UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region8

JAN 03 2018

Ref: 8P-AR

Mike Weaver
Midstream Operations Manager
Anadarko Uintah Midstream, LLC
P.O. Box 173779
Denver, Colorado 80202-3779

Re: Anadarko Uintah Midstream, LLC, Proposed Synthetic Minor New Source Review Permits for Multiple Facilities

Dear Mr. Weaver:

The U.S. Environmental Protection Agency Region 8 has completed its review of Anadarko Uintah Midstream, LLC's applications requesting synthetic minor permits pursuant to the Tribal Minor New Source Review (MNSR) Permit Program at 40 CFR part 49 for six (6) facilities on Indian country lands within the Uintah and Ouray Indian Reservation, in Uintah County, Utah. The six (6) facilities are listed below.

- East Bench Compressor Station - Permit # SMNSR-UO-000824-2016.001;
- Sage Grouse Compressor Station - Permit # SMNSR-UO-001875-2016.001;
- North East Compressor Station - Permit # SMNSR-UO-001874-2016.001;
- North Compressor Station - Permit # SMNSR-UO-000071-2016.001;
- Archie Bench Compressor Station - Permit # SMNSR-UO-000817-2016.001; and
- Bitter Creek Compressor Station - Permit # SMNSR-UO-000818-2016.001.

Enclosed are the proposed permits and the corresponding technical support documents for each permit action. The regulations at 40 CFR 49.157 require that the affected community and the general public have the opportunity to submit written comments on any proposed MNSR permit. All written comments submitted within 30 calendar days after the public notice is published will be considered by the EPA in making its final permit decisions. Also, enclosed is a copy of the public notice which will be published on the EPA's website located at: https://www.epa.gov/caa-permitting/caa-permit-public-comment-opportunities-region-8, on January 8, 2018. The public comment period will end at 5:00 p.m. on February 7, 2018.

The conditions contained in the proposed permits will become effective and enforceable by the EPA if the permits are issued final. If you are unable to accept any term or condition of the proposed permits, please submit your written comments, along with the reason(s) for non-acceptance to:

Tribal NSR Permit Contact
c/o Air Program (8P-AR)
U.S. EPA, Region 8
1595 Wynkoop Street
Denver, Colorado 80202

or

R8AirPermitting@epa.gov

If you have any questions concerning any of the enclosed proposed permits or technical support documents, please contact Eric Wortman, of my staff, at (617) 918-1624.

Sincerely,

Monica S. Morales
Director, Air Program
Office of Partnerships & Regulatory Assistance

Enclosures (13)

cc: Bruce Pargeets, Director, Energy, Minerals and Air, Ute Indian Tribe
Minnie Grant, Air Coordinator, Energy, Minerals, and Air, Ute Indian Tribe
Natalie Ohlhausen, Senior HSE Representative, Anadarko Uintah Midstream, LLC

United States Environmental Protection Agency
Region 8, Air Program
1595 Wynkoop Street
Denver, CO 80202

Air Pollution Control
Minor Source Permit to Construct

40 CFR 49.151

 # SMNSR-UO-000824-2016.001

Permit to Construct to establish legally and practically enforceable limitations and requirements on sources at an existing facility.

Permittee:

Anadarko Uintah Midstream, LLC

Permitted Facility:

East Bench Compressor Station
Uintah and Ouray Indian Reservation
Uintah County, Utah

PROPOSED

Summary

On November 8, 2016, the EPA received an application from Anadarko Uintah Midstream, LLC (Anadarko), requesting a synthetic minor permit for the East Bench Compressor Station (East Bench) in accordance with the requirements of the Tribal Minor New Source Review (MNSR) Permit Program.

This permit action will apply to an existing facility operating on the Uintah and Ouray Indian Reservation in Utah. The physical location is Latitude 39.907616N, Longitude -109.466166W, in Uintah County, Utah.

This permit does not authorize the construction of any new emission sources, or emission increases from existing units, nor does it otherwise authorize any other physical modifications to the facility or its operations. This permit is intended only to incorporate required and requested enforceable emission limits and operational restrictions from a March 27, 2008, federal Consent Decree (CD) between the United States of America (Plaintiff), and the state of Colorado, the Rocky Mountain Clean Air Action and the Natural Resources Defense Council (Plaintiff-Intervenors), and Kerr-McGee Corporation (Civil Action No. 07-CV-01034-EWN-KMT) and the November 8, 2016 synthetic MNSR application. Anadarko has requested legally and practically enforceable requirements for the installation and operation of a catalytic control system on two (2) field gas-fired 4-stroke lean-burn (4SLB) reciprocating internal combustion engines (used for field gas compression at the facility), including associated carbon monoxide (CO) control efficiency requirements, consistent with the CD. Anadarko also requested an enforceable requirement to install and operate only low-bleed, no-bleed, or instrument air-driven pneumatic controllers, consistent with the CD.

Upon compliance with the permit, Anadarko will have legally and practically enforceable restrictions on emissions that can be used when determining the applicability of other Clean Air Act (CAA) permitting requirements, such as those imposed by the Prevention of Significant Deterioration (PSD) Permit Program at 40 CFR part 52 and the Title V Operating Permit Program at 40 CFR part 71 (Part 71 Permit Program).

The EPA has determined that issuance of this MNSR permit will not contribute to National Ambient Air Quality Standards (NAAQS) violations, or have potentially adverse effects on ambient air quality.

PROPOSED

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PROPOSED

I. Conditional Permit to Construct

A. General Information

Facility:	Anadarko Uintah Midstream, LLC – East Bench Compressor Station
Permit Number:	SMNSR-UO-000824-2016.001
SIC Code and SIC Description:	1311- Crude Petroleum and Natural Gas
Site Location: East Bench Compressor Station SE/NW Sec 32 T10S R22E Uintah and Ouray Indian Reservation Uintah County, Utah Latitude 39.907616N, Longitude -109.466166W	Corporate Office Location Anadarko Uintah Midstream, LLC P.O. Box 173779 Denver, Colorado 80202-3779

The equipment listed in this permit shall be operated by Anadarko Uintah Midstream, LLC at the location described above.

