

Discipline Function		NEBB Instrument Master List (Effective January 1, 2022)											BET BSC CRT FHT RCx Sound TxB Vibration							Notes	Calibration Requirements		
		RANGE				ACCURACY				RESOLUTION													
Air	Air Pressure	0	in wg	to	10	in wg	± 2%	of reading	± 0.001	in wg	0.001	in wg	< 1	in wg	x	x	x	x			12 Months		
		0.01	in wg	>	1	in wg					0.01	in wg	>	1	in wg								
		0	Pa	to	2500	Pa	± 2%	of reading	± 0.25	Pa	0.10	Pa	<	250	Pa								
		1.0	Pa	>	250	Pa					1.0	Pa	>	250	Pa								
	Air Velocity Instrument for Pitot Traverse	100	fpm	to	3500	fpm	± 5%	of reading	± 7	fpm	1	fpm				x	x	x	x			12 Months	
		0.50	m/s	to	20	m/s	± 5%	of reading	± 0.04	m/s	0.01	m/s											
	FHT Air Velocity	25	fpm	to	2500	fpm	± 3%	of reading	± 3	fpm	1	fpm						x					12 Months
		0.10	m/s	to	12.7	m/s	± 3%	of reading	± 0.02	m/s	0.01	m/s											
Digital Direct Reading Hood	100	cfm	to	2000	cfm	± 5%	of reading	± 7	cfm	1	cfm				x	x	x	x			12 Months		
	50	l/s	to	944	l/s	± 5%	of reading	± 4	l/s	1	l/s												
Temperature	Air Meter with probe	0	°F	to	200	°F	± 0.5%	of reading	+ 2.0	°F	0.1	°F			x	x		x	x			12 Months	
		-20	°C	to	100	°C	± 0.5%	of reading	+ 1.0	°C	0.1	°C											
	Immersion Meter with probe	0	°F	to	200	°F	± 0.5%	of reading	+ 2.0	°F	0.1	°F			x			x	x			12 Months	
		-20	°C	to	100	°C	± 0.5%	of reading	+ 1.0	°C	0.1	°C											
Humidity	Humidity Meter (w/Probe, if req'd)	10	% RH	to	90	% RH	± 3%	RH							x			x	x			12 Months	
Electrical	Amperage Measurement	0.1	AC Ampere	to	100	AC Amperes	± 2%	of reading	± 5	digits	0.1	AC Ampere			x			x	x			12 Months	
	Voltage Meter - True RMS	1	VAC	to	600	VAC	± 2%	of reading	± 5	digits	1	Volt										12 Months	
Rotation	Rotation Measurement	60	rpm	to	5000	rpm	± 2%	of reading	± 2	rpm	1	rpm			x			x	x			12 Months	
Hydronic	Pressure Measurement	0.4	psi	to	200	psi	± 2%	of reading	± 1	psi	0.1	psi			x			x	x			12 Months	
		3	kPa	to	1400	kPa	± 2%	of reading	± 7	kPa	1.0	kPa											
	Δ Pressure measurement	0.4	psi	to	75	psi	± 2%	of reading	± 0.5	psi	0.01	psi			x			x	x			12 Months	
		3	kPa	to	500	kPa	± 2%	of reading	± 3.5	kPa	0.1	kPa											
RCx Instruments	Receptacle Circuit Tester	125	VAC				Not Applicable				Not Applicable						x					Not Required	
	Voltage Detector	50	VAC	to	1000	VAC	Not Applicable				Not Applicable							x					Not Required
	Light Level Measurement	0	FC	to	4000	FC	± 3%	of reading	+ 5%	full scale	0.1	FC							x				Per Manufacturer's Requirements
0		lx	to	40000	lx	± 3%	of reading	+ 5%	full scale	1.0	lx												
BET / RCx Instruments	Temp Documentation Thermal Camera	-4	°F	to	450	°F	± 2%		or 3.6	°F	0.1 @ 86 °F	&	160 x 120					x			*8	Per Manufacturer's Requirements	
		-20	°C	to	232	°C	± 2%		or 2.0°C	°C	0.1 @ 30 °C	&	160 x 120					x					Per Manufacturer's Requirements

