



**CENTRAL POLLUTION CONTROL BOARD**  
**'PARIVESH BHAWAN', EAST ARJUN NAGAR, PAMS DIVISION, DELHI**

**GUIDELINES FOR AMBIENT AIR QUALITY MONITORING UNDER NATIONAL AIR QUALITY MONITORING PROGRAMME (NAMP)**

'Guidelines for Ambient Air Quality Monitoring' of CPCB may be followed for measurement methods, location selection, quality control and quality assurance procedures etc. (See Box right).

**BOX: FOR INTERNAL CIRCULATION**

It is strongly recommended the guidelines should be circulated to all field staff of CPCB/SPCBs/PCCs/ZOs who involved in NAMP so that the quality control/quality assurance programme can be strengthened in the National Interest.

**1. Measurement Methods**

The following methods will be used for measuring air pollutants. All the seven parameters could be measured by existing Respirable Dust Sampler (RDS) while PM<sub>2.5</sub> sampler could be procured separately

- a) Sulphur dioxide (SO<sub>2</sub>) - Modified West and Gaeke method
- b) Nitrogen dioxide (NO<sub>2</sub>) - Sodium Arsenite method
- c) Particulate Matter (PM<sub>2.5</sub>)—FRM or Equivalent Method (Gravimetric method).
- d) Respirable Suspended Particulate Matter (RSPM) -Gravimetrically with GFA/EPM 2000 filter paper using respirable dust sampler (Cyclonic Flow Technique).
- e) Ammonia (NH<sub>3</sub>)-Indophenols Blue Method
- f) Lead (Pb) & AAS method after sampling on EPM Filter paper
- g) Nickel (Ni)- AAS method after sampling on EPM Filter paper
- h) Benzo(a) Pyrene (BaP)- Solvent Extraction followed by GC/HPLC

***Note: Suspended Particulate Matter (SPM)—High volume method (Gravimetric method) to be discontinued from December 2010.***

**2. Following information will also be collected during monitoring**

- a) Major sources of air pollutants near the site including any major highway near the monitoring location, any major industries near the sites with details of air pollutant emitted from industries, location of industries with respect to site & predominant wind direction at site.
- b) Any traffic jam on roads near monitoring site during monitoring or any other situation that may result in very high or low values.
- c) Incidence of rainfall during monitoring and weather conditions.

- d) Duration of power failure & machine failure during monitoring if any.
- e) In case monitoring is not carried out as per the desired frequency and duration then the reasons may be mentioned in the Environmental Data Bank.

### 3. Location of Monitoring Station

The location of monitoring site/instrument must satisfy the following requirement.

- a) The site should be open from all sides and sampling should be in a free stream.
- b) The instrument should not be located in a balcony, corner or a confined place or next to a building.
- c) The instrument should not be located near any absorbing surface.
- d) The site should be away from nearby pollution sources.
- e) The site should be available for a long period of time.
- f) Easy access to the site should be there anytime throughout the year.
- g) Site sheltering and facilities such as electricity of sufficient rating etc. should be available.
- h) It should be vandal proof and protected from extreme weather
- i) Height of the inlet must be 3 – 10 m above the ground level.
- j) The sampler must be more than 20 m from trees.
- k) Distance of the sampler to any air flow obstacle i.e. buildings, must be more than two times the height of the obstacle above the sampler.
- l) There should be unrestricted airflow in three of four quadrants
- m) There should be no nearby furnace or incinerator fumes.

### 4. Sampling, Analysis, Data Reporting and Checks on Data

**(i) Sampling:** The following precautions must be followed in sampling of air pollutants

- a) The PM<sub>2.5</sub> Sampler and Respirable dust sampler (RDS) must be properly calibrated to get the correct flow rate.
- b) Corrective and preventive maintenance of the HVS/RDS must be done.
- c) The filter paper used for sampling should be of good quality (having better mechanical stability, chemical stability, particle sampling efficiency, flow resistance, cost and availability etc.).
- d) In case of BaP (Benzo-a-pyrene-PAH) preferably quartz filter paper
- e) Filter should be mounted properly on the support screen with the rough side of the filter facing upwards.
- f) The wing nuts should be tightened properly to avoid any leakage
- g) Weighing of filter paper must be done after conditioning in dessicator having active moisture absorbent.
- h) Weighing of filter paper must be done in balance having accuracy of 0.01 mg and silica gel bottle must be kept in weighing chamber to avoid error while weighing.

- i) Distilled water must be used in manometer tube and water must be changed every fortnightly and zero level must be checked every time.
- j) Shelter should be provided at the sampling site for protection of instruments during rainy season.
- k) Ice should be kept in the sampling tray during sampling to avoid evaporation loss and better absorption.
- l) Evaporation loss if any must be made up with distilled water.
- m) Proper preservation of samples must be done after sampling. Gaseous samples must be preserved properly in an ice box or refrigerator (below 5 ° C) prior to analysis.