B. Applicability

1. This federal Permit to Construct is being issued under authority of the MNSR Permit Program.

2. The requirements in this permit have been created, at the Permittee's request and pursuant to the MNSR permit program, to establish legally and practically enforceable emissions restrictions for pneumatic controllers and control of CO emissions from field gas-fired engines.

3. Any conditions established for this facility or any specific units at this facility pursuant to any permit issued under the authority of the PSD Permit Program or the MNSR Permit Program shall continue to apply.

4. By issuing this permit, the EPA does not assume any risk of loss which may occur as a result of the operation of the permitted facility by the Permittee, Owner and/or Operator, if the conditions of this permit are not met by the Permittee, Owner and/or Operator.

C. Requirements for 4SLB Compressor Engines

1. Construction and Operational Requirements

   (a) The Permittee shall install and operate emission controls as specified in this permit on two (2) existing engines used for field gas compression, all meeting the following specifications:

      (i) Operated as a 4-stroke lean-burn engine;
      (ii) Fired with field gas; and
      (iii) Two (2) engines limited to a maximum site rating of 1,340 horsepower (hp).

PROPOSED

(b) Only the engines that are operated and controlled as specified in this permit are approved for installation under this permit.

2. Control, Operation and Maintenance Requirements

(a) The Permittee shall install, continuously operate and maintain a catalytic control system on each engine that is capable of reducing the uncontrolled emissions of CO by at least 93.0% by weight when the engine is operating at a 90% load or higher.

(b) The Permittee shall follow, for each engine and its respective catalytic control system, the manufacturer's recommended maintenance schedule and procedures or equivalent procedures developed by the Permittee or vendor, to ensure optimum performance of each engine and its respective catalytic control system to ensure compliance with the CO control efficiency requirement in this permit.

(c) The Permittee may rebuild an existing permitted engine or replace an existing permitted engine with an engine of the same hp rating, and configured to operate in the same manner as the engine being rebuilt or replaced. Any operational requirements, control technologies, testing or other provisions that apply to the engines that are rebuilt or replaced shall also apply to the replacement engines.

(d) The Permittee may resume operation without the catalytic control system during an engine break-in period, not to exceed 200 operating hours, for any rebuilt or replaced engines.

3. Performance Test Requirements

(a) Performance tests shall be conducted on each engine and catalytic control system for measuring CO to demonstrate compliance with the control efficiency requirement specified in this permit. The performance tests shall be conducted in accordance with the Carbon Monoxide Control Efficiency Portable Analyzer Monitoring Protocol in Appendix A of this permit to measure the oxygen (O_2) and CO concentrations at the inlet (pre-catalyst) and outlet (post-catalyst) of the catalytic control system.

(i) Initial performance tests shall be conducted no later than 60 calendar days after installation of the catalytic control system, including installation of the catalytic control system on engines that are rebuilt or replaced. The results of initial performance tests conducted prior to the effective date of this permit may be used to demonstrate compliance with the initial performance test requirements, provided the tests were conducted in an equivalent manner as the performance test requirements in this permit.

(ii) Subsequent performance tests shall be conducted semi-annually on each engine. After compliance is demonstrated for two (2) consecutive tests, the testing frequency may be reduced to annually. If an annual test indicates non-compliance, then the Permittee shall resume semi-annual testing.

(b) The Permittee may submit to the EPA a written request for approval of alternate test methods, but shall only use the alternate test methods after obtaining written approval from the EPA.

PROPOSED

(c) The Permittee shall not perform engine tuning or make any adjustments to engine settings, catalytic control system settings, processes or operational parameters immediately prior to the engine testing or during the engine testing. Any such tuning or adjustments may result in a determination by the EPA that the test is invalid.

(d) The Permittee shall not abort any engine tests that demonstrate non-compliance with the CO control efficiency requirement specified in this permit.

(e) All performance tests conducted on the engines shall meet the following requirements:

(i) Each test shall consist of at least two (2) consecutive 21-minute or longer valid test runs, one (1) pre-catalyst run and one (1) post-catalyst run;
(ii) The CO control efficiency shall be determined based on the pre- and post-catalyst CO measurements;
(iii) If the catalyst fails to meet the CO control efficiency requirement specified in this permit, appropriate steps shall be taken to correct the deficiency and the catalyst shall be retested within 30 days after the failed test;
(iv) Performance test plans for alternate test methods shall be submitted to the EPA for approval at least 60 calendar days prior to the date the test is planned; and
(v) Alternate test plans shall include and address the following elements:

(A) Purpose of the test;
(B) Engines and catalytic control systems to be tested;
(C) Expected engine operating rate(s) during the test;
(D) Sampling and analysis procedures (sampling locations and test methods);
(E) Quality assurance plan (calibration procedures and frequency and field documentation; and
(F) Data processing and reporting (description of data handling and quality control procedures, report content).

(f) The Permittee shall notify the EPA at least 30 calendar days prior to scheduled performance testing. The Permittee shall notify the EPA at least 1 week prior to scheduled performance testing if the testing cannot be performed.

(g) If a permitted engine is not operating, the Permittee does not need to start up the engine solely to conduct the subsequent performance test. The subsequent performance test requirements apply when the engine is restarted and operates more than 720 consecutive hours (or 30 consecutive days) in a given semi-annual period. If an engine for which the EPA has been notified of a scheduled test is permanently shut down prior to testing, the Permittee does not need to start up the engine solely to conduct the performance test.

4. <u>Recordkeeping Requirements</u>

(a) Records shall be kept of manufacturer and/or vendor specifications for each engine, catalytic control system and portable analyzer.

