIONS UNITS

Fuel Type	SO_2 Emission Factors
Pipeline Natural Gas (as defined in §72.2)	0.0006
Natural Gas	0.06
Residual Oil or Other Oil	2.10
Diesel Fuel	0.50

TABLE 50: CO2 EMISSION FACTORS (TON/MMBTU) FOR LOW MASS EMISSIONS UNITS

Fuel Type	CO_2 Emission Factors
Natural Gas	0.059
Oil	0.081

TABLE 51: UNITS OF MEASURE CODES BY PARAMETER

Units of Measure Code	Description	Parameter Code
PCT	Percent	CO2N, CO2X, H2O, H2ON, H2OX, O2N, O2X
LBMMBTU	Pounds per Million Btu	MNNX, NOXR, SO2R, NORX
MMBTUHR	Million Btu per Hour	MNHI, MHHI
TNMMBTU	Tons per Million Btu	CO2R
SCFH	Standard Cubic Feet per Hour	MNOF, FLOX,
PPM	Parts per million	SO2X, NOCX
GALHR	Gallons of Oil per Hour	MNOF
BBLHR	Barrels of Oil per Hour	MNOF
M3HR	Cubic Meters of Oil per Hour	MNOF
LBHR	Pounds of Oil per Hour	MNOF
HSCF	Hundred SCF of Gas per Hour	MNGF

TABLE 52: DEFAULT PURPOSE CODES AND DESCRIPTIONS

Code	Description	Parameter Code
DC	Diluent Cap	CO2N, O2X
DM	Default Minimum Fuel Flow Rate	MNGF, MNOF
F23	SO_2 Emission Rate Default for Use in Equation F-23	SO2R
LM	Low Mass Emissions Unit Default (§§75.19 and 75.81(b))	CO2R, SO2R, NOXR, MHHI
MD	Missing Data, Unmonitored Bypass Stack, or Emergency Fuel	CO2X, FLOX, H2ON, H2OX, MNHI, MNNX, NOCX, NORX, O2N, SO2X
PM	Primary Measurement Methodology	BWA, H2O

TABLE 53: FUEL CODES AND DESCRIPTIONS

Type	Code	Description
LME Defaults (§75.19)	BFG	Blast Furnace Gas
	BUT	Butane (if measured as a gas)
	CDG	Coal Derived Gas
	COG	Coke Oven Gas

Monitoring Plan XML File Codes

Type	Code	Description
	DGG	Digester Gas
	DSL	Diesel Oil
	LFG	Landfill Gas
	LPG	Liquefied Petroleum Gas (if measured as a gas)
	NNG	Natural Gas
	OGS	Other Gas
	OIL	Residual Oil
	OOL	Other Oil
	PDG	Producer Gas
	PNG	Pipeline Natural Gas (as defined in §72.2)
	PRG	Process Gas
	PRP	Propane (if measured as a gas)
	RFG	Refinery Gas
	SRG	Unrefined Sour Gas
Moisture	ANT	Anthracite Coal
	BT	Bituminous Coal
	CRF	Coal Refuse (culm or gob)
	LIG	Lignite
	NNG	Natural Gas (including Pipeline Natural Gas)
	PNG	Pipeline Natural Gas
	SUB	Sub-bituminous Coal
	W	Wood
SO_2 Emission Rate Default for Use in Equation F-23	NNG	Natural Gas
	PNG	Pipeline Natural Gas
	OGS	Other Gas
	* or MIX	*With an approved petition, any liquid or solid fuel type that qualifies as very low sulfur fuel, or a mixture of such fuels. See fuel code list in UNIT FUEL DATA
Fuel-Specific CEMS Missing Data	BFG	Blast Furnace Gas
	BUT	Butane (if measured as a gas)
	C	Coal
	CDG	Coal-Derived Gas
	COG	Coke Oven Gas
	CRF	Coal Refuse (culm or gob)

