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Geraghty & Miller, Inc.

Geraghty & Miller, Inc.

July 1994

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Neenah Paper-KC Co.

Neenah, WI

Package Boiler

WDNR0094
100 8140

Duplicate

COMPLIANCE PARTICULATE MATTER SOURCE EMISSIONS MEASUREMENT PROGRAM NEBRASKA PACKAGE BOILER KIMBERLY-CLARK CORPORATION NEENAH, WISCONSIN

Gas 5/25/94

Oil 5/26/94

July 1994

30 Day NOx Test May 2, 1994 - June 1, 1994

Prepared for

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COMPLIANCE PARTICULATE
MATTER SOURCE EMISSIONS
MEASUREMENT PROGRAM
NEBRASKA PACKAGE BOILER
KIMBERLY-CLARK CORPORATION
NEENAH, WISCONSIN

July 1994

Geraghty & Miller, Inc. is submitting this report to Kimberly-Clark Corporation for work performed at the Kimberly-Clark Corporation, Neenah, Wisconsin facility. The report was prepared in conformance with Geraghty & Miller's strict quality assurance/quality control procedures to ensure that the report meets the highest standards in terms of the methods used and the information presented. If you have any questions or comments concerning this report, please contact one of the individuals below.

Respectfully submitted,

GERAGHTY & MILLER, INC.

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Project Scientist/Project Manager

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1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

Kimberly-Clark Corporation (Kimberly-Clark) has been authorized to construct and temporarily operate a steam boiler in conjunction with proposed expansion plans, at the Neenah Paper Mill facility in Neenah, Wisconsin. A site location map may be found presented in Figure 1-1 of this report. The steam boiler is subject to New Source Performance Standards (NSPS) under United States Environmental Protection Agency (USEPA) codified in 40 CFR, Part 60, Subpart Db, *Standards of Performance for Industrial-Institutional Steam Generating Units*, and Wisconsin s. NR 440.205. The NSPS Subpart Db regulations cover facilities with steam generating units that commenced construction, modification, or reconstruction after June 19, 1984, and that have a heat input capacity of greater than 29 megawatts (MW) or 100 million British thermal units per hour (mmBtu/hr). The operating permit is pending the outcome of the compliance demonstration test performed on May 25 and 26, 1994. The steam boiler was operated in conformity with the emission limits, monitoring, record keeping, reporting requirements, and specific conditions set forth in the permit to construct, as issued by the Wisconsin Department of Natural Resources (WDNR), March 9, 1993. In accordance with NR 439.07 a compliance emission test plan was submitted to the WDNR, prior to the commencement of the compliance test program.

Simultaneous measurements were conducted at the outlet of the Nebraska boiler operated at the Neenah Paper Mill during the compliance test program. The parameters measured during the program were particulate matter, opacity, oxides of nitrogen (NO_x), and flow rate monitoring.

The remainder of this report is devoted to the compliance demonstration for the Nebraska Package Boiler that is operated by Kimberly-Clark Corporation. The document is composed of five sections. Section 2 provides a discussion of the plant and sampling location descriptions. Section 3 presents a summary and discussion of the test program results. The sampling and analytical procedures utilized for the compliance demonstration are given in Section 4. The last section, Section 5, summarizes the Quality Assurance and Quality Control activities performed during the compliance demonstration.

1.2 KEY PERSONNEL

The field sampling portion of the program was performed on May 25 and 26, 1994. The Geraghty & Miller field test crew consisted of Mr. Frank Paolo, Designer; Mr. Gerry Tumbali, Staff Engineer I; Mr. Michael Bowling, Scientist II; and Mr. Keith Marquardt, Scientist II. The test program quantified total suspended particulate matter (TSP) and visual emissions (VE) concentrations for the Nebraska Package Boiler outlet. The test program further determined oxides of nitrogen (NO_x) from the boiler exhaust.

The key personnel who coordinated the test program and their phone numbers are:

- Michael Weiner, G&M Project Manager (414) 277-6229
- Gerry Tumbali, G&M Technical Coordinator (414) 276-7742
- Frank Paolo, G&M Field Test Coordinator (412) 826-3636
- Mike Bowling, G&M CEM Operator (919) 544-4535
- Craig O'Keefe, KCC Plant Contact (414) 721-2000
- Robert Waldron, KCC Plant Boiler Supervisor (414) 721-3615
- John McKinnon, KCC Corporate Technical Contact (404) 587-7067

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION AND OPERATION

The source to be operated at the Neenah Paper Mill site is a Nebraska D-frame package boiler equipped with a Coen DAF low-NO_x burner, and an economizer. The boiler does not employ staged combustion, nor does the boiler employ flue gas recirculation for NO_x control. The source has been identified by Kimberly-Clark as Process (Boiler) #B23 and Stack #S13. The boiler has a steaming capacity of 120,000 pounds per hour (lb/hr), with a maximum fuel input rate of 143 mmBtu/hr when firing natural gas and 137 mmBtu/hr when firing distillate fuel oil. The steam boiler will normally fire natural gas, and will use low sulfur distillate oil for back-up fuel. In accordance with Wisconsin s. 144.394(3), the applicable limitation for SO_2 content in the distillate fuel is 0.50 percent. Kimberly-Clark has optioned to fire a low sulfur content (less than 0.311 percent) distillate oil, to ensure compliance with the SO_2 ambient air quality standards under s. 144.394(3).

The boiler has also been equipped with an on-line combustion control monitor for steaming rate and flue gas oxygen concentration. Oxygen content of the flue gas was analyzed for combustion control utilizing a Rosemont Model 3001NF Oxygen Analyzer with auto-calibration and a 3-foot probe. The boiler will be controlled using a Rosemont Distributed Control System (DCS). The DCS was also used to track and record data to generate monitoring reports for submittal to the WDNR for the required emissions monitoring.

2.2 FLUE GAS SAMPLING LOCATIONS

The Kimberly-Clark Corporation steam boiler sampling was conducted on the 54-inch diameter exhaust duct of the steam boiler through two 90-degree opposed sampling ports utilizing 12 traverse points (6 per port). The stack configuration may be found presented in Figures 2-1 and 2-2 of this report. Sample ports met the USEPA criteria of eight duct diameters downstream and 2 duct diameters upstream from any flow disturbances. Traverse point selection was made in accordance with USEPA Method 1. Velocity profiles were obtained before testing and near the middle of each sampling run, and once again at the conclusion of the test series. A minimum of three nominal 72-minute test runs were performed to establish the particulate matter, opacity, and NO_x emission rates while firing natural gas, and an additional three test runs were performed while firing distillate oil.

A slip stream of the flue gas was extracted from the stack for the Geraghty & Miller temporary continuous emissions monitoring by means of a probe and filtering system. The gas stream was then transported through a heat-traced teflon line to a microprocessor-controlled condenser which reduced the temperature of the gas stream, condensing out most of the moisture in the gas. The moisture was continuously removed from the condenser by means of a peristaltic metering pump. The dry gas stream then passed through a flow control valve and the pump. Immediately after the pump, a fraction of the stream was drawn off by the two analyzers and the remainder exhausted to the atmosphere through a calibrated orifice which was monitored with a magnehelic pressure gauge equipped with a minimum-activated alarm system. Both the NO_x analyzer and the oxygen analyzer were equipped with their own pumps which drew the appropriate gas required for proper operation. With this flow scheme, each analyzer's flow system inlet pressure was independent of the changing pressure across the particulate filter.

As long as some flow was maintained through the exhaust vent, the analyzers were assured of "seeing" an unbiased representative dry particulate-free gas sample at ambient pressure and temperature. If the flow was reduced below the needs of the two analyzers, the alarm on the magnehelic would have been activated to alert the system operator that some type of corrective action was required on the sample conditioning and transport system.

3.0 SUMMARY AND DISCUSSION OF TEST RESULTS

3.1 OBJECTIVES AND TEST MATRIX

The purpose of the test program was to determine the compliance status for the Nebraska Boiler operating permit.

The specific objectives were:

- Measure the emission rates of PM, CPM, VE, O_2, CO_2, CO, and NO_x at the Nebraska Boiler outlet locations.

- Determine compliance status with PM permit limitations

- Determine compliance status with VE permit limitations

- Determine compliance status with NO_x permit limitations

The sampling test matrix may be found summarized in Tables 3-1 and 3-2 for the gas-fired and oil-fired runs, respectively.

3.2 FIELD TEST CHANGES AND PROBLEMS

The only field test changes or problems encountered during the compliance test program were a rescheduling of the original set of compliance tests. The original compliance tests were slated to be performed on May 11 and 12, 1994, but due to boiler operational problems at the maximum steaming rate of 120,000 lb/hr, the tests were rescheduled for a later date. The WDNR was made aware of the operational problems and agreed to the rescheduling. There were no other field test changes or problems encountered during the compliance test program.

3.3 PRESENTATION OF RESULTS

This section address each of the specific objectives and presents a summary of the results in tabular form, along with a discussion of the data.

3.3.1 Flow Rates, Temperature, And Moisture

To determine mass emission rates, flow rate is an important component. In this test program, two separate trains provided simultaneous measurements of velocities, temperatures, and moisture contents. Table 3-2 summarizes the flow rate data. Method 3A data for O_2 and CO_2 are also included in this table.

The following observations were made:

- The temperature measurements of the Nebraska Package Boiler outlet compare to within ±2°F of each other.

- The moisture contents of the Nebraska Package Boiler outlet compare to within ±1 percent moisture of each other, except for Run G-1 which was within ±2 percent moisture of the other runs.

- The flow rate from M5/WI-½, and all three runs from the gas and oil-fired particulate runs agree within ±3 when compared to flow rates from the corresponding runs.

Based on the above observations, the average flow rates as shown in Table 3-3 are considered to provide the best data and, therefore, were used to calculate the mass emission rates.

3.3.2 Particulate Matter Emissions

Stack conditions, TSP concentrations, and mass emission rates for the test program are summarized in Table 3-4 and 3-5 for the gas-fired runs and oil-fired runs, respectively. The particulate matter concentrations are reported in grains per dry standard cubic feet (gr/DSCF) and mass emission rates as pounds per hour (lb/hr). Results are also provided in the F-factor emission rate unit of lb NO_x/mmBtu. Gas flow rates are presented in units of actual cubic feet per minute (ACFM) at prevailing stack conditions, as well as in dry standard cubic feet per minute (DSCFM), referenced to conditions of 29.92-inches mercury (Hg) and 68° Fahrenheit (F) on a dry basis. DSCFM flow rates were utilized in calculating emission rates for all constituents. Equations and sample calculations may be found presented in Appendix A of this report. Gas sample volumes ranged from 66 to 69 ft^3 for the TSP sampling trains on a dry standard basis. Particulate concentrations averaged 0.0007 gr/DSCF during Gas-fired Runs 1 through 3, and 0.0014 gr/DSCF during oil-fired Runs 1 through 3. Particulate mass emission rates averaged 0.16 and 0.36 lb/hr, or 0.0009 and 0.0019 lb/mmBtu, for the gas-fired and oil-fired runs, respectively. All test runs were within the acceptable (90 percent to 110 percent) isokinetic criteria. Particulate matter measurement data and field data sheets may be found in Appendix B

3.3.3 Visual Opacity Emissions

Visual opacity measurement data may be found in Appendix C along with further details of the measurements. There were no visual readings over 0 percent during any of the three 1-hour measurement periods for either gas-fired or oil-fired runs.

3.3.4 NO_x Emissions Monitoring

The results of the parametric analysis will be summarized in a test report to be published by Geraghty & Miller's Air Quality Services as the basis for the NO_x alternate monitoring plan. Results of the 30-day performance test consisted of seven hundred-twenty (720) 1-hour averages for NO_x concentrations averaged over the 30-day period and reported. The 30-day average NO_x concentrations were 72.3 ppm_v. The 30-day average NO_x emission factor in terms of lb NO_x/mmBtu was 0.108 lb NOx/mmBtu. The 30-day performance test demonstrated that the boiler was in compliance with the NO_x New Source Performance Standard (NSPS) of 0.20 lb/mmBtu. May 2, 1994 – June 1, 1994

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

The basic framework for flow rate and moisture testing utilized promulgated USEPA Methods 1, 2, 3 and 4. These standard test procedures are reproduced in their entirety in 40 CFR, Part 60, Appendix A.

The testing procedures outlined here are based on the best available information with regard to process conditions and the test site. Concurrent with each test run, pertinent operating data including process steam rates, and oxygen concentrations from process monitors, temperature, and any other pertinent parameters were recorded. In the event of any process upsets, testing was temporarily halted and restarted upon achievement of previous process rate levels and operating parameters. Should process variations or site specific requirements dictate that procedures be modified, changes were made in the field accordingly to ensure data of sufficient accuracy. The approval of the WDNR source test observer was solicited in the field for any modifications to the previously submitted protocol.

4.1.1 Flow Rate, Moisture, and Particulate Matter

USEPA Method 1 was utilized in the selection of traverse points for the boiler exhaust source test location. During the compliance test program 12 traverse points were utilized for each of two 90-degree opposed ports. USEPA Method 2 was followed for the determination of gas velocity and volummetric flow rate. This procedure utilized an S-type pitot tube and inclined manometer for determination of stack-gas velocity head. USEPA Method 2 was incorporated as part of the USEPA Method 5 particulate matter test run.

USEPA Method 3A was utilized for determination of stack-gas molecular weight. Continuous emission monitors (CEMs) were employed at stack sampling location to determine the percent by volume of CO_2 and O_2 in the gas. In conjunction with the CO_2 and O_2 determinations, Nitrogen (N_2) was determined by difference. USEPA Method 10A was utilized to continuously measure CO concentrations. An Infrared Industries, Inc., Model IR-702 nondispersive infrared (NDIR) gas analyzer, or equivalent, was used to measure the CO_2 and CO concentrations. An Infrared Industries, Inc., Model IR-2200 zirconium oxide cell O_2 analyzer, or equivalent, was utilized to measure flue gas O_2 concentrations. Oxygen differentially diffuses through the membrane at a rate proportional to its partial pressure. Once in the cell, the oxygen is electrochemically consumed generating a current proportional to the oxygen content in the sample gas stream. The signal is amplified by the operational amplifier in the analyzer which in turn produces a stable analog output proportional to the oxygen content of the gas. The fuel cell is temperature compensated and is highly insulated to prevent temperature changes which are too rapid for the compensation system.

The analog outputs of each analyzer were connected to a multichannel strip chart recorder, the range of which was adjusted to the selected range of the analyzers. The output was also connected to a Keithley Metrabyte Corporation Model DAS8-AO data acquisition board and Laboratory Notebook/XE Version 7.20.4 for Windows 3.1 data logging software. The data logger was programmed to calculate and store 15-minute averages, in addition 30-minute and 1-hour averages were collected. The data was stored in standard ASCII format data files which could be directly manipulated by LOTUS 1-2-3, or BASIC programs. The redundancy of the data acquisition system insured 100 percent data recovery. The unit was calibrated (including zero and span checks) before testing unless calibration checks show drift above accepted limits as stated in the method.

In addition, Geraghty & Miller utilized the above mentioned CEMs in order to verify proper operation and calibration of the Kimberly-Clark's combustion control O_2 analyzer to ensure the boiler O_2 analyzer will yield acceptable data during the operation of the boiler. A certification of the boiler O_2 analyzer was performed in accordance with the quality assurance and calibration criteria presented in 40 CFR Part 60, Appendix B, Performance Specification Methods 3, 4 and 6.

USEPA Method 4 outlines a procedure for determination of moisture content of the stack gas. Pretest moisture determinations was performed for the compliance testing programs. Actual moisture determination was performed during each USEPA Method 5 test run.

To determine compliance with the 0.10 pounds of particulate matter per million British thermal units (lb PM/mmBtu) emission limitation contained in s. NR 440.205(4)(b), USEPA Method 5 was utilized for the determination of particulate matter concentration in the designated source. The nominal 12 traverse points selected in accordance with USEPA Method 1 were isokinetically sampled for 12 minutes each, resulting in a minimum 72-minute test runs. A minimum of 60 dry standard cubic feet (DSCF) sample volume was collected during each of the 72-minute test run. An isokinetic ratio criteria of 90 to 110 percent was met for all acceptable particulate matter runs. Following WDNR guidelines, the total particulate matter catch included both front-half and filterable back-half fractions. Particulate matter results are provided in concentration units of grains per dry standard cubic foot (gr/DSCF), and mass emission rates in units of pounds per hour (lb/hr) and lb PM/mmBtu. Three individual test runs were performed during the field investigation for each fuel type resulting in a total of six tests. In order to determine compliance with the emission limitation, the arithmetic mean of the results of all the repetitions apply. Three repetitions were used unless there was a forced shut-down of the process, a production cycle is shortened, an interruption of the test due to bad weather, an accidental loss of the sample, or other circumstances out of the control of the tester.

4.1.2 Visual Emissions Determination

To determine compliance with the 20 percent opacity emission limitation contained in s. NR 431.05, a certified opacity reader observed and evaluated any visible particulate matter emissions generated during boiler operations concurrent with other sampling activities, while both natural gas and distillate oil were being fired. The visual emissions observer certification is included in Appendix C of this report. USEPA Method 9 outlines a procedure for the visual determination of opacity emissions from stationary sources. Opacity measurements were visibly taken at a frequency of one reading every 15 seconds continuously for 1 hour, for a total of 240 readings. The opacity or "smoke" reading was performed by a certified "smoke" reader in conjunction with the USEPA Method 5 TSP sampling schedule. Visual emissions monitoring data was synchronized with TSP sampling and boiler process parameters to assure representative sampling and to facilitate an emission result comparison with process parameters.

The opacity determination procedures followed applicable sections of USEPA Method 9 published in 40 CFR 60, Appendix A. Visual emission observations were conducted for a nominal 1-hour period, one observation period for each of three particulate test runs. A certified opacity observer performed the following tasks throughout testing activities:

- Stood at a distance sufficient to provide a clear view of any emissions with the sun oriented in the 140-degree sector to his back.
- Maintained a line of vision approximately perpendicular to the plume direction.
- Observed the plume at the point of greatest opacity, at the point where condensed water vapor is not present (attached or detached steam plumes).
- Observed the plume momentarily at 15-second intervals.
- Recorded the time, estimated distance, approximated wind direction, sketched the observer's position, and described the sky condition on a field data sheet.
- Recorded observations to the nearest 5 percent.
- Performed continuous sets of 15-second observations whenever a plume was observed for a nominal 6-minute period, resulting in the minimum 24 observations per period.

4.1.3 NO_x Monitoring

To determine compliance with the 0.20 lb NO_x/mmBtu emission limitation contained in s. NR 440.205(5) and (6), a CEM was used to measure the concentration of NO_x at the source. Real-time analysis for total NO_x was performed using a Thermo Environmental Model 10 chemiluminescent analyzer, in accordance with USEPA Method 7E. An extractive gas conditioning system was used to convey the sample gas to the NO_x analyzer. The analog outputs of the analyzer were connected to a multichannel strip chart recorder, the range of which was adjusted to the selected range of the analyzers. The output was also connected to a Keithley Metrabyte Corporation Model DAS8-AO data acquisition board and Laboratory Notebook/XE Version 7.20.4 for Windows 3.1 data logging software. The data logger was programmed to calculate and store 15-minute averages, in addition 30-minute and 1-hour averages were collected. The data was stored in standard ASCII format data files which could be directly manipulated by LOTUS 1-2-3, or BASIC programs. The redundancy of the data acquisition system insured 100 percent data recovery. The unit was calibrated (including zero and span checks) before testing unless calibration checks show drift above accepted limits as stated in the method.

The monitor measures the light given off by the chemical reaction on nitric oxide (NO) with ozone (which is internally generated). A converter reduces any nitrogen dioxide (NO_2) in the gas stream back to NO. The sum of both of these produces an analog output proportional to the NO_x concentration in the gas stream and is insensitive to the other gases in the exhaust stream such as water, methane, carbon dioxide, nitrogen, carbon monoxide, and trace hydrocarbons. The NOx analyzer was operated in the 0-1000 ppm range during the 30-day performance test.

The NO_x system underwent a calibration error check and system bias check prior to and immediately after the end of the monitoring period. In addition, the system was zeroed and spanned on a daily basis with a certified USEPA Protocol 1 calibration gas to provide calibration drift data and documentation of calibration accuracy. The daily span value of calibration gas was 840 ppmv. Commercially available standard gases were used to calibrate the NO_x analyzer in accordance with USEPA Method 7E, and oxygen in nitrogen standard gases meeting the requirements of USEPA Method 3A was used to calibrate the oxygen analyzer.

The operation of the NO_x CEMS was verified on a daily basis by a Geraghty & Miller, Inc./Acurex Environmental Corp. field scientist who checked all operational parameters, reviewed the most recent calibration and performed any corrective actions required. Calibrations, performance specifications, quality assurance criteria, and minimum data availability for NO_x CEMS was performed in accordance with Performance Specification Methods 2 and 3, as presented in 40 CFR Part 60, Appendices B and F. Results are presented in units of lb NO_x/mmBtu expressed as nitrogen dioxide (NO_2), in accordance with WDNR requirements. Results were calculated for a 3-hour and a 30-day rolling average as per WDNR requirements.

