



Compliance Measurements



Mike Klein & Robert Kettig

BTS (609) 530-4140





BTS Emission Measurement Section

- Bureau Chief (vacant)
- 1 Section Chief
- 1 Supervisor
- 5* Staff Professionals + 1-2 part time Consultants + 2 part time from AQEval
- Part time Clerical Staff

* Recently added 1 lateral transfer to replace multiple staff lost to attrition.

BTS is located under the Permitting Program and includes the Emission Measurement Section (EMS) and the Air Quality Evaluation (AQEval) Section. We are not part of AC&E.



•
•
•



BTS 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

• • • • • • • •



Resource Allocation

Stack Test Program Effort Level

100 % of protocols are reviewed

~90 % of tests programs are observed

100 % of reports are reviewed


Bureau Hours Utilized in Effort

- ~25 % of hours on Protocols
- ~25 % of hours on Observations
- ~35 % of hours on Reports
- ~15% of hours on Other





BTS Technical Manual for Stack Testing

- Technical Manual 1004 (TM1004)
 - “Guidelines for Compliance Stack Emission Test Programs”
 - www.state.nj.us/dep/bts (Look under Consultant Services)
 - Revision approved September 2009.
 - New protocol templates.
 - Updated protocol templates.
 - Safety.
 - NJ Certified Labs required.
 - Basis and Operation during testing.
-  Plan to revise again in 2012 to incorporate electronic submittals.

Electronic Reporting to BTS



EPA's Electronic Reporting Tool (ERT)

- Software to Standardize Source Test Planning, Reporting and Assessment.
- http://www.epa.gov/ttn/chief/ert/ert_tool.html
- Enhancements made to improve and simplify ERT use based on BTS requests. BTS will require electronic submittals of protocols, stack test reports and CEMS PST reports to improve efficiency.





ERT History

- Way to electronically receive source tests
- ERT v1 - 2006
- ERT v4 – 2011 (included BTS requested enhancements)
 - MS Access 2007; 2010; 2010 64bit
 - Data Entry Spreadsheets
 - Exports to Word
 - Custom Methods / Target Parameters
 - QA for Test Plan
 - Test Quality Questions
 - Performance Specification Tests

•
•
•



ERT In Progress / Future Updates

- Lab Import
- New Methods
- Audit Sample / Blank Train Results
- Calculate Totals from Subcomponents
- Method Notes in Report
- Additional changes as requested during BTS training session

-
-
-



ERT Overview

- ERT Application
 - Microsoft Access 2007 / 2010 / 2010 64bit
- Project Data Set
 - Contains all data for one test report
- Workflow
 - Many methods supported. Custom method option for those not supported.
 - Test Plans (Protocol) – can also include attachments
 - Review / Approve
 - Test Report – can also include attachments
 - Review / Approve

•
•
•



ERT – Methods Supported

- Methods 1 through 4
- Method 3A
- Method 5
- Methods 5B and 5F
- Method 6C
- Method 7E
- Method 8
- Method 10
- Method 12
- Methods 13A and 13B
- Method 17
- Method 23
- Method 25A
- Method 26
- Method 26A
- Method 29
- Method 101
- Method 101A
- Method 102
- Method 103
- Method 104
- Method 108
- Method 201A
- Method 202
- Method 0011
- Method 0061
- Method 315
- Method 316
- CT Method 39
- Performance Standard 2
- Performance Standard 3
- Performance Standard 4
- Custom test methods*

• • • • • • • •



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 (NO_x)
- Sulfur Dioxide
- Sulfuric Acid
- Sulfur Trioxide
- Metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Hexavalent 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



ERT Overview - Main Menu Sections

- Menu Items
 - Test Plan
 - Test Report
 - Review
 - Printing
- Project Data Set Selection
 - Select / Create / Save as / Compact
- Submittal History
 - Shows PDS history





ERT – Main Menu

ERT v 4 4/15/2011

Compatibility Warning This database uses some features which may be incompatible with the current version of ERT v 4 4/15/2011. [More Info ...](#)

ERT - Main Menu

| | | | |
|--|--|--|--|
| Setup / Test Plan Facility Info Process Info Locations / Methods Signatures Full Test Plan | Test Data Run Data Process Data Tester Comments Attachments | Test Plan Review Test Plan Review Test Data Review Observer Comments Test Reviewer Comments Test Review QAQ's | Printed Reports Test Plan Test Plan Review Test Report/Data Tables Test Report Report Signatures Emission Factor Export |
|--|--|--|--|

