STATE OF MONTANA AIR QUALITY CONTROL IMPLEMENTATION PLAN	Subject: Yellowstone County Air Pollution Control Program

56.9.4.5 EXHIBIT A - EMISSION LIMITATIONS AND OTHER CONDITIONS - MONTANA SULPHUR & CHEMICAL COMPANY, BILLINGS, MONTANA

EXHIBIT A

EMISSION LIMITATIONS AND CONDITIONS

Montana Sulphur & Chemical Company
Billings, Montana

SECTION 1. AFFECTED FACILITIES

(A) Plant Location:

Montana Sulphur is located near the Exxon Refinery complex and is about three miles northeast of Billings. The plant is located in Yellowstone County, Township 1 North, Range 26 East, Section 24 and contiguous sections.

(B) Affected Equipment and Facilities:

(1) SRU 100 meter stack
(2) Railroad Boiler stack, H-1 unit stack, H1-A unit stack, H1-1 unit stack, H1-2 unit stack
(3) SRU 30 meter stack (old SRU stack)

SECTION 2. DEFINITIONS

(A) The following definitions apply throughout this Exhibit A.

(1) "Annual Emissions" means the amount of sulfur dioxide (SO_2) emitted in a calendar year, expressed in pounds per year rounded to the nearest pound.

Where:

[Annual Emissions] = Σ [Daily Emissions]

(2) "Attachment #1" means the "Performance Specifications for Stack Flow Rate Monitors", attached to this Exhibit and incorporated herein by reference.

(3) "Buoyancy Flux" means a stack plume rise parameter defined by the following equation:

$$F = \frac{2.45\ VD^2\ (T_s - T)}{T_s}$$

Where:

F = Buoyancy Flux in m^4/sec^3;
V = stack gas exit velocity in meters per second at actual conditions obtained from either the primary (CEMS) or backup temperature and flowrate monitoring system;
D = inside stack-top diameter in meters (1.07 meters);
T_s = stack gas temperature in degrees Kelvin obtained from either the primary (CEMS) or backup temperature and flowrate monitoring system; and
T = ambient air temperature in degrees Kelvin.

The ambient air temperature used in all Buoyancy Flux calculations required by this control plan shall be 8.0°C (281.2°K), the Billings annual average ambient temperature.

Whenever the CEMS-derived stack parameters "V" and/or "T_S" are unavailable to determine a Buoyancy Flux "F", a substituted Hourly Buoyancy Flux shall be used. The substituted Hourly Buoyancy Flux shall be determined from data derived from the backup temperature and flowrate monitoring system required by Section 6(B)(3) which:

(a) by itself meets the specifications, operating requirements, and quality assurance and control requirements of Section 6 and Section 2(A)(8) and is designed to achieve a temporal sampling resolution of at least one temperature and flowrate measurement per minute; or

(b) in combination with the primary CEMS meets the specifications, operating requirements, and quality assurance and control requirements of Section 6 and Section 2(A)(6 and 8).

The backup temperature and flowrate monitoring system equipment is only required to operate when the primary temperature and flowrate monitoring system equipment (those components of the CEMS required by Section 6(B)(2)) has failed and is determined to be unable to obtain and record Hourly Average temperature and flowrate data.

In the absence of such data a substitute Hourly Buoyancy Flux "F" shall be the average "F" determined for a period immediately prior to the loss of the stack parameters "V" and/or "T_S" that is equal in length to the time period over which stack parameters "V" and/or "T_S" are unavailable. That time period, called the "look-back" period, is measured in increments of Calendar Days.

Specifically, the substituted Hourly Buoyancy Flux "F" shall be the hourly average Buoyancy Flux "F" determined for the applicable "look-back" period. The applicable "look-back" period is a period, measured in Calendar Day increments, which is equal to the number of consecutive

Calendar Days during which one or more hours of the stack parameters "V" and/or"Ts" are unavailable. The applicable "look-back" period begins with the Calendar Day immediately preceding the Calendar Day in which the stack parameters "V"and/or "T_S" first became unavailable and continues backward in time for the number of Calendar Days equal to the number of Calendar Days during which one or more hours of the stack parameters "V"and/or "T_S" are unavailable.

For example, if stack parameters "V"and/or "T_S" are unavailable for a period beginning at 10:59 p.m. on January 3rd and ending at 1:01 a.m. January 5th, the applicable look-back periods would be:

- for the 24th hour of Calendar Day January 3rd, the look-back period would be one Calendar Day - in this case January 2nd;
- for each hour of Calendar Day January 4th, the look-back period would be two Calendar Days - in this case January 1st and January 2nd;
- for the 1st hour of Calendar Day, January 5th, the look-back period would be three Calendar Days - in this case December 31st, January 1st and January 2nd.

Substituted values for Buoyancy Flux may not be used to satisfy Montana Sulphur's Quarterly Data Recovery Rate unless the data is derived from the backup temperature and flowrate monitoring system required by Section 6(B)(3) or by backup equipment that by itself or in combination with the primary CEMS meets the specifications, operating requirements, and quality assurance and control requirements of Section 6 and Section 2(A)(6 and 8).

The Buoyancy Flux for any three hour period, "F_3", shall be determined by averaging the Hourly Buoyancy Fluxes for the three hour period.

$$F_3 = \frac{\Sigma \text{ Hourly Buoyancy Fluxes (F) for the Three Hour Period}}{3}$$

When an Hourly Buoyancy Flux value is unavailable due to failure of both the primary (CEMS) and backup temperature and flowrate monitoring systems, Montana Sulphur shall use the substitution procedure for "F" defined above.

(4) "Calendar Day" means a 24-hour period starting at 12:00 midnight and ending at 12:00 midnight, 24 hours later.

(5) "Clock Hour" means one twenty-fourth (1/24) of a Calendar Day and refers to any of the standard

60-minute periods in a day which are generally identified and separated on a clock by the whole numbers one through twelve.

(6) "Continuous Emission Monitoring System (CEMS)" means all equipment necessary to obtain an Hourly SO_2 Emission Rate, provided each SO_2 concentration and stack gas volumetric flow rate monitor is designed to achieve a temporal sampling resolution of at least one concentration or flow rate measurement per minute. Such equipment includes:

(a) a continuous emission monitor (CEM) which determines SO_2 concentrations in a stack gas, a continuous stack gas volumetric flow rate monitor which determines stack gas flow rate, and associated data acquisition equipment.

(7) "Daily Emissions" means the amount of SO_2 emitted in a Calendar Day, expressed in pounds per day rounded to the nearest pound.

Where:

[Daily Emissions] = Σ [Three Hour Emissions]

Each Calendar Day is comprised of eight non-overlapping 3-hour periods. The Three Hour Emissions from all of the 3-hour periods in a Calendar Day shall be used to determine that day's emissions.

(8) "Hourly Average" means an arithmetic average of all Valid and complete 15-minute data blocks in a Clock Hour. Four (4) Valid and complete 15-minute data blocks are required to determine an Hourly Average for each monitor and source per Clock Hour.

Exclusive of the above definition, an Hourly Average may be determined with two (2) Valid and complete 15-minute data blocks, for two of the 24 hours in any Calendar Day.

