LAB COMPANION

Focus: Ambient Air

Bioindicator of clean ambient air

Lichens are highly sensitive to atmospheric pollutants like sulfur dioxide and nitrogen oxides. The healthy, widespread patches of light greyish-green crustose lichens covering the bark indicate that the surrounding air is very clean and free from significant industrial or vehicle pollution.

Photo credit:Randeep

2026 APR-JUN 01 NEWSLETTER


Photo credit:Randeep

From the Editor

The sky isn't actually blue—it's a daylight trick played by air and sunlight scattering light across the atmosphere. This comforting illusion, woven to hide the abyssal blackness of space behind a veil of blue, is being dismantled as emissions and particulate matter choke our air. In stripping away this natural wonder through environmental neglect, we reveal a troubling truth: we are not awakening to reality but rather trading a celestial masterpiece for a man-made mask. We need environmental monitoring laboratories to step up and fulfil their crucial role in preserving the sky as nature intended.

Namita Thakur
Managing Editor

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Editorial Team

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Intermediate Checks on Air Pollution Monitoring Instruments

Dr. Rajendra Prasad, CEO Ecotech Instruments, Greater Noida

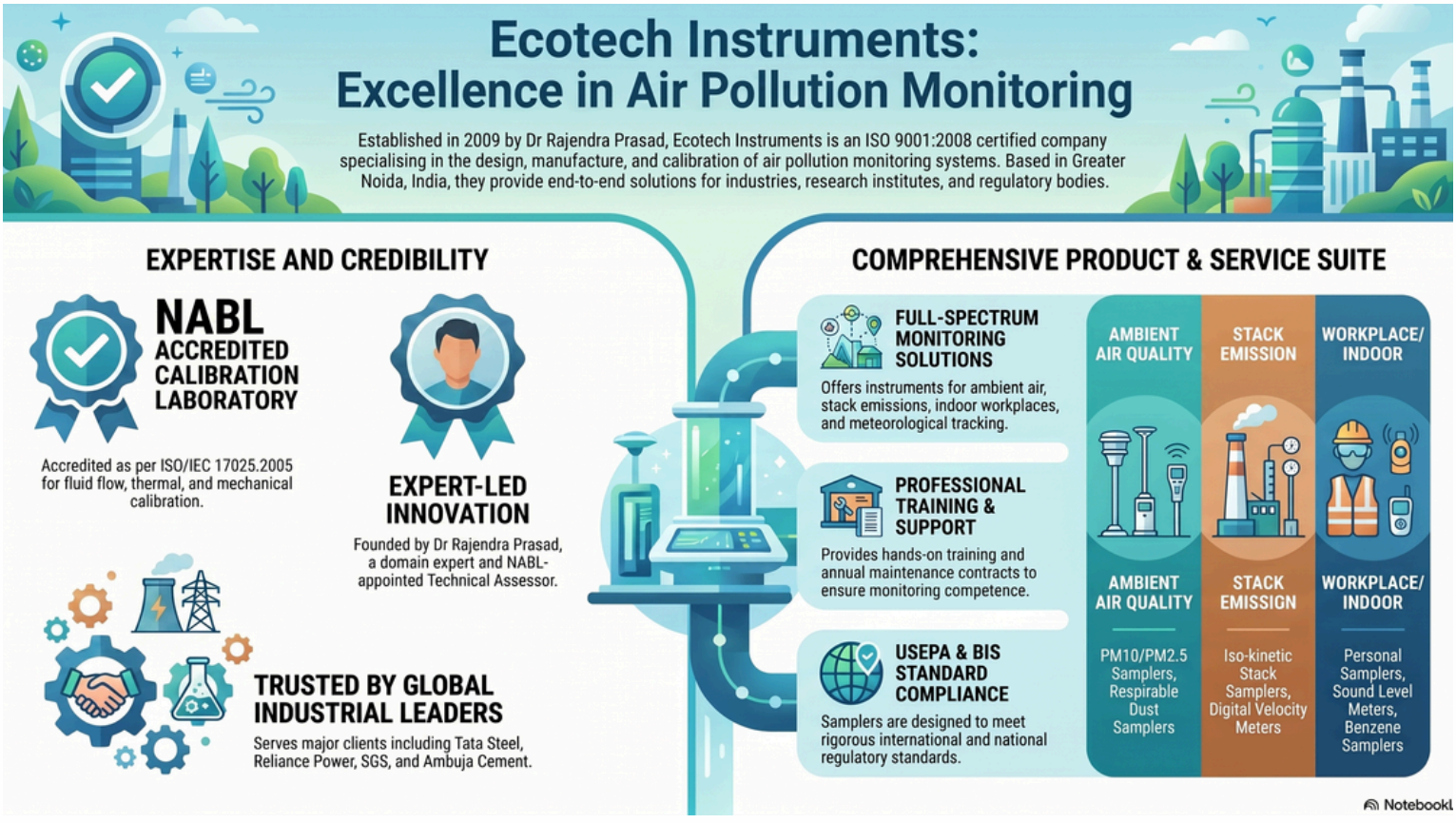
This article summarizes intermediate checks required on key equipment used in sampling of particulates and gaseous pollutants in ambient air as per BIS 5182 standards series. Dust sample collection is done gravimetrically. The gaseous pollutants are first absorbed in absorbing reagents, followed by their chemical analysis to find out prevailing concentration of pollutants present in air.