Select Project Data Set Create New Project Data Set Save Project Data Set As Compact Project Data Set

Current Project Data Set: V:\BTECH\shared\MIKE\WJ ERT\EWS Example Data v3-1\EWS Example Data v3-1.mdb

Project Submittal History:

| Action | SubmitDate | SubmittedTo | SubmittedFrom | Comment |
|-------------------|------------|-------------|---------------|-----------|
| Submit Test Plan | 4/15/2005 | NC Agency | MACTEC | 1st Final |
| Approve Test Plan | 5/14/2005 | MACTEC | NC Agency | Approved |
| * | | | | |

Record: 1 of 2 No Filter Search

Start Novell Group... Microsoft Po... ERT v 4 4/... 9:34 AM



Protocol Templates

- Standardized procedures for commonly used methods developed by BTS. They have fill-ins and check boxes to make source-specific.
- Using Templates greatly reduces the BTS protocol review time.
- Currently have 17 Protocol Templates available for use.
- Developing an additional 10 Protocol Templates for incorporation into TM1004.
- Planning to require the use of Protocol Templates for any method that has one available.
- Protocol Templates will be incorporated into NJ ERT submittals as attachments.





Protocol Preparation Tool

| General Facility Information | | | | | | | | | | | | | | |
|--|-------------|------------------------------|---------------|------------|--------------|--------------------|--|---------------------------------|--------------------------------|--|--|--|--|--|
| Facility Name: | | | | | TST No.: | | | | | | | | | |
| Program Interest No.: | PCP No.: | | | | BOP No.: | | | | | | | | | |
| Operating Scenario: | ORE %: | | | | CET: | | | | | | | | | |
| NPS?: | | NESHAPS?: | | MACT?: | | Hours/Year: | | | | | | | | |
| Outlet Stack and Flow Rate Information | | | | | | | | | | | | | | |
| Stack Diameter Dimensions (inches) <input type="checkbox"/> Rectangular <input type="checkbox"/> Round | | | | | | | | | | | | | | |
| Round <input type="checkbox"/> | Length (ft) | Width (ft) | Temp. (F) | AGEM | SCM | Assumed Moisture % | Assumed Stack O2% | Assumed Moisture % @ Saturation | Assumed Stack O2% @ Saturation | | | | | |
| | | | | | | | | | | | | | | |
| Inlet Stack and Flow Rate Information | | | | | | | | | | | | | | |
| Stack Diameter Dimensions (inches) <input type="checkbox"/> Rectangular <input type="checkbox"/> Round | | | | | | | | | | | | | | |
| Round <input type="checkbox"/> | Length (ft) | Width (ft) | Temp. (F) | AGEM | SCM | Assumed Moisture % | Assumed Stack O2% | Assumed Moisture % @ Saturation | Assumed Stack O2% @ Saturation | | | | | |
| | | | | | | | | | | | | | | |
| Outlet Traverse Details | | | | | | | Inlet Traverse Details | | | | | | | |
| <input type="checkbox"/> Non-Particulate Traverse | | | | | | | <input type="checkbox"/> Non-Particulate Traverse | | | | | | | |
| Diameter or Equivalent <input type="checkbox"/> Inches <input type="checkbox"/> Distance "B" <input type="checkbox"/> Distance "A" | | | | | | | Diameter or Equivalent <input type="checkbox"/> Inches <input type="checkbox"/> Distance "B" <input type="checkbox"/> Distance "A" | | | | | | | |
| Diameters to Disturbance | | | | | | | Diameters to Disturbance | | | | | | | |
| Required Traverse/Flow Methods | | | | | | | Required Traverse/Flow Methods | | | | | | | |
| Traverse Point Calculation | | | | | | | Traverse Point Calculation | | | | | | | |
| Parameters of Interest (outlet only) | | | | | | | | | | | | | | |
| grains * 64.799 = mgps | | | | | | | | | | | | | | |
| EPA Method 25 vs 25A | | | | | | | | | | | | | | |
| Particulate | LMtr Limit | mg/m3 | Inlet VOC lbs | % Carbon | % Production | CO | DE | Other spec. | | | | | | |
| PM-10 | | | 60 | 95 | 100 | 95 | 95 | | | | | | | |
| PM-2.5 | | | | | | | | | | | | | | |
| Reporting Threshold Allowables (outlet only) | | | | | | | | | | | | | | |
| Parameter | USE | Reporting Unit | Lb/hr | SOTA lb/yr | Lb/hr | Reporting Unit | SOTA Tonn/yr | Lb/hr | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Metals (outlet only) | | | | | | | | | | | | | | |
| Front Half Sample Volume (ml) | 300 | Back Half Sample Volume (ml) | 150 | | | | | | | | | | | |
| Run Duration (Hrs) | 1 | LMtr Limit | mg/m3 | SCM | ASBCVARS | RFARS | CFMS | Anal. vol/m3 | mg/m3 (10% of use) | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Organics & Gases (outlet only) | | | | | | | | | | | | | | |
| Sample Volume (L) | 60 | Impinger Start Volume (ml) | 0 | | | | | | | | | | | |
| LMtr Limit | mg/m3 | ASBCVARS | RFARS | CFMS | Anal. vol/m3 | mg/m3 (10% of use) | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

