

Certificate of Calibration

Certificate Number: EDCQP200-4.11.5

Environmental Devices Corporation certifies the Haz-Scanner model EPAS is calibrated to published specifications and NIST traceable.

Calibration Dust Specifications are NIST traceable using Coulter Mutisizer II e. ISO12103 –1 A2 Fine Test Dust and is designed to agree with EPA Class I and Class III FRM and FEM particulate samplers and monitors and EN 12341 and EN 14907 standards.

Gas sensors are Calibrated against NIST/EPA traceable Calibration Gas using NIST primary Flow Standard: LFE774300 to ISO 17025 and EPA Instrumental Test Methods as defined by 40 CFR Part 60.

Quality system standard to meet the requirements of ANSI/ASQC standard Q9000-1994 (ISO 9001), MIL-STD 45662A, and customer's specification if required.

Temperature = 22°C

Relative Humidity = 30%

Atmospheric Pressure = 760 mmHg

Measurement Uncertainty Estimated @ 95% Confidence Level (k=2) using ISO 17025 guidelines.

Model	Serial Number	Calibration Date	Next Calibration Due
EPAS	914055	2020	2021

Calibration Span Accessory if purchased	Sensor A K=	Sensor B K=	Model :
--	----------------	----------------	---------

Technician	Supervisor
Dan Okuniewicz	Mark Sullivan

Environmental Devices Corporation
4 Wilder Drive Building #15
Plaistow, NH 03865
ISO-9001 Certified

PARTICULATES NOT OTHERWISE REGULATED, RESPIRABLE 0600

DEFINITION: aerosol collected by sampler with 4- μm median cut point **CAS:** None **RTECS:** None

METHOD: 0600, Issue 3	EVALUATION: FULL	Issue 1: 15 February 1984 Issue 3: 15 January 1998
OSHA : 5 mg/m ³ NIOSH: no REL ACGIH: 3 mg/m ³	PROPERTIES: contains no asbestos and quartz less than 1%; penetrates non-ciliated portions of respiratory system	
SYNONYMS: nuisance dusts; particulates not otherwise classified		
SAMPLING		MEASUREMENT
SAMPLER: CYCLONE + FILTER (10-mm nylon cyclone, Higgins-Dewell [HD] cyclone, or Aluminum cyclone + tared 5- μm PVC membrane)	TECHNIQUE: GRAVIMETRIC (FILTER WEIGHT)	
FLOW RATE: nylon cyclone: 1.7 L/min HD cyclone: 2.2 L/min Al cyclone: 2.5 L/min	ANALYTE: mass of respirable dust fraction	
VOL-MIN: 20 L @ 5 mg/m ³ -MAX: 400 L	BALANCE: 0.001 mg sensitivity; use same balance before and after sample collection	
SHIPMENT: routine	CALIBRATION: National Institute of Standards and Technology Class S-1.1 or ASTM Class 1 weights	
SAMPLE STABILITY: stable	RANGE: 0.1 to 2 mg per sample	
BLANKS: 2 to 10 field blanks per set	ESTIMATED LOD: 0.03 mg per sample	
ACCURACY		
RANGE STUDIED: 0.5 to 10 mg/m ³ (lab and field)	PRECISION: <10 μg with 0.001 mg sensitivity balance; <70 μg with 0.01 mg sensitivity balance [3]	
BIAS: dependent on dust size distribution [1]		
OVERALL PRECISION (S_{rt}): dependent on size distribution [1,2]		
ACCURACY: dependent on size distribution [1]		
APPLICABILITY: The working range is 0.5 to 10 mg/m ³ for a 200-L air sample. The method measures the mass concentration of any non-volatile respirable dust. In addition to inert dusts [4], the method has been recommended for respirable coal dust. The method is biased in light of the recently adopted international definition of respirable dust, e.g., $\approx +7\%$ bias for non-diesel, coal mine dust [5].		
INTERFERENCES: Larger than respirable particles (over 10 μm) have been found in some cases by microscopic analysis of cyclone filters. Over-sized particles in samples are known to be caused by inverting the cyclone assembly. Heavy dust loadings, fibers, and water-saturated dusts also interfere with the cyclone's size-selective properties. The use of conductive samplers is recommended to minimize particle charge effects.		
OTHER METHODS: This method is based on and replaces Sampling Data Sheet #29.02 [6].		