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Function		RANGE				ACCURACY				RESOLUTION																	
Data Loggers	Carbon Dioxide CO ₂	0	ppm	to	2500	ppm	±	5%	of reading	±	50	ppm	1	ppm							x		Qty = 1	Per Manufacturer's Requirements			
	Carbon Monoxide CO	0	ppm	to	1000	ppm	±	10%	of reading	±	3	ppm	1	ppm									Qty = 1	Per Manufacturer's Requirements			
	Lighting Levels	0	FC	to	3000	FC	±	10	FC				2	FC									Qty = 1	See Note 5			
		0	lx	to	30000	lx	±	100	lx				0	lx													
	Electrical	0	VAC	to	600	VAC	±	2%	of reading				VAC	1.0	VAC									Qty = 2	See Note 5		
		0	Amperes	to	100	Amperes	±	4%	of reading				Ampere	0.1	Ampere												
	Static Pressure - Low	0	in wc	to	0.25	in wc	±	1%	full scale				0.01	in wc	<	1	in wc							Qty = 1	See Note 5		
													0.1	in wc	>	1	in wc										
		0	Pa	to	60	Pa	±	1%	full scale				2.5	Pa	<	250	Pa										
	Static Pressure - High	0	in wc	to	6.00	in wc	±	1%	full scale				0.01	in wc	<	1	in wc							Qty = 1	See Note 5		
													0.1	in wc	>	1	in wc										
0		pa	to	1500	Pa	±	1%	full scale				2.5	Pa	<	250	Pa											
Water Pressure	0	psi	to	100	psi	±	1%	of reading	psi			1.0	psi										Qty = 1	See Note 5			
	0	kPa	to	700	kPa	±	1%	of reading	kPa			0.1	kPa														
Temperature	-4	°F	to	150	°F	±	0.63	°F	@	32-122	°F	0.05	°F	@	77	°F							Qty = 8	See Note 5			
	-20	°C	to	65	°C	±	0.35	°C	@	0-50	°C	0.03	°C	@	25	°C											
Humidity	10	% RH	to	90	% RH	±	2.5%	RH				1%	RH										Qty = 8	See Note 5			
Event	Not Applicable				Not Applicable				Not Applicable														Qty = 2	Not required			
RCx Instruments	Thermal Infrared Thermometer	-4	°F	to	500	°F	±	2%	of reading	±	4	°F	0.5	°F										Per Manufacturer's Requirements			
		-20	°C	to	260	°C	±	2%	of reading	±	2	°C	0.2	°C													
	TDS Meter	0	μ	to	1000	μ	±	2%	full scale				1.0%											Per Manufacturer's Requirements			
		0	ppm	to	1000	ppm	±	2%	full scale																		
Capacitance Moisture Meter	0%		to	100%		±	5%					0.75	inches		Penetration								Per Manufacturer's Requirements				
CPT Instruments	Particle Counter	A light scattering instrument with display or recording means to count and size discrete particles in air, as defined by ASTM F50-07. Instruments of this type shall provide for a minimum sampling flow rate of 28.3 L/min (1.0 cfm) and a threshold size discrimination of a minimum of 0.3 micrometer in size.																						x	*7	12 Months	

