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1.0 Stack Pipe Data

Table 1: Stack Pipe ID Prefixes

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

2.0 Unit Control Data

Table 2: Parameter Codes and Descriptions

Code	Description
NOX	Nitrogen Oxides
SO2	Sulfur Dioxide
PART	Particulates (opacity)
HG	Mercury
HCL	Hydrogen chloride
HF	Hydrogen fluoride

Table 3: 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)

Monitoring Plan XML File Codes

Parameter	Control Code	Description
	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
	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
HG	UPAC	Injection of untreated powdered activated carbon (PAC) sorbents
	HPAC	Injection of halogenated powdered activated carbon (PAC) sorbents
	SORB	Injection of other (non-PAC) sorbents
	APAC	Additives to enhance PAC and existing equipment performance
	CAT	A catalyst (gold, palladium, or other) used to oxidize mercury
	REAC	Regenerative Activated Coke Technology
HCL, HF	DSI	Dry Sorbent Injection

3.0 Unit Fuel Data

Table 4: Unit 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
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: Unit 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 Monitoring Location Attribute Data

Table 8: Duct/Stack Material Codes and Descriptions

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

Table 9: Duct/Stack Shape Codes and Descriptions

Code	Description
RECT	Rectangular
ROUND	Round

5.0 MONITORING METHOD DATA

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)
HCLRE	Electrical Output-Based HCL Emission Rate (lb/MWh)
HCLRH	Heat Input-Based HCL Emission Rate (lb/mmBtu)
HFRE	Electrical Output-Based HF Emission Rate (lb/MWh)
HFRH	Heat Input-Based HF Emission Rate (lb/mmBtu)
HGRE	Electrical Output-Based Hg Emission Rate (lb/GWh)
HGRH	Heat Input-Based Hg Emission Rate (lb/TBtu)
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)
SO2RE	Electrical Output-Based SO_2 Emission Rate (lb/Mhr)
SO2RH	Heat Input-Based SO_2 Emission Rate (lb/mmBtu)

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
HCLRE or HCLRH	CEM	HCl Continuous Emission Monitoring System
HFRE or HFRH	CEM	HF Continuous Emission Monitoring System
HGRE	ST	Sorbent Trap Monitoring System
	CEM	Hg Continuous Emission Monitoring System (Hg CEMS)
	CEMST	Hg CEMS and Sorbent Trap Monitoring System
HGRH	ST	Sorbent Trap Monitoring System
	CEM	Hg Continuous Emission Monitoring System (Hg CEMS)
	CEMST	Hg CEMS and Sorbent Trap Monitoring System
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

Monitoring Plan XML File Codes

Parameter	Method Code	Description
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
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)
SO2RE	CEM	SO_2 Continuous Emission Monitoring System
SO2RH	CEM	SO_2 Continuous Emission Monitoring System

* Use of this method requires EPA approval

TABLE 12: SUBSTITUTE DATA CODES AND DESCRIPTIONS

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

TABLE 13: BYPASS APPROACH CODES AND DESCRIPTIONS

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

* Note that MEC or MCR may be used for documented controlled hours.

6.0 SUPPLEMENTAL MATS COMPLIANCE METHOD DATA

TABLE 14: SUPPLEMENTAL MATS PARAMETER CODES

Paramenter Code	Description
HG	Mercury
HF	Hydrogen Fluoride
HCL	Hydrogen Chloride
TM	Total HAP Metals (Including Hg)
TNHGM	Total non-Hg HAP Metals
IM	Individual HAP Metals (Including Hg)
INHGM	Individual non-Hg HAP Metals
LU	Limited-Use Oil-Fired Unit

TABLE 15: SUPPLEMENTAL MATS MEASURED PARAMETERS AND APPLICABLE MONITORING METHODS

Parameter Code	Method Code	Description
HG (Coal and pet coke-fired EGUs and IGCCs only)	LEE	Low Emitting EGU
HF or HCL	LEE	Low Emitting EGU
	QST	Quarterly Stack Testing
	PMO	Percent Moisture in the Oil (Oil-fired EGUs only)
TM (Oil-fired EGUs only)	LEE	Low Emitting EGU for Total HAP metals, including Hg
	QST	Quarterly Stack Testing for Total HAP metals, including Hg
	PMQST	Quarterly Stack Testing for Particulate Matter
	PMCEMS	Particulate Matter Continuous Monitoring System
	PMCPMS	Particulate Matter Continuous Parametric Monitoring System
	CEMS	Continuous Emission Monitoring System (Requires Administrative Approval under 40 CFR 63.7(f))
TNHGM (Coal & pet coke-fired EGUs and IGCCs only)	LEE	Low Emitting EGU for Total non-Hg HAP metals
	QST	Quarterly Stack Testing for Total non-Hg HAP metals
	PMQST	Quarterly Stack Testing for Particulate Matter
	PMCEMS	Particulate Matter Continuous Monitoring System
	PMCPMS	Particulate Matter Continuous Parametric Monitoring System
	CEMS	Continuous Emission Monitoring System (Requires Administrative Approval under 40 CFR 63.7(f))
IM (Oil-fired EGUs only)	LEE	Low Emitting EGU for each of the individual HAP metals, including Hg
	QST	Quarterly Stack Testing for each of the HAP metals, including Hg
	LEST	Low Emitting EGU for some of the HAP metals and Quarterly Stack Testing for the rest
	CEMS	Continuous Emission Monitoring System for the individual HAP metals (Requires Administrative Approval under 40 CRF 63.7(f))
INHGM (Coal-fired and IGCC EGUs only)	LEE	Low Emitting EGU for each of the non-Hg HAP metals
	QST	Quarterly Stack Testing for each of the non-Hg HAP metals
	LEST	Low Emitting EGU for some of the non-Hg HAP metals and Quarterly Stack Testing for the rest