A complete 15-minute data block for each sulfur dioxide continuous emission monitor, stack gas temperature monitor, and stack gas flow rate monitor shall have a minimum of one (1) data point value; however, each monitor shall be operated such that all Valid data points acquired in any 15-minute block shall be used to determine that 15-minute block's reported concentration and flow rate.

(9) "Hourly SO_2 Emission Rate" means the pounds per Clock Hour of sulfur dioxide emissions from a stack determined using Hourly Averages and rounded to the nearest one tenth of a pound.

(a) For stack systems, SO_2 concentrations shall be measured in parts per million (PPM) on either a wet or dry basis.

(i) If the SO_2 concentration is measured on a wet basis, Montana Sulphur shall calculate the Hourly SO_2 Emission Rate using the following equation:

$$E_H = K * C_H * Q_H$$

Where:

E_H = Hourly SO_2 Emission Rate in pounds per hour and rounded to the nearest tenth of a pound;
K = 1.663×10^{-7} in (pounds/SCF)/PPM;
C_H = Hourly Average SO_2 concentration in PPM; and
Q_H = stack gas Hourly Average volumetric flow rate, measured on an actual wet basis, converted to Standard Conditions, and reported in standard cubic feet per hour (SCFH).

(ii) If the SO_2 concentration is measured on a dry basis, Montana Sulphur shall either install, operate, and maintain a continuous moisture monitor for measuring and recording the moisture content of the stack gases or determine the moisture content of the stack gases continuously (or on an hourly basis) and correct the measured hourly volumetric stack gas flow rates for moisture. Montana Sulphur shall calculate the Hourly SO_2 Emission Rate using the following equation:

$$E_H = K * C_H * Q_H * \frac{(100 - \%H_2O)}{100}$$

Where:
E_H = Hourly SO_2 Emission Rate in pounds per hour and rounded to the nearest tenth of a pound;
K = 1.663×10^{-7} in (pounds/SCF)/PPM;
C_H = Hourly Average SO_2 concentration in PPM (dry basis);
Q_H = stack gas Hourly Average volumetric flow rate, measured on an actual wet basis, converted to Standard Conditions, and reported in standard cubic feet per hour (SCFH); and
$\%H_2O$= Hourly Average stack gas moisture content, in percent by volume.

(10) "Operating" means whenever an affected facility is starting up, shutting down, using fuel, or processing materials and SO_2 emissions are expected from the source or stack, except that for the SRU starting up and shutting down shall only include time periods when sulfur-bearing gases are being delivered to the

SRU.

(11) "Quarterly Data Recovery Rate" means the percentage of hours in a calendar quarter when CEMS derived Hourly SO_2 Emission Rate data are available for a source (stack) in comparison to the number of corresponding Operating hours for that source.

The Quarterly Data Recovery Rate (QDRR) for a source shall be calculated in accordance with the following equation:

$$QDRR = \frac{VH}{OH} * 100\%$$

Where:

VH = number of hours of Hourly SO_2 Emission Rate data that are also source Operating hours in a calendar quarter;
OH = total number of source Operating hours in a calendar quarter; and
QDRR = Quarterly Data Recovery Rate.

(12) "Standard Conditions" means 20.0°C (527.7°R, 68.0°F, or 293.2°K) and 1 atmosphere pressure (29.92" Hg).

(13) "Three Hour Emissions" means the amount of SO_2 emitted in each of the eight non-overlapping three hour periods in a Calendar Day, expressed in pounds and rounded to the nearest pound.

Where:

[Three Hour Emissions] = Σ [Hourly SO_2 Emission Rates]

Whenever Hourly SO_2 Emission Rates are unavailable and the facility is not Operating, zero pounds per hour shall be substituted for the missing Hourly SO_2 Emission Rates.

(14) "Valid" means data that is obtained from a monitor or meter serving as a component of a CEMS which meets the applicable specifications, operating requirements, and quality assurance and control requirements of Section 6.

SECTION 3. EMISSION LIMITATIONS

~~(A) Emission Limitations~~

(1) SRU 100 meter Stack

(a) The following SO_2 emission limitations shall apply to the SRU 100 meter stack except when SO_2 emissions from the Railroad Boiler, the H-1 Unit, the H1-A Unit, the H1-1 Unit or the H1-2 Unit are exhausting through the SRU 30 meter stack:

(i) the Three Hour Emission Limitation (E_L) for SO_2 from the SRU 100 meter stack is dependent upon, and varies in accordance with, the Three Hour Average Buoyancy Flux (F_3) of the exhaust gas that is emitted from the SRU 100 meter stack.

(ii) Three Hour Emissions of SO_2 in pounds of SO_2 per three hours from the SRU 100 meter stack shall not exceed the value of the Three Hour Emission Limitation, E_L, as determined by the following equations:

For $F_3 < 20.58\ m^4/s^3$
$E_L = 0.2665*(F_3)^3 - 8.6096*(F_3)^2 + 138.100*F_3 + 2694.86$

For $20.58 \leq F_3 \leq 129.8\ m^4/s^3$
$E_L = 0.0019*(F_3)^3 - 0.5168*(F_3)^2 + 86.327*F_3 + 2639.10$

For $F_3 > 129.8\ m^4/s^3$
$E_L = 9291.86$

Where:

F_3 = Three Hour Average Buoyancy Flux in m^4/sec^3; and
E_L = Three Hour Emission Limitation for SO_2 in pounds of SO_2 per three hours.

(iii) Daily Emissions of SO_2 from the SRU 100 meter stack shall not exceed the sum of all of the Three Hour Emission Limitations, ΣE_L, for the eight non-overlapping three hour periods in a Calendar Day.

(iv) Annual Emissions of SO_2 from the SRU 100 meter stack shall not exceed 9,088,000 pounds per calendar year.

(b) The following SO_2 emission limitations shall apply to the SRU 100 meter stack whenever SO_2 emissions from either the Railroad Boiler, the H-1 Unit, the H1-A Unit, the H1-1 Unit, or the H1-2 Unit are exhausting through the SRU 30 meter stack:

(i) Three Hour Emissions of SO_2 from the SRU 100 meter stack shall not exceed 3,577.4 pounds per three hour period.

(ii) Daily Emissions of SO_2 from the SRU 100 meter stack shall not exceed 28,618.9 pounds per Calendar Day.

(iii) Annual Emissions of SO_2 from the SRU 100 meter stack shall not exceed 9,088,000 pounds per calendar year.

(2) SRU 30 meter Stack;

(a) Three Hour Emissions of SO_2 from the SRU 30 meter stack shall not exceed 12.0 pounds per three hour period.

(b) Daily Emissions of SO_2 from the SRU 30 meter stack shall not exceed 96.0 pounds per Calendar Day.

(c) Annual Emissions of SO_2 from the SRU 30 meter stack shall not exceed 35,040 pounds per calendar year.

(d) Montana Sulphur shall burn only low sulfur fuel gas or natural gas in any unit being exhausted through the SRU 30 meter stack. Except as provided in (e) below, the following units are the only SO_2 emitting units that are allowed to be exhausted through the 30-meter stack:

(i) the Railroad Boiler,
(ii) the H-1 Unit,
(iii) the H1-A Unit,
(iv) the H1-1 Unit, and
(v) the H1-2 Unit.

