EMISSION TESTS
ON COGEN ENGINES 1, 2, AND 3
RIVERSIDE MEDICAL CENTER

TEST DATE: NOVEMBER 17, 2021
IEPA FACILITY ID NUMBER 091055ADE

Prepared For:

RIVERSIDE MEDICAL CENTER
350 NORTH WALL STREET
KANKAKEE, ILLINOIS 60901

Prepared By:

CIVIL & ENVIRONMENTAL
CONSULTANTS, INC. ST. LOUIS, MISSOURI

CEC Project 314-911

Report Date: December 15, 2021

REPORT CERTIFICATION

This report, testing details, and approach have been developed under the supervision (including review) of the persons named below. Results contained in this report relate only to the sources tested and the parameters included in the test program.

Civil & Environmental Consultants, Inc. (CEC) operates as an accredited air emission testing body (AETB) under a quality management system in conformance with ASTM D7036-04 (Reapproved 2011) "Standard Practice for Competence of Air Emission Testing Bodies". CEC has been issued accreditation certificate number 3913.01, expiration November 30, 2023, by the joint American Association for Laboratory Accreditation (A2LA) and the Stack Testing Accreditation Council (STAC).

Date: 12/15/2021 Signature _____

Franklin M. Stevens
Vice President
Civil & Environmental Consultants, Inc.

Date: 12/15/2021 Signature _____

Pierre Bourgeade, QSTI
Project Manager
Civil & Environmental Consultants, Inc.

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1.0 INTRODUCTION

Civil & Environmental Consultants, Inc. (CEC) was contracted by Riverside Medical Center (Riverside) located in the city of Kankakee, Illinois. Emissions from Cogen 1, Cogen 2, and Cogen 3 were tested to determine the concentration of carbon monoxide (CO) to demonstrate compliance with the provisions of Title 40,*Code of Federal Regulations* (CFR), "Protection of Environment", Part 63 "National Emission Standards for Hazardous Air Pollutants for Source Categories," Subpart ZZZZ "National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines" (40 CFR 63, Subpart ZZZZ) aka RICE MACT; and the provisions of Riverside's emissions permit. The three engines operate under Riverside's Lifetime Operating Permit (84010065) issued by the Illinois Environmental Protection Agency (IEPA).

Riverside is considered an area source of hazardous air pollutants (HAPs) under the RICE MACT. As allowed under the RICE MACT, Riverside has elected to comply with the CO exhaust limit of 47 ppmvd or lower, corrected to 15 vol% oxygen (O_2) as a surrogate for demonstration of formaldehyde emissions compliance, for all three engines.

Tests were conducted using methods as published in 40 CFR 60 "Standards of Performance for New Stationary Sources", Appendix A. Method 1 "Sample and Velocity Traverses for Stationary Sources" and provisions in the RICE MACT were used to determine the number and location of sample points. Method 3A "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)" was used to determine the O_2 concentrations in order to adjust emissions data to a 15 vol% O_2 basis. Method 10 "Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)" was used to determine the concentration of CO emissions.

CEC project management was conducted by Donna Oswald with quality assurance oversight provided by Pierre Bourgeade. Riverside was represented by Aaron MacGilray who coordinated testing with facility operations. CEC's emission test team consisted of Pierre Bourgeade who acted as test team lead and test crew member Ben Murowchick. A request to an adjustment of the deadline for submitting a test notice 60 days prior to testing as required under NESHAP Subpart ZZZZ was approved via email from Mr. Kevin Mattison of IPA on October 15, 2021. IEPA was not represented on-site on the test date. Project participants are listed in Table 1.

Table 1: List of Project Participants

Riverside Medical Center			
Participant	**Title**	**Affiliation**	**Contact**
Donna Oswald	Project Manager	CEC	Telephone: 630-541-0621 doswald@cecinc.com
Pierre Bourgeade	Project Manager	CEC	Telephone: 614-6 56-4566 pbourgeade@cecinc.com
Ben Murowchick	Technician	CEC	----------
Aaron MacGilray	Plant Operations Maintenance Supervisor	Riverside Medical Center	Telephone: 815-935-4783 Cell: (815) 216-1731 AMacGilray@rhc.net

This report contains the results of the emission tests conducted during this test program. Appendices to this report contain data in support of the test results as follows:

- Appendix A presents the Reference Method Test Data;
- Appendix Bpresents the Facility Data;
- Appendix C presents the Reference Method Gas Certifications;
- Appendix D presents the Example Calculations; and
- Appendix E presents the Test Personnel Certifications
- Appendix F presents the IEPA Testing Notification Waiver
- Appendix G presents the Test Plan

1.1 ERRORS, OMISSIONS AND METHOD DISCREPANCIES/MODIFICATIONS

No modification or discrepancies were noted during this testing event.

2.0 PROCESS DESCRIPTION

Riverside is a 350-bed hospital facility located in Kankakee, Illinois. The facility is considered an Area Source of HAP under the RICE MACT. Riverside operates a backup electrical power system consisting of three identical electrical generation sets, each driven by a 750 brake horsepower-hour (bhp-hr) (560 kilowatt-hr [kW-hr]), natural-gas fired, spark ignition, 4-stroke lean-burn, RICE. Exhaust emissions from the engines are controlled using an oxidative catalyst installed on the exhaust stack of each engine. Engine specifications are as follows;

Engine Manufacturer:	Caterpillar
Engine Model:	CAT G3512
Engine Max. Site-Rated Power:	750 bhp-hr (560 kW-hr)
Engine Design:	4-Stroke, Lean-Burn
Fuel/Fuel Ignition:	Natural Gas/Spark Ignition
Construction/Reconstruction Date:	June 1992

The facility powers up the generation sets/engines for approximately 30 minutes/month for testing and maintenance purposes. All three generation sets participate in a demand response program and are therefore considered non-emergency engines under the RICE MACT.

3.0 TEST RESULTS

CEC conducted emission tests at Riverside on November 17, 2021. Emissions from Cogen 1, Cogen 2, and Cogen 3 were tested to determine the concentrations of CO and O_2. A single, 15-minute duration test run was conducted on each engine at the exhaust of the emissions control catalyst. Emissions prior to the catalyst were not tested.

3.1 COGEN 1 TEST RESULTS

Emission tests were conducted on Cogen 1 while the engine was operating at its normal/full load rate of 570 kW-hr. Carbon monoxide emissions averaged 0.08 ppmvd corrected to 15% O_2, which is in compliance with the 40 CFR 63, Subpart ZZZZ emission limit of 47 ppmvd. Results are summarized in Table 2.

Table 2: Summary of Test Results (Cogen 1)

Riverside Medical Center			
Parameter	**Units of Measure**	**Run 1**	**Subpart ZZZZ Limit**
Carbon Monoxide	ppmvd	0.20	------
	ppmvd @ 15% O_2	0.08	**47**
Oxygen	Vol% dry	5.47	------
Fuel Usage	cubic feet (cf)	1,500	------
Engine Load	kW	570	------

3.2 COGEN 2 TEST RESULTS

Emission tests were conducted on Cogen 2 while the engine was operating at its normal/full load rate of 576 kW-hr. Carbon monoxide emissions averaged 0.42 ppmvd corrected to 15% O_2, which is in compliance with the 40 CFR 63, Subpart ZZZZ emission limit of 47 ppmvd. Results are summarized in Table 3.

Table 3: Summary of Test Results (Cogen 2)

Riverside Medical Center			
Parameter	**Units of Measure**	**Run 1**	**Subpart ZZZZ Limit**
Carbon Monoxide	ppmvd	1.09	------
	ppmvd @ 15% O_2	0.42	**47**
Oxygen	Vol% dry	5.74	------
Fuel Usage	cubic feet (cf)	1,700	------
Engine Load	kW	576	------

3.3 COGEN 3 TEST RESULTS

Emission tests were conducted on Cogen 3 while the engine was operating at its normal/full load rate of 570 kW-hr. Carbon monoxide emissions averaged 2.58 ppmvd corrected to 15% O_2, which is in compliance with the 40 CFR 63 Subpart ZZZZ emission limit of 47 ppmvd. Results are summarized in Table 4.

Table 4: Summary of Test Results (Cogen 3)

Riverside Medical Center			
Parameter	**Units of Measure**	**Run 1**	**Subpart ZZZZ Limit**
Carbon Monoxide	ppmvd	6.76	------
	ppmvd @ 15% O_2	2.58	**47**
Oxygen	Vol% dry	5.46	------
Fuel Usage	cubic feet (cf)	1,600	------
Engine Load	kW	580	------

3.4 CONTINUOUS PARAMETER MONITORING SYSTEM

The Continuous Parameter Monitoring System (CPMS) records temperature at the inlet to the catalyst housing and the pressure differential across the catalyst bed to demonstrate compliance with the RICE NESHAP. CEC utilized a thermocouple to collect temperature readings for comparison to the CPMS monitor readings. A manometer was used to measure the pressure differential across the catalyst. Pressure readings were obtained from the inlet and outlet and the differential pressure calculated. The pressure readings from the CPMS were recorded concurrently with the manometer readings. The installed CPMS thermocouples must have a minimum tolerance of ±5° F. Table 5 of this report presents the results for the tests performed at Riverside.

Table 5: Summary of CPMS Testing

Riverside		**CPMS**		**Reference Method**		**Difference**	
Engine	**Time**	**Pressure Drop (In. H_2O)**	**Temperature (°F) Pre / Post**	**Pressure Drop (In. H_2O)**	**Temperature (°F) Pre / Post**	**Pressure Drop (In. H_2O)**	**Temperature (°F) Pre / Post**
Cogen 1	900-915	2.16	901/ 845	2.15	907 / 854	0.01	6 / 9
Cogen 2	940-955	3.31	954 / 922	3.44	953 / 916	0.13	1 / 6
Cogen 3	1015-1030	2.18	845 / 860	3.21	846 / 864	1.03	1 / 4

The differential between the CPMS reading and reference readings for temperature are slightly outside of manufacturers certification of ±5° F relative to a certified reference source. The CPMS continuously monitors catalyst temperature according to the requirements in §63.6625(b) and will shut down if the inlet temperature exceeds 1350° F. The facility was alerted that the thermocouples cannot be recalibrated but rather require replacement and advised them to follow up with their engine maintenance service provider.

4.0 TESTING SCHEDULE

CEC conducted the compliance emissions testing on Engine located at Riverside on May 28, 2020. The emission testing equipment was set-up prior to testing each engine. Each compliance test consisted of one 15-minute sample run, based on the requirements of 40 CFR 63, Subpart ZZZZ (RICE MACT). Table 6 presents a summary of the test schedule for this project.

Table 6: Test Schedule

Engine	Date	Start Time	End Time
Cogen 1	11/17/21	900	915
Cogen 2		940	955
Cogen 3		1015	1030

5.0 SUMMARY OF REFERENCE TEST METHODS

This section describes the sampling strategy, sampling and analytical methods, and quality assurance/quality control procedures that were implemented during this project. The project involved performing test runs for the parameters listed in Section 1 of this document on the gas fueled engines located at Riverside.

5.1 SAMPLING STRATEGY

The USEPA methods that were utilized in this sampling program are:

- Method 3A for the determination of O_2 concentrations at the outlet of the catalytic convertors.
- Method 10 for the determination of CO at the inlet/outlet of the catalytic convertors.

These test methods are available in 40 CFR 60, Appendix A, USEPA's web site: www.epa.gov/ttn/emc/ or by request from CEC.

5.2 SAMPLING AND ANALYTICAL PROCEDURES

A sampling and analysis synopsis for these methods are discussed briefly in the following subsections.

5.2.1 USEPA Method 3A - Oxygen

The O_2 sampling was conducted in accordance with 40 CFR 60, Appendix A, Method 3A. A Servomex Model 1440 paramagnetic analyzer with a range of 0-25 percent was used for the diluent measurements. The Model 1440 analyzer operates on the principle that oxygen (O_2) is attracted into a strong magnetic field, whereas most other gases are not. This paramagnetism is used to obtain fast, accurate O_2 measurements. The sample is drawn into the Model 1440 through the sample bulkhead and flows through the optical bench where a focused magnetic field is created. Any oxygen present is attracted into the strongest part of the magnetic field. Two nitrogen filled glass spheres are mounted on a rotating suspension with a magnetic field and a mirror is mounted centrally on the suspension. Light is shone onto the mirror and the reflected light is directed onto a pair of photocells. The oxygen attracted into the magnetic field displaces the nitrogen filled spheres, causing the suspension to rotate. The photocells detect the movement and generate a signal that is passed to a feedback system. The feedback system passes a current around a wire mounted on the suspension causing a motor effect, which keeps the suspension in its original

position. The current measured flowing around the wire is directly proportional to the concentration of oxygen within the gas mixture. The Model 1440 uses an internally stored calibration curve to accurately linearize the instrument output over any range up to a concentration of 25 percent. The Model 1440 outputs the O_2 concentration to the front panel display, the analog outputs and also makes the data available over a serial connection.

