

# 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 :
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**Technician**

**Supervisor**

Dan Okuniewicz	Mark Sullivan
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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- $\mu$ m 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<sup>3</sup>

**NIOSH:** no REL

**ACGIH:** 3 mg/m<sup>3</sup>

**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	
<b>SAMPLER:</b>	CYCLONE + FILTER (10-mm nylon cyclone, Higgins-Dewell [HD] cyclone, or Aluminum cyclone + tared 5- $\mu$ m PVC membrane)	<b>TECHNIQUE:</b>	GRAVIMETRIC (FILTER WEIGHT)
<b>FLOW RATE:</b>	nylon cyclone: 1.7 L/min HD cyclone: 2.2 L/min Al cyclone: 2.5 L/min	<b>ANALYTE:</b>	mass of respirable dust fraction
<b>VOL-MIN:</b>	20 L @ 5 mg/m <sup>3</sup>	<b>BALANCE:</b>	0.001 mg sensitivity; use same balance before and after sample collection
<b>-MAX:</b>	400 L	<b>CALIBRATION:</b>	National Institute of Standards and Technology Class S-1.1 or ASTM Class 1 weights
<b>SHIPMENT:</b>	routine	<b>RANGE:</b>	0.1 to 2 mg per sample
<b>SAMPLE STABILITY:</b>	stable	<b>ESTIMATED LOD:</b>	0.03 mg per sample
<b>BLANKS:</b>	2 to 10 field blanks per set	<b>PRECISION:</b>	<10 $\mu$ g with 0.001 mg sensitivity balance; <70 $\mu$ g with 0.01 mg sensitivity balance [3]
ACCURACY			
<b>RANGE STUDIED:</b>	0.5 to 10 mg/m <sup>3</sup> (lab and field)		
<b>BIAS:</b>	dependent on dust size distribution [1]		
<b>OVERALL PRECISION (<math>\hat{S}_r</math>):</b>	dependent on size distribution [1,2]		
<b>ACCURACY:</b>	dependent on size distribution [1]		

**APPLICABILITY:** The working range is 0.5 to 10 mg/m<sup>3</sup> 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  $\mu$ m) 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

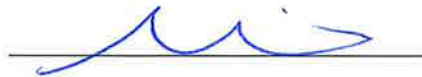
Power Voltage	PASS
CPU Diagnostic Test	PASS
Air Flow Rate	PASS
Digital Communication	PASS
Sensor Output Voltages	PASS
Signal Channel Voltages	PASS
Memory Card Voltages	PASS

SENSOR	Low Span	Observed Low Test Result	High Span	Observed High Test Result	Calibration Accuracy
<i>PM A (10<math>\mu</math>m)</i>	0 $\mu$ g/m <sup>3</sup>	0 $\mu$ g/m <sup>3</sup>	5000 $\mu$ g/m <sup>3</sup>	5000 $\mu$ g/m <sup>3</sup>	+/- 10ug/m3
<i>PM B (2.5<math>\mu</math>m)</i>	0 $\mu$ g/m <sup>3</sup>	0 $\mu$ g/m <sup>3</sup>	5000 $\mu$ g/m <sup>3</sup>	5000 $\mu$ g/m <sup>3</sup>	+/- 10 ug/m3
<i>CO</i>	0 ppm	0 ppm	2.5 ppm	2.5 ppm	+/- 0.01 ppm
<i>NO<sub>2</sub></i>	0 ppb	0 ppb	374 ppb	374 ppb	+/- 5 ppb
<i>SO<sub>2</sub></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**

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## CAPÍTULO 1: DATOS GENERALES DEL PROYECTO

<b>Proyecto</b>	“RESTAURACIÓN DEL CASTILLO DE SAN LORENZO, CORREGIMIENTO DE CRISTOBAL, DISTRITO Y PROVINCIA DE COLÓN,”
<b>Ubicación</b>	Colón, San Lorenzo
<b>País</b>	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	<b>SENSOR</b>	<b>Low Span</b>	<b>Observed Low Test Result</b>	<b>High Span</b>	<b>Observed High Test Result</b>	<b>Calibration Accuracy</b>
	<i>PM A (10µm)</i>	0 µg/m³	0 µg/m³	5000 µg/m³	5000 µg/m³	+/- 10ug/m3
	<i>PM B (2.5µm)</i>	0 µg/m³	0 µg/m³	5000 µg/m³	5000 µg/m³	+/- 10 ug/m3
	<i>CO</i>	0 ppm	0 ppm	2.5 ppm	2.5 ppm	+/- 0.01 ppm
	<i>NO<sub>2</sub></i>	0 ppb	0 ppb	374 ppb	374 ppb	+/- 5 ppb
	<i>SO<sub>2</sub></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%

## 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
		12:55 a.m.	1:50 p.m.
Fecha de realización: 11 de febrero de 2021			

Detalle	CO (ppb)	NO2 (ppb)	PMA 10 uG/m3	PMB 2.5 uG/m3	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”

## CAPÍTULO 5: ANEXOS

<i>Certificate of Calibration</i>			
<i>Certificate Number: EDCQP200-4.11.5</i>			
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<p>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.</p>			
<p>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.</p>			
<p>Quality system standard to meet the requirements of ANSI/ASQC standard Q9000-1994 (ISO 9001), MIL-STD 45662A, and customer's specification if required.</p>			
<p><b>Temperature = 22°C</b> <b>Relative Humidity = 30%</b> <b>Atmospheric Pressure = 760 mmHg</b> <b>Measurement Uncertainty Estimated @ 95% Confidence Level (k=2) using ISO 17025 guidelines.</b></p>			
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	
<p>Environmental Devices Corporation 4 Wilder Drive Building #15 Plaistow, NH 03865 ISO-9001 Certified</p>			

“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 <sup>3</sup> NIOSH: no REL ACGIH: 3 mg/m <sup>3</sup>		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: -MAX:	20 L @ 5 mg/m <sup>3</sup> 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
PRECISION		PRECISION:	<10 µg with 0.001 mg sensitivity balance; <70 µg with 0.01 mg sensitivity balance [3]
RANGE STUDIED:			
BIAS:			
OVERALL PRECISION (S <sub>r</sub> ):			
ACCURACY:			
APPLICABILITY: The working range is 0.5 to 10 mg/m <sup>3</sup> 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., = +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.			
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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
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