The key parameters in ambient air monitoring equipment, which require calibration and intermediate checks to meet the requirements of clause 6.4.6 and 7.7.1(e) of ISO/IEC 17025: 2017 are flow and time as both these parameters take part in calculation of air volume passed through the sampling media. The calibration of sampler is to be undertaken from a calibration laboratory accredited as per ISO/IEC 17025: 2017.

The intermediate checks, however, are undertaken by the laboratory itself using a **calibrated reference standard**. Here it is important to understand few key terms and details of the frequently used units like-

1) **Resolution** is the smallest change in value that the instrument can actually detect and display. It is the "fineness" and lowest measurable value with confidence. If resolution of flow parameter is 0.05 lpm (litres per minute) it means the device measures or displays flow in increments of .

2) **Accuracy** tells you how close the instrument's reading is to the true value. An accuracy of ±2% FS (Full Scale) means error margin is calculated on Span value (the maximum capacity of the device). Therefore, if a rotameter is having a range (Full Scale) of 0.15 to 1.5 lpm with an accuracy of ±2% FS, it means error margin is ±0.03 lpm a constant value across the entire range of the rotameter.



3)**Dry Gas Meter (DGM)** is a mechanical / positive displacement device. It uses flexible diaphragms or bellows that fill and empty, physically driving a mechanical gear counter. Measures volumetric throughput at prevailing temperature and pressure conditions of medium (air). **Requires separate temperature sensors and manometers to manually calculate corrected standard volume**

4)**Digital Gas Flow Meter (DGFM)** is an electronic / sensor-based device. It uses mass sensors, ultrasonic transducers, or digital differential pressure sensors. Provides **instantaneous flow rate** and **cumulative standard volume** in real time. Integrated sensors automatically adjust measurements for temperature and barometric pressure fluctuations in real time.

For **PM2.5 sampler** IS 5182 P-24, 2019 Reaffirmed 2024 specifies sample flow rate of 16.67 lpm should be maintained with an accuracy of ±2%. The CPCB has notified PM2.5 specifications (Office order EQ 11012/1/2023-AQMN-HO-CPCB-H Dated: 30.01.2023) which specifies sample flow rate of 16.7 lpm with an accuracy of ±2% of the reading. However, it further specifies flow rate shall not vary more than ±5% from the specified flow of 16.7 lpm.

For intermediate checks the reference standard to be used is a DGFM (Digital Gas Flow Meter). It must be more precise than the Unit Under Test (UUT). Taking into consideration CPCB specifications the maximum allowable error in flow rate for PM2.5 sampler is ±0.83 lpm (±5% of flow value). It means sampler's flow rate must remain strictly within during full operation cycle of 24 hrs. To conduct an effective intermediate check the DGFM must follow the Test Accuracy Ratio (TAR) of at least 2:1 compared to the UUT. Therefore, required Flow calibrator accuracy should be at least ±0.33 lpm (+ 2% of flow reading). To reliably capture and display variations down to without rounding errors, the resolution must be one order finer than the target tolerance, that is, Minimum Acceptable Flow Calibrator Resolution must be 0.01 lpm, although an ideal one is 0.001 lpm.

However, most of the laboratories in India use DGM instead of DGFM because of lack of understanding, cost implications. The DGM in common use is suitable for measuring volume with resolution of 0.2 liter (Normally 0.0002 m^3 is mentioned to give an impression it is having very high resolution) with a flow range of 0.25 - 40.0 lpm (0.02 - 2.5 m^3/hour). The specified Dry Gas Meter (DGM) **is generally not recommended** for conducting intermediate checks on a PM2.5 sampler. Mechanical DGMs introduce significant backpressure (internal diaphragm friction). PM2.5 samplers rely on sharp particle cut-offs (WINS impactors), which require stable inlet pressure. High backpressure distorts the actual operating flow rate during the check. Further mechanical DGM requires manual timing using a stopwatch which introduces significant human reaction time error into the measurement. To achieve an acceptable flow rate measurement without timing/resolution errors dominating the result, a manual timing test across a dial increment of 0.2 litre requires a very long duration (passing at least per run), making it impractical for routine dynamic verification. **If at all a DGM is to be used for intermediate checks on PM2.5 sampler the appropriate specifications can be 5 to 30 lpm (0.3 – 1.8 m^3/hour) with accuracy of ±0.16 lpm and resolution of ±0.01 lpm with all for said issues and devoting more time for checks.**

The Orifice based flow controller should maintain a flow rate within 15% of the designed flow rate of 1 m^3/minute (1000 lpm) for which a cyclone separator/impactor is fitted in instrument to get D50 at desired cut off range) for a **PM10 Sampler or Respirable Dust Sampler** (IS 5182 P-23, 2006 Reaffirmed 2022) thus intermediate checks should be done in the range 0.9-1.1 m^3/min.