(b) Records shall be kept of all calibration and maintenance conducted for each engine, catalytic control system and portable analyzer.

PROPOSED

(c) Records shall be kept of all required testing in this permit. The records shall include the following:

(i) The date, place and time of portable analyzer measurements;
(ii) The company or entity that performed the portable analyzer measurement;
(iii) The portable analyzer measurement techniques or methods used;
(iv) The results of such measurements; and
(v) The operating conditions as existing at the time of measurement.

(d) Records shall be kept of all engine rebuilds and engine replacements.

(e) Records shall be kept of each rebuilt or replaced engine break-in period, pursuant to the requirements of this permit, where the existing engine that has been rebuilt resumes operation without the catalyst control system for a period not to exceed 200 hours.

(f) Records shall be kept of each time a deviation in the CO control efficiency required in this permit is detected for an engine. The Permittee shall include in the record the cause of the problem, the corrective action taken and the timeframe for bringing the CO control efficiency into compliance.

5. Requirements under **Section C. Requirements for 4SLB Compressor Engines** shall be effective upon termination of the March 27, 2008, federal CD between the United States of America (Plaintiff), and the state of Colorado, the Rocky Mountain Clean Air Action and the Natural Resources Defense Council (Plaintiff-Intervenors), and Kerr-McGee Corporation (Civil Action No. 07-CV-01034-EWN-KMT).

D. Requirements for Pneumatic Controllers

1. The Permittee shall not operate any high-bleed pneumatic controllers. High-bleed controllers are defined as any controller with the capacity to bleed in excess of 6 standard cubic feet of gas (scf) per hour (50,000 scf per year) in normal operation. The Permittee is not required to install low or no-bleed pneumatic controllers if the use of low or no-bleed pneumatic devices is not technically or operationally feasible.

2. Records shall be kept of manufacturer's and/or vendor's specifications for each pneumatic controller that is not operated using instrument air.

3. Records shall be kept of the determination for each high-bleed pneumatic controller that is installed and operated if the use of low or no-bleed pneumatic devices is not technically or operationally feasible.

4. Requirements under **Section D. Requirements for Pneumatic Controllers** shall be effective upon termination of the March 27, 2008, federal CD between the United States of America (Plaintiff), and the state of Colorado, the Rocky Mountain Clean Air Action and the Natural Resources Defense Council (Plaintiff-Intervenors), and Kerr-McGee Corporation (Civil Action No. 07-CV-01034-EWN-KMT).

PROPOSED

E. Requirements for Records Retention

1. The Permittee shall retain all records required by this permit for a period of at least 5 years from the date the record was created.

2. Records shall be kept in the vicinity of the facility, such as at the facility, the location that has day-to-day operational control over the facility or the location that has day-to-day responsibility for compliance of the facility.

F. Requirements for Reporting

1. Test reports shall be submitted within 60 days after each required initial engine and catalytic control system performance test.

2. The Permittee shall submit a report to the EPA no later than 30 days after each retest after a failed initial test. The retest report shall include a summary of the steps taken to comply and the retest results.

3. Annual Reports

   (a) The Permittee shall submit a written annual report of all required monitoring and testing conducted on emission units at the facility covered under this permit each year no later than March 1st. The annual report shall cover the period for the previous calendar year. All reports shall be certified to truth and accuracy by the person designated by the Permittee as responsible for CAA compliance for the facility.

   (b) The report shall include:

      (i) A summary of the results of each required initial engine and catalytic control system performance test;
      (ii) Test reports for all required subsequent engine and catalytic control system performance tests; and
      (iii) A summary of all deviations of permit conditions and corrective actions taken, per paragraph I.F.5. of this permit.

4. All documents required to be submitted under this permit shall be submitted to:

   U.S. Environmental Protection Agency, Region 8
   Office of Enforcement, Compliance & Environmental Justice
   Air Toxics and Technical Enforcement Program, 8ENF-AT
   1595 Wynkoop Street
   Denver, Colorado 80202

   Documents may be submitted via electronic mail to R8AirReportEnforcement@epa.gov.

5. The Permittee shall promptly submit to the EPA a written report of any deviations of control or operational limits specified in this permit and a description of any corrective actions or preventative measures taken. A "prompt" deviation report is one that is post marked or submitted via electronic mail to r8airreportenforcement@epa.gov as follows:

PROPOSED

(a) Within 30 days from the discovery of a deviation that would cause the Permittee to exceed the control or operational limits in this permit if left uncorrected for more than 5 days after discovering the deviation; and

(b) By March 1st for the discovery of a deviation of recordkeeping or other permit conditions during the preceding calendar year that do not affect the Permittee's ability to meet the control or operational limits, included as part of the Annual Reports required in this permit.

6. The Permittee shall submit any record or report required by this permit upon EPA request.

II. General Provisions

A. Conditional Approval

Pursuant to the authority of 40 CFR 49.151, the EPA hereby conditionally grants this permit to construct. This authorization is expressly conditioned as follows:

1. *Document Retention and Availability:* This permit and any required attachments shall be retained and made available for inspection upon request at the location set forth herein.

2. *Permit Application:* The Permittee shall abide by all representations, statements of intent and agreements contained in the application submitted by the Permittee. The EPA shall be notified 10 days in advance of any significant deviation from this permit application as well as any plans, specifications or supporting data furnished.

3. *Permit Deviations:* The issuance of this permit may be suspended or revoked if the EPA determines that a significant deviation from the permit application, specifications and supporting data furnished has been or is to be made. If the proposed source is constructed, operated or modified not in accordance with the terms of this permit, the Permittee will be subject to appropriate enforcement action.

4. *Compliance with Permit:* The Permittee shall comply with all conditions of this permit, including emission limitations that apply to the affected emissions units at the permitted facility/source. Noncompliance with any permit term or condition is a violation of this permit and may constitute a violation of the CAA and is grounds for enforcement action and for a permit termination or revocation.

