केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

EQ-11012/1/2023-AQMN-HO-CPCB-HO

Dated:30.01.2023

To
The Member Secretaries
All SPCBs/PCCs

Subject: Specification of $PM_{2.5}$ Low Volume Sampler – regarding

Sir,

This is to inform that the specifications of manual low volume samplers for ambient PM2.5 monitoring has been reviewed by an Expert Group comprising experts from National Physical Laboratory (NPL), National Environmental Engineering Research Institute (NEERI), Indian Institute of Technology (IIT) Kanpur & Delhi, State Pollution Control Board (SPCB) of Karnataka & Madhya Pradesh and CPCB.

NPL, the notified agency for certification of environmental monitoring systems in India, after testing of critical parameters related to manual $PM_{2.5}$ samplers, will issue initial provisional certificate which can be used as adequate safeguards for going ahead with installations. A detailed field performance and testing report as per ISO17065 will be issued by NPL subsequently.

A copy of revised specifications is attached for reference. You are requested to follow these specifications while installing $PM_{2.5}$ manual samplers.

Yours faithfully,

(Prashant Gargava)
Member Secretary

Encl: As above

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

1. The Member Secretary
Andaman & Nicobar Islands Pollution Control Committee
Department of Science & Technology, Dollygunj Van Sadan,
Haddo P.O., Port Blair – 744102
2. The Member Secretary
Andhra Pradesh State Pollution Control Board
D.No. 33-26-14 D/2, Near Sunrise Hospital,
Pushpa Hotel Centre, Chalamvari Street,Kasturibaipet,
Vijayawada – 520 010, Andhra Pradesh
3. The Member Secretary
Arunachal Pradesh State Pollution Control Board
Paryavaran Bhawan, Papu Hill, Yupia Road,
Naharlagun- 791110, Arunachal Pradesh
4. The Member Secretary
Assam Pollution Control Board
Bamunimaidan, Guwahati – 781021 Assam
5. The Member Secretary
Bihar State Pollution Control Board
Parivesh Bhawan, Plot No. NS-B/2
Paliputra Industrial Area,
Patliputra, Patna - 800 023 Bihar
6. The Member Secretary
Chandigarh Pollution Control Committee
Paryavaran Bhawan, Ground Floor,Sector-19 B, Madhya
Marg, Chandigarh
7. The Member Secretary
Chhattisgarh Environment Conservation Board
Paryavas Bhavan, North Block Sector-19,
Naya Raipur -492002 Chhattisgarh
8. The Member Secretary
Goa State Pollution Control Board
Nr. Pilerne Industrial Estate,
Opp. Saligao Seminary,
Saligao - Bardez Goa - 403511
9. The Member Secretary
Gujarat Pollution Control Board
Paryavan Bhavan, Sector 10- A
Gandhinagar – 382 043 Gujarat
10. The Member Secretary
Haryana State Pollution Control Board
C-11, Sector-6.
Panchkula-134109 Haryana

11. The Member Secretary
Himachal Pradesh Pollution Control Board
Him Parivesh, Phase-III, New Shimla - 171009
Himachal Pradesh
12. The Member Secretary
Jammu & Kashmir State Pollution Control Board
Parivesh Bhawan, Forest Complex, Gladni, Narwal, transport Nagar, Jammu, Jammu and Kashmir 180004
13. The Member Secretary
Jharkhand Pollution Control Board
T.A Building, HEC,
P.O. Dhurwa, Ranchi – 834004 Jharkhand
14. The Member Secretary
Karnataka State Pollution Control Board
Parisara Bhavan, 4th & 5th Floor,
49, Church St., Bangalore-560 001 Karnataka
15. The Member Secretary
Kerala State Pollution Control Board
Plamoodu Jn., Pattom Palace P.O.
Thiruvananthapuram-695 004 Kerala
16. The Member Secretary
Lakshadweep Pollution Control Committee
Department of Science, Technology & Environment, Kavarati-682555
17. The Member Secretary
Laddak Pollution Control Committee
Department of Wildlife Protection, Badami Bagh Skara,
18. Madhya Pradesh Pollution Control Board
E-5, Arera Colony, Paryavaran Parisar,
Bhopal - 462 016 Madhya Pradesh
19. The Member Secretary
Maharashtra Pollution Control Board
Kalpataru Point, 2nd – 4th Floor
Opp. Cine Planet Cinema, Nr. Sion Circle, Sion (E)
Mumbai – 400 022, Maharashtra
20. The Member Secretary
Manipur Pollution Control Board
Lamphelpat,
Near Imphal West
D.C. Office, Imphal, Manipur
21. The Member Secretary
Meghalaya Pollution Control Board
Arden-Lumpyngngad
Shillong: 793014 Meghalya
22. The Member Secretary
Mizoram Pollution Control Board

New Secretariat Complex, Khatla Thlanmual Peng, Khatla,
Aizawl, Mizoram: 796001 Mizoram