Data was gathered over the entire operating range of the boiler in accordance with s. NR 440.205(10)(c) and (7)(e) with respect to steaming capacity and oxygen range over the 30-day NO_x alternate monitoring program. The range of steaming capacities of boiler operation tested during the 30-day performance test was from the nominal low-fire rate of 20,000 lb/hr to the maximum high-fire capacity of 120,000 lb/hr. In addition, monitoring was performed during the firing of both natural gas and distillate fuel, in order to properly characterize the boiler operations under all conditions.

Alternate monitoring program data gathering was conducted simultaneously during the 30-day performance testing. Mr. Joseph Perez from the WDNR, Bureau of Air Quality, agreed to this procedure prior to the commencement of the test program.

4.2 PROCEDURES FOR OBTAINING PROCESS DATA

The process monitor for the Nebraska package boiler, a Rosemont Model 3001NF O_2 monitor, served a dual role during the compliance test program. The process monitor controlled boiler operations through a DCS system used to track and record data from the process monitor, and was utilized to generate monitoring reports for submittal to the WDNR for NO_x emissions monitoring. Additionally, the data from the DCS system was incorporated into the 30-day NO_x performance test and parametric analysis program for development of an NO_x predictor model.

5.0 QA/QC PROCEDURES AND RESULTS

5.1 QA/QC PROCEDURES AND RESULTS

The objectives of a quality assurance/quality control (QA/QC) program is to assure that the precision and accuracy of all environmental data generated by Geraghty & Miller are commensurate with data quality objectives (DQOs). DQOs are based on a common understanding of the intended end use(s) of the data, the measurement process, and the availability of resources. Once DQOs are established, formally or informally, QC protocol can be defined for the measurements.

The data quality objectives in this project are to provide defensible data that can be used for determination of emission rates for compliance. The final data user will be the WDNR.

The goal of a QA/QC program is that data generated and used for decision-making are scientifically sound, of known quality, and documented to be "in control." To accomplish this goal, standardized methods or procedures are used whenever possible. They must be validated for their intended use, rigorously followed, and data reported with quality indicators (precision, accuracy, completeness, etc.).

Two basic concepts used in a QC program are to:

1. Control errors; and
2. Verify that the entire Sampling and Analytical (S&A) method is operating within acceptable performance limits.

Use of qualified personnel, reliable and well-maintained equipment, appropriate calibrations and standards, and close supervision of all operations are important components of the QC system. QC in this test program included the use and documentation of calibrated sampling and analytical instruments, use of EPA validated methods (EPA 40 CFR Part 60), adherence to established protocol, method blanks as a check against possible contamination, sample chain-of-custody documentation, and redundant data calculation with checking.

All of the equipment used was calibrated according to procedures outlined in the Quality Assurance Handbook for Air Pollution Measurement System, Volume III, EPA-600/4-77-027b. Actual calibration data sheets are provided in Appendix E.

5.2 PARTICULATE MATTER AND VOLUMETRIC FLOW

5.2.1 Barometer

Barometric pressure values for the testing period were recorded from a calibrated barometer on-site and verified by telephone from a local airport and were corrected for elevation to stack sample port level (0.01 inches Hg per 10 ft. elevation).

5.2.2 Probe Nozzle

The probe nozzles used in this test were calibrated initially by the manufacturer and thereafter by the field sampling crew by checking for dimension roundness. This was performed by making three separate measurements using alternative inside diameters and calculating the average. A micrometer with a minimum tolerance of 0.001 inch was used for measuring. If a deviation of more than 0.004 inch is found between any measurements, the nozzle is either discarded or repaired and remeasured.

5.2.3 Pitot Tubes

Each pitot tube used in sampling meets the design specifications for type-S pitot tubes in EPA Method 2. Therefore, a maximum value baseline coefficient (C_p) of 0.84 is assigned to each pitot tube. Calibration at the manufacturer for pitot face-opening alignment included measuring the external tubing diameter (dimension D_t), the base-to-opening plane distance (dimensions P_a and P_b), and the face opening misalignment angles, with all terms as described in Figures 2-2 and 2-3 of EPA Method 2. Pitot tubes were visually inspected at the completion of the test to insure structural integrity.

5.2.4 Calibration Meter and Metering System

The secondary reference meter equipment arrangement for calibration is shown in Figure 5.7 of USEPA Method 5. The prescribed procedures were followed. A wet test meter with a 1 ft^3/rev capacity and ± 1 percent accuracy is used as the primary calibrant. The dry gas meter's pump is operated for a minimum of 5 minutes at a flow rate of 0.35 cfm to condition the interior surface of the wet test meter. Leak checks are performed and if satisfactory, triplicate runs at each of no less than five different flow rates are performed. A calibration curve is prepared and the meter is recalibrated after 200 hours of operation or annually, whichever comes first.

The calibration set-up for the dry gas metering system using the secondary reference meter in lieu of the wet test meter is given in Figure 5.5 of EPA Method 5. A leak check of the metering system before calibration was performed as shown in Figure 5.4 of EPA Method 5. The metering system's pump is operated for 5 minutes at an orifice manometer setting of 0.5 inches H_20 to heat up the pump and system to stabilize the meter inlet and outlet temperatures. Values for the orifice setting (delta H), wet test meter volume (V_w), corresponding dry test meter volume (V_d), dry test meter inlet and outlet gas temperatures (t_{di} and t_{do}), and time are recorded for the initial calibration. The ratio of the wet test meter to the dry test meter (gamma) and the orifice pressure differential that equates to 0.75 cfm at standard conditions (delta H@) are then calculated. A copy of the calibration is in Appendix F.

5.2.5 Post-Test Meter Calibration Check

A post-test meter calibration was performed on the dry gas meter used during the test to check its accuracy against the pre-test calibration. This post-test calibration was made using the average orifice setting obtained during each test run and setting the vacuum at the maximum value obtained during each test run. These test runs were performed against Geraghty & Miller's secondary reference dry gas meter which was calibrated against a wet test meter. A copy of the calibration data is included Appendix E.

5.2.6 Thermocouples and Digital Indicators

Thermocouples are calibrated by comparison to an ASTM-3F mercury-in-glass thermometer at approximately 32° F (ice water), ambient temperature and approximately 100° F (hot oil). Each thermocouple is calibrated against temperature ranges to which it is typically exposed during test conditions, and they must agree within 1.5 percent (expressed in °R) of the reference thermometer throughout the entire calibration range.

Digital indicators are checked by introducing a series of millivolt signal strengths to the input and comparing the indicator reading with the actual signal strength. Acceptable calibration error must not exceed 0.5 percent when temperatures are expressed in °R.

5.2.7 Analytical Balance

The analytical balance was calibrated by comparing its readings against NBS Class-S1 standard weights, with acceptable agreement within 0.5 mg.

5.2.8 Blanks

Filter, distilled water, acetone, and methylene chloride blanks were provided for gravimetric analysis as a check against potential sample contamination. Particulate samples were blank corrected.

5.2.9 Replicates and Precision

Replicate samples of particulate catch are not possible due to the nature of gravimetric analysis. In addition, no analytical precision estimate can be determined.

Precision and accuracy are quantitative measures that characterize the amount of variability and bias inherent in a given data set. Precision refers to the level of agreement among repeated measurements of the same parameter. Accuracy refers to the difference between an estimate based on the data and the true value of the parameter being estimated. The error due to measurement variability for particulate concentration can be as much as ± 10.4 percent of concentration (intralab precision determined by EPA during collaborative method validation tests). Accuracy for particulate concentration cannot be determined because no "true" concentration can be created to estimate accuracy. Instead, documentation of equipment calibration is used to establish traceability as a surrogate for accuracy of particulate measurements.

Table 3-1. Gas-Fired Sampling Matrix

RUN NO. DATE FUEL	SAMPLE TYPE	TEST METHOD	LOCATION/CLOCK TIME/SAMPLING TIME BOILER OUTLET
1 5/25/94 GAS	PM CPM O_2/CO_2 VE NO_X CO	M5 WI B-½ M3A M9 M7E M10	1005-1125 72 72 Continuous 72 Continuous Continuous
2 5/25/94 GAS	PM CPM O_2/CO_2 VE NO_X CO	M5 WI B-½ M3A M9 M7E M10	1245-1405 72 72 Continuous 72 Continuous Continuous
3 5/25/94 GAS	PM CPM O_2/CO_2 VE NO_X CO	M5 WI B-½ M3A M9 M7E M10	1500-1620 72 72 Continuous 72 Continuous Continuous

Table 3-2. Oil-Fired Sampling Matrix

RUN NO. DATE FUEL	SAMPLE TYPE	TEST METHOD	LOCATION/CLOCK TIME/SAMPLING TIME BOILER OUTLET
1 5/26/94 OIL	PM CPM O_2/CO_2 VE NO_X CO	M5 WI B-½ M3A M9 M7E M10	1330-1457 72 72 Continuous 72 Continuous Continuous
2 5/26/94 OIL	PM CPM O_2/CO_2 VE NO_X CO	M5 WI B-½ M3A M9 M7E M10	1530-1650 72 72 Continuous 72 Continuous Continuous
3 5/26/94 OIL	PM CPM O_2/CO_2 VE NO_X CO	M5 WI B-½ M3A M9 M7E M10	1750-1908 72 72 Continuous 72 Continuous Continuous

Table 3-3. Volumetric Flow Rate Data

RUN NO.	FLOW RATE, dscfm	TEMPERATURE, °F	MOISTURE, %H_2O	CEM, % *	
	M5/WI B-½	M5/WI B-½	M5/WI B-½	O_2	CO_2
G-1	26,700	306.6	17.1	4.5	9.2
G-2	27,400	306.8	15.3	4.4	9.2
G-3	26,800	307.2	17.4	4.4	9.2
Avg	27,000	306.8	16.6	4.4	9.2
O-1	29,000	305.1	11.7	5.1	12.0
O-2	29,500	307.8	10.4	5.6	11.7
O-3	29,500	308.1	11.9	5.6	11.7
Avg	29,300	307.0	11.3	5.5	11.8

* Geraghty & Miller temporary CEMs on stack outlet.

TABLE 3-4
Gas-Fired Particulate Emissions Summary
Nebraska Package Boiler, Neenah Paper Mill
Kimberly-Clark Corporation, Neenah, Wisconsin

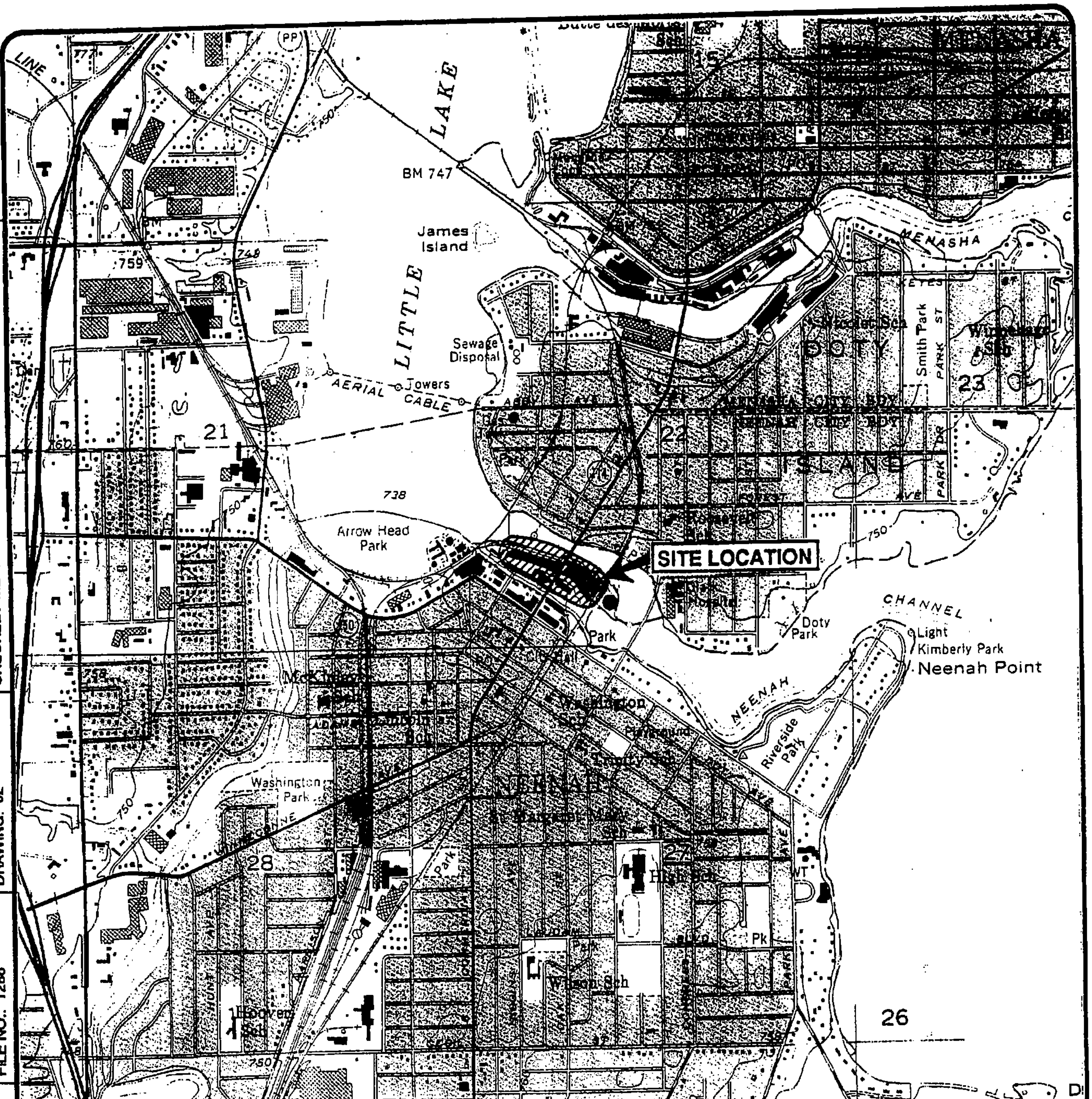
filename: A:\KCC-1.WK1 7/21/94

SYMBOL	SAMPLING PARAMETERS	RUN NO.==> DATE==> RUN TIME==> UNITS	Gas Run 1 06/25/94 1005-1125	Gas Run 2 06/25/94 1245-1405	Gas Run 3 06/25/94 1500-1620	AVERAGE
	MEASURED DATA AT STACK					
(Y)	Dry Gas Meter Calibration Factor	--	0.936	0.936	0.936	
(Vi)	Initial Meter Volume	cf	571.190	649.040	725.590	
(Vf)	Final Meter Volume	cf	648.885	725.405	802.170	
(Lp)	Leak Check Correction	cfm	0	0	0	
(Vm)	Total Meter Volume	cf	77.695	76.365	76.580	76.880
(t)	Sampling Time	min	72	72	72	72
(Vwc)	Volume of Water Collected	mL	279.1	217.7	278.2	258.3
(Vwsg)	Silica Gel Weight Increase	g	21.4	39.1	21.1	27.2
(Vlc)	Total Water Collected	mL	300.5	256.8	299.3	285.5
(Pbar)	Barometric Pressure	in. Hg	28.80	28.80	28.80	28.80
(Pg)	Stack Static Pressure	in. H2O	-0.2	-0.2	-0.2	
(del H)	Avg. Orifice Pressure Drop del H	in. H2O	2.88	2.75	2.75	
(Ts)	Avg. Stack Gas Temperature	deg F	306.6	306.8	307.0	306.8
(Tm)	Avg. Dry Gas Meter Temperature	deg F	83.3	85.3	89.0	
(Dn)	Nozzle Diameter	inches	0.307	0.307	0.307	
(Ds)	Diameter of Stack	inches	54.000	54.000	54.000	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	--	0.84	0.84	0.84	
(del p)1/2	Avg. Square Root Velocity Head p	--	0.723	0.729	0.729	
(%O2)	Stack Gas Oxygen	%	4.5	4.4	4.4	4.4
(%CO2)	Stack Gas Carbon Dioxide	%	9.2	9.2	9.2	9.2
(%N2)	Stack Gas Nitrogen	%	86.3	86.4	86.4	86.4
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	28.79	28.79	28.79	28.79
(%Bws)	Stack Gas Moisture	%	17.1	15.3	17.4	16.6
(%B'w)	Moisture at Saturation	%	99.9	99.9	99.9	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	67.968	66.560	66.296	66.941
(Md)	Dry Gas Molecular Weight	lb/lb-mole	29.65	29.65	29.65	29.65
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	27.66	27.87	27.62	27.72
(vs)	Stack Gas Velocity	ft/s	50.96	51.18	51.40	51.2
(A)	Stack Area	ft2	15.90	15.90	15.90	
(Qsd)	Volumetric Gas Flow Rate	dscfm	26,700	27,400	26,800	26,967
(Qa)	Volumetric Gas Flow Rate	acfm	48,600	48,800	49,000	48,800
(%EA)	Percent Excess Air	%	22.1	21.4	21.4	21.6
(%I)	Isokinetic Variation	%	109.4	104.4	106.3	
	PARTICULATE COLLECTION ANALYSIS					
(Wfi)	Tare Weight of Filter	g	0.70420	0.75860	0.69830	
(Wff)	Final Filter Weight	g	0.70390	0.75820	0.69840	
(mf)	Weight on Filter	mg	-0.3	-0.3 -.4	-0.3 -.1	
(Wai)	Acetone Rinse Tare Weight	g	95.653	93.4091	96.8962	
(Waf)	Acetone Rinse Final Weight	g	95.6563	93.4115	96.9007	
(ma)	Weight in Acetone Rinse	mg	3.3	3.3	3.3	
(Vaw)	Acetone Volume Used in Rinse	mL	50	50	50	
(Va)	Acetone Volume Used in Blank	mL	100	100	100	
(Wa)	Weight in Acetone Blank	g	0.0002	0.0002	0.0002	
(Ca)	Acetone Blank Correction	g/mL	0.00000	0.00000	0.00000	
(mn)	Total Particulate Collected	mg	3.00	3.00	3.00	3.00
	Train Fractionation: Probe Rinse	%	110	110	110	110
	Filter	%	-10	-10	-10	-10
(mo)	Condensible Organic PM Collected	mg	3.3	2.4	4.5	
(mi)	Condensible Inorganic PM Collected	mg	63.6	11.8	6.6	
	Condensible Fractionation: Organic	%	5	17	41	21
	Inorganic	%	95	83	59	79
(Fd)	Natural Gas Heat F-Factor	scf/mmBtu	8,710	8,710	8,710	
	PARTICULATE EMISSIONS					
(Cs)	Particulate Concentration	gr/dscf	0.0007	0.0007	0.0007	0.0007
(Cd)	Particulate Concentration	lb/dscf	9.73E-08	9.93E-08	9.97E-08	9.88E-08
(Cm)	Particulate Concentration	mg/m3	1.6	1.6	1.6	1.6
(Ccpm)	Condensible Particulate Concentration	gr/dscf	0.0152	0.0033	0.0026	0.0070
(E)	Particulate Emission Rate	lb/hr	0.16	0.16	0.16	0.16
(Ebh)	Condensible Particulate Emission Rate	lb/hr	3.48	0.77	0.59	1.61
(E)	Emission Rate, F-Factor Based	lb/mmBtu	~~0.0008~~ .0011	0.0009	0.0009 .0013	~~0.0009~~ .0011
	% of Emission Limit (0.10 lb/mmBtu)	%	0.8	0.9	0.9	0.9