5. *Fugitive Emissions:* The Permittee shall take all reasonable precautions to prevent and/or minimize fugitive emissions during the construction period.

6. *NAAQS and PSD Increments:* The permitted source shall not cause or contribute to a NAAQS violation or a PSD increment violation.

7. *Compliance with Federal and Tribal Rules, Regulations, and Orders:* Issuance of this permit does not relieve the Permittee of the responsibility to comply fully with all other applicable federal and tribal rules, regulations and orders now or hereafter in effect.

PROPOSED

8. *Enforcement:* It is not a defense, for the Permittee, in an enforcement action to claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

9. *Modifications of Existing Emissions Units/Limits:* For proposed modifications, as defined at 40 CFR 49.152(d), that would increase an emissions unit allowable emissions of pollutants above its existing permitted annual allowable emissions limit, the Permittee shall first obtain a permit modification pursuant to the MNSR regulations approving the increase. For a proposed modification that is not otherwise subject to review under the PSD or MNSR regulations, such proposed increase in the annual allowable emissions limit shall be approved through an administrative permit revision as provided at 40 CFR 49.159(f).

10. *Relaxation of Legally and Practically Enforceable Limits:* At such time that a new or modified source within this permitted facility/source or modification of this permitted facility/source becomes a major stationary source or major modification solely by virtue of a relaxation in any legally and practically enforceable limitation which was established after August 7, 1980, on the capacity of the permitted facility/source to otherwise emit a pollutant, such as a restriction on hours of operation, then the requirements of the PSD regulations shall apply to the source or modification as though construction had not yet commenced on the source or modification.

11. *Revise, Reopen, Revoke and Reissue, or Terminate for Cause:* This permit may be revised, reopened, revoked and reissued or terminated for cause. The filing of a request by the Permittee, for a permit revision, revocation and reissuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any permit condition. The EPA may reopen this permit for a cause on its own initiative, e.g., if this permit contains a material mistake or the Permittee fails to assure compliance with the applicable requirements.

12. *Severability Clause:* The provisions of this permit are severable, and in the event of any challenge to any portion of this permit, or if any portion is held invalid, the remaining permit conditions shall remain valid and in force.

13. *Property Rights:* This permit does not convey any property rights of any sort or any exclusive privilege.

14. *Information Requests:* The Permittee shall furnish to the EPA, within a reasonable time, any information that the EPA may request in writing to determine whether cause exists for revising, revoking and reissuing, or terminating this permit or to determine compliance with this permit. For any such information claimed to be confidential, the Permittee shall also submit a claim of confidentiality in accordance with 40 CFR part 2, subpart B.

15. *Inspection and Entry:* The EPA or its authorized representatives may inspect this permitted facility/source during normal business hours for the purpose of ascertaining compliance with all conditions of this permit. Upon presentation of proper credentials, the Permittee shall allow the EPA or its authorized representative to:

    (a) Enter upon the premises where this permitted facility/source is located or emissions-related activity is conducted, or where records are required to be kept under the conditions of this permit;

PROPOSED

(b) Have access to and copy, at reasonable times, any records that are required to be kept under the conditions of this permit;

(c) Inspect, during normal business hours or while this permitted facility/source is in operation, any facilities, equipment (including monitoring and air pollution control equipment), practices or operations regulated or required under this permit;

(d) Sample or monitor, at reasonable times, substances or parameters for the purpose of assuring compliance with this permit or other applicable requirements; and

(e) Record any inspection by use of written, electronic, magnetic and photographic media.

16. *Permit Effective Date:* This permit is effective immediately upon issuance unless a later effective date is specified in the permit, or unless comments resulted in a change in the proposed permit, in which case this permit is effective 30 days after issuance. If within 30 days after the service of notice of the final permit issuance, a person petitions the Environmental Appeals Board to review any condition(s) of the final permit in accordance with 40 CFR 49.159(d), the specific terms and conditions of the permit that are the subject of the request for review must be stayed.

17. *Permit Transfers:* Permit transfers shall be made in accordance with 40 CFR 49.159(f). The Air Program Director shall be notified in writing at the address shown below if the company is sold or changes its name.

    U.S. Environmental Protection Agency, Region 8
    Office of Partnerships & Regulatory Assistance
    Tribal Air Permitting Program, 8P-AR
    1595 Wynkoop Street
    Denver, Colorado 80202

18. *Invalidation of Permit:* Unless this permitted source of emissions is an existing source, this permit becomes invalid if construction is not commenced within 18 months after the effective date of this permit, construction is discontinued for 18 months or more, or construction is not completed within a reasonable time. The EPA may extend the 18-month period upon a satisfactory showing that an extension is justified. This provision does not apply to the time period between the construction of the approved phases of a phased construction project. The Permittee shall commence construction of each such phase within 18 months of the projected and approved commencement date.

19. *Notification of Start-Up:* The Permittee shall submit a notification of the anticipated date of initial startup of this permitted source to the EPA within 60 days of such date, unless this permitted source of emissions is an existing source.