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		Function		RANGE		ACCURACY			RESOLUTION													
CPT Option 1	Aerosol Photometer	CHOOSE ONLY 1 OF THE 2 OPTIONS	The instrument shall have a threshold sensitivity of 10 ⁻³ micrograms/liter of challenge aerosol particles and be capable of measuring concentrations over a range of 105 times the threshold sensitivity. Sample flow rate shall be 28.3 L/min (1 cfm). Readout shall be either linear with an accuracy of 1% of full scale of the selected range. ± 2% of reading ± 0.1 psi 0.04 psi (US)																	*1 & *7	12 Months or 400 operating hours	
	Pneumatic Aerosol Generator		A device that can aerosolize oil medium to serve as an artificial challenge for filter integrity testing of systems under 3,000 cfm, typically Laskin nozzle(s) type, thermal generator, atomizer, etc.																	*1	Not Required	
	Thermal Aerosol Generator		A device that can aerosolize oil medium to serve as an artificial challenge for filter integrity testing of systems of 3,000 to 60,000 cfm																		*1	Not Required
CPT Option 2	Optical Particle Counter for Scan Test		A particle counter should have a 1.0 cfm flow rate with a threshold sensitivity of at least 0.3µm. The counter must have an audible alarm for every particle that is counted. The particle counter shall have a continuous counting mode or a sample time that exceeds the time required to completely scan the area of the filter under test. This counter may also be used for Cleanliness Classification above.																		*1 & *7	12 Months
	Diluter		A device used with the scanning particle counter to sample the aerosol challenge upstream of a filter under test. The dilution ratio shall be between 300 – 1,000:1. The resulting counts after dilution should not exceed 100,000 particles.																		*1	12 Months
	Aerosol Generator		A device that can aerosolize oil or microsphere medium to serve as an artificial challenge for filter integrity testing. A low output (defined as one which supplies of < 5 x 10 ⁻⁹ particles /min of ≥ 0.3 um in size) or a normal output generator may be used.																		*1	Not Required
FHT Instruments	Tracer gas Detector			Minimum detection range: 0.01 PPM Minimum response time: 1 second The units shall be configured to measure sulfur hexafluoride (SF6), or other approved tracer gas, and display in concentration measurement units (PPM)		±	10%	of reading	or	0.025	ppm	0.01	ppm									12 Months
	Detection Calibrator			Device used to calibrate the detection instrument in accordance with the manufacturer's specifications.		Not Applicable			Not Applicable													12 Months When Required
	Local Challenge Source			Device that can generate a small relatively neutrally buoyant smoke, discharging with minimal velocity.		Not Applicable			Not Applicable													Not Required
	Large Challenge Source		Device that can generate a large relatively neutrally buoyant smoke, discharging with minimal velocity.		Not Applicable			Not Applicable													Not Required	
	Ejector w/critical orifice		Shall conform to the requirements as indicated in the current edition of NEBB FHT PS. See appendix D for instrument specifications		Not Applicable			Not Applicable														Not Required
	Orifice Calibrator	Flow Meter	0	l/m	to	10	l/m	±	3%			0.1	l/m									Calibrate to appropriate tracer gas
		Mechanical Device	0	l/m	to	15	l/m	±	0.1	l/m		0.1	l/m									12 Months
	Tracer Gas		Sulfur Hexafluoride Commercial grade (Minimum purity of 99%) or approved replacement gas		Not Applicable			Not Applicable														SDS Required
Mannequin		A three dimensional mannequin (torso) with arms and shall be of reasonable human proportions and be clothed with a lab coat. The height must be adjustable to meet the height requirements of the various hood configurations; i.e. standard bench hood, ADA height, floor mounted, etc. Probe shall be placed in the normal breathing zone based on the various heights.				Not Applicable			Not Applicable												Not Required	
BET Instruments	Digital pressure flow measurement system		Not Applicable		±	4%	of reading				0.1 Pa (0.0004 inwc, 0.002 psf)										Per Manufacturer's Requirements	