Parameter Code	Method Code	Description
	CEMS	Continuous Emission Monitoring System for the individual non-Hg HAP metals (Requires Administrative Approval under 40 CRF 63.7(f))
LU (Oil-fired units only)	NA	No Applicable Method

7.0 Component Data

Table 16: 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)
HCL	HCL Concentration Analyzer
HF	HF Concentration Analyzer
HG	Mercury Concentration Analyzer (Hg CEMS)
MS	Mass Spectrograph
NOX	Nitrogen Oxide Concentration Analyzer
O2	Oxygen Concentration Analyzer
OFFM	Oil Fuel Flowmeter
OP	Opacity Measurement
PLC	Programmable Logic Controller
PRB	Probe
PRES	Pressure Transmitter/Transducer

Monitoring Plan XML File Codes

Code	Description
SO2	Sulfur Dioxide Concentration Analyzer
STRAIN	Sorbent Trap Sampling Train Component, consisting of a sample gas flow meter and the associated sorbent trap
TANK	Oil Supply Tank
TEMP	Temperature Transmitter/Transducer

TABLE 17: SAMPLE ACQUISITION METHOD CODES FOR COMPONENTS

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 Sorbent Traps	ADSP	Hg Adsorption on Sorbent Medium
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 18: MOISTURE BASIS CODES AND DESCRIPTIONS FOR CEM ANALYZER AND SORBENT TRAP SAMPLING TRAIN COMPONENTS

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

* For sample acquisition method (SAM) codes IS, ISP, ISC, DIN, DOU, DIL, and WXT---wet basis. For SAM code EXT---dry basis. For all stack flow monitors---wet basis. For sampling train (STRAIN) components in sorbent trap systems---dry basis. For others---check with vendor if uncertain.

8.0 ANALYZER RANGE DATA

TABLE 19: ANALYZER RANGE CODES AND DESCRIPTIONS

Code	Description
H	High Range
L	Low Range
A	Auto Ranging

9.0 MONITORING SYSTEM DATA

TABLE 20: 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
HCL	HCL Concentration CEMS
HF	HF Concentration CEMS
HG	Hg Concentration CEMS
LTGS	Long Term Gas Fuel Flow System (LME)

Code	Description
LTOL	Long Term Oil Fuel Flow System (LME)
NOX	NO_x Emission Rate System
NOXC	NO_x Concentration System
NOXE	Appendix E NO_x System
NOXP	NO_x Emission Rate PEMS System
O2	O_2 Concentration System
OILM	Mass of Oil Fuel Flow System
OILV	Volumetric Oil Fuel Flow System
OP	Opacity (ARP only)
PM	Particulate Matter Monitoring System
SO2	SO_2 Concentration System
ST	Sorbent Trap Monitoring System

TABLE 21: SYSTEM DESIGNATION CODES 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 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 22: MONITORING SYSTEM 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), Sorbent Trap Monitoring Systems, 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

10.0 Monitoring System Fuel Flow Data

Table 23: 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

11.0 Monitoring Formula Data

Table 24: 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)
HCLRE	Electrical Output-Based HCl Emission Rate (lb/MWh)
HCLRH	Heat Input-Based HCl Emission Rate (lb/mmBtu)
HFRE	Electrical Output-Based HF Emission Rate (lb/MWh)
HFRH	Heat Input-Based HF Emission Rate (lb/mmBtu)
HGRE	Electrical Output-Based Hg Emission Rate (lb/GWh)
HGRH	Heat Input-Based Hg Emission Rate (lb/TBtu)
HI	Heat Input Rate (mmBtu/hr)
HIT	Heat Input Total (mmBtu)

Code	Description
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
SO2RE	Electrical Output-Based SO_2 Emission Rate (lb/MWh)
SO2RH	Heat Input-Based SO_2 Emission Rate (lb/mmBtu)

TABLE 25: 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	$F = \frac{3.64(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O)}{GCV} x\ 10^6$	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 D1826-88 for gaseous fuels, as applicable GCV_w = Calorific value (Btu/lb) of fuel combusted, wet basis
F-7B	FC	$F_c = \frac{321\ x\ 10^3\ x\ (\%C)}{GCV}$	
19-14	FW	$F_w = \frac{5.57(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O) + 0.21(\%H_2O)}{GCV_w} x\ 10^6$	
F-8**	FD, FC, or FW	$F = \sum_{i=1}^{n} X_i F_i$ $F_c = \sum_{i=1}^{n} X_i (F_c)_i$ $F_w = \sum_{i=1}^{n} X_i (F_w)_i$	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-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 26: 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

* For sample acquisition method (SAM) codes IS, ISP, ISC, DIN, DOU, DIL, and WXT = wet extractive; for EXT = dry extractive, located under component. Exceptions are possible. Check with vendor if uncertain.