For a **High-Volume Sampler for Suspended Particulate Matter** (IS 5182 P-4, 1999 Reaffirmed 2019) intermediate checks should be done in the range 1.0 - 1.4 m^3/min

Intermediate checks on these equipment's (PM10 Sampler/ High Volume Sampler) are done using a set of calibrated Top-Loading Orifice Calibrator, with set of 5 multi-hole plates Resistance Plates (typically 5, 7, 10, 13, and 18 holes) used to simulate clean to choked filter conditions by physically restricting airflow through resistance plates, a water-filled single limb manometer or a digital manometer with minimum resolution of 0.1 mm H_2O to measure the pressure drop across the orifice and a barometer and thermometer to measure ambient pressure and ambient temperature at the time of intermediate checks at checking site. While a full calibration involves a 5-point annual check with varying resistance plates from an accredited laboratory. However, an intermediate check is a quick single-point or two-point verification done under normal operating conditions and observed deviations are worked out after applying correction to calibration curve conditions of Top Loading Orifice Calibrator.

Gas samplers for absorbing Ozone (IS 5182 P-9, 2026), Ammonia (IS 5182 P-25, 2026), Sulphur dioxide (IS 5182 P-2 Sec 1, 2023) or Oxides of nitrogen (IS 5182 P-6, Sec-1 2026) consist of a cabinet which can be with built in sampling pump or without sampling pump in which case the suction for sampling the gases is provided by blower of particulate sampler. A rotameter shall be used for flow measurement with a range of 0.15 -1.5 lpm with a resolution of 0.05 lpm and accuracy of ±5% FS (full scale). The rotameter's scale resolution (0.5 lpm) is smaller than its specified accuracy limits (± 0.075 lpm). When reading the float reading point (widest part of float) height, operator visual interpolation between scale lines is necessary, and error limits should account for this visual uncertainty. The calibration of rotameter should be done on at least 3 test points covering the operating range (typically , , and of full scale 0.30 lpm (low flow), 0.75 lpm (Mid flow) and 1.20 lpm (High flow). For doing intermediate checks the industry standard recommendation is a minimum 2:1 accuracy ratio, meaning the flow checking unit should be at least 2 times more accurate than the rotameter (flow calibrator accuracy in the range 0.15 to 1.5 need to be 0.03 lpm (2% of FS)

Doing intermediate checks on an ambient air **benzene sampler** operating at a very low flow rate of 20–200 mL/min with a tight tolerance of requires extreme precision. A Low-Flow Primary Calibrator 20-200 mL/min, accuracy ±0.5% FS or a Soap-Film calibrator with high-precision micro-burettes (50 mL/100 ml capacity with 0.05 mL graduations) is basic requirement to achieve objectives.

Looking into the ground level reality and a very cost sensitive market, but without compromising with quality, it is recommended that to maintain regulatory confidence and comply with ISO/IEC 17025: 2017 requirements as given in Table below can be minimum acceptable:

Ambient Air Equipment and Flow criteria	Suitable Reference Standard or Master for undertaking the Intermediate checks on Flow rate
PM2.5 Sampler 16.7 lpm should be maintained with an accuracy of ±5%.	A **DGFM** with accuracy ±0.33lpm (+/-2%), Minimum resolution is 0.01 lpm. It can serve the purpose for gaseous samplers only. If at all a **DGM** is to be used for intermediate checks on PM2.5 sampler the appropriate specifications can be 5 to 30 lpm (0.3 – 1.8 m^3/hour) with accuracy of ±0.16 lpm and resolution of ±0.01 lpm
PM10 High Volume Sampler flow rate should be maintained between ±15% of the designed flow rate of 1 m3/min (0.85 - 1.15 m3/min)	A Top-Loading Orifice Calibrator, with set of 5 multi-hole plates Resistance Plates (typically 5, 7, 10, 13, and 18 holes), a water-filled single limb manometer or digital manometer to measure the pressure drop across the orifice and a barometer and thermometer to measure ambient pressure and ambient temperature are required

Ambient Air Equipment and Flow criteria	Suitable Reference Standard or Master for undertaking the Intermediate checks on Flow rate
Gaseous Rotameter 0.15-1.5 lpm with a resolution of 0.05 lpm and accuracy of ±5% FS (0.075lpm)	**DGM is not suitable.** A **DGFM** with accuracy ±0.33lpm (+/-2%), Minimum resolution is 0.01 lpm. It can serve the purpose for gaseous samplers only
Benzene Sampler 20–200 mL/min with a tolerance of ± 1 mL/min which is ±0.5% of FS	A Low-Flow Primary Calibrator 20-200 mL/min, accuracy ±0.5% FS or a Soap-Film calibrator with high-precision micro-burettes (50 mL/100 ml capacity with 0.05 mL graduations). Since for a regular laboratory it is not practical to maintain these kinds of standards, labs may go for more frequent calibration depending on the use for better confidence in values.

When reference standards are used strictly for intermediate checks, laboratories may adopt a calibration interval of 2 to 3 years, including they are handled and stored with care. In addition, laboratories should use only trained personnel to handle the reference standards. The laboratories should be careful when purchasing equipment's and should communicate its requirements to suppliers for the products to be provided and acceptance criteria clearly (6.6.3 ISO/IEC 17025: 2017). This will help ensure validity of results.