- Calculates many of the items needed for a protocol submittal.

- Currently available from BTS website:

<http://www.state.nj.us/dep/bts/consult.html>

- The functions of this spreadsheet have been incorporated into ERT .



BTS Stack Testing Program

Stack Testing Process

- Test required (Permit, Regulation, Enforcement Action)
- Protocol submitted (often without pre-test site survey)
- Reviewed / comments issued /Eventually approved
 - Notice of Deficiency (NOD) for method choices or procedure
- Mutually acceptable test date established
 - only after protocol approval
- Testing conducted
 - problems often discovered
- Report submitted for review





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.





Protocol Preparation

Protocol Information & Development

- Source information (ERT)
- Sampling locations (ERT)
- Proposed test methods and summaries (ERT and Templates)
- Sampling, recovery and analytical procedures (Templates)
- Method specific tuning information (Templates)
- Production Information (ERT)
- Final report preparation details
- QA/QC Procedures (Templates)



-
-
-



Typical Categories of 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, recovery procedures, etc.
- Errors caused by inexperienced and/or frustrated testers.



Protocol Preparation

Sampling Locations

- Internal stack diameter
- Sampling port location(s)
 - diagram required
- Location(s) relative to disturbances
 - must meet minimum requirements
 - If not > 3D traverse required





Protocol Preparation

Sampling Locations (cont.)

- Required # of Sampling Points
 - based on disturbance locations and stack diameter
- Approximate Stack Conditions
 - needed for preliminary calculations
- Pre-site Survey should be conducted
 - We believe they're rarely done!





Protocol Preparation

Test Methods

- Name and Source of Proposed Method(s)
- In-Stack Detection Limits vs. Methods
 - metals, analyzers, GCs, particulate, etc.
- Description of Sampling Trains
 - include unusual items
 - nozzles, frits, filters, thermocouples, etc.





Protocol Preparation

Test Methods (cont.)

- Analyzer Spans and Calibration Gases
 - Span ideally based on actual concentrations, but generally based on the allowable.
 - Calibration gases based on analyzer span.
 - Might need gases for multiple spans.
 - Frequent problem causing delays.



•
•
•



Protocol Preparation

Test Methods (cont.)

- Equipment Calibration Procedures
- Sample Recovery Procedures
- Holding Times
- QA/QC
- Proposed Deviations and Justification

• • • • • • • •



Protocol Preparation

Production Data

- Reflect regulations and Permit
- Raw material information
- Control equipment parameters
- Fuel usage rates
- Production output
- Other pertinent information





Protocol Preparation

Protocol Review and Approval

- Minimum of 3 valid test runs
- 60 min./run or batch step (whichever is longer)
 - DLs may require longer test runs
- Existing promulgated methods considered FIRST
- Mutually acceptable test date(s)
 - Generally 30-45 days from request





Laboratory Certification

- NJAC 7-18, "Regulations Governing the Certification of Laboratories and Environmental Measurements," was modified to include oversight of air pollution samples. NJAC 7:18-2.2 states, "No laboratory other than a certified laboratory shall analyze samples for the purpose of establishing compliance with any regulatory program."
 - Effective April 18, 2004, all stack test analytical samples analyzed for any affected method must be performed by a NJ Certified laboratory.
 - For additional details on this regulation and the certification process, please refer to the regulation, which can be found at:
<http://www.nj.gov/dep/oqa/labcert.html>.

