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EMISSIONS FROM OUTDOOR WOOD-BURNING RESIDENTIAL HOT WATER FURNACES

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FOREWORD

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E. Timothy Oppelt, Director
National Risk Management Research Laboratory

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EMISSIONS FROM OUTDOOR WOOD-BURNING RESIDENTIAL HOT WATER FURNACES

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ABSTRACT

Modern outdoor residential wood-burning hot water furnaces are freestanding units situated outside the envelope of the structure to be heated. They typically consist of a firebox and water reservoir, assembled in a horizontal configuration. Hot combustion gases flow from the firebox at one end, through channels or tubes in the water reservoir, to the stack. The gases may pass through the water reservoir once to the stack at the end opposite the firebox (one pass) or an additional set of pipes may bring the gases back to the stack located above but isolated from the combustion chamber (double pass). The heated water is pumped through radiators in the dwelling or through a heat exchanger in the HVAC duct in response to the home thermostat. A separate pipe coil in the water reservoir may be used to provide domestic hot water, year round if desired. The furnace draft is controlled by a thermostat monitoring the temperature of the water in the reservoir. Central heating furnaces of all types are exempt from the EPA wood heater (wood stove) standard. In this project, emissions were measured from one single pass and one double pass furnace at average heat outputs of 15,000 and 30,000 Btu/hr while burning typical oak cordwood fuel. One furnace was also tested once at each heat output while fitted with a prototype catalytic unit installed in the combustion chamber. Emissions measured included: EPA Method 5G particulate, semivolatile and condensible organics, 20 target PAH compounds, and carbon monoxide. Emission results are presented in terms of rate per hour, quantity per unit weight of wood burned, and quantity per unit of heat delivered. Delivered efficiencies are also presented. Compared to a wide range of residential heating options, these furnaces' emissions were of the same order as other stick wood burning appliances.

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CONVERSION TABLE

Most quantities in this report are in nonmetric units. Readers more familiar with metric units may use the following values to convert to that system.

Nonmetric	Multiply by	Yields metric
Btu/hr	1.055×10^{3}	joule (J)
Btu/lb	2.326×10^{3}	J/kg
Btu/(lb-°F)	4.187×10^{3}	J/kg-K
degree Fahrenheit (T_F)	$(T_F+459.67)/1.8$	K
cfm	4.719×10^{-4}	m^3/s
ft	3.048×10^{-1}	m
gpm	6.309×10^{-5}	m^3/s
lb	4.536×10^{-1}	kg
lb/ft^3	1.602×10	kg/m^3
lb/gal	1.198×10^{2}	kg/m^3
lb/min	7.560×10^{-3}	kg/s
in. H_2O @ 60°F	2.488×10^{2}	pascal (Pa)

SECTION 1.0 - INTRODUCTION

In the early 1980's, the state of Oregon began developing methods for characterizing source emissions from residential wood combustion units. The developed methods have since blossomed into test methods used to audit and certify wood-burning heaters. From these beginnings, the U.S. Environmental Protection Agency (EPA) has established emission performance standards for residential wood heaters.

The federal regulations established by the EPA in 1988 limit emissions from residential wood heaters, such as wood stoves, pellet-stoves, and factory built fireplace inserts. These regulations, however, do not include all wood-fired heating appliances. For example, central heating furnace/boilers are not covered under the current regulations.

In general, emissions from the combustion of wood in stoves and furnaces contain significant levels of carbon monoxide (CO) and fine particulate matter consisting, in part, of mutagenic polycyclic aromatic hydrocarbons (PAH). If atmospheric conditions are conducive for accumulating smog-like clouds of emissions, the wood smoke could pose a health hazard. With the potential for such a condition under consideration, the EPA established maximum acceptable emissions levels for the certification of most residential wood-fired heaters.

Typically, the modern outdoor residential wood-burning hot water furnace is a freestanding unit situated outside the envelope of the structure to be heated. The unit consists of a closed combustion chamber surrounded by a water tank and vented through a stack. A wood burning fire is contained and controlled in the combustion chamber or fire-box of the furnace. During the combustion process, heat is transferred through the walls of the chamber into the water. The hot water from the furnace tank can then be circulated through radiators or air-handling heat exchangers to transfer heat into a residence. Some central heating furnaces are equipped with additional plumbing to provide domestic hot water.

Most commercial central heating furnaces are supplied with an 8- to 10-foot stack. Typical indoor wood burning stoves have chimneys which extend through the roof of a home to heights of 20 to 30 feet. The relatively low chimney height of the central heating furnace/boiler, compared to the conventional wood stove installations, creates a greater potential for the localization of objectionable emissions in and around residences. Additionally, concerns have been raised about the manner in which

the combustion process is controlled and how the control affects the emissions.

The State of Wisconsin has asked the Control Technology Center of EPA's Air Pollution Prevention and Control Division (APPCD) for assistance in determining whether the need exists to regulate these furnaces. Therefore, the EPA has undertaken the task of evaluating the emissions from the central heating furnaces and the manner in which the combustion is controlled. The objective is to develop baseline emission factors for comparison with other residential heating systems.

Section 2 provides a description of the experimental approach and sampling and analytical methods employed. Steps to ensure project quality are described in Section 3. Data, results and discussion are presented in Section 4. The appendices contain the detailed data.

SECTION 2.0 - PROJECT DESCRIPTION

2.1 EXPERIMENTAL APPROACH

In order to determine whether the need exists to regulate the central heating furnace/boilers, the EPA needs to establish baseline emission factors. The subject investigation was undertaken as a means of "scoping" the performance of typical furnace types under normal operating conditions. The objective of the investigation was to gather emissions data using standard EPA test methods developed for certifying and auditing wood-fired heaters (wood stoves). These results could then be compared to the emission factors established for other gas-, oil, and wood-fired residential heating equipment. There are significant differences in the way these home heating furnaces are designed and operated which produce widely different emission properties and levels. For example, the wood-fired furnaces tested in this project used thermostats to deliver a more constant amount of heat, compared to wood stoves which usually have manual draft controls.

The outdoor residential wood-burning hot water furnaces were tested following EPA Reference Method 28 (M28-40 CFR Part 60, Appendix A). Method 28 is the test method used to certify and audit wood-fired heaters (stick and pellet burning woodstoves). The method specifies fuel preparation, furnace operation, and the reporting of the results. Method 28 requires Method 5G or 5H (CFR Part 60, Appendix A) to determine the concentrations of oxygen (O_2), carbon dioxide (CO_2), carbon monoxide (CO), and particulate matter (PM) in the emissions.

For the purposes of these tests, some of the fuel preparation procedures under Method 28 were modified in favor of preparing the fuel and operating the furnace as recommended by the manufacturer. Cordwood was used instead of the dimensioned lumber specified for wood heater certification. Method 28A was used to calculate the stack gas dry molecular weight, as required for flow measurements. Method 5G was the primary sampling method used for the test. The sampling method, Method 5G, was modified with the addition of an XAD-2 absorbent trap to collect organics; this modified sampling method will hereafter be referred to as Modified Method 5G (MM5G). The collected MM5G samples were analyzed for total particulate matter (PM), total semivolatile organics [sometimes referred to as total chromatographable organics (TCO)], condensible organics as measured by gravimetric analysis (GRAV), and polycyclic aromatic hydrocarbons (PAHs).

The efficiencies of the units were measured as a secondary objective for reporting emissions relative to the input heating value of the wood and to their heat output from the furnace.

The stack test location and MM5G probe location were selected according to the criteria established by EPA methods for the testing of wood-fired heaters. The emissions sampling system consisted of a dilution tunnel and hood. The hood, or bell, is positioned inches above the stack exit. The released emissions plus dilution air are captured and drawn into the hood and dilution tunnel by an induced draft (ID) fan. A draft differential pressure of <0.005 in H_2O was maintained on the wood-fired furnace as required by Method 28. The MM5G samples were taken from the dilution tunnel duct. The flue gas concentrations as measured by the CEM's were sampled from the chimney. The various protocols for sampling in small ducts as described in EPA Methods 1A, 2C, and 5C (CFR Part 60, Appendix A) were followed. An additional CO monitor was positioned to sample CO concentrations in the dilution tunnel. This allowed the furnace stack flow to be calculated by multiplying the dilution tunnel flowrate by the ratio of dilution tunnel CO to furnace stack CO.

$$\text{Furnace Stack Flow} = \text{dilution tunnel flow} \times CO_{dilution} / CO_{stack}$$

The MM5G sampling train consisted of a pump which draws gas from the dilution tunnel through a system of filters, an XAD-2 organics trap, a condenser and a gas meter. Sampled gas temperatures were measured, and recorded, throughout the train. Also, the velocity head and temperature in the dilution tunnel were measured at the point of average velocity (as determined by a preliminary velocity and temperature traverse). Sampling rates were controlled to maintain a constant ratio of proportionality between dilution tunnel flow and flow pulled through the probe.

2.2 EXPERIMENTAL SET-UP

The combustion rate of the central heating furnaces investigated is controlled by a thermostat that maintains the temperature of the water within a specified temperature range. When the temperature of the water increases to the upper limit of the range, the temperature switch will stop or slow the combustion air supply into the combustion chamber. The combustion process will be stalled, slowing the amount heat being transferred to the water. During this period of stalled combustion, the temperature in the tank will drop as heat is removed via the water circulated from the tank through the external space heating heat exchanger. Once the water temperature falls to the lower limit of the temperature range, the temperature switch will allow combustion air to enter the combustion chamber. The combustion process will increase, boosting the heat transfer to the water.