**(ii) Analysis:** The following precautions must be followed in analysis of air pollutants

- a) Properly clean glassware must be used.
- b) One set of glassware must be calibrated as per requirement.
- c) All critical chemicals used must be of analytical grade.
- d) Double distilled or nano-pure water must be used for preparation of reagents and analysis.
- e) Glassware and storage bottles must be rinsed with distilled water and chemicals respectively.
- f) Reagent bottles must be properly marked by name, strength and date of preparation, expiry date and initial of chemist who has prepared the reagent.
- g) Desiccant in the dessicator must be changed as per requirements
- h) The chemicals whose strength changes with time must be standardized before use.
- i) Calibration graphs must be made every time a new stock solution is prepared.
- j) Reagent bottles must be made air tight before storage.
- k) Key reagents must be prepared fresh on the date of analysis.
- l) Storage of chemicals must be done as per recommendations like away from sunlight etc.
- m) Active silica gel bottles with holes must be placed inside the weighing chamber.
- n) The analytical balance must have a sensitivity of 0.1 mg or better.

**(iii) Data reporting and Checks on Data:** Data must be sending via Environmental Data Bank. The following checks may be carried out on data

**a) Outliers**

Any outlier values in 4-hourly value for SO<sub>2</sub> and NO<sub>2</sub> and 8-hourly value for SPM and PM<sub>10</sub> (RSPM) found should be checked for contamination of sample, sudden change of environmental conditions in the vicinity of the monitoring site etc. and discarded if necessary. Outliers vary with the monitoring location and should be chosen based on range of values obtained over last 8-10 years.

**b) SPM must always be greater than PM<sub>10</sub> (RSPM)**

8-hourly SPM values must always be greater than corresponding 8-hourly PM<sub>10</sub> (RSPM) values. In case Respirable Dust Sampler is used for measuring SPM and PM<sub>10</sub> (RSPM) then:

- Particulate matter collected on filter paper represents PM<sub>10</sub> (size <10 µm) is Respirable fraction;
- Particulate matter collected in cup below cyclone represents Non-respirable suspended particulate matter (NRSPM, size > 10 µm);
- Sum of particulate matter collected in cup below cyclone and filter paper gives an indication of SPM;

In case of SPM, if it is less than corresponding PM<sub>10</sub> (RSPM), then data may kindly be rechecked.

**(c) Reporting of Particulate Matter (PM<sub>2.5</sub>/PM<sub>10</sub>):** PM<sub>2.5</sub>/PM<sub>10</sub> values which are very high should be reported in round figures (without decimal place).

**d) Below Detection Limit Values**

The values should not be reported below the detection limit as per the method.

Parameter	Lower Detection Limit	Method
SO <sub>2</sub> (Sulphur dioxide)	4 µg/m <sup>3</sup>	Modified West and Gaeke Method
NO <sub>2</sub> (Nitrogen dioxide)	9 µg/m <sup>3</sup>	Sodium Arsenite Method
PM <sub>10</sub> (Respirable Particulate Matter) and SPM (Suspended Particulate Matter)	5 µg/m <sup>3</sup>	Respirable Dust Sampling/ High volume sampling (Gravimetric)
PM <sub>2.5</sub> (Particulate Matter size < 2.5 µm)	2.0 µg/m <sup>3</sup>	FRM or Equivalent Method/ Low volume sampling (Gravimetric)
NH <sub>3</sub> (Ammonia)	20 µg/m <sup>3</sup>	Indo-phenol Blue Method
Pb (Lead)	0.022 µg/m <sup>3</sup>	AAS method after sampling on EPM Filter paper
Ni (Nickel)	0.0011 µg/m <sup>3</sup>	AAS method after sampling on EPM Filter paper
BaP (Benzo-a-pyrene)	GC-FID – 2 ng/ m <sup>3</sup> HPLC & GCMS-1ng/ m <sup>3</sup>	Solvent Extraction followed by GC/HPLC

**e) Calculation of monthly average concentration**

For calculating 24 hourly averages of various parameters, BDL is considered as half the lower D.L. i.e.

- For calculating 24 hourly average of SO<sub>2</sub>, if any 4-hourly average is BDL then for calculation purpose its value is taken as 2 µg/m<sup>3</sup>,
- For calculating 24 hourly average of NO<sub>2</sub>, if any 4-hourly average is BDL then for calculation purpose its value is taken as 4.5 µg/m<sup>3</sup>,

- For calculating 24 hourly average of PM<sub>10</sub> RSPM, if any 8-hourly average is BDL then for calculation purpose its value is taken as 2.5 µg/m<sup>3</sup>,
- For calculating 24 hourly average of PM<sub>2.5</sub>, if any 24-hourly average is BDL then for calculation purposes its value is taken as 1.0 µg/m<sup>3</sup>,
- For calculating 24 hourly average of NH<sub>3</sub>, if any 1-hourly average is BDL then for calculation purpose its value is taken as 10 µg/m<sup>3</sup>,
- For calculating 24 hourly average of Lead (Pb) is BDL then for calculation purpose its value is taken as µg/m<sup>3</sup>,
- For calculating 24 hourly average of Nickel (Ni) is BDL then for calculation purpose its value is taken as µg/m<sup>3</sup>,
- For calculating 24 hourly average of BaP is BDL then for calculation purpose its value is taken as 0.5 ng/m<sup>3</sup>,

Values monitored for 16 hours and more in a day are considered for calculation of 24-hour average. Average of 24-hourly average (calculated as mentioned above) is taken as monthly average.

## **5. Calibration work for quality assurance**

Calibration of orifice and rotameter in Respirable Dust Sampler must be carried out regularly by standard methods and correction factor must be applied to the flow. Calibration of orifice may be carried out by top loading calibrator and calibration of rotameter may be carried out by digital dry gas meter (if not, by soap bubble meter) etc.

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