Stack Testing Oversight in New Jersey

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Emission Measurement Section (EMS)

The Emission Measurement Section is responsible for the quality assurance / quality control of all stack sampling events in NJ.

The Section was moved in July 2015 from the Division of Air Quality to the Division of Air Enforcement. EMS was formerly part of, and known as, the Bureau of Technical Services.

EMS Staffing:

- 1 Section Chief
- 7* Staff Professionals + 1 (occasionally 2) part-time Consultants
- Part-time Clerical Staff

* Hired 2 Trainees in September 2015. First Trainees hired since 2003!
Lost CEMS Supervisor to a transfer in March 2015.

Emission Measurement Section

Although moved, the Emission Measurement Section's mission has not changed:

> *Ensure that the DEP/Public/Industry have accurate and reliable stack emissions data for the purposes of assessing Permit compliance and for making decisions.*

Data quality is our primary objective. Compliance is secondary. Issues uncovered in the course of our work just as often prevent emissions results from being biased high as being biased low.

EMS Testing Activities

Stack Test Program

- Protocol Reviews
- Test Observations
- Stack Test Report Reviews
- Approximately 200 per year

CEMS Certification Program

- Equipment Protocol Reviews
- Certification Test Protocol Reviews
- Generally not observed
- Certification Test Report Reviews
- Approximately 30 per year

Stack Test Quality Assurance Steps

Protocol Review – Initial step. Ensures that not only the proper methods are selected, but that they are tailored to the source specific conditions.

Test Observation – The most critical step. Testing is complicated and often conducted in harsh conditions. Errors affecting the data quality could not be documented without direct observation.

Report Review – The final step. Includes calculation confirmation and review of laboratory data. Validated results can then be compared to Permit limits or other standards.

Why is there oversight of testing?

- **1994 EMS Internal Assessment**

  - 47% of the test observations resulted in significant corrections by BTS.

- **EPA Inspector General Audit of 1998 Test Programs**

  - Test Protocols: EMS found **86%** of the protocols to be deficient.

  - Test Observations: EMS made significant corrections in **57%** of the test programs.

  - Test Reports:
    - **26%** of the reports required significant correction, clarification or were rejected by EMS.
    - EMS required **29%** of the test programs to be repeated for at least one parameter (**23%** exceeded an emission limit and **6%** were deemed invalid by EMS.)

"In conclusion, we found NJDEP had an effective and efficient stack testing program."

Why is there oversight (cont.)?

- EPA Emissions Factors Workgroup went to over 30 States collecting over 4,000 test reports.
  - It was stated they "noticed a definite change in the quality of the test reports when they toured New Jersey. Most test reports in other States were poor quality. Being at the site and observing tests makes a big difference in the quality of the final product."

- A 40 CFR Part 75 rule requires minimum competency standards for testers.
  - In the response to comments, EPA acknowledged that even if adopted, this will "not guarantee proper performance of any individual test" and "EPA also believes that third party (e.g. State agency) oversight helps ensure that testing is properly conducted and strongly encourages such oversight to continue."
  - It was further stated that "EPA believes the evidence is strong that unqualified, under-trained and inexperienced testers are routinely deployed on testing projects."

- The adopted rule states, "EPA recommends that proper observation of tests and review of test results continue, regardless of whether an AETB fully conforms to ASTM D7036-04."

EPA National Stack Testing Guidance

- Stationary Source Compliance Monitoring Strategy (CMS)

  - CMS "recognizes that consistent, complete and accurate stack test information is critical in managing a national air program."

    - States/locals should require a stack test where there is no other means for determining compliance with the emission limits.

    - States/locals should conduct a stack test whenever they deem appropriate regardless of whether there are other means for determining compliance.

- High Priority Violations (HPV) Policy

  - "The following criteria trigger HPV status…Violations that involve testing, monitoring,...A violation of an allowable emission limit detected during a reference method stack test."

EPA National Stack Testing Guidance (cont.)

- **Protocols**

  – "The submission of plan prior to the stack test helps to ensure that the testing requirements are interpreted correctly and required test methods are followed; minimizes potential problems encountered during the test; and reduces the possibility of testing errors."

  – "Ultimately, having the plan reviewed and approved prior to the test reduces the number of retests."

EPA National Stack Testing Guidance (cont.)