PROPOSED

B. Authorization

Authorized by the United States Environmental Protection Agency, Region 8

_____

Monica S. Morales Date
Director, Air Program
Office of Partnerships & Regulatory Assistance

PROPOSED

Appendix A

Carbon Monoxide Control Efficiency Portable Analyzer Monitoring Protocol

[Copy of Appendix F to the CD in the matter of United States of America and the State of Colorado V. Kerr-McGee Corporation (Civil Action No. 07-CV-01034-EWN-KMT), Carbon Monoxide Control Efficiency Portable Analyzer Monitoring Protocol]

PROPOSED

APPENDIX F

to the

Consent Decree

in the matter of

United States of America and the State of Colorado v. Kerr-McGee Corporation

CARBON MONOXIDE CONTROL EFFICIENCY PORTABLE ANALYZER MONITORING PROTOCOL

Determination of Carbon Monoxide Control Efficiency from Controlled Natural Gas-Fired Reciprocating Engines Located in the Uinta Basin

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OVERVIEW AND PURPOSE

Kerr-McGee has agreed to conduct portable analyzer testing for carbon monoxide ("CO") on certain reciprocating internal combustion engines ("RICE") located in the Uinta Basin that are controlled with oxidation catalysts as part of a settlement of alleged Clean Air Act violations with the United States and the State of Colorado. The terms of that settlement will be memorialized in a consent decree to be entered by the United States District Court for the District of Colorado to be styled *United States of America and the State of Colorado v. Kerr-McGee Corporation* (hereafter the "Consent Decree"). As required in the Consent Decree at Section IV.D., Kerr-McGee will conduct portable analyzer testing on certain RICE located in the Uinta Basin that will be controlled with oxidation catalysts.

1. APPLICABILITY AND PRINCIPLE

1.1 Applicability. This protocol was prepared to be implemented by Kerr-McGee Oil and Gas Onshore LP, Westport Field Services LLC and/or certain of their corporate affiliates ("Kerr-McGee") will monitor carbon monoxide (CO) and oxygen (O_2) concentrations from controlled natural gas-fired reciprocating engines using portable analyzers with electrochemical cells.

1.2 Principle. A gas sample is continuously extracted from a stack and conveyed to a portable analyzer for determination of CO and O_2 gas concentrations using electrochemical cells. Analyzer design specifications, performance specifications, and test procedures are provided to ensure reliable data. Additions to or modifications of vendor-supplied analyzers (e.g. heated sample line, flow meters, etc.) may be required to meet the design specifications of this test method.

2. RANGE AND SENSITIVITY

2.1 Analytical Range. The analytical range for each gas component is determined by the electrochemical cell design. A portion of the analytical range is selected to be the nominal range by choosing a span gas concentration near the flue gas concentrations or permitted emission level in accordance with Sections 2.1.1 and 2.1.2.

2.1.1 CO Span Gas. Choose a CO span gas such that the concentration is approximately 1.25 times average expected pre-catalyst stack gas reading.

2.1.2 O_2 Span Gas. The O_2 span gas shall be dry ambient air at 20.9% O_2.

2.1.2 NO Span Gas. The NO span gas shall be approximately 250 ppm.

3. DEFINITIONS

3.1 Measurement System. The total equipment required for the determination of gas concentration. The measurement system consists of the following major subsystems:

3.1.1 Sample Interface. That portion of a system used for one or more of the following: sample acquisition, sample transport, sample conditioning, or protection of the electrochemical cells from particulate matter and condensed moisture.

3.1.2 External Interference Gas Scrubber. A tube filled with scrubbing agent used to remove interfering compounds upstream of some electrochemical cells.

3.1.3 Electrochemical (EC) Cell. The portion of the system that senses the gas to be measured and generates an output proportional to its concentration. Any cell that uses diffusion-limited oxidation and reduction reactions to produce an electrical potential between a sensing electrode and a counter electrode.

3.1.4 Data Recorder. It is recommended that the analyzers be equipped with a strip chart recorder, computer, or digital recorder for recording measurement data. However, the operator may record the test results manually in accordance with the requirements of Section 7.4.

3.2 Nominal Range. The range of concentrations over which each cell is operated (25 to 125 percent of span gas value). Several nominal ranges may be used for any given cell as long as the linearity and stability check results remain within specification.

3.3 Span Gas. The high level concentration gas chosen for each nominal range.

3.4 Zero Calibration Error. For the CO channel, the absolute value of the difference, expressed as a percent of the span gas, between the gas concentration exhibited by the gas analyzer when a zero level calibration gas is introduced to the analyzer and the known concentration of the zero level

calibration gas. For the O_2 channel, the difference, expressed as percent O_2, between the gas concentration exhibited by the gas analyzer when a zero level calibration gas is introduced to the analyzer and the known concentration of the zero level calibration gas.

3.5 Span Calibration Error. For the CO channel, the absolute value of the difference, expressed as a percent of the span gas, between the gas concentration exhibited by the gas analyzer when a span gas is introduced to the analyzer and the known concentration of the span gas. For the O_2 channel, the difference, expressed as percent O_2, between the gas concentration exhibited by the gas analyzer when a span gas is introduced to the analyzer and the known concentration of the span gas.

3.6 Response Time. The amount of time required for the measurement system to display 95 percent of a step change in the CO gas concentration on the data recorder.

3.7 Linearity Check. A method of demonstrating the ability of a gas analyzer to respond consistently over a range of gas concentrations.

3.8 Stability Check. A method of demonstrating an electrochemical cell operated over a given nominal range provides a stable response and is not significantly affected by prolonged exposure to the analyte.

3.9 Stability Time. As determined during the stability check; the elapsed time from the start of the gas injection until a stable reading has been achieved.

3.10 Test. The collection of emissions data consisting of two consecutive 21 minute sampling periods, 21 minutes pre-catalyst and 21 minutes post catalyst, from each source.

4. MEASUREMENT SYSTEM PERFORMANCE SPECIFICATIONS

4.1 Zero Calibration Error. Less than or equal to ±3 percent of the span gas value for CO channels and less than or equal to ±0.3 percent O_2 for the O_2 channel.

4.2 Span Calibration Error. Less than or equal to ±5 percent of the span gas value for CO channels and less than or equal to ±0.5 percent O_2 for the O_2 channel.

4.3 Linearity. For the zero, mid-level, and span gases, the absolute value of the difference, expressed as a percent of the span gas, between the gas value and the analyzer response shall not be greater than 2.5 percent for the CO cell.

4.4 Stability Check Response. The analyzer responses to CO span gases shall not vary more than 3.0 percent of span gas value over a 30-minute period or more than 2.0 percent of the span gas value over a 15-minute period.