(e) Montana Sulphur may vent other units through the 30-meter stack if such venting is the result of a "like-kind" replacement for any unit listed in (i) through (v) above or otherwise simply replaces fuel-burning potential for such listed units. Montana Sulphur may also vent other units through the 30-meter stack provided that:

(i) Montana Sulphur first obtains an air quality permit from the Department for the additional unit or obtains the Department's concurrence that no permit is required, and the additional unit is a combustion source that is fired exclusively on pipeline quality natural gas or LP gas or their equivalents in pounds of sulfur per BTU, or

(ii) the SO_2 emissions from the 30-meter stack are being monitored by parametric methods approved by the Department and EPA or a CEMS that meets the requirements of Section 6.

~~(3) If, for any 3-hour period during the course of a Calendar Day, the conditions for Section 3(A)(1)(a) and Section 3(A)(1)(b) both apply, then the resulting three hour emission limitation for the SRU 100 meter stack shall be determined by prorating, on an hourly basis, the emission limits contained in Section 3(A)(1)(a and b).~~

~~(4) The combined SO_2 emissions from the auxiliary vent stacks associated with the Railroad Boiler, the H-1 Unit, the H1-A unit, the H1-1 unit, and the H1-2 unit shall be limited to 12 lbs/3-hour period.~~

(5) Other Minor Sources;

Montana Sulphur shall utilize appropriate maintenance, repair, and operating practices to control emissions of sulfur bearing gases from minor sources such as ducts, stacks, valves, vents, vessels, and flanges which are not otherwise subject to this Exhibit A.

(B) Facility Modifications

(1) By March 4, 1998, Montana Sulphur shall provide additional ducting to allow direct merging of fuel combustion exhaust gases from the Railroad Boiler, the H-1 Unit, the H1-A unit, the H1-1 unit, and the H1-2 unit to the emissions stream flowing through the SRU 100 meter stack.

(2) Montana Sulphur may design and implement connections to allow the diversion of fuel combustion exhaust gases from the Railroad Boiler, the H-1 Unit, the H1-A unit, the H1-1 unit, and/or the H1-2 unit to the SRU 30 meter stack.

(3) By March 4, 1998, Montana Sulphur shall vent emissions from the Railroad Boiler, the H-1 unit, the H1-A unit, the H1-1 unit, and the H1-2 unit from either the individual vents associated with each of those emission units, the SRU 30 meter stack, or the SRU 100 meter stack, except as provided for in Section 3(A)(5).

(4) MSCC may relocate the west flare to the SRU 100 meter stack support cylinder or raise it to 65.0 meters and/or raise the east flare to 65.0 meters without requirements for further dispersion modeling during the permit process.

(5) Montana Sulphur may install and operate emission limiting equipment (ELE) at their Lockwood Facility. Installation and operation of ELE is subject to any applicable permit requirements, except that as part of the permit application process additional dispersion modeling will not be necessary for

demonstrating compliance with the National Ambient Air Quality Standards for sulfur dioxide, if the emissions from these units are vented to the SRU 100 meter stack and construction of the ELE commences by August 9, 1998. Nothing herein shall be construed to require or waive additional dispersion modeling or prohibit the installation or operation of ELE upon which construction begins after August 9, 1998. Such construction or operation is to be governed by then-existing requirements as they may be applicable to the specific project. For the purposes of this document, "Emission Limiting Equipment" means one or more of the following facilities or modifications installed and operated for the purpose of reducing emissions:

(a) Catalytic Equipment which may consist of additional Claus Reactor equipment, CBA/Sub-dewpoint Reactor equipment, or SuperClaus(TM) equipment; or

(b) alkali Wet-Scrubbing Equipment with or without sulfur dioxide/hydrogen sulfide (SO_2/H_2S) regeneration (e.g.-ATS/ABS systems).

SECTION 4. COMPLIANCE DETERMINATIONS

(A) Compliance with the emission limitations for the SRU 100 meter stack shall be determined using data from the CEMS required by Section 6(B)(1 and 2) and in accordance with the appropriate equation(s) in Section 2(A)(1), (3), (7), (9), and (13) except when CEMS data is not available and as provided in Section 2(A)(3) and (13). Although the CEMS data is the method of demonstrating compliance on a continuous basis, the data from the testing required by Sections 5(A) or Sections 6(C and D) shall also be used to demonstrate compliance.

(B) Compliance with the Quarterly Data Recovery Rate requirements.

(1) Compliance with the Quarterly Data Recovery Rate requirements contained in Section 6(A)(2) shall be determined in accordance with Section 2(A)(11), with no exceptions for out-of-specification data or monitor downtime, except as provided in Section 6(A)(2).

(2) For quarters in which Operating hours are reduced (short quarters), a determination of whether Montana Sulphur has violated the Quarterly Data Recovery Rate (QDRR) requirements in Section 6(A)(2)(b) shall include consideration of whether the reduced Operating hours made compliance with Section 6(A)(2)(b) unreasonable.

(3) Upon determination that the CEMS is not functioning properly, Montana Sulphur shall implement short term corrective measures, and if necessary, long term corrective measures to accomplish, as expeditiously as practicable, either:

(a) correction of the failure; or

(b) development, installation (if necessary), testing, maintenance, and operation of a new CEMS or appropriate replacement portions of the affected CEMS.

SECTION 5. EMISSION TESTING

(A) In order to accurately determine the sulfur dioxide emission rates in pounds per hour for the SRU 100 meter stack, Montana Sulphur shall perform annual source testing using EPA approved methods (40 CFR Part 60, Appendix A, Methods 1-4 and 6/6C as appropriate for this Exhibit A) or an equivalent method approved by the Department and EPA, and in accordance with the Montana Source Testing Protocol (ARM 17.8.106). The annual Relative Accuracy Test Audits (RATAs) required by Sections 6(C and D) may substitute for the annual source tests provided that the flow rate RATA and the concentration RATA are performed simultaneously and additional calculations are made to determine and report the data in pounds per hour of sulfur dioxide.

(B) Montana Sulphur shall notify the Department in writing of each annual source test a minimum of 25 working days prior to the actual testing (unless otherwise specified by the Department).

SECTION 6. CONTINUOUS MONITORING

(A) CEM Quarterly Data Recovery Rates

(1) "Unusual Circumstances" means circumstances which are unforeseeable, beyond Montana Sulphur's control, and which could not reasonably have been prevented or mitigated by Montana Sulphur. Such circumstances may include but are not limited to earthquakes, power outages, or fire; but do not include failures of any monitoring or metering equipment or associated data acquisition equipment unless such failures meet the following conditions:

(a) prior to the failure, the equipment was installed, operated, and maintained in accordance with the requirements of Section 6;

(b) upon failure, Montana Sulphur initiates the short term corrective measures and, if necessary, the long term corrective measures required by Section 4(B);

(c) within two working days of occurrence, Montana Sulphur notifies the Department's Permitting and Compliance Division by telephone of the occurrence of Unusual Circumstances, as defined herein; and

(d) Montana Sulphur demonstrates, by utilizing properly signed contemporaneous CEMS operating logs and other relevant evidence, in the first quarterly report following the failure that the failure meets the above conditions.

(2) Quarterly Data Recovery Rates

(a) Notwithstanding the QDRR requirements specified in Section 6(A)(2)(b), whenever a source or stack is Operating Montana Sulphur shall use best efforts to operate the associated CEMS in a manner to achieve the highest Quarterly Data Recovery Rate (QDRR) that is technically feasible.