TABLE 27: SO2 EMISSION FORMULAS

Code	Parameters	Formula	Where:
F-1	SO2	$E_h = K \; x \; C_h \; x \; Q_h$	E_h = Hourly SO_2 mass emission rate (lb/hr) K = 1.660×10^{-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	$E_h = K \; x \; C_{hp} \; x \; Q_{hs} \; x \; \frac{100 - \% H_2O}{100}$	
D-1H	SO2R	$ER = \frac{2.0}{7000} \; x \; 10^6 \; x \; \frac{S_{total}}{GCV}$	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

Code	Parameters	Formula	Where:
D-2	SO2	$SO2_{rate\text{-}oil} = 2.0 \; x \; OIL_{rate} \; x \; \frac{\% S_{oil}}{100.0}$	$SO_{2rate\text{-}oil}$ = 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	$SO2_{rate} = (2.0/7000) \; x \; GAS_{rate} \; x \; S_{gas}$	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	$SO2_{rate} = ER \; x \; HI_{rate}$	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)
F-23	SO2	$E_h = ER \; x \; HI$	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	$SO2_{rate} = \frac{\sum_{all\text{-}fuels} SO2_{rate\text{-}i} \, t_i}{t_u}$	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 28: SO2 EMISSION RATE FORMULA REFERENCE TABLE FOR THE MATS RULE

Usage	Moisture Basis	Appropriate Hourly Formulas
SO_2 CEMS	WET	S-2 and S-4 for electrical output-based SO_2 emission limit (lb/MWh)
		19-2, 19-3, 19-4, 19-7, or 19-8 (select one) for heat input-based SO_2 emission limit (lb/mmBtu)
	DRY	S-3 and S-4 for electrical output-based SO_2 emission limit (lb/MWh)
		19-1, 19-5, 19-6, or 19-9 (select one) for heat input-based SO_2 emission limit (lb/mmBtu)

TABLE 29
SO2 EMISSION FORMULAS FOR THE MATS RULE

Code	Formula	Where:
19-1	$E = K \; x \; C_d \; x \; F_d \; x \; \frac{20.9}{20.9 - \%O_{2d}}$	The conversion factor "K" is needed to convert SO_2 concentration (C_d or C_w) from ppm to lb/scf. E = Unadjusted heat input-based SO_2 emission rate (lb/mmBtu) K = 1.660×10^{-7} (lb/scf-ppm) C_d = Unadjusted SO_2 concentration (ppm, dry basis) C_w = Unadjusted SO_2 concentration (ppm, wet basis) F_d = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO2/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_{2d} = Oxygen diluent concentration (percent of effluent gas, dry basis) O_{2w} = Oxygen diluent concentration (percent of effluent gas, wet basis) O_{2def} = Default diluent cap O_2 value (14.0 percent) CO_{2d} = Carbon dioxide diluent concentration (percent of effluent gas, dry basis) CO_{2w} = Carbon dioxide diluent concentration (percent of effluent gas, wet basis)
19-2	$E = K \; x \; C_w \; x \; F_w \; x \; \frac{20.9}{20.9(1 - B_{wa}) - \%O_{2w}}$	
19-3*	$E = K \; x \; C_w \; x \; F_d \; x \; \frac{20.9}{20.9 \; x \left[\frac{100 - \% H_2O}{100}\right] - \% O_{2w}}$	
19-3D	$E = K \; x \; C_w \; x \; F_d \; x \; \frac{20.9}{20.9 \; x \left[\frac{100 - \% H_2O}{100}\right] - \% O_{2def} \; x \left[\frac{100 - \% H_2O}{100}\right]}$	
19-4*	$E = K \; x \; \frac{(C_w \; x \; F_d)}{(100 - \% H_2O) \div 100} \; x \; \frac{20.9}{(20.9 - \% O_{2d})}$	
19-5*	$E = \frac{20.9 \; x \; K \; x \; C_d \; x \; F_d}{20.9 - \left[\% O_{2w} \div \left(\frac{100 - \% H_2O}{100}\right)\right]}$	
19-5D	$E = K \; x \; C_d \; x \; F_d \; x \; \frac{20.9}{20.9 - \% O_{2def}}$	
19-6	$E = K \; x \; C_d \; x \; F_c \; x \; \frac{100}{\% CO_{2d}}$	
19-7	$E = K \; x \; C_w \; x \; F_c \; x \; \frac{100}{\% CO_{2w}}$	
19-8*	$E = K \; x \; \frac{(C_w \; x \; F_c)}{(100 - \% H_2O) \div 100} \; x \; \frac{100}{\% CO_{2d}}$	
19-9*	$E = K \; x \; C_d \; x \left[\frac{100 - \% H_2O}{100}\right] x \; F_c \; x \; \frac{100}{\% CO_{2w}}$	