TABLE 3-5
Oil-Fired Particulate Emissions Summary
Nebraska Package Boiler, Neenah Paper Mill
Kimberly-Clark Corporation, Neenah, Wisconsin

filename: C:\123R4W\KIMBERLY\KCC-2.WK1 7/21/94

SYMBOL	SAMPLING PARAMETERS	UNITS	Oil Run 1	Oil Run 2	Oil Run 3	AVERAGE
	RUN NO.==>		Oil Run 1	Oil Run 2	Oil Run 3	
	DATE==>		06/26/94	06/26/94	06/26/94	
	RUN TIME==>		1330-1457	1530-1650	1750-1908	
	MEASURED DATA AT STACK					
(Y)	Dry Gas Meter Calibration Factor	--	0.936	0.936	0.936	
(Vi)	Initial Meter Volume	cf	804.355	879.790	957.370	
(Vf)	Final Meter Volume	cf	879.560	957.175	1034.705	
(Lp)	Leak Check Correction	cfm	0	0	0	
(Vm)	Total Meter Volume	cf	75.205	77.385	77.335	76.642
(t)	Sampling Time	min	72	72	72	72
(Vwc)	Volume of Water Collected	mL	161.7	132.9	176.9	157.2
(Vwsg)	Silica Gel Weight Increase	g	30.8	37.0	23.0	30.3
(Vlc)	Total Water Collected	mL	192.5	169.9	199.9	187.4
(Pbar)	Barometric Pressure	in. Hg	28.92	28.92	28.92	28.92
(Pg)	Stack Static Pressure	in. H2O	-0.2	-0.2	-0.2	
(del H)	Avg. Orifice Pressure Drop del H	in. H2O	2.83	2.91	2.96	
(Ts)	Avg. Stack Gas Temperature	deg F	305.1	307.8 (767.42)	308.1 (767.75)	307.0
(Tm)	Avg. Dry Gas Meter Temperature	deg F	68.0	79.5	73.0	
(Dn)	Nozzle Diameter	inches	0.307	0.307	0.307	
(Ds)	Diameter of Stack	inches	54.000	54.000	54.000	
(W)	Width of Stack	inches	0.000	0.000	0.000	
(L)	Length of Stack	inches	0.000	0.000	0.000	
(Cp)	Pitot Tube Coefficient	--	0.84	0.84	0.84	
(del p)1/2	Avg. Square Root Velocity Head p	--	0.748	0.754	0.758	
(%O2)	Stack Gas Oxygen	%	5.1	5.6	5.6	5.4
(%CO2)	Stack Gas Carbon Dioxide	%	12.0	11.7	11.7	11.8
(%N2)	Stack Gas Nitrogen	%	82.9	82.7	82.7	82.8
	CALCULATED STACK GAS DATA					
(Ps)	Stack Gas Pressure	in. Hg	28.91	28.91	28.91	28.91
(%Bws)	Stack Gas Moisture	%	11.7	10.4	11.9	11.3
(%B'w)	Moisture at Saturation	%	99.5	99.5	99.5	
(Vmstd)	Standard Dry Gas Meter Volume	dscf	67.977	68.452	69.247	68.559
(Md)	Dry Gas Molecular Weight	lb/lb-mole	30.12	30.10	30.10	30.11
(Ms)	Wet Gas Molecular Weight	lb/lb-mole	28.71	28.84	28.66	28.74
(vs)	Stack Gas Velocity	ft/s	51.61	51.97	52.44	52.0
(A)	Stack Area	ft2	15.90	15.90	15.90	
(Qsd)	Volumetric Gas Flow Rate	dscfm	29,000	29,500	29,300	29,267
(Qa)	Volumetric Gas Flow Rate	acfm	49,300	49,600	50,000	49,633
(%EA)	Percent Excess Air	%	26.8	30.9	30.9	29.5
(%I)	Isokinetic Variation	%	100.8	99.7	101.7	
	PARTICULATE COLLECTION ANALYSIS					
(Wfi)	Tare Weight of Filter	g	0.71460	0.69130	0.71200	
(Wff)	Final Filter Weight	g	0.71830	0.69700	0.71760	
(mf)	Weight on Filter	mg	3.7	~~3.7~~ 5.7	~~3.7~~	
(Wai)	Acetone Rinse Tare Weight	g	95.1191	95.319	100.3134	
(Waf)	Acetone Rinse Final Weight	g	95.1217	85.3214	100.3158	
(ma)	Weight in Acetone Rinse	mg	2.6	~~2.6~~	~~2.6~~	
(Vaw)	Acetone Volume Used in Rinse	mL	50	50	50	
(Va)	Acetone Volume Used in Blank	mL	100	100	100	
(Wa)	Weight in Acetone Blank	g	0.0002	0.0002	0.0002	
(Ca)	Acetone Blank Correction	g/mL	0.00000	0.00000	0.00000	
(mn)	Total Particulate Collected	mg	6.30	~~6.30~~	~~6.30~~	6.30
	Train Fractionation: Probe Rinse	%	41	41	41	41
	Filter	%	59	59	59	59
(mo)	Condensible Organic PM Collected	mg	2.6	2.6	2.4	
(mi)	Condensible Inorganic PM Collected	mg	12.8	21	11.5	
	Condensible Fractionation: Organic	%	17	11	17	15
	Inorganic	%	83	89	83	85
(Fd)	No.2 Fuel Oil F-Factor	scf/mmBtu	9,190	9,190	9,190	
	PARTICULATE EMISSIONS					
(Cs)	Particulate Concentration	gr/dscf	0.0014	0.0014	0.0014	0.0014
(Cd)	Particulate Concentration	lb/dscf	2.04E-07	2.03E-07	2.01E-07	2.03E-07
(Cm)	Particulate Concentration	mg/m3	3.3	3.2	3.2	3.2
(Ccpm)	Condensible Particulate Concentration	gr/dscf	0.0035	0.0053	0.0031	0.0040
(E)	Particulate Emission Rate	lb/hr	0.36	~~0.36~~ .46	~~0.35~~ .45	0.36
(Ebh)	Condensible Particulate Emission Rate	lb/hr	0.87	1.35	0.78	1.00
(E)	Emission Rate, F-Factor Based	lb/mmBtu	~~0.0019~~	~~0.0019~~ .0033	~~0.0018~~ .0032	~~0.0019~~ .00297
	% of Emission Limit (0.10 lb/mmBtu)	%	1.9	1.9	1.8	1.9



SOURCE: USGS 7.5 Minute Topographic Map, NEENAH, WISCONSIN Quadrangle, 1984

N

0 1000 2000 4000

SCALE IN FEET

GERAGHTY & MILLER, INC.
Environmental Services

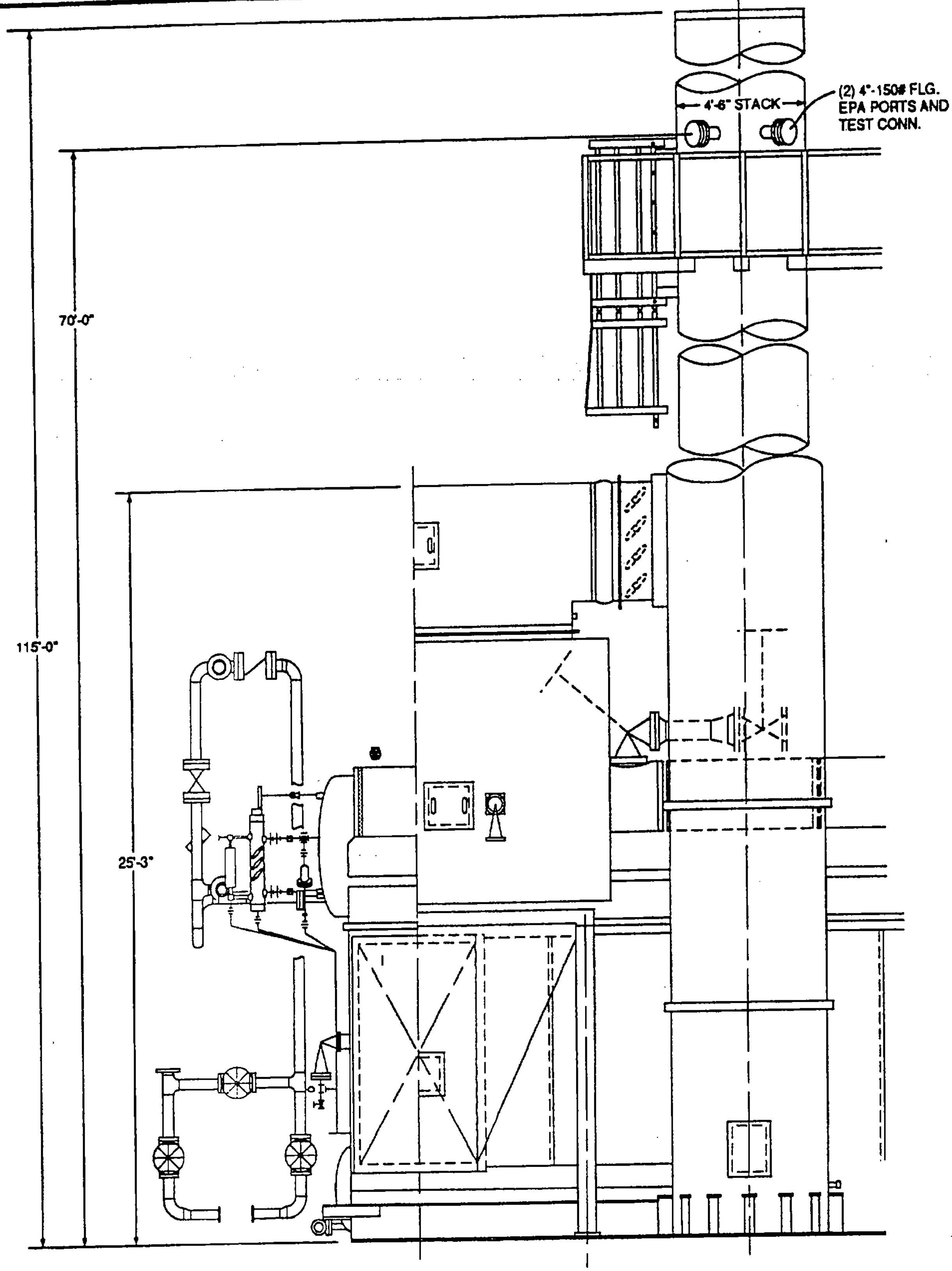
SITE LOCATION MAP

KIMBERLY-CLARK CORPORATION
NEENAH, WISCONSIN

FIGURE

1

DRAFTER: SCB
APPROVED:
CHECKED: MBW
DRAWING: 02
FILE NO.: 1286
PRJCT NO.: WI0415.001
DWG DATE: 21MAR94



DRAFTER: SCB | APPROVED: | CHECKED: | DRAWING: 03 | FILE NO.: 1286 | PRJCT NO.: WI0415.001 | DWG DATE: 22JUL94

GERAGHTY & MILLER, INC.
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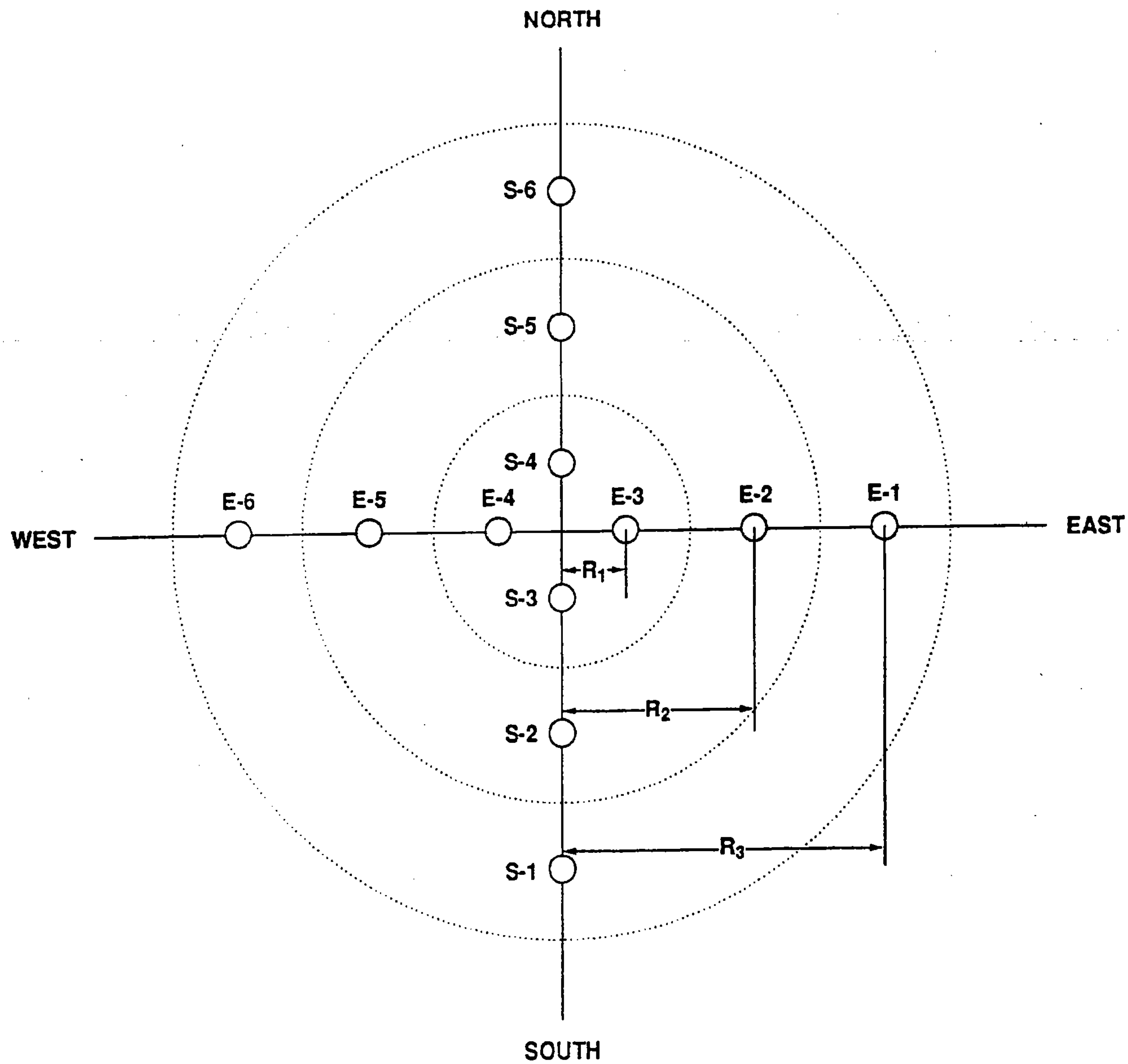
NEBRASKA PACKAGE
BOILER ELEVATION DRAWING

KIMBERLY – CLARK CORPORATION
NEENAH, WISCONSIN

FIGURE
2-1

DRAFTER: SCB | APPROVED: | CHECKED: MBW | DRAWING: 01b | FILE NO.: 1286 | PRJCT NO.: WI0415.001 | DWG DATE: 22JUL94



#	% of dvl.	in. from Opp. Walls
1	4.4	2.38
2	14.6	7.88
3	29.6	15.98
4	70.4	38.02
5	85.4	46.12
6	95.6	51.62

DIAMETER = 54"
RADIUS = 27"

GERAGHTY & MILLER, INC.
Environmental Services

NSPS COMPLIANCE TEST
PACKAGE BOILER OUTLET DUCT

KIMBERLY–CLARK CORPORATION
NEENAH, WISCONSIN

FIGURE
2-2

APPENDIX A

EQUATIONS AND EXAMPLE CALCULATIONS

The following equations were used to develop the final results for the test program. A "Nomenclature" section which describes the variables used in the equations is also included. Equations 1 through 7 were used to determine input data for flow equations 8 through 10.

The following is a sample calculation for Gas Test Run 1.

1. Volume of water collected
(USEPA Method 5, Equation 5-2)

$$V_{wstd} = (0.04707 \text{ ft}^3 / \text{ml} @ 68\ ^\circ\text{F}) (V_w)$$
$$= (0.04707)(300.5)$$
$$= 14.145 \text{ ft}^3$$

2. Volume of gas metered, standard conditions
(USEPA Method 5, Equation 5-1)

$$V_{mstd} = \frac{V_m * T_{std} * P_{bar}\ Y^d}{T_m * P_{std}}$$

$$= \frac{77.695 * 528 * 28.80 * 0.936}{549 * 29.92}$$

$$= 67.323$$

3. Moisture content (measured)

4. Moisture content (saturated)

CE Power Systems steam tables

$$P_{s,sat} = \frac{525\ (lb/in^2)\ (29.92"\ Hg)}{14.69\ (lb/in^2)}$$

$$= 1069"\ Hg$$

$$M_{sat} = P_{s,sat} / P_s$$

$$= 1069 / 28.79$$

$$= 37.13$$

$$= 3713\%$$

Stack Moisture Content < M_{sat}

5. Molecular Weight of dry gas stream

(USEPA Method 3, Equation 3-1)

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%CO + \%N_2)$$

$$= 0.44(9.2) + 0.32(4.4) + 0.28(86.3)$$

$$= 29.65$$

6. Molecular weight of stack gas (wet)

(USEPA Method 2, Equation 2-5)

$$M_s = M_d\ (1-B_{wo}) + 18(B_{wo})$$

$$= 29.65(1-.1736)+18(.1736)$$

$$= 27.66$$

7. Stack gas velocity

(USEPA Method 2, Equation 2-9)

$$v_s = K_p C_p \sqrt{(\Delta p)}_{avg} \sqrt{\frac{T_{s(avg)}}{P_s M_s}}$$

$$v_s = (85.49)(0.84)(0.7233)\sqrt{\frac{(306.6+460)}{(28.80+(-0.20/13.6))*27.66}}$$

$$v_s = 50.96 ft/sec$$

8. Stack Gas Flow Rate (actual ft^3/min)

(USEPA Method 2, Equation 2-10[1])

$$Q_{ACFM} = (v_s)(A_s)(60\ sec/min)$$
$$= (50.96)(15.9\ ft^2)(60)$$
$$= 48{,}600\ actual\ ft^3/min$$

9. Stack Gas Flow Rate (standard ft^3/min)

(USEPA Method 2, Equation 2-10)

$$Q_{SCFM} = Q_{ACFM}\ (T_{std}/P_{std})\ (P_s + P_a/T_s)$$
$$= 48{,}600\ (528/29.92)\ ((28.79 + -0.20/13.6))/(306.6+460)$$
$$= 32{,}309\ standard\ ft^3/min$$

10. Stack Gas Flow Rate (dry standard ft^3/min)

(USEPA Method 2, Equation 2-10)

$$Q_{DSCFM} = Q_{SCFM}\ (1-B_{wo})$$
$$= 32{,}309\ (1-.1736)$$
$$= 26{,}700\ dry\ standard\ ft^3/min$$

---

[1] For the sake of clarity, the corrections to standard conditions and to dry standard conditions were performed separately.

NOMENCLATURE

A_s	Area of stack, square feet
ACFM	Actual cubic feet per minute
B_{wo}	Moisture content of the sample gas
cm^3	Cubic centimeters
CO_2	Carbon dioxide
C_p	Pitot coefficient
DSCFM	Dry standard cubic feet per minute
ft^2	Square feet
ft^3	Cubic feet
hr	Hour
K_p	Pitot tube constant, 85.49 for English units (See Method 2, Equation 2-9)
lb	Pounds
lb-mole	Pound-mole
M_s	Molecular weight of stack gas, wet basis
M_{sat}	Ratio of vapor pressure of water at stack conditions to stack pressure
MBtu	Million British thermal units
min	Minute
ml	Milliliters
O_2	Oxygen
Δp	Gas velocity pressure (in water)
P_a	Stack static pressure (inches mercury)
P_b	Barometric pressure (inches water)
P_s	Absolute stack pressure (barometric + static pressure in inches of H_2O)
$P_{s,sat}$	Vapor pressure of water at stack conditions
P_{std}	Standard pressure, 29.92-inches mercury
ppm_v	Parts per million by volume
SCFM	Standard cubic feet per minute
T_s	Temperature of the stack
T_{std}	Standard temperature, 68° Fahrenheit (F)
V_m	Volume of sample gas measured by the dry gas meter
V_w	Volume of water collected in the impingers and silica gel
Y_d	Dry gas meter correction factor

APPENDIX B

PARTICULATE FIELD DATA AND RECOVERY SHEETS

GERAGHTY & MILLER, INC., AIR QUALITY PROGRAM
STACK SAMPLING RAW DATA SHEET

lient:	KCC	Test #:	1 - GAS	Delta H@:	1.8249	Start Time:	1005
ate:	5/25/94	Nozzle Dia:	.307	Meter Correction:	.9360	Stop Time:	1125
lant:	NEENAH PAPER	Static Press, Ps:	-.2 " H_2O	Pitot Correction:	.84	Sample Box #:	2
ocation:	# 3 STACK	Ambient Temp:	60	Control Box #:	2	Probe #:	6SSL1
roject #:	W10415001	Barometric Press:	28.80 " Hg	Assumed Moisture:	12 %	Filter #:	107
est Crew:	GT / KM	Initial Meter Vol:	571.190	Calculator Multiplier:	5.5	Stack Diameter:	54"
						Umbilical Length:	50'
						Stack Area:	15.904 sq ft

Point	Elapsed Time 6 MIN/pt	Metered Volume (dcf)	Velocity Head (DELTA P) in. H2O	Orifice Delta H in. H2O Required	Orifice Delta H in. H2O Actual	Meter Vacuum in. Hg	Stack Temp. °F	Probe Temp. °F	Oven Temp. °F	Imp. Temp. °F Out	Imp. Temp. °F In	Meter Temp. Tm °F Out	Meter Temp. Tm °F In	N W N ↑ Comments 11" port length
	0	571.190	~~.55~~	~~3.03~~	~~3.0~~									
W - 1	6	577.690	.55	3.0	3.0	7.5	308	257	253	59	163	67	69	
2	12	584.20	.55	3.03	3.0	7.5	310	252	256	52	243	68	75	
3	18	591.10	.60	3.3	3.3	8.5	312	252	263	54	250	70	80	
4	24	597.64	.55	3.03	3.0	7.5	311	270	265	58	254	73	85	
5	30	603.995	.50	2.75	2.8	7.0	310	259	265	58	250	76	89	
6	36	609.725	.40	2.2	2.2	5.5	279	257	263	59	252	79	92	
														← Port change at 1040
N - 1	42	616.13	.50	2.75	2.8	7.0	309	244	239	58	208	80	88	← start @ 1047
2	48	622.80	.55	3.03	3.0	7.0	312	254	239	55	55	81	92	
3	54	629.75	.60	3.3	3.3	8.0	313	256	234	51	53	82	95	Md = 29.65
4	60	636.445	.55	3.03	3.0	7.5	313	269	240	52	57	84	99	Ms = 27.64
5	66	643.125	.55	3.03	3.0	7.5	311	263	242	53	60	86	100	Vs = 50.98 ft/s
6	72	648.885	.40	2.2	2.2	6.0	291	238	242	54	64	87	102	% BWO = 17.23
														ACFM = 48645
		77.695												SCFM = 32234
														DSCFM = 26680
AVERAGE			.7232		2.8833		306.5833					83.2917		% I = 109.56%