(b) At a minimum, Montana Sulphur shall achieve the following QDRR requirements, unless prevented by Unusual Circumstances or by reduced Operating hours as provided in Section 4(B)(2):

(i) for the SRU 100 meter stack CEMS, Montana Sulphur shall achieve a QDRR of equal to or greater than 90%. Valid data obtained from backup temperature and flow rate monitoring system equipment in combination with data from the primary sulfur dioxide continuous monitor shall count towards meeting this requirement.

(c) In its evaluation of whether Montana Sulphur used best efforts to achieve the highest QDRR technically feasible, the Department will consider:

(i) the design capabilities of the CEMS; and whether:

(ii) Montana Sulphur has properly operated and maintained the CEMS, including the maintenance of an adequate spare parts inventory;

(iii) Montana Sulphur has complied with the quality assurance requirements described in Section 6;

(iv) Montana Sulphur has taken timely and appropriate action to correct a failure in the CEMS; and

(v) Unusual Circumstances have occurred, as defined in Section 6 (A)(1).

(d) Any time that a CEMS, including the associated data acquisition system, is not functioning properly, Montana Sulphur shall implement the short term corrective measures, and if necessary, the long term corrective measures required by Section 4(B).

(B) Affected Sources

(1) By July 1, 1997, Montana Sulphur shall install, operate, and maintain a continuous emission monitor to measure sulfur dioxide concentrations from the SRU 100 meter stack.

(2) By July 1, 1997, Montana Sulphur shall install, operate, and maintain a continuous stack flow rate monitor and temperature monitor (at a minimum, a thermocouple) to measure the stack gas flow rates from the SRU 100 meter stack.

~~(3) By January 1, 1999, or a date 6 months after EPA approval of the Buoyancy Flux monitoring requirements contained in this document (whichever date is later), Montana Sulphur shall install and maintain a backup temperature and flowrate monitoring system to measure and record the stack gas temperature and flow rate from the SRU 100 meter stack. The back-up temperature and flowrate monitoring system shall be capable of obtaining and recording stack parameters to determine "V" and/or "T_S" in the event of the failure of the primary temperature and flowrate monitoring system which is a component of the CEMS required by Section 6(B)(2) and shall meet the performance specifications contained in Section 2(A)(3). However, the back-up system may rely upon the in-stack pitot tube and associated mechanical connections that are components of the primary temperature and flowrate monitoring system up to, but not including, the transducer.~~

~~For purposes of compliance with this requirement, the backup monitoring equipment must include as a minimum a differential pressure transducer, a thermocouple, and either:~~

~~(a) chart recorder(s) capable of recording "T_S" and pitot tube differential pressure, or~~
~~(b) a data logger capable of recording "T_S" and the calculated "V", the calculated flowrate, or the pitot tube differential pressure necessary to calculate "V" and flowrate.~~

~~Upon installation, Montana Sulphur shall operate the backup temperature and flowrate monitoring system whenever the primary (CEMS) temperature and flowrate monitoring system is determined to have failed.~~

(4) By July 1, 1997, Montana Sulphur shall install, operate, and maintain a temperature monitor (at a minimum, a thermocouple) to measure the stack gas temperature of the SRU 30 meter stack.

(C) CEM Performance Specifications

(1) All continuous SO_2 concentration monitors required by this control plan shall:

(a) be installed, certified (on a concentration basis), and operated in accordance with the performance specifications in 40 CFR Part 60, Appendix B, Performance Specifications 2; and

(b) be subject to and meet the quality assurance and quality control requirements (on a concentration basis) of 40 CFR Part 60 Appendix F including but not limited to:

(i) daily calibration drift checks (zero/span or Z/S) using either electro - optical methods or certified calibration gas (however, in addition to the requirements of Appendix F at least one Z/S per calendar week must be conducted using a certified calibration gas),

(ii) quarterly Cylinder Gas Audits (CGA) or Relative Accuracy Audits (RAA), and

(iii) the annual Relative Accuracy Test Audit (RATA).

(2) Montana Sulphur shall notify the Department in writing of each annual Relative Accuracy Test Audit a minimum of twenty-five (25) working days prior to the actual testing (unless otherwise specified by the Department).

(D) Stack Gas Flow Rate Monitor Performance Specifications

(1) All continuous stack gas flow rate monitors required by this control plan shall:

(a) be installed, certified (on a flow rate basis), and operated in accordance with Department Method A-1 of Attachment #1; and

(b) be subject to and meet (on a flow rate basis) the quality assurance and quality control requirements of Department Method B-1 of Attachment #1.

(2) Montana Sulphur shall notify the Department in writing of each annual Relative Accuracy Test Audit a minimum of twenty-five (25) working days prior to the actual testing (unless otherwise specified by the Department).

SECTION 7. DATA REPORTING REQUIREMENTS

(A) Montana Sulphur shall submit quarterly reports on a calendar year basis, beginning with the first calendar quarter of 1998. The quarterly reports shall be submitted within 30 days of the end of each calendar quarter. The quarterly reports shall be submitted to the Department's Permitting and Compliance Division office in Helena and the Billings Regional Office. The quarterly report format shall consist of both a comprehensive electronic-magnetic report and a written or hard copy data summary report.

(B) The electronic report format and records structure shall require hourly CEMS data, stack temperature and calibration data to be submitted to the Department as required in Section 7(A). The data shall be submitted to the Department on magnetic or optical media, and such submittal shall follow the reporting format specified by the Department in 1996, as may be subsequently amended. The Department shall reserve the right to call for any necessary future revisions to the reporting format delineated in this Section.

(1) The electronic report shall contain the following:

(a) Hourly Average SO_2 concentrations in PPM from the SRU 100 meter stack;

(b) Hourly Average stack volumetric flow rates in SCFH from the SRU 100 meter stack;

(c) Hourly Average stack gas temperatures in °F from the SRU 30 meter stack and the SRU 100 meter stack;

(d) Hourly SO_2 Emission Rates in pounds per Clock Hour from the SRU 100 meter stack;

(e) Hourly Buoyancy Flux, F, in m^4/s^3 and Three Hour Buoyancy Fluxes, F_3, in m^4/s^3; and

(f) daily calibration data from the CEMS required by Section 6(B)(1) and (2) or, if applicable, Section 6(B)(3).

(2) In addition to submitting the electronic-magnetic quarterly reports to the Department, Montana Sulphur shall also record, organize and archive for at least five years the same data, and upon request by the Department, Montana Sulphur shall provide the Department with any data archived in accordance with this Section.

(C) The quarterly written report shall consist of summarized CEMS data for Daily Emissions, Three Hour Emissions, Three Hour Average Buoyancy Flux, Quarterly Data Recovery Rates, and text regarding excess emissions. The quarterly written report shall also list the date and time periods that emissions are exhausted through the SRU 30 meter stack and the unit-specific auxiliary vent stacks, the operating units whose emissions are exhausted from the SRU 30 meter stack, and include engineering estimate of the Three Hour Emissions and Daily Emissions from the SRU 30 meter stack and the unit-specific auxiliary vent stacks.