Code	Formula	Where:
S-2	$$M_h = K\, C_h\, Q_h$$	M_h = Hourly SO2 mass emission rate (lb/hr) K = 1.660×10^{-7} (lb/scf-ppm) C_h = Unadjusted hourly average SO_2 concentration, dry basis (ppm) Q_h = Unadjusted hourly average volumetric flow rate (scfh) B_{ws} = Moisture fraction of the stack gas, expressed as a decimal (equal to $\%H_2O/100$)
S-3	$$M_h = K\, C_h\, Q_h\, (1 - B_{ws})$$	
S-4	$$E_{ho} = \frac{M_h}{(MW)_h}$$	E_{ho} = Unadjusted electrical output-based SO_2 emission rate (lb/MWh) M_h = Hourly SO_2 mass emission rate (lb/hr) $(MW)_h$ = Hourly gross electrical load (megawatts)

TABLE 30: 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 31: 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 32: HG EMISSION FORMULA REFERENCE TABLE FOR THE MATS RULE

Monitoring Methodology	Moisture Basis	Appropriate Hourly Formulas Part 63, Subpart UUUUU, Appendix A
Hg CEMS	WET	A-2 and A-4 for electrical output-based Hg emission limit (lb/GWh)
		19-2, 19-3, 19-4, 19-7, or 19-8 (select one) for heat input-based Hg emission limit (lb/TBtu)
	DRY	A-3 and A-4 for electrical output-based Hg emission limit (lb/GWh)
		19-1, 19-5, 19-6, or 19-9 (select one) for heat input-based Hg emission limit (lb/TBtu)
Sorbent Trap Hg Monitoring Systems	DRY	A-3 and A-4 for electrical output-based Hg emission limit (lb/GWh)
		19-1, 19-5, 19-6, or 19-9 (select one) for heat input-based Hg emission limit (lb/TBtu)

TABLE 33: HG EMISSIONS FORMULAS FOR THE MATS RULE

Code	Formula	Where:
A-2	$M_h = K\, C_h\, Q_h$	M_h = Hourly Hg mass emissions rate (lb/hr) K = 6.24×10^{-11} (lb-scm/µg-scf) C_h = Hourly average, Hg concentration , wet basis (µg/scm) Q_h = Hourly unadjusted average volumetric flow rate (scfh)
A-3	$M_h = K\, C_h\, Q_h\, (1 - B_{ws})$	M_h = Hourly Hg mass emissions rate (lb/hr) K = 6.24×10^{-11} (lb-scm/µg-scf) C_h = Hourly average, Hg concentration, dry basis (µg/scm) Q_h = Hourly unadjusted average volumetric flow rate (scfh) B_{ws} = Moisture fraction of the stack gas, expressed as a decimal (equal to %H_2O/100)

Code	Formula	Where:
19-1	$E = K \; x \; C_d \; x \; F_d \; x \; \frac{20.9}{20.9 - \%O_{2_d}}$	The conversion factor "K" is needed to convert Hg concentration (C_d or C_w) from µg/scm to lb/scf. E = Hg emission rate (lb/mmBtu) K = 6.24 x 10^{-11} (lb-scm/ µg/scf) C_d = Hg concentration (µg/scm, dry basis) C_w = Hg concentration (µg/scm, 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_{2d} = Oxygen diluent concentration (percent of effluent gas, dry basis) O_{2w} = Oxygen diluent concentration (percent of effluent gas, wet basis) O_{2def} = Default diluent cap O_2 value (14.0 percent for boilers, 19.0 percent for IGCC units) CO_{2d} = Carbon dioxide diluent concentration (percent of effluent gas, dry basis) CO_{2w} = Carbon dioxide diluent concentration (percent of effluent gas, wet basis)
19-2	$E = K \; x \; C_w \; x \; F_w \; x \; \frac{20.9}{20.9(1 - B_{wa}) - \%O_{2_w}}$	
19-3*	$E = K \; x \; C_w \; x \; F_d \; x \; \frac{20.9}{20.9 \; x \left[\frac{100 - \% H_2O}{100}\right] - \% O_{2_w}}$	
19-3D	$E = K \; x \; C_w \; x \; F_d \; x \; \frac{20.9}{20.9 \; x \left[\frac{100 - \% H_2O}{100}\right] - \% O_{2_{def}} \; x \left[\frac{100 - \% H_2O}{100}\right]}$	
19-4*	$E = K \; x \; \frac{(C_w \; x \; F_d)}{(100 - \% H_2O) \div 100} \; x \; \frac{20.9}{(20.9 - \% O_{2_d})}$	
19-5*	$E = \frac{20.9 \; x \; K \; x \; C_d \; x \; F_d}{20.9 - \left[\% O_{2_w} \div \left(\frac{100 - \% H_2O}{100}\right)\right]}$	
19-5D	$E = K \; x \; C_d \; x \; F_d \; x \; \frac{20.9}{20.9 - \% O_{2_{def}}}$	
19-6	$E = K \; x \; C_d \; x \; F_c \; x \; \frac{100}{\%CO_{2_d}}$	
19-7	$E = K \; x \; C_w \; x \; F_c \; x \; \frac{100}{\%CO_{2_w}}$	
19-8*	$E = K \; x \; \frac{(C_w \; x \; F_c)}{(100 - \% H_2O) \div 100} \; x \; \frac{100}{\%CO_{2_d}}$	
19-9*	$E = K \; x \; C_d \; x \left[\frac{100 - \% H_2O}{100}\right] x \; F_c \; x \; \frac{100}{\% CO_{2_w}}$	