-
-
-



Conducting the Stack Test

Operation and Safety during Stack Testing

- The stack test is not the time to troubleshoot the equipment. Once the process is stabilized and operating at the production level necessary for compliance testing and the testing team has completed any preliminary measurements and set-up, sampling shall begin. Adjusting or tuning the process based on real time emissions data not normally available to the equipment operators is prohibited.
- All test runs that are started should be completed unless there is a valid technical difficulty with the testing equipment or for safety reasons.



Conducting the Stack Test

Operation and Safety during Stack Testing

- Testing must be conducted at worst-case permitted operating conditions with regard to meeting the applicable emission standards, but without creating an unsafe condition.
- Stack sampling and source evaluation exposes DEP officials and consultants to potential safety hazards in the field. If the BTS observer identifies an unsafe condition that poses an undue risk to BTS, test consultant or facility field staff, the test will be postponed at his/her discretion.





Report Preparation & Review

- Proper facility information
- Source description & actual site info.
- Summary of results
- Production data
- Copies of all raw lab & field data
- Sample calculations
- All calibration data and QA/QC data
- Required certifications (P.E. or C.I.H and N.J.A.C. 7:27-1.39)

NOTE: ERT submittals either include these directly, or you will include attachments as necessary.



-
-
-



Stack Test Quality Assurance Audits

- Audits formerly provided by EPA free of charge. Funding ended in 2010. No audits since May 2010.
- Regulation revisions approved in September 2010 to require purchase of audits from private Accredited Audit Sample Providers (AASP) from an approved audit program, if available.
- The NELAC Institute (TNI) has developed consensus standards for a privatized audit program (<http://www.nelac-institute.org/ssas>) and is an EPA-approved audit program.
- One AASP has been approved (not for all methods.) Two AASPs must be available before purchase of audits is required by the regulation.



Stack Tester Accreditation

- An Air Emissions Testing Body (AETB) can be accredited to ASTM D-7036 through the Stack Testing Accreditation Council (STAC).
- STAC is working with TNI to become a recognized accrediting organization.
- Accreditation has been required by some regulations. AETB certification required by section 6.1.2(b) of Appendix A to Part 75.
- We have some additional ideas.
- <http://www.betterdata.org>



BTS CEM Program

Why are CEMS required?

Federal Regulations (examples)

- NSPS (40 CFR, Part 60)
- BIF (40 CFR, Part 266)
- RCRA (40 CFR, Part 264)
- Sludge (40 CFR, Part 503)
- Acid Rain (40 CFR, Part 75)





BTS CEM Program

Why are CEMS required?

State Regulations (examples)

- N.J.A.C. 7:26
- N.J.A.C. 7:27 - 16 (VOC RACT)
- N.J.A.C. 7:27 - 19 (NO_x RACT)
- N.J.A.C. 7:27 - 27C (RGGI)
- SIP



•
•
•



BTS CEM Program

Typical Parameters Monitored

- Nitrogen Oxides
- Carbon Monoxide
- Sulfur Dioxide
- Specific Organics
- Total Hydrocarbons
- Oxygen
- Carbon Dioxide*
- Opacity
- Hydrogen Sulfide
- Total Reduced Sulfur
- Mercury*
- Particulates*
- Stack gas flow rate
- Fuel flow rate

• • • • • • • •

•
•
•



BTS CEM Program

CEMS Approval Process

- CEMS equipment protocol submitted for review and approval
- CEMS certification (PST) protocol submitted for review and approval
- QA/QC Plan Development



BTS CEM Program

Types of CEMS

- Extractive (dilution or not)
- Insitu (point or cross stack)
- *Predictive*





BTS CEM Program

Analytical Techniques

- Adsorption
 - NDIR
 - GFCIR
 - UV
- Luminescence
 - chemiluminescence
 - fluorescence





BTS CEM Program

Analytical Techniques (cont.)

- Electro-analytical
 - electrochemical
 - paramagnetic





BTS CEM Program

CEMS Equipment Protocol - Major Items

- Sampling locations
 - representative location required
- Analyzer ranges
 - Dual allowables
 - generally 2 times allowable
 - accuracy of 1% of span



•
•
•



BTS CEM Program

CEMS Equipment Protocol - Major Items (cont.)

- Analyzer interferences
 - principle dependent (example SO₂)
- Conditioning system
 - 44 degree outlet temperature



BTS CEM Program

CEMS Equipment Protocol - Major Items (cont.)