542.966

Sample Train Leak Check

	in Hg	Rate
Before	15	.01 cfm
After	10	.005 cfm

Pitot Leak Check

	PRETEST	POST
Red	ok	OK
Black	OK	OK

Gas Analysis

	1	2	3	Avg
CO2	9.2	9.2	9.2	9.2
O2	4.5	4.5	4.5	4.5
CO	13.7	13.7	13.7	13.7
N2				

Impinger	Contents	Grams Final	Grams Initial	Difference
1	100 ml DI	794.0	592.8	
2	100 ml DI	659.9	594.0	
3	empty	513.9	501.9	
4	Silica Gel	693.6	672.2	300.5
5				

23-MAY-92

FORMSDATASHEE.WK3

GERAGHTY & MILLER, INC., AIR QUALITY PROGRAM
STACK SAMPLING RAW DATA SHEET

Client:	KCC	Test #:	2-6AS	Delta H@:	1.8249	Start Time:	1245
Date:	5/25/94	Nozzle Dia:	.307	Meter Correction:	.9360	Stop Time:	1405
Plant:	Neenah Paper	Static Press, Ps:	-.2 "H_2O	Pitot Correction:	.84	Sample Box #:	4
Location:	#3 Stack	Ambient Temp:	60	Control Box #:	2	Probe #:	6SSL1
Project #:	W10415001	Barometric Press:	28.80 "Hg	Assumed Moisture:	17%	Filter #:	103
Test Crew:	CT/KM	Initial Meter Vol:	649.04	Calculator Multiplier:	5.17	Stack Diameter:	54
						Umbilical Length:	50'
						Stack Area:	15.904 sq ft

Point	Elapsed Time	Metered Volume (dcf)	Velocity Head (DELTA P)	Orifice Delta H in. H2O		Meter Vacuum	Stack Temp.	Probe Temp.	Oven Temp.	Imp. Temp. °F		Meter Temp. Tm °F		Comments (11" port length)
	∅	649.04	in. H2O	Required	Actual	in. Hg	°F	°F	°F	Out	In	Out	In	
W-1	6	655.26	.50	2.59	2.6	6	308	234	262	57	151	73	76	
2	12	661.96	.6	3.10	3.10	7.5	310	258	261	64	189	75	81	
3	18	668.68	.6	3.10	3.10	8.0	311	269	253	58	210	76	84	
4	24	675.13	.55	2.84	2.80	7.5	310	264	249	57	219	79	89	
5	30	681.35	.50	2.59	2.60	7.0	307	241	242	58	222	80	91	
6	36	687.225	.45	2.32	2.30	6.0	298	235	245	64	221	81	93	
	AVG	FOR ΔH	.7293		2.75		307					81.5		← change port @ 1324
N-1	42	693.66	.50	2.59	2.6	6.0	307	244	246	57	179	81	88	← start @ 1330
2	48	699.81	.55	2.84	2.80	7.0	310	252	247	59	179	82	92	Md = 29.65
3	54	706.545	.60	3.10	3.10	7.5	311	256	250	59	186	82	94	% Bwo = 13.03
4	60	713.290	.60	3.10	3.10	7.5	311	268	250	57	199	83	97	Ms = 28.13
5	66	719.725	.55	2.84	2.80	7.0	308	247	247	58	204	85	99	Vs = 50.93 ft/s
6	72	725.405	.40	2.07	2.10	6.0	290	241	240	58	201	87	99	ACFM = 48603
			.7297		2.75		301.6					89.0833		SCFM = 32220
														OSCFM = 28013
		[illegible]												% Iso = 102.20 %
AVERAGE			.7290		2.75		306.5					85.2917		

Sample Train Leak Check

	in Hg	Rate
Before	15	.012 cfm
After	10	.01 cfm

Pitot Leak Check

	PRE	POST
Red	ok	ok
Black	ok	ok

Gas Analysis

	1	2	3	Avg
CO2	9.2	9.2	9.2	9.2
O2	4.4	4.4	4.4	4.4
CO	13.6	13.6	13.6	13.6
N2				

Impinger	Contents	Grams Final	Grams Initial	Difference
1	100 ml DI H_2O	672.1	595.1	
2	100 ml DI H_2O	707.6	610.0	
3	[illegible]	541.3	498.2	
4	Silica Gel	685.7	646.6	
5				218

[illegible]-MAY-92

FORMS\DATASHEE.WK3

GERAGHTY & MILLER, INC., AIR QUALITY PROGRAM
STACK SAMPLING RAW DATA SHEET

Client:	KCC	Test #:	3 - GAS	Delta H@:	1.8249	Start Time:	1500
Date:	5/25/94	Nozzle Dia:	.307	Meter Correction:	.9360	Stop Time:	1620
Plant:	Neenah, Paper	Static Press, Ps:	-.2	Pitot Correction:	.84	Sample Box #:	2
Location:	# 3 STACK	Ambient Temp:	65	Control Box #:	2	Probe #:	6SSL1
Project #:	W10415001	Barometric Press:	28.80	Assumed Moisture:	17 %	Filter #:	106
Test Crew:	GT / KM	Initial Meter Vol:	725.590	Calculator Multiplier:	5.17	Stack Diameter:	54"
						Umbilical Length:	50'
						Stack Area:	15.904 sq ft

Point	Time	Metered Volume (dcf)	Velocity Head (DELTA P) in. H2O	Orifice Delta H in. H2O Required	Orifice Delta H in. H2O Actual	Meter Vacuum in. Hg	Stack Temp. °F	Probe Temp. °F	Oven Temp. °F	Imp. Temp. °F Out	Imp. Temp. °F In	Meter Temp. Tm °F Out	Meter Temp. Tm °F In	Comments FLOW OUT OF PAGE; 11" port length
	Ø	725.590												
W-1	6	732.02	.55	2.84	2.80	6	306	244	225	56	90	79	82	
2	12	738.44	.55	2.84	2.80	6	308	254	237	53	94	80	87	
3	18	745.18	.60	3.10	3.10	6.5	312	261	244	54	102	81	91	
4	24	751.635	.55	2.84	2.80	6	311	252	248	57	104	82	93	
5	30	757.855	.50	2.59	2.60	5.5	309	262	245	57	105	84	96	
6	36	763.49	.40	2.07	2.10	4.5	297	251	249	61	114	85	97	
			.7232		2.70		307.167					86.4167		← port change @ 1537
N-1	42	769.72	.50	2.84	2.80	5.5	307	225	245	56	96	84	91	← start @ 1548
2	48	776.485	.60	3.10	3.10	6.0	310	258	249	50	146	84	95	Md = 29.65
3	54	783.280	.60	3.10	3.10	6.0	312	263	256	48	178	85	97	% Bwo = 17.53
4	60	790.04	.60	3.10	3.10	6.5	311	268	252	48	196	86	99	Ms = 27.61
5	66	796.51	.55	2.84	2.80	6.0	309	252	257	50	209	87	101	Vs = 51.41 ft/s
6	72	802.17	.40	2.07	2.10	4.5	292	235	249	51	211	88	102	Acfm = 49055
			.7342		2.8		306.833						91.0833	scfm = 32488
		76.58												DSCFM = 26793
														% Iso = 106.41 %
AVERAGE			.7287		2.75		307 (766.67°R)					89 (548.67°R)		

Sample Train Leak Check

	in Hg	Rate
Before	15	.008 cfm
After	9	.006 cfm

Pitot Leak Check

	PRE	POST
Red	OK	OK
Black	OK.	OK

Gas Analysis

	1	2	3	Avg
CO2	9.2	9.2	9.2	9.2
O2	4.4	4.4	4.4	4.4
CO	13.4	13.6	13.6	13.6
N2				

Impinger	Contents	Grams Final	Grams Initial	Difference
1	100 ml DI H_2O	805.3	600.1	
2	100 ml DI H_2O	656.5	596.4	
3	empty	508.1	495.2	
4	Silica Gel	693.6	672.5	299.30
5				

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FORMSDATASHEE.WK

GERAGHTY & MILLER, INC., AIR QUALITY PROGRAM
STACK SAMPLING RAW DATA SHEET

...ent:	Kcc
...te:	5/26/94
...nt:	NEENAH PAPER
...cation:	#3 STACK
...oject #:	W10415001
...st Crew:	GT/KM

Test #:	1-OIL
Nozzle Dia:	.307
Static Press, Ps:	-.2
Ambient Temp:	50 °F
Barometric Press:	28.92 "Hg
Initial Meter Vol:	804.355

Delta H@:	1.8249
Meter Correction:	.9360
Pitot Correction:	.84
Control Box #:	2
Assumed Moisture:	17 %
Calculator Multiplier:	5.02

Start Time:	1330
Stop Time:	1457
Sample Box #:	2
Probe #:	6SSL1
Filter #:	110
Stack Diameter:	54"
Umbilical Length:	50'
Stack Area:	15.409 sq ft

0900 ready to test

Point	Time	Metered Volume (dcf)	Velocity Head (DELTA P) in. H2O	Orifice Delta H in. H2O Required	Orifice Delta H in. H2O Actual	Meter Vacuum in. Hg	Stack Temp. °F	Probe Temp. °F	Oven Temp. °F	Imp. Temp. °F Out	Imp. Temp. °F In	Meter Temp. Tm °F Out	Meter Temp. Tm °F In	Comments
0	0	804.355							257	6				P_T = 28.90
W-1	6	810.475	.55	2.76	2.8	6	301	252	257	63	150	54	57	
2	12	816.95	.60	3.01	3.0	6.5	306	259	263	59	183	55	62	
3	18	823.335	.60	3.01	3.0	6.5	307	265	261	58	191	56	66	
4	24	829.77	.60	3.01	3.0	6.5	309	255	260	59	194	58	70	
5	30	836.045	.55	2.76	2.8	6	305	240	253	59	200	61	74	
6	36	841.415	.40	2.01	2.0	4.5	296	236	255	60	197	62	75	← port change @ 1415
			.7399		2.7667		304					62.5		
N-1	42	848.30	.55	2.76	2.8	6	304	235	230	57	155	65	71	← start @ 1420
2	48	853.97	.60	3.01	3.0	6	308	261	260	58	195	66	76	Md = 30.12
3	54	860.76	.65	3.26	3.3	7	310	269	254	59	217	67	79	Ms = 28.69
4	60	867.29	.60	3.01	3.0	6.5	311	257	236	60	228	68	81	Bwo = 11.76 %
5	66	874.00	.60	3.01	3.0	6.5	308	255	241	61	231	70	83	Vs = 51.62 [illegible]
6	72	879.56	.45	2.28	2.3	5.0	296	243	250	62	235	71	85	ACFM = [illegible]
													73.5	[illegible]
			.7571		2.9		306.167							DSCFM = [illegible]
		[illegible]												% Iso = 100.87
AVERAGE			.7485		2.8334		305.0833					68		

Sample Train Leak Check

	in Hg	Rate
Before	18	.010 cfm
After	6	.009 cfm

Pitot Leak Check

	PRE	POST
Red	OK	OK
Black	OK	OK

Gas Analysis

	1	2	3	Avg
CO2	12	12	12	12
O2	5.1	5.1	5.1	5.1
CO				
N2				

Impinger	Contents	Grams Final	Grams Initial	Difference
1	100 ml H2O	686.2	595.0	
2	100 ml H2O	653.6	577.9	
3	empty	517.6	502.8	
4	Silica Gel	724.8	694.0	
5				192.5

FORMSDATASHEE.WK3

22-MAY-92

GERAGHTY & MILLER, INC., AIR QUALITY PROGRAM
STACK SAMPLING RAW DATA SHEET

ient: KCC
ate: 5/26/94
ant: Neenah Paper
ocation: #3 Stack
oject #: W10415001
st Crew: GT/KM

Test #: 2-OIL
Nozzle Dia: .307
Static Press, Ps: -.2
Ambient Temp: 55 °F
Barometric Press: 28.92 "Hg
Initial Meter Vol: 879.790

Delta H@: 1.8249
Meter Correction: .936
Pitot Correction: .84
Control Box #: 2
Assumed Moisture: 17
Calculator Multiplier: 5.02

Start Time: 1530
Stop Time: 1650
Sample Box #: 4
Probe #: 655L1
Filter #: 105
Stack Diameter: 54"
Umbilical Length: 50'
Stack Area: 15.40959 ft

Point	Time	Metered Volume (dcf)	Velocity Head (DELTA P) in. H2O	Orifice Delta H in. H2O Required	Orifice Delta H in. H2O Actual	Meter Vacuum in. Hg	Stack Temp. °F	Probe Temp. °F	Oven Temp. °F	Imp. Temp. °F Out	Imp. Temp. °F In	Meter Temp. Tm °F Out	Meter Temp. Tm °F In	Comments (N, W; flow out of page; 11' port length)
~~0~~	~~0~~	~~879.790~~	~~.55~~	~~2.76~~	~~2.80~~	~~6~~	~~306~~	~~230~~	~~233~~	~~52~~	~~88~~	~~68~~	~~73~~	
W-1	6	885.99	.55	2.76	2.80	6	306	230	233	52	88	68	73	
2	12	892.575	.60	3.01	3.00	7	309	259	247	59	152	69	77	
3	18	899.42	.65	3.26	3.30	7.5	312	271	271	59	186	70	82	
4	24	906.28	.65	3.26	3.30	8.0	311	259	260	60	204	72	86	
5	30	912.645	.555	2.81	2.80	7.0	310	241	259	62	213	74	88	← change Kfactor to 5.10
6	36	918.090	.40	2.04	2.00	5.5	294	236	250	68	217	75	89	
			.7510		2.8667		307					76.9167		← port change @ 1607
N-1	42	924.460	.55	2.81	2.80	7.0	307	250	250	62	128	74	81	← start @ 1613
2	48	931.125	.60	3.06	3.10	7.5	312	265	250	57	221	75	86	Md = 30.096
3	54	937.975	.65	3.32	3.30	8.0	313	274	240	60	237	76	89	Bwo = 10.49
4	60	944.700	.60	3.06	3.10	8.0	312	260	236	61	243	77	90	Ms = 28.83
5	66	951.34	.60	3.06	3.10	8.0	311	257	232	62	249	78	91	Vs = 51.18
6	72	957.175	.45	2.30	2.30	6.0	296	249	231	63	231	78	91	ACFM = 45600
			.7571		2.95		308.5					82.1667		SCFM = 32954
		77.[illegible]												DSCFM = 29497
														%Iso = 99.53
AVERAGE			.7541		2.9084		307.75					81.0417		

767.42 °R

Sample Train Leak Check

	in Hg	Rate
Before	14	.01 cfm
After	9	.008 cfm

Pitot Leak Check

	PRE	POST
Red	OK	OK
Black	OK	OK

Gas Analysis

	1	2	3	AVE
CO2	11.7	11.7	11.7	11.7
O2	5.6	5.6	5.6	5.6
CO				
N2				

Impinger	Contents	Grams Final	Grams Initial	Difference
1	100 ml DI H2O	628.5	600.3	
2	100 ml DI H2O	684.3	610.9	
3	empty	530.2	498.9	
4	Silica Gel	690.7	653.7	
5				169.9

GERAGHTY & MILLER, INC., AIR QUALITY PROGRAM
STACK SAMPLING RAW DATA SHEET

Client: KCC	Test #: 3 - OIL	Delta H@: 1.8249	Start Time: 1750
Date: 5/26/94	Nozzle Dia: .307	Meter Correction: .936	Stop Time: 1908
Plant: Neenah Paper	Static Press, Ps: -.2	Pitot Correction: .84	Sample Box #: 2
Location: # 3 Stack	Ambient Temp: 60	Control Box #: 2	Probe #: 655L
Project #: W104/5001	Barometric Press: 28.92	Assumed Moisture: 17	Filter #: 109
Test Crew: GT/KM	Initial Meter Vol: 957.37	Calculator Multiplier: 5.10	Stack Diameter: 54"
			Umbilical Length: 50'
			Stack Area: 15.909 sq ft

Point	Time	Metered Volume (dcf)	Velocity Head (DELTA P) in. H2O	Orifice Delta H in. H2O Required	Orifice Delta H in. H2O Actual	Meter Vacuum in. Hg	Stack Temp. °F	Probe Temp. °F	Oven Temp. °F	Imp. Temp. °F Out	Imp. Temp. °F In	Meter Temp. Tm °F Out	Meter Temp. Tm °F In	Comments
0	0	957.37	,											
N-1	6	963.98	.60	3.06	3.10	8	306	241	242	58	77	64	68	
2	12	970.56	.60	3.06	3.10	7.5	312	265	248	56	115	64	72	
3	18	977.34	.65	3.32	3.30	8	312	267	246	57	128	65	76	
4	24	984.115	.65	3.32	3.30	8.5	312	260	255	58	136	66	79	
5	30	990.42	.55	2.81	2.80	7	311	247	263	59	140	67	81	
6	36	995.57	.35	1.79	1.80	5	298	241	258	62	140	68	82	
			.7491		2.90		308.6667					71		← port change @ 1825
N-1	42	1001.895	.55	2.81	2.80	7	307	239	238	55	103	67	74	← start @ 1830
2	48	1008.68	.65	3.32	3.30	8	312	259	260	42	147	67	79	Md = 30.096
3	54	1015.48	.65	3.32	3.30	8	313	269	256	42	185	68	82	%Bwo = 11.96 %
4	60	1022.275	.65	3.32	3.30	8	313	259	250	42	209	69	83	Ms = 28.65
5	66	1028.920	.60	3.06	3.10	8	310	249	238	43	225	70	85	Vs = 52.45 ft/s
6	72	1034.705	.45	2.30	2.30	6	290	233	231	44	224	71	85	ACFM = 50050
			.7676		3.01667	~~307.5~~	301.5					75		SCFM = 33239
		77.335												PSCFM = 29263
					9.958									%Iso = 101.78 %
AVERAGE			.7584		~~3.0166~~		308.08333					73		

Sample Train Leak Check

	in Hg	Rate
Before	16	.008 cfm
After		

Pitot Leak Check

	PRE	POST
Red	OK	OK
Black	OK	OK

Gas Analysis

	1	2	3	Avg
CO2	11.7	11.7	11.7	11.7
O2	5.6	5.6	5.6	5.6
CO				
N2				

Impinger	Contents	Grams Final	Grams Initial	Difference
1	100 ml H2O	721.1	595.6	
2	100 ml H2O	642.5	599.7	
3	empty	511.9	~~[illegible]~~ 503.1	
4	Silica Gel	737.2	714.2	
5				199.9

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FORMSDATASHEE.WK3

APPENDIX C

VISUAL EMISSIONS FIELD OBSERVATION SHEETS

PENNSTATE

1855

(814) 865-1415

Environmental Resources Research Institute
Pennsylvania Center for Water Resources Research
Center for Air Environment Studies
Center for Land Resources Research
Office for Remote Sensing of Earth Resources
Office of Hazardous and Toxic Waste Management

226 Fenske Laboratory
The Pennsylvania State University
University Park, PA 16802

0 /19/94

Frank T. Paolo
Geraghty & Miller Eng
1050 William Pitt Way
Pittsburgh, PA 15238

Dear Frank:

Please be advised that you have successfully completed the Visible Emissions course given 04/04/94. For a period of six months you are certified to evaluate visible emissions since you have met the standards described as Method 9 in the Federal Register of November 12, 1974.

These standards are:

1) To maintain an average deviation of less than 7.5% for a set of 25 white smoke plumes and a set of 25 black smoke plumes.

2) To have no single reading of the 50 plumes to be in error by more than 15%.

Sincerely,

Robert Jennings Heinsohn

Robert Jennings Heinsohn
Professor of Mechanical Engineering
Project Director

RJH/

Enclosure

PENNSTATE

1855

Continuing Education

Visible Emissions Evaluation Program

this certifies that

Frank T. Paolo

has met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by The Pennsylvania State University.