Code	Formula	Where:
A-4	$$E_{ho} = \frac{M_h}{(MW)_h} x\, 10^3$$	E_{ho} = Electrical output based emissions rate (lb/GWh) M_h = Hourly Hg mass emissions rate (lb/hr) $(MW)_h$ = Hourly gross electrical load (megawatts) 10^3 = Conversion factor from MW to GW
HG-1	$$E_f = E\, x\, 10^6$$	E_f = Hg emission rate (lb/TBtu) E = Hg emission rate (lb/mmBtu) 10^6 = Conversion factor (mmBtu/TBtu)

* 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 34: HCL EMISSION RATE FORMULA REFERENCE TABLE FOR THE MATS RULE

Usage	Moisture Basis	Appropriate Hourly Formulas
HCl CEMS	WET	HC-2 and HC-4 for electrical output-based HCl emission limit (lb/MWh)
		19-2, 19-3, 19-4, 19-7, or 19-8 (select one) for heat input-based HCl emission limit (lb/mmBtu)
	DRY	HC-3 and HC-4 for electrical output-based HCl emission limit (lb/MWh)
		19-1, 19-5, 19-6, or 19-9 (select one) for heat input-based HCl emission limit (lb/mmBtu)

TABLE 35: HCL EMISSION FORMULAS FOR THE MATS RULE

Code	Formula	Where:
19-1	$E = K \, x \, C_d \, x \, F_d \, x \, \frac{20.9}{20.9 - \%O_{2_d}}$	The conversion factor "K" is needed to convert HCl concentration (C_d or C_w) from ppm to lb/scf.
19-2	$E = K \, x \, C_w \, x \, F_w \, x \, \frac{20.9}{20.9(1 - B_{wa}) - \%O_{2_w}}$	E = Unadjusted heat input-based SO_2 emission rate (lb/mmBtu) K = 9.43×10^{-8} (lb/scf-ppm)
19-3*	$E = K \, x \, C_w \, x \, F_d \, x \, \frac{20.9}{20.9 \, x \left[\frac{100 - \%H_2O}{100}\right] - \%O_{2_w}}$	C_d = Unadjusted HCl concentration (ppm, dry basis) C_w = Unadjusted HCl concentration (ppm, wet basis)
19-3D	$E = K \, x \, C_w \, x \, F_d \, x \, \frac{20.9}{20.9 \, x \left[\frac{100 - \%H_2O}{100}\right] - \%O_{2_{def}} \, x \left[\frac{100 - \%H_2O}{100}\right]}$	F_d = Dry-basis F-factor (dscf/mmBtu)
19-4*	$E = K \, x \, \frac{(C_w \, x \, F_d)}{(100 - \%H_2O) \div 100} \, x \, \frac{20.9}{(20.9 - \%O_{2_d})}$	F_c = Carbon-based F-factor (scf CO2/mmBtu)
19-5*	$E = \frac{20.9 \, x \, K \, x \, C_d \, x \, F_d}{20.9 - \left[\%O_{2_w} \div \left(\frac{100 - \%H_2O}{100}\right)\right]}$	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
19-5D	$E = K \, x \, C_d \, x \, F_d \, x \, \frac{20.9}{20.9 - \%O_{2_{def}}}$	O_{2d} = Oxygen diluent concentration (percent of effluent gas, dry basis)
19-6	$E = K \, x \, C_d \, x \, F_c \, x \, \frac{100}{\%CO_{2_d}}$	O_{2w} = Oxygen diluent concentration (percent of effluent gas, wet basis)
19-7	$E = K \, x \, C_w \, x \, F_c \, x \, \frac{100}{\%CO_{2_w}}$	O_{2def} = Default diluent cap O_2 value (14.0 percent)
19-8*	$E = K \, x \, \frac{(C_w \, x \, F_c)}{(100 - \%H_2O) \div 100} \, x \, \frac{100}{\%CO_{2_d}}$	CO_{2d} = Carbon dioxide diluent concentration (percent of effluent gas, dry basis)
19-9*	$E = K \, x \, C_d \, x \left[\frac{100 - \%H_2O}{100}\right] x \, F_c \, x \, \frac{100}{\%CO_{2_w}}$	CO_{2w} = Carbon dioxide diluent concentration (percent of effluent gas, wet basis)

Code	Formula	Where:
HC-2	$$M_h = K\,C_h\,Q_h$$	M_h = Hourly HCl mass emission rate (lb/hr) K = 9.43×10^{-8} (lb/scf-ppm) C_h = Unadjusted hourly average HCl concentration, dry basis (ppm) Q_h = Unadjusted hourly average volumetric flow rate (scfh) B_{ws} = Moisture fraction of the stack gas, expressed as a decimal (equal to $\%H_2O/100$)
HC-3	$$M_h = K\,C_h\,Q_h\,(1 - B_{ws})$$	
HC-4	$$E_{ho} = \frac{M_h}{(MW)_h}$$	E_{ho} = Unadjusted electrical output-based HCl emission rate (lb/MWh) M_h = Hourly HCl mass emission rate (lb/hr) $(MW)_h$ = Hourly gross electrical load (megawatts)