(1) The following data shall be recorded, organized, reported, and archived for a minimum of five years:

(a) Three Hour Emission Limitations for SO_2 from the SRU 100 meter stack;

(b) Three Hour Emissions of SO_2 from the SRU 100 meter stack;

(c) Three Hour Average Buoyancy Flux for the exhaust gases from the SRU 100 meter stack;

(d) Daily Emissions of SO_2 in pounds per Calendar Day from the SRU 100 meter stack;

(e) Daily Emission Limitations for SO_2 from the SRU 100 meter stack;

(f) the Quarterly Data Recovery Rate for the CEMS required by Section 6(B)(1) and (2) expressed in percent (Valid data obtained from backup temperature and flow rate monitoring system equipment in combination with data from the primary sulfur dioxide continuous monitor shall count towards meeting the QDRR requirements.);

(g) the Operating hours during the calendar quarter for the source or units associated with the SRU 100 meter stack;

(h) the date and time identifying each period of continuous monitoring system downtime during the reporting period, including quality control and quality assurance checks, and the nature of system repairs or adjustments;

(i) the results of the quarterly CGA's or RAA's and flow rate checks, the annual or semiannual RATA's required in Sections 6(C and D), and the annual source tests required by Section 5(A);

(j) any documentation which demonstrates that a CEMS failure meets the conditions of Unusual Circumstances;

(k) the date and time periods that emissions are exhausted through the SRU 30 meter stack, the operating units whose emissions are exhausted from the SRU 30 meter stack, and include engineering estimates of the Three Hour Emissions and Daily Emissions from the SRU 30 meter stack; and

(l) the date and time periods that emissions are exhausted through the auxiliary vent stacks associated with each of the Railroad Boiler, the H-1 Unit, the H1-A Unit, the H1-1 Unit, and the H1-2 Unit and include engineering estimates of the combined Three Hour Emissions and Daily Emissions from those stacks.

(2) For each Calendar Day on which any emission limitations are exceeded, the written report shall identify the source or unit with excess emissions and include the following information in a report submittal as specified in Section 7(A):

(a) total hours of Operation with excess emissions, the Hourly SO_2 Emission Rates, the Three Hour Emissions, the Three Hour Emission Limitations for SO_2, the Daily Emission Limitations for SO_2, and the Daily Emissions;

(b) all information regarding reasons for Operating with excess emissions; and

(c) corrective actions taken to mitigate excess emissions.

(D) Upon request from a representative of the Department, EPA or Yellowstone County Air Pollution Control, Montana Sulphur shall provide Hourly SO_2 Emissions Rate data for any prior day not covered by the latest quarterly report for the sources or units covered by this control plan and listed in Section 1(B).

(E) By January 1, 2000, the Department shall reevaluate the reporting requirements of this Section and determine if revisions are necessary or desirable. The purpose of the reevaluation is to determine if the reporting requirements should be modified to more closely meet the informational needs of the Department and the public, and to reduce or simplify the requirements for Montana Sulphur while still providing the necessary information. Any revisions shall be made only after consultation with Montana Sulphur, consideration of the number and type of data requests made by the public, and the Department's emission inventory and compliance needs.

SECTION 8. ADDITIONAL REQUIREMENTS AND CONDITIONS

Except as otherwise provided herein, nothing in this Exhibit A or Attachment #1 shall be construed to alter Montana Sulphur's obligation under any other applicable state, federal and local laws and regulations, orders, and permit conditions. In any enforcement proceeding pertaining to such other requirements, Montana Sulphur reserves the right to raise any and all available equitable or legal defenses.

SECTION 9. GENERAL CONDITIONS

(A) Inspection - For purposes of ensuring compliance with this Exhibit A and Attachment #1, Montana Sulphur shall, pursuant to 75-2-403, MCA, allow the Department representative(s) access to all SO_2 emitting sources at the Montana Sulphur facility such that, the Department representative(s) may, pursuant to 75-2-403, MCA, enter and inspect, at any reasonable time, any property, premises, or place, except a private residence, on or at which an SO_2 emitting source is located or is being constructed or installed. The Department representatives shall be allowed to conduct surveys, collect samples, obtain emissions data, audit any monitoring equipment (CEMS), or observe any monitoring or testing, and conduct all other necessary functions related to this control plan.

As provided in Section 75-2-105, MCA, Montana Sulphur may seek a court order declaring certain trade secret information as confidential and not a matter of public record. If Montana Sulphur claims that certain information is entitled to trade secret protection, the Department shall maintain such information as confidential pending issuance of a court order under Section 75-2-105, MCA, provided that Montana Sulphur initiate such court action within 14 days of delivering the information to the Department.

(B) Enforcement - Any violation of a limitation, condition, or other requirement contained herein constitutes grounds for judicial or administrative enforcement action. If the incident causing the violation would also form the basis of a violation of ARM Title 17, Chapter 8, or of Title 75, Chapter 2, MCA, the Department shall not count the violation of the requirement contained herein as an additional or separate violation incident for penalty calculation and assessment purposes.

ATTACHMENT 1
PERFORMANCE SPECIFICATIONS FOR STACK FLOW RATE MONITORS
(Includes Methods A-1 and B-1)

METHOD A-1
INSTALLATION AND INITIAL CERTIFICATION
IN-STACK OR IN-DUCT FLOW MONITORS

1.0 FLOW MONITOR INSTALLATION AND MEASUREMENT LOCATION

Install the flow monitor in a location that provides representative volumetric flow for all operating conditions. Such a location provides an average velocity of the flue gas flow over the stack or duct cross section, provides a representative SO_2 emission rate (in lb/hr), and is representative of the pollutant concentration monitor location. Where the moisture content of the flue gas affects volumetric flow measurements, use the procedures in both Reference Methods 1 and 4 of 40 CFR Part 60, Appendix A to establish a proper location for the flow monitor.

The Department recommends (but does not require) performing a flow profile study following the procedures in 40 CFR Part 60, Appendix A, Test Method 1, Section 2.5 to determine the acceptability of the potential flow monitor location and to determine the number and location of flow sampling points required to obtain a representative flow value. The procedure in 40 CFR part 60, Appendix A, Test Method 1, Section 2.5 may be used even if the flow measurement location is greater than or equal to 2 equivalent stack or duct diameters downstream or greater than or equal to 1/2 duct diameter upstream from a flow disturbance. If a flow profile study shows that cyclonic (or swirling) or stratified flow conditions exist at the potential flow monitor location that are likely to prevent the monitor from meeting the performance specifications of this Method, then the Department recommends either (1) selecting another location where there is no cyclonic (or swirling) or stratified flow condition, or (2) eliminating the cyclonic (or swirling) or stratified flow condition by straightening the flow, e.g., by installing straightening vanes. The Department also recommends selecting flow monitor locations to minimize the effects of condensation, coating, erosion, or other conditions that could adversely affect flow monitor performance.

1.1 Acceptability of Flow Monitor Location

The installation of a flow monitor is acceptable if (1) the location satisfies the minimum siting criteria of Method 1 in Appendix A to 40 CFR Part 60 (i.e., the location is greater than or equal to eight stack or duct diameters downstream and two diameters upstream from a flow disturbance; or, if necessary, two stack or duct diameters downstream and one-half stack or duct diameter upstream from, a flow disturbance), (2) the results of a flow profile study, if performed, are acceptable (i.e., there are no cyclonic (or swirling) or stratified flow conditions), and (3) the flow monitor satisfies the performance specifications of this Method. If the flow monitor is installed in a location that does not satisfy these physical criteria, but the monitor achieves the performance specifications of this Method, then the Department and EPA may certify the location as acceptable.