Certified, from and to

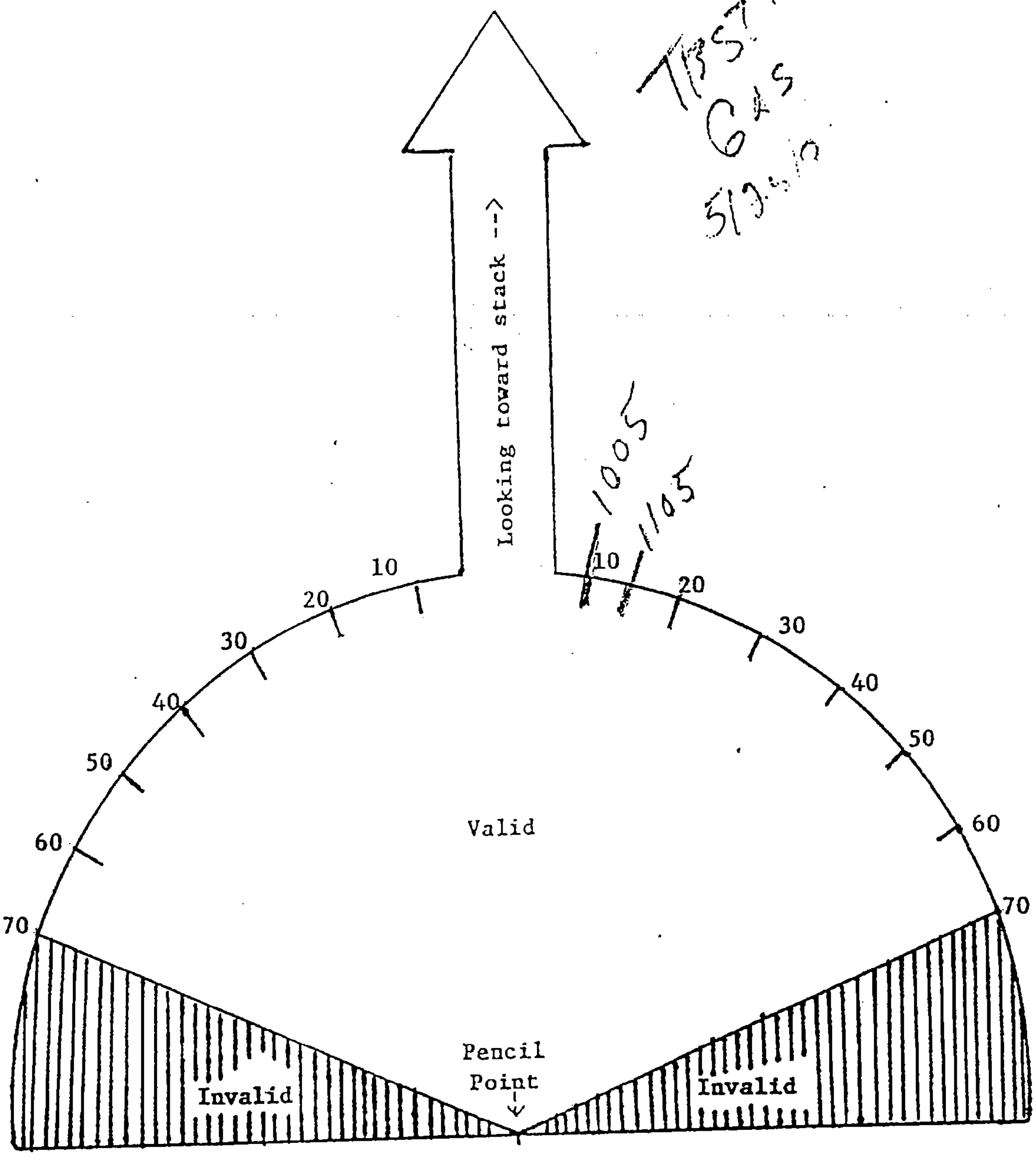
4 Ap '94 – 3 Oct '94

Recertified, from and to

Vice President and Dean for
Continuing and Distance Education

Project Director of Visible Emissions
Training Program
Environmental Resources Research Institute

SUN SHADOW LINE



INSTRUCTIONS

1. Hold paper horizontally and point toward stack.
2. Hold pencil verticially and place point at point 0.
3. Record position of shadow on arc.
4. For evaluation to be valid, shadow must not lay in shaded area.

IPS #1 Gas
5/25/94

Start (hr, min) 1005, Finish (hr, min) 1105

Part of Minutes

0	0	0	0	0	20	0	0	0	0	40	0	0	0	0
1	0	0	0	0	21	0	0	0	0	41	0	0	0	0
2	0	0	0	0	22	0	0	0	0	42	0	0	0	0
3	0	0	0	0	23	0	0	0	0	43	0	0	0	0
4	0	0	0	0	24	0	0	0	0	44	0	0	0	0
5	0	0	0	0	25	0	0	0	0	45	0	0	0	0
6	0	0	0	0	26	0	0	0	0	46	0	0	0	0
7	0	0	0	0	27	0	0	0	0	47	0	0	0	0
8	0	0	0	0	28	0	0	0	0	48	0	0	0	0
9	0	0	0	0	29	0	0	0	0	49	0	0	0	0
10	0	0	0	0	30	0	0	0	0	50	0	0	0	0
11	0	0	0	0	31	0	0	0	0	51	0	0	0	0
12	0	0	0	0	32	0	0	0	0	52	0	0	0	0
13	0	0	0	0	33	0	0	0	0	53	0	0	0	0
14	0	0	0	0	34	0	0	0	0	54	0	0	0	0
15	0	0	0	0	35	0	0	0	0	55	0	0	0	0
16	0	0	0	0	36	0	0	0	0	56	0	0	0	0
17	0	0	0	0	37	0	0	0	0	57	0	0	0	0
18	0	0	0	0	38	0	0	0	0	58	0	0	0	0
19	0	0	0	0	39	0	0	0	0	59	0	0	0	0

Summary		
Opacity	No. of Readings	Total Time Minutes
< 20%	240	60
> 20%	—	—
> 60%	—	—
Average	240	60

This source was or was not in in compliance the time the evaluation was made.

[signature] 5/25/94

Signature of Observer, Date

[lori]\form\minpart.wk4

SUMMARY OF DATA, SET NUMBER #1 GAS 5/25/94

Clock Time (start, finish)	1005
Observer Location	
Distance to Discharge (ft)	250 FT
Direction from Discharge	EAST
Height of Observation Point (ft)	GROUND
Background	
Contrast with Sky - no, yes	YES
Target - no, yes (what)	NO
Observed Point in Plume	TOP OF STACK
Weather	
Wind Direction	NORTH EAST
Wind Speed (MPH)	2-5
Ambient Temperature (° F)	60
Sky (% Clouds)	90%
Precipitation	NO
Plume	
Color	NONE
Steam - no, yes (Beginning and End)	NO
Distance Visible (mi)	5 mi

{LORI}\form\datasum.sht

SUGGESTED RECORD OF OBSERVATIONS

DESCRIPTION OF SOURCE

Company: KIMB CLARK

Location: NEEHAN PAPER

Test Number: #1 GAS

Date: 5/25/94

Type of Facility: GAS/OIL BOILER

Control Device: NONE

Hours of Observation: 1 HOUR

Observer: FRANK T PAOLO

Observer Certification Date: APRIL 4-94

Observer Affiliation: GERAGHTY & MILLER

Point of Emissions: STACK

Height of Discharge Point: 300 FT

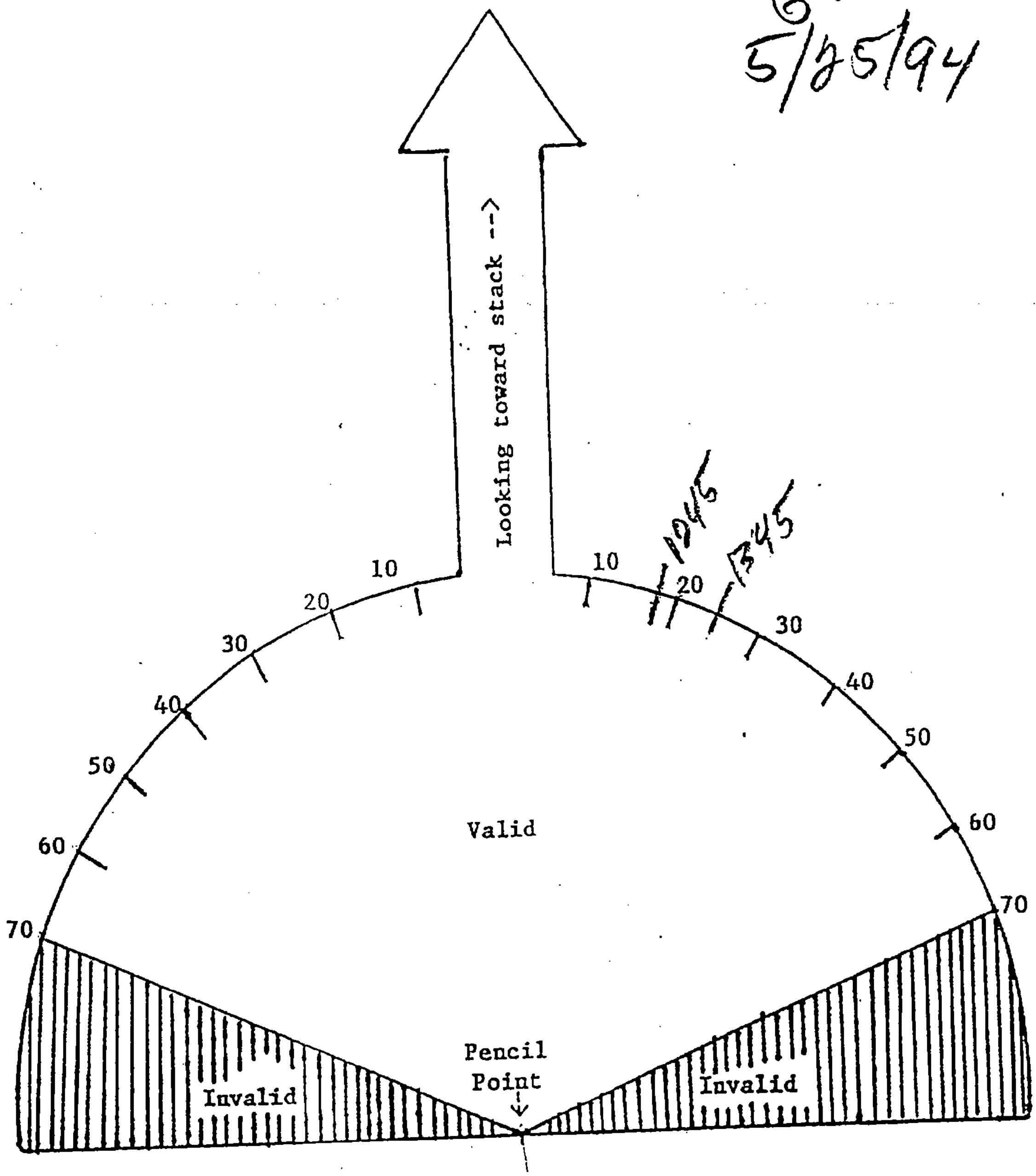
Stack Diameter: 54"

SKETCH

(show source, observer, north, buildings, roads, etc.)

TEST #2
GAS
5/25/94

SUN SHADOW LINE



INSTRUCTIONS

1. Hold paper horizontally and point toward stack.
2. Hold pencil verticially and place point at point 0.
3. Record position of shadow on arc.
4. For evaluation to be valid, shadow must not lay in shaded area.

[LORI]form\sunshado.frm

IPS/#2
GAS

Start (hr, min) 1245, Finish (hr, min) 1345

Part of Minutes

0	0	0	0	0	20	0	0	0	0	40	0	0	0	0
1	0	0	0	0	21	0	0	0	0	41	0	0	0	0
2	0	0	0	0	22	0	0	0	0	42	0	0	0	0
3	0	0	0	0	23	0	0	0	0	43	0	0	0	0
4	0	0	0	0	24	0	0	0	0	44	0	0	0	0
5	0	0	0	0	25	0	0	0	0	45	0	0	0	0
6	0	0	0	0	26	0	0	0	0	46	0	0	0	0
7	0	0	0	0	27	0	0	0	0	47	0	0	0	0
8	0	0	0	0	28	0	0	0	0	48	0	0	0	0
9	0	0	0	0	29	0	0	0	0	49	0	0	0	0
10	0	0	0	0	30	0	0	0	0	50	0	0	0	0
11	0	0	0	0	31	0	0	0	0	51	0	0	0	0
12	0	0	0	0	32	0	0	0	0	52	0	0	0	0
13	0	0	0	0	33	0	0	0	0	53	0	0	0	0
14	0	0	0	0	34	0	0	0	0	54	0	0	0	0
15	0	0	0	0	35	0	0	0	0	55	0	0	0	0
16	0	0	0	0	36	0	0	0	0	56	0	0	0	0
17	0	0	0	0	37	0	0	0	0	57	0	0	0	0
18	0	0	0	0	38	0	0	0	0	58	0	0	0	0
19	0	0	0	0	39	0	0	0	0	59	0	0	0	0

Summary		
Opacity	No. of Readings	Total Time Minutes
< 20%	240	60
> 20%	—	—
> 60%	—	—
Average	240	60

This source was or was not in in compliance the time the evaluation was made.

[signature]
Signature of Observer, Date 5/25/94

[lori]\form\minpart.wk4

SUMMARY OF DATA, SET NUMBER #2 GAS 5/25/94

Clock Time (start, finish)	1245 1345
Observer Location	
Distance to Discharge (ft)	200
Direction from Discharge	NORTH
Height of Observation Point (ft)	GROUND
Background	
Contrast with Sky - no, yes	SKY
Target - no, yes (what)	NO
Observed Point in Plume	TOP STACK
Weather	
Wind Direction	FROM SOUTH
Wind Speed (MPH)	2-5
Ambient Temperature (° F)	60°F
Sky (% Clouds)	90%
Precipitation	NO
Plume	
Color	NO
Steam - no, yes (Beginning and End)	NO
Distance Visible (mi)	5-8

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SUGGESTED RECORD OF OBSERVATIONS

DESCRIPTION OF SOURCE

Company: KIMBLEY CLARK

Location: NEENAH PAPER

Test Number: #2 GAS

Date: 5/25/94

Type of Facility: NEW BOILER

Control Device: NONE

Hours of Observation: 1 HOUR

Observer: FRANK T PAOLO

Observer Certification Date: APRIL 4-94

Observer Affiliation: GERAGHTY & MILLER

Point of Emissions: BOILER STACK

Height of Discharge Point: 300 FT

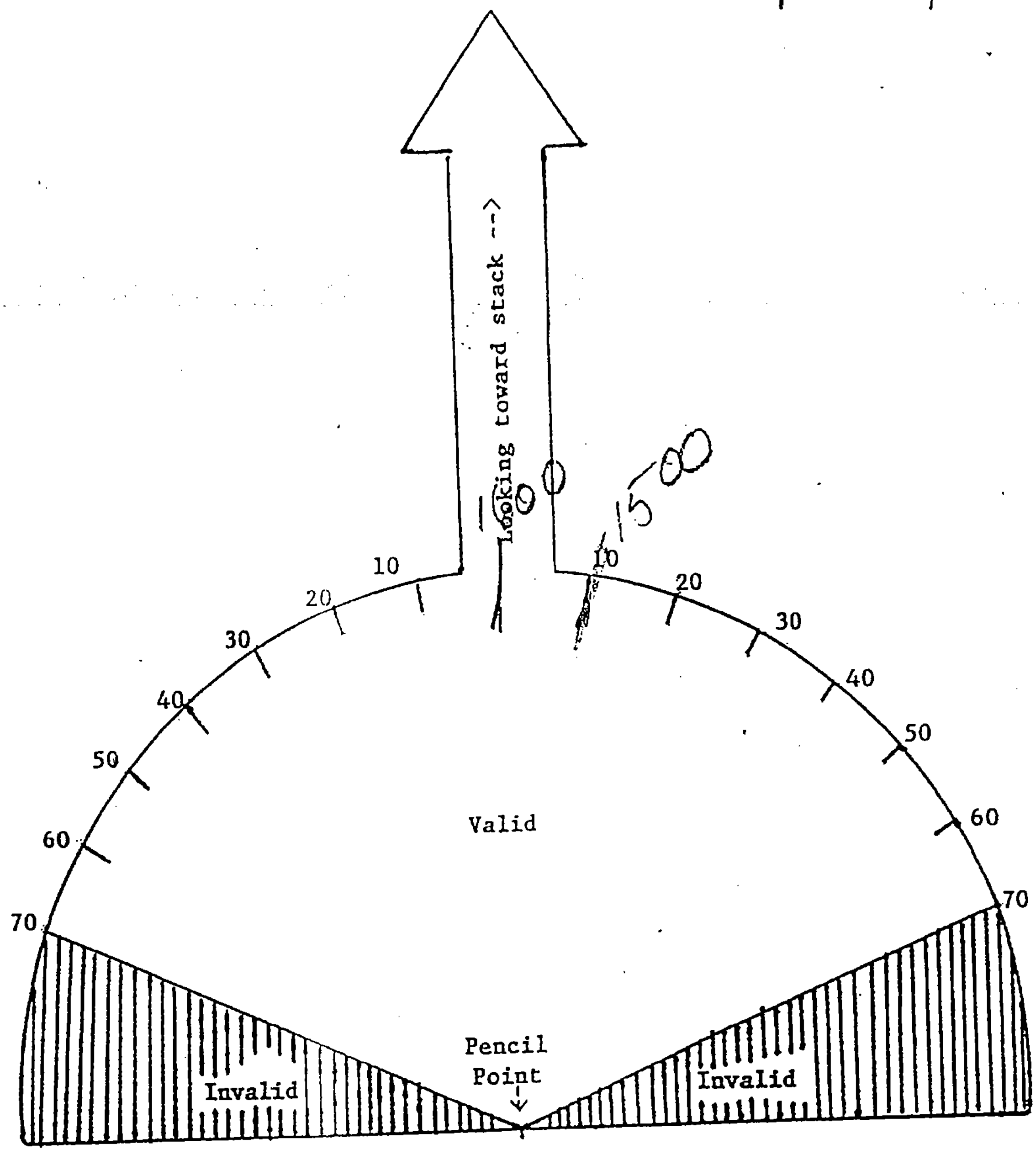
Stack Diameter: 54"

SKETCH

(show source, observer, north, buildings, roads, etc.)

TEST #3
1500 GWS
5/25/94

SUN SHADOW LINE



INSTRUCTIONS

1. Hold paper horizontally and point toward stack.
2. Hold pencil verticially and place point at point 0.
3. Record position of shadow on arc.
4. For evaluation to be valid, shadow must not lay in shaded area.

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TBST#3
GAS

Start (hr, min) 1500, Finish (hr, min) 1600

Part of Minutes

0	0	0	0	0	20	0	0	0	0	40	0	0	0	0
1	0	0	0	0	21	0	0	0	0	41	0	0	0	0
2	0	0	0	0	22	0	0	0	0	42	0	0	0	0
3	0	0	0	0	23	0	0	0	0	43	0	0	0	0
4	0	0	0	0	24	0	0	0	0	44	0	0	0	0
5	0	0	0	0	25	0	0	0	0	45	0	0	0	0
6	0	0	0	0	26	0	0	0	0	46	0	0	0	0
7	0	0	0	0	27	0	0	0	0	47	0	0	0	0
8	0	0	0	0	28	0	0	0	0	48	0	0	0	0
9	0	0	0	0	29	0	0	0	0	49	0	0	0	0
10	0	0	0	0	30	0	0	0	0	50	0	0	0	0
11	0	0	0	0	31	0	0	0	0	51	0	0	0	0
12	0	0	0	0	32	0	0	0	0	52	0	0	0	0
13	0	0	0	0	33	0	0	0	0	53	0	0	0	0
14	0	0	0	0	34	0	0	0	0	54	0	0	0	0
15	0	0	0	0	35	0	0	0	0	55	0	0	0	0
16	0	0	0	0	36	0	0	0	0	56	0	0	0	0
17	0	0	0	0	37	0	0	0	0	57	0	0	0	0
18	0	0	0	0	38	0	0	0	0	58	0	0	0	0
19	0	0	0	0	39	0	0	0	0	59	0	0	0	0

Summary		
Opacity	No. of Readings	Total Time Minutes
< 20%	240	60
> 20%	—	—
> 60%	—	—
Average	240	60

This source was or was not in in compliance the time the evaluation was made.