It is important that all stakeholders give due attention to help improve over a period of time to achieve scientifically meaningful compliance. Regulatory bodies and standards organizations are key to advancing quality frameworks by maintaining rigorous oversight of manufacturers. They must also establish clear, uniform, and actionable specifications. The accreditation bodies should keep their assessors updated on technical fronts and provide suitable timelines to laboratories for changeover in a gradual manner. Knowledge should not become a tool of harassment.

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IS 5182 Series for parameters listed in NAAQS 2009

IS 5182 : Part 2 : Sec 1 : 2023 Sulphur Dioxide
IS 5182 : Part 6 : Sec 1 : 2026 Oxides of Nitrogen
IS 5182 : Part 9 : 2026 Oxidants
IS 5182 : Part 10 : 1999 (Reaffirmed Year : 2019) Carbon Monoxide
IS 5182 : Part 11 : 2006 (Reaffirmed Year : 2022) Benzene
IS 5182 : Part 12 : 2004 (Reaffirmed Year : 2019) PAHs in air particulate matter [Benzo(a)pyrene]
IS 5182 : Part 14 : 2000 (Reaffirmed Year : 2019) Planning the Sampling of Atmosphere
IS 5182 : Part 23 : 2006 (Reaffirmed Year : 2022) Respirable Suspended Particulate Matter (PM 10)
IS 5182 : Part 24 : 2019 (Reaffirmed Year : 2024) Fine Particulate Matter (PM2.5)
IS 5182 : Part 25 : 2026 Ammonia
IS 5182 : Part 30 : 2025 Metals in Particulate Matter in Ambient Air (As, Pb, Ni)

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Certification of PM2.5 Samplers by CSIR-NPL

Summary by Dr. R.S Saini with inputs from Dr. Shankar G. Aggarwal, Scientist G & Head- Aerosol & Gas Metrology and Dr. Rupesh Das, Scientist F & Head- Air Metrology, CSIR-NPL, New Delhi

CSIR-NPL, at the behest of CPCB, initiated provisional certification of low-volume samplers to ensure the quality of this equipment in the market following strict compliance with the national/international standards.
The following critical parameters are checked for the purpose -

1. Cut point
   - 1.1 D50 cut-off size of impactor /cyclone
   - 1.2 Sharpness of the penetration efficiency curve.
2. Size Selective Inlet Type
3. Height of the Inlet
4. Time Totalizer
5. Flow rate
6. Temperature sensor
7. Pressure sensor

The pass/fail criteria is followed as per the CPCB guideline no. 102946/2023/AQMN-HO on the above listed parameters.

With over two years having elapsed since the introduction of this scheme, adequate time has been given to the manufacturers for updating their manufacturing infrastructure/skills. Going forward, laboratories purchasing PM2.5 samplers must strictly procure CSIR-NPL certified model of the samplers (not just by checking calibration certificates, e.g. cutoff size, flow rate, etc. of the parts/sensors used in the sampler).

Concurrently, laboratories must be aware of what to verify with the manufacturers when procuring PM2.5 samplers. **As on date, CSIR-NPL has certified the makes and models of three manufacturers, listed in the Table below:**

Malke and Model	Manufacturer Name	Reference No.
Make: Envirotech Model: APM 550 MFC	Envirotech Instruments Private Limited, New Delhi	PLoC/Pm2.5/NPLI CS-01 Issued on 01.09.25 Valid up to 31.08.27
Make: Ecotech Model: AAS 127 MFC	Ecotech Instruments, Noida	PLoC/Pm2.5/NPLI CS-02 Issued on 18.12.25 Valid up to 17.12.27
Make: Envirotech Model: APM 550 MMFC	Touchwood Private Limited, New Delhi	PLoC/Pm2.5/NPLI CS-03 Issued on 24.04.26 Valid up to 23.4.28

Laboratories may note, while purchasing the PM2.5 samplers, they should ask for the model which is having valid certification 'CSIR-NPL India certification Scheme'. **Beware of manufacturers trying to sell the equipment's by showing calibration certificates given by NPL for one or other parameters** (e.g. cutoff size, flow rate, etc.). A sample certificate is provided below for reference by laboratories when purchasing a PM2.5 sampler.

सीएसआईआर-एनपीएल भारत प्रमाणन योजना
CSIR-NPL India Certification Scheme
(NPLI CS)
(सीएसआईआर-राष्ट्रीय भौतिक प्रयोगशाला: राष्ट्रीय मापन संस्थान, भारत)
डॉ. के.एस. कृष्णन मार्ग, नई दिल्ली-110012, भारत
(CSIR-National Physical Laboratory: National Metrology Institute of India)
Dr. K. S. Krishnan Marg, New Delhi-110012, India

Application No.: Date of issue:
Reference No.: Date of validity:

This is to certify that the
Manual $PM_{2.5}$ Sampler
Make: _____
Model: _____

Manufactured by:

Qualifies the acceptability criteria prescribed in CPCB Guidelines 102946/2023/AQMN-HO

Acceptability has been verified under CSIR-NPL India Certification Scheme (NPLI CS) through laboratory testing/calibration of approved parameters at the CSIR-National Physical Laboratory, India. This is a provisional certificate; for final Product Conformity Certificate, the manufacturer needs to submit above make and model samplers to CSIR-NPL for all weather field testing.