1.2 Alternative Flow Monitoring Location

Whenever the flow monitor is installed in a location that is greater than or equal to two stack or duct diameters downstream and greater or equal to one-half diameter upstream from a flow disturbance, and/or in a location that is acceptable based on a flow profile study, but nevertheless the monitor does not achieve the performance specifications of this Method, perform another flow profile study (the procedures described in 40 CFR Part 60, Appendix A, Method 1, Section 2.5 may be used) to select an alternative flow monitoring installation site.

Whenever the owner or operator successfully demonstrates that modifications to the exhaust duct or stack (such as installation of straightening vanes, modifications of ductwork, and the like) are necessary for the flow monitor to meet the performance specifications, the Department and EPA may approve an interim alternative flow monitoring methodology and an extension to the required certification date for the flow monitor.

Where no location exists that satisfies the physical siting criteria in section 1.1, where the results of flow profile studies performed at two or more alternative flow monitor locations are unacceptable, or where installation of a flow monitor in either the stack or the ducts is demonstrated to be technically infeasible, the owner or operator may petition the Department and EPA for an alternative method for monitoring flow.

2.0 FLOW MONITOR EQUIPMENT SPECIFICATIONS

2.1 Instrument Span - General Requirements

In implementing Section 2.1.1 of this Method, to the extent practicable, measure at a range such that the majority of readings obtained during normal operation are between 25 and 75 percent of full-scale range of the instrument.

2.1.1 Instrument Span for Flow Monitors

Select the full-scale range of the flow monitor so that it is consistent with Section 2.1 of this Method, and can accurately measure all potential volumetric flow rates at the flow monitor installation site. Establish the span value of the flow monitor at a level which is approximately 80% of the full-scale range and 125% of the maximum expected flow rate. Based upon the span value, establish reference values for the calibration error test in accordance with Section 2.2.1.

If the volumetric flow rate exceeds the flow monitor's ability to accurately measure and record values, adjust the full-scale range, span value, and reference values as described above and in Section 2.2.1. Record the new span value and report the new span value and reference values as parts of the results of the calibration error test required by Method B-1. Whenever the span value is adjusted, use reference values for the calibration error test based on the new span value.

2.2 Flow Monitor Design for Quality Control Testing

Design all flow monitors to meet the applicable performance specifications of this Method.

2.2.1 Flow Monitor Calibration Error Test

Design and equip each flow monitor to allow for a daily calibration error test consisting of at least two reference values: (1) Zero to 20 percent of span or an equivalent reference value (e.g., pressure pulse or electronic signal) and (2) 50 to 70 percent of span. Flow monitor response, both before and after any adjustment, must be capable of being recorded by the data acquisition and handling system. Design each flow monitor to allow a daily calibration error test of (1) the entire flow monitoring system, from and including the probe tip (or equivalent) through and including the data acquisition and handling system, or (2) the flow monitoring system from and including the transducer through and including the data acquisition and handling system.

2.2.2 Flow Monitor Interference Check

Design and equip each flow monitor in a manner to minimize interference due to moisture. Design and equip each flow monitor with a means to detect, on at least a daily basis, pluggage of each sample line and sensing port, and malfunction of each resistance temperature detector (RTD), transceiver or equivalent.

Design and equip each differential pressure flow monitor to provide (1) an automatic, periodic back purging (simultaneously on both sides of the probe) or equivalent method of sufficient force and frequency to keep the probe and lines sufficiently free of obstructions on a least a daily basis to prevent velocity sensing interference, and (2) a means for detecting leaks in the system on a least a quarterly basis (manual check is acceptable).

Design and equip each thermal flow monitor with a means to ensure on at least a daily basis that the probe remains sufficiently clean to prevent velocity sensing interference.

Design and equip each ultrasonic flow monitor with a means to ensure on at least a daily basis that the transceivers remain sufficiently clean (e.g., backpurging system) to prevent velocity sensing interference.

3.0 FLOW MONITOR PERFORMANCE SPECIFICATIONS

3.1 Flow Monitor Calibration Error

The calibration error of flow monitors shall not exceed 3.0 percent based upon the span of the instrument as calculated using Equation A-1 of this Method.

3.2 Flow Monitor Relative Accuracy

Except as provided in this Section, the relative accuracy for flow monitors, where volumetric gas flow is measured in scfh, shall not exceed 20.0 percent. For affected units where the average of the flow monitor measurements of gas velocity during the relative accuracy test audit is less than or equal to 10.0 fps, the mean value of the flow monitor velocity measurements shall not exceed ±2.0 fps of the reference method mean value in fps wherever the relative accuracy specification above is not achieved.

4.0 DATA ACQUISITION AND HANDLING SYSTEMS

Automated data acquisition and handling systems shall: (1) read and record the full range of pollutant concentrations and volumetric flow from zero through span; and (2) provide a continuous record of all measurements and required information in an electronic format specified by the Department and capable of transmission via an IBM-compatible personal computer diskette or other electronic media. These systems also shall have the capability of interpreting and converting the individual output signals from a pollutant concentration monitor and a flow monitor to produce a continuous readout of pollutant mass emission rates in pounds per hour.

Data acquisition and handling systems shall also compute and record monitor calibration error .

5.0 INITIAL FLOW MONITOR CERTIFICATION TESTS AND PROCEDURES

5.1 Flow Monitor Pretest Preparation

Install the components of the continuous flow monitor as specified in Sections 1.0, 2.0, and 3.0 of this Method, and prepare each system component and the combined system for operation in accordance with the manufacturer's written instruction. Operate the unit(s) during each period when measurements are made.

5.2 7-Day Calibration Error Test for Flow Monitors

Measure the calibration error of each flow monitor according to the following procedures.

Introduce the reference signal corresponding to the values specified in Section 2.2.1 of this Method to the probe tip (or equivalent), or to the transducer. During the 7-day certification test period, conduct the calibration error test once each day while the unit is operating (as close to 24-hour intervals as practicable). Record the flow monitor responses by means of the data acquisition and handling system. Calculate the calibration error using Equation A-1 of this Method.

Do not perform any corrective maintenance, repair, replacement or manual adjustment to the flow monitor during the 7-day certification test period other than that required in the monitor operation and maintenance manual. If the flow monitor operates within the calibration error performance specification, (i.e., less than or equal to 3 percent error each day and requiring no corrective maintenance, repair, replacement or manual adjustment during the 7-day test period) the flow monitor passes the calibration error test portion of the certification test. Whenever automatic adjustments are made, record the magnitude of the adjustments. Record all maintenance and required adjustments. Record output readings from the data acquisition and handling system before and after all adjustments.

5.3 Flow Monitor Relative Accuracy

Within 90 days of installation concurrent relative accuracy test audits may be performed by conducting simultaneous SO_2 concentration and volumetric flow relative accuracy test audit runs, or by alternating an SO_2 relative accuracy test audit run with a flow relative accuracy test audit run until all relative accuracy test audit runs are completed. Where two or more probes are in the same proximity, care should be taken to prevent probes from interfering with each other's sampling. For each SO_2 pollutant concentration monitor and each flow monitor, calculate the relative accuracy with data from the relative accuracy test audits.