[signature]

Signature of Observer, Date 5/25/94

[lori]\form\minpart.wk4

SUMMARY OF DATA, SET NUMBER #3 GAS

5/25/94

Clock Time (start, finish)	1500 /
Observer Location	
Distance to Discharge (ft)	600 FT
Direction from Discharge	SOUTH WEST
Height of Observation Point (ft)	GROUND
Background	
Contrast with Sky - no, yes	YES
Target - no, yes (what)	NO
Observed Point in Plume	TOP STACK
Weather	
Wind Direction	TOWNWEST
Wind Speed (MPH)	5-10
Ambient Temperature (° F)	62°F
Sky (% Clouds)	90%
Precipitation	NO
Plume	
Color	NO
Steam - no, yes (Beginning and End)	NO
Distance Visible (mi)	5-10 MI

[LORI]\form\datasum.sht

SUGGESTED RECORD OF OBSERVATIONS

DESCRIPTION OF SOURCE

Company: KIMBLEY CLARK

Location: NEENAH PAPER

Test Number: #3 GAS

Date: 5/29/04

Type of Facility: NEW BOILER

Control Device: NONE

Hours of Observation: 1 HOUR

Observer: FRANK TRAOLO

Observer Certification Date: APRIL 4-94

Observer Affiliation: GERAGHTY & MILLER

Point of Emissions: BOILER STACK

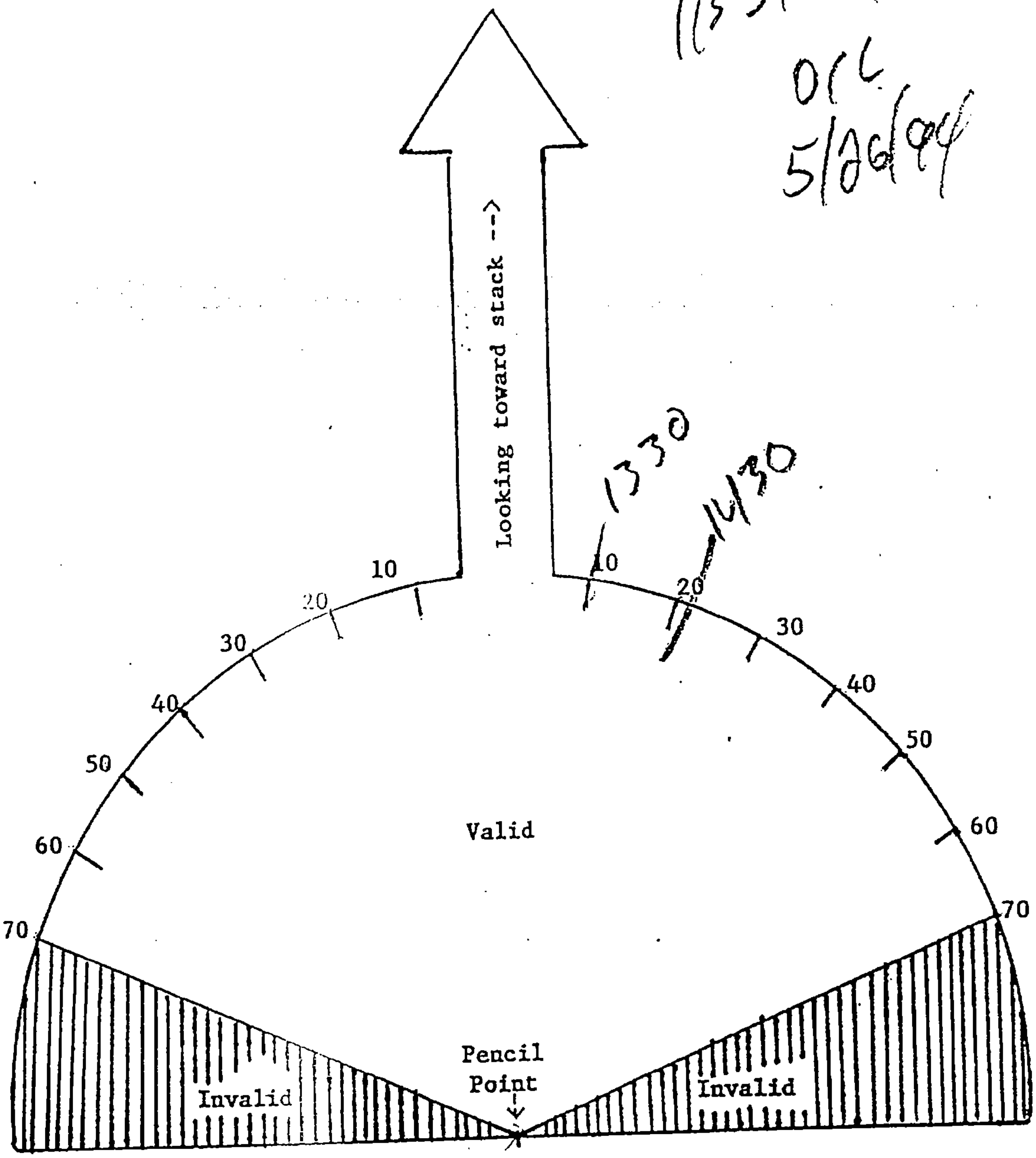
Height of Discharge Point: 300 FT

Stack Diameter: 5Y"

SKETCH

(show source, observer, north, buildings, roads, etc.)

SUN SHADOW LINE



INSTRUCTIONS

1. Hold paper horizontally and point toward stack.
2. Hold pencil verticially and place point at point 0.
3. Record position of shadow on arc.
4. For evaluation to be valid, shadow must not lay in shaded area.

Test #1
01C

Start (hr, min) 1330, Finish (hr, min) 1930

Part of Minutes

0	0	0	0	0	20	0	0	0	0	40	0	0	0	0
1	0	0	0	0	21	0	0	0	0	41	0	0	0	0
2	0	0	0	0	22	0	0	0	0	42	0	0	0	0
3	0	0	0	0	23	0	0	0	0	43	0	0	0	0
4	0	0	0	0	24	0	0	0	0	44	0	0	0	0
5	0	0	0	0	25	0	0	0	0	45	0	0	0	0
6	0	0	0	0	26	0	0	0	0	46	0	0	0	0
7	0	0	0	0	27	0	0	0	0	47	0	0	0	0
8	0	0	0	0	28	0	0	0	0	48	0	0	0	0
9	0	0	0	0	29	0	0	0	0	49	0	0	0	0
10	0	0	0	0	30	0	0	0	0	50	0	0	0	0
11	0	0	0	0	31	0	0	0	0	51	0	0	0	0
12	0	0	0	0	32	0	0	0	0	52	0	0	0	0
13	0	0	0	0	33	0	0	0	0	53	0	0	0	0
14	0	0	0	0	34	0	0	0	0	54	0	0	0	0
15	0	0	0	0	35	0	0	0	0	55	0	0	0	0
16	0	0	0	0	36	0	0	0	0	56	0	0	0	0
17	0	0	0	0	37	0	0	0	0	57	0	0	0	0
18	0	0	0	0	38	0	0	0	0	58	0	0	0	0
19	0	0	0	0	39	0	0	0	0	59	0	0	0	0

Summary

Opacity	No. of Readings	Total Time Minutes
< 20%	240	60
> 20%	—	—
> 60%	—	—
Average	240	60

This source was or was not in in compliance the time the evaluation was made.

[signature]

Signature of Observer, Date 5/26/95

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SUMMARY OF DATA, SET NUMBER #1 OIC 5/26/95

Clock Time (start, finish)	1330/1430
Observer Location	
Distance to Discharge (ft)	300 FT
Direction from Discharge	SOUTH PWEST
Height of Observation Point (ft)	Ground
Background	
Contrast with Sky - no, yes	YES
Target - no, yes (what)	NO
Observed Point in Plume	TOP STACK
Weather	
Wind Direction	From NORTH
Wind Speed (MPH)	2-5
Ambient Temperature (°F)	48°F
Sky (% Clouds)	70 90
Precipitation	NO
Plume	
Color	NO
Steam - no, yes (Beginning and End)	NO
Distance Visible (mi)	5-10

[LORI]\form\datasum.sht

SUGGESTED RECORD OF OBSERVATIONS

DESCRIPTION OF SOURCE

Company: KIMBERLY CLARK

Location: NEENAH PAPER

Test Number: TEST #1 OIL

Date: 5/26/94

Type of Facility: NEW BOILER

Control Device: NONE

Hours of Observation: 1 HOUR

Observer: FRANK TDHOLO

Observer Certification Date: APRIL 4-94

Observer Affiliation: GERAGHTY & MILLER

Point of Emissions: BOILER STACK

Height of Discharge Point: 300 FT

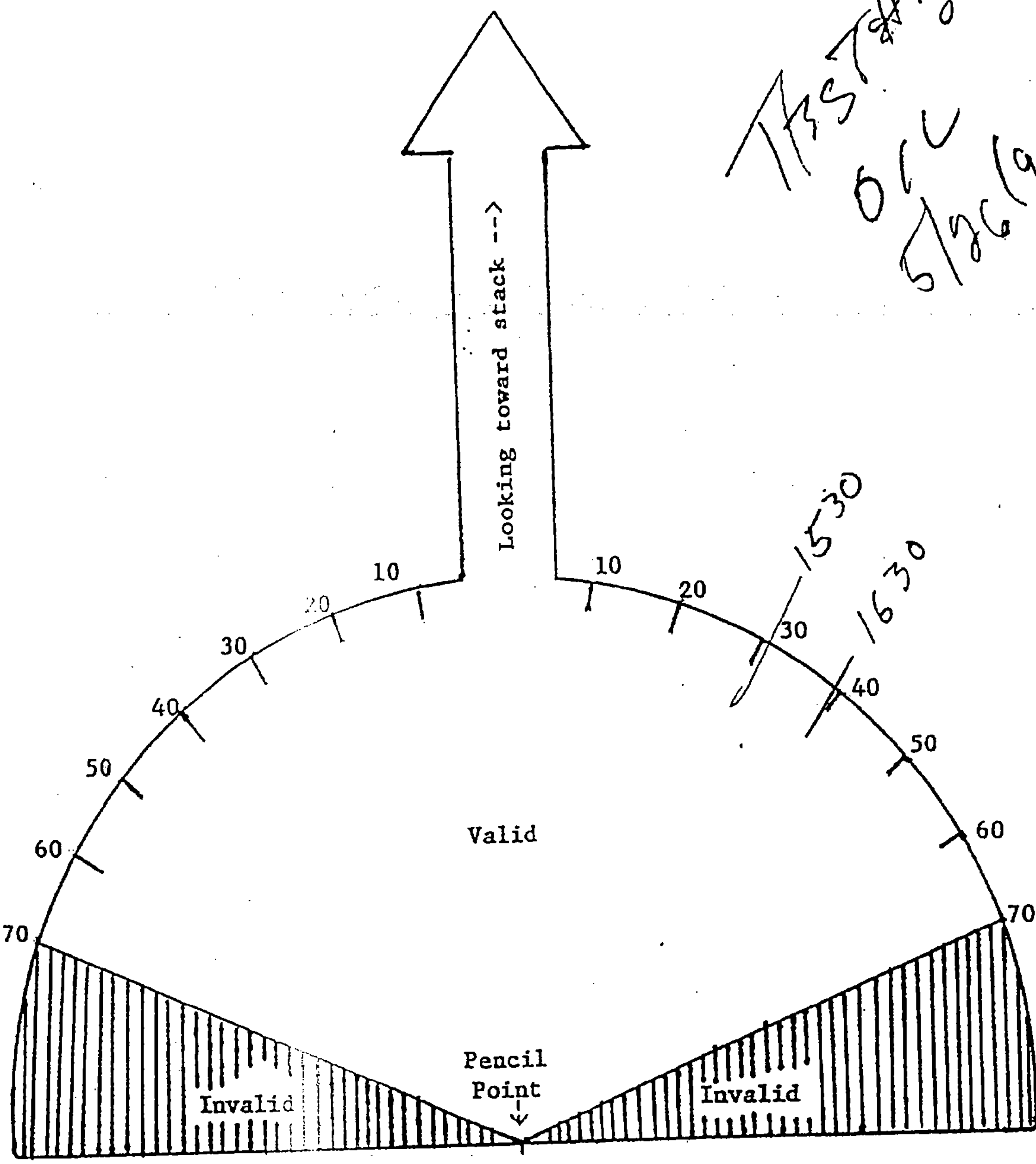
Stack Diameter: 5'4"

SKETCH

(show source, observer, north, buildings, roads, etc.)

SUN SHADOW LINE

TTBST#2 O/C 5/26/94



INSTRUCTIONS

1. Hold paper horizontally and point toward stack.
2. Hold pencil verticially and place point at point 0.
3. Record position of shadow on arc.
4. For evaluation to be valid, shadow must not lay in shaded area.

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TEST #2 B/C

Start (hr, min) 1530, Finish (hr, min) 1630

Part of Minutes

0	0	0	0	0	20	0	0	0	0	40	0	0	0	0
1	0	0	0	0	21	0	0	0	0	41	0	0	0	0
2	0	0	0	0	22	0	0	0	0	42	0	0	0	0
3	0	0	0	0	23	0	0	0	0	43	0	0	0	0
4	0	0	0	0	24	0	0	0	0	44	0	0	0	0
5	0	0	0	0	25	0	0	0	0	45	0	0	0	0
6	0	0	0	0	26	0	0	0	0	46	0	0	0	0
7	0	0	0	0	27	0	0	0	0	47	0	0	0	0
8	0	0	0	0	28	0	0	0	0	48	0	0	0	0
9	0	0	0	0	29	0	0	0	0	49	0	0	0	0
10	0	0	0	0	30	0	0	0	0	50	0	0	0	0
11	0	0	0	0	31	0	0	0	0	51	0	0	0	0
12	0	0	0	0	32	0	0	0	0	52	0	0	0	0
13	0	0	0	0	33	0	0	0	0	53	0	0	0	0
14	0	0	0	0	34	0	0	0	0	54	0	0	0	0
15	0	0	0	0	35	0	0	0	0	55	0	0	0	0
16	0	0	0	0	36	0	0	0	0	56	0	0	0	0
17	0	0	0	0	37	0	0	0	0	57	0	0	0	0
18	0	0	0	0	38	0	0	0	0	58	0	0	0	0
19	0	0	0	0	39	0	0	0	0	59	0	0	0	0

Summary		
Opacity	No. of Readings	Total Time Minutes
< 20%	240	60
> 20%	—	—
> 60%	—	—
Average	240	60

This source was or was not in in compliance the time the evaluation was made.

[signature]

Signature of Observer, Date 5/26/94

[lori]\form\minpart.wk4

SUMMARY OF DATA, SET NUMBER #2 OIL 5/26/95

Clock Time (start, finish)	1530/1630
Observer Location	
Distance to Discharge (ft)	300 FT
Direction from Discharge	SOUTH EAST
Height of Observation Point (ft)	Ground
Background	SKY
Contrast with Sky - no, yes	NO
Target - no, yes (what)	TOP OF STACK
Observed Point in Plume	
Weather	
Wind Direction	FROM NORTH
Wind Speed (MPH)	2-5
Ambient Temperature (°F)	55°F
Sky (% Clouds)	70%
Precipitation	N
Plume	
Color	NO
Steam - no, yes (Beginning and End)	NO
Distance Visible (mi)	5-10

[LORI]\form\datasum.sht

SUGGESTED RECORD OF OBSERVATIONS

DESCRIPTION OF SOURCE

Company: KIMBERLY CLARK

Location: NEENAH PAPER

Test Number: # 2 OIL

Date: 5/2/94

Type of Facility: NEW BOILER

Control Device: NONE

Hours of Observation: 1 HOUR

Observer: FRANK T PAOLO

Observer Certification Date: APRIL 4-94

Observer Affiliation: GERAGHTY + MILLER

Point of Emissions: BOILER STACK

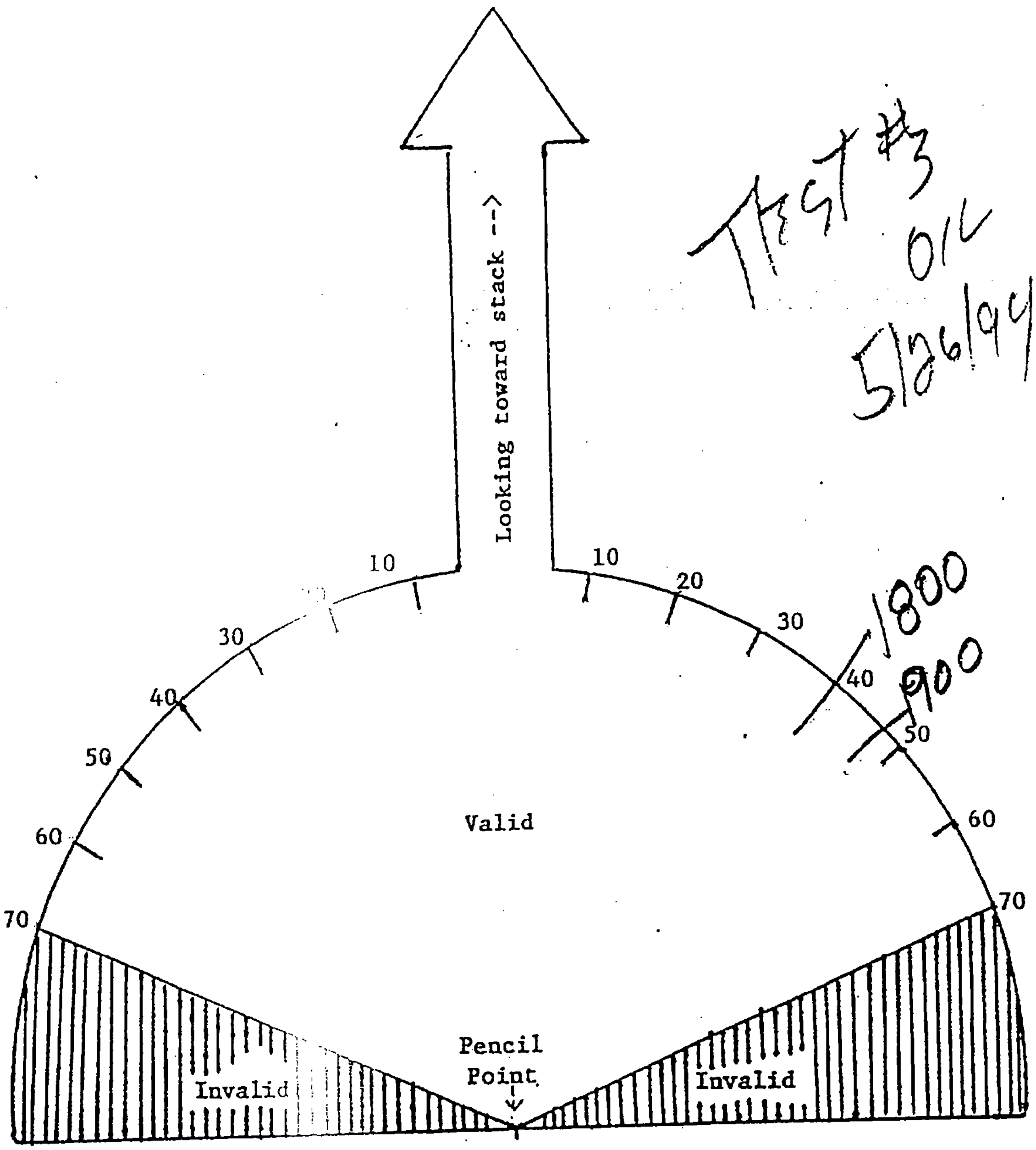
Height of Discharge Point: 300 FT

Stack Diameter: 54"

SKETCH

(show source, observer, north, buildings, roads, etc.)

SUN SHADOW LINE



INSTRUCTIONS

1. Hold paper horizontally and point toward stack.
2. Hold pencil verticially and place point at point 0.
3. Record position of shadow on arc.
4. For evaluation to be valid, shadow must not lay in shaded area.

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TBST #3
OIC

Start (hr, min) 1800, Finish (hr, min) 1900

Part of Minutes

0	0	0	0	0	20	0	0	0	0	40	0	0	0	0
1	0	0	0	0	21	0	0	0	0	41	0	0	0	0
2	0	0	0	0	22	0	0	0	0	42	0	0	0	0
3	0	0	0	0	23	0	0	0	0	43	0	0	0	0
4	[illegible]	[illegible]	[illegible]	[illegible]	24	0	0	0	0	44	0	0	0	0
5	0	0	0	0	25	0	0	0	0	45	0	0	0	0
6	0	0	0	0	26	0	0	0	0	46	0	0	0	0
7	0	0	0	0	27	0	0	0	0	47	0	0	0	0
8	0	0	0	0	28	0	0	0	0	48	0	0	0	0
9	0	0	0	0	29	0	0	0	0	49	0	0	0	0
10	0	0	0	0	30	0	0	0	0	50	0	0	0	0
11	0	0	0	0	31	0	0	0	0	51	0	0	0	0
12	0	0	0	0	32	0	0	0	0	52	0	0	0	0
13	0	0	0	0	33	0	0	0	0	53	0	0	0	0
14	0	0	0	0	34	0	0	0	0	54	0	0	0	0
15	0	0	0	0	35	0	0	0	0	55	0	0	0	0
16	0	0	0	0	36	0	0	0	0	56	0	0	0	0
17	0	0	0	0	37	0	0	0	0	57	0	0	0	0
18	0	0	0	0	38	0	0	0	0	58	0	0	0	0
19	0	0	0	0	39	0	0	0	0	59	0	0	0	0

Summary

Opacity	No. of Readings	Total Time Minutes
< 20%	240	60
> 20%	—	—
> 60%	—	—
Average	240	60

This source was or was not in in compliance the time the evaluation was made.