Date of validity:

Chairman Certification Committee
(NPL India Certification Scheme)

CSIR-National Physical Laboratory
(National verification agency for certifying instruments and equipment for monitoring emissions and ambient air)
Dr. K. S. Krishnan Marg, New Delhi-110012, India

Fax : 91-11-45609310 E-mail : cfct.nplindia@csir.res.in
NPLI CS : 91-11-45608287 : ics.nplindia@csir.res.in
General Enquiry : 91-11-45608650 Website: www.nplindia.org

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Page 1 of 4

As on date, the certificate consists of 4 pages. The laboratories need not worry about the date of validity of certification. **The certification should be valid at the time of purchase.** Once purchased a model/make with valid certification, labs shall get the equipment calibrated, preform intermediate checks, leak tests and other QA/QC required in line with requirements laid down in ISO/IEC 17025: 2017. Please visit the CSIR-NPL website regularly for the latest information and updates.

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A Handy Guide to Key Checkpoints in Ambient Air Sampling and Analysis

Dr. Prem Kumar Srivastav, Ex. Senior Scientist at MP Pollution Control Board

National Ambient Air Quality Standards (NAAQS) 2009, lists, 12 parameters to be monitored to assess air quality. This article summarizes key checks and or information excluding calibration or intermediate checks that needs to be taken care of while performing analysis/sampling to ensure validity of data.

Sulphur Dioxide (SO_2) IS 5182 (Part 2/Sec 1): 2023 Tetrachloromercurate Pararosaniline Method- Key Points for Quality Assurance:

- The method specifies, a spectrophotometer suitable for measurement of absorbance at *560 nm* with an effective spectral band width of not more than 5 nm is required. As spectral band width is narrow (≤ 5 nm) with narrow slits, small wavelength offsets produce disproportionately large errors in absorbance (A) and break the linear relationship assumed by the Beer-Lambert law. If the instrument's mechanical or optical alignment shifts and projects *565nm* when set to 560nm , the measurement occurs off-peak, resulting in falsely low absorbance readings. The method therefore asks that the wavelength calibration of the instrument shall be verified. To verify wavelength calibration, you scan a reference filter, convert the output to absorbance (A), identify the measured peak wavelengths (maxima), and confirm they match the reference filter's (Holmium Oxide or Didymium filters) certified wavelengths within tolerance (e.g. *±0.5nm* or*±1 nm*). The laboratory can get verification done from the equipment's manufacturer / supplier as part of its AMC. Modern UV-Vis spectrophotometers execute automated self-tests at startup using internal filters or lamp lines, logging any wavelength shift beyond specification. **(Functional check)**
- Before use always check Potassium Tetrachloromercurate (TCM), 0.01 M. Precipitates should not form.
- **CRM** required in the method is **Potassium Iodate (KIO_3)** used to standardize Stock Sodium Thiosulphate Solution, 0.1 N (In the spectrophotometric determination of SO_2 the calibration graph is plotted using a standardized Sodium Sulphite (Na_2SO_3) or Sodium Metabisulfite ($Na_2S_2O_5$) solution. However, sodium sulphite is chemically unstable and rapidly oxidizes in air; therefore, it cannot be weighed directly to make a primary calibration standard. Instead, its exact concentration must be determined titrimetrically via iodometry.
- Ensure quality of pararosaniline hydrochloride dye. It shall have a wavelength of maximum absorbance at *540 nm* when assayed in a buffered solution of 0.1 M sodium acetate-acetic acid.
- 24 hours sample shall be drawn – at 24h x 1 shift at 0.5 lpm or at 8 hours x 3 Shifts at 1 lpm or 4 hours x 6 shifts at 1 lpm in 30 ml absorbing solution

Oxides of Nitrogen (as NO_2) IS 5182 (Part 6/Sec 1): 2026 Colorimetric Method Using NEDA- Key Points for Quality Assurance:

- Ensure quality of N-(1-Naphthyl)-Ethylenediamine Di-Hydrochloride (NEDA)- 1 percent aqueous solution should have only one absorption peak at 320 nm over the range of 260 nm to 400 nm.
- CRM- Sodium Nitrite ($NaNO_2$, assay > 97%) or aqueous NO_2 standard solution at 1000 mg/L
- In impinger a fritted bubbler is to be used instead of nozzle type bubbler.
- 24 hours sample shall be drawn - at 8 hours x 3 Shifts at 0.5 lpm or 4 hours x 6 shifts at 1 lpm in 30 ml absorbing solution

Ozone (O_3) IS 5182 (Part 9): 2026- Key Points for Quality Assurance:

- Am amber colour impinger shall be used. In addition O_3 sampling impinger should have provision to keep SO_2 trapping filters at inlet where bulb kind arrangement needed in impinger. (Glass microfiber filter dipped in saturated chromium trioxide solution and dried before use). Filter from impinger trap must be replaced with every change of absorbing reagent taken in to the impinger
- **CRM- Potassium bi-iodate** [$KH(IO_3)_2$] or **Potassium dichromate** ($K_2Cr_2O_7$).
- 8 hours sample shall be drawn - at 8 hours x 1 Shift at 1 lpm in 30 ml absorbing solution / 1 hour sample shall be drawn – 1 hour x 1shift at 1 lpm in 10 ml absorbing solution

Ammonia (NH_3) IS 5182 (Part 25): 2026- Key Points for Quality Assurance:

- A spectrophotometer suitable for measurement of absorbance with an effective spectral band width of not more than 5 nm is required
- A 25 mm 2-piece air sampling plastic cassette preloaded with glass fibre filter which can be connected in line before the impinger. If prefilters are not used, the method will determine both gaseous ammonia and ammonium contained in particulates.
- **CRM- Ammonium Chloride** (NH_4Cl) or **Ammonium Sulphate** ($(NH_4)2SO_4$) or **Ammonium Ion standard solution** 1000 mg/ and Potassium Iodate (KIO_3) for standardization.
- Samples can be drawn in 8 hours x 3 shifts each instead of drawing 1 hour x 24shifts, as it has practical issues at 1 lpm in 25 ml absorbing solution

For sampling of gases the updated BIS 5182 series has notified -
A cold box capable of holding 4 impingers capable of thermoelectrically maintaining temperature of absorbing reagents in impingers during sampling at (15 ± 5) °C.

Storage temperature directly affects the shelf life of many testing reagents used for analysis of amabient air gases. Analysts must strictly monitor storage conditions (refrigeration at 5°C vs. room temperature) and routinely label all prepared solutions with their preparation date.

Metals in Particulate Matter IS 5182 (Part 30): 2025 (Multiple Elements) : 2026- Key Points for Quality Assurance:

- **Single/Multi-Element Liquid CRMs**: Single element 1000 mg/L Arsenic (Pb), Lead (Pb), and Nickel (Ni) standard solutions in dilute nitric acid (HNO_3)
- Use commercially available filter papers as EPM 2000 or equivalent or analyse 5 percent of the total number of filters for the presence of specific metals, prior to sample collection, to verify reproducibility and low background metal concentrations. Maximum concentration shall be Pb- 4.8, As- 2.8 Ni- 3.0 ng/cm^2

Benzene (C_6H_6) IS 5182 (Part 11): 2006 Reaffirmed 2022 Gas Chromatography (GC-FID) Method- Key Points for Quality Assurance:

- Activated Charcoal Sampling followed by GC-FID. Modular glass or stainless tube (C)D 6-8 mm length 10-15 cm) packed with chromatography grade coconut shell activated charcoal, chromatography grade with particle size in the range 60 to 80 mesh. Glass beads or any other porous inert material must be packed in inlet part of front section for uniform distribution of sucked air through tube at the time of sampling.
- **CRM- Benzene** in Methanol/CS_2 solution 1000 ug/ml

Benzo(a)pyrene [BaP] IS 5182 (Part 12): 2004 Reaffirmed 2019– High Volume Sampling followed by Solvent Extraction and HPLC Analysis- Key Points for Quality Assurance:

- Collect sample through a high volume-sampler (HVS) using glass fibre (EPM — 2000) or equivalent filter paper at a flow rate of -1.2 m^3/min over an extended period of time usually 8 h for ambient air
- **Single Element / Mix CRM**: **Benzo(a)pyren**e CRM in Acetonitrile or Dichloromethane 100 ug/ml or 1000 ug/ml

Carbon Monoxide (CO) IS 5182 (Part 10): 1999 Reaffirmed 2019 Non-dispersive Infrared Absorption Method- Key Points for Quality Assurance:

- NDIR Method- Continuous analysis with flow rate between 100 ml per minute to 1000 ml per minute is suitable in line with NAAQS 2009 as sample is to be drawn continuously.
- An initial warm-up period is required and no readings shall be taken until the apparatus has reached steady temperature conditions and is giving a steady response. This shall not be more than 6 h. Sampler should have data logging capabilites.
- Two **standard gas mixtures** are required for calibration purposes. One shall contain between 90 to 100 mg/l of carbon monoxide in air or nitrogen (span gas) and the other air or nitrogen with not more than I mg/l carbon monoxide (zero gas).

For sampling of gases the updated BIS 5182 series has also notified:

Checks for impingers- (a) On receipt, pipette 35 ml reagent grade water (Grade 2 or better) using 5 ml calibrated pipette and check correctness of markings on impinger; **(b)** On receipt and on use from time to time using a 3 mm thickness metal disk check gap between bottom and tip of the impinger. 3mm disk should not be loose after fitting head of impinge; and **(c)** Use drill bits of 0.9 mm, 1.0 mm and 1.1 mm to check bore size of nozzle. Bore size has to be 1.0 mm with tolerance of 0.1 mm. Clean impingers thoroughly after every use.