ENVIRONMENTAL DEVICES CORPORATION

Calibration Report

Date: May 2020

Customer Name:

System ID: Serial Number 914055

Notes:

BASIC CHECK

Power Voltage	PASS
CPU Diagnostic Test	PASS
Air Flow Rate	PASS
Digital Communication	PASS
Sensor Output Voltages	PASS
Signal Channel Voltages	PASS
Memory Card Voltages	PASS

SENSOR	Low Span	Observed Low Test Result	High Span	Observed High Test Result	Calibration Accuracy
<i>PM A (10µm)</i>	0 µg/m ³	0 µg/m ³	5000 µg/m ³	5000 µg/m ³	+/- 10ug/m3
<i>PM B (2.5µm)</i>	0 µg/m ³	0 µg/m ³	5000 µg/m ³	5000 µg/m ³	+/- 10 ug/m3
<i>CO</i>	0 ppm	0 ppm	2.5 ppm	2.5 ppm	+/- 0.01 ppm
<i>NO₂</i>	0 ppb	0 ppb	374 ppb	374 ppb	+/- 5 ppb
<i>SO₂</i>	0 ppb	0 ppb	352 ppb	352 ppb	+/- 5 ppb
<i>Temperature</i>	0°C	0°C	50°C	50°C	+/- 2°C
<i>Relative Humidity</i>	13%	13%	75%	75%	+/- 3%

Calibration Technician
Dan Okuniewicz



Supervisor
Mark Sullivan



2021

Informe de Monitoreo de Calidad de Aire

PROMOTOR:

Ministerio de Cultura

PROYECTO:

**“RESTAURACIÓN DEL CASTILLO DE SAN LORENZO,
CORREGIMIENTO DE CRISTOBAL, DISTRITO Y
PROVINCIA DE COLÓN,”**

REPÚBLICA DE PANAMÁ

Contenido

CAPÍTULO 1: DATOS GENERALES DEL PROYECTO	2
CAPÍTULO 2: MÉTODO DE MEDICIÓN	2
CAPÍTULO 3: RESULTADOS.....	3
CAPÍTULO 4: BIBLIOGRAFÍA.....	4

CAPÍTULO 1: DATOS GENERALES DEL PROYECTO

Proyecto	“RESTAURACIÓN DEL CASTILLO DE SAN LORENZO, CORREGIMIENTO DE CRISTOBAL, DISTRITO Y PROVINCIA DE COLÓN,”
Ubicación	Colón, San Lorenzo
País	Panamá