- **Observations**
  - "…whenever possible, delegated agencies should observe the tests to ensure that the regulatory testing requirements are being met; the site-specific test plan is being followed; and the results are being accurately and completely recorded and documented in the test report."
  - "The presence of an observer also helps to reduce the likelihood of sample recovery and handling errors, as well as equipment errors, and to ensure that testing is conducted under the proper process conditions."
  - "Ultimately, the presence of a state/local observer reduces the number of retests."

EPA National Stack Testing Guidance (cont.)

- **Test Reports**
  - The report "should be sufficient to assess…adherence to the test requirements."
  - The report should "enable the delegated agency to determine whether a complete and representative stack test was performed."
  - "The report should include…sufficient raw data and cross correlations in the appendices such that a new set of calculations including statistics could be independently generated from the raw data…"

Typical Protocol Deficiencies

Note: We recommend using available Technical Manual 1004 Protocol Templates to speed our review. Using Templates can prevent many of the issues that follow:

- Not including a stack diagram with the port locations, stack diameter, the distances from disturbances, and the number and location of traverse points.
- Proposing an inappropriate method.
- Not including an adequate description of the sampling train, including materials of construction and reagents used.
- Not including an adequate description of sample train operation, including leak checks, required temperatures, sample rates/volumes, sample times, and other method-specific requirements.

Typical Protocol Deficiencies (cont.)

- Not calculating in-stack detection limits and/or proposing sample train operation that will not provide an adequate detection limit to demonstrate compliance.
- Not including an adequate description of sample train recovery, including reagents and recovery equipment.
- Not providing an adequate description of the analytical methods or procedures, including calibration and QA/QC procedures (ie: replicate analysis, blanks, spikes, audits, etc.)
- Not providing analyzer operating ranges and/or calibration gases, or proposing an inappropriate range (ie: 0 – 1000 ppm for a 10 ppm allowable).

Typical Protocol Deficiencies (cont.)

- Not specifying the source and control device operation during testing and/or the monitoring to verify the operation during testing. (Permits require operation at worst-case with respect to meeting the emission limits without creating an unsafe condition.)
- Not specifying sample location acceptability verification procedures (ie: cyclonic flow check and stratification check, as applicable).
- Not specifying what will be included in the test report, including required certifications, and/or specifying a report submittal date that is contrary to the Permit requirements.
- Not filling out all required fields when using the Electronic Reporting Tool (ERT) to prepare the protocol.

EPA's Electronic Reporting Tool (ERT)

- EPA Software to Standardize Source Test Planning, Reporting and Assessment.
- EMS started exploring electronic reporting in 2006. The Air Permitting Program began to include language in Permits approved on or after July 1, 2014 that required stack test protocols and stack test reports to be submitted to the Emission Measurement Section using ERT (unless otherwise approved by EMS). This did not affect any tests where protocols were already submitted or approved, though ERT use is still encouraged for all tests.

ERT – Pollutants Quantified

- Filterable Particulate Matter
- Condensable Particulate Matter
- Filterable PM10
- Filterable PM2.5
- Acetaldehyde
- Formaldehyde
- Carbon Monoxide
- Chlorine, Chloride, Hydrogen Chloride, Total Chloride
- Nitrogen Oxides (NOx)
- Sulfur Dioxide
- Sulfuric Acid
- Sulfur Trioxide
- Metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Hexavelant Chromium, Lead, Manganese, Mercury, Nickel, Phosphorus (yellow or white), Selenium, Silver, Thallium and Zinc
- Total Fluoride
- Hydrogen Fluoride
- Hydrogen Bromide
- Total organic compounds (TOC) (as Carbon, Ethane, Methane, Propane)
- Dioxin/Furan Cogeners
- Coplaner PCB's
- PAH Compounds
- Dioxins / Furans

The CEMS Relative Accuracy Test Audits which can be documented include:

- Carbon Monoxide
- Carbon Dioxide
- Nitrogen Oxides
- Sulfur Dioxide
- Oxygen

Typical Issues in the Field

- Pre-test site survey errors (failure to perform one)

  - unacceptable sample location, equipment/electrical needs, clearances, safety issues, etc.

- Sample recovery & handling errors.

  - recovery location (not clean), improper reagents/equipment, improper procedures, etc.

- Equipment errors

  - operating ranges/calibrations, materials of construction, incorrect equipment, etc.

- Procedural errors

  - cyclonic flow, leak checks, traverse points, isokinetics, temperatures, etc.

Typical Issues in the Field (cont.)