Perform relative accuracy test audits for each flow monitor at normal operating load expressed in terms of percent of flow monitor span. If a flow monitor fails the relative accuracy test, the relative accuracy test audit must be repeated.

Complete each relative accuracy test audit within a 7-day period while the unit is operating in a normal condition. Do not perform corrective maintenance, repairs, replacements or adjustments during the relative accuracy test audit other than as required in the operation and maintenance manual.

5.3.1 Calculations

Using the data from the relative accuracy test audits, calculate relative accuracy in accordance with the procedure and equations specified in Section 6 of this Method.

5.3.2 Reference Method Measurement Location

Select a location for reference method measurements that is (1) accessible; (2) in the same proximity as the monitor or monitoring system location; and (3) meets the requirements of Method 1 (or 1A) of 40 CFR Part 60, Appendix A for volumetric flow, except as otherwise indicated in this Section.

5.3.3 Reference Method Traverse Point Selection

Select traverse points that (1) ensure acquisition of representative samples of pollutant concentration, moisture content, temperature, and flue gas flow rate over the flue cross section; and (2) meet the requirements of Method 1 (or 1A) (for volumetric flow), and Method 4 (for moisture determination) in 40 CFR part 60, Appendix A.

5.3.4 Sampling Strategy

Conduct the reference method tests so they will yield results representative of the moisture content, temperature, and flue gas flow rate from the unit and can be correlated with the flow monitor measurements. Conduct any moisture measurements that may be needed simultaneously with the flue gas flow rate measurements. To properly correlate volumetric flow rate data with the reference method data, mark the beginning and end of each reference method test run (including the exact time of day) on the individual chart recorder(s) or other permanent recording device(s).

5.3.5 Correlation of Reference Method and Continuous Emission Monitoring System

Confirm that the monitor or monitoring system and reference method test results are on consistent moisture, pressure, and temperature basis (e.g., since the flow monitor measures flow rate on a wet basis, Method 2 test results must also be on a wet basis). Compare flow-monitor and reference method results on a scfh basis. Also consider the response time of the flow monitoring system to ensure comparison of simultaneous measurements. For each relative accuracy test audit run, compare the measurements obtained from the flow monitor against the corresponding reference method values. Tabulate the paired data in a table similar to the one shown in Figure 1.

5.3.6 Number of Reference Method Tests

Perform a minimum of nine sets of paired monitor (or monitoring system) and reference method test data for every required relative accuracy test audit. Conduct each set within a period of 30 to 60 minutes.

The tester may choose to perform more than nine sets of reference method tests. If this option is chosen, the tester may reject a maximum of three sets of the test results as long as the total number of test results used to determine the relative accuracy is greater than or equal to nine. Report all data, including the rejected data, and reference method test results.

5.3.7 Reference Methods

The following methods from 40 CFR Part 60, Appendix A or their approved alternatives are the reference methods for performing relative accuracy test audits: Method 1 or 1A for siting; Method 2 (or 2A, 2C, or 2D as appropriate) for velocity; and Method 4 for moisture.

6.0 CALCULATIONS

6.1 Flow Monitor Calibration Error (Drift)

For each reference value, calculate the percentage calibration error based upon span using the following equation:

$$CE = \frac{(R-A)}{S} x\ 100 \qquad \text{(EQ.A-1)}$$

Where:

CE = Calibration error;
R = Low or high level reference value specified in Section 2.2.1 of this Method;
A = Actual flow monitor response to the reference value; and
S = Flow monitor span.

Whenever the flow rate exceeds the monitor's ability to measure and record values accurately, adjust the span to prevent future exceedances. If process parameters change or other changes are made such that the expected flue gas velocity may change significantly, adjust the span to assure the continued accuracy of the monitoring system.

6.2 Relative Accuracy for Flow Monitors

Analyze the relative accuracy test audit data from the reference method tests for flow monitors using the following procedures. Summarize the results on a data sheet. An example is shown in Figure 1. Calculate the mean of the monitor or monitoring system measurement values. Calculate the mean of the reference method values. Using data from the automated data acquisition and handling system, calculate the arithmetic differences between the reference method and monitor measurement data sets. Then calculate the arithmetic mean of the difference, the standard deviation, the confidence coefficient, and the monitor or monitoring system relative accuracy using the following procedures and equations.

6.2.1 Arithmetic Mean

Calculate the arithmetic mean of the differences, $\bar{d}$, of a data set as follows.

$$\text{(Eq. A-2)} \quad \bar{d} = \frac{1}{n}\sum_{i=1}^{n} d_i$$

Where:

n=Number of data points

$\sum_{i=1}^{n} d_i$ = Algebraic sum of the individual differences d_i

d_i = The difference between a reference method value and the corresponding continuous flowrate monitoring system value (RM_i-FR_i) at a given point in time i.

When calculating the arithmetic mean of the difference of a flow monitor data set, be sure to correct the monitor measurements for moisture if applicable.

6.2.2 Standard Deviation

Calculate the standard deviation, S_d of a data set as follows:

$$S_d = \sqrt{\frac{\sum_{i=1}^{n} d_i^2 - \left[\frac{(\sum_{i=1} d_i)^2}{n}\right]}{n-1}}$$

(Eq. A-3)

6.2.3 Confidence Coefficient

Calculate the confidence coefficient (one-tailed), cc, of a data set as follows.

$$CC = t_{0.025}\frac{S_d}{\sqrt{n}} \quad \text{(Eq. A-4)}$$

where:

$t_{0.025}$ = t value (see Table 2)

TABLE 2 T-VALUES

n-1	$t_{0.025}$	n-1	$t_{0.025}$	n-1	$t_{0.025}$
1.......	12.706	12	2.179	23	2.069
2.......	4.303	13	2.160	24	2.064
3.......	3.182	14	2.145	25	2.060
4.......	2.776	15	2.131	26	2.056
5.......	2.571	16	2.120	27	2.052
6.......	2.447	17	2.110	28	2.048
7.......	2.365	18	2.101	29	2.045
8.......	2.306	19	2.093	30	2.042
9.......	2.262	20	2.086	40	2.021
10......	2.228	21	2.080	60	2.000
11......	2.201	22	2.074	>60	1.960

6.2.4 Relative Accuracy

Calculate the relative accuracy of a data set using the following equation.

$$RA = \frac{|\bar{d}| + |cc|}{\overline{RM}} x\ 100 \qquad \text{(Eq. A-5)}$$

where:

RM = Arithmetic means of the reference method values.

$|\bar{d}|$ = The absolute value of the mean difference between the reference method values and the corresponding continuous flow monitor values.

$|cc|$ = The absolute value of the confidence coefficient.

FIGURE 1.-RELATIVE ACCURACY DETERMINATION (FLOW MONITORS)

Run No.	Date & Time	Flow rate (Normal) (scf/hr)*		
		RM	M	Diff
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
Mean or mean of differences				
		Confidence coefficient		
		Relative accuracy		

* Make sure RM and M are on a consistent moisture basis.

METHOD B-1
ON-GOING QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES
FOR IN-STACK AND IN-DUCT FLOW MONITORS

1.0 FREQUENCY OF FLOW MONITOR TESTING

A summary chart showing each quality assurance test and the frequency at which each test is required is located at the end of this Method in Table 1.