TABLE 36: HF EMISSION RATE FORMULA REFERENCE TABLE FOR THE MATS RULE

Usage	Moisture Basis	Appropriate Hourly Formulas
HF CEMS	WET	HF-2 and HF-4 for electrical output-based HF emission limit (lb/MWh)
		19-2, 19-3, 19-4, 19-7, or 19-8 (select one) for heat input-based HF emission limit (lb/mmBtu)
	DRY	HF-3 and HF-4 for electrical output-based HF emission limit (lb/MWh)
		19-1, 19-5, 19-6, or 19-9 (select one) for heat input-based HF emission limit (lb/mmBtu)

TABLE 37: HF EMISSION FORMULAS FOR THE MATS RULE

Code	Formula
19-1	$E = K \, x \, C_d \, x \, F_d \, x \dfrac{20.9}{20.9 - \%O_{2_d}}$
19-2	$E = K \, x \, C_w \, x \, F_w \, x \dfrac{20.9}{20.9(1 - B_{wa}) - \%O_{2_w}}$
19-3*	$E = K \, x \, C_w \, x \, F_d \, x \dfrac{20.9}{20.9 \, x \left[\dfrac{100 - \% \, H_2O}{100}\right] - \% \, O_{2_w}}$
19-3D	$E = K \, x \, C_w \, x \, F_d \, x \dfrac{20.9}{20.9 \, x \left[\dfrac{100 - \%H_2O}{100}\right] - \%O_{2_{def}} \, x \left[\dfrac{100 - \%H_2O}{100}\right]}$
19-4*	$E = K \, x \dfrac{(C_w \, x \, F_d)}{(100 - \% \, H_2O) \div 100} \, x \dfrac{20.9}{(20.9 - \% \, O_{2_d})}$
19-5*	$E = \dfrac{20.9 \, x \, K \, x \, C_d \, x \, F_d}{20.9 - \left[\% \, O_{2_w} \div \left(\dfrac{100 - \% \, H_2O}{100}\right)\right]}$
19-5D	$E = K \, x \, C_d \, x \, F_d \, x \dfrac{20.9}{20.9 - \% \, O_{2_{def}}}$
19-6	$E = K \, x \, C_d \, x \, F_c \, x \dfrac{100}{\%CO_{2_d}}$
19-7	$E = K \, x \, C_w \, x \, F_c \, x \dfrac{100}{\%CO_{2_w}}$
19-8*	$E = K \, x \dfrac{(C_w \, x \, F_c)}{(100 - \% H_2O) \div 100} \, x \dfrac{100}{\%CO_{2_d}}$
19-9*	$E = K \, x \, C_d \, x \left[\dfrac{100 - \% \, H_2O}{100}\right] x \, F_c \, x \dfrac{100}{\% \, CO_{2_w}}$

Where:

The conversion factor "K" is needed to convert HF concentration (C_d or C_w) from ppm to lb/scf.

E	=	Unadjusted heat input-based HF emission rate (lb/mmBtu)
K	=	5.18×10^{-8} (lb/scf-ppm)
C_d	=	Unadjusted HF concentration (ppm, dry basis)
C_w	=	Unadjusted HF concentration (ppm, wet basis)
F_d	=	Dry-basis F-factor (dscf/mmBtu)
F_c	=	Carbon-based F-factor (scf CO2/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_{2d}	=	Oxygen diluent concentration (percent of effluent gas, dry basis)
O_{2w}	=	Oxygen diluent concentration (percent of effluent gas, wet basis)
O_{2def}	=	Default diluent cap O_2 value (14.0 percent)
CO_{2d}	=	Carbon dioxide diluent concentration (percent of effluent gas, dry basis)
CO_{2w}	=	Carbon dioxide diluent concentration (percent of effluent gas, wet basis)

Code	Formula	Where:
HF-2	$$M_h = K\,C_h\,Q_h$$	M_h = Hourly HF mass emission rate (lb/hr) K = 5.18 x 10^{-8} (lb/scf-ppm) C_h = Unadjusted hourly average HF concentration, dry basis (ppm) Q_h = Unadjusted hourly average volumetric flow rate (scfh) B_{ws} = Moisture fraction of the stack gas, expressed as a decimal (equal to $\%H_2O/100$)
HF-3	$$M_h = K\,C_h\,Q_h\,(1 - B_{ws})$$	
HF-4	$$E_{ho} = \frac{M_h}{(MW)_h}$$	E_{ho} = Unadjusted electrical output-based HF emission rate (lb/MWh) M_h = Hourly HF mass emission rate (lb/hr) $(MW)_h$ = Hourly gross electrical load (megawatts)

TABLE 38: MOISTURE FORMULAS

Code	Parameter	Formula	Where:
F-31	H2O	$$\%H_2O = \frac{(O_{2_d} - O_{2_w})}{O_{2_d}} x\,100$$	$\%H_2O$ = 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 39: 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 40: CO_2 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 x 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)
F-11	CO2	$E_h = K \times C_h \times Q_h$	E_h = Hourly CO_2 mass emission rate (tons/hr) K = 5.7x10^{-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)

Code	Parameter	Formula	Where:
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)
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)

Code	Parameter	Formula	Where:
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 68EF 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
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 41: 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

* For sample acquisition method (SAM) codes IS, ISP, ISC, DIN, DOU, DIL, and WXT = wet extractive; for EXT = dry extractive, locate under the component. Exceptions are possible.