The sample was extracted through stainless-steel probes using an air dimensions diaphragm sample pump regulated by a Millennium Instruments flow panel. The sample was then transported to a Universal Analyzer gas conditioner via heated 3/8-inch PTFE sample line maintained above the dew point of the flue gas where the water vapor was removed. The sample was then analyzed continuously for the duration of each test period. The analyzer output was recorded continuously by a STRATA Version 3.2.112 Data Acquisition System (DAS) manufactured by AMP-Cherokee instruments.

USEPA Protocol-1 calibration gases were used to calibrate each of the analyzer systems. A calibration error test was performed on the O_2 analyzer by introducing a zero, mid and high-level calibration gas directly to the analyzer inlet. A zero gas (nitrogen) of less than 0.25 percent of span, a certified Protocol-1 mid-level (40 to 60 percent) of span and a certified Protocol-1 high-level (100 percent) of span were used for the analyzer calibration error test. At the conclusion of test series, the zero and an upscale calibration gases were delivered to the analyzer system determine if the system had any drift in the calibration that would affect the sample results. The concentration of O_2 was measured in percentage (% O_2) by volume on a dry basis. The reference Method 3A CEMS data is presented in Appendix A. The calibration gas certificates are located in Appendix C of this report.

Table 7 presents a summary of the Protocol-1 gases used to calibrate the reference method analyzers.

Table 7: Reference Method CEMS Calibration Gases

Pollutant	Level	Cylinder #	Certified Value
CO	Zero	CC19165	0.00 ppm
	Mid	EB0007966	25.1 ppm
	High	CC727587	50.7 ppm
O_2	Zero	CC19165	0.00%
	Mid	EB0010961	11.0%
	High	EB0096884	22.9%
CO_2	Zero	CC19165	0.00%
	Mid	EB0010961	10.8%
	High	EB0096884	22.6%

5.2.2 USEPA Method 10 – Carbon Monoxide

The CO sampling was conducted in accordance with 40 CFR 60, Appendix A, Method 10. A Thermo Scientific Model 48i non-dispersive infrared (NDIR) analyzer with a range of 0-10,000 ppm was used for the pollutant measurements. The Model 48i NDIR analyzer operates on the principle that CO absorbs infrared radiation at a wavelength of 4.6 microns. The sample is drawn into the Model 48i through the sample bulkhead and flows through the optical bench. Radiation from an infrared source is chopped and then passed through a gas filter alternating between CO and N_2. The radiation then passes through a narrow band-pass interference filter and enters the optical bench where absorption by the sample gas occurs. The infrared radiation then exits the optical bench and falls on an infrared detector. The CO gas filter acts to produce a reference beam, which cannot be further attenuated by CO in the sample cell. The N_2 side of the filter wheel is transparent to the infrared radiation and therefore produces a measurement beam, which can be absorbed by CO in the cell. The chopped detector signal is modulated by the alternation between the two gas filters with an amplitude related to the concentration of CO in the sample cell. Other gases do not cause modulation of the detector signal since they absorb the reference and measure beams equally. Thus, the GFC system responds specifically to CO. Since infrared absorption is a non-linear measurement, it is necessary to transform the basic analyzer signal into a linear output. The Model 48i uses an internally stored calibration curve to accurately linearize the instrument output. The Model 48i outputs the CO concentration to the front panel display, the analog outputs and also makes the data available over a serial or Ethernet connection.

The sample was extracted through stainless-steel probes using an air dimensions diaphragm sample pump regulated by a Millennium Instruments flow panel. The sample was then transported to a Universal Analyzer gas conditioner via heated 3/8-inch PTFE sample line maintained above the dew point of the flue gas where the water vapor was removed. The sample was then analyzed continuously for the duration of each test period. The analyzer output was recorded continuously by a STRATA Version 3.2.112 Data Acquisition System (DAS) manufactured by AMP-Cherokee instruments.

USEPA Protocol-1 calibration gases were used to calibrate the analyzer system. A calibration error test was performed on the CO analyzer by introducing a zero, mid and high-level calibration gas directly to the analyzer inlet. A zero gas (nitrogen) of less than 0.25 percent of span, a certified Protocol-1 mid-level (40 to 60 percent) of span and a certified Protocol-1 high-level (100 percent) of span were used for the analyzer calibration error test. At the conclusion of the calibration error test, the zero and an upscale calibration gases were delivered to the probe tip and transported to the analyzer to determine the response time for the analyzer system configuration and to determine if the system had any biases that would affect the sample results. The system bias test was

conducted prior to and at the conclusion of each test run. The concentration of CO was measured in parts per million by volume on a dry basis. The reference method 10 data is presented in Appendix A. The calibration gas certificate of analysis are located in Appendix C.

Figure 1 presents a schematic of the USEPA Method 3A/10 CEMS.

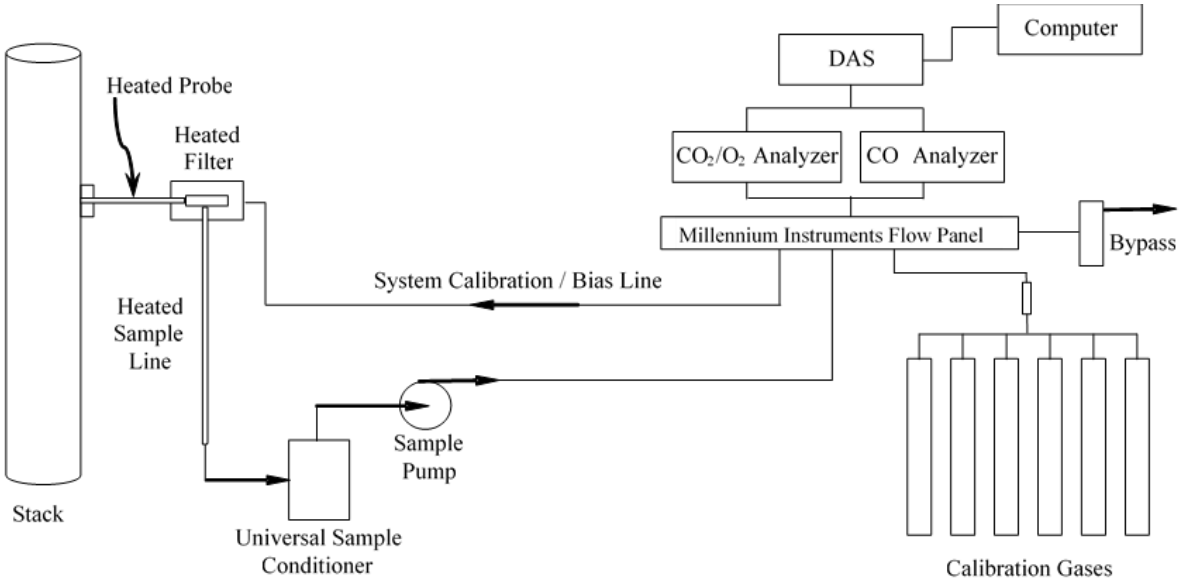

Figure 1: USEPA Method 3A/10 CEMS

The measurement system was required to meet the following QA/QC criteria for this test program:

- Analyzer Calibration Error: ± 2.0 percent of the calibration span for the zero, mid and high level calibration gases.
- System Bias: ± 5.0 percent of the analyzer calibration span for the zero and upscale calibration gases.
- Calibration Drift: ± 3.0 percent of the analyzer calibration span for the zero and mid- or high-level gases.

The O_2 and CO analyzers were located in a temperature-controlled CEMS trailer to minimize thermal effects on the calibration of the instrument. The concentration of O_2 was measured in percentage of oxygen ($\%O_2$) by volume on a dry basis. The concentration of CO was measured in parts per million (ppm) by volume on a dry basis. The reference Method 3A/10 CEMS data is presented in Appendix A.

6.0 QUALITY ASSURANCE / QUALITY CONTROL RESULTS

CEC has established quality assurance and quality control (QA/QC) guidelines for providing quality sampling and analytical data from source tests. These QA/QC procedures were implemented to ensure the acceptability and reliability of the data generated.

In summary, an appropriate degree of data quality was maintained throughout this project. System performance specifications as stated in Methods 3A and 10 were met. A linearity check on each analyzer was conducted to limits of ± 2 percent of span before sampling was commenced. Immediately after each sampling run, system bias and drift determinations were performed to validate the sample's integrity. The results of analyzer calibrations, bias checks and drift checks are presented in Appendix A.

Field data and final results were entered into CEC's air quality data system by a staff professional, and reviewed by a project manager for verification of data. After QC review by the project manager, a senior professional verified the final report for completeness and reasonableness of data. The report was returned to the staff professional for review and preparation of the final draft. The report requires the signature of the staff professional and a project manager before release to the client. Data and final reports are archived in a secured area for a minimum period of seven years.

7.0 DATA UNCERTAINTY

Both qualitative and quantitative factors contribute to field measurement uncertainty and should be taken into consideration when interpreting the results presented in this test report. There are several factors that can affect qualitative and quantitative measurements.

Qualitative uncertainty factors include, but are not limited to, unknown chemical interferences, sample matrix interactions, environmental conditions, sample handling and instrument operation and maintenance. To reduce the impact of these qualitative uncertainty factors, CEC has developed a set of Standard Operating Procedures (SOPs) in accordance with our corporate quality assurance guidelines and ASTM D 7036-04.

Quantitative uncertainty factors known to directly affect uncertainty include the accuracy of calibration standards as well as the precision and accuracy of instrument measurements and the test methods utilized. To reduce the impact of these quantitative uncertainty factors, CEC utilizes testing and analytical methodology that has been approved by EPA or the American Society for Testing and Materials (ASTM) where applicable. In addition, CEC personnel perform routine instrument and equipment calibrations according to manufacturer's guidelines and/or test method specifications.

The limitations of the various methods, instruments, equipment, and materials utilized during this project have been reasonably considered to be in accordance with the project data quality objective, but the ultimate impact of the cumulative uncertainty of this project is not fully identified within the results of this test report.

APPENDIX A

REFERENCE METHOD TEST DATA

Civil & Environmental Consultants, Inc.

Run averages corrected for bias
Operator: Ben Murowchick
Plant Name: Riverside Medical Center
Location: Kankakee, IL
Date: 11/17/2021

Riverside	O2	CO2	CO	CO @
Generator	%	%	ppm	15% O2
Cogen 1	5.47	8.724	0.20	**0.08**
Cogen 2	5.74	8.532	1.09	**0.42**
Cogen 3	5.46	8.728	6.76	**2.58**

Response Time Test

Civil & Environmental Consultants, Inc.

Client	Riverside
Location	Kankakee
Project	314-911
Date	11/17/2021
Unit	Cogen 3, 2, 1
Technician	Ben Murowchick

Riverside Medical Center

CO	Zero Gas	Upscale Gas
	0.00 ppm	50.70 ppm
Downscale Response	Target Concentration 2.54 ppm	Time 53 seconds
Upscale Response	Target Concentration 48.17 ppm	Time 51 seconds

Response Time Test

O_2	Zero Gas	Upscale Gas
	0.00 %	22.90 %
Downscale Response	Target Concentration 1.15 %	Time 42 seconds
Upscale Response	Target Concentration 21.76 %	Time 40 seconds

Riverside Medical Center
Stratification Test

Civil & Environmental Consultants, Inc.