Signature of Observer, Date 5/26/94

[lori]\form\minpart.wk4

SUMM RY OF DATA, SET NUMBER #301C 5/26/94

Clock Time (start, finish)	1800/1900
Observer Location	
Distance to Discharge (f	1500FT
Direction from Discharg	WEST
Height of Observation P rt (ft)	GROUND
Background	
Contrast with Sky - no, s	YES
Target - no, yes (what)	NO
Observed Point in Plum	TOP STACK
Weather	
Wind Direction	FROM NORTH
Wind Speed (MPH)	2-5
Ambient Temperature ( )	60°F
Sky (% Clouds)	50%
Precipitation	NO
Plume	
Color	NO
Steam - no, yes (Begi ng and End)	NO
Distance Visible (mi)	5-10

[LORI]\form\datasum.sht

SUGGESTED RECORD OF OBSERVATIONS

DESCRIPTION OF SOURCE

Company: KIMBERLY CLARK

Location: NEENAH PAPER

Test Number: #3 [illegible]

Date: 5/26/9[illegible]

Type of Facility: NEW BOILER

Control Device: NONE

Hours of Observation: 1 HOUR

Observer: FRANK TPAOLO

Observer Certification Date: APRIL 4-94

Observer Affiliation: GERAGHTY+MILLER

Point of Emissions: BOILER STACK

Height of Discharge Point: 300F

Stack Diameter: 54"

SKETCH

(show source, observer, north, buildings, roads, etc.)

Kimberly Clark WI0415.001

DISH #	Sample	Tare 1	Tare 2	Tare 3	Tare 4
19	Run1-Gas F½	95.6531	95.6527	95.6531	
20	Run2-Gas F½	93.4091	93.4094	93.4089	
21	Run3-Gas F½	96.8958	96.8963	96.8964	
22	Run1-Oil-F½	95.1187	95.1191	95.1195	
23	Run2-Oil F½	95.3189	95.3194	95.3188	
24	Run3-Oil F½	100.3131	100.3136	100.3136	
-					
25	Run-1-Gas-B½	89.1513	89.1511		
26	Run2 Gas B½	100.4539	100.4541		
27	Run3 Gas B½	95.9379	95.9382		
28	Run1 Oil B½	95.8589	95.8593		
29	Run2 Oil B½	90.8415	90.8418		
30	Run3 Oil B½	93.8160	93.8165		
-					
31	Run1 Gas B½	92.4176	92.4176		
32	Run1 Gas B½	91.2366	91.2366		
33	Run1 Gas B½	93.2879	93.2907 X	93.2876	
34	Run2 Gas B½	94.7350	94.7353		
35	Run2 Gas B½	87.8630	87.8627		
36	Run2 Gas B½	93.5563	93.5437 X	93.5435	
-					
37	Run3 Gas B½	97.9284	97.9286		
38	Run3 Gas B½	100.2677	100.2636 X	100.2631	
39	Run3 Gas B½	95.2450	95.2454		
40	Run1 Oil B½	91.6015	91.6013		
41	Run1 Oil B½	96.7557	96.7552		
42	Run3 Oil B½	102.0708	102.0705		
-		94.8282 (PAB)			
43	Run2 Oil B½	~~94.8262~~	94.8283		
44	Run2 Oil B½	95.1258	95.1238	95.1187	95.1190
45	Run2 Oil B½	94.8272	94.8286	95.3180	95.3183
46	Run3 Oil B½	96.8975	96.8979		
47	Run3 Oil B½	93.4141	93.4088	93.4085	
48	Run3 Oil B½	100.3175	100.3143	100.3123	100.3125

Marginal annotations (written vertically): 5-2-94 OR; 6-3-94 - DRM; 6-7-94 10:30AM PAB; 6-8-94 8:00AM PAB; 6-8-94 1:00PM PAB; 6-8-94 8:30AM PAB; 6-8-94 1:30PM; 6-8-94 5:30AM PAB; 6-8-94 9:30AM PAB; 6-8-94 2:00PM PAB; 6-10-94 8:30AM; 6-10-94 11:30AM PAB; 6-10-94 3:08pm PAB; 6-10-94 5:15pm PAB; 6-13-94 8:00AM PAB; 6-14-94 PAB

Kimberly Clark WI0415.001 Page 2 of 3

Dish #	Sample	Gross 1	Gross 2	Gross 3
19	Run 1 - Gas - F½	5_.6565	95.6560	
20	Run 2 - Gas - F½	93.4117	93.4113	
21	Run 3 - Gas - F½	96.9004	96.9009	
22	Run 1 - Oil - F½	95.1226	95.1212x	95.1213
23	Run 2 - Oil - F½	95.3214	95.3214	
24	Run 3 - Oil - F½	_.3158	100.3158	
		6-8-94 10:00 am PAB	6-8-94 3:30 pm PAB	6-8-94 5:30 pm PAB
25	Run 1 - Gas - B½ - Ac	9_.1539	89.1539	
26	Run 2 - Gas - B½ - Ac	_.4481	100.4480	
27	Run 3 - Gas - B½ - Ac	95.9396	95.9395	
28	Run 1 - Oil - B½ Ac	95.8613	95.8616	
29	Run 2 - Oil - B½ - Ac	90.8461	90.8458	
30	Run 3 - Oil - B½ - Ac	93.8184	93.8184	
		6-10-94 8:00 am PAB	6-10-94 11:30 AM PAB	
31	Run 1 Gas F½ Solvent	92.4231	92.4216	92.4213
32	Run 1 Gas F½ Liq	91.2422	91.2403	91.2399
33	Run 1 Gas F½ Liq	93.2906	93.2902	
34	Run 2 Gas F½ Solv.	94.7416	94.7412	
35	Run 2 Gas F½ Liq	87.8669	87.8671	
36	Run 2 Gas F½ Liq	93.5465	93.5464	
		6-10-94 9:00 AM PAB	6-10-94 11:30 AM PAB	6-10-94 2:00 PM PAB
37	Run 3 Gas F½ Solv	97.9301	97.9302	
38	Run 3 Gas F½ Liq	100.2674	100.2671	
39	Run 3 Gas F½ Liq	95.2461	95.2460	
40	Run 1 Oil F½ Sol	91.6014	91.6014	
41	Run 1 Oil F½ Liq	96.7630	96.7626	
42	Run 1 Oil F½ Liq	102.0739	102.0736	
		6-13-94 8:00 AM PAB	6-13-94 10:30 pm PAB	
43	Run 2 Oil F½ Solvent	94.8286	94.8285	
44	Run 2 Oil F½ Liq	95.1286	95.1284	
45	Run 2 Oil F½ Liq	95.3278	95.3279	
46	Run 3 Oil F½ Sol	96.8979	96.8975	
47	Run 3 Oil F½ Liq	93.4159	93.4159	
48	Run 3 Oil F½ Liq	100.3183	100.3181	
		6-14-94 8:0 AM PAB	6-14-94 11 AM PAB	

Kimberly Clark WI 0415.005

Dish #	Sample	Tare 1	Tare 2	Tare 3
49	Acetone Blank	95.6556 PAB 6-13-94 10:30 Am	95.6555	~~[illegible]~~
50	Methylene Cl Blank	100.4437	100.4441 PAB 6-13-94 1:00 PM	~~[illegible]~~
51	Di H_2O Blank	89.1504	89.1504	

Dish #	Sample	Gross 1	Gross 2	Gross 3
49	Acetone Blank	95.6557 PAB 6-14-94 8:15 am	95.6554	
50	$MeCl_2$ Blank	100.4440	100.4441 6-14-94 PAB 11:00 Am	
51	DI H_2O Blank	89.1510	89.1511	

Filter #	Sample	Gross 1	Gross 2	Gross 3
103	R2-GAS	0.7581	0.7582	
105	R2-OIL	0.6971	0.6969	
106	R3-GAS	0.6984	0.6983	
107	R1-GAS	0.7037	0.7041	
108	BLANK	0.7010 PAB	0.7009	
109	RUN 3-OIL	0.7176	0.7176	
110	RUN 1-OIL	0.7184 6-14-94 PAB 8:30 Am	0.7182 6-14-94 PAB 11:30 AM	

Kimberly Clark WT0415.005 week ending 6-10-94

6-7-94 Tuesday	Receive samples sent by G. Tumbali
	Inventory samples w/ Chain of Custody
	Tare dessicated dishes (10 available)
	Wash and dessicated more dishes
	and separator funnels
	Evaporate at elevated temperature
	Front Half Acetone rinsates
	Dessicate F½ Ac dishes for gross wts
6-8-94 Wednesday	Tare remaining dishes (2 or 3 times)
	Take gross weights of F½ Ac dishes
	Evaporate at ambient temp/pressure
	Back Half acetone rinsates
6-9-94 Thursday	Start methylene chloride Back Half
	separations. Due to large volume of impinger contents + rinsates, only
	3 to 4 separations per day possible.
	Solvent phase evaporated at ambient
	temperature and pressure
	Liquid phase evaporated on hot plate
	Separation performed in triplicate
	Completed separation of Run 1-Gas, Run-2-Gas,
	and Run 3-Gas
6-10-94 Friday	Enough clean, tared dishes available to
	complete Run 1-Oil separation.
	Front half acetone dishes were reconstituted
	in appropriate bottles, cleaned + dessicated
	Back half acetone dish gross weights were
	taken (6-9 and 6-10-94). The samples
	reconstituted, dishes cleaned and dessicated.
	All separations, two dishes were used
	to evaporate the liquid phase to expedite
	sample analysis. (No particular volume or content)
	All separations, one dish was used to
	evaporate the solvent phase.

Kimberly C... ...P WI0415.001 week ending 6-17-94

6-13-94 - ...ning - dishes tared. - Wisconsin requires ... two hours between weights, so long as they remain within 5 tenths of a ... ...ligram.

- P... ...rmed Run 2 Oil Separation and Run 3 Oil Separation.

- Gr... weights of previous separations

- Re... ...stitute into appropriate sample bo... ...s

- Bo... liquid dishes and the solvent dish we... reconstituted into the DI 8½ ... ...ose catch bottles (if there were two 8½ bo... ...s for the same run).

- The ...olvent dishes were reconstituted with H_2O (distilled) so that the whole sample ... could be stored in the same bottle.

- Bla... distilled water, acetone, and (150-200 ml) met... ...lene chloride samples were evaporated. Ac... and $MeCl_2$ at ambient temp + press.

- Recei... ...filters and dessicated

6-14-94 - Ta... gross weights of remaining s... ...ration dishes, blank dishes a... filters

- rec... ...stitute samples and pa... ...for shipment.

- Sen... out 2 day economy

GERAGHTY & MILLER, INC.
Environmental Services

Laboratory Task Order No. ________

CHAIN-OF-CUSTODY RECORD

Project Number: W1O415OO1

Project Location: KIMBERLY CLARK - Neenah, WI

Laboratory: G&M - Pittsburgh

Sampler(s)/Affiliation: G. Tumbali - G&M - Milwaukee Air

ANALYSIS ~~SAMPLE BOTTLE / CONTAINER DESCRIPTION~~

SAMPLE IDENTITY	Code	Date/Time Sampled	Lab ID	Gravimetric EPA Method 5	WI B1/2 Condensible								TOTAL
B1/2 Acetone	L	R1 - GAS		X ✓									1
	↓	R2 - GAS		X									1
↓	↓	R1 - OIL		X ✓									1
		R2 - OIL		X ✓									1
		R3 - OIL		X ✓									1
B1/2 DI H_2O	L	R1 - GAS			X ✓✓								2
↓	↓	R2 - GAS			X ✓✓								2
		R3 - GAS			X ✓✓								2
		R1 - OIL			X ✓								1
		R2 - OIL			X ✓								1
		R3 - OIL			X ✓								1
B1/2 Acetone	L	R1 - GAS			X ✓								1
↓	↓	R2 - GAS			X ✓								1
		R3 - GAS			X ✓								1

Sample Code: L = Liquid; S = Solid; A = Air

Total No. of Bottles/Containers: ________

Relinquished by: ________ Received by: ________	Organization: ________ Organization: ________	Date / / Time ________	Seal Intact? Yes No N/A
Relinquished by: G. Tumbali Received by: Patricia A Beer	Organization: Geraghty & Miller - Milwaukee Organization: Geraghty & Miller - Pittsburgh	Date 6/6/94 Time 1030 6-7-94 10:30am	Seal Intact? (Yes) No N/A

Special Instructions/Remarks: RUNS 1-3 FOR GAS WAS ON 5/25/94
RUNS 1-3 FOR OIL WAS ON 5/26/94
All sample bottles are glass amber bottles.

Delivery Method: ☐ In Person ☐ Common Carrier FED. EXPRESS (SPECIFY) ☐ Lab Courier ☐ Other ________ (SPECIFY)

GERAGHTY & MILLER, INC.
Environmental Services

Laboratory Task Order No. ________

CHAIN-OF-CUSTODY RECORD

Project Number W10415 001

Project Location KIMBERLY CLARK - Neenah, WI

Laboratory G&M - Pittsburgh

Sampler(s)/Affiliation G. Tumbali → G&M - Milwaukee Air

ANALYSIS
~~SAMPLE BOTTLE / CONTAINER DESCRIPTION~~

SAMPLE IDENTITY	Code	Date/Time Sampled	Lab ID	GRAVIMETRIC EPA M5	WI B1/2 condensible								TOTAL
B1/2 Acetone	L	R1-OIL			X ✓								1
"	"	R2-OIL			X ✓								1
Acetone Blank	L	BLANK		X	X ✓								1
DI H2O Blank	↓	BLANK		X	X ✓								1

Sample Code: L = Liquid; S = Solid; A = Air

Total No. of Bottles/ Containers 23

Relinquished by: ______ Received by: ______	Organization: ______ Organization: ______	Date _/_/_ Time ______	Seal Intact? Yes No N/A
Relinquished by: G. Tumbali Received by: Rebecca A. Rees	Organization: Geraghty & Miller - Milwaukee Organization: Geraghty & Miller - Pittsburgh	Date 6/6/94 Time 1030	Seal Intact? (Yes) No N/A

6-7-94 10:30am

Special Instructions/Remarks: RUNS 1-3 FOR GAS WAS ON 5/25/94
RUNS 1-3 FOR OIL WAS ON 5/26/94
All sample bottles are glass amber bottles.

Delivery Method: ☐ In Person ☒ Common Carrier FED EXPRESS (SPECIFY) ☐ Lab Courier ☐ Other ______ (SPECIFY)

Cubberly(?) & MILLER, INC.
Environmental Services

Laboratory Task Order No. ________

CHAIN-OF-CUSTODY RECORD

Project Number W10415001
Project Location Kimberly - Clark
Laboratory G & M Pittsburgh
Sampler(s)/Affiliation G & M Milwaukee
G Tumbali

ANALYSIS ~~SAMPLE BOTTLE / CONTAINER DESCRIPTION~~

SAMPLE IDENTITY	Code	Date/Time Sampled	Lab ID	GRAVIMETRICS									TOTAL
5" Filter	S	R1 · OIL	110										1
		[illegible]	[illegible]										1
			[illegible]										1
		R2 · GAS	103										1
		R1 · GAS	107										1
BLANK		Ø	108										1

Sample Code: L = Liquid; S = Solid; A = Air

Total No. of ~~Bottles/~~ Containers: 7

Relinquished by: ________ Received by: ________	Organization: ________ Organization: ________	Date / / Time ________	Seal Intact? (Yes) No N/A
Relinquished by: G Tumbali Received by: ________	Organization: G & M Organization: ________	Date / / Time ________	Seal Intact? Yes No N/A

Special Instructions/Remarks: ________

Delivery Method: ☐ In Person ☒ Common Carrier Fed Express (SPECIFY) ☐ Lab Courier ☐ Other ________ (SPECIFY)

APPENDIX E

EQUIPMENT CALIBRATION DATA

METER BOX PRE-CALIBRATION DATA AND CALCULATION FORM (English Units)

Date: 03-Dec-93
Bar. Pres: 29.39 in. Hg

Meter Box Number: 2
Calibrated by: RHB

Gas Volume / Temperature

Meterbox Orifice Manometer Setting (del H) in. H20	Wet Gas Meter Volume (Vw) ft³	Dry gas Meter Volume (Vd) ft³	Wet Test Meter (tw) °F	Dry Gas Meter Inlet (tdi) °F	Dry Gas Meter Outlet (tdo) °F	Dry Gas Meter Avg (td) °F	Calibration Time (0) min.	Meter Correction Factor Yi	Meter Correction del H @ in H20
0.450	6.090	6.580	74.0	87.0	79.0	83.0	16.95	0.9401	1.9745
1.000	5.260	5.871	75.0	105.0	93.0	99.0	9.75	0.9338	1.8975
1.500	11.700	13.056	75.0	103.0	91.0	97.0	17.08	0.9295	1.7718
2.000	11.350	12.500	75.0	103.0	93.0	98.0	14.28	0.9423	1.7516
3.000	11.000	12.097	75.0	112.0	96.0	104.0	11.38	0.9515	1.7576
4.000	24.235	27.526	75.0	112.0	96.0	104.0	21.95	0.9190	1.7961

Evaluation Comments

Minimum vs. Average
Yi is within tolerance
del H@ is within tolerance

Maximum vs. Average
Yi is within tolerance
del H@ is within tolerance

USEPA Criteria

Yi (+/-) : 0.02
del H@ (+/-) : 0.2

	Yi	del H@
Min	0.9190	1.7516
Max	0.9515	1.9745
Avg	0.9360	1.8248

BOX2CAL.WK4

METER BOX CALI[illegible]ON DATA AND CALCULATION FORM

[illegible]nglish units)

Date 7-13-94 Meter box number 2

Barometric pressure, P_b = 29.[illegible] in. Hg Calibrated by DRM/PAB

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter Inlet (t_{d_i}), °F	Temperatures: Dry gas meter Outlet (t_{d_o}), °F	Temperatures: Dry gas meter Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5	123.402 128.683		77 81	75 76		13.00	0.9496	1.9516
1.0	5	128.900 134.311		81 86	76 79		9.00	0.9286	1.8646
1.5	~~20~~ 6	135.389 141.872		88 92	80 82		8.50	0.9346	1.7119
2.0	~~30~~ 5	142.440 147.872		91 97	84 85		6.00	0.9403	1.6265
3.0	~~20~~ 5	148.215 153.671		97 98	86 86		5.08	0.9580	1.7431
4.0	10	153.840 164.820		98 98	86 105		8.66	0.9375	1.6729
							Avg	0.9581	1.7618

See Attached Spread[illegible]

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
4.0	0.294		

[a] If there is only one thermom[illegible] on the dry gas meter, record the temperature under t_d.

METER BOX POST-CALIBRATION DATA AND CALCULATION FORM (English Units)

Date: 13-Jul-94
Bar. Pres: 29.25 in. Hg

Meter Box Number: 2
Calibrated by: DRM

Meterbox Orifice Manometer Setting (del H) in. H20	Gas Volume: Wet Gas Meter Volume (Vw) ft^3	Dry gas Meter Volume (Vd) ft^3	Temperature: Wet Test Meter (tw) ° F	Dry Gas Meter Inlet (tdi) ° F	Dry Gas Meter Outlet (tdo) ° F	Dry Gas Meter Avg (td) ° F	Calibration Time (0) min.	Meter Correction Factor Yi	Meter Correction del H @ in H20
0.500	5.000	5.281	75.0	79.0	75.5	77.3	13.00	0.9496	1.9516
1.000	5.000	5.411	75.0	83.5	74.5	79.0	9.00	0.9286	1.8646
1.500	6.000	6.521	75.0	90.0	81.0	85.5	8.50	0.9346	1.7119
2.000	5.000	5.432	75.0	94.0	84.5	89.3	6.00	0.9403	1.6265
3.000	5.000	5.456	75.0	97.5	86.0	91.8	5.08	0.9380	1.7410
4.000	10.000	10.980	75.0	98.0	94.5	96.3	8.66	0.9375	1.6729

Evaluation Comments

USEPA Criteria -

Minimum vs. Average
Yi is within tolerance
del H@ is within tolerance

Maximum vs. Average
Yi is within tolerance
del H@ is within tolerance

Yi (+/-) :	0.02	Min	0.9286	1.6265
del H@ (+/-) :	0.2	Max	0.9496	1.9516
		Avg	0.9381	1.7614

KIMCAL.WK4

NOZZLE CALIBRATION

Date: 04-Feb-94 Calibrated by: DRM

Nozzle Identification Number	Nozzle Size (inches)	D1, In.	D2, In.	D3, In.	del D, in.	D avg
1A	1/8	[illegible]9	0.139	0.139	0.000	0.139
2A	3/16	[illegible]8	0.149	0.150	0.002	0.149
3A	5/16	[illegible]0	0.309	0.310	0.001	0.310
4A	1/4	[illegible]0	0.241	0.240	0.001	0.240
5A	3/8	[illegible]3	0.371	0.373	0.002	0.372
6A	7/16	[illegible]36	0.437	0.436	0.001	0.436
7A	1/2	[illegible]75	0.479	0.478	0.004	0.477

where:
D1,2,3 = Nozzle diameter measured on a different diameter, inches.
Tolerance = measured within 0.001 inches.

del D = Maximum difference between any two measurements, inches.
Tolerance = [illegible] inches.

D avg = Average of D1, D2 and D3.