TABLE 42: HEAT INPUT FORMULAS

Code	Parameter	Formula	Where:
D-15A	HI	$HI_{rate-hr} = \frac{\sum_{all-fuels} HI_{rate-i}\, t_i}{t_u}$	$HI_{rate-hr}$ = Heat input rate from all fuels combusted during the hour (mmBtu/hr) HI_{rate-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	$HI = Q_w \ x \ \frac{1}{F_c} \ x \ \frac{\%CO_{2w}}{100}$	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	$HI = Q_h \ x \left[\frac{100 - \%H_2O}{100 F_c}\right]\left[\frac{\%CO_{2d}}{100}\right]$	
F-17	HI	$HI = Q_w \ x \ \frac{1}{F} \ x \ \frac{[(20.9/100)(100 - \%H_2O) - \%O_{2w}]}{20.9}$	
F-18	HI	$HI = Q_w \ x \left[\frac{(100 - \%H_2O)}{100F}\right]\left[\frac{(20.9 - \%O_{2d})}{20.9}\right]$	
D-3	OILM	$OIL_{rate} = V_{oil-rate} \ x \ D_{oil}$	OIL_{rate} = Mass rate of oil consumed per hr (lb/hr) $V_{oil-rate}$ = 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	$HI_{rate-oil} = OIL_{rate} \ x \ \frac{GCV_{oil}}{10^6}$	$HI_{rate-oil}$ = 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	$HI_o = M_o \, x \, \dfrac{GCV_o}{10^6}$	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	$HI_{rate\text{-}gas} = \dfrac{GAS_{rate} \, x \, GCV_{gas}}{10^6}$	$HI_{rate\text{-}gas}$, 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	$HI_g = \dfrac{(Q_g \, x \, GCV_g)}{10^6}$	

** For units required to monitor NO_x mass emissions but not 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 43: APPORTIONMENT AND SUMMATION FORMULAS

Code	Parameter	Formula	Where:
F-21A	HI	$HI_i = HI_{CS} \left(\dfrac{t_{CS}}{t_i} \right) \left[\dfrac{MW_i \, t_i}{\sum_{i=1}^{n} MW_i \, t_i} \right]$	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	$HI_i = HI_{CS} \left(\dfrac{t_{CS}}{t_i} \right) \left[\dfrac{SF_i \, t_i}{\sum_{i=1}^{n} SF_i \, t_i} \right]$	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 44: NOX MASS EMISSIONS FORMULAS (LBS/HR)

<table>
<tr><th>Code</th><th>Parameter</th><th>Formula</th><th>Where:</th></tr>
<tr><td>F-24A</td><td>NOX</td><td>$E_{(NOx)h} = ER_{(NOx)h} \ x \ HI_h$</td><td rowspan="3">$E_{(NOx)h}$ = Hourly NO_x mass emissions rate in lb/hr
K = 1.194 x 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)</td></tr>
<tr><td>F-26A</td><td>NOX</td><td>$E_{(NOx)h} = K \times C_{hw} \times Q_h$</td></tr>
<tr><td>F-26B</td><td>NOX</td><td>$E_{(NOx)h} = K \ x \ C_{h_d} \ x \ Q_h \ x \ \frac{(100 - \% H_2O)}{100}$</td></tr>
</table>

TABLE 45: 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)

Code	Parameter	Description
SS-3B	HI	Hourly heat input rate for a particular affected unit in a subtractive stack configuration (mmBtu/hr)
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 46: REPRESENTATIONS FOR ELECTRONIC REPORTING OF FORMULAS

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 x 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 MONITORING DEFAULT DATA

TABLE 47: 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 48: ROUNDING RULES FOR DEFAULT VALUES

	Round to 0 Decimal Places	Round to 1 Decimal Places	Round to 2 Decimal Places	Round to 3 Decimal Places	Round to 4 Decimal Places	Round to Nearest 1000
Parameter Codes		CO2N, CO2X, H2O, H2ON, H2OX, MHHI, MNGF, MNHI, MNOF, NOCX, O2X, O2N, SO2X		BWA, CO2R, MNNX, NORX, NOXR	SO2R	FLOX

TABLE 49: 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 50: 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 51: 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 52: 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 53: CO2 EMISSION FACTORS (TON/MMBTU) FOR LOW MASS EMISSIONS UNITS

Fuel Type	CO_2 Emission Factors
Natural Gas	0.059
Oil	0.081

TABLE 54: 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 55: 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 56: MONITORING DEFAULT 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
	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

Monitoring Plan XML File Codes

Type	Code	Description
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)
	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)

Type	Code	Description
	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
	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

Type	Code	Description
	W	Wood
	WL	Waste Liquid

TABLE 57: MONITORING DEFAULT 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 58: 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)).