Client	Riverside
Location	Kankakee
Project	314-911
Date	11/17/2021
Unit	Cogen 1
Technician	Ben Murowchick

Sample Point	Sample Time	Oxygen %	Carbon Monoxide ppm
1	8:35	5.85	2.75
2	8:36	5.70	2.62
3	8:37	5.53	2.72
Arithmetic Average		5.70	2.70

Stratification Test Results

Oxygen percent		Carbon Monoxide ppm	
Difference	Status	Difference	Status
2.76	Passed	1.98	Passed
0.14	Passed	-2.84	Passed
-2.90	Passed	0.87	Passed

Calibration Error Test at Run 1 . STRATA Version 3.2.112

		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	Volts	Volts	Volts
11/17/2021	8:12:25	0.229	0.075	13.26	0.0896	0.0294	1.326
11/17/2021	8:13:25	6.21	6.28	-0.68	2.4295	2.4567	-0.068
11/17/2021	8:14:26	22.309	22.276	-1.43	8.7273	8.7143	-0.143
11/17/2021	8:15:25	16.635	16.317	-1.47	6.5074	6.3831	-0.147
11/17/2021	8:16:25	11.101	11.187	-1.35	4.3427	4.3762	-0.135
11/17/2021	8:17:25	14.483	7.476	-1.35	5.6656	2.9247	-0.135
11/17/2021	8:18:26	20.111	0.259	0.31	7.8676	0.1013	0.031
11/17/2021	8:19:25	1.341	0.109	40.93	0.5244	0.0426	4.093
11/17/2021	8:20:25	0.08	0.108	41.87	0.0314	0.0424	4.187
11/17/2021	8:21:25	0.084	0.114	27.35	0.0329	0.0447	2.735

Calibration Error Test at Run 1

Operator:	BJM			
Plant Name:	Riverside Medical			
Location:	Kankakee, IL			
	Reference Cylinder Numbers			
	Zero	Low-range	Mid-range	High-range
O2	CC719165		EB0010961	EB0096884
CO2	CC719165		EB0010961	EB0096884
CO	EB0046706		EB0007966	CC727587

Date/Time	11/17/2021	8:21:47	PASSED	
Analyte	O2	CO2	CO	
Units	%	%	ppm	
Zero Ref Cyl	0	0	0	
Zero Avg	-0.001	0.082	0	
Zero Error%	0	0.3	0	
Low Ref Cyl				
Low Avg				
Low Error%				
Mid Ref Cyl	11	10.8	25.1	
Mid Avg	11.041	11.127	25.29	
Mid Error%	0.2	1.3	0.2	
High Ref Cyl	22.9	22.6	50.7	
High Avg	22.946	22.589	51.03	
High Error%	0.2	0	0.3	

Initial System Bias Check for Run 1 . STRATA Version 3.2.112

		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	Volts	Volts	Volts
11/17/2021	8:22:53	3.478	0.12	11.35	1.3605	0.0471	1.135
11/17/2021	8:23:53	1.549	1.699	0.02	0.606	0.6648	0.002
11/17/2021	8:24:53	10.371	10.604	-0.52	4.0572	4.1482	-0.052
11/17/2021	8:25:53	19.352	2.234	-0.38	7.5705	0.8738	-0.038
11/17/2021	8:26:54	13.526	0.135	4.44	5.2912	0.0529	0.444

Initial System Bias Check for Run 1

Operator:	BJM	
Plant Name:	Riverside Medical	
Location:	Kankakee, IL	
	Reference Cylinder Numbers	
	Zero	Span
O2	CC719165	EB0010961
CO2	CC719165	EB0010961
CO	EB0046706	EB0007966

Date/Time	11/17/2021	8:27:35	PASSED
Analyte	O2	CO2	CO
Units	%	%	ppm
Zero Ref Cyl	0	0	0
Zero Cal	-0.001	0.082	0
Zero Avg	0.02	0.108	-0.1
Zero Bias%	0.1	0.1	0.1
Zero Drift%			
Span Ref Cyl	11	10.8	25.1
Span Cal	11.041	11.127	25.29
Span Avg	10.705	10.922	24.94
Span Bias%	1.3	0.8	0.4
Span Drift%			

Test Run 1 Begin. STRATA Version 3.2.112
Operator: BJM
Plant Name: Riverside Medical
Location: Kankakee, IL

		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	Volts	Volts	Volts
11/17/2021	8:28:35	11.422	0.165	16.57	4.4683	0.0647	1.657
11/17/2021	8:29:36	18.201	1.452	7.94	7.1202	0.5679	0.794
11/17/2021	8:30:36	6.528	8.267	58.99	2.5538	3.234	5.899
11/17/2021	8:31:36	6.027	8.54	4.07	2.3577	3.3407	0.407
11/17/2021	8:32:35	6.066	8.508	4.12	2.3729	3.3283	0.412
11/17/2021	8:33:36	6.056	8.517	3.49	2.3691	3.3319	0.349
11/17/2021	8:34:36	5.973	8.54	3.05	2.3365	3.3409	0.305
11/17/2021	8:35:35	5.853	8.536	2.75	2.2898	3.3393	0.275
11/17/2021	8:36:36	5.704	8.576	2.62	2.2314	3.3551	0.262
11/17/2021	8:37:36	5.531	8.674	2.72	2.1636	3.3932	0.272
11/17/2021	8:38:35	5.354	8.788	3.4	2.0944	3.438	0.34
11/17/2021	8:39:36	5.186	8.895	5.26	2.0287	3.4798	0.526
11/17/2021	8:40:35	5.105	8.946	6.04	1.9973	3.4997	0.604
11/17/2021	8:41:36	4.984	9.026	7.19	1.9496	3.5311	0.719
11/17/2021	8:42:36	4.829	9.124	7.69	1.889	3.5693	0.769
11/17/2021	8:43:36	4.605	9.27	7.2	1.8016	3.6263	0.72
11/17/2021	8:44:35	4.589	9.276	6.6	1.7951	3.6287	0.66

Begin calculating run averages
Pause
End Pause

11/17/2021	8:46:14	8.07	7.317	2.34	3.1571	2.8624	0.234
Average of Test Run		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	%	%	ppm
11/17/2021	8:46:16	10.452	5.963	2.02	4.0887	2.3326	0.202

Test Run 1 End

Final System Bias Check for Run 1 . STRATA Version 3.2.112

		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	Volts	Volts	Volts
11/17/2021	8:47:18	2.104	3.835	2.71	0.823	1.5001	0.271
11/17/2021	8:48:18	0.379	0.235	-0.43	0.1484	0.0919	-0.043
11/17/2021	8:49:19	9.806	9.797	-0.98	3.8362	3.8327	-0.098
11/17/2021	8:50:18	11.526	10.162	-1.11	4.509	3.9753	-0.111
11/17/2021	8:51:18	20.842	0.767	-0.78	8.1533	0.3002	-0.078
11/17/2021	8:52:19	14.405	-0.011	3.87	5.6352	-0.0045	0.387

Final System Bias Check for Run 1

Operator: BJM

Plant Name: Riverside Medical

Location: Kankakee, IL

	Reference Cylinder Numbers	
	Zero	Span
O2	CC719165	EB0010961
CO2	CC719165	EB0010961
CO	EB0046706	EB0007966

Date/Time	11/17/2021	8:53:02	PASSED
Analyte	O2	CO2	CO
Units	%	%	ppm
Zero Ref Cyl	0	0	0
Zero Cal	-0.001	0.082	0
Zero Avg	0.099	-0.018	-0.02
Zero Bias%	0.4	0.4	0
Zero Drift%	0.3	-0.5	0.1
Span Ref Cyl	11	10.8	25.1
Span Cal	11.041	11.127	25.29
Span Avg	10.919	10.858	25.28
Span Bias%	0.5	1.1	0
Span Drift%	0.9	-0.3	0.3
Ini Zero Avg	0.02	0.108	-0.1
Ini Span Avg	10.705	10.922	24.94
Run Avg	10.452	5.963	2.02
Co	0.06	0.045	-0.06
Cm	10.812	10.89	25.11
Correct Avg	10.631	5.893	2.07

Test Engine 1 Begin. STRATA Version 3.2.112
Operator: BJM
Plant Name: Riverside Medical
Location: Kankakee, IL

		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	Volts	Volts	Volts
11/17/2021	8:54:02	2.825	5.076	17.21	1.1051	1.9858	1.721
11/17/2021	8:55:03	5.373	8.749	0.71	2.102	3.4225	0.071
11/17/2021	8:56:02	5.519	8.727	0.44	2.159	3.4141	0.044
11/17/2021	8:57:02	5.524	8.733	0.33	2.1611	3.4164	0.033
11/17/2021	8:58:03	5.532	8.732	0.26	2.164	3.416	0.026
11/17/2021	8:59:02	5.497	8.756	0.2	2.1506	3.4254	0.02
11/17/2021	9:00:02	5.526	8.739	0.13	2.1617	3.4188	0.013
Begin calculating run averages							
11/17/2021	9:01:04	5.528	8.742	0.08	2.1627	3.42	0.008
11/17/2021	9:02:05	5.499	8.769	0.02	2.1512	3.4303	0.002
11/17/2021	9:03:04	5.49	8.778	-0.01	2.1478	3.4341	-0.001
11/17/2021	9:04:04	5.468	8.788	-0.07	2.1391	3.438	-0.007
11/17/2021	9:05:05	5.49	8.782	-0.06	2.1476	3.4357	-0.006
11/17/2021	9:06:04	5.469	8.798	-0.1	2.1396	3.4418	-0.01
11/17/2021	9:07:04	5.507	8.779	-0.1	2.1544	3.4343	-0.01
11/17/2021	9:08:05	5.481	8.793	0.01	2.144	3.4397	0.001
11/17/2021	9:09:04	5.492	8.789	0.15	2.1486	3.4383	0.015
11/17/2021	9:10:05	5.465	8.806	0.12	2.1379	3.4451	0.012
11/17/2021	9:11:04	5.478	8.806	0.13	2.1432	3.4448	0.013
11/17/2021	9:12:04	5.51	8.787	0.15	2.1556	3.4373	0.015
11/17/2021	9:13:05	5.496	8.799	0.08	2.1502	3.4422	0.008
11/17/2021	9:14:04	5.487	8.803	0.07	2.1466	3.4435	0.007
11/17/2021	9:15:05	5.46	8.821	0.06	2.1361	3.451	0.006
Average of Test Run		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	%	%	ppm
11/17/2021	9:15:05	5.488	8.789	0.04	2.147	3.4384	0.004

Test Engine 1 End

Final System Bias Check for Engine 1 . STRATA Version 3.2.112

		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	Volts	Volts	Volts
11/17/2021	9:16:12	2.384	3.472	0.81	0.9327	1.3583	0.081
11/17/2021	9:17:11	0.138	0.065	0.18	0.0542	0.0253	0.018
11/17/2021	9:18:12	7.556	7.635	-0.18	2.956	2.9866	-0.018
11/17/2021	9:19:12	10.914	10.869	-0.47	4.2694	4.2519	-0.047
11/17/2021	9:20:12	18.142	1.772	0.18	7.0973	0.6931	0.018

Final System Bias Check for Engine 1

Operator: BJM
Plant Name: Riverside Medical
Location: Kankakee, IL

	Reference Cylinder Numbers	
	Zero	Span
O2	CC719165	EB0010961
CO2	CC719165	EB0010961
CO	EB0046706	EB0007966

Date/Time	11/17/2021	9:20:59	PASSED
Analyte	O2	CO2	CO
Units	%	%	ppm
Zero Ref Cyl	0	0	0
Zero Cal	-0.001	0.082	0
Zero Avg	0.13	0.052	-0.32
Zero Bias%	0.5	0.1	0.3
Zero Drift%	0.1	0.3	-0.3
Span Ref Cyl	11	10.8	25.1
Span Cal	11.041	11.127	25.29
Span Avg	10.932	10.895	25.25
Span Bias%	0.4	0.9	0
Span Drift%	0	0.2	0
Ini Zero Avg	0.099	-0.018	-0.02
Ini Span Avg	10.919	10.858	25.28
Run Avg	5.488	8.789	0.04
Co	0.114	0.017	-0.17
Cm	10.925	10.877	25.27
Correct Avg	5.468	8.724	0.2

Test Engine 2 Begin. STRATA Version 3.2.112
Operator: BJM
Plant Name: Riverside Medical
Location: Kankakee, IL

		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	Volts	Volts	Volts
11/17/2021	9:22:00	3.171	5.041	17.18	1.2404	1.9721	1.718
11/17/2021	9:23:00	13.198	4.202	0.45	5.1632	1.6437	0.045
11/17/2021	9:23:59	20.599	0.124	0.2	8.0585	0.0486	0.02
11/17/2021	9:25:00	20.711	0.065	0.17	8.102	0.0253	0.017
11/17/2021	9:26:00	20.719	0.058	0.16	8.1052	0.0226	0.016
11/17/2021	9:26:59	20.726	0.051	0.16	8.1079	0.02	0.016
11/17/2021	9:28:00	20.663	0.09	0.23	8.0836	0.0354	0.023
11/17/2021	9:29:00	8.997	6.904	5.64	3.5195	2.7008	0.564
11/17/2021	9:30:00	4.061	9.616	6.96	1.5887	3.7617	0.696
11/17/2021	9:31:00	4.402	9.41	6.1	1.7222	3.6814	0.61
11/17/2021	9:32:00	4.823	9.165	5.15	1.8868	3.5854	0.515
11/17/2021	9:33:00	5.081	9.018	4.93	1.9877	3.5277	0.493
11/17/2021	9:34:00	5.254	8.902	4.44	2.0553	3.4825	0.444
11/17/2021	9:35:00	5.489	8.746	3.81	2.1471	3.4216	0.381
11/17/2021	9:36:00	5.783	8.567	3.63	2.2625	3.3515	0.363
11/17/2021	9:37:00	5.743	8.587	2.94	2.2466	3.359	0.294
11/17/2021	9:37:59	5.734	8.589	2.43	2.2431	3.3601	0.243
11/17/2021	9:39:00	5.687	8.616	2.06	2.2246	3.3706	0.206
11/17/2021	9:40:00	5.714	8.601	1.81	2.2352	3.3646	0.181
Begin calculating run averages							
11/17/2021	9:41:04	5.614	8.67	1.53	2.1962	3.3916	0.153
11/17/2021	9:42:04	5.764	8.591	1.34	2.2547	3.3608	0.134
11/17/2021	9:43:05	5.917	8.51	1.41	2.3146	3.3291	0.141
11/17/2021	9:44:05	5.916	8.516	1.25	2.3142	3.3314	0.125
11/17/2021	9:45:04	5.824	8.574	1.03	2.2785	3.3543	0.103
11/17/2021	9:46:05	5.869	8.546	1.15	2.2958	3.343	0.115
11/17/2021	9:47:05	5.848	8.557	1.02	2.2879	3.3474	0.102
11/17/2021	9:48:05	5.821	8.567	0.84	2.2772	3.3513	0.084
11/17/2021	9:49:05	5.849	8.542	0.79	2.2882	3.3416	0.079
11/17/2021	9:50:05	5.911	8.504	0.87	2.3123	3.3268	0.087
11/17/2021	9:51:05	5.766	8.59	0.57	2.2558	3.3605	0.057
11/17/2021	9:52:05	5.704	8.623	0.45	2.2315	3.3734	0.045
11/17/2021	9:53:05	5.71	8.614	0.41	2.2337	3.3699	0.041
11/17/2021	9:54:05	5.638	8.655	0.33	2.2057	3.3858	0.033
11/17/2021	9:55:05	5.595	8.674	0.3	2.1887	3.3932	0.03
Average of Test Run		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	%	%	ppm
11/17/2021	9:55:05	5.783	8.582	0.89	2.2623	3.3573	0.089