Monitoring Plan XML File Codes

Type	Code	Description
	DGG	Digester Gas
	DSL	Diesel Oil
	LFG	Landfill Gas
	LPG	Liquefied Petroleum Gas (if measured as a gas)
	MIX	Co-Fired Fuels
	NNG	Natural Gas
	OGS	Other Gas
	OIL	Residual Oil
	OOL	Other Oil
	OSF	Other Solid Fuel
	PDG	Producer Gas
	PNG	Pipeline Natural Gas (as defined in §72.2)
	PRG	Process Gas
	PRP	Propane (if measured as a gas)
	PRS	Process Sludge
	PTC	Petroleum Coke
	R	Refuse
	RFG	Refinery Gas
	SRG	Unrefined Sour Gas
	TDF	Tire-Derived Fuel
	W	Wood
	WL	Waste Liquid
Fuel-Specific MPC/MER or MEC/MCR Reporting During Bypass Stack Operating Hours	BFG	Blast Furnace Gas
	BUT	Butane (if measured as a gas)
	C	Coal
	CDG	Coal-Derived Gas
	COG	Coke Oven Gas
	CRF	Coal Refuse (culm or gob)
	DGG	Digester Gas
	DSL	Diesel Oil
	LFG	Landfill Gas
	LPG	Liquefied Petroleum Gas (if measured as a gas)
	NNG	Natural Gas

Type	Code	Description
	OGS	Other Gas
	OIL	Residual Oil
	OOL	Other Oil
	OSF	Other Solid Fuel
	PDG	Producer Gas
	PNG	Pipeline Natural Gas (as defined in §72.2)
	PRG	Process Gas
	PRP	Propane (if measured as a gas)
	PRS	Process Sludge
	PTC	Petroleum Coke
	R	Refuse
	RFG	Refinery Gas
	SRG	Unrefined Sour Gas
	TDF	Tire-Derived Fuel
	W	Wood
	WL	Waste Liquid

TABLE 54: OPERATING CONDITION CODES AND DESCRIPTIONS

Operating Condition Code	Description
A	Any Hour
C	Controlled Hour
B	Base Load Hour (LME units)
P	Peak Load Hour (LME units)
U	Uncontrolled Hour

TABLE 55: DEFAULT SOURCE CODES AND DESCRIPTIONS

Default Source Code	Source of Value Description	Parameter
APP*	Approved (Petition)	MNNX, SO2R, MNHI, H2O, MHHI
DATA**	Historical or Other Relevant Data	O2N, O2X, CO2X, H2ON, H2OX, FLOX, SO2X, NOCX, NORX, NOXR, MNOF, MNGF, BWA
PERM	Maximum Weight Percent Sulfur in Fuel Oil, as Specified by Operating Permit (for LME)	SO2R, NORX, NOCX
TEST	Unit/Stack Testing	NOXR, FLOX, SO2X, NOCX, NORX
SAMP	Fuel Sampling	SO2R, CO2R, SO2X
CONT	Contract Maximum	SO2R
DEF	Default Value from Part 75	CO2R, NOXR, CO2N, O2X, SO2R, H2ON, H2OX, SO2X, NOCX, NORX, H2O
MAXD	Maximum Value Based on Design or Nameplate Capacity	MHHI, NORX, NOCX

* "APP" is reported if a source has an approved petition to use a site-specific SO_2 emission factor for very low sulfur solid or liquid fuels.

** "DATA" is reported when a source is reporting the maximum potential NO_x emission rate in the interval from the first hour of use of the LME methodology until the hour of completion of fuel-and-unit specific NO_x emission rate testing (see §75.19 (a)(4)).

16.0 QUALIFICATIONS

TABLE 56: QUALIFICATION TYPE CODES AND DESCRIPTIONS

Category	Code	Description
Gas-Fired	GF	Gas-Fired Qualification
Low Mass Emitter	LMEA	Low Mass Emitter Qualification (Annual) -- Required when reporting on a year-round basis
	LMES	Low Mass Emitter Qualification (Ozone Season) -- Required when subject to an Ozone-Season NO_x program
Peaking	PK	Peaking Unit Qualification (Annual)
	SK	Peaking Unit Qualification for Ozone Season (applies exclusively to sources that report on an ozone season-only basis)

Category	Code	Description
QA Test Exemption	PRATA1	Single Load RATA Qualification by petition approval
	PRATA2	Two Load RATA Qualification by petition approval
	COMPLEX	Exemption from Flow-to-Load Testing Due to Complex Configuration
	LOWSULF	SO_2 RATA Exemption for a Source Combusting Only Very Low Sulfur Fuel

TABLE 57: QUALIFICATION DATA TYPE CODE AND DESCRIPTIONS

Code	Description
A	Actual Percent Capacity Factor or Fuel Usage
P	Projected Capacity Factor or Fuel Usage
D	720 Hours of Unit Operating Data (gas-fired only)