1.1 **Daily** Flow Monitor Assessments

For each flow monitor perform the following assessments during each day in which the unit is operating. These requirements are effective as of the date when the monitor or continuous emission monitoring system completes certification testing.

1.1.1 Calibration Error Test for Flow Monitors

Test, compute, and record the calibration error of each flow monitor at least once on each operating day. Introduce the reference values (specified in section 2.2.1 of Method A-1) to the probe tip (or equivalent) or to the transducer. Record flow monitor output from the data acquisition and handling system before and after any adjustments to the flow monitor. Keep a record of all maintenance and adjustments. Calculate the calibration error using Equation A-1 in Method A-1.

1.1.2 Flow Monitor Interference Check

Perform the daily flow monitor interference checks specified in section 2.2.2 of Method A-1 at least once per operating day (when the unit(s) operate for any part of the day).

1.1.3 Flow Monitor Recalibration

Adjusts the calibration, at a minimum, whenever the daily calibration error exceeds the limits of the applicable performance specification for the flow monitor in Method A-1. Repeat the calibration error test procedure following the adjustment or repair to demonstrate that the corrective actions were effective.

1.1.4 Flow Monitor Out-of-Control Period

An out-of-control period occurs when either the low or high level reference value calibration error exceeds 6.0 percent based upon the span value for five consecutive daily periods or 12.0 percent for any daily period. The out-of-control period begins with the hour of completion of the failed calibration error test and ends with the hour of completion following an effective recalibration. Whenever the failed calibration, corrective action, and effective recalibration occur within the same hour, the hour is not out of control if two or more complete and valid readings are obtained during that hour. An out-of-control period also occurs whenever interference of a flow monitor is identified. The out-of-control period begins with the hour of completion of the failed interference check and ends with the hour of completion of an interference check that is passed. During any period that the flow monitor is out-of-control, the data may not be used in calculating emission compliance nor be counted towards meeting minimum data recovery requirements.

1.1.5 Flow Monitor Data Recording

Record and tabulate all calibration error test data according to month, day, clockhour, and magnitude in scfh. Program monitors that automatically adjust data to the corrected calibration values (e.g., microprocessor control) to record either: (1) The unadjusted flow rate measured in the calibration error test prior to resetting the calibration or (2) the magnitude of any adjustment. Record the following applicable flow monitor interference check data: (1) sample line/sensing port pluggage, and (2) malfunction of each RTD, transceiver, or equivalent.

1.2 **Quarterly** Flow Monitor Assessments

For each flow monitor, conduct a quarterly stack velocity and flow rate check by performing a velocity traverse and visual inspection of the pitot tubes. Perform the following assessments during each calendar quarter in which the unit operates. This requirement is effective as of the calendar quarter following the calendar quarter in which the flow monitor is provisional certified.

1.2.1 Flow Monitor Leak Check

For differential pressure flow monitors, perform a leak check of all sample lines (a manual check is acceptable) at least once during each unit operating quarter. Conduct the leak checks no less than two months apart.

1.2.2 Flow Monitor Flow Rate Check

Once during each operating quarter and for each flow monitor, perform a flow rate check by completing a single velocity traverse, calculating the associated average flow rate, and comparing the average flow with the concurrent flow measured by the continuous flow monitor. The flow rate check shall be performed at normal operating rates or load level. The flow rate check shall be performed in accordance with Section 5.3 of Method A-1 as appropriate for a single traverse. The difference (PD) between the average flow rate determined by the single velocity traverse and the continuous flow monitor shall not exceed 20 percent as determined by equation B-1. If the single velocity traverse fails to meet the 20% difference specification, the owner/operator may conduct an additional single velocity traverse or a complete Relative Accuracy Test Audit (RATA) in accordance with Section 5.3 of Method A-1 in order to demonstrate compliance with the 20% difference or 20% relative accuracy requirements.

$$PD = \frac{TF - FR}{TF} \times 100 \qquad \text{(Eq. B-1)}$$

Where:

PD = Percent Difference;
TF = Traverse Flow (scfh);
FR = Continuous Flow Monitor Flow (scfh); and
TF and FR are on a consistent moisture basis.

If the Relative Accuracy of the latest annual Relative Accuracy Test Audit (RATA) conducted pursuant to Section 1.3.1 is less than 10%, the single velocity traverse flow rate check may be discontinued. However, if future RATAs indicate a Relative Accuracy of 10% or greater, performance of the single velocity traverse flow rate check shall resume.

1.2.3 Flow Monitor Out-of-Control Period

An out-of-control period occurs when a flow monitor fails the quarterly flow rate check (the difference between the average flow rate determined by the velocity traverse and the continuous flow monitor exceeds 20%), the visual inspection of the pitot tube indicates pluggage or wear, or if a sample line leak is detected. The out-of-control period begins with the hour of the failed flow rate check, visual inspection, or leak check and ends with the hour of a satisfactory flow rate check, RATA, leak check, or cleaning or replacement of the pitot tube. During any period that the flow monitor is out-of-control, the data may not be used in calculating emission compliance nor be counted towards meeting minimum data recovery requirements.

1.3 **Annual** Flow Monitor Assessments

For each flow monitor, perform the following assessments once annually. This requirement is effective as of the calendar quarter in which the monitor or continuous emission monitoring system is provisionally certified.

1.3.1 Flow Monitor Relative Accuracy Test Audit

For flow monitors, relative accuracy test audits shall be performed annually. The relative accuracy audit shall be performed at the normal operating rate or load level (with a minimum of 9 paired velocity traverses). The relative accuracy test audit shall be conducted according to the procedures and specifications of Method A-1.

1.3.2 Flow Monitor Out-of-Control Period

An out-of-control period occurs under any of the following conditions: (1) the relative accuracy of a flow monitor exceeds 20.0 percent or (2) for low flow situations (≤10.0 fps), the flow monitor mean value (if applicable) exceeds ±2.0 fps of the reference method mean whenever the relative accuracy is greater than 20.0 percent. For flow relative accuracy test audits, the out-of-control period begins with the hour of completion of the failed relative accuracy test audit and ends with the hour of completion of a satisfactory relative accuracy test audit. During any period that the flow monitor is out-of-control, the data may not be used in calculating emission compliance nor be counted towards meeting minimum data recovery requirements.

TABLE 1.-FLOW MONITOR QUALITY ASSURANCE TEST REQUIREMENTS

Test	QA test frequency requirements		
	Daily	Quarterly	Annual
Calibration Error (2 pt.)	x		
Interference (flow)	x		
Visual probe check		x	
Flow rate check (single traverse)		x[1]	
Leak (flow)		x[2]	
RATA (flow)			x

[1] The owner/operator has an option to perform a RATA if the quarterly flow rate check (single traverse) fails specifications. In addition, if the Relative Accuracy determined by the latest RATA is less than 10%, the quarterly single velocity traverse flow rate check may be discontinued. However, if future RATAs indicate a Relative Accuracy of 10% or greater, performance of the quarterly single velocity traverse flow rate check shall resume.

[2] The leak check requirement only applies to differential pressure flow rate monitors and does not apply to thermal or ultrasonic flow rate monitors.