Test Engine 2 End

Final System Bias Check for Engine 2 . STRATA Version 3.2.112

		O2 %	CO2 %	CO ppm	O2 Volts	CO2 Volts	CO Volts
11/17/2021	9:56:08	2.99	4.29	0.92	1.1696	1.6783	0.092
11/17/2021	9:57:09	1.488	1.368	0.12	0.5823	0.535	0.012
11/17/2021	9:58:09	10.467	10.362	-0.49	4.0945	4.0535	-0.049
11/17/2021	9:59:08	15.77	5.817	-0.45	6.169	2.2757	-0.045
11/17/2021	10:00:08	14.07	0.072	3.95	5.5042	0.0283	0.395

Final System Bias Check for Engine 2

Operator:	BJM	
Plant Name:	Riverside Medical	
Location:	Kankakee, IL	
	Reference Cylinder Numbers	
	Zero	Span
O2	CC719165	EB0010961
CO2	CC719165	EB0010961
CO	EB004670(	EB0007966

Date/Time	########	10:00:48	PASSED
Analyte	O2	CO2	CO
Units	%	%	ppm
Zero Ref Cyl	0	0	0
Zero Cal	-0.001	0.082	0
Zero Avg	0.176	0.018	-0.12
Zero Bias%	0.7	0.3	0.1
Zero Drift%	0.2	-0.1	0.2
Span Ref Cyl	11	10.8	25.1
Span Cal	11.041	11.127	25.29
Span Avg	10.945	10.814	25.16
Span Bias%	0.4	1.3	0.1
Span Drift%	0.1	-0.3	-0.1
Ini Zero Avg	0.13	0.052	-0.32
Ini Span Avg	10.932	10.895	25.25
Run Avg	5.783	8.582	0.89
Co	0.153	0.035	-0.22
Cm	10.938	10.855	25.21
Correct Avg	5.742	8.532	1.09

Test Engine 3 Begin. STRATA Version 3.2.112
Operator: BJM
Plant Name: Riverside Medical
Location: Kankakee, IL

		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	Volts	Volts	Volts
11/17/2021	10:01:49	11.581	0.015	17.18	4.5305	0.0057	1.718
11/17/2021	10:02:49	20.664	0.03	0.37	8.0838	0.0117	0.037
11/17/2021	10:03:49	20.747	0.023	0.14	8.1164	0.009	0.014
11/17/2021	10:04:49	20.748	0.02	0.08	8.1166	0.0077	0.008
11/17/2021	10:05:49	8.822	6.991	1.71	3.4512	2.7347	0.171
11/17/2021	10:06:49	3.965	9.632	4.32	1.5509	3.7679	0.432
11/17/2021	10:07:49	4.484	9.317	4.83	1.7542	3.6447	0.483
11/17/2021	10:08:50	4.982	9.026	5.03	1.9489	3.5308	0.503
11/17/2021	10:09:49	5.136	8.939	5.45	2.0092	3.4968	0.545
11/17/2021	10:10:49	5.208	8.898	5.92	2.0372	3.481	0.592
11/17/2021	10:11:50	5.398	8.78	6.37	2.1116	3.4346	0.637
11/17/2021	10:12:49	5.598	8.663	6.75	2.1901	3.3888	0.675
11/17/2021	10:13:49	5.571	8.669	6.72	2.1793	3.3915	0.672
11/17/2021	10:14:50	5.554	8.677	6.63	2.1728	3.3944	0.663
Begin calculating run averages							
11/17/2021	10:16:12	5.54	8.676	6.5	2.1672	3.394	0.65
11/17/2021	10:17:13	5.519	8.698	6.49	2.1589	3.4027	0.649
11/17/2021	10:18:13	5.525	8.711	6.5	2.1614	3.4079	0.65
11/17/2021	10:19:13	5.52	8.717	6.47	2.1596	3.4102	0.647
11/17/2021	10:20:12	5.506	8.726	6.52	2.1538	3.4136	0.652
11/17/2021	10:21:13	5.496	8.737	6.4	2.1501	3.4178	0.64
11/17/2021	10:22:13	5.507	8.736	6.37	2.1544	3.4173	0.637
11/17/2021	10:23:14	5.486	8.753	6.53	2.146	3.4242	0.653
11/17/2021	10:24:12	5.527	8.731	6.66	2.1622	3.4156	0.666
11/17/2021	10:25:13	5.5	8.753	6.72	2.1518	3.4241	0.672
11/17/2021	10:26:13	5.51	8.746	6.86	2.1555	3.4214	0.686
11/17/2021	10:27:13	5.544	8.727	6.92	2.1689	3.4141	0.692
11/17/2021	10:28:13	5.525	8.719	6.9	2.1612	3.411	0.69
11/17/2021	10:29:12	5.546	8.693	6.94	2.1695	3.4006	0.694
11/17/2021	10:30:13	5.531	8.685	6.94	2.1638	3.3977	0.694
Average of Test Run		O2	CO2	CO	O2	CO2	CO
		%	%	ppm	%	%	ppm
11/17/2021	10:30:13	5.519	8.721	6.65	2.1589	3.4115	0.665

Test Engine 3 End

Final System Bias Check for Engine 3 . STRATA Version 3.2.112

		O2 %	CO2 %	CO ppm	O2 Volts	CO2 Volts	CO Volts
11/17/2021	10:31:25	2.8	3.973	5.88	1.0954	1.5541	0.588
11/17/2021	10:32:25	1.976	1.84	0.08	0.7731	0.7198	0.008
11/17/2021	10:33:26	10.619	10.469	-0.62	4.1542	4.0954	-0.062
11/17/2021	10:34:26	18.921	2.675	-0.44	7.4021	1.0465	-0.044
11/17/2021	10:35:26	21.753	0.015	-0.19	8.5098	0.0059	-0.019
11/17/2021	10:36:26	6.262	-0.005	12.1	2.4496	-0.0021	1.21

Final System Bias Check for Engine 3

Operator:	BJM	
Plant Name:	Riverside Medical	
Location:	Kankakee, IL	
	Reference Cylinder Numbers	
	Zero	Span
O2	CC719165	EB0010961
CO2	CC719165	EB0010961
CO	EB0046706	EB0007966

Date/Time	11/17/2021	10:36:48	PASSED
Analyte	O2	CO2	CO
Units	%	%	ppm
Zero Ref Cyl	0	0	0
Zero Cal	-0.001	0.082	0
Zero Avg	0.202	0.009	-0.18
Zero Bias%	0.8	0.3	0.2
Zero Drift%	0.1	0	-0.1
Span Ref Cyl	11	10.8	25.1
Span Cal	11.041	11.127	25.29
Span Avg	10.924	10.76	25.03
Span Bias%	0.5	1.5	0.3
Span Drift%	-0.1	-0.2	-0.1
Ini Zero Avg	0.176	0.018	-0.12
Ini Span Avg	10.945	10.814	25.16
Run Avg	5.519	8.721	6.65
Co	0.189	0.014	-0.15
Cm	10.934	10.787	25.1
Correct Avg	5.456	8.728	6.76

Interference Check

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Thermo Scientific Model 48i CO and Model 410i O_2 Analyzer
Potential Interference Gas Response

Potential Interference		Thermo Scientific Model 48i	Thermo Scientific Model 410i
Test Gas	Concentration	CO	O_2
CO_2	4.99 %	0.040 ppm	N/A
CO_2	19.8 %	0.113 ppm	N/A
H_2O	1.00 %	N/A	N/A
NO	10.0 ppm	N/A	0.03 %
NO_2	12.65 ppm	N/A	N/A
N_2O	10 ppm	N/A	N/A
CO	50	N/A	N/A
SO_2	20	N/A	N/A
CH_4	50.4 ppm	N/A	N/A
HCl	12 ppm	N/A	N/A
H_2	50	N/A	N/A
NH_3	9.97 ppm	N/A	N/A
Sum of Responses		0.153	.03
Span Value		100	20
% of Calibration Span		0.1 %	0.002 %

Interference acceptable criteria – Sum of responses ≤ 2.5% of the analyzer calibration span. Alternatively, sum of responses: ≤ 0.5 ppmv for calibration spans of 5 to 10 ppmv or ≤ 0.2 ppmv for calibrations spans < 5 ppmv.

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To Whom It May Concern:

In an effort to assist our customers with meeting the requirements of the Instrumental Methods for testing, 3A, 6C, 7E, 10, and 20, we are providing a summary of interferences for certain Thermo Scientific analyzers.

The requirement for conducting analyzer interference checks for potential interfering gases is the responsibility of the testing organizations. The Methods do, however, allow the manufacturer of instruments to provide this data. Test are required to be conducted on the same "make and model" as those being used for method testing.

The information contained in the accompanying tables pertains to the "make" of analyzers under the names of; Thermo Electron Corporation, Thermo Environmental Instruments and Thermo Scientific. The "model" are models; Model 42 for NO, NO_2, NO_x, Model 43 for SO_2, and Model 410i for CO_2. The specific pollutant detection and analytical technology for each of the above listed specific models have remained the same for the various series of analyzers manufactured over the past years. Therefore, the interference test results shown for iSeries analyzers would produce essentially the same results for C Series and earlier Series of these models.

The potential interference gases test results shown in the tables to follow indicate that none of the Thermo Scientific analyzers tested have a collective analytical detection interference that would sum more than 0.06% of analyzer span value. The acceptance criterion is; the sum of the interference responses must not be greater than 2.5% of analyzer span value.

If you have any questions regarding the information contained herein please do no hesitate to contact us.

Thermo Fisher Scientific

Frank Duckett
Product Manager, Continuous Gas Analyzers
Air Quality Instruments

Air Quality Instruments
Environmental Instruments
27 Forge Parkway
Franklin, MA
02038
(508) 520-0430
(508) 520-1460 fax
www.thermofisher.com

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Thermo Scientific Model 43 SO_2 and Model 410i CO_2 Analyzer
Potential Interference Gas Responses

Potential Interferent		Model 43iLH	Model 410iHL
Test Gas	Concentration	SO_2	CO_2
CO_2	5.20%	0.03	5.2
CO_2	15.60%	0.14	15.6
H_2O	1.00%	-0.05	0
NO	15 ppm	0.2	0
NO_2	15 ppm	0.06	0
N_2O	10 ppm	0	0
CO	50 ppm	0	0
SO_2	21 ppm	21	0
CH_4	50 ppm	0	0
HCl	10 ppm	0	0
NH_3	10 ppm	0	0
Sum of Responses		0.45	0
Span Value		800	16
% of Calibration Span		0.06%	0%

Acceptance Criteria found in Section 13.4 of Method 7E is the sum of responses must not be greater than 2.5% of the analyzer calibration span value.

This document is subject to change without notice.

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Thermo Scientific Model 42 NO-NO_2-NO_x Analyzer
Potential Interference Gas Responses

Potential Interferent		Model 42iLS			Model 42iHL		
Test Gas	Concentration	NO	NO_2	NO_x	NO	NO_2	NO_x
CO_2	5.20%	0.001	0.004	0.004	0.001	0.003	0.004
CO_2	15.60%	0	0.003	0.003	0.001	0.004	0.005
H_2O	1.00%	0	0	0	0.003	0.001	0.004
NO	15 ppm	14.9	0.1	15	15	-0.06	14.99
NO_2	15 ppm	1.1	14	15	0.4	14.6	15
N_2O	10 ppm	0	0	0	0	0	0
CO	50 ppm	0	0	0	0	0	0
SO_2	21 ppm	-0.01	0	-0.01	0.007	0	0.007
CH_4	50 ppm	0	0	0	0	0	0
HCl	10 ppm	0	0.006	0.006	0	0.004	0.004
NH_3[1]	10 ppm	0	0	0	0.17	8.9	9.1
Sum of Responses		0.011	0.01	0.02	0.011	0.009	0.02
Span Value		160	152	160	160	152	160
% of Calibration Span		0.01%	0.01%	0.01%	0.01%	0.01%	0.01%

Acceptance Criteria found in Section 13.4 of Method 7E is the sum of responses must not be greater than 2.5% of the analyzer calibration span value.