For these scoping tests, two types of furnaces were selected as representative of the industry. One of these

furnaces was tested with a pre-production prototype catalyst designed to reduce emissions. The type of furnace is defined by the configuration of the unit. The flue gases exit the combustion chamber by way of a flue that passes through the water tank. In general, a single pass furnace allows the flue gases to pass once through the flue in the water tank before exiting through the chimney. As the hot flue gases pass through the flue, heat is transferred to the water in the tank. In a double pass furnace, flue gases pass through the water tank twice before exiting through the chimney. The second pass of the stack is designed to provide more surface area and more contact time between the hot flue gases and the water in the tank. Representative furnaces of both types were provided to EPA/APPCD for testing.

The double pass furnace tested consists of a plate steel combustion chamber surrounded by a water tank on all sides but one. As shown schematically in Figure 2-1, a door on the exposed surface of the chamber provides the only access to the fire-box for fuel loading and ash removal. Combustion air is supplied to the fire-box by a forced draft fan on the door. The forced draft fan is controlled by the previously mentioned thermostat switch on the front of the unit. A damper on the fan intake was used to adjust the air supplied to the combustion chamber. The flue gases produced during the combustion process exit the fire-box through four flue pipes at the rear of the combustion chamber. The flue pipes extend through the water tank to a chamber at the rear of the unit. In the secondary chamber, flue gases travel upward toward two flue pipes, where they pass back through the water tank to the front of the unit. The upper two flue pipes empty into the chimney where the flue gases exit the furnace. The exterior of the water tank is insulated and covered with exterior metal sheeting. The rear of the water tank is equipped with a pump and plumbing from which the heated water can be circulated. Additional pipe connections and valves are located on the rear of the furnace to fill the water tank. The manufacturer provided the furnace with an air-handling exchanger for heat removal.

Similar to the double pass furnace, the single pass unit shown schematically in Figure 2-2 contains a steel plate fire-box surrounded by a water tank. Several transverse water filled tubes and a water filled transverse baffle provide additional heat transfer surfaces. A door on the front of the unit provides access to the fire-box. The combustion air is controlled by a thermostat and an electrically controlled damper. The hot gases flow around the tubes and baffle to the rear of the furnace and empty into the chimney. The pump and plumbing for circulating the water are located on the rear of the furnace. The single pass furnace was equipped by the manufacturer with a water cooled heat exchanger for the test.

The furnaces were tested at two conditions. Under the first condition, heat was removed from the furnaces at a rate typical of the average winter heat demands for homes in warmer climate regions (15 to 20 kBtu/h). At the second condition, heat

was removed at a higher rate (30 to 40 kBtu/h) to simulate colder climate requirements. The heat extracted from the furnaces during the testing was well below the possible heating output of the furnaces when fully charged. Testing under these conditions caused cycling of the controlled combustion process.

Each furnace was tested twice at each of the test conditions. One of the units, equipped with a prototype removable catalyst, was additionally tested once at the high heat removal rate and once at lower heat removal rate. Blank MM5G samples were also collected for each furnace. The test matrix for this study is shown in Table 2-1.

The project generated sample sets representing 12 tests and three blanks. Each of the test runs spanned the time to burn a full wood charge at a set heat output rate, as defined by the test matrix shown in Table 2-1. Each furnace was connected to an exchanger through which its heated water was circulated. One unit was provided with a forced-air (air-to-air) heat exchanger. The other unit utilized a water-to-water heat exchanger. The heat output rate through the exchanger was determined by measuring the flow rate and the inlet and outlet temperatures of the circulated water. The heat output rate was controlled by regulating the water flow rate being circulated from the furnace and by regulating the flow of the cooling medium across the exchanger. This measurement isolated the deliverable efficiency of the furnace from the deliverable efficiency of the exchanger. The delivered efficiency was defined as the energy removed from the hot water divided by the energy in the wood burned as

TABLE 2-1. TEST MATRIX FOR WOOD-FIRED FURNACE TESTING

Furnace	Test Condition	Test Number
Furnace A Scoping test	High Heat Removal Rate (30 to 40 kBtu/hr)	A-1[a], A-2
Furnace A without catalyst	High Heat Removal Rate (30 to 40 kBtu/hr)	A-3, A-4
Furnace A without catalyst	Low Heat Removal Rate (15 to 20 kBtu/hr)	A-5, A-6
Furnace A with catalyst	High Heat Removal Rate (30 to 40 kBtu/hr)	A-7[b]
Furnace A with catalyst	Low Heat Removal Rate (15 to 20 kBtu/hr)	A-8[b]
Furnace B	High Heat Removal Rate (30 to 40 kBtu/hr)	B-1, B-2
Furnace B	Low Heat Removal Rate (15 to 20 kBtu/hr)	B-3, B-4
Furnace A without catalyst	Dilution Tunnel Blank	A-9
Furnace A with catalyst	Dilution Tunnel Blank	A-10
Furnace B	Dilution Tunnel Blank	B-5

a Water temperature significantly below manufacturer's recommendation (see text).
b Substantial smoke spillage when draft fan on.

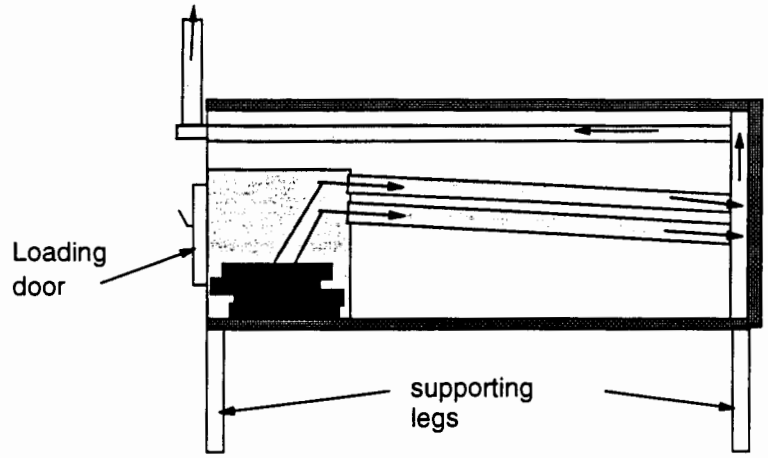


Figure 2-1. Double pass furnace schematic.

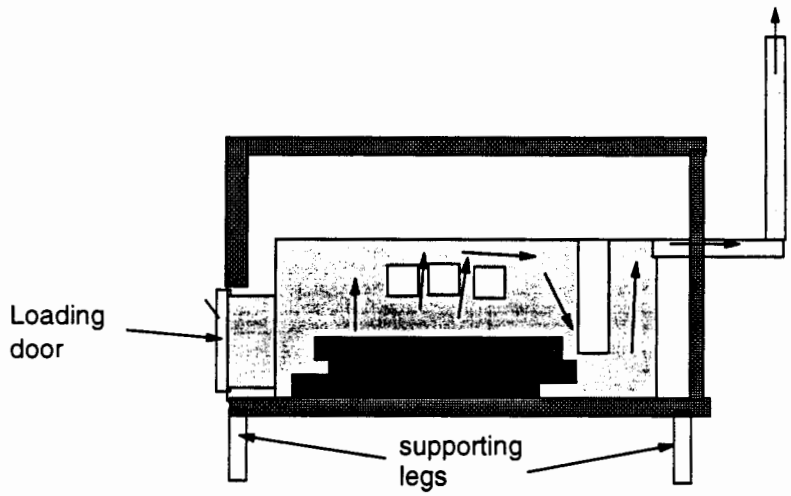
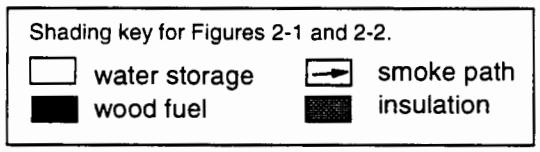


Figure 2-2. Single pass furnace schematic.



determined using the lower heating value (see Sample A, Table 2-2). Specifically:

Delivered efficiency = 100 x $\sum$energy removed$_t$/energy input (1)
where:

Energy removed$_t$ = (water$_t$/60) x density$_t$ x (T_2 - T_1) x [(t+1) - t] x specific heat$_t$

water$_t$ = corrected water flow, gpm
density$_t$ = corrected water density, lb/gal
T_2 = temperature of water leaving furnace
T_1 = temperature of water entering furnace
t+1 = time at end of recording interval, sec.
t = time at start of recording interval, sec.
specific heat = 1 Btu/(lb-°F)

and:

Energy input = (wood weight$_{start}$ - wood weight$_{end}$) x lower heating value/(1 + wood moisture content)

wood weight, lb
lower heating value, Btu/lb dry
moisture content, %

The furnaces were tested at separate wood stove testing facilities. Both facilities are designed specifically for Method 5 dilution tunnel sampling and should, therefore, have produced similar quality results. The Method 5G facility specifications are restrictive enough to ensure that there were no substantial differences in the dilution tunnel arrangement. The testing at both facilities adhered to the guidance provided by the Quality Assurance Project Plan (QAPP) developed under the EPA Work Assignment entitled "Emissions from Wood-Fired Residential Central Heating Furnaces." A representative from EPA/APPCD's Technical Services Branch audited both facilities during testing to determine any deviations from the QAPP.