- Data recorder / DAS / Strip Chart
 - Units of the standard
- Calibration procedures
 - Injected where?
 - Daily
 - Gases



•
•
•



BTS CEM Program

CEMS PST Protocol - Major Items

- Source description
- Summary of test program
 - operating conditions
 - concurrent CD/RA
 - Three point traverse
 - Acceptable criteria
- Sample locations



BTS CEM Program

CEMS PST Protocol - Major Items (cont.)

- Detailed summary of methods
 - Spans (\leq facility CEMS)
 - Method 7E calibration procedures
- Sample calculations
 - RM or STD in the denominator
- Explanation of data to be submitted
- Certification - N.J.A.C. 7:27-1.39





BTS CEM Program

CEMS PST Report - Major Items

- Source description
- Summary of test program
- Sample locations
- Detailed summary of methods
- Results Summary
- Raw data





BTS CEM Program

CEMS PST Report - Major Items (cont.)

- Corrected data
 - units of the standard
- Serial numbers of equipment (analyzers)
- Calculations
- Certification
 - N.J.A.C. 7:27-1.39
- Electronic Submittals will soon be required!





BTS CEM Program

CEMS Part 75 - Major Items [75.22 (a) (5)]

- EPA Method 205 is NOT allowed
- Beginning 3/27/12 – AETBs required for MOST testing.
- Must have a QI onsite at all times
- May not skip bias checks between RATA runs
- May not use multi-hole probes





BTS Technical Manual #1005

Technical Manual #1005

Guidelines

for

Continuous Emissions Monitoring Systems (CEMS),

Continuous Opacity Monitoring Systems (COMS)

and

Periodic Monitoring Procedures (PMPs)

www.state.nj.us/dep/bts

Look under Consultant Services





BTS Technical Manual #1005

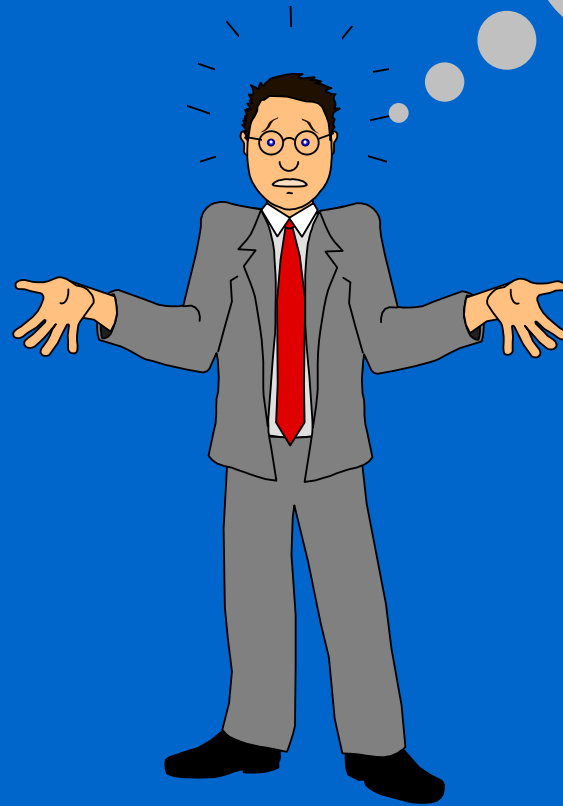
Technical Manual 1005 - June 1, 2010 revision

- Quarterly converter efficiency checks added as part of the Quarterly Audits required by Parts 60 and 75.
- Language added to address recertification requirements.
- Downtime clarification added for those permits which do not allow downtime.
- Clarification added for those sources with CEMs required for both permit compliance determinations as well as a budgeting program purposes. Linearity checks (if conducted in the applicable quarter) satisfy the CGA requirement under Appendix F. If not conducted due to a grace period allowance, the CGA must be conducted.
- Procedure for the determination of THC allowables added.
- Procedure for validating CEMS data after a significant equipment change added.
- Periodic Monitoring Procedures (PMP) and clarifications added.





Why ???





Frequency of Field Problems





Frequency of Field Problems

Internal Audit

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





Frequency of Problems (cont.)

EPA Inspector General Audit of Program

- Test Observations
 - BTS made significant corrections in **57 %** of the test programs.
- Test Protocols
 - BTS found **86 %** of the protocols to be deficient.





Frequency of Problems (cont.)

EPA Inspector General Audit of Program

- Testing Programs
 - BTS required **28 %** of the test programs to be repeated for at least one parameter.
- Test Reports
 - **26 %** of the reports required significant correction, clarification or were rejected by BTS.





And they know
we're looking!!!