- Errors caused by inexperienced testers (in general or with testing in NJ).

"But that's how we do it in [Insert State name here]."

- Preparedness

(Backup equipment and glassware, additional calibration gases for unexpected concentrations, insufficient ice, etc. Person(s) performing the test did not write or read the protocol, including correspondences.)

- Coordination between Testers and Facility

(Proper source operation, collection of process data, etc.)

- "End of Day Syndrome"

(Like the proverbial tree in the forest, if a leak check fails after a long day when it is 20ºF outside and an observer doesn't witness it, will the failure be recorded and the test repeated?)

Safety – Our #1 Field Priority

- Stack sampling and source evaluation exposes DEP officials and consultants to potential safety hazards in the field. Ensuring the safety of all field personnel at facilities is an issue that the EMS takes very seriously.
- To insure the safety of all field personnel, stack sampling platforms, both permanent and temporary, and access ways leading to and from the platforms or testing locations, must be designed and erected in such a manner as to conform to published safety laws and regulations.
- If the EMS observer identifies an unsafe condition that poses an undue risk to EMS, test consultant or facility field staff, the test will be postponed at his/her discretion.

Safety, Safety, Safety……and Safety!

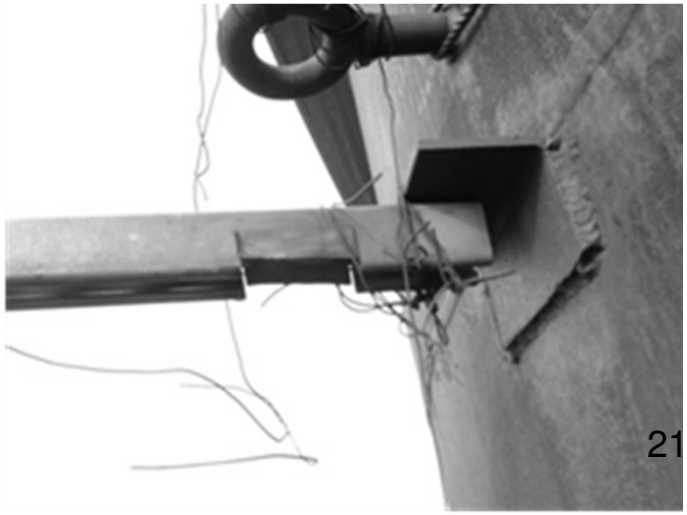
OSHA regulations for a ladderway floor opening or platform opening: "Every ladderway floor opening or platform shall be guarded by a standard railing with standard toeboard on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening."

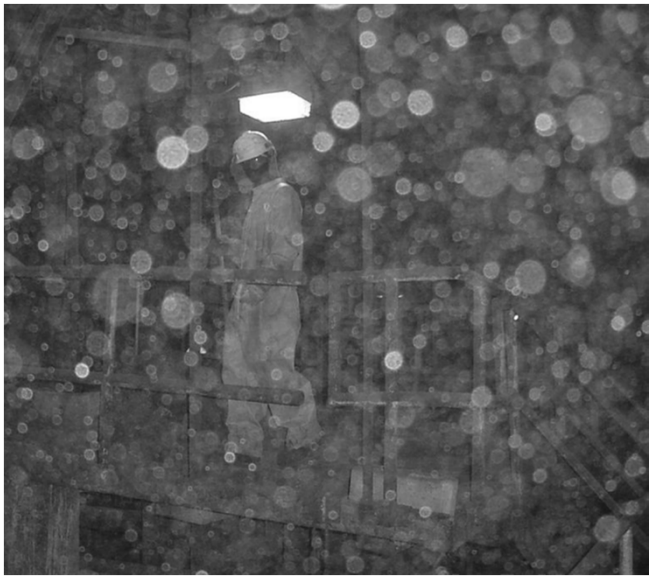
…..and Safety!

Monorail system to support Sample Trains

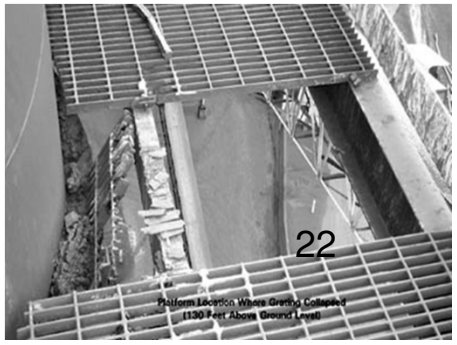
Monorail literally held in place with baling wire…supporting the weight of a sample train box over 100 feet above ground.