13.0 Monitoring Span Data

Table 59: Component Type Codes and Descriptions for Monitor Span

Code	Description
CO2	CO_2 Concentration (percent)
FLOW	Stack Flow
HCL	HCl Concentration (ppm)
HF	HF Concentration (ppm)
HG	Hg concentration (µg/scm)
NOX	NO_x Concentration (ppm)
O2	O_2 Concentration (percent)
SO2	SO_2 Concentration (ppm)

Table 60: 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 Value or Other Default Value from Part 75 or from 40 CFR Part 63, Subpart UUUUU, Appendix A
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
FS	Fuel Sampling and Analysis (for Hg MPC)

TABLE 61: CRITERIA FOR MAXIMUM POTENTIAL CONCENTRATIONS (MPC)/ MAXIMUM EXPECTED CONCENTRATION (MEC)/ MAXIMUM POTENTIAL FLOW RATE (MPF) DETERMINATIONS

Component Type	Scale	Method Used to Determine MPC/MEC/MPF	Selection Criteria	Method Code
NOX	High	800 or 1600 ppm, as applicable	For coal-fired units	TB
		400 ppm	For oil- or gas-fired units	TB
		2000 ppm	Cement kilns	TB
		500 ppm	Process heaters burning oil	TB
		200 ppm	Process heaters burning only gaseous fuels	TB
		Historical CEM data	For initial determination or for changes in MPC as described in Section 2.1.2.5 of Appendix A	HD
		Other constant values from Appendix A, Tables 2-1 and 2-2	If historical data not available by boiler type and fuel	TB
		Test results	If historical data not available	TR
		Other, including other state/federal requirements	As justified	OL
		Manufacturer=s estimate of uncontrolled emissions	For initial MPC determination, principally for new units	ME
	Low	Equation A-2	For units with emission controls	F
		Historical CEM data	For initial determination or for changes in MEC as described in Sections 2.1.2.2(c) and 2.1.2.5 of Appendix A	HD
		Other, including other state/federal requirements	As justified	OL
		Test results	If available	TR
		Permit limit	For initial MEC determination, principally for new units	PL
HG	High	Fuel-Specific Default MPC Values from 40 CFR Part 63, Subpart UUUUU, Appendix A	10 µg/scm Bituminous coal 10 µg/scm Sub-bituminous coal 16 µg/scm Lignite 10 µg/scm Waste coal	TB
		Site-Specific Emission Testing	Use the highest observed test results	TR
		Fuel Sampling and Analysis	Use the average weight percent of Hg from 3 samples, together with maximum fuel feed rate, fuel GCV, appropriate F-factor, etc.	FS
FLOW	N/A	Equation A-3a and Equation of Continuity*	Based on %CO_2	F

Component Type	Scale	Method Used to Determine MPC/MEC/MPF	Selection Criteria	Method Code
		Equation A-3b and Equation of Continuity*	Based on $\%O_2$	F
		Historical data	For changes in MPF, as described in Section 2.1.4.3 of Appendix A	HD
		Test results	If available	TR
SO2	High	Equation A-1a	Based on $\%CO_2$	F
		Equation A-1b	Based on $\%O_2$	F
		Historical CEM data	For initial determination or for changes in MPC as described in Section 2.1.1.5 of Appendix A	HD
		Test results	If available	TR
		Other, including other state/federal requirements	As justified	OL
	Low	Equation A-2	For units with emission controls	F
		Historical CEM data	For initial determination or for changes in MEC as described in Section 2.1.1.5 of Appendix A	HD
		# 200 ppm (span value)	For units burning only very low sulfur fuel (as defined in §72.2)	GS
		Other, including other state/federal requirements	As justified	OL

* The maximum potential flow rate (MPF) is calculated using the Equation of Continuity: MPF = 60 x MPV x A_s. In this equation, MPV is the maximum potential velocity (from Equation A-3a or A-3b or from test results), in units of wet, standard feet per minute, and A_s is the cross-sectional area of the stack at the flow monitor location.

TABLE 62: 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
AFSEC	Actual Feet of Stack Flow per Second
AMSEC	Actual Meters 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

Code	Description
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
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

14. Rectangular Duct WAF Data

Table 63: WAF Method Codes 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)

15. Monitoring Load Data

Table 64: 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.

16.0 MONITORING QUALIFICATION DATA

TABLE 65: QUALIFICATION TYPE CODES AND DESCRIPTIONS

Category	Code	Description
Low-emitting EGU (LEE)— Hg or HCl	LEE	LEE qualification
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)
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

17.0 MONITORING QUALIFICATION LME DATA

TABLE 66: DATA REQUIREMENTS FOR MONITORING QUAL LME

		Linked to MONITORING QUALIFICATION DATA Record with QualificationTypeCode:			
		LMEA		LMES	
Reporting Frequency	**Program Applicability**	**SO_2 Tons**	**NO_x Tons**	**SO_2 Tons**	**NO_x Tons**
Annual	Subject to Acid Rain Program (or CAIRSO2 plus CAIRNOX), but not subject to Ozone Season NO_x program	✓	✓	Do not report LMES record	
	Subject to Acid Rain Program (or CAIRSO2 plus CAIRNOX), and also subject to Ozone Season NO_x program	✓	✓	--	✓
	Subject to CAIRSO2, but not subject to any NO_x program	✓	--	Do not report LMES record	
	Subject to Ozone Season NO_x program and reporting year-round, but not subject to CAIRSO2	--	✓	--	✓
	Subject to CAIRNOX, but not subject to CAIRSO2 or Ozone Season NO_x program	--	✓	Do not report LMES record	
Ozone Season Only	Subject to Ozone Season NO_x program and reporting during Ozone Season only	Do not report LMEA record		--	✓

18.0 MONITORING QUALIFICATION PERCENT DATA

TABLE 67: QUALIFICATION DATA TYPE CODES 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)