23. The Member Secretary
Nagaland Pollution Control Board
Signal Point,
Dimapur – 797112 Nagaland

24. The Member Secretary
Odisha Pollution Control Board
A-118, Nilakanta Nagar,
Unit –VIII, Bhubaneshwar – 751012. Odisha

25. The Member Secretary
Pollution Control Committee Dadra and Nagar Haveli and Daman and Diu
1st Floor, Udhyog Bhavan
Bhenslore, Dunetha
NaniDaman, Daman - 396210

26. The Member Secretary
Pondicherry Pollution Control Committee
Housing Board Complex,
Anna Nagar, Puducherry-600 005

27. The Member Secretary
Punjab Pollution Control Board
Vatavaran Bhawan, Nabha Road,
Patiala – 147001 Punjab

28. The Member Secretary
Rajasthan Pollution Control Board
4, Jhalana Institutional Area, Jhalana Doongri, Jaipur,
Rajasthan - 302 004

29. The Member Secretary
Sikkim State Pollution Control Board
Department of Forest, Environment & Wildlife Management
Government of Sikkim, Deorali,
Gangtok, -737102 Sikkim

30. The Member Secretary
Tamil Nadu Pollution Control Board
76, Mount Salai, Guindy,
Chennai-600 032 Tamilnadu

31. The Member Secretary
Telangana State Pollution Control Board
Paryavaran Bhawan, A-3, I.E. Sanath Nagar,
Hyderabad-500 018 Telangana

32. The Member Secretary
Tripura Pollution Control Board
Vigyan Bhawan
Pandit Nehru Complex, Gorkhabasti, PO: Kunjaban Agartala:
799006,Tripura

33. The Member Secretary
Uttar Pradesh Pollution Control Board
Building.No. TC-12V Vibhuti Khand, Gomti Nagar
Lucknow-226 010 Uttar Pradesh

34. The Member Secretary
Uttarakhand Pollution Control Board
Gaura Devi Bhawan, 46 B IT Park Sahastradhara, Dehradun – 248001 Uttarakhand

35. The Member Secretary
West Bengal Pollution Control Board
Paribesh Bhavan, 10A, Block-L.A., Sector III, Bidhan Nagar, Kolkata - 700 106 West Bengal

CC:

1) The Director, CSIR – NPL, Dr. K. S. Krishnan Marg
New Delhi 110012
E.mail: dnpl.npl@nic.in; director@nplindia.org
Ph: +91 11 45609201, 45609301
2) DH – IT : for uploading on CPCB website
3) AS (CP Division) MoEF&CC : for information please
4) PA to CCB : for information please
5) DH-AQM : for information please
6) DH-Air Lab : for information please
7) DH-AQMN : for information please

TECHNICAL SPECIFICATIONS
MANUAL FILTER BASED LOW VOLUME $PM_{2.5}$ SAMPLER

Sampler	Manual Filter Based Sampler (filter diameter 47 mm) as per sampler design & performance criteria as mentioned at Section A,B,C & D in the document.
Flow rate	1 m^3/hour (16.7 lpm) controlled by a suitable Flow Controller. The Flow Performance criteria should comply with BIS method 5182 (Part 24) 2019 Accuracy ± 2% of the reading.
Size Selective Inlets	Should have opposed jet impaction for PM10 cut-off and WINS impactor/VSCC for $PM_{2.5}$ collection on filter paper.
Height of the Inlet	The height of the inlet should be between 2 ± 0.2 m from the base of the sampler and the sampler should stand alone firmly at erected position
Time Totalizer	Operates only during operation of the pump, display time with a resolution of one second.
Vacuum pump	Suitable pump with brushless motor for providing the designed flow rate. Pulsating pump should have built-in pulse dampeners.
Flowrate Control	Sampler should maintain designed volumetric flow rate (16.7 LPM) at inlet incorporating dynamic volumetric corrections with respect to temperature and barometric pressure. Necessary compensation of volumetric flow rate due to compensating pressure drop across the filter should also be ensured. Ambient temperature, barometric pressure during sampling must be displayed and recorded. Flow rate should be measured at least at 30 seconds interval and averaged over 5 minutes. The flow rate shall not vary more than ± 5% from the specified flow of 16.7 lpm.
Data Management	Memory-based recording for flowrate and total volume over five minutes should be downloadable to a computer through a suitable port and USB drive. Current/last logged data should be displayed. Logged data should have cloud connectivity and data of last sampling ten days must be available for crosschecking. Data management requirements (other) & ready reference as mentioned in the document Sections C & D.