Look out below!





Why the focus on safety? To the right is a photo (not in NJ) of where a corroded platform collapsed and a tester fell 130 feet to his death.



Simple Examples of Errors Observed in the Field – Pitot Tubes

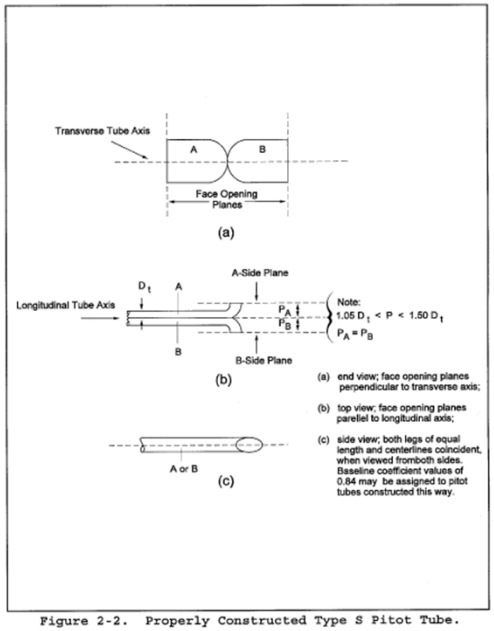


Figure 2-2. Properly Constructed Type S Pitot Tube.

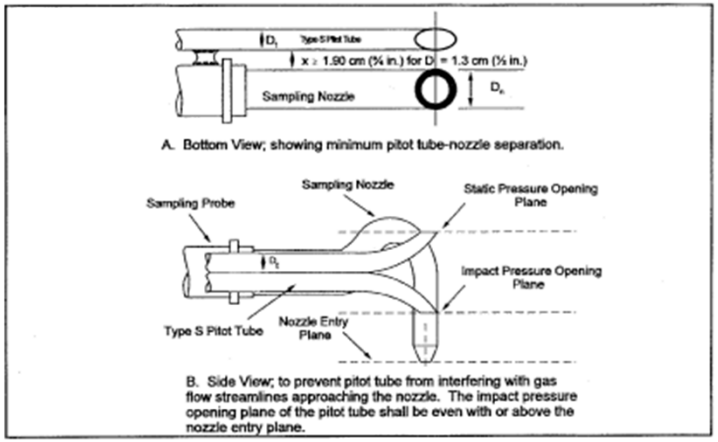
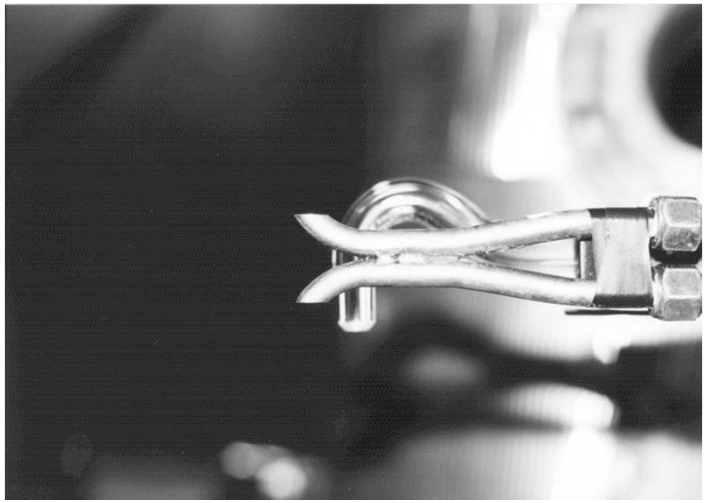


Figure 2-7. Proper pitot tube-sampling nozzle configuration.



Typical Issues with Reports

- Test report does not include all the required certification statements (N.J.A.C. 7:27-1.39) and signatures (Tester, Responsible Official and PE/CIH).
- Raw field data sheets missing or incomplete.
- Full laboratory report(s) missing (summaries are not acceptable).
- Certified laboratory not utilized for analysis.
- Calibration data and/or QA/QC data missing or incomplete.
- Hold-times exceeded, excessive blank values, audit failures, other criteria not met.
- Calculations not included or incorrect.
- Process data missing or incomplete.
- Testing not conducted at worst-case production levels.
- Report not organized in a logical fashion.