The unsplit, mixed hardwood used for the two scoping tests on Furnace A was supplied by Furnace A's manufacturer. The red oak fuel used at both test facilities for all other tests came from the same seasoned lot of cordwood. Samples of the red oak fuel were sent to Commercial Testing and Engineering for an ultimate and proximate Analysis. The results of the analysis are shown in Table 2-2. The results from Sample B reflect the analysis of a wood chip taken from the surface of a typical piece of test fuel at one facility. The analysis of Sample A reflects the results from core samples taken from a number of pieces of typical test fuel at the other facility.

2.3 EXPERIMENTAL AND SAMPLING PROCEDURES

Each furnace was installed per manufacturers' installation instructions at its respective test facility upon an electronic

weighing scale as shown in Figure 2-3. The manufacturers also provided the testing facilities with instructions on loading and operating the furnace. Once installed and visually inspected, the furnaces were pre-burned and checked with the assistance of representatives from the manufacturers.

TABLE 2-2. PROXIMATE AND ULTIMATE ANALYSIS FOR RED OAK

SAMPLE A

PROXIMATE ANALYSIS	As Received	Dry Basis	ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	21.98	xxxxx	% Moisture	21.98	xxxxx
% Ash	0.27	0.35	% Carbon	39.09	50.10
% Volatile	69.03	88.48	% Hydrogen	4.89	6.27
% Fixed Carbon	8.72	11.17	% Nitrogen	0.18	0.23
Total	100.00	100.00	% Sulfur	0.02	0.03
			% Ash	0.27	0.35
Btu/lb	6295	8069	% Oxygen	33.57	43.02
% Sulfur	0.02	0.03	Total	100.00	100.00
MAF Btu		8097			

SAMPLE B

PROXIMATE ANALYSIS	As Received	Dry Basis	ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	9.29	xxxxx	% Moisture	9.29	xxxxx
% Ash	0.77	0.85	% Carbon	45.21	49.84
% Volatile	79.26	87.38	% Hydrogen	5.60	6.17
% Fixed Carbon	10.68	11.77	% Nitrogen	0.27	0.30
Total	100.00	100.00	% Sulfur	0.02	0.02
			% Ash	0.77	0.85
Btu/lb	7680	8467	% Oxygen	38.84	42.82
% Sulfur	0.02	0.02	Total	100.00	100.00
MAF Btu		8540			

As noted above, the fuel burned during all the tests, except the two scoping tests on Furnace A, was seasoned, cut and split cordwood purchased from the same source. For all tests, a test charge of 7 lbs of wood/ft^3 of useful combustion chamber volume was selected from the cordwood. For Furnace A, each piece was weighed and measured in three locations for moisture content. The weighted average of the moisture content was determined for the combined test charge. For Furnace B, moisture measurements were averaged without weighting. As specified by the test method, the average moisture content of the test fuel was between 15- and 25-percent moisture dry basis.

Prior to the testing, the furnace was pre-loaded with a warm-up charge consisting of 40 to 80 lb of cordwood similar to the test fuel charge. The pre-load was to be sufficient enough

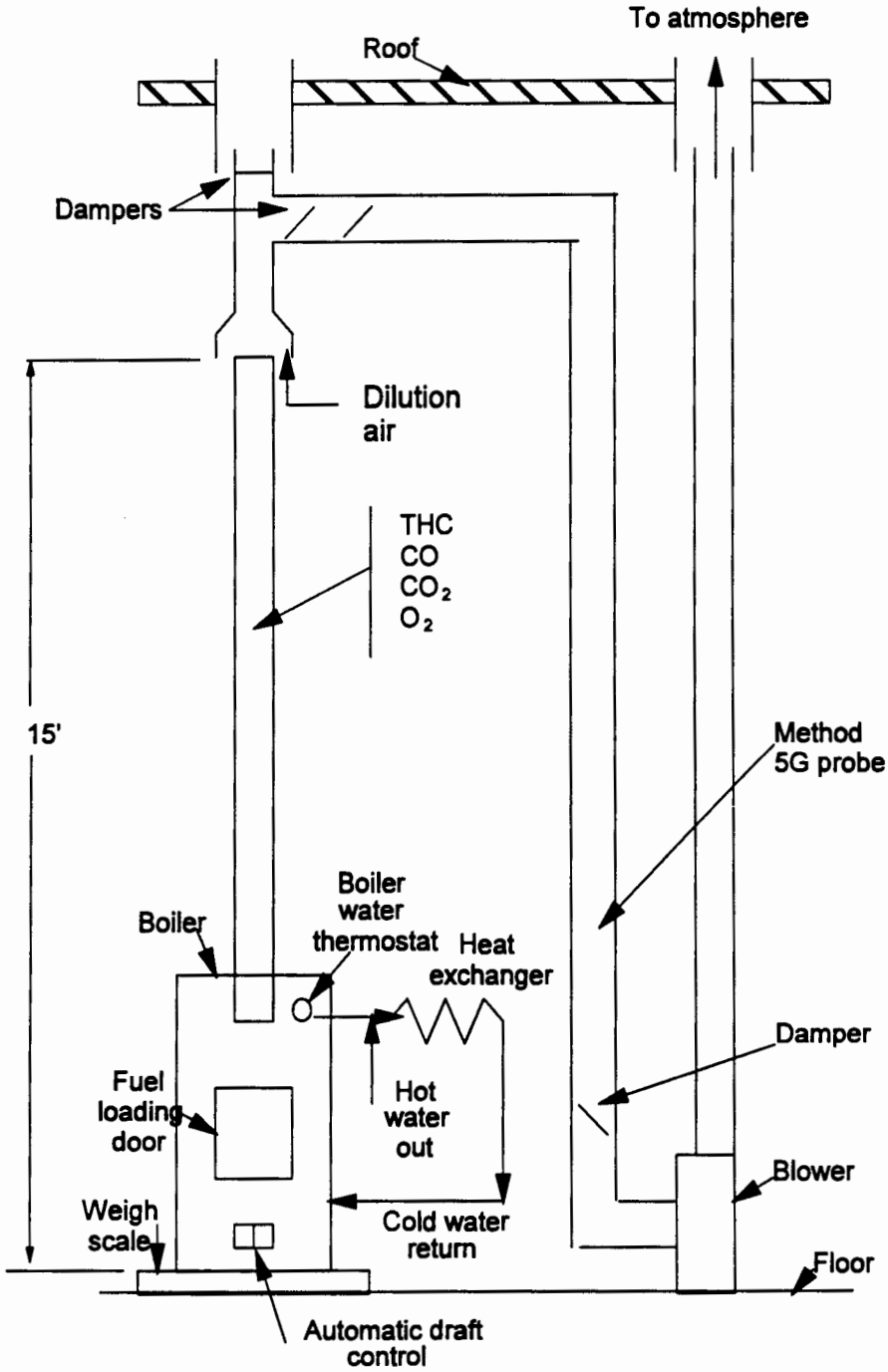


Figure 2-3. Typical furnace test setup.

to raise the water temperature in the tank to the operating temperature of ~180 °F. At least one hour before the sampling was to begin, the heat removal rate and the furnace were adjusted to the test conditions. During the pre-burn period the continuous emissions monitors (CEMs) were calibrated to appropriate zero and span values. After the two-point calibration, the CEMs were set to sample. Also during this time, the MM5G sampling train was assembled and checked for leakage. Upon passing the leak check as specified by the test methods, the sampling trains were set to sample.

Once the pre-load fuel had been reduced to hot coals, the MM5G sampling pumps and CEM pumps were started. The furnace was stoked to its specified fuel charge. The initial scale readings were recorded along with the process temperatures, flue gas concentrations, and ambient temperature and humidity. The critical parameters were continually monitored and recorded at regular intervals throughout the test. During the test, the systems were continually monitored. The water flow rate was adjusted during the test, as needed, to maintain the desired heat removal rate. The furnace's built-in temperature controlling thermostat continually measured the temperature in the water tank and adjusted the combustion process to suit the heat removal rate.

The sampling was ceased when the entire test fuel charge had been expended as measured by the weight. A post-test, leak check of the MM5G sampling train and verification of the CEM's zero and span calibration values were conducted. The MM5G sample filters were recovered by returning the filters to their labeled petri dishes and returning them to a desiccator. The XAD-2 absorbent trap was sealed and stored in a freezer. The probe and glassware were triple rinsed with acetone into a clean, tare weighed pan and placed into a fume hood for reduction. The sample fractions and XAD-2 were stored for later semivolatile, polycyclic aromatic hydrocarbon (PAH), and condensible organic analyses. These terms are described in more detail below.

2.4 ANALYSIS

Upon recovery of sample at the conclusion of a test, the filters and the pan from the probe rinse were transferred to a desiccator. After a minimum of 24 hours in a desiccator, the filters and pan rinse were weighed. The collected particulate matter was calculated as the difference between the filter and pan final weight and the tare weight. The total particulate matter was calculated as the sum of all the values from each of the components for each test.

The collected particulate and organics from the filters, pan rinses, and XAD-2 canisters were then extracted with methylene chloride and reduced to a volume of 5mL. This reduced sample was used to measure the organic composition of the particulate.

The condensible fraction represents compounds with boiling points greater than 300°C. A 1 mL aliquot was removed from the 5mL extract solution. The aliquot was added to prepared and tared micrograv pans. The pan weights were measured and repeated

at 24-hour intervals until a 1-percent or less relative difference was recorded between consecutive weighings. Between weighings, the pans were stored in a desiccator over activated carbon and silica gel. The net weight of the reduced aliquot was calculated by subtracting the tare weight. The net weight was multiplied by five to obtain the total extracted condensible organics sampled.

A second 1mL aliquot was removed from the extracted solvent solution for total chromatographable organic (TCO) analysis. TCO compounds are defined as semivolatile organics with boiling points between 100 and 300°C. The TCO determinations were measured with a gas chromatograph. The aliquot was sealed in a glass autosampler vial. The samples were injected into a fused-silica capillary column heated to a final temperature of 250°C. The column was connected to a flame ionization detector (FID) that produced a response approximately proportional to the weight of organic material present in the sample. The analyzer then used algorithms to calculate and validate data. The TCO program summed together all valid data from duplicate runs of each sample. The TCO program then used storage parameters to calculate TCO mass per sample and statistical information about the replicate results.

The polycyclic aromatic hydrocarbons were analyzed using a mass spectrometer (MS). The MS was tuned for better resolution around a list of target analytes. The target analytes are listed in Table 2-3.

TABLE 2-3. PAH Target Analyte List [number in () refers to Figures 4-2 and 4-3].

Naphthalene (1)	Chrysene (11)
2-methyl naphthalene (2)	Benzo(a)anthracene (12)
Acenaphthylene (3)	Benzo(b)fluoranthene (13)
Acenaphthene (4)	7,12-Dimethylbenz(a)anthracene (14)
Dibenzofuran (5)	Benzo(k)fluoranthene (15)
Fluorene (6)	Benzo(a)pyrene (16)
Phenanthrene (7)	3-methyl cholanthrene (17)
Anthracene (8)	Indeno(1,2,3-cd)pyrene (18)
Fluoranthene (9)	Dibenz(a,h)anthracene (19)
Pyrene (10)	Benzo(ghi)perylene (20)

SECTION 3.0 - QUALITY ASSURANCE AND QUALITY CONTROL

3.1 PREPARATION OF SAMPLING MEDIA

All MM5G sampling glassware was acetone rinsed, scrubbed with a nylon brush if necessary, and left under a fume hood for 24 hours prior to assembling the sampling trains. The quartz fiber filters were desiccated for a minimum of 24 hours. An average tare weight was recorded for each filter after three consecutive weight measurements. The filter casings were then assembled and sealed with aluminum foil until the final assembly.

The XAD-2 canister and resin were cleaned prior to assembling. Impurities were extracted from the resin by sequentially pumping toluene and dichloromethane through the media. The solvents were then removed from the resin by evaporation with a stream of nitrogen. The XAD canister was baked in an oven for 24 hours to remove impurities. Once cleaned, the canister was filled with the XAD-2 resin and sealed. The sealed containers were refrigerated until the final assembly in the sample trains.

When all the components for the sampling train were ready for assembling, the components were visually inspected and assembled. Once the sampling train was assembled, a vacuum leak check was performed on the system. The assembly was accepted if less than 0.02 ft^3/min, or approximately two-percent of the normal sampling rate, could be pulled through the sampling train while the probe was capped or plugged. If the sampling train did not pass the leak check, it was disassembled, reassembled, and checked again until the leakage was reduced to the acceptable level. The sampling train was also checked for leaks at the completion of the test. If the sampling train did not pass the post-test leak check, the test was disregarded.

The MM5G dry gas meters have been calibrated semi-annually against a spirometer. Temperature and pressure measurements are taken before and after the meter, so as to convert the measured dry gas volume flow rates to standard pressure and temperature.

3.2 MEASUREMENTS

All thermocouples used for measuring temperatures were calibrated at the end of the test period. The thermocouples were calibrated at two points, in freezing water and in boiling water. All of the thermocouples measured the two calibration standards to within 1F°. The results of the calibration are reported in Appendix A.

The continuous emission monitors (CEMs) used to measure the gas concentrations in the stack and dilution tunnel were zeroed and spanned prior to and following each test. The CEMs were calibrated to two values. First, the CEMs were calibrated to zero with nitrogen. The other value for the calibration, the instrument span, was measured against bottled gases of known concentrations. At one facility, a three-point calibration was conducted prior to testing. The other facility performed a five point calibration at the completion of all the tests. The daily zero and span calibration checks are reported with the test information data. The post-test calibrations are reported in Appendix B.

The volume flow rate of the water circulated from the tank of the furnace was measured with either a rotameter (Furnace A) or a totalizing flow meter (Furnace B). The meters were calibrated by weighing the water collected in a container over a set flowrate and timed interval. The total volume of water as determined from the weight was then compared to the measured volume flow as measured by the meter. The results from the water meter calibrations are reported in Appendix C.

The method used to determine the average moisture content of the fuel differed between the two facilities. One facility determined the average moisture content of the fuel in a manner consistent with Method 28. Each individual piece of test fuel was weighed and measured for moisture content. The weight and moisture content of the individual pieces of test fuel ranged from 1.5 to 5 lbs and 10- to 35-percent respectively. The moisture content value used in the calculations was determined as the average measured moisture content. Because the test fuel used was not dimensioned lumber as per Method 28, the other facility determined the moisture content of the fuel as a weighted average. Each individual piece was weighed and measured for moisture content. The total weight and moisture weight was determined. The resulting weighted average was determined as the fraction of total moisture per total dry weight of the fuel charge. Both laboratories used the Delmhorst electric conductivity instrument to measure the moisture content of the individual pieces of wood. This instrument provides a direct reading of the moisture content on a dry wood basis.

The fuel charges were also loaded differently at the two facilities. This investigation was undertaken to determine baseline emission factors for these furnaces at normal operating conditions. The furnaces were therefore loaded in a manner recommended by the respective manufacturers. One facility loaded the test fuel into the firebox in a latticed fashion. Each layer of fuel was turned perpendicular to the preceding layer. The other facility loaded fuel into the firebox in a more compact stack of parallel layers.

3.3 DATA QUALITY INDICATOR GOALS

Despite their differences, both facilities were able to remain (with minor exceptions) within the guidelines of the technical objectives and data quality indicator goals established

in the Quality Assurance Project Plan. The EPA audited the test procedures and equipment at each of the testing facilities. Through the Technical Systems Audit (TSA), the EPA identified all procedural modifications and differences. The EPA concluded that "The TSA did not identify any major problems associated with the implementation of the QAPP ... The quality of data generated is expected to satisfy the project's technical objectives."

The manufacturer of Furnace A recommended a water reservoir set point (temperature at which the draft is turned off) of 160 °F. Scoping Test A-1 set point was incorrectly set at 120 °F. Average water outlet temperature for test A-1 was 124 °F. The set point for the remaining tests on Furnace A was 160 °F; the water outlet temperature for these tests ranged from 156 to 172 °F. Average Furnace B water reservoir outlet temperature ranged from 180 - 182 °F for the four tests. Although the QAPP was written with the concept of requiring a set point temperature ≥180 °F, this requirement was abandoned for the tests on Furnace A in favor of the manufacturer's recommendation. Manufacturer of furnace B recommended a set point of 180 °F as being typical of field operation.

Scoping Tests A-1 and A-2 on Furnace A burned mixed hardwood fuel. All the remaining tests on Furnace A, and all tests on furnace B, used seasoned red oak fuel from the same source.

The data quality indicator goals from the QAPP are identified in Table 3-1. It should be noted that due to the length of these tests, and the fact that tests were not intended as certification tests, the DQI goals for O_2, CO_2, and CO measurements were relaxed from the standards of Method 5H to the less stringent standards set forth in Methods 3A and Method 10.

TABLE 3-1. PRECISION, ACCURACY, AND COMPLETENESS OBJECTIVES

Measurement Method or Parameter	Reference	Experimental Conditions	Precision Standard Deviation	Accuracy	Completeness
Velocity-Pitot/ Manometer	EPA-2	Stack	10%	None	100%
Moisture-Condenser	EPA-4	Stack	5%	None	100%
Moisture-Wet Bulb/ Dry Bulb Thermocouple		Ambient	±5%	None	100%
Moisture-Condenser	EPA-4	Dilution Tunnel	±5%	None	100%
Stack Temperature		Stack	±5%		100%
Boiler Water Temperature (In & Out)		Furnace	±5%		100%
Stove Surface Temperature	EPA-28	External Surface	±5%	±1°F	100%
Stove Combustion Temperature	EPA-28	Firebox	±5%	±1°F	100%
O_2-Paramagnetic Monitor	44FR58625	Stack	±10%	±10% Bias	100%
CO/CO_2-Nondispersive Infrared Monitor	44FR58625	Stack	±2%	±5% Bias	100%
CO-NDIR		Dilution Tunnel	—	—	—
THC-FID	44FR58625	Stack	±10%	±10% Bias	100%
Particulate Emissions	EPA-MM5,5G	Dilution Tunnel	±10% RPD[a]	±15%	100%
Total Chromatographic Organics	EPA-MM5G	Dilution Tunnel	±10% RPD[a]	±25%	100%
Semivolatile Organics	EPA-MM5G	Dilution Tunnel	±10%	±20%	100%
Test Fuel Weight Electronic Weight Scale	EPA-28	—	±5%	±0.5	100%
Test Fuel Moisture Electrical Resistance	EPA-28	—	±5%	±3% Bias	100%
Test Fuel Moisture ASTM		—	—	—	—

[a] Relative Percent Difference

SECTION 4.0 - DATA, RESULTS AND DISCUSSION

4.1 GENERAL DISCUSSION

The two furnaces were tested at separate wood stove testing facilities following prescribed EPA test methods. One of the laboratories is EPA-accredited for certification testing wood heaters. The test methods provided sufficient controls to ensure that the testing results were comparable. The test methods did, however, allow for some flexibility in the equipment and means in which the data were collected.

Both facilities were equipped with similar dilution tunnel arrangements. The position of the dilution tunnel "bell" relative to the stack is set so that the negative pressure in the tunnel does not affect the stack pressure. The Method 28 criteria require that, with the tunnel turned on, the effect on stack pressure must be <0.005 in. of H_2O. The negative pressures maintained in the dilution tunnel pull the stack emissions into it along with ambient (dilution) air. A greater or lesser amount of excess air may have been pulled into the dilution tunnel depending upon the stack flow, so that the total tunnel volumetric flow remains relatively constant. The sampling rate was related to the volume flow rate within the dilution tunnel. The resulting calculation yielded a value of total measured emissions independent of the quantity of the excess air.

At one of the testing facilities, the dilution tunnel flow rate was sized for normal wood stove testing which easily accommodates stack flows in the 10 - 30 cfm range. During preliminary firing of Furnace A, it was found that with the draft setting at its maximum, a significant fraction of the stack emissions were not captured by the tunnel. However, during actual testing, the draft setting was reduced per the manufacturer's direction to a nearly closed position, limiting air flow into the furnace. Under these reduced draft flow conditions, all stack emissions were captured during tests of the standard furnace. When testing Furnace A with the prototype catalyst (tests A-7 and A-8), the draft setting was closed down, again at the manufacturer's direction. However, when the draft was on, significant emissions escaped the furnace and were not captured by the tunnel. The draft was on for a small fraction of the total test period. The effect on the measured emissions cannot be quantified; the final emission numbers presented in this report may be under estimated by as much as 20% for tests A-7 and A-8.

Another variance between the testing facilities was the manner in which the data were recorded. One facility utilized a data acquisition system (DAS) to record, at one minute intervals, the temperatures, the CEM measured gas concentrations, and the weight of the remaining fuel. The other facility manually recorded the same information at ten-minute intervals. During the ten minute intervals, significant excursions in the measured gas concentrations may have occurred without being recorded. The data were averaged over the duration of the test to minimize the affects the excursions might have on the resulting data. In addition, the difference in the manner in which this portion of the data was recorded did not affect the MM5G particulate measurements.

Scoping tests A-1 and A-2 with Furnace A were conducted as preliminary runs to evaluate the test methods and collect data to predict heat load maintenance operations, and filter and XAD-2 loadings. Both of these scoping tests were run using a different fuel (mixed hardwoods) than the remaining tests. In addition, Scoping Test A-1 was run at the incorrect water reservoir temperature set point. The results from scoping tests A-1 and A-2, and from the two tests with the preproduction prototype catalyst (tests A-7 and A-8) are presented separately from the other tabulated test results.

4.2 CALCULATED RESULTS

The MM5G sampling train was used to calculate the total particulate matter (PM) in the emissions. The total PM was divided by the sampling time to calculate the average emissions in grams per hour. The burn rate of the fuel was determined from the dry weight of the initial fuel charge and the sampling time. The input fuel energy was determined from the dry charge weight and the dry basis heating value of the wood as determined by the ultimate and proximate analyses. The ratio of particulate weight to dry fuel weight was determined from the average PM emission rate and the burn rate. The total PM was then compared to the total input heat; the result was a calculation of milligrams of particulate matter per Btu of input heat. This value was also converted to milligrams of PM per megajoule (MJ) of input heat. The total PM was also compared to the furnace output in units of milligram per Btu of output heat. The MM5G particulate results for the comparable tests on both furnaces are presented in Table 4-1a. The organics results in the samples, measured as GRAV, TCO, and PAH fractions, are reported in Table 4-2a. The PAH results shown in Table 4-2a are based on the target compounds listed in Table 2-3. The gas concentrations shown in Table 4-3a are reported as averages over the duration of the tests.

4.3 EVALUATION OF RESULTS

The first two tests on Furnace A (scoping tests A-1 and A-2) were performed as an evaluation of the test methods. As previously stated, the test methods were developed for the testing and certification of wood stoves and had to be modified for testing the central heating furnaces. These two initial

scoping tests were therefore used for methods evaluation and development. These data, reported separately in Tables 4-1b through 4-3b, indicate that the developmental tests results, even with different, somewhat higher moisture cordwood as fuel, are consistent with the other tests. Note also that scoping test A-1 was run at a lower water temperature set point (120° F compared to 160° F for all the rest of Furnace A tests). The results from the prototype catalyst tests on Furnace A are also presented in Tables 4-1b through 4-3b.

In all test cases, the furnaces delivered heat at an efficiency of about 50 percent, plus or minus 10 percent, of the input heating value of the wood. This measurement reflects the combustion of the fuel and transfer of the heat to the water in the tank to be circulated. This does not account for the efficiency of the heat exchanging device or electrical energy required for the draft fan, the draft damper or the thermostats.

As noted previously one furnace (Furnace A) was supplied by the manufacturer with a water-air heat exchanger to simulate the home heat demand. Furnace B's manufacturer provided a water-water heat exchanger for this purpose. Appendices D and E, respectively, show that this had a significant effect on the draft on/off cycle times. Furnace A's cycle was quite variable. Typically, it cycled on for about 120 min. At the higher burn rate, it then cycled off for about 60 min. At the lower burnrate it cycled off for about 80 min. Furnace B exhibited a typical on cycle of 8 minutes, followed by 30 and 60 min. off cycles at higher and lower burn rates, respectively.

The MM5G data were analyzed to see if a relationship existed between the measured emissions, in grams per MJ heat input rate, and the average burn rate, in dry kilograms of fuel burned per hour. The relationships are illustrated in Figure 4-1. The particulate matter emission factor does not show a clear trend as a function of the burn rate. At a glance, the organic measurements do not show any trend, either. For a given furnace configuration, the emission factors derived from Figure 4-1 appear to be relatively constant across the burn rate range studied. Furnace A with the prototype catalyst showed higher levels of TCO and PAH emissions, especially at the lower burn rate. This may have been due to cracking of the larger organic molecules as they passed through the catalyst but not complete oxidation due to a lack of excess air.

The difference in the catalyst versus noncatalyst results from Furnace A can be explained in two possible ways. The catalyst could have greatly changed the combustion process and therefore, the emissions composition. For example, it was noted that the furnace operated much differently with the catalyst installed. The heat was transferred to the furnace's water tank at a much higher rate with the catalyst. Also, the excess oxygen level fell to nearly zero when the draft was on (see runs TTCD-1 and 2 in Appendix D). But when the temperature in the tank reached the maximum of the set range, the thermostat would stall the combustion. During the periods of stalled combustion, the temperatures at the catalyst were not sufficient for the catalyst

to be effective. The overall process resulted in the furnace cycling "on and off" more frequently.

Another possible explanation for the difference in catalyst versus noncatalyst results was the timely manner in which the samples were analyzed. All samples for all tests were measured for total particulate within 24 to 36 hours after the tests. The separate components were then stored for analytical analysis. The samples were then extracted within 30 days after the measurements for total particulate. The extracted samples were then stored in a freezer until all the tests were completed. The non-catalyst samples were stored for nearly 6 months while the catalyst samples were stored for 45 days. The non-catalyst samples were analyzed well outside the test method specified hold times. Based on experience on a number of prior projects, however, it is believed that the without catalyst PAH data were not severely compromised by this delay.

Furnace A results for the low heat output without catalyst runs (tests A-5 and A-6) and both tests with the catalyst in place (tests A-7 and A-8) are suspect because the weigh scale showed periods of weight gain near the end of each test (see Appendix D, Run TTD-1A, for example). These tests were continued until the scale reached zero as specified in the method. The reasons for the weight increases are not known; possibilities include a shift in the plumbing to the heat exchanger which placed more weight on the scale or moisture condensation in the furnace-stack system (although the latter seems highly unlikely). The plastic plumbing looped from the back of the furnace, across the laboratory floor, and then up to the heat exchanger mounted on an 8 ft high shelf. It is very possible that the piping was bumped or changed position due to thermal stresses during the suspect tests. The data from these tests are consistent with the other results so they are included in the tables, but should be treated with caution, especially the values calculated on a emission per hour basis. The values calculated on an emissions per unit weight of fuel and per unit heat value are less likely to have been affected by the weigh scale anomaly. These anomalies occurred late in each test during the final phase of the charcoal burn when very little particulate was being generated.

The laboratory which tested Furnace A was equipped with two CO monitors in the stack, one calibrated over a 0-5000 ppm range, the other over a 0-5% range. A third CO monitor, calibrated over a 0-2000 ppm range analyzed samples from the dilution tunnel. At some point during all tests on Furnace A, the stack low range instrument and the dilution tunnel CO monitor experienced CO concentrations exceeding their respective high limits. Under this condition, the instruments are effectively pegged and the readings are useless. Therefore, the Furnace A CEM data in Appendix D include the minute readings on these two monitors but no average is shown since it would be incorrect.

Two basic furnace designs (single and double pass boiler heat exchanger) were chosen for these tests to see if this impacted emissions. Table 4-4 presents the particulate and PAH

emission factor data and efficiency aggregated by furnace and operating mode. Furnace A with the prototype catalyst showed markedly higher PAH emissions compared to the standard Furnace A. Furnace B showed much less variability in operation and emissions data compared to Furnace A. Whether this is due to (1) furnace design, (2) the way the fuel was loaded, and/or (3) the differences in the draft on/off cycles cannot be determined without further tests; more than likely, all three variables exerted significant influences.

Table 4-5 lists the emission results for various residential combustion devices. Furnace A test results (the next to last line in Table 4-5) are the average of the four tests(A-3 through A-6) shown in Table 4-1a. The test results from Furnace B (the last line in Table 4-5) are included as an average from all four tests (B-1 through B-4). Note that all particulate emission values have been converted to the EPA Method 5H equivalents. The levels of PAHs in the emissions are comparable to EPA-certified wood stoves. The data presented in Table 4-5 were originally generated by different researchers using a variety of sampling and analytical methodologies. A number of assumptions had to be made to "normalize" the data for comparison. Consequently, only order of magnitude differences should be considered significant. Readers are encouraged to review the reference cited in the footnote for a more thorough understanding of the data.

Figures 4-2 and 4-3 present results for the individual PAH compounds for each test on Furnaces A and B, respectively. In testing Furnace B, dual MM5G sampling trains were used and the PAH results from each train are presented separately in Figure 4-3 to illustrate the excellent precision achieved. The target compounds are listed in order in Table 2-3.

These tests were designed to provide Wisconsin DNR with a first look at emissions from residential wood burning furnaces. The differences in fuel load configuration and draft on/off cycling time make it difficult to discern any significant difference between the results from the two furnaces. If further emissions testing is conducted, it should be designed to verify the measured results and further investigate the effects of variations in furnace design (including the draft on/off cycle time) and operating protocol.

TABLE 4-1a. SUMMARY OF TEST RESULTS - FURNACES A AND B COMPARATIVE DATA.

Furnace/Test/ Condition	Wood Load (wet lbs)	Coal Bed (lbs)	Moisture (% dry basis)	Average Burnrate (dry kg/hr)	Average Delivered Efficiency (%)	Particulate, EPA Method 5G				
						g/hr	g/kg of dry fuel	mg/Btu output	mg/MJ output	mg/MJ input
Furnace A/A-3/high heat removal	87.0	21.3	23.9	5.86	38.8	143.2	24.5	3.55	3361	1305
Furnace A/A-4/high heat removal	81.2	12.0	22.1	4.11	53.4	61.0	14.8	1.56	1482	791
Furnace A/A-5/low heat removal[a]	80.5	30.0	21.8	2.42	46.4	38.5	15.9	1.93	1829	849
Furnace A/A-6/low heat removal[a]	83.0	18.5	20.4	2.81	42.4	48.6	17.3	2.30	2177	924
Furnace B/B-1/high heat removal	133.0	29.5	23.7	3.36	50.5	36.5	10.8	1.21	1145	579
Furnace B/B-2/high heat removal	136.9	29.5	23.7	2.84	57.1	37.6	13.3	1.31	1238	707
Furnace B/B-3/low heat removal	125.3	28.0	24.7	1.51	55.4	14.3	9.5	0.96	911	505
Furnace B/B-4/low heat removal	139.5	28.0	23.6	1.68	55.1	15.5	9.2	0.94	892	491

a. Weigh scale data suspect; per hour data therefore suspect. Per kg and per heat unit data not as likely to have been affected.

TABLE 4-1b. SUMMARY OF TEST RESULTS - FURNACE A SCOPING AND PROTOTYPE CATALYST DATA.

Furnace/Test/ Condition	Wood Load (wet lbs)	Coal Bed (lbs)	Moisture (% dry basis)	Average Burnrate (dry kg/hr)	Average Delivered Efficiency (%)	Particulate, EPA Method 5G				
						g/hr	g/kg of dry fuel	mg/Btu output	mg/MJ output	mg/MJ input
Furnace A/scoping test A-1/high heat removal	82.5	NA[a]	29.0	4.14	58.9	35.1	8.5	0.81	767	452
Furnace A/scoping test A-2/ high heat removal	83.5	NA	25.1	3.95	58.2	49.9	12.6	1.22	1158	674
Furnace A/with catalyst test A-7/ high heat removal[b]	84.0	NA	21.7	4.73	47.6	53.8	11.4	1.35	1276	583
Furnace A/with catalyst test A-8/ low heat removal[b]	87.5	NA	18.9	2.49	54.4	37.8	15.2	1.58	1492	812

a. Data not available for these tests.
b. Weigh scale data suspect; per hour data therefore suspect. Per kg and per heat unit data not as likely to have been affected.

TABLE 4-2a. ORGANIC EMISSIONS SUMMARY - FURNACES A AND B COMPARATIVE DATA.

Furnace/Test/ Condition	Gravimetric Analysis		Total Chromatographable Organics		Polycyclic Aromatic Hydrocarbons	
	g/h	mg/MJ in	g/h	mg/MJ in	g/h	mg/MJ in
Furnace A/A-3/high heat removal	90.5	823	3.75	34.2	2.80	25.5
Furnace A/A-4/high heat removal	42.0	546	2.84	36.8	0.890	11.6
Furnace A/A-5/low heat removal[a]	27.1	597	8.31	183	0.594	13.1
Furnace A/A-6/low heat removal[a]	33.3	632	4.53	85.9	0.641	12.2
Furnace B/B-1/high heat removal	23.2	370	3.83	61.0	1.09	17.5
Furnace B/B-2/high heat removal	21.6	407	5.40	102	0.893	16.8
Furnace B/B-3/low heat removal	9.41	329	3.00	105	0.356	12.5
Furnace B/B-4/low heat removal	10.0	319	2.33	74.1	0.557	17.7

a. Weigh scale data suspect; per hour data therefore suspect. Per heat unit data not as likely to have been affected.

TABLE 4-2b. ORGANIC EMISSIONS SUMMARY - FURNACE A SCOPING AND PROTOTYPE CATALYST DATA.

Furnace/Test/ Condition	Gravimetric Analysis		Total Chromatographable Organics		Polycyclic Aromatic Hydrocarbons	
	g/h	mg/MJ in	g/h	mg/MJ in	g/h	mg/MJ in
Furnace A/scoping test A-1/high heat removal	24.9	321	1.57	20.3	0.543	7.00
Furnace A/scoping test A-2/high heat removal	28.1	380	5.93	80.1	0.435	5.88
Furnace Awith catalyst A-7/ high heat removal[a]	20.7	234	26.7	301	2.58	29.1
Furnace A/with catalyst A-8/ low heat removal[a]	54.6	1170	42.8	917	2.68	57.4

a. Weigh scale data suspect; per hour data therefore suspect. Per heat unit data not as likely to have been affected.

TABLE 4-3a. GAS CONCENTRATIONS - FURNACES A AND B COMPARATIVE DATA.

Furnace/Test/Condition	O_2 %	CO_2 %	CO %	THC ppm
Furnace A/A-3/high heat removal	9.70	10.42	2.44	Na[a]
Furnace A/A-4/high heat removal	9.55	10.30	1.79	Na
Furnace A/A-5/low heat removal	11.01	8.82	1.46	Na
Furnace A/A-6/low heat removal	9.92	9.61	1.75	Na
Furnace B/B-1/high heat removal	15.76	4.01	0.93	Na
Furnace B/B-2/high heat removal	16.09	3.71	0.78	Na
Furnace B/B-3/low heat removal	15.40	4.68	1.27	Na
Furnace B/B-4/low heat removal	15.38	4.63	1.10	Na

a. Hydrocarbon analyzer not available for these tests.

TABLE 4-3b. GAS CONCENTRATIONS - FURNACE A SCOPING AND PROTOTYPE CATALYST DATA.

Furnace/Test/Condition	O_2 %	CO_2 %	CO %	THC ppm
Furnace A/scoping test A-1/high heat removal	14.27	6.38	1.15	1057
Furnace A/scoping test A-2/high heat removal	15.59	5.16	0.62	1640
Furnace A/with catalyst A-7/high heat removal	11.08	9.39	1.37	2533
Furnace A/with catalyst A-8/low heat removal	13.52	7.32	0.95	1358

TABLE 4-4.COMPARITIVE DATA AGGREGATED BY OPERATING MODE AND FURNACE [RANGE IN ( )].

Operating Mode	Furnace		Parameter
	A	B	
High Heat	19.6 (14.8-24.5) 0.347(0.216-0.478) 45.6 (38.8-53.4)	12.0 (10.8-13.3) 0.319 (0.315-0.324) 53.8 (50.5-57.1)	M5G Particulates, g/kg PAH, g/kg Delivered Efficiency, %
Low Heat removal	16.6 (15.9-17.3) 0.236 (0.228-0.245) 44.4 (42.4-46.4)	9.35 (9.2-9.5) 0.283 (0.235-0.332) 55.2 (55.1-55.4)	M5G Particulates, g/kg PAH, g/kg Delivered Efficiency, %

TABLE 4-5. OVERALL COMPARISON OF RESIDENTIAL WOOD, OIL, AND GAS COMBUSTION EMISSIONS[a]

Combustion Device	M5H Particulate, mg/MJ input	PAHs, mg/MJ input	Mutagenicity, krev/MJ input[b]
Natural gas furnace			
Conventional	0.44	0.000124	0.007[c]
High Efficiency	0.43	0.000028	ND[c,d]
Oil Furnace			
Retention head	3.2	--[e]	6
Conventional	15.1	--	20
Conventional wood stove	786	40	600
Certified wood stove			
Non-catalytic	383	28	100
Catalytic	425	24	--
Pellet (certified)	110	0.082	--
Pellet (exempt)	176	0.014	--
Fireplace	907	41	--
Wood furnace			
Cordwood-Swedish lab tests			
Intermittent firing	1862	--	
Continuous firing	182	15.3	148[f]
Chips (dry)	45.3	<0.02	0.48[f]
U.S. EPA lab tests (this report)			
Furnace A[g]	*1048*	*15.6*	--
Furnace B	*681*	*16.1*	--

a = All data except that in *italics* taken from: McCrillis, R.C., "Review and Analysis of Emissions Data for Residential Wood-Fired Central Furnaces," In Proceedings of the 88th Annual Meeting of the AWMA, Air & Waste Management Association, San Antonio, TX, June 1995, Paper No. 95-RP137.04.
b = Microsuspension assay, TA98+S9 unless otherwise noted.
c = Ames plate incorporation assay, TA98+S9.
d = ND means not detected.
e = No data available for this parameter.
f = Ames plate incorporation assay, TA100+S9.
g = Only includes comparison data.

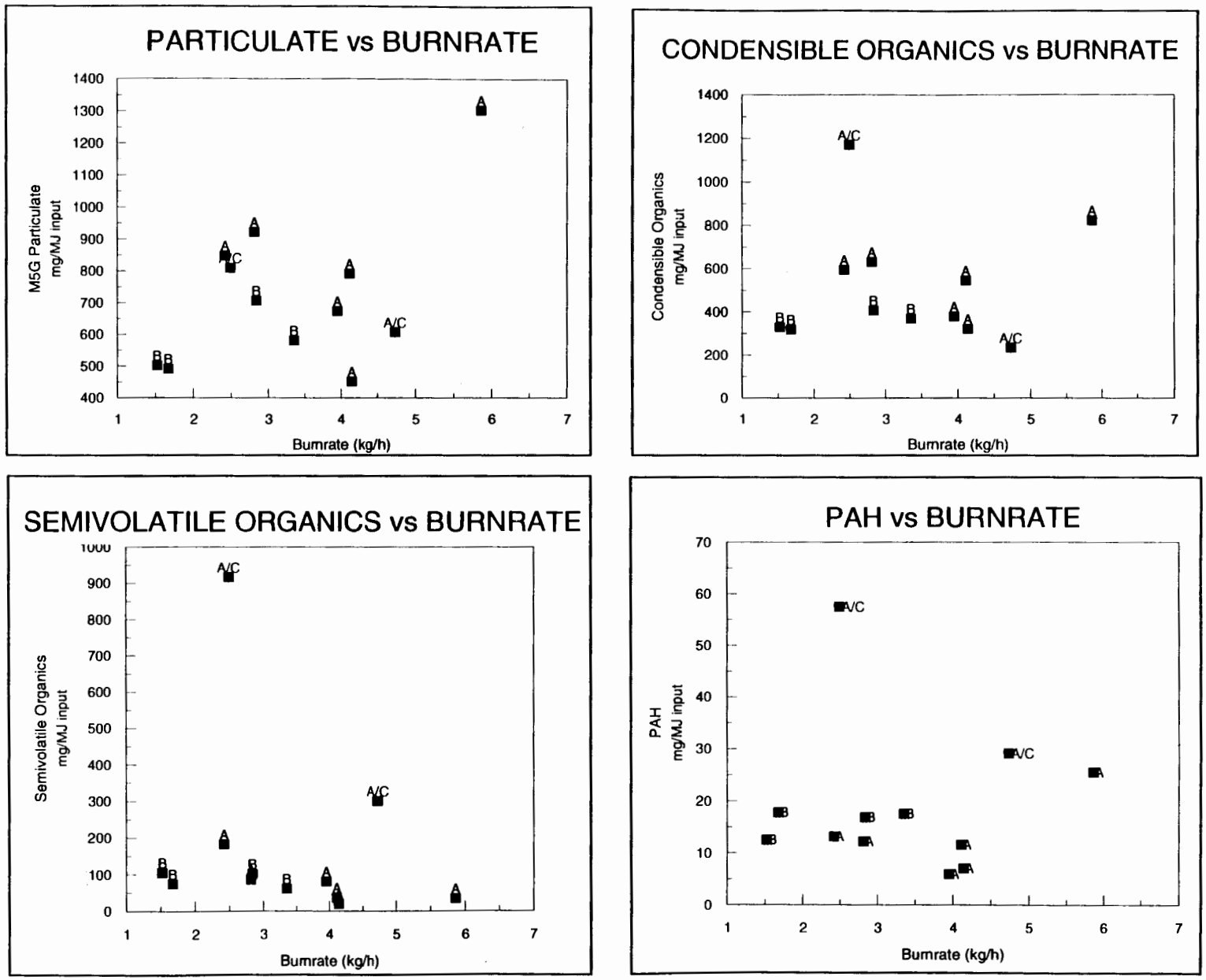


Figure 4-1. Summary of particulate and organic emissions data for wood-fired furnnaces A and B.

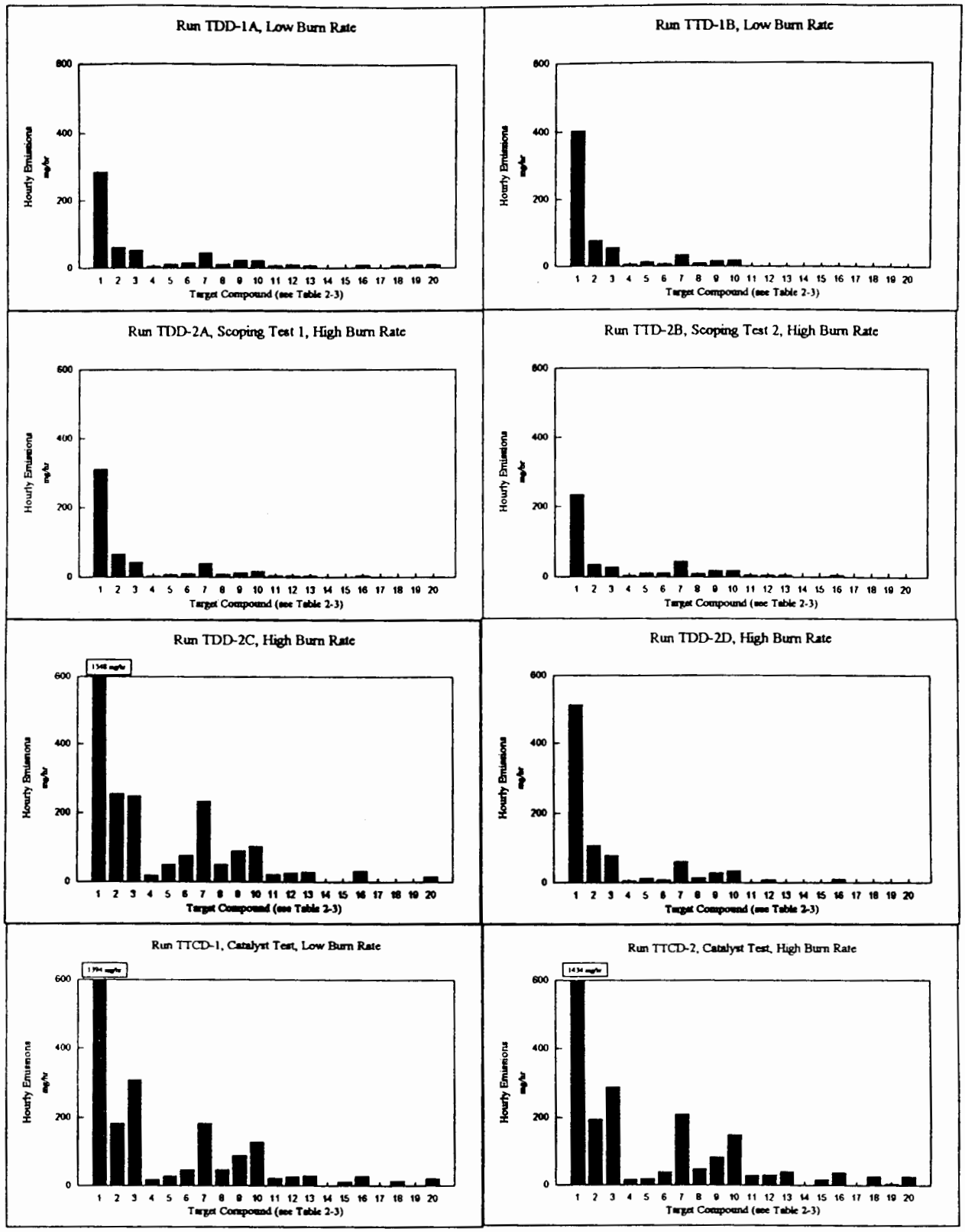


Figure 4-2. PAH Results for Furnace A. (Target Compounds are Identified in Table 2-3.)

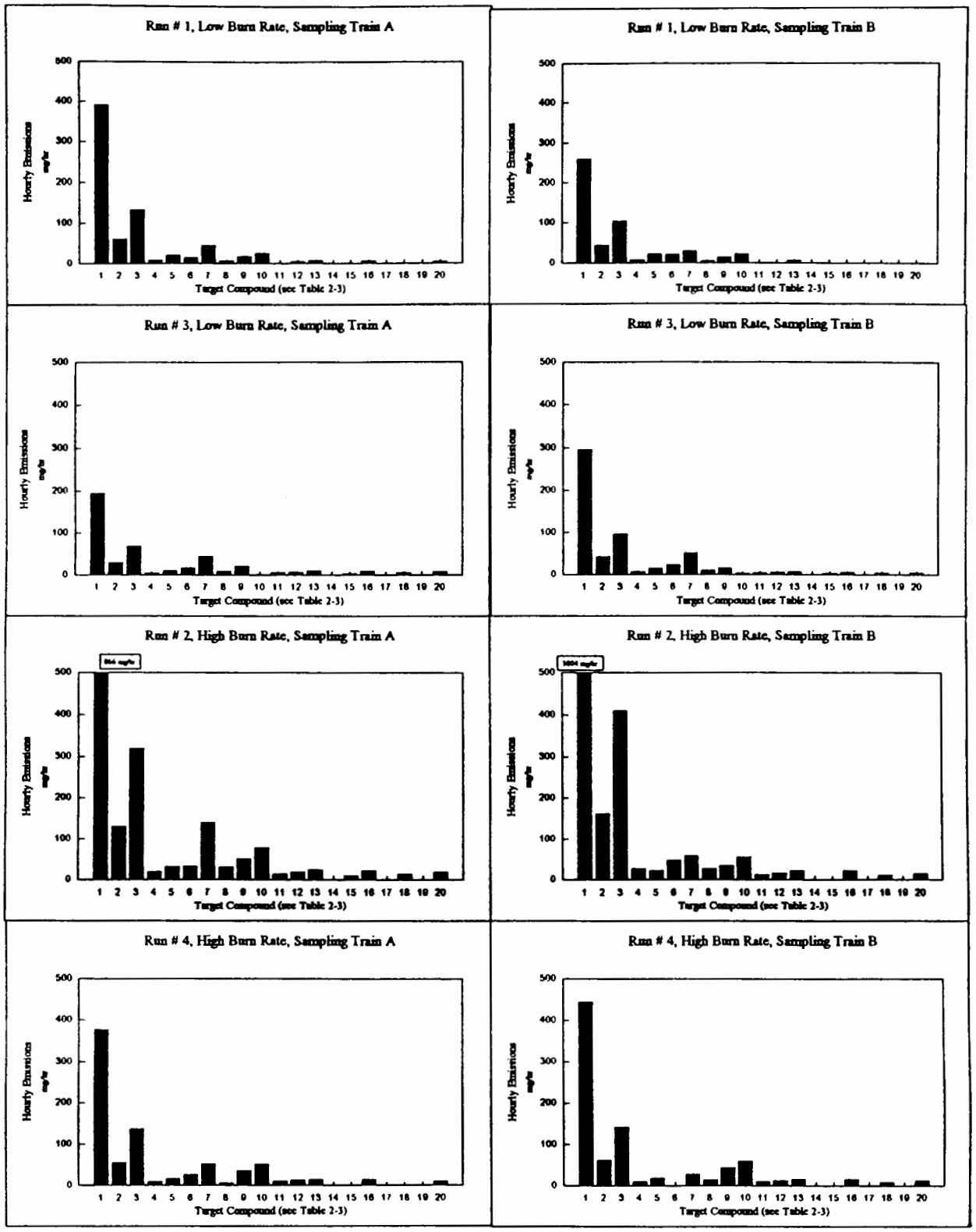


Figure 4-3. PAH Results for Furnace B. (Target Compounds are Identified in Table 2-3.)

SECTION 5 - CONCLUSIONS

There were several data quality problems with tests of Furnace A, all of which, although significant, are thought to be small enough to not bias the results for Furnace A sufficiently to cause an order of magnitude error. Tests of Furnace B had no reported data quality problems. All tests of Furnace B particulate matter emissions were in the range of 36.5 to 37.6 g/hr (high heat removal rate - tests B-1 and B-2) and 14.3 to 15.5 g/hr (low heat removal rate - tests B-3 and B-4) as shown in Table 4-1a. Particulate matter emissions from Furnace A appear consistently higher but, within the limits of these tests, experimental error, and considering the testing problems previously discussed that may have compromised the data quality for Furnace A, a direct comparison of Furnace A and Furnace B emissions is without adequate foundation and therefore is not meaningful. However, from inspection of Table 4-5, it is evident that all wood-burning home heating combustion equipment, including wood stoves, boilers, and fireplaces, has much higher particulate matter emissions than gas-fired or oil-fired home heating furnaces.

Appendix A - Thermocouple Calibration Data

FURNACE A THERMOCOUPLE CALIBRATIONS

DATE: July 10, 1995
NAME: Joseph Valenti and Russell Logan
TEST: Emissions from wood-fired residential heating furnace

DATA ACQUISITION	BOILING WATER °F	ICE WATER °F	AMBIENT °F	% DIFFERENCE
Fire Box	211.4	32.4	68.3	0.56
Stove Exit	212.6	32.4	68.3	0.11
Stack	212.8	32.4	68.0	0.22
Dilution	211.7	32.4	68.3	0.39
Ambient	212.6	32.4	69.1	0.11
Water In	210.7	32.4	67.4	0.94
Water Out	210.7	32.4	68.0	0.94
METER BOX				
Dilution	213	31	67	1.11
Filter	213	32	68	0.56
Inlet	211	32	68	0.56
Condenser	213	31	68	1.11
Temp Out	212	32	67	0.00

FURNACE B THERMOCOUPLE CALIBRATIONS

DATE: April 13,1995

TEST: Emissions from wood-fired residential heating furnace

Thermocouple Number	BOILING WATER °F	ICE WATER °F	% DIFFERENCE
1-Flue Gas	211	32	0.56
2-Room Temperature	211	32	0.56
3-Dry Bulb-Tunnel	211	32	0.56
4-Wet Bulb-Tunnel	211	32	0.56
5-Unit Top	211	32	0.56
6-Unit Back	211	32	0.56
7-Unit Right Side	211	32	0.56
8-Unit Left Side	211	32	0.56
9-Unit Bottom	211	32	0.56
10-Catalyst Downstream	211	32	0.56
11-Catalyst Center	211	32	0.56
12-(not used)	211	32	0.56
13-(not used)	211	32	0.56
14-(not used)	211	32	0.56
15-(not used)	211	32	0.56
16-(not used)	211	32	0.56
17-DGM in	211	32	0.56
18-DGM out	211	32	0.56
19-Filter	211	32	0.56
20-DGM in	211	32	0.56
21-DGM out	211	32	0.56
22-Filter (2)	211	32	0.56

Appendix B - CEM Calibration Data

FURNACE A CEM CALIBRATIONS

DATE: July 10, 1995
NAME: Joseph Valenti and Russell Logan

TEST: Emissions from wood-fired residential heating furnace

CEM ANALYZER	ZERO	SPAN	ACTUAL	% CALIBRATION ERROR
CO high	0 ppm	39307 ppm	39400 ppm	0.186
CO low	0 ppm	3760 ppm	3760 ppm	0
CO dilution	0 ppm	2004 ppm	2060 ppm	2.8
O2	0.06 %	9.61 %	9.7 %	0.36
CO2	0.02 %	6.4 %	6.0 %	1.48

SYSTEM BIAS	ZERO	SPAN	ACTUAL	% SYSTEM BIAS
CO high	0 ppm	10132 ppm	10060 ppm	0.144
CO low	0 ppm	2093 ppm	2060 ppm	0.66
CO dilution	0 ppm	467 ppm	465 ppm	0.1
O2	0.04 %	15.01 %	15 %	0.04
CO2	0.02 %	15 %	15 %	0

AMBIENT	
CO high	61 ppm
CO low	0 ppm
CO dilution	2 ppm
O2	20.66 %
CO2	0.05 %

FURNACE B CEM CALIBRATIONS

DATE: June 28,1995

TEST: Emissions from wood-fired residential heating furnace

CEM ANALYZER	ZERO	SPAN	ACTUAL	% CALIBRATION ERROR
CO	0 %	9.99 %	9.99 %	0
O2	0 %	24.5 %	24.50 %	0
CO2	0 %	20.93 %	20.93 %	0

CAL GAS #1	ACTUAL	SHOULD BE	% SYSTEM BIAS
CO	0.93 %	0.987 %	5.78
O2	10.2 %	10.05 %	1.49
CO2	9.43 %	9.99 %	5.61

CAL GAS #2	ACTUAL	SHOULD BE	% SYSTEM BIAS
CO	2.27 %	2.36 %	3.81
O2	5.69 %	5.55 %	2.52
CO2	5.58 %	5.88 %	5.10

CAL GAS #3	ACTUAL	SHOULD BE	% SYSTEM BIAS
CO	7.68 %	7.94 %	3.27
O2	17.58 %	17.53 %	0.29
CO2	19.05 %	19.89 %	4.22

AVERAGE	% SYSTEM BIAS
CO	4.29
O2	1.43
CO2	4.98

Appendix C - Water Meter Calibration Data

Furnace A water meter flow calibration.

DATE: July 10, 1995
NAME: Joseph Valenti and Russell Logan
TEST: Emissions from wood-fired residential heating furnace