Leak check for gaseous sampler- A provision should be there to close inlet of the sampler and a known vacuum above (100+ mmHg) need to be generated and trapped in the sampler when all connection and tubing's are fitted with impinger in place and manifold is in open position at flow rate of 1 lpm for all 4 impinger. Created vacuum must not reduce more than 10mmHg in one minute than sampler can be considered as leak free. Leak check test must be performed before starting of each sampling.

Key Points for Quality Assurance PM10 / PM2.5 Sampling and Analysis

Leak check on PM2.5 sampler checks the system's ability to hold a vacuum of at least 75 cm water column for a period of 10 min with a drop in pressure that corresponds to a leak rate of less than 80 ml/min.

Filter inspections preferably should be done using a light box and filters with following defects shall be discarded as applicable- (a) Pinhole (b) Separation of Ring (c) Chaff or Flashing (d) Loose Materials (e) Discoloration and (f) a filter with any imperfection not described above, such as, irregular surfaces or poor workmanship. Lot blank checks should be done on filters.

Handling filters with bare hands is a clear no. For **conditioning/equilibration** of filter prior to weighing, place blank or exposed filters in conditioning chamber with temperature maintained at 25 ± 2°C and RH at 45 ± 5 percent for at least 24 h. The filters are considered fully **stabilized** when consecutive weighings of filters (typically performed 24 hours apart) yield a mass difference of less than 0.015 mg.

EPA Recognition for laboratories: Key requirements in discipline/group of air

Summary by Dr. R.S Saini with inputs from Dr. Namita Mishra, Scientist 'E' / Quality Manager, Central Laboratory Central Pollution Control Board, Delhi.

Under Section 12 (1) and (13) of the Environment Protection Act, 1986, the recognition to Environmental laboratories are granted by the Central Pollution Control Board for the Government as well as the private Laboratories including Semi Govt., Public Sector undertaking, Educational Institutes laboratories and NGO's laboratories as per the guidelines laid down by the Central Pollution Control Board and revised in December 2024 (LATS/9/2024-25), in accordance to the powers delegated by the Ministry of Environment, Forest and Climate Change vide Gazette Notification No. S.O. 2340 (E) dated 16th June 2021 (Addendum-2) and amended Notification S.O. 2409 (E)dated 19th June 2024, Environmental laboratories seeking recognition under the Environment (Protection) Act, 1986 are required to have analytical capabilities for analysing the samples under different environmental matrices (ambient air, source emissions, water, wastewater, soil, sludge, sediments etc.) essentially for all the defined criteria parameters. As specified in Annexure-III of LATS/9/2024-2025 and further revised in the 4th Expert committee meeting, in the discipline/group of air, laboratories must cover eleven parameters in the Ambient Air, nine parameters in Stack Gas/Source Emission, two parameters in Noise Level and four parameters in meteorological monitoring designated as mandatory parameters.

NABL Accreditation (ISO/ IEC 17025:2017) in all the mandatory parameters is an essential requirement for the EPA recognition for any environmental laboratory. In order to demonstrate the competency in all the parameters under the scope as well as to fulfil the requirement of the recognition, participation in Inter-Laboratory Analytical Quality Control (ILC/ AQC) or Proficiency Testing (PT) programmes for these mandatory parameters is necessary. As per clause 2.10.22 recognized labs must compulsorily participate in Analytical Quality Control exercises organized by Central Pollution Control Board as per the plan posted on CPCB official website and the passing score is ≥ 70%. In addition, failure to participate in CPCB AQC Programme may lead to suspension of EPA recognition if not participated in at least 2 out of last 3 AQCs conducted by CPCB (clause 2.26)

Beyond the mandatory parameters, laboratories may also seek recognition for additional or secondary parameters listed in Annexure IV. While these parameters provide an opportunity to expand the laboratory's scope of services, they also bring additional responsibilities. LATS specifies that for secondary parameters Recognition shall be withdrawn for those unsatisfactory parameters in the last 3 AQC /PT for which corrective action was not taken

A key message emerging from the current LATS requirements is that true environmental analysis begins in the field. Reliable analytical results are only possible when representative samples are collected using appropriate methods and competent personnel. Laboratories should therefore place equal emphasis on sampling competence, equipment maintenance, calibration practices and field quality assurance activities. Participation in Sampling Proficiency Testing programmes can provide valuable evidence of competency in sample collection and strengthen confidence in test results. Infrastructure also plays an equally important role in demonstrating technical capability. As per Table 2.1 of LATS/9/2024-2025, laboratories carrying out Ambient Air and Source Emission Monitoring & Analysis should maintain a minimum laboratory area of 25 square metres. In addition, adequate space for Temperature Humidity Chamber (Conditioning room for Filter papers) and storage of sampling equipment should be available.

Personnel qualifications specified in Table 2.3 of LATS/9/2024-2025, further reinforce the importance of technical competence. For air analysis activities, personnel are expected to possess qualifications in Chemistry or Environmental Sciences. For air sampling activities, qualifications may include Chemistry, Environmental Sciences, Engineering, Physical Sciences or Diploma in Engineering, ensuring that field monitoring is carried out by suitably trained and technically competent professionals.