NOZZSETA.WK4

[…]ZZLE CALIBRATION

Date: 04-Feb-94 Calibrated by: DRM

Nozzle Identification Number	Nozzle Size (inches)	[…]1, In.	D2, In.	D3, In.	del D, in.	D avg
1B	3/16	[…].180	0.179	0.181	0.002	0.180
2B	1/4	[…].242	0.243	0.244	0.002	0.243
3B	1/8	[…].126	0.125	0.126	0.001	0.126
4B	3/8	[…].372	0.374	0.371	0.003	0.372
5B	7/16	[…].433	0.433	0.434	0.001	0.433
6B	1/2	[…].486	0.486	0.482	0.004	0.485
7B	5/16	[…].314	0.315	0.314	0.001	0.314

where:

D1,2,3 = Nozzle diameter […]asured on a different diameter, inches.
Tolerance = […]asured within 0.001 inches.

del D = Maximum differen[…] in any two measurements, inches.
Tolerance = […]04 inches.

D avg = Average of D1, D[…]nd D3.

NOZZSETB.WK4

N[illegible]LE CALIBRATION

Date: 04-Feb-94 Calibrated by: DRM

Nozzle Identification Number	Nozzle Size (inches)	[illegible] In.	D2, In.	D3, In.	del D, in.	D avg
1C	1/4	[illegible]47	0.247	0.246	0.001	0.247
2C	5/16	[illegible]00	0.299	0.299	0.001	0.299
3C						
4C	3/8	[illegible]74	0.372	0.374	0.002	0.373
5C	1/2	[illegible]95	0.499	0.496	0.004	0.497
6C	5/16	[illegible]82	0.282	0.282	0.000	0.282

where:
D1,2,3 = Nozzle diameter [illegible]sured on a different diameter, inches.
Tolerance = [illegible]sured within 0.001 inches.

del D = Maximum differenc[illegible] any two measurements, inches.
Tolerance = [illegible]4 inches.

D avg = Average of D1, D[illegible]d D3.

NOZZSETC.WK4

6SS1

Gerag[illegible] and Miller, Inc.

Type S [illegible]ot Tube Inspection Data Form

Date: 9/3/92 ~~7SS1~~
Pitot ID. ~~X~~ 6SS1

Pitot t[illegible] assembly level? Assembly
Pitot t[illegible] openings damaged? NO

Pa = .559 in Pb = .560 in Pavg = .560 in
Dt = .381 in A = 1.12 in Pavg/Dt= 1.47 in
(Pa + [illegible] (1.05<X <1.5)

Traverse Axis (Alpha1)= [illegible] (<10) Long.Axis(Beta1): 1 °(<5)
Traverse Axis (Alpha2)= [illegible] (<10) Long.Axis(Beta2): 0 °(<5)

Front Angle(Gamma)= 1.[illegible] Side Angle(Theta)= 1 °

Align Displacement Z = .02 [illegible] (A sin gamma) <.125 in
Align Displacement W = .01 [illegible] (A sin theta) <.03125 in

Comments :

Calibration Required? Calibrated By :

PITOT CALIBRATION STANDARDS

Construction Standards:

1. Dt - between 0.48 and 0. centimeters

2. Pa = Pb 1.05 Dt ≤ P ≤ 1 Dt

3. a1, a2 < 10°

4. B1, B2 < 5°

5. $Z \leq 0.32$ cm

6. $W \leq 0.08$ cm

Pitot Alignment Standards:

1. $X \geq 1.90$ cm

2. Ip must be higher than

3. $W \geq 7.62$ cm

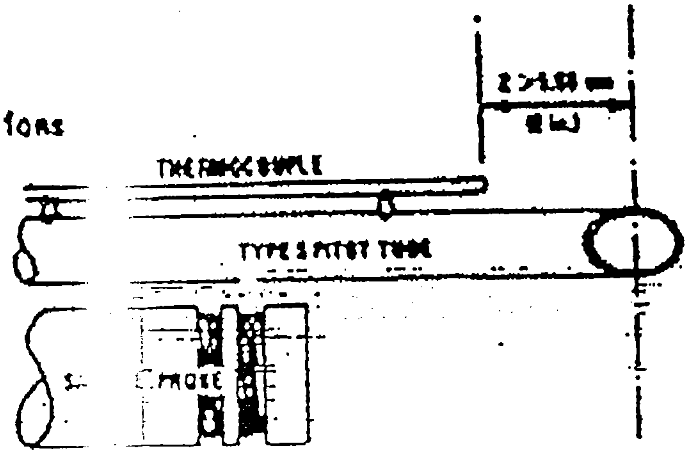
4. $Z \geq 1.90$ cm

5. $Y \geq 7.62$ cm

TYPE S TOT TUBE CALIBRATION SHEET

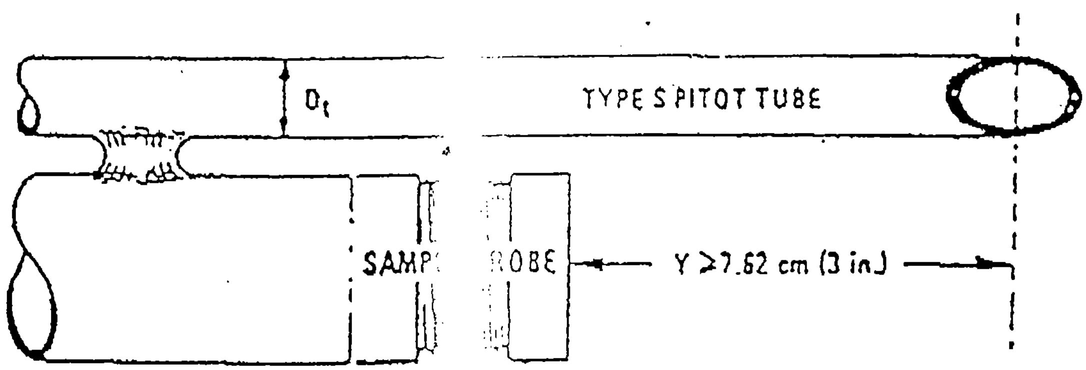
Pitot I.D. No. 65541 Date ______________ Performed BY DM

Pitot Alignment Calibrations



W = ______

Z = 2 cm



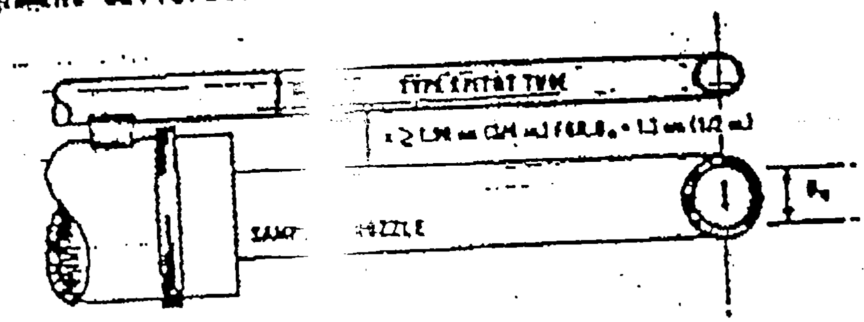
Y = 10 cm

Determined Coefficient ______________

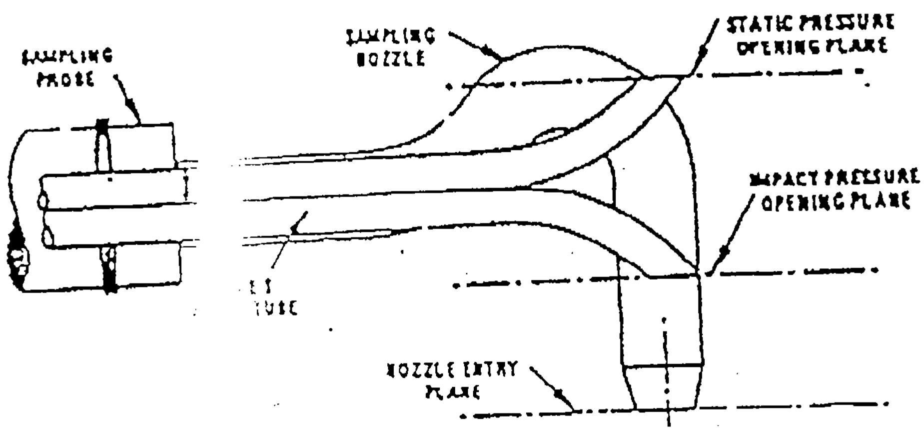
TYPE S PITOT TUBE CALIBRATION SHEET

Pitot I.D. No. ______________ Date ______________ Performed By ______________

Pitot Alignment Calibration:



X = 1.9 CM



Is Ip ...her than Np = YES

PRM

STACK TEMPER[illegible]URE SENSOR CALIBRATION DATA FORM

Probe

Date 9/4/92 ______ Thermocouple number 6551

Ambient temperature ______ °F Barometric pressure 29.37 in. Hg

Calibrator ______ Reference: mercury-in-glass ______

other ______

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °F	Temperature difference,[c] %
		[illegible]°C = 9/5 (99.1) + 32 = 210.4	213	

[a]Every 30°C (50°F) [illegible] each reference point.

[b]Type of calibrati[illegible] system used.

[c]$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%$.

Matheson Gas Products
World Leader in Specialty Gases & Equipment

CERTIFICA OF ANALYSIS-EPA PROTOCOL MIXTURES

CUSTOMER: JACKSON W ING

REFERENCE #: 109-29215

CYLINDER #: SX-23481

PROTOCOL: 1

CYLINDER PRESSURE: 2000

LAST ANALYSIS DATE: 04/2 4

EXPIRATION DATE: 04/2 5

REPLICATE CONCENTRATIONS

COMPONENT : NITRIC O		DATE: 04/13/94	DATE: 04/22/94
MEAN CONC : 873 PPM		873 PPM 874 PPM 873 PPM	871 PPM 873 PPM 871 PPM
COMPONENT : NITROGEN OXIDE		DATE: / /	DATE: / /
MEAN CONC : 1 PPM			
COMPONENT :		DATE: / /	DATE: / /
MEAN CONC :			

BALANCE GAS: NITROGEN

REFERENCE STANDARDS

SRM # : GMIS 168

CYLINDER # : SX-16053

CONCENTRATION: 993 PPM

1650 Enterprise Parkway
Twinsburg, Ohio 44087
Phone: (216) 425-4406
Toll Free: (800) 426-9427

CERTIFICATION INSTRUMENTS

COMPONENT	NITRI XIDE
MAKE/MODEL	TECO
SERIAL NUMBER	14A-1 8-134
MEASUREMENT PRINC.	CHEMI INESCENCE
LAST CALIBRATION	04-20

REPLICATE DATA COMPO IT: NITRIC OXIDE

DATE 04/13/94

1.	Z =-0.01	C =8.2	R =9.40
2.	C =8.27	R =9.4	Z =-0.007
3.	R =9.48	Z =-0.0	C =8.33

DATE 04/22/94

Z = -0.006	C =8.565	R =9.77
C = 8.57	R =9.76	Z =-0.00
R = 9.75	Z =-0.006	C =8.54

REPLICATE DATA COMPO NT:

DATE / /

1.	Z =	C =	R =
2.	C =	R =	Z =
3.	R =	Z =	C =

DATE / /

Z =	C =	R =
C =	R =	Z =
R =	Z =	C =

REPLICATE DATA COMP NT:

DATE / /

1.	Z =	C =	R =
2.	C =	R =	Z =
3.	R =	Z =	C =

DATE / /

Z =	C =	R =
C =	R =	Z =
R =	Z =	C =

R = Reference Gas C = Candidate Gas, Z = Zero Gas

This certification was p ormed according to EPA Protocol method (s) described in section 3. G1 and/or section 3.0.4.G2.
Rev. Sept. 1993

ANALYST [signature]

DATE 4.22.94

Matheson Gas Products
World Leader In Specialty Gases & Equipment

CERTIFICATE ANALYSIS-EPA PROTOCOL MIXTURES

CUSTOMER: JACKSON WEL IG

CYLINDER #: SX-23675

CYLINDER PRESSURE: 2000

LAST ANALYSIS DATE: 04/02

EXPIRATION DATE: 04/20

REFERENCE #: 109-28215

PROTOCOL: 1

REPLICATE CONCENTRATIONS

COMPONENT : NITRIC OXI

MEAN CONC : 451 PPM

DATE: 04/12/94
454 PPM
452 PPM
448 PPM

DATE: 04/20/94
448 PPM
450 PPM
452 PPM

COMPONENT : NITROGEN DIO E

MEAN CONC : <0.5 PPM

DATE: / /

DATE: / /

COMPONENT :

MEAN CONC :

DATE: / /

DATE: / /

BALANCE GAS: NITROGEN

REFERENCE STANDARDS

SRM # : GMIS 168

CYLINDER # : SX-1605

CONCENTRATION: 993 PPM

1650 Enterprise Parkway
Twinsburg, Ohio 44087
Phone: (216) 425-4406
Toll Free: (800) 426-9427

Matheson
Gas Products
World Leader in Specialty Gases & Equipment

CERTIFICATION INSTRUMENT:

COMPONENT	NITR OXIDE
MAKE/MODEL	TECO A
SERIAL NUMBER	14A- 8-134
MEASUREMENT PRINC.	CHEM INESCENCE
LAST CALIBRATION	04-2 4

REPLICATE DATA COMP NT: NITRIC OXIDE

DATE 04/12/94

1.	Z =-0.005	C =4.3	R =9.48
2.	C =4.36	R =9.6	Z =-0.005
3.	R =9.54	Z =-0.	C =4.28

DATE 04/20/94

Z = -0.008	C =4.39	R =9.82
C = 4.41	R =9.81	Z =-0.0C
R = 9.79	Z =-0.006	C =4.42

REPLICATE DATA COMP ENT:

DATE / /

1.	Z =	C =	R =
2.	C =	R =	Z =
3.	R =	Z =	C =

DATE / /

Z =	C =	R =
C =	R =	Z =
R =	Z =	C =

REPLICATE DATA COMP ENT:

DATE / /

1.	Z =	C =	R =
2.	C =	R =	Z =
3.	R =	Z =	C =

DATE / /

Z =	C =	R =
C =	R =	Z =
R =	Z =	C =

R = Reference Ga C = Candidate Gas, Z = Zero Gas

This certification was formed according to EPA Protocol method (s) described in section 3. .G1 and/or section 3.0.4.G2.
Rev. Sep. 1993

ANALYST [signature] ____________

DATE 4-22-94

1650 Enterprise Parkway
Twinsburg, Ohio 44087
Phone: (216) 425-4406
Toll Free: (800) 426-9427

Scott Special[illegible] Gases, Inc.

1290 COMBERMERE STREET, TRO[illegible] [illegible]8083 [illegible] (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANAL[illegible]S: EPA PROTOCOL GAS

Customer
CAE INSTRUMENTAL RENTA[illegible]
246 WOODWORK LANE
PALATINE, IL. 60067-9760

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order 10084-71500
Scott Project # 559258

ANALYTICAL INFORMATI[illegible]

Certified to exceed the minimum s[illegible] [illegible]tions of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number AAL1670[illegible]
Cylinder Pressure 1900 psig

Certification Date 12-8-93 **Expiration Date** 12-8-96
Previous Certification Dates None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Dioxide	6.019 %	±1% NIST Directly Traceable
Oxygen	13.98 %	±1% NIST Directly Traceable

Balance Gas: Nitrogen

*Analytical uncertainty is inclusive of usual [illegible] [illegible]rror sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration D[illegible]	Cylinder Number	Concentration
CRM 1674B	3-3-96	SV13122	7.05% CO_2 in N_2
CRM 2659	2-6-94	AAL-18549	20.67 % O_2 in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
HORIBA/PIR 2000/02609015	11-3-93	Non-Dispersive Infrared
O_2: Beckman/755/1001192	9-29-93	Paramagnetic

ANALYZER READINGS

([illegible] [illegible] Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad A[illegible]		Second Triad Analysis	Calibration Curve
Carbon Dioxide	Date: 12-8-93 Z1=0.00 R[illegible] R2=60.10 Z[illegible] Z3=0.00 T[illegible] Avg. Conc. of C[illegible]	[illegible]onse Units: mv T1=53.20 T2=53.20 R3=60.10 6.019 %		Concentration=A+Bx+Cx²+Dx³+Ex⁴ r=0.99999 SRM 1674B Constants: A=-0.002937619 B=0.09316452 C=0.00017009 D=-0.000003822 E=0
Oxygen	Date: 12-8-93 Z1=0.00 R[illegible] R2=100.0 Z[illegible] Z3=0.00 T[illegible] Avg. Conc. of C[illegible]	[illegible]onse Units: mv T1=67.60 T2=67.60 R3=100.0 13.98 %		Concentration=A+Bx+Cx²+Dx³+Ex⁴ r=0.99999 CRM 2659 Constants: A=0.01177201 B=0.2065823 C=0 D=0 E=0
				Concentration=A+Bx+Cx²+Dx³+Ex⁴

Special Notes

Analyst Frank P. Doran

Scott Special Gases, Inc.
1290 COMBERMERE STREET, TRC 8083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANA S: EPA PROTOCOL GAS

Customer
C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE IL 60067-5000

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order 10084-71500
Scott Project # 559264

ANALYTICAL INFORMATIC

Certified to exceed the minimum s ations of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number AAL3437
Cylinder Pressure 1900 psig
Certification Date 12-13-93
Previous Certification Dates None
Expiration Date 12-13-95

ANALYZED CYLINDER Components	Certified Concentration	Analytical Uncertainty*
Nitric Oxide	224.1 ppm	±1% NIST Directly Traceable
Total Oxides of Nitrogen	224.4 ppm	Reference Value Only

Balance Gas: Nitrogen

*Analytical uncertainty is inclusive of usual error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD Type	Expiration D	Cylinder Number	Concentration
NTRM 1685	11-19-94	ALM-024062	244.7 ppm NO in N_2

INSTRUMENTATION Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
NO: Beckman/951/0101177	11-10-93	Chemiluminescence

ANALYZER READINGS ( ) Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad An	Second Triad Analysis	Calibration Curve
Nitric Oxide	Date: 12-6-93 onse Units: mv Z1=0.00 R1 T1=91.40 R2=100.0 Z2 T2=91.40 Z3=0.00 T3 R3=100.0 Avg. Conc. of C 3.7 ppm	Date: 12-13-93 Response Units: mv Z1=0.00 R1=100.0 T1=91.70 R2=100.0 Z2=0.00 T2=91.70 Z3=0.00 T3=91.70 R3=100.0 Avg. Conc. of Cust. Cyl. 224.4 ppm	Concentration=A+Bx+Cx²+Dx³+Ex⁴ r=0.99999 NTRM 1685 Constants: A=0.2631951 B=2.444368 C=0 D=0 E=0
			Concentration=A+Bx+Cx²+Dx³+Ex⁴
			Concentration=A+Bx+Cx²+Dx³+Ex⁴

Special Notes

Analyst Frank P. Doran

Scott Specia[illegible] Gases, Inc.
1290 COMBERMERE STREET, TR[illegible] 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANA[illegible]IS: EPA PROTOCOL GAS

Customer
CAE INSTRUMENTAL RENTA[illegible]
246 WOODWORK LANE
PALATINE, IL. 60067-9760

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order 10084-71500
Scott Project # 559258

ANALYTICAL INFORMAT[illegible]

Certified to exceed the minimum [illegible]cations of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number ALM016[illegible]
Cylinder Pressure 1900 psi[illegible]

Certification Date 12-8-93
Previous Certification Dates None

Expiration Date 12-8-96

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Dioxide	6.019 %	±1% NIST Directly Traceable
Oxygen	13.98 %	±1% NIST Directly Traceable

Balance Gas: Nitrogen

*Analytical uncertainty is inclusive of usu[illegible] error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration D[illegible]	Cylinder Number	Concentration
CRM 1674B	3-3-96	SV13122	7.05% CO_2 in N_2
CRM 2659	2-6-94	AAL-18549	20.67 % O_2 in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
HORIBA/PIR 2000/02609015	11-3-93	Non-Dispersive Infrared
O_2: Beckman/755/1001192	9-29-93	Paramagnetic

ANALYZER READINGS

[illegible]re Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad A[illegible]is	Second Triad Analysis	Calibration Curve
Carbon Dioxide	Date: 12-8-93 [illegible]sponse Units: mv Z1=0.00 R[illegible] T1=53.20 R2=60.10 [illegible] T2=53.20 Z3=0.00 [illegible] R3=60.10 Avg. Conc. of [illegible] 6.019 %		Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$ r=0.99999 SRM 1674B Constants: A=-0.002937619 B=0.09316452 C=0.00017009 D=0.000003822 E=0
Oxygen	Date: 12-8-93 [illegible]sponse Units: mv Z1=0.00 [illegible] T1=67.60 R2=100.0 [illegible] T2=67.60 Z3=0.00 [illegible] R3=100.0 Avg. Conc. of [illegible] 13.98 %		Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$ r=0.99999 CRM 2659 Constants: A=0.01177201 B=0.2065823 C=0 D=0 E=0
			Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

Special Notes

Analyst Frank P. Doran