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		RANGE	ACCURACY	RESOLUTION											
Sound Instruments	Sound Level Meter, Real Time Analyzer, & Octave Band Analyzer	Sound Level Meters (SLM's) and Real Time Analyzers	Sound Level Meters (SLM's) and Real Time Analyzers	which conforms Appendix A of the NEBB Instrument List											
		Real Time Analyzers	As listed in ANSI S1.4 Tables 3.1.1, 3.1.2 and ANSI S1.11 Table 3.2.1	which conforms Appendix A of the NEBB Instrument List						x			#3	12 Months	
		Full Octave Filters	As listed in ANSI S1.11 Table 3.2.1	which conforms Appendix A of the NEBB Instrument List											
	Acoustic Calibrator	Sound Pressure Calibrator. Shall meet the requirements specified in Appendix A of the NEBB Instrument List.								x			#3	12 Months	
Vibration Instruments	Vibration Analyzer / Meter, Real Time Analyzer & Spectrum Analyzer	Shall meet the minimum requirements as specified below:													
		Displacement – 0.1 to 100 mils (0.0001 to 0.1 inches)													
Velocity – 0.0005 to 10 in/sec															
Acceleration – 0.0001 to 30 G's															
Frequency Range – 1 to 1000 Hz (60 to 60,000 RPM)															
Frequency Resolution (bandwidth) – at least 1.25 Hz (1 / 75 RPM) Minimum															
Lines of resolution ≥ 800															
Detection - Peak, Peak-to-Peak, RMS															
FFT Windowing- Hanning at least															
Averaging – exponential or time and selectable to at least four averages															
Vibration Instruments	Accelerometers / Transducer	Shall have the following minimum specifications:													
		Sensitivity (± 10%) ≥ 100 mV/G typical													
		Measurement Range = ± 20 G peak													
		Frequency Range = 2 to 3000 Hz at ± 5%													
NOTES															
*1 CPT Option - choose only Option 1 OR Option 2 - along with required instrument for CPT certification (All instruments in any of the chosen is required)															
*2 FHT Orifice Calibrator - Choose only one.															
*3 Refer to Appendix A for complete instrumentation requirements for Sound Measurement (SM)															
*4 Firms may own or rent vibration equipment instrumentation for vibration certification															
*5 Calibration Requirement: Data logger calibration may be verified from a calibrated instrument with an associated calibration form showing calibration readings from both the calibrated instrument and the data logger. If a data logger is out of calibration and cannot be adjusted, the logger must be sent back to the factory for re-calibration or be replaced															
*6 Accuracy of an instrument is either stated as a percentage of full scale or as a percentage of the reading. NEBB has chosen percentage of reading due to it being a more accurate reading. Since a % of reading error becomes smaller as you read near the lowest part of the scale the instrument resolution and accuracy must be very small to maintain the accuracy of the reading. To overcome this the manufactures add a standard offset to the % of reading to maintain a reasonable accuracy at all locations on the scale. Normally for TAB readings we are never operating at the extreme ends of the scale so this has no impact on our work.															
*7 Calibrated per Industry/Manufacturer standards.															
*8 Firms may own or rent Temp Documentation Thermal Camera for RCx. BET Temp Documentation Thermal Camera must be owned.															
General Note: Some local jurisdictions require qualified electrician for any electrical readings															
Calibration Requirement: Instruments require a 3-point calibration, traceable to National Institute of Standards and Technology (NIST) or National Metrology Institute (NMI) unless otherwise noted.															

NEBB Required Instrumentation (Effective January 1, 2022)

Appendix A - NEBB Sound Level Meter and Acoustic Calibrator Instrumentation Minimum Calibration Data

1.0 Introduction:

NEBB allows for ANSI S1.4 Type 1 or Type 2 meters; which, minimally have full octave band filters sets. There are two general configurations of SLM and filter set instruments used by NEBB firms; an older SLM with an external filter set which attaches to the SLM and more modern SLM / Real Time Analyzer, which has the filters built into the instrument. Most NEBB firms use modern instruments, SLM / Real Time Analyzer.

The amplitude tolerances for Type 1 and 2 meters are different in each octave band. Therefore, there are two sets of compliance tables; one set for Type 1 / Class 1 instruments and one set for Type 2 / Class 2 instruments. The two sets cannot be combined, since, some NEBB firms have Type 1 instruments which are required for government work.

Additionally, many of the newer Real Time Analyzers have both full and third octave band filter sets. The NEBB S&V certification is to measure and report sound levels, which are in the form of overall A-weighted levels (overall dBA) or data input to Noise Criteria (NC) and /or Room Criteria (RC) curves. Both of which only use full octave band data. Therefore, the minimum calibration information is for full octave bands only.

As a matter of procedure for calibration of SLM / Real Time Analyzers, the information listed below is the minimum number of calibration check test points which must be on a calibration certificate.