The choice of analytical and monitoring methods is another critical aspect of compliance. Laboratories are expected to follow recognised national and international methods for Ambient Air, Indoor Air, Fugitive Emission and Source Emission Monitoring. These can include any approved national and international latest Methods like BIS, USEPA etc. Adoption of standard methods helps ensure consistency, reliability and regulatory acceptance of monitoring results. Methods other than standard methods must be validated appropriately before introducing them in their System.

Laboratories should also pay close attention to the availability of sampling equipment and field monitoring infrastructure. Annexure VI of LATS/9/2024-2025, provides an indicative list of key equipment's /items required for sampling of Ambient Air / Fugitive Emission, Source Emissions and Ambient Noise/Source Noise.

EPA recognition is therefore much more than an analytical exercise. It represents a comprehensive demonstration of competence across sampling, analysis, quality assurance, infrastructure and personnel capability. Laboratories that proactively align themselves with the requirements of LATS/9/2024-2025 are better positioned not only to obtain but maintain recognition as well as to deliver reliable valid results that supports regulatory compliance and environmental protection

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Snapshots 2026

- The United Nations General Assembly designated 7 September as **'International Day of Clean Air for blue skies'** in 2019, with the first Day held in 2020. This global day aims to raise public awareness, build partnerships, and share solutions to reduce air pollution and improve global air quality. 2026 campaign spotlights new findings from the Global Economic Assessment of Integrated Climate and Clean Air Action, released by UNEP and the Climate and Clean Air Coalition (CCAC) under the theme **"Clean Air, Healthy Choices: Acting Together for People and Planet"**. The campaign emphasizes how individual, urban, and industrial choices—such as investment in transit, city planning, cleaner production, and family energy options—directly dictate global air quality, public health, and economic prosperity.
- The European Parliament has given its final approval to new EU vehicle circularity rules covering a vehicle's entire lifecycle – along with a ban on the export of high-emitting, unsafe used vehicles- "**vehicles unfit for European roads will not be shipped overseas**." The era of exporting poor vehicles to the communities least equipped to bear the consequences is finally drawing to a close.
- In April 2026, transport and energy ministers from across Africa gathered in Johannesburg to endorse a continent-wide blueprint for **investment in cycling and walking**. The document, formally known as the Pan-African Action Plan for Active Mobility, was shaped through consultations with more than 1,300 stakeholders across the continent and is co-led by the UN Environment Programme (UNEP), UN-Habitat and the World Health Organization (WHO).

- **"Breathe better: How leading cities have rapidly cut air pollution"**, published by the Breathe Cities initiative. The research identified **19 leading cities across 9 countries** that successfully reduced both fine particulate matter () and nitrogen dioxide () levels by at least 20% (and up to 45%) between 2010 and 2024 (London, Paris, Berlin, Heidelberg, Brussels, Amsterdam, Rotterdam, Rome, Warsaw, Beijing, Chengdu, Hangzhou, Hong Kong, Nanjing, Qingdao, Shenzhen, Wuhan, Zhenjiang, San Francisco). The core drivers included (a) Transportation (b) Energy & Heating Transitions (c) Industrial Controls & Data:

- Clean Air Asia, along with co-organizers, the Asian Development Bank (ADB), the Climate and Clean Air Coalition (CCAC), the Economic and Social Commission for Asia and the Pacific (ESCAP), and the UN Environment Programme (UNEP), presented the 12th Better Air Quality conference (BAQ 2026), held on 11-13 March 2026, at the UN Conference Centre (UNCC) in Bangkok. **The BAQ 2026 theme, Together for Clear Skies: Driving Action, Accelerating Investment** was supported by the Bangkok Metropolitan Administration (BMA) and the Pollution Control Department (PCD) of Thailand as co-hosts, the Asian Institute of Technology (AIT) as local partner. Read more at **https://cleanairasia.org/baq**

- **The Transboundary & Indo-Gangetic Plains–Himalayan Foothills (IGP-HF) Scoping Study** forms a core framework for assessing and addressing the transboundary air pollution crisis in South Asia. Spanning Pakistan, India, Nepal, and Bangladesh, the IGP-HF regional airshed is home to nearly one billion people and represents one of the most severely polluted geographic corridors in the world. It is supported by the World Bank, ICIMOD (International Centre for Integrated Mountain Development), Asia-Pacific Network for Global Change Research (APN) and National Research & Academic Consortia (Research institutes across the region)

- The **National Clean Air Programme (NCAP)** is India's flagship national framework launched in January 2019 by the Ministry of Environment, Forest and Climate Change (MoEFCC). It represents the country's first time-bound, multi-sectoral strategy designed to reduce particulate matter (and) pollution levels. NCAP targets 131 to 132 "non-attainment cities"—urban centres that consistently failed to meet National Ambient Air Quality Standards (NAAQS) over a consecutive five-year period with base year as 2017. It aims for up to a 40% reduction in particulate matter concentrations by 2026. While many NCAP cities have logged reductions in annual average levels, critical challenges persist. City-bound action plans often struggle against transboundary or regional pollution, prompting recent calls (**NCAP 2.0 initiatives) to expand focus from individual city boundaries to regional airshed management.**