Safety Concerns



























24 12:30 PM



18 7 2001

































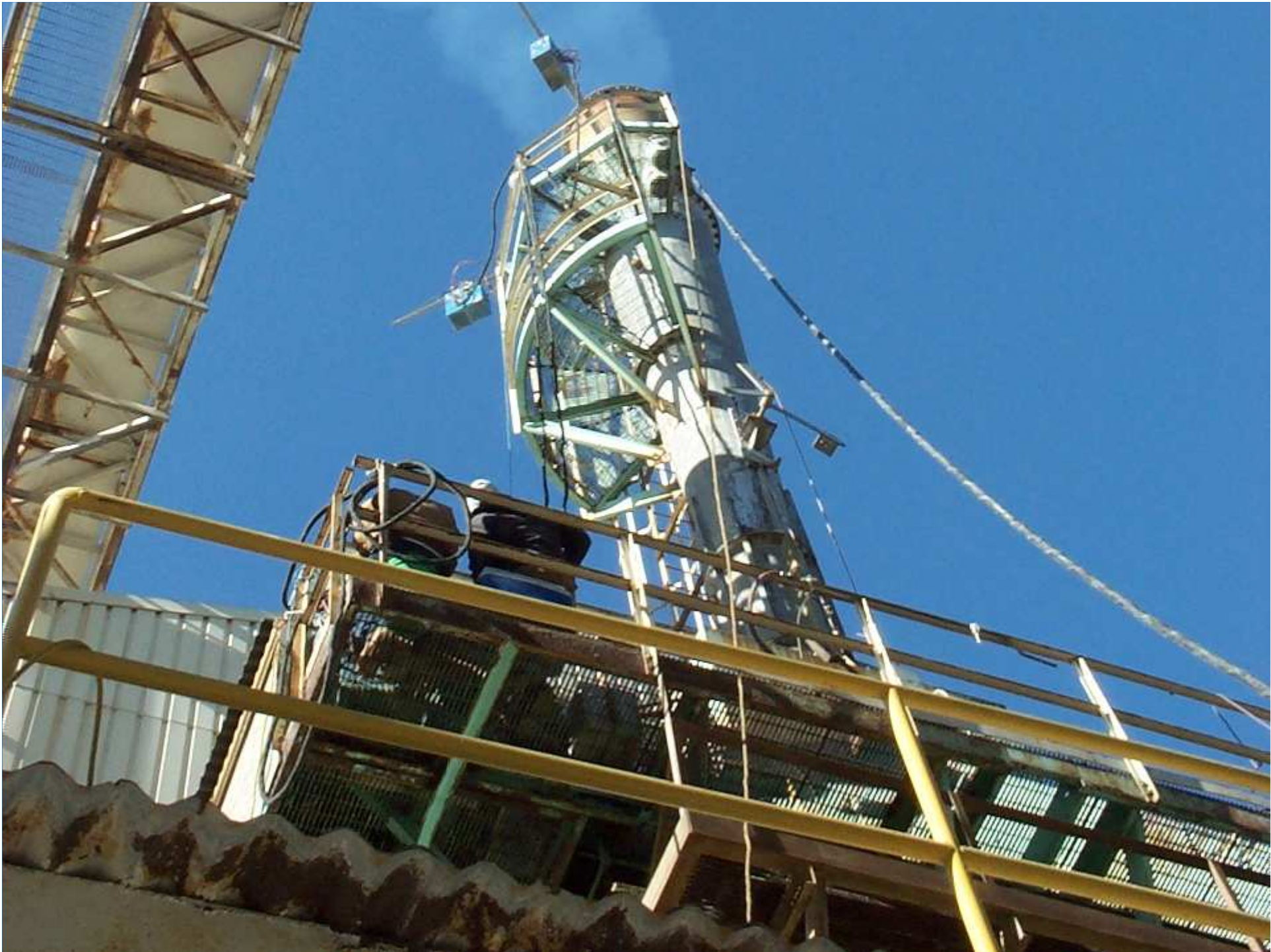
9.19.2000





10.18.2000















**Platform Location Where Grating Collapsed
(130 Feet Above Ground Level)**



BTS Contact Information

- Phone - (609) 530-4041
- Fax - (609) 530-4504
- E-Mail - `xxxx.yyyy@dep.state.nj.us`
 - x = first name
 - y = last name
 - examples
 - michael.klein@dep.state.nj.us
 - fred.ballay@dep.state.nj.us
 - Exceptions for duplication