[1]NH_3 interferent results shown for the Model 42iHL was not used in calculation of interference response check because it is a known interferent with an approximate 1 ppm to 1 ppm positive bias in analyzers using stainless steel NO_2 to NO converters. Thermo recommends that NO_x analyzers with stainless steel NO_2 to NO converters must use a NH_3 scrubber when testing sources with potential NH_3 in the flue gas.

This document is subject to change without notice.

www.thermofisher.com

CPMS

CPMS

Civil & Environmental Consultants, Inc.

Client	Riverside
Location	Kankakee
Project	314-911
Date	11/17/2021
Unit	Cogen 1, 2, and 3
Technician	Ben Murowchick

Generator	Pre run Fuel	Post Run Fuel	Fuel Usage (cf)	Engine Load	CPMS Pressure Drop	Reference Pressure Drop
1	269700	271200	1500	570 kW	2.16 in H2O	2.15 in H2O
2	273600	275300	1700	576 kW	3.31 in H2O	3.44 in H2O
3	277300	278900	1600	580kW	2.18 in H2O	3.21 in H2O

Generator	Temperature F	Pre Cat CPMS Temperature	Pre Cat Reference Temperature	Post Cat CPMS Temperature	Post Cat Reference Temperature
1		901	907	845	854
2		954	953	922	916
3		845	846	860	864

Manometer Leak Check

Civil & Environmental Consultants, Inc.

Client	Riverside Medical Center
Location	Riverside Medical Center
Project#	314-911
Date	11/17/2021
Unit	1

Manometer	"H2O	Time (seconds)
Pre leak check	5	15
Post leak check	6	15

APPENDIX B

FIELD DATA

Facility Data

Client Riverside Medical Center
Location Kankakee
Project No. 314-911
Date 11-17-21
Unit (s) 3 engines 1, 2, 3

Engine #	Time Start - End	Fuel Con. Start (cf)	Fuel Con. End (cf)	Engine Load
CoGen #1	900 915	00269700	00271200	570
#2	940 955	00273600	00275300	576
#3	1015 1030	00277300	00278900	580

CPMS Annual Inspection Data Sheet

Site: Riverside Medical Center Kankakee
Generator: Co Generator 1
Date: 11-17-21
Technician: Pierre BOURGEADE

1. **Visual Inspection of K-Type Thermocouple with Extension Wire**
   Note condition and indicate if replacement performed:
   Good Condition

2. **Visual Inspection of Enclosure and CPMS**
   Note condition of sensing lines and indicate if replacement performed:
   Good Condition

3. **Accuracy Verification of Thermocouple**[2]

	CPMS Temperature (F)	*Reference Temperature (F)*	*Reference Serial Number*	*Reference Source*
Pre	901	907	TMD-52 / 1196	thermometer
Post	845	854		

4. **Accuracy Verification of Pressure Transducer**

CPMS Pressure Drop (in water)	*Reference Pressure Drop (in. water)*	*Reference type*
2.16	2.15	475-00 FM Nist manometer

[2] According to PattenCat, there is little to be done to calibrate the thermocouple. To check the reading values, the thermocouples can be pulled and another put in place to be used as a comparison.

CPMS Annual Inspection Data Sheet

Site: Riverside M.C. Kankakee
Generator: Co Generator 2
Date: 11-17-21
Technician: Pierre BOURGEATE

1. **Visual Inspection of K-Type Thermocouple with Extension Wire**
   Note condition and indicate if replacement performed:
   Good Condition.

2. **Visual Inspection of Enclosure and CPMS**
   Note condition of sensing lines and indicate if replacement performed:
   Good Condition.

3. **Accuracy Verification of Thermocouple**

	CPMS Temperature (F)	*Reference Temperature (F)*	*Reference Serial Number*	*Reference Source*
Pre	954	953	TMJ52 / 71916	thermometer
Post	922	916		

4. **Accuracy Verification of Pressure Transducer**

CPMS Pressure Drop (in water)	*Reference Pressure Drop (in. water)*	*Reference type* 47500 FMNIST
3.31	3.44	manometer

CPMS Annual Inspection Data Sheet

Site: Riverside MC Kankakee
Generator: CO Generator 3.
Date: 11-17-21
Technician: Pierre Bourgeois

1. **Visual Inspection of K-Type Thermocouple with Extension Wire**
Note condition and indicate if replacement performed:
Good Condition

2. **Visual Inspection of Enclosure and CPMS**
Note condition of sensing lines and indicate if replacement performed:
Good Condition

3. **Accuracy Verification of Thermocouple**

CPMS Temperature (F)	*Reference Temperature (F)*	*Reference Serial Number*	*Reference Source*
845	846	TMD 52/71916	thermometer
860	864		

4. **Accuracy Verification of Pressure Transducer**

CPMS Pressure Drop (in water)	*Reference Pressure Drop (in. water)*	*Reference type* 4780 FM NIST
2.18	3.21	manometer

APPENDIX C

CALIBRATIONS AND GAS CERTIFICATIONS

CERTIFICATE OF CALIBRATION

Dwyer Instruments, Inc. P.O. Box 373 Michigan City, IN 46361
Fax: (219) 872-9057 Phone: (219) 879-8000

Customer: CIVIL AND ENVIRONMENTAL CONSULTANTS
Address: 3000 LITTLE HILLS EXPY STE 102
SAINT CHARLES, MO. 63301

Date March 4, 2021
Due March 4, 2022
PO # S487748/REPLACE
Model # 475-00-FM
Sales Order # S543031
RGA #
Certificate No.: 21DWY09-560

Accuracy: 0.50% % of Span

Input High:	4	Scale High:	4
Input Low:	0	Scale Low:	0
Input Span:	4	Scale Span:	4
Input Units:	Inches W.C.	Scale Units:	Inches W.C.

This certifies that the instrument listed below has been calibrated using a standard having an accuracy as listed, and is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST). Master Gage Accuracy: 0.1% % Full Scale

Calibration Standard Information

	Serial No.	Cert. Rpt. No.	Last Cal. Date
Base:	49412	20DWYPSL-0261	12/01/20
Module 1:	39392	QA1900R	09/15/20
Module 2:			

Instrument Information

I.D. No. of Instrument being Calibrated
S543031-001
Customer's I.D. No. (If Different)

Instrument Status	X New	After Repair	As Received

Notes:

NEW / AS RECEIVED

Input Pressure Setting	Instrument Scale Reading	% Scale Error
0.000	0.000	0.000%
1.003	1.003	0.010%
2.009	2.008	-0.017%
3.003	3.003	0.010%
4.007	4.007	-0.012%

AFTER REPAIR OR CAL.

Signed: _____ **Procedure No.:** TC-00030

PRESSURE

FR# 01-001019-00
Rev. 9 (08/03)

ACCREDITED
A2LA Certificate No. 1750.01
Calibration

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4421-11919003

Traceable® Certificate of Calibration for Waterproof Food Thermometer

Manufactured for and distributed by : Fisher Scientific "300 Industry Drive,,Pittsburgh,PA,15275-1001"

Instrument Identification:

Model: 14-649-101,11769715 S/N: 210071916 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Temperature Calibration Bath	93139		
Thermistor Module	A17118	26 Jun 2021	100455972
Temperature Calibration Bath	A42238		
Temperature Probe	3039	26 Jun 2021	15-C8Q9F-20-1
Digital Thermometer	200821229	18 Dec 2021	4000-11821388

Certificate Information:

Technician: 420 Procedure: CAL-03 Cal Date: 01 Feb 2021 Cal Due Date: 01 Feb 2023

Test Conditions: 37.36%RH 22.69°C 1026mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C	N.A.	N.A.		0.00	0.0	Y	-0.4	0.4	0.058	>4:1
°C	N.A.	N.A.		50.00	49.9	Y	49.6	50.4	0.058	>4:1

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement : (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ± U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min=As Left Nominal(Rounded) – Tolerance; Max= As Left Nominal(Rounded) + Tolerance;

Nicol Rodriguez

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

Maintaining Accuracy:

In our opinion once calibrated your Waterproof Food Thermometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Waterproof Food Thermometer change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

Issue Date : 01 Feb 2021

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.traceable.com

Type-K Thermocouple Calibration Worksheet

Thermocouple ID: TC-120-4

Reference Thermometer S/N: 210071916

Reference Point	Source	Reference Temperature		Type-K Temp. (°F)	% Difference (°R)
		Target (°F)	Actual (°F)		
1	Ice Water	32	33	35	0.41%
2	Ice Water	32	33	35	0.41%
3	Ice Water	32	33	35	0.41%
1	Dry Block	212	211	208	-0.45%
2	Dry Block	212	211	208	-0.45%
3	Dry Block	212	211	208	-0.45%
1	Dry Block	300	298	299	0.13%
2	Dry Block	300	298	299	0.13%
3	Dry Block	300	298	299	0.13%

Calibrated By: BJM

Date: 11/19/2021

Signature: BJM

*** Calibration Accuracy Range ± 1.5 %**

Red Ball Technical Gas Service
555 Craig Kennedy Way
Shreveport, LA 71107
800-551-8150
PGVP Vendor ID # G12020

PJLA Calibration and Testing
Accreditation #62754

EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

Cylinder Number:	CC727587	**Certification Date:**	08/25/2020
Product ID Number:	124236	**Expiration Date:**	08/23/2028
Cylinder Pressure:	1900 PSIG	**MFG Facility:**	- Shreveport - LA
COA #	CC727587.20200818-0	**Lot Number:**	CC727587.20200818
Customer PO. NO.:		**Tracking Number:**	098854879
Customer:		**Previous Certification Dates:**	

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

Certified Concentration(s)

Component	Concentration	Uncertainty	Analytical Principle	Assayed On
Carbon Monoxide	**50.7 PPM**	±0.3 PPM	FTIR	08/25/2020
Nitrogen	Balance			

Analytical Measurement Data Available Online.

Reference Standard(s)

Serial Number	Lot	Expiration	Type	Balance	Component	Concentration	Uncertainty(%)	NIST Reference
EB0081003	EB0081003.20190205	01/08/2028	GMIS	N2	CO	201.4 PPM	0.461	SRM 1680b

Analytical Instrumentation

Component	Principle	Make	Model	Serial	MPC Date
CO	FTIR	MKS	MKS 2031DJG2EKVS13T	017146467	08/24/2020

SMART-CERT

This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

Anthony Cyr
Assistant Operations Manager
Assay Laboratory: Red Ball TGS
Version 02-J, Revised on 2018-09-17

Red Ball Technical Gas Service
555 Craig Kennedy Way
Shreveport, LA 71107
800-551-8150
PGVP Vendor ID # G12018

PJLA Calibration and Testing
Accreditation #62754

EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

Cylinder Number:	EB0007966	**Certification Date:**	04/05/2018
Product ID Number:	124652	**Expiration Date:**	04/03/2026
Cylinder Pressure:	1900 PSIG	**MFG Facility:**	- Shreveport - LA
COA #	EB0007966.20180326-0	**Lot Number:**	EB0007966.20180326
Customer PO. NO.:		**Tracking Number:**	013132017
Customer:		**Previous Certification Dates:**	

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

Certified Concentration(s)

Component	Concentration	Uncertainty	Analytical Principle	Assayed On
Carbon Monoxide	**25.1 PPM**	±0.15 PPM	GCF	04/05/2018
Nitrogen	Balance			

Analytical Measurement Data Available Online.

Reference Standard(s)

Serial Number	Lot	Expiration	Type	Balance	Component	Concentration	Uncertainty(%)	NIST Reference
EB0087736	EB0087736.20160721	10/30/2025	GMIS	N2	CO	202.6 PPM	0.395	1681B

Analytical Instrumentation

Component	Principle	Make	Model	Serial	MPC Date
CO	GCF	Thermo	T48i	11708001	04/04/2018

SMART-CERT

This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

Anthony Cyr
Analytical Chemist
Assay Laboratory: Red Ball TGS
Version 02-I, Revised on 2017-09-07

RED BALL TECHNICAL GAS SERVICES

PJLA Calibration and Testing
Accreditation #62754

Red Ball Technical Gas Service
555 Craig Kennedy Way
Shreveport, LA 71107
800-551-8150
PGVP Vendor ID # G12020

EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

Cylinder Number:	EB0010961	**Certification Date:**	08/21/2020
Product ID Number:	125371	**Expiration Date:**	08/19/2028
Cylinder Pressure:	1900 PSIG	**MFG Facility:**	- Shreveport - LA
COA #	EB0010961.20200810-0	**Lot Number:**	EB0010961.20200810
Customer PO. NO.:		**Tracking Number:**	013067087
Customer:		**Previous Certification Dates:**	

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

Certified Concentration(s)

Component	Concentration	Uncertainty	Analytical Principle	Assayed On
Carbon Dioxide	**10.80 %**	±0.08 %	NDIR	08/21/2020
Oxygen	**11.00 %**	±0.06 %	MPA	08/19/2020
Nitrogen	Balance			

Analytical Measurement Data Available Online.

