**CENTRAL POLLUTION CONTROL BOARD**

**Parivesh Bhawan, East Arjun Nagar, Delhi 110032**

**AIR LABORATORY**

**SOURCE EMISSION MONITORING FIELD DATA SHEET**

**Part 1 (General Information)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 01 | Name and Type of Industry | : |  | |
| 02 | Address | : |  | |
| 03 | Stack Attached to | : |  | |
| 04 | Type of Fuel | : |  | |
| 05 | Installed Capacity in terms of fuel use | : | Q / hour |  |
| 06 | Running Load on day of monitoring | : | Q / hour |  |
| 07 | Height of the Stack | : | meter |  |
| 08 | Type of stack at sampling Port | : | (Circular or Rectangular) | |
| 09 | Height of Port Hole (from Ground Level)  Height /Distance of Port Hole (from last Disturbance) | : | meter  meter |  |
| 10 | Dimension of Stack (Internal Diameter for circular and Internal Length & Width for duct) in meter | : | meter |  |
| 11 | Number of accessible Port Holes | : |  | |
| 12 | Collar length from inner wall | : | cm |  |
| 13 | Scheme of Air Pollution Control Devices | : |  | |
| 14 | Position and Capacities of ID and FD Fans | : |  | |
| Name & Signature of Representative of Plant | | : |  | |
| Name & Signature of Representative of CPCB | | : |  | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Part 2**  **(Technical Information)** | | | | | | | | | | | | | | | | | | | |
| 01 | Reference of Sampling Plan | | : |  | | | | | | | | | | | | | | | |
| 02 | Sampling Team | | : |  | | | | | | | | | | | | | | | |
| 03 | Stack Monitoring Kit ID No. | | : |  | | | | | | | | | | | | | | | |
|  | Calibration due date | | : |  | | | | | | | | | | | | | | | |
| 04 | Pitot Constant | | : |  | | | | | | | | | | | | | | | |
| 05 | Calibration Factor for Dry Gas Meter (CFDGM) | | : |  | | | | | | | | | | | | | | | |
| 06 | Thimble number | |  |  | | | | | | | | | | | | | | | |
| 07 | Number of Traverse Points with respect to Stack Diameter or Equivalent Diameter for Rectangular Stack | |  | < 0.3 m = 4  0.3 – 0.6 m = 8 0.6 – 1.2 m = 12 1.2 – 2.4 m = 20  > 2.4 m = 32 | | | | | | |  | | | | | | | | |
| 08 | Traverse distance from inner wall in cm | | : | A | | B | | C | | D | | | E | | F | | G | | H |
|  |  | |  | |  | |  | | |  | |  | |  | |  |
|  | H | | G | | F | | E | | | D | | C | | B | | A |
|  |  | |  | |  | |  | | |  | |  | |  | |  |
| 09 | Traverse distances with collar in cm | |  | A | | B | | C | | D | | | E | | F | | G | | H |
|  |  | |  | |  | |  | | |  | |  | |  | |  |
|  | H | | G | | F | | E | | | D | | C | | B | | A |
|  |  | |  | |  | |  | | |  | |  | |  | |  |
| 10 | Atmospheric Pressure at Platform level mm Hg (P bar); if P bar has been noted at ground level altitude correction has to be done @ 1 mm of Hg less / 10 m | | : |  | | | | | | | | | | | | | | | |
| 11 | Measurement of Flue gas concentration | | : | Average CO2 % =  Average O2 % =  Average (CO + N2) % =  {100 – (% CO2 + % O2)} | | | | | | | | | | | | | | | |
| 12 | Calculation of Dry Molecular Weight (Md) | |  | CO2 % x 0.44 (X) =  O2 % x 0.32 (Y) =  (CO + N2) % x 0.28 (Z) =  (X) + (Y) + (Z) = | | | | | | | | | | | | | | | |
| 13 | a) Determination of Moisture by Condensate Method | | | | | | | | | | | | | | | | | | |
| Set 2 – 3 LPM in Gas manifold. Keep 50 ml chilled water in impinger, Keep sufficient ice for condensation. Run pump with Blank or old thimble for at least 30 min for collection of condensate.  Note the readings of : Tm during run  and Vacuum Pressure at start (PMi) and just before putting off the pump (PMf) Calculate Pm = {(PMf) – (PMi)} / 2  Volume of condensate (VC) = (Total Volume of water in impinger – 50) ml | | |  | (VC\*22.4\*Tm\*760)  VV (m3) = -----------------------------------  {(1000\*18\*273\*( Pbar - Pm)}  Where,  VV = Equivalent vapour volume of condensate  Pm = Average Vacuum Pressure mm Hg.  Pbar = Atmospheric pressure in the stack mm Hg.  Vc = Vol. of condensate (ml)  Tm = Metering temperature (K)  (VV)  Moisture Fraction (BW0) = ----------------  (VV + V)  Moisture % (M%) = (BW0) \* 100  Where,  V = Volume of air sampled in m3 | | | | | | | | | | | | | | | |
|  | | b) Determination of Moisture by Dry and Wet Method (Psychrometric) | | | | | | | | | | | | | | | | | |
|  | | Wrap the tip of thermocouple by wet cloth  Put it inside the Stack, Block port hole to prevent air ingress  Observe the temperature readings; primarily it increases steadily then the increment slows down for 30 – 40 seconds and then shoots up rapidly. Note down the average temperature readings in valley region (during that 30 – 40 seconds when it slows down). This is Wet Temperature  Remove wet cloth, insert thermocouple again in stack, Take Dry Temperature readings  Using Wet Temperature, Dry Temperature and Barometric Pressure data calculate % Moisture from excel sheet through Psychrometric formulae | | | | | | | | | | | | | | | | | |
| 14 | | Molecular Weight on Wet basis (MS) | : | MS = Md (1 - BW0) + 18 BW0 | | | | | | | | | | | | | | | |
|  | |  | A | | B | | C | | D | | | E | | F | | G | | H | |
| 15 | | Stack temperature, TS= °C + 273 K |  | |  | |  | |  | | |  | |  | |  | |  | |
|  | |  | H | | G | | F | | E | | | D | | C | | B | | A | |
|  | |  |  | |  | |  | |  | | |  | |  | |  | |  | |
| 16 | | Differential pressure, ΔP | A | | B | | C | | D | | | E | | F | | G | | H | |
|  | |  |  | |  | |  | |  | | |  | |  | |  | |  | |
|  | |  | H | | G | | F | | E | | | D | | C | | B | | A | |
|  | |  |  | |  | |  | |  | | |  | |  | |  | |  | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | A | B | C | D | E | F | G | H |
| 17 | Static Pressure ΔPS mm H2O  Unplug +ve end of pitot, rotate it at 90 º take reading of displacement | |  |  |  |  |  |  |  |  |
| 18 | Average Static Pressure ΔPS mm H2O | |  | | | | | | | |
| 19 | Absolute stack pressure, PS mm Hg  Ps = Pbar ± (ΔPS / 13.6)  Negative if it is under suction  Positive if it is under forced draught | |  | | | | | | | |
|  | Velocity (V) = 34.94 \* Cp √{ (ΔP\*Ts) / ( PS \*MS)} (m/s) | |  |  |  |  |  |  |  |  |
| 20 | Average Velocity (m/s) | |  | | | | | | | |
| 21 | Iso Kinetic discharge Rate at nozzle (RS) = 6\*V\*AN=LPM  Area of Nozzle (AN) : (S = 0.3167\*10-4 , M = 0.7123\*10-4, L = 1.267\*10-4 ) | |  |  |  |  |  |  |  |  |
| 22 | Iso Kinetic sampling rate at metering point (RM) = RS[{(TM / TS)\*{PS / (Pbar – PM0)}\*(1 – Bwo )}] LPM  PM0 is vacuum pressure at start of sampling | |  |  |  |  |  |  |  |  |
| 23 | Total required sampling time (Minutes)  For 1 m3 sample = (1000 / RM) Minutes | |  | | | | | | | |
| 24 | Sampling duration at each traverses (Min.) | |  |  |  |  |  |  |  |  |
| 25 | Vol. of flue gas sampled at each traverse in litre | |  |  |  |  |  |  |  |  |
| 26 | Total vol. of flue gas sampled (VG) litre | |  | | | | | | | |
| 27 | Pressure Drop (PM) mm of Hg  At each sampling point | Initial (PMi) |  |  |  |  |  |  |  |  |
| Final (PMf) |  |  |  |  |  |  |  |  |
| 28 | Average Pressure Drop (PM)={(PMf – PMi)/2} mm of Hg  Vacuum at start and end of sampling | |  | | | | | | | |
| 29 | TM (Temperature readings at meter) ºC | |  |  |  |  |  |  |  |  |
| 30 | Average TM (K) = ºC + 273 | |  | | | | | | | |
| 31 | Vol. of air sampled at normal condition (VN) = VG \*{(Pbar – PM) / 760} \* {(273 + 25) / (273 + Tm)} Nm3 | |  | | | | | | | |
| 32 | Initial Reading of DGM (IDGM) m3 | |  | | | | | | | |
| 33 | Final Reading of DGM (FDGM) m3 | |  | | | | | | | |
| 34 | Total Dry Volume Passed (V DGM) | | V DGM =(FDGM – IDGM) \* CFDGM m3 | | | | | | | |
| 35 | Vol. of air passed through DGM at normal condition  (VNDGM) = (V DGM) \*{(Pbar – PM) / 760} \* {(273 + 25) / (273 + Tm)} Nm3 | |  | | | | | | | |
| 36 | Isokineticity  ((VNDGM – VN) / VNDGM \*100 should be ≤10% | |  | | | | | | | |