30/11/2023

Power Supply	A stabilized power supply through suitable voltage stabilizer having display of input and output voltage should ensure an output voltage within 230 ±10 V, AC 50 Hz.
Supply of Accessories	Manufacturer's standard operation kit must include all required, fittings and accessories for the operation of sampler. Accessories to be supplied with each unit should include Leak check unit-1No., Filter cassettes-2Nos, Filter Cassette Holder-1No., Blunt Tip Forceps-1No., Filter Carrier-3Nos., Silicon Grease10gm -1 box, Impaction Oil - 100 ml-1 bottle, One Set of O-rings and Cleaning Brush.
Documents	Operation and maintenance manual of sampler, along with data transfer protocols used with their technical description for data management and data transfer.
Certificates	Calibration certificates issued by the manufacturer with references used for Flowrate, Temperature, Barometric Pressure and Time Totalizer should be supplied with each instrument. A satisfactory performance check certificate as mentioned in section B (para 2) is provided along-with all the data-sets recorded in the system for data management etc.
Validation	Preliminary test report/validation issued by NPL to be submitted for respective make and model. Any changes in model or declared components of the equipment require revalidation by NPL. Submission of a preliminary test report/validation from NPL as per the set criteria of NPL is mandatory on or before 30th September 2023.

Section A: Sampler Design Criteria

Impactors of the sampler shall be designed as per specifications mentioned in Appendix L of 40 CFR part 50 Appendix L as defined in BIS 5182 part 24 and tolerances to be followed as specified for PM_{10} and $PM_{2.5}$ impactor in L14 & L21.

The Material of Construction for the impactor assembly shall be strictly anodised aluminium only

Sampler Body must be of two parts for ease of transport and fabricated by lightweight rust-free metal. The door must open up to 180 degrees and be fitted with a master lock and key. A soft handle with metallic holder and lock should be provided on the machine for ease of handling.

30/01/2023

The connectors shall be leak proof, preferably push fit type with engraved grove for gaskets at male parts.

Filter cassette loading mechanism and filter holder assembly shall be designed in user-friendly way and sufficient space must be provided to ensure proper handling of filter while loading and unloading it in the sampler.

Pressure drop across the filter should be monitored during sampling and whenever it reaches above 200 mm of Hg; the sampler shall stop automatically with an error message recorded.

Provision is required to limit the temperature rise of the sample filter from insolation & internal heat dissipation. The rise should not be more than 5-degree C above the ambient temperature during the sampling duration. The temperature error message should be recorded if temperature rise is more than 5 degrees C.

Section B: Sampler Performance criteria

The coefficient of variation (CV) in sample flow rate (taken at every 30 seconds) should be calculated and if the %CV (in 24hours of operation) is found more than 4% error message should be displayed and recorded.

Satisfactory performance check (the variation in $PM_{2.5}$ concentrations against sampler fitted with certified impactors should be within ±10 %) for a minimum of five samples should be undertaken for every sampler manufactured and a certificate for satisfactory performance to be provided.

Section C: Data management requirements(other)

The 5 minutes recording of the average Flow rate, Barometric Pressure, Ambient Temperature, Filter Temperature with the date and time stamp should be available with the sampler

The software should be able to collect the flow sensor status every 30 seconds and display on the screen and compare it with the set flow (i.e, 16.7 LPM). Deviation should not be more than ± 5% of the set value (16.7 LPM).

The software should have the capability to compare the recorded 5 minutes' average flow data with the set value of 16.7 lpm. If the deviation is more than 10% of set value for 6 consecutive readings instrument must be automatically switched off with an error message.

Average flow should be derived by the cumulative volume data recorded (collected by integration of flow data at desired intervals) divided by the ON-Time of machine.

30/01/2023

Section D: The Data management requirements - ready reference -

Parameter	Availability				Formats & resolutions	
	Anytime on display	End of Period in download	Visual Display on Screen	Data Output in download	Digital Reading	Units
Flow Rate, 30 Seconds Interval	Required	Not required	Required	Not required	XX.X	L/min
Flow rate, average for the sample period	Not required	Required	Required	Required	XX.X	L/min
Flow rate, Coefficient of variation (CV), for the sample period	Not required	Required	Not required	Required	XX.X	%
Flow rate, 5 minutes average	NA	Required	Not required	Required	XX.X	L/min
Sample volume, Total	Required	Required	Any Time	Required	XX.XXX	m3
Temperature, ambient, 30 seconds interval	Required	Not required	Yes	Not required	XX.X	°C
Temperature, ambient Average for recording interval (5 minute)	NA	Required	Not required	For sampling period	XX.X	°C
Barometric Pressure, ambient, 30 seconds interval	Required	Not required	Yes	Not required	XXX	mmHg / mbar
Barometric Pressure, ambient Average for Recording Interval (5 Minute)	Not required	Not required	Not required	For sampling period	XXX	mmHg / mbar
Filter Temperature, 30 seconds interval	Required	Not required	Yes	Not required	XX.X	°C
Date and Time	Required	Required	Required	For sampling period	dd/mm/yy * HH.MM.SS	D/M/Y HR:M:S

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29/01/2023

Sampling Start and Stop Time Setting	Not required	Required	Not required	For sampling period	Dd/mmm/yy* HH:MM:SS	Y/M/D HR:M:S
Time Totalizer	Required	Required	Required	For sampling period	HH:MM:SS	HR:M:S
User enter information such as Filter number and site identification	Required			At the start of sampling	As entered	

*formats may vary

30/01/2023