Reference Standard(s)

Serial Number	Lot	Expiration	Type	Balance	Component	Concentration	Uncertainty(%)	NIST Reference
EB0006119	EB0006119.20190327	06/18/2027	GMIS	N2	CO2	9.51 %	0.191	C1579010.02
EB0041474	EB0041474.20180504	07/21/2026	GMIS	N2	O2	24 %	0.497	071001
EB0059422	EB0059422.20191017	01/07/2028	GMIS	N2	O2	12.02 %	0.139	SRM 2659a
EB0097897	EB0097897.20171018	02/06/2026	GMIS	N2	CO2	24.9 %	0.398	C1309410.01

Analytical Instrumentation

Component	Principle	Make	Model	Serial	MPC Date
O2	MPA	Thermo	410i	1162980025	07/23/2020
CO2	NDIR	Thermo	410i	1162980025	08/03/2020

SMART-CERT

This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

Jasmine Godfrey

Jasmine Godfrey
Analytical Chemist
Assay Laboratory: Red Ball TGS
Version 02-J, Revised on 2018-09-17

Red Ball Technical Gas Service
555 Craig Kennedy Way
Shreveport, LA 71107
800-551-8150
PGVP Vendor ID # G12021

PJLA Calibration and Testing
Accreditation #62754

EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

Cylinder Number:	EB0096884	**Certification Date:**	03/16/2021
Product ID Number:	125372	**Expiration Date:**	03/14/2029
Cylinder Pressure:	1900 PSIG	**MFG Facility:**	- Shreveport - LA
COA #	EB0096884.20210311-0	**Lot Number:**	EB0096884.20210311
Customer PO. NO.:		**Tracking Number:**	095687009
Customer:		**Previous Certification Dates:**	

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

Certified Concentration(s)

Component	Concentration	Uncertainty	Analytical Principle	Assayed On
Carbon Dioxide	**22.6 %**	±0.2 %	NDIR	03/15/2021
Oxygen	**22.9 %**	±0.12 %	MPA	03/16/2021
Nitrogen	Balance			

Analytical Measurement Data Available Online.

Reference Standard(s)

Serial Number	Lot	Expiration	Type	Balance	Component	Concentration	Uncertainty(%)	NIST Reference
EB0007615	EB0007615.20190610	11/24/2027	GMIS	N2	CO2	24.71 %	0.274	C1579010.02
EB0041474	EB0041474.20180504	07/21/2026	GMIS	N2	O2	24 %	0.497	071001

Analytical Instrumentation

Component	Principle	Make	Model	Serial	MPC Date
CO2	NDIR	Thermo	410i	1162980025	03/11/2021
O2	MPA	Thermo	410i	1162980025	03/16/2021

SMART-CERT

This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

Anthony Cyr
Assistant Operations Manager
Assay Laboratory: Red Ball TGS
Version 02-J, Revised on 2018-09-17

Assay Laboratory: Red Ball TGS
555 Craig Kennedy Way
Shreveport, LA 71107
800-551-8150

CERTIFICATE OF ANALYSIS
(Zero Ambient Air)

Cylinder Number:	CC191651	**Certification Date:**	11/11/2021
Product ID Number:	121699	**Expiration Date:**	11/09/2029
Cylinder Pressure:	1900 PSIG	**MFG Facility:**	RBTGS-Shreveport-LA
COA #	CC191651.20211111-0	**Lot Number:**	CC191651.20211111
Customer PO. NO.:		**Tracking Number:**	040297329
Customer:		**Previous Certification Dates:**	

This mixture is for laboratory use only, not for drug, household or other use.
This mixture is certified in Mole % to be within ±2% of the actual number reported with a confidence of 95%.
This mixture was manufactured by scale; weights traceable to N.I.S.T. Certificate #822/266926-02.
Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

Composing Material: Zero Ambient Air, Cert., Sz152

Component	Specification	Concentration
Nitrogen	Balance	Balance
Oxygen as Impurity	20%-22%	21.5%
Carbon Dioxide as Impurity	<0.5 PPM	<0.5 PPM
Carbon Monoxide as Impurity	<0.5 PPM	<0.5 PPM
Total Oxides of Nitrogen as Impurity	<0.1 PPM	<0.1 PPM
Sulfur Dioxide as Impurity	<0.1 PPM	<0.1 PPM
Total Hydrocarbons as Impurity	<0.1 PPM	<0.1 PPM

Red Ball Technical Gas Service
PGVP Vendor ID # G12021
Information and Ordering
800-551-8150
Fax (318-425-6309)

Accreditation #62754

Signature Not Found

Tyler Perryman
Analytical Chemist

Version 02-D, Revised on 2018-07-08

APPENDIX D

EXAMPLE CALCULATIONS

CEMS Example Calculations

Civil & Environmental Consultants, Inc.

Test Run	Gen 1
Pollutant	O2
Gas Range	Mid

Nomenclature:

ACE	=	Analyzer calibration error, percent of calibration span
C_{DIR}	=	Measured concentration of a calibration gas when introduced in direct calibration mode
C_V	=	Manufacturer certified concentration of a calibration gas
CS	=	Calibration span
SB	=	System bias, percent of calibration span
C_S	=	Measured concentration of a calibration gas when introduced in system calibration mode
D	=	Drift assessment, percent of calibration span
SB_{Final}	=	Post-run system bias, percent of calibration span
SB_i	=	Pre-run system bias, percent of calibration span
C_{Gas}	=	Average effluent gas concentration adjusted for bias
C_{Avg}	=	Average unadjusted gas concentration indicated by data recorder for the test run
C_0	=	Average of initial and final system calibration bias check responses from the zero calibraton gas
C_M	=	Average of initial and final system calibration bias check responses for the upscale calibration gas
C_{MA}	=	Actual concentration of the upscale calibration gas

Test Data:

C_{DIR}	11.041	
C_V	11	
CS	22.9	
C_{si}	10.705	
C_{SFinal}	10.919	
C_{Avg}	5.488	
C_0	0.114	v
C_M	10.925	v
C_{MA}	11	v

$$ACE = \frac{C_{Dir} - C_V}{CS} \times 100 \quad \text{Eq. 7E-1}$$

$$ACE = \frac{11.041 - 11}{22.9} \times 100$$

ACE = 0.18 %

$$SB = \frac{C_S - C_{Dir}}{CS} \times 100 \quad \text{Eq. 7E-2}$$

$$SB_i = \frac{10.705 - 11.041}{22.9} \times 100$$

SB_i = -1.47 %

$$SB_{Final} = \frac{10.919 - 11.041}{22.9} \times 100$$

SB_{Final} = -0.53 %

$$D = |SB_{Final} - SB_i| \quad \text{Eq. 7E-4}$$

$$D = |-0.53 - (-1.47)|$$

D = 0.93

$$C_{Gas} = (C_{Avg} - C_O)\frac{C_{MA}}{C_M - C_O}$$

$$C_{gas} = 5.488 - 0.114 \times \frac{11}{10.925 - 0.114}$$

C_{gas} = 5.468 %

CEMS Example Calculations

Civil & Environmental Consultants, Inc.

Test Run	Gen 1
Pollutant	CO
Gas Range	Mid

Nomenclature:

ACE	=	Analyzer calibration error, percent of calibration span
C_{DIR}	=	Measured concentration of a calibration gas when introduced in direct calibration mode
C_V	=	Manufacturer certified concentration of a calibration gas
CS	=	Calibration span
SB	=	System bias, percent of calibration span
C_S	=	Measured concentration of a calibration gas when introduced in system calibration mode
D	=	Drift assessment, percent of calibration span
SB_{Final}	=	Post-run system bias, percent of calibration span
SB_i	=	Pre-run system bias, percent of calibration span
C_{Gas}	=	Average effluent gas concentration adjusted for bias
C_{Avg}	=	Average unadjusted gas concentration indicated by data recorder for the test run
C_0	=	Average of initial and final system calibration bias check responses from the zero calibraton gas
C_M	=	Average of initial and final system calibration bias check responses for the upscale calibration gas
C_{MA}	=	Actual concentration of the upscale calibration gas

Test Data:

C_{DIR}	25.29
C_V	25.1
CS	50.7
C_{si}	24.94
C_{SFinal}	25.25
C_{Avg}	0.04
C_0	-0.17
C_M	25.27
C_{MA}	25.29

O2 Conc 5.47

$$ACE = \frac{C_{Dir} - C_V}{CS} \times 100 \quad \text{Eq. 7E-1}$$

$$ACE = \frac{25.29 - 25.1}{50.7} \times 100$$

ACE = 0.37475 %

$$SB = \frac{C_S - C_{Dir}}{CS} \times 100 \quad \text{Eq. 7E-2}$$

$$SB_i = \frac{24.94 - 25.29}{50.7} \times 100$$

SB_i = -0.69 %

$$SB_{Final} = \frac{25.25 - 25.29}{50.7} \times 100$$

SB_{Final} = -0.07890 %

$$D = |SB_{Final} - SB_i| \quad \text{Eq. 7E-4}$$

$$D = |-0.08 - (-0.69)|$$

D = 0.6114

$$C_{Gas} = (C_{Avg} - C_O)\frac{C_{MA}}{C_M - C_O}$$

$C_{gas} = 0.040 - -0.170 \times \frac{25.29}{25.27 - -0.17}$

$C_{gas} = 0.2$ ppm

CO @ 15% O2

$$C_{adj} = C_{meas}(20.9-15)/(20.9-\%O_2)$$

CO @ 15% O2 = 0.21 * (20.9-15) / (20.9- 5.47)

CO @ 15% O2 = 0.21 * 5.9 / 15.43

CO @ 15% O2 = 0.08 ppm

APPENDIX E

TEST PERSONNEL CERTIFICATIONS

STAC STACK TESTING ACCREDITATION COUNCIL

A2LA American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

CIVIL AND ENVIRONMENTAL CONSULTANTS, INC. (CEC)

In recognition of the successful completion of the joint A2LA and Stack Testing Accreditation Council (STAC) evaluation process, this laboratory is accredited to perform testing activities in compliance with ASTM D7036:2004 - Standard Practice for Competence of Air Emission Testing Bodies.

Presented this 8th day of December 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3913.01
Valid to November 30, 2023

This accreditation program is not included under the A2LA ILAC Mutual Recognition Arrangement.

From: Theresa Lowe
To: Bourgeade, Pierre
Subject: [SUSPECTED SPAM] SES Exam Results - Pierre Bourgeade
Date: Sunday, September 22, 2019 6:07:02 PM
Importance: Low

THIS EMAIL IS THE OFFICIAL NOTIFICATION OF YOUR SES QUALIFIED SOURCE TESTING INDIVIDUAL OR OBSERVER (QSTI/QSTO) EXAM(S) RESULTS (*Please Print Out for Your Records*)

To:	***Pierre Bourgeade***
Employed by:	***Civil & Environmental Consultants, Inc.***
Phone:	***314-626-4566***
Email:	***pbourgeade@cecinc.com***

The Source Evaluation Society, through its contract with Eastern Technical Associates, has received the score of the exam(s) you completed on the date(s) as listed below. You are required to receive a score of 40 to pass an exam. As noted below, a "P" indicates you passed the exam, a "DNP" indicates that you did not pass the exam.

Group #	*Exam*	*Date of Exam*	*Exam #*	*Score*	*Status*
1	EPA Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods	9/12/19	14942	42	P
1A	Stack Gas Flow Rate Measurements Sampling Methods				
2	EPA Manual Gaseous Pollutants Source Sampling Methods	9/12/19	14951	40	P
3	EPA Gaseous Pollutants Instrumental Methods	9/13/19	14954	30	NDP
4	EPA Hazardous Metals Measurement Methods	9/13/19	14962	42	P
5	Part 75 CEMS RATA Testing				

NOTE: (1) The ECMPS AETB reporting requirements include a provision for an email address to be noted for the exam provider. Your exam provider is the Source Evaluation Society. Please use the following email address: qstiprogram@gmail.com. (2) Your exam score(s), per ASTM D7036-04, will be applicable for five years. You will need to re-take your exam(s) before expiration in order to maintain a current status. You are responsible for keeping track of scheduling for your re-test.

If you passed one or more exams, you are eligible to apply for your SES QSTI/QSTO qualification approval(s). To complete the qualification process, you will need to do the following: For New Applications / Additional Group Certificates / Renewals: Please check the SES Website (www.sesnews.org) under the link for the "SES QSTI/QSTO Program" for directions on how to apply for your certificate or contact Theresa Lowe at qstiprogram@gmail.com.

Please contact Theresa Lowe of SES (qstiprogram@gmail.com) with any questions about the exams. If you are interested in rescheduling the exam(s), please contact Kristy Radford or Janie Rose-Lofty of ETA (kristy@smokeschool.com; Janie@smokeschool.com)

All information regarding the QSTI/QSTO application process may be sent by email (*which is the preferred and faster method*) to qstiprogram@gmail.com, or mail your application to:
SES g P. O. Box 12124 g Research Triangle Park, NC g 27709-2124

Please let me know if you have any questions or if I can be of any assistance.

Theresa Lowe
SES QSTI/QSTO Review Committee Administrator

SOURCE EVALUATION SOCIETY

Name: **Benjamin J Murowchick**
SES ID: **DO NOT DISPLAY - 5113262**
Test Name: **GROUP 1**
Test Date: **6/21/2019**

On behalf of the Source Evaluation Society, we are pleased to inform you that you achieved a passing score on the Group 1 - EPA Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods examination. The tables below show your overall score and performance in each content area of the exam.