**Part 2 A**

**(Technical Information)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **01** | **Particulars of gaseous sampling** | | | | | | | | | | | | | |
|  | Name of parameter | | Name of method | | Absorbing solution used | | Volume of absorbing solution | | | Flow rate lpm | | Sampling time minutes | | Remarks |
|  |  | |  | |  | |  | | |  | |  | |  |
|  |  | |  | |  | |  | | |  | |  | |  |
|  |  | |  | |  | |  | | |  | |  | |  |
|  |  | |  | |  | |  | | |  | |  | |  |
|  |  | |  | |  | |  | | |  | |  | |  |
| 02 | Particulars of NOX Sampling | | | | | | | | | | | | | |
| Sample No | | Initial Readings | | | | | | | Final Readings | | | | | |
| Atmospheric Pressure (mm Hg) | | Differential Pressure (mm Hg) | | Temperature of Flue gas (K) | | | Atmospheric Pressure (mm Hg) | | Differential Pressure (mm Hg) | | Temperature of Flue gas (K) | |
|  | |  | |  | |  | | |  | |  | |  | |
|  | |  | |  | |  | | |  | |  | |  | |
|  | |  | |  | |  | | |  | |  | |  | |
|  | |  | |  | |  | | |  | |  | |  | |
| 03 | Observation during monitoring (if any) | | | | | | |  | | | | | | |
| 04 | Name & designation of official who indented the monitoring | | | | | | | Name & Signature of Team Leader | | | | | | |