2.0 Acoustic Calibrators (ANSI S1.40)

Acoustic calibrators typically have one or two sound amplitude levels and one or two frequencies. That is amplitudes 94 or 114 dB, and frequency 250 or 1000 Hz. These combinations cover 99% of all sound level (acoustic) calibrators. The tolerances are,

Parameter	Type / Class 1	Type / Class 2
Amplitude	±0.55 dB	±0.95 dB
Frequency	±1.3%	±2.3%

3.0 Sound Level Meters / Real Time Analyzers

3.1 Calibration Tolerances and Minimum Data (ANSI S1.4)

The data listed in Tables 3.1.1 and 3.1.2 are minimum performance checks on a sound level meter, with the meter set in the overall sound level mode. The data in Tables 3.1.1 and 3.1.2 is **not** to be used to assess compliance of filter sets. Tolerance parameters for filter sets (analog or digital) is presented in Section 3.2

Table 3.1.1: Overall Meter Performance Tolerances

Acoustical Parameter Check	Type 1	Type 2
Overall SPL Accuracy	±0.7 dB	±1.0 dB
Fast Response	-1 ±1.0 dB	-1, (+1, -2) dB
Slow Response	-4.1 ±1.0 dB	-4.1 ±2.0 dB
Linearity	±0.4 dB	±0.6 dB
Noise Floor	Note 1	Note 1

Note 1: 5 dB below manufacturers minimum published level.

Table 3.1.2: Overall Meter Frequency Response.

Frequency (Hz)	A-weighted Relative Response Level dB	Tolerance Limit dB	C-weighted Relative Response Level dB	Tolerance Limit dB	Z-weighted Relative Response Level dB	Tolerance Limit dB
31.5	-39.4	± 1.5	-3.0	+/-1.5	0.0	+/-1.5
63	-26.2	± 1	-0.8	+/-1	0.0	+/-1
125	-16.1	± 1	-0.2	+/-1	0.0	+/-1
250	-8.6	± 1	0.0	+/-1	0.0	+/-1
500	-3.2	± 1	0.0	+/-1	0.0	+/-1
1K	0	± 1	0.0	+/-1	0.0	+/-1
2K	1.2	± 1	-0.2	+/-1	0.0	+/-1
4K	1.0	± 1	-0.8	+/-1	0.0	+/-1
8K	-1.1	± 1.5/-3	-3.0	+1.5/-3	0.0	+1.5/-3

3.2 Filter Set Requirements

(ANSI S1.11)

Table 3.2.1 Octave Band Filter Roll-Off Response

Octaveband Center Freq. Hz	Lower Octaveband Edge Limit, Hz	Band edge Roll-off Limits dB		Upper Octaveband Edge Limit< Hz	Band edge Roll-off Limits dB	
		Type 1	Type 2		Type 1	Type 2
31.5	22.4	-2.0 to -5.0	-1.6 to -5.5	44.7	-2.0 to -5.0	-1.6 to -5.5
63	44.7	-2.0 to -5.0	-1.6 to -5.5	89.1	-2.0 to -5.0	-1.6 to -5.5
125	89.1	-2.0 to -5.0	-1.6 to -5.5	178	-2.0 to -5.0	-1.6 to -5.5
250	178	-2.0 to -5.0	-1.6 to -5.5	355	-2.0 to -5.0	-1.6 to -5.5
500	355	-2.0 to -5.0	-1.6 to -5.5	708	-2.0 to -5.0	-1.6 to -5.5
1,000	708	-2.0 to -5.0	-1.6 to -5.5	1413	-2.0 to -5.0	-1.6 to -5.5
2,000	1413	-2.0 to -5.0	-1.6 to -5.5	2,818	-2.0 to -5.0	-1.6 to -5.5
4,000	2818	-2.0 to -5.0	-1.6 to -5.5	5623	-2.0 to -5.0	-1.6 to -5.5
8,000	5623	-2.0 to -5.0	-1.6 to -5.5	11220	-2.0 to -5.0	-1.6 to -5.5
16,000	11220	-2.0 to -5.0	-1.6 to -5.5	22390	-2.0 to -5.0	-1.6 to -5.5

3.3 Other Information Required to be on Calibration Certificate

Laboratory Conditions during Calibration:

1. Atmospheric Pressure,
2. Temperature, and
3. Humidity