CAPÍTULO 2: MÉTODO DE MEDICIÓN

Norma aplicable	Anteproyecto de Norma de Calidad de Aire Ambiental de la República de Panamá, 2006.																																																				
Referencias	National Ambient Air Quality Standards-EPA (Agencia de Protección Ambiental) “Guías de calidad del aire de la OMS relativas al material particulado, el ozono, el dióxido de nitrógeno y el dióxido de azufre”																																																				
Ubicación de la medición	Se ubicó el equipo de medición en un punto estratégico .																																																				
Método	Lectura Directa																																																				
Instrumento utilizado	EPAS, número de serie 914055.																																																				
Instrumento utilizados	HAZ-SCANNER EPAS																																																				
Datos de los sensores	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>SENSOR</th> <th>Low Span</th> <th>Observed Low Test Result</th> <th>High Span</th> <th>Observed High Test Result</th> <th>Calibration Accuracy</th> </tr> </thead> <tbody> <tr> <td><i>PM A (10μm)</i></td> <td>0 μg/m³</td> <td>0 μg/m³</td> <td>5000 μg/m³</td> <td>5000 μg/m³</td> <td>+/- 10ug/m3</td> </tr> <tr> <td><i>PM B (2.5μm)</i></td> <td>0 μg/m³</td> <td>0 μg/m³</td> <td>5000 μg/m³</td> <td>5000 μg/m³</td> <td>+/- 10 ug/m3</td> </tr> <tr> <td><i>CO</i></td> <td>0 ppm</td> <td>0 ppm</td> <td>2.5 ppm</td> <td>2.5 ppm</td> <td>+/- 0.01 ppm</td> </tr> <tr> <td><i>NO₂</i></td> <td>0 ppb</td> <td>0 ppb</td> <td>374 ppb</td> <td>374 ppb</td> <td>+/- 5 ppb</td> </tr> <tr> <td><i>SO₂</i></td> <td>0 ppb</td> <td>0 ppb</td> <td>352 ppb</td> <td>352 ppb</td> <td>+/- 5 ppb</td> </tr> <tr> <td><i>Temperature</i></td> <td>0°C</td> <td>0°C</td> <td>50°C</td> <td>50°C</td> <td>+/- 2°C</td> </tr> <tr> <td><i>Relative Humidity</i></td> <td>13%</td> <td>13%</td> <td>75%</td> <td>75%</td> <td>+/- 3%</td> </tr> </tbody> </table>					SENSOR	Low Span	Observed Low Test Result	High Span	Observed High Test Result	Calibration Accuracy	<i>PM A (10μm)</i>	0 μ g/m ³	0 μ g/m ³	5000 μ g/m ³	5000 μ g/m ³	+/- 10ug/m3	<i>PM B (2.5μm)</i>	0 μ g/m ³	0 μ g/m ³	5000 μ g/m ³	5000 μ g/m ³	+/- 10 ug/m3	<i>CO</i>	0 ppm	0 ppm	2.5 ppm	2.5 ppm	+/- 0.01 ppm	<i>NO₂</i>	0 ppb	0 ppb	374 ppb	374 ppb	+/- 5 ppb	<i>SO₂</i>	0 ppb	0 ppb	352 ppb	352 ppb	+/- 5 ppb	<i>Temperature</i>	0°C	0°C	50°C	50°C	+/- 2°C	<i>Relative Humidity</i>	13%	13%	75%	75%	+/- 3%
SENSOR	Low Span	Observed Low Test Result	High Span	Observed High Test Result	Calibration Accuracy																																																
<i>PM A (10μm)</i>	0 μ g/m ³	0 μ g/m ³	5000 μ g/m ³	5000 μ g/m ³	+/- 10ug/m3																																																
<i>PM B (2.5μm)</i>	0 μ g/m ³	0 μ g/m ³	5000 μ g/m ³	5000 μ g/m ³	+/- 10 ug/m3																																																
<i>CO</i>	0 ppm	0 ppm	2.5 ppm	2.5 ppm	+/- 0.01 ppm																																																
<i>NO₂</i>	0 ppb	0 ppb	374 ppb	374 ppb	+/- 5 ppb																																																
<i>SO₂</i>	0 ppb	0 ppb	352 ppb	352 ppb	+/- 5 ppb																																																
<i>Temperature</i>	0°C	0°C	50°C	50°C	+/- 2°C																																																
<i>Relative Humidity</i>	13%	13%	75%	75%	+/- 3%																																																

“RESTAURACIÓN DEL CASTILLO DE SAN LORENZO, CORREGIMIENTO DE
CRISTOBAL, DISTRITO Y PROVINCIA DE COLÓN,”
INFORME DE MONITOREO DE CALIDAD DE AIRE

CAPÍTULO 3: RESULTADOS

Punto de muestreo No.1			
Castillo de San Lorenzo	Coordenadas UTM (WGS84)	Duración	
	609627.00 m E 1030701.00 m N	Inicio	Final
Fecha de realización: 11 de febrero de 2021			