Overall Test Results:

	Results
Your Score	**43**
Passing Score	40
Possible Score	50

Results By Domain:

Your performance in each content area or domain is based on small subsets of test questions and should be considered a rough estimate of your knowledge within each area.

Domain	Percent Correct
Fundamentals, test planning, test site preparation	63%
Method applicability and specifications, pollutants measured, interferences	100%
Sampling equipment preparation, calibration, operating procedures	92%
Isokinetic sampling, gas flow and emissions calculations	75%

* Percent Correct is the number of items answered correctly in a domain divided by the total number of scored items within that domain.

You are now eligible to apply for the SES QSTI/QSTO qualification approval(s). Please check the SES Website (www.sesnews.org) under the link for the "SES QSTI/QSTO Program" for directions on how to apply for your certificate or contact the SES QSTI Administrator at qstiprogram@gmail.com.

NOTE: (1) The ECMPS AETB reporting requirements include a provision for an email address to be noted for the exam provider. Your exam provider is the Source Evaluation Society. Please use the following email address: qstiprogram@gmail.com. (2) Your exam score(s), per ASTM D7036-04, will be applicable for five years. You will need to retake your exam(s) before expiration in order to maintain a current status. You are responsible for keeping track of scheduling for your retest.

Please contact the SES QSTI Administrator at qstiprogram@gmail.com with any questions about the exams. All information regarding the QSTI/QSTO application process may be sent by email (which is the preferred and faster method) to the SES QSTI Administrator at qstiprogram@gmail.com, or mail your application to:

Source Evaluation Society
P. O. Box 12124
Research Triangle Park, NC
27709-2124

SOURCE EVALUATION SOCIETY

Name: **Benjamin J Murowchick**
SES ID: **DO NOT DISPLAY - 5113262**
Test Name: **GROUP 2**
Test Date: **9/12/2019**

On behalf of the Source Evaluation Society, we are pleased to inform you that you achieved a passing score on the Group 2 - EPA Manual Gaseous Pollutants Source Sampling Methods examination. The tables below show your overall score and performance in each content area of the exam.

Overall Test Results:

	Results
Your Score	**46**
Passing Score	40
Possible Score	50

Results By Domain:

Your performance in each content area or domain is based on small subsets of test questions and should be considered a rough estimate of your knowledge within each area.

Domain	Percent Correct
Fundamentals, test planning, test site preparation	100%
Method applicability and specifications, pollutants measured, interferences	87%
Sampling equipment preparation, calibration, operating procedures	96%
Isokinetic and proportional sampling, gas flow and emissions calculations	80%

* Percent Correct is the number of items answered correctly in a domain divided by the total number of scored items within that domain.

You are now eligible to apply for the SES QSTI/QSTO qualification approval(s). Please check the SES Website (www.sesnews.org) under the link for the "SES QSTI/QSTO Program" for directions on how to apply for your certificate or contact the SES QSTI Administrator at qstiprogram@gmail.com.

NOTE: (1) The ECMPS AETB reporting requirements include a provision for an email address to be noted for the exam provider. Your exam provider is the Source Evaluation Society. Please use the following email address: qstiprogram@gmail.com. (2) Your exam score(s), per ASTM D7036-04, will be applicable for five years. You will need to retake your exam(s) before expiration in order to maintain a current status. You are responsible for keeping track of scheduling for your retest.

Please contact the SES QSTI Administrator at qstiprogram@gmail.com with any questions about the exams. All information regarding the QSTI/QSTO application process may be sent by email (which is the preferred and faster method) to the SES QSTI Administrator at qstiprogram@gmail.com, or mail your application to:

Source Evaluation Society
P. O. Box 12124
Research Triangle Park, NC 27709-2124

Murowchick, Ben

From: Theresa Lowe <tf_lowe@yahoo.com>
Sent: Sunday, September 22, 2019 5:40 PM
To: Murowchick, Ben
Subject: SES Exam Results - Benjamin J. Murowchick

THIS EMAIL IS THE OFFICIAL NOTIFICATION OF YOUR SES QUALIFIED SOURCE TESTING INDIVIDUAL OR OBSERVER (QSTI/QSTO) EXAM(S) RESULTS (*Please Print Out for Your Records*)

To:	***Benjamin J. Murowchick***
Employed by:	***Civil & Environemtnal Consultants, Inc.***
Phone:	***314-656-4586***
Email:	***bmurowchick@cecinc.com***

The Source Evaluation Society, through its contract with Eastern Technical Associates, has received the score of the exam(s) you completed on the date(s) as listed below. You are required to receive a score of 40 to pass an exam. As noted below, a "P" indicates you passed the exam, a "DNP" indicates that you did not pass the exam.

Group #	*Exam*	*Date of Exam*	*Exam #*	*Score*	*Status*
1	EPA Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods				
1A	Stack Gas Flow Rate Measurements Sampling Methods				
2	EPA Manual Gaseous Pollutants Source Sampling Methods				
3	EPA Gaseous Pollutants Instrumental Methods	9/13/19	14959	43	P
4	EPA Hazardous Metals Measurement Methods	9/13/19	14963	48	P
5	Part 75 CEMS RATA Testing				

NOTE: (1) The ECMPS AETB reporting requirements include a provision for an email address to be noted for the exam provider. Your exam provider is the Source Evaluation Society. Please use the following email address: qstiprogram@gmail.com. (2) Your exam score(s), per ASTM D7036-04, will be applicable for five years. You will need to re-take your exam(s) before expiration in order to maintain a current status. You are responsible for keeping track of scheduling for your re-test.

If you passed one or more exams, you are eligible to apply for your SES QSTI/QSTO qualification approval(s). To complete the qualification process, you will need to do the following: For New Applications / Additional Group Certificates / Renewals: Please check the SES Website (www.sesnews.org) under the link for the "SES QSTI/QSTO Program" for directions on how to apply for your certificate or contact Theresa Lowe at qstiprogram@gmail.com.

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APPENDIX F

IEPA NOTIFICATIONS

Oswald, Donna

From: Mattison, Kevin <Kevin.Mattison@Illinois.gov>
Sent: Friday, October 15, 2021 2:32 PM
To: Macgilvray, Aaron
Cc: Oswald, Donna
Subject: RE: 091055ADE - Riverside Medical Center: Less Than 60 Day Test Notice Request

Less Than 60 Day Test Notice – Approval

Illinois Environmental Protection Agency

Mr. MacGilvray,

This is in response to your request dated October 15, 2021, requesting an adjustment of deadlines for submitting a test notice 60 days prior to testing as required under NESHAP Subpart ZZZZ . NESHAP Subpart A, 63.9(i)(2) provides time periods or postmark deadlines may be changed by mutual agreement between the owner or operator and the Administrator, under limited circumstances.

The Illinois EPA has reviewed your request and ~~a~~accepts the lesser time frame of the test notice for this test program.

Sincerely,

Kevin Mattison

Office ☏ 847-294-4019

1

From: Macgilvray, Aaron <amacgilvray@RHC.net>
Sent: Friday, October 15, 2021 1:57 PM
To: Mattison, Kevin <Kevin.Mattison@Illinois.gov>
Cc: Oswald, Donna <doswald@cecinc.com>
Subject: [External] IEPA Facility ID: 091055ADE Riverside Medical Center

Good afternoon Kevin,

Riverside Medical Center (IEPA Source ID 091055ADE), a ROSS facility located in Kankakee, plans to conduct emission testing of their three natural gas-fired; four-stroke-lean-burn spark ignited reciprocating internal combustion engines. A test protocol for the emission testing was previously submitted to IEPA on August 19, 2019. EPA Methods 1, 3A , 4, and 10 as documented in 40 CFR, Part 60 will be used. No deviations from the submitted protocol are planned. The proposed testing dates of November 15-16, 2021 are less than the 60 day advance notification required by 40CFR63.6645(g). As we would like to complete the testing and reporting by the end of the year, Riverside Medical Center is requesting an adjustment of the time period and/or post mark requirement for advance notification of planned testing per 40CFR 63.9(i).

Please let us know if we can proceed.

Aaron MacGilvray
Power Plant Supervisor
Riverside Medical Center
350 N. Wall Street - Kankakee, IL 60901
Phone: (815) 935-7483 ext 30416
Mobile: (815) 216-1731
Fax: (815) 935-7868
amacgilvray@rhc.net

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APPENDIX G

TEST PLAN

TEST PLAN

EXHAUST EMISSIONS COMPLIANCE TEST
RECIPROCATING INTERNAL COMBUSTION ENGINE
NUMBERS 1, 2, AND 3
LOCATED AT
RIVERSIDE MEDICAL CENTER

IEPA FACILITY ID: 091055ADE

Prepared For:

RIVERSIDE MEDICAL CENTER
350 NORTH WALL STREET
KANKAKEE, ILLINOIS 60901

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
4848 PARK 370 BOULEVARD
HAZELWOOD, MISSOURI 63042

CEC PROJECT 191-074

(also used for 314-911)

APRIL 2019

Civil & Environmental Consultants, Inc.
St. Louis 4848 Park 370 Boulevard, Suite F | Hazelwood, MO 63042 | p: 314-656-4566 f: 314-656-4595 | www.cecinc.com

PLAN CERTIFICATION

This Test Plan was developed under the supervision (including review) of the persons named below. For this Civil & Environmental Consultants, Inc. (CEC) project, Mr. Nicholas Pichee is the Project Manager, Sandra Cupp is the Project Quality Manager, and Mike Sepulveda is the Project Safety Manager. Contents of this Test Plan relate only to the sources planned to be tested, only for the specified test parameters, and under the specified test conditions.

CEC operates under a quality management system in conformance with the requirements of American Society for Testing and Materials D7036-04 (Reapproved 2011) and maintains third party accreditation through a joint agreement between the Stack Testing Accreditation Council and the American Association for Laboratory Accreditation. CEC's current accreditation certification was issued on December 20, 2017 (Certificate No. 3913.01) with an expiration date of November 30, 2019.

Date: 04/19/2019 Signature 

Franklin M. Stevens, QSTI
Vice President
Civil & Environmental Consultants, Inc.

Date: 04/19/2019 Signature 

Nicholas A. Pichee, QSTI
Project Manager
Civil & Environmental Consultants, Inc.

TABLE OF CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

Civil & Environmental Consultants, Inc. (CEC) has been contracted by Riverside Medical Center (Riverside) to conduct emission testing at Riverside's facility located in the City of Kankakee, Illinois, identified as Illinois Environmental Protection Agency (IEPA) ID No. 091055ADE. Riverside maintains three backup electrical generation systems, each driven by a 750 brake horsepower-hour (bhp-hr) (560 kilowatt-hour [kW-hr]), natural-gas fired, spark ignition, 4-stroke lean-burn, reciprocating internal combustion engine (4SLB SI-RICE). The engines are identified as Engines 1, 2, and 3.

The engines are exempt from permitting per Title 35 Illinois Administrative Code (IAC) 201.146(i) which exempts stationary internal combustion engines with a rated power output of less than 1,118 kilowatts (kW) (1,500 brake horsepower) from permitting requirements. They are, however, required to meet applicable regulatory air emissions limits and annual testing requirements per Title 40, *Code of Federal Regulations* (CFR), Part 63.6585. The facility has enrolled the engines in question in an electrical demand response program with the local utility.

Emission tests are scheduled to be conducted on June 13, 2019. Notification of intent to conduct a performance test as required under 40 CFR 63.7(b)(1) will be submitted under separate cover with this Test Plan becoming a part thereunder. Notification shall be submitted at least 60 days prior to the planned test date.

1.1 TEST OBJECTIVES

Tests on the exhaust emissions from Engines 1, 2, and 3 will be conducted in order to demonstrate compliance with United States CFR, Title 40, Part 63, Subpart ZZZZ "National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines" aka RICE MACT. Riverside is considered an area source of hazardous air pollutants (HAP) under the RICE MACT.

Riverside has elected under the RICE MACT, for all three engines, to limit the concentration of carbon monoxide (CO) in the engines' exhaust catalyst outlet to <47 parts per million, volumetric dry (ppmvd) corrected to 15% oxygen (O_2) as a surrogate for demonstration of formaldehyde emissions compliance (Table 6 to RICE MACT, condition 14).

The concentrations of CO and oxygen (O_2) will be determined per Table 4 of the RICE MACT. Each of the engines will be subject to a single 15-min duration tests which will be conducted with

the engines operating at >90% of maximum rates (40 CFR 63.6640 (c). Operation of the continuous parameter monitoring system located on each engine will also be verified.

Although not required under the RICE MACT, CO mass emission rate and emission factors will be determined as will be exhaust carbon dioxide (CO_2) concentrations. No other exhaust emissions components will be determined.