4.5 CO Measurement, Hydrogen (H_2) Compensation. It is recommended that CO measurements be performed using a hydrogen-compensated EC cell since CO-measuring EC cells can experience significant reaction to the presence of H_2 in the gas stream. Sampling systems equipped with a scrubbing agent prior to the CO cell to remove H_2 interferent gases may also be used.

5. APPARATUS AND REAGENTS

5.1 Measurement System. Use any measurement system that meets the performance and design specifications in Sections 4 and 5 of this method. The sampling system shall maintain the gas sample at a temperature above the dew point up to the moisture removal system. The sample conditioning system shall be designed so there are no entrained water droplets in the gas sample when it contacts the electrochemical cells. A schematic of an acceptable measurement system is shown in Figure 1. The essential components of the measurement system are described below:

5.1.1 Sample Probe. Glass, stainless steel, or other nonreactive material, of sufficient length to sample per the requirements of Section 7. If necessary to prevent condensation, the sampling probe shall be heated.

5.1.2 Heated Sample Line. Heated (sufficient to prevent condensation) nonreactive tubing such as teflon, stainless steel, glass, etc. to transport the sample gas to the moisture removal system. (Includes any particulate filters prior to the moisture removal system.)

5.1.3 Sample Transport Lines. Nonreactive tubing such as teflon, stainless steel, glass, etc. to transport the sample from the moisture removal system to the sample pump, sample flow rate control, and electrochemical cells.

5.1.4 Calibration Assembly. A tee fitting to attach to the probe tip or where the probe attaches to the sample line for introducing calibration gases at ambient pressure during the calibration error checks. The vented end of the tee should have a flow indicator to ensure sufficient calibration gas flow. Alternatively use any other method that introduces calibration gases at the probe at atmospheric pressure.

5.1.5 Moisture Removal System. A chilled condenser or similar device (e.g., permeation dryer) to remove condensate continuously from the sample gas while maintaining minimal contact between the condensate and the sample gas.

5.1.6 Particulate Filter. Filters at the probe or the inlet or outlet of the moisture removal system and inlet of the analyzer may be used to prevent accumulation of particulate material in the measurement system and extend the useful life of the components. All filters shall be fabricated of materials that are nonreactive to the gas being sampled.

5.1.7 Sample Pump. A leak-free pump to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. The pump may be constructed of any material that is nonreactive to the gas being sampled.

5.1.8 Sample Flow Rate Control. A sample flow rate control valve and rotameter, or equivalent, to maintain a constant sampling rate within 10 percent during sampling and calibration error checks. The components shall be fabricated of materials that are nonreactive to the gas being sampled.

5.1.9 Gas Analyzer. A device containing electrochemical cells to determine the CO and O_2 concentrations in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

5.1.10 Data Recorder. A strip chart recorder, computer, or digital recorder, for recording measurement data. The data recorder resolution (i.e., readability) shall be at least 1 ppm for CO and 0.1 percent O_2 for O_2; and one degree (C or F) for temperature.

5.1.11 External Interference Gas Scrubber. Used by some analyzers to remove interfering compounds upstream of a CO electrochemical cell. The scrubbing agent should be visible and should have a means of determining when the agent is exhausted (e.g., color indication).

5.2 Calibration Gases. Both the CO and NO calibration gases for the gas analyzer shall be CO or

NO in nitrogen.

5.2.1 Span Gases. Used for calibration error, linearity, and interference checks of each nominal range of each cell. Select concentrations according to procedures in Section 2.1.1. Clean dry air may be used as the span gas for the O_2 cell as specified in Section 2.1.2.

5.2.2 Mid-Level Gases. Select concentrations that are 40-60 percent of the span gas concentrations.

5.2.3 Zero Gas. Concentration of less than 0.25 percent of the span gas for each component. Ambient air may be used in a well ventilated area for the CO.

6. MEASUREMENT SYSTEM PERFORMANCE CHECK PROCEDURES. Perform the following procedures before the measurement of emissions under Section 7.

6.1 Calibration Gas Concentration Certification. For the mid-level and span cylinder gases, use calibration gases certified according to EPA Protocol 1 procedures. Calibration gases must meet the criteria under 40 CFR 60, Appendix F, Section 5.1.2 (3). Expired Protocol 1 gases may be recertified using the applicable reference methods.

6.2 Linearity Check. Conduct the following procedure once for each nominal range to be used on each electrochemical cell. After a linearity check is completed, it remains valid for seven consecutive calendar days. After the seven calendar day period has elapsed, the linearity check must be reaccomplished. Additionally, reaccomplish the linearity check if the cell is replaced.

6.2.1 Linearity Check Gases. For the CO cell obtain the following gases: zero (0-0.25 percent of nominal range), mid-level (40-60 percent of span gas concentration), and span gas (selected according to Section 2.1).

6.2.2 Linearity Check Procedure. If the analyzer uses an external interference gas scrubber with a color indicator, using the analyzer manufacturer's recommended procedure, verify the scrubbing agent is not depleted. After calibrating the analyzer with zero and span gases, inject the zero, mid-level, and span gases appropriate for each nominal range to be used on each cell. Gases need not be injected through the entire sample handling system. Purge the analyzer briefly with ambient air between gas injections. For each gas injection, verify the flow rate is constant and the analyzer responses have stabilized before recording the responses on Form A.

6.3 Stability Check. Conduct the following procedure once for the maximum nominal range to be used on each electrochemical cell. After a stability check is completed, it remains valid for seven consecutive calendar days. After the seven calendar day period has elapsed, the stability check must be reaccomplished. Additionally, reaccomplish the stability check if the CO cell is replaced.