Detalle	CO (ppb)	NO2 (ppb)	PMA 10 uG/m ³	PMB 2.5 uG/m ³	SO2 (ppb)
Promedio	0.000833	251.05	146.833	158.583	5393.25
Max	0.01	782.00	492.00	533.00	5806.00
Min	0.00	2.00	2.00	1.00	5110.00

CAPÍTULO 4: BIBLIOGRAFÍA

- Guías de calidad del aire de la OMS relativas al material particulado, el ozono, el dióxido de nitrógeno y el dióxido de azufre Actualización mundial 2005.
- Anteproyecto de Norma de Calidad de Aire Ambiental de la República de Panamá, 2006.
- National Ambient Air Quality Standards-EPA (Agencia de Protección Ambiental) “Guías de calidad del aire de la OMS relativas al material particulado, el ozono, el dióxido de nitrógeno y el dióxido de azufre”

“RESTAURACIÓN DEL CASTILLO DE SAN LORENZO, CORREGIMIENTO DE
CRISTOBAL, DISTRITO Y PROVINCIA DE COLÓN,”
INFORME DE MONITOREO DE CALIDAD DE AIRE

CAPÍTULO 5: ANEXOS

Certificate of Calibration

Certificate Number: EDCQP200-4.11.5

Environmental Devices Corporation certifies the Haz-Scanner model EPAS is calibrated to published specifications and NIST traceable.

Calibration Dust Specifications are NIST traceable using Coulter Mutisizer II e. ISO12103 –1 A2 Fine Test Dust and is designed to agree with EPA Class I and Class III FRM and FEM particulate samplers and monitors and EN 12341 and EN 14907 standards.

Gas sensors are Calibrated against NIST/EPA traceable Calibration Gas using NIST primary Flow Standard: LFE774300 to ISO 17025 and EPA Instrumental Test Methods as defined by 40 CFR Part 60.

Quality system standard to meet the requirements of ANSI/ASQC standard Q9000-1994 (ISO 9001), MIL-STD 45662A, and customer's specification if required.

Temperature = 22°C

Relative Humidity = 30%

Atmospheric Pressure = 760 mmHg

Measurement Uncertainty Estimated @ 95% Confidence Level (k=2) using ISO 17025 guidelines.

Model	Serial Number	Calibration Date	Next Calibration Due
EPAS	914055	2020	2021

Calibration Span Accessory if purchased	Sensor A K=	Sensor B K=	Model :
--	----------------	----------------	---------

Technician

Supervisor


Dan Okuniewicz


Mark Sullivan

Environmental Devices Corporation
4 Wilder Drive Building #15
Plaistow, NH 03865
ISO-9001 Certified

**“RESTAURACIÓN DEL CASTILLO DE SAN LORENZO, CORREGIMIENTO DE
CRISTOBAL, DISTRITO Y PROVINCIA DE COLÓN,”**
INFORME DE MONITOREO DE CALIDAD DE AIRE

PARTICULATES NOT OTHERWISE REGULATED, RESPIRABLE 0600

DEFINITION: aerosol collected by sampler with 4- μm median cut point **CAS:** None **RTECS:** None

METHOD: 0600, Issue 3		EVALUATION: FULL	Issue 1: 15 February 1984 Issue 3: 15 January 1998
OSHA: 5 mg/m ³	NIOSH: no REL	PROPERTIES:	contains no asbestos and quartz less than 1%; penetrates non-ciliated portions of respiratory system
ACGIH: 3 mg/m ³			
SYNOMYS: nuisance dusts; particulates not otherwise classified			
SAMPLING		MEASUREMENT	
SAMPLER:	CYCLONE + FILTER (10-mm nylon cyclone, Higgins-Dewell [HD] cyclone, or Aluminum cyclone + tared 5- μm PVC membrane)	TECHNIQUE:	GRAVIMETRIC (FILTER WEIGHT)
FLOW RATE:	nylon cyclone: 1.7 L/min HD cyclone: 2.2 L/min Al cyclone: 2.5 L/min	ANALYTE:	mass of respirable dust fraction
VOL-MIN:	20 L @ 5 mg/m ³	BALANCE:	0.001 mg sensitivity; use same balance before and after sample collection
-MAX:	400 L	CALIBRATION:	National Institute of Standards and Technology Class S-1.1 or ASTM Class 1 weights
SHIPMENT:	routine	RANGE:	0.1 to 2 mg per sample
SAMPLE STABILITY:	stable	ESTIMATED LOD:	0.03 mg per sample
BLANKS:	2 to 10 field blanks per set	PRECISION:	<10 μg with 0.001 mg sensitivity balance; <70 μg with 0.01 mg sensitivity balance [3]
ACCURACY			
RANGE STUDIED:	0.5 to 10 mg/m ³ (lab and field)		
BIAS:	dependent on dust size distribution [1]		
OVERALL PRECISION ($S_{r,r}$):	dependent on size distribution [1,2]		
ACCURACY:	dependent on size distribution [1]		
APPLICABILITY: The working range is 0.5 to 10 mg/m ³ for a 200-L air sample. The method measures the mass concentration of any non-volatile respirable dust. In addition to inert dusts [4], the method has been recommended for respirable coal dust. The method is biased in light of the recently adopted international definition of respirable dust, e.g., $\approx +7\%$ bias for non-diesel, coal mine dust [5].			
INTERFERENCES: Larger than respirable particles (over 10 μm) have been found in some cases by microscopic analysis of cyclone filters. Over-sized particles in samples are known to be caused by inverting the cyclone assembly. Heavy dust loadings, fibers, and water-saturated dusts also interfere with the cyclone's size-selective properties. The use of conductive samplers is recommended to minimize particle charge effects.			
OTHER METHODS: This method is based on and replaces Sampling Data Sheet #29.02 [6].			

NIOSH Manual of Analytical Methods (NMAM), Fourth Edition

“RESTAURACIÓN DEL CASTILLO DE SAN LORENZO, CORREGIMIENTO DE
CRISTOBAL, DISTRITO Y PROVINCIA DE COLÓN,”
INFORME DE MONITOREO DE CALIDAD DE AIRE

ENVIRONMENTAL DEVICES CORPORATION
Calibration Report

Date: May 2020

Customer Name:

System ID: Serial Number 914055

Notes:

BASIC CHECK

Power Voltage	PASS
CPU Diagnostic Test	PASS
Air Flow Rate	PASS
Digital Communication	PASS
Sensor Output Voltages	PASS
Signal Channel Voltages	PASS
Memory Card Voltages	PASS

SENSOR	Low Span	Observed Low Test Result	High Span	Observed High Test Result	Calibration Accuracy
<i>PM A</i> (10 μ m)	0 μ g/m ³	0 μ g/m ³	5000 μ g/m ³	5000 μ g/m ³	+/- 10ug/m3
<i>PM B</i> (2.5 μ m)	0 μ g/m ³	0 μ g/m ³	5000 μ g/m ³	5000 μ g/m ³	+/- 10 ug/m3
<i>CO</i>	0 ppm	0 ppm	2.5 ppm	2.5 ppm	+/- 0.01 ppm
<i>NO₂</i>	0 ppb	0 ppb	374 ppb	374 ppb	+/- 5 ppb
<i>SO₂</i>	0 ppb	0 ppb	352 ppb	352 ppb	+/- 5 ppb
<i>Temperature</i>	0°C	0°C	50°C	50°C	+/- 2°C
<i>Relative Humidity</i>	13%	13%	75%	75%	+/- 3%

Calibration Technician
Dan Okuniewicz



Supervisor
Mark Sullivan