1.2 TEST PLAN SUMMARY

Emission tests will be conducted to determine the concentration of O_2 and CO_2 from Engines 1, 2, and 3. Tests will be conducted using methods documented in 40 CFR 60, Appendix A. EPA Method 3A will be used to determine the concentrations of O_2. EPA Method 10 will be used to determine the concentration of CO. An Emission Test Plan Summary is presented in Table 1.

TABLE 1
EMISSION TEST PLAN SUMMARY

Source(s) to be Tested	Test Conditions	Parameter to Test	Test Method	No. Tests & Test Duration
Engines 1, 2, and 3	>90% of Maximum Rate	Carbon Monoxide (CO)	EPA Method 10	One, 15-min. duration test per engine
		Oxygen (O_2)	EPA Method 3A	

1.3 PROJECT PARTICIPANTS AND CONTACT INFORMATION

Key project participants are listed with contact information in Table 2.

TABLE 2
PROJECT PARTICIPANTS AND CONTACT INFORMATION

Participant	Project Function	Affiliation	Contact
Nicholas Pichee, QSTI	Project Manager	CEC	Telephone: (314) 578-0668 npichee@cecinc.com
Sandra Cupp, P.E.	Project Quality Manager	CEC	
Mike Sepulveda, QSTI	Test Team Lead	CEC	Cell: (314) 705-7151
David Rivard	Facility Operations Manager	Riverside Medical Center	Telephone: 815-935-4783 Cell: 815-263-0091 drivard@rhc.net

2.0 PROJECT BACKGROUND AND SCOPE OF TESTING

In order to comply with regulatory requirements, Riverside has contracted with CEC to conduct tests on emissions from Engines 1, 2, and 3. Emission tests conducted under this plan relate only to the sources planned to be tested, only for the specific test parameters, and under the specified test conditions as documented below.

Tests will be conducted on June 13, 2019 and will be completed during a single mobilization to the Riverside facility from CEC's St. Louis office.

2.1 SOURCES TO BE TESTED

Tests will be conducted on exhaust emissions from Engine Nos. 1, 2, and 3. The exhausts of Engines 1, 2, and 3 are each equipped with an emissions control catalyst. Tests will be conducted at the outlet of the catalyst. Engine exhaust sample ports are depicted in Figure I. Physical dimensions, location of upstream/downstream flow disturbances, and actual number of sample points will be determined on the date of testing.

2.2 TEST PARAMETERS, METHODS, NUMBER, AND DURATION

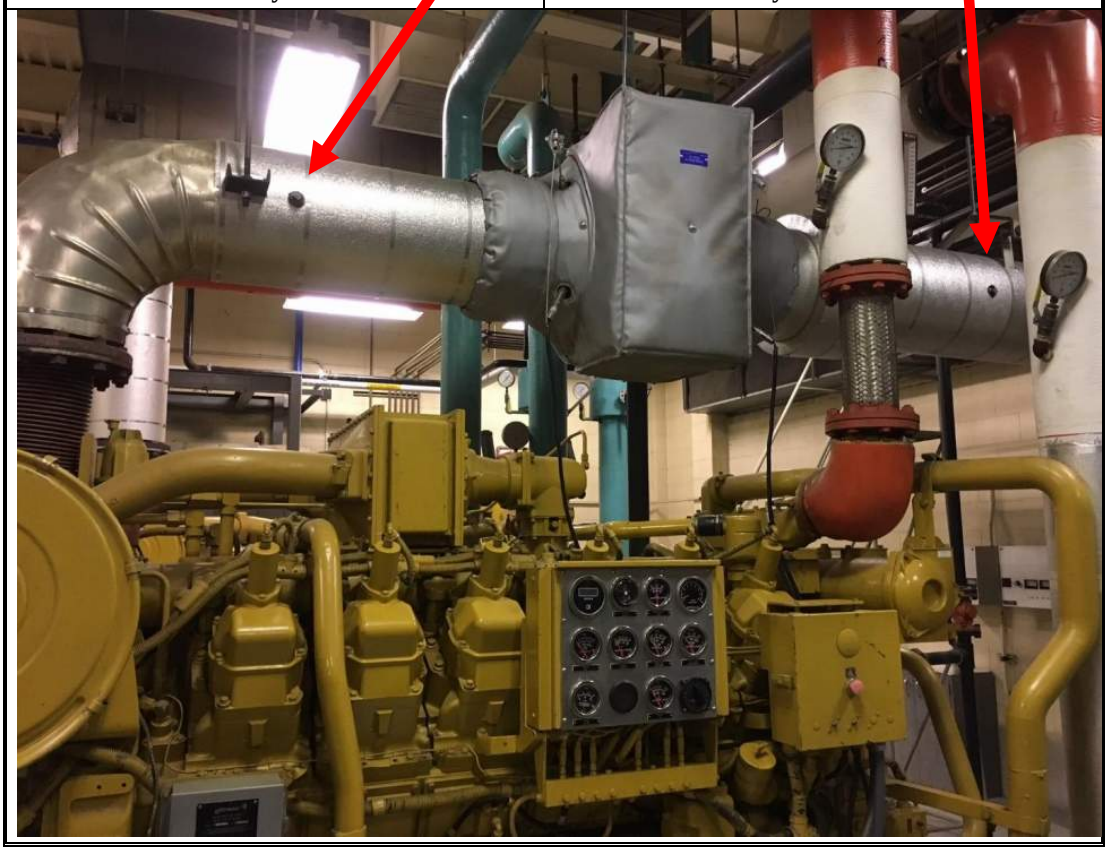
All emission tests will be conducted using United States Environmental Protection Agency (USEPA) test methods documented in 40 CFR 60, Appendix A. Summaries of the test methods utilized and any method modifications are presented in Section 4.

Emissions from the engines exhaust will be tested to determine the CO concentration (ppmvd corrected to 15% O_2). USEPA Method 10 will be used to determine CO concentration. USEPA Method 3A will be used to determine O_2 and CO_2 concentrations.

One 15-minute duration test will be conducted on each engine.

FIGURE I
ENGINE EXHAUST SAMPLE PORTS PICTURE

Catalyst Inlet Port	Catalyst Outlet Port



2.3 TEST CONDITIONS AND PROCESS DATA

Tests on emissions from engines 1, 2, and 3 will be conducted with the engines operating at >90% of the maximum load rating (750 bhp-hr). During the tests, Riverside shall record the engine operating data; fuel firing rate (million standard cubic feet per hour), engine speed (revolutions per minute), and engine power (bhp-hr). Data shall be recorded at a minimum of once per the 15-minute test duration. Riverside will request a recent fuel gas analysis from their fuel supplier and provide the data to CEC. As soon as possible after the tests, engine operating data shall be communicated to CEC for inclusion in the report of results.

3.0 PROCESS DESCRIPTION

Riverside Medical Center (Riverside) is a 350-bed hospital facility located in Kankakee, Illinois. The facility is considered an Area Source of HAP under the RICE MACT.

Riverside maintains a backup electrical power system consisting of three identical electrical generation sets, each driven by a 750 bhp-hr (560 kW-hr), natural-gas fired, 4SLB SI-RICE. Exhaust emissions from the engines are controlled using an oxidative catalyst installed on the exhaust stack of each engine. Engine specifications are as follows;

Engine Manufacturer:	Caterpillar
Engine Model:	CAT G3512
Engine Max. Site-Rated Power:	750 bhp-hr (560 kW-hr)
Engine Design:	4-Stroke, Lean Burn
Fuel/Fuel Ignition:	Natural Gas/Spark Ignition
Construction/Reconstruction Date:	June 1992

The facility powers up the generation sets/engines for approximately 30 minutes/month for testing and maintenance purposes. All three generation sets participate in a demand response program and are therefore considered non-emergency engines under the RICE MACT.

4.0 TEST METHODS AND ANALYTICAL TECHNIQUE

All tests will be conducted using USEPA test methods documented in 40 CFR 60, Appendix A or USEPA approved alternate methods without deviation from the method as published unless noted otherwise. During the tests, any unusual conditions or deviations from the methods will be noted.

4.1 SAMPLE POINT LOCATION

Applicable Source(s): Engines 1, 2, and 3

The sample port location and number/location of sample traverse points will be determined per Table 4 to the RICE MACT, which may include provisions from USEPA Methods 1 and 7E. Specific data and sample point selection will be determined on-site prior to the emission tests.

4.2 USEPA METHOD 3A - DETERMINATION OF OXYGEN AND CARBON DIOXIDE CONCENTRATIONS IN EMISSIONS FROM STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

Applicable Source(s): Engines 1, 2, and 3

Concentrations of oxygen and carbon dioxide in the stack gas are determined from samples continuously collected from the source using a stainless-steel sample probe. Sample gas exiting the probe is routed through a heated, Teflon sample line to a sample conditioning system. The sample conditioning system removes water vapor and particulate from the sample prior to routing to the test analyzers.

Oxygen concentration in the gas sample is determined using a Thermo Scientific Model 410i paramagnetic analyzer. Carbon dioxide concentration in the gas sample is determined using a Thermo Scientific Model 410i non-dispersive infrared (NDIR) analyzer.

Prior to analysis, the analyzers are calibrated using a zero and two upscale calibration gases having known concentrations prepared per USEPA Protocol 1, traceable to National Institute of Standards and Technology (NIST) standards. Following calibration, samples are introduced to the analyzer and responses recorded.

4.3 USEPA METHOD 10 - DETERMINATION OF CARBON MONOXIDE EMISSIONS FROM STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

Applicable Source(s) : Engines 1, 2, and 3

The concentration of carbon monoxide in the stack gas is determined from samples continuously collected from the source using a stainless-steel sample probe. Sample gas exiting the probe is routed through a heated, Teflon sample line to a sample conditioning system. The sample conditioning system removes water vapor and particulate from the sample prior to routing to the test analyzers.

Carbon monoxide concentration in the gas sample is determined using a Thermo Scientific Model 48i NDIR analyzer.

Prior to analysis, the analyzers are calibrated using a zero and two upscale calibration gases having known concentrations prepared per USEPA Protocol 1, traceable to NIST standards. Following calibration, samples are introduced to the analyzer and responses recorded.

5.0 QUALITY ASSURANCE / QUALITY CONTROL

CEC has established quality assurance and quality control (QA/QC) guidelines for providing quality sampling and analytical data from source tests. These QA/QC procedures are implemented to ensure the acceptability and reliability of the data generated. Procedures in each test method require equipment calibrations, measurement control parameters, equipment performance evaluations, and other criteria.

6.0 HEALTH, SAFETY, AND SECURITY

Maintenance of the health and safety of CEC employees and those working with and around CEC projects is a primary goal and commitment of CEC. To that end, each individual associated with the project has the right and responsibility to work safely and has the right to halt work due to any safety concern.

All employees participate in an ongoing CEC safety training program. Additionally, all employees have completed the 40-hour Occupational Safety and Health Administration, Hazardous Waste Operations and Response course with annual 8-hour refreshers.

A project specific safety plan shall be developed prior to commencement of any work activities. This plan shall be reviewed by each CEC employee prior to participating on the project and each employee shall sign the plan indicating understanding of the safety hazards, controls, and personal protective equipment (PPE) needed. At the beginning of each workday, CEC shall convene a Job Safety Analysis (JSA) meeting to further review task specific hazards, engineering controls, and PPE requirements. At any time during the day that job tasks, environmental, or other conditions change significantly, an additional JSA meeting shall be conducted.

The CEC test team will comply with the health, safety, and permitting requirements set forth by Riverside and shall attend any site-specific safety training, respirator fit test or other requirements necessary for safe work.

CEC shall have Safety Data Sheets (SDS) for all chemicals brought onto the test site. At the request of Riverside, CEC shall provide electronic copies of these SDS prior to facility entry.

CEC requires safe non-distracted driving and must comply with Department of Transportation (DOT) hours of service regulations when traveling with a mobile laboratory. CEC employees may not travel with the mobile laboratory when daily hours on the job, including travel, exceed 14 hours. CEC projects are planned to meet this requirement; however, project delays not the fault of CEC and/or out of scope work causing the test team to exceed 14 hours in any one day may, under DOT requirements, require an additional night's stay. This may result in additional Out of Scope per diem fees.

CEC employees maintain transportation worker identification credentials issued by the United States Transportation Security Administration (US TSA). US TSA conducts a security threat assessment (background check) to determine a person's eligibility and issues the credential to

qualified individuals. CEC understands that no additional security requirements will be required at the Riverside facility.

Each CEC project test team member will have the following PPE available on-site; hard hat, safety glasses, goggles, hearing protection, steel toe boots, high-visibility vest, and fall protection harness. Specific PPE required for each job task shall be detailed in the site specific safety plan.

7.0 REPORT OF RESULTS

CEC shall issue an electronic draft report of results within twenty-one days after completion of the field testing provided any necessary facility data is made available in a timely manner. The final report, an electronic copy, shall be issued to Riverside and an electronic copy and one hardcopy shall be submitted to IEPA within five days after receipt of comments on the draft report from Riverside's project manager or within thirty days after completion of the field testing whichever comes first. The report will contain all emission test field data, results, equipment calibration, standards, certifications, calculations, and other supporting data.

THIS IS THE LAST PAGE OF THE REPORT