6.3.1 Stability Check Procedure. Inject the CO span gas for the maximum nominal range to be used during the emission testing into the analyzer and record the analyzer response at least once per minute until the conclusion of the stability check. One-minute average values may be used instead of instantaneous readings. After the analyzer response has stabilized, continue to flow the span gas for at least a 30-minute stability check period. Make no adjustments to the analyzer during the stability check except to maintain constant flow. Record the stability time as the number of minutes elapsed between the start of the gas injection and the start of the 30-minute stability check period. As an alternative, if the concentration reaches a peak value within five minutes, you may choose to record the data for at least a 15-minute stability check period following the peak.

6.3.2 Stability Check Calculations. Determine the highest and lowest CO concentrations recorded during the 30-minute period and record the results on Form B. The absolute value of the difference between the maximum and minimum values recorded during the 30-minute period must be less than 3.0 percent of the span gas concentration. Alternatively, record stability check data in the same manner for the 15-minute period following the peak concentration. The difference between the maximum and minimum values for the 15-minute period must be less than 2.0 percent of the span gas concentration.

6.4 Interference Check. Conduct the following procedure once for the average anticipated NO stack gas concentration as reported by the manufacuture (250 ppm for Caterpillar lean burns). After a interference check is completed, this value will be utilized for interference calculations for the next 7 calendar days. After the seven calendar day period has elapsed, the interference check must be reaccomplished.

6.4.1 Interference Check Procedure. Inject the 250 ppm NO span gas for the into the analyzer and record the analyzer response at least once per minute until the conclusion of the interference check. One-minute average values may be used instead of instantaneous readings. After the analyzer response has stabilized, continue to flow the span gas for at least a 15-minute period. Make no adjustments to the analyzer during the stability check except to maintain constant flow. Record the CO cell response to this NO calibration gas.

7. EMISSION TEST PROCEDURES.

Prior to performing the following emission test procedures, calibrate/challenge all electrochemical cells in the analyzer in accordance with the manufacturer's instructions.

7.1. Pre/Post-Catalyst Sampling. Select both a pre-catalyst and post catalyst sampling site that will provide continuous uninterrupted exhaust gas flow.

7.2 Warm Up Period. Assemble the sampling system and allow the analyzer and sample interface to warm up and adjust to ambient temperature at the location where the stack measurements will take place.

7.3 Pretest Calibration Error Check. Conduct a zero and span calibration error check before testing each new facility. Conduct the calibration error check near the sampling location just prior to the start of the first emissions test.

7.3.1 Scrubber Inspection. For analyzers that use an external interference gas scrubber tube, inspect the condition of the scrubbing agent and ensure it will not be exhausted during sampling. If scrubbing agents are recommended by the manufacturer, they should be in place during all sampling, calibration and performance checks.

7.3.2 Zero and Span Procedures. Inject the zero and span gases using the calibration assembly. Ensure the calibration gases flow through all parts of the sample interface. During this check, make no adjustments to the system except those necessary to achieve the correct calibration gas flow rate at the analyzer. Set the analyzer flow rate to the value recommended by the analyzer manufacturer. Allow each reading to stabilize before recording the result on Form C. The time allowed for the span gas to stabilize shall be no less than the stability time noted during the stability check. After achieving a stable response, disconnect the gas and briefly purge with ambient air.

7.3.3 Response Time Determination. Determine the CO response time by observing the time required to respond to 95 percent of a step change in the analyzer response for both the zero and span

gases. Note the longer of the two times as the response time.

7.3.4 Failed Pretest Calibration Error Check. If the zero and span calibration error check results are not within the specifications in Section 4, take corrective action and repeat the calibration error check until acceptable performance is achieved.

7.4 Sample Collection. Position the sampling probe at the pre-catalyst sample point and begin sampling at the same rate used during the calibration error check. Maintain constant rate sampling (± 10 percent of the analyzer flow rate value used in Section 7.3.2) during the entire test. The concentration data must be recorded either (1) at least once each minute, or (2) as a block average for the test using values sampled at least once each minute. Repeat this procedure from the post-catalyst sampling location. Two consecutive 21 minute samples, one pre-catalyst and one post catalyst, shall be considered a test for each source

7.5 Re-Zero. At least once every four hours, recalibrate the analyzer at the zero level according to the manufacturer's instructions and conduct a pretest calibration error check before resuming sampling. If the analyzer is capable of reporting negative concentration data (at least 5 percent of the span gas below zero), then the tester is not required to re-zero the analyzer.

8. DATA COLLECTION. This section summarizes the data collection requirements for this protocol.

8.1 Linearity Check Data. Using Form A, record the analyzer responses in ppm for CO, and percent O_2 for the zero, mid-level, and span gases injected during the linearity check under Section 6.2.2.

8.2 Stability Check Data. Record the analyzer response in pmm for CO at least once per minute during the stability check under Section 6.3.1. One-minute average values may be used instead of instantaneous readings. Record the stability time as the number of minutes elapsed between the start of the gas injection and the start of the 30-minute stability check period. If the concentration reaches a peak value within five minutes of the gas injection, you may choose to record the data for at least a 15-minute stability check period following the peak. Use the information recorded to determine the analyzer stability under Section 6.3.2.

8.3 Pretest Calibration Error Check Data. On Form C, record the analyzer responses to the zero and span gases for CO and O_2 injected prior to testing each new source. Record the calibration zero and span gas concentrations for CO and O_2. For CO, record the absolute difference between the analyzer response and the calibration gas concentration, divide by the span gas concentration, and multiply by 100 to obtain the percent of span. For O_2, record the absolute value of the difference between the analyzer response and the O_2 calibration gas concentration. Record whether the calibration is valid by comparing the percent of span or difference between the calibration gas concentration and analyzer O_2 response, as applicable, with the specifications under Section 4.1 for the zero calibrations and Section 4.2 for the span calibrations. Record the response times for the CO zero and span gases as described under Section 7.3.3. Select the longer of the two times as the response time for that pollutant.

8.4 Test Data. On Form D-1 record the source operating parameters during the test. Record the test start and end times. From the analyzer responses recorded each minute during the test, obtain the average flue gas concentration of each pollutant.

9. CONTROL EFFICIENCY CALCULATIONS

9.1 Control Efficiency Calculations. CO control efficiencies will be calculated using the following calculation:

$$\% \quad Control = \frac{(C_{pre} - C_{post})}{C_{pre}} \times 100$$

where: % control = actual control efficiency of the oxidation catalyst
C_{Pre} = stack gas concentration at the pre-catalyst sampling location (ppm)
C_{post} = stack gas concentration at the post-catalyst sampling location (ppm)

9.2 Interference Check. Utilize the data collected in Section 6.3.4 and the average pre-catalyst CO emission concentrations to calculate interference responses (I_{CO}) for the CO cell. If an interference response exceeds 5 percent, all emission test results since the last successful interference test for that compound are invalid.

9.2.1 CO Interference Calculation.

$$I_{CO} = [(\frac{R_{CO\text{-}NO}}{C_{NOG}})(\frac{C_{NOS}}{C_{COS}})]x100$$

where:
I_{CO} = CO interference response (percent)
$R_{CO\text{-}NO}$ = CO response to NO span gas (ppm CO)
C_{NOG} = concentration of NO span gas (ppm NO)
C_{NOS} = Anticipated concentration of NO in stack gas (250 ppm NO)
C_{COS} = concentration of CO in stack gas (ppm CO)

10. REPORTING REQUIREMENTS AND RECORD KEEPING REQUIREMENTS

Test reports shall be submitted to the Environmental Protection Agency (EPA), as required by Section IV C of Consent Decree, within thirty (30) days of completing the test. A separate test report shall be submitted for each facility where an emission source was tested and, at a minimum, the following information shall be included:

- **Form A, Linearity/Interference Check Data Sheet,** Submit the linearity check as required by Section 6.2 for the nominal range tested.
- **Form B, Stability Check Data Sheet,** Submit the stability check as required by Section 6.4 for the nominal range tested.
- **Form C, Calibration Error Check Data Sheet**
- **Form D-1,** Submit the appropriate test results form.

Records pertaining to the information above and supporting documentation shall be kept for five (5) years and made available upon request by EPA. Additionally, if the source is equipped with a fuel meter, records of all maintenance and calibrations of the fuel meter shall be kept for five (5) years from the date of the last maintenance or calibration.

Form A

Linearity/Interference Check Data Sheet

Date:_____

Analyst:_____

Analyzer Manufacturer/Model #:_____

Analyzer Serial #:_____

Pollutant		Calibration Gas Concentration (ppm)	Analyzer Response (ppm CO)	Analyzer Response% O_2	Absolute Difference (ppm)	Percent of Span	Linearity Valid (Yes or No)
CO	Zero						
	Mid						
	Span						
NO	Span						

Form B
Stability Check Data Sheet

Date:_____ **Analyst:**_____
Analyzer Manufacturer/Model #:_____

Analyzer Serial #:_____

Pollutant: CO Span Gas Concentration (ppm):_____

STABILITY CHECK					
Elapsed Time (Minutes)	Analyzer Response	Elapsed Time (Continued)	Analyzer Response	Elapsed Time (Continued)	Analyzer Response
1		17		33	
2		18		34	
3		19		35	
4		20		36	
5		21		37	
6		22		38	
7		23		39	
8		24		40	
9		25		41	
10		26		42	
11		27		43	
12		28		44	
13		29		45	
14		30		46	
15		31		47	
16		32		48	

For 30-minute Stability Check Period:

Maximum Concentration (ppm): _____ **Minimum Concentration (ppm):** _____

For 15-minute Stability Check Period:

Maximum Concentration (ppm): _____ **Minimum Concentration (ppm):** _____

Maximum Deviation = 100*(Max. Conc. - Min. Conc.)/Span Gas Conc. = _____ **percent**

Stability Time (minutes): _____

Form C
Calibration Error Check Data Sheet

Company:_____ **Facility:**_____

Source Tested:_____ **Date:**_____

Analyst:_____ **Analyzer Serial #:**_____

Analyzer Manufacturer/Model #:_____

PRETEST CALIBRATION ERROR CHECK								
			A	B	|A-B|	|A-B|/SG*100		
		Pump Flow Rate (Indicate Units)	Analyzer Reading (Indicate Units)	Calibration Gas Concentration (Indicate Units)	Absolute Difference (Indicate Units)	Percent of Span Note 1	Calibration Valid (Yes or No)	Response Time (Minutes)
CO	Zero							
	Span							
O_2	Zero							
	Span							

SG = Span Gas

Form D-1
Reciprocating Engine Test Results

Company:_____ **Facility:**_____

Source Tested:_____ **Date:**_____

Source Manufacturer/Model #:_____

Site-rated Horsepower:_____ **Source Serial #:**_____

Type of Emission Control:_____

Analyst:_____ **Analyzer Serial #:**_____

Analyzer Manufacturer/Model #:_____

Operating Conditions

Source operating at 90 percent or greater site-rated horsepower during testing? yes no

Engine Tested Horsepower (hp)	Engine RPM	Engine Fuel Consumption (Indicate Units)	Fuel Heat Content (Btu/cf)	Engine Specific Fuel Consumption (Btu/hp-hr)[1]

[1] As reported by the Manufacturer

Test Results

Test Start Time:_____ _____Test End Time:_____

O_2	CO				
Avg. Tested O_2 %	Avg. Pre-Catalyst CO ppm	Avg. Post-Catalyst CO ppm	Tested CO Reduction (%)	Required CO Reduction (%)	CO Interference Response (I_{CO}, %):
				93%	

I certify to the best of my knowledge the test results are accurate and representative of the emissions from this source.

_____ _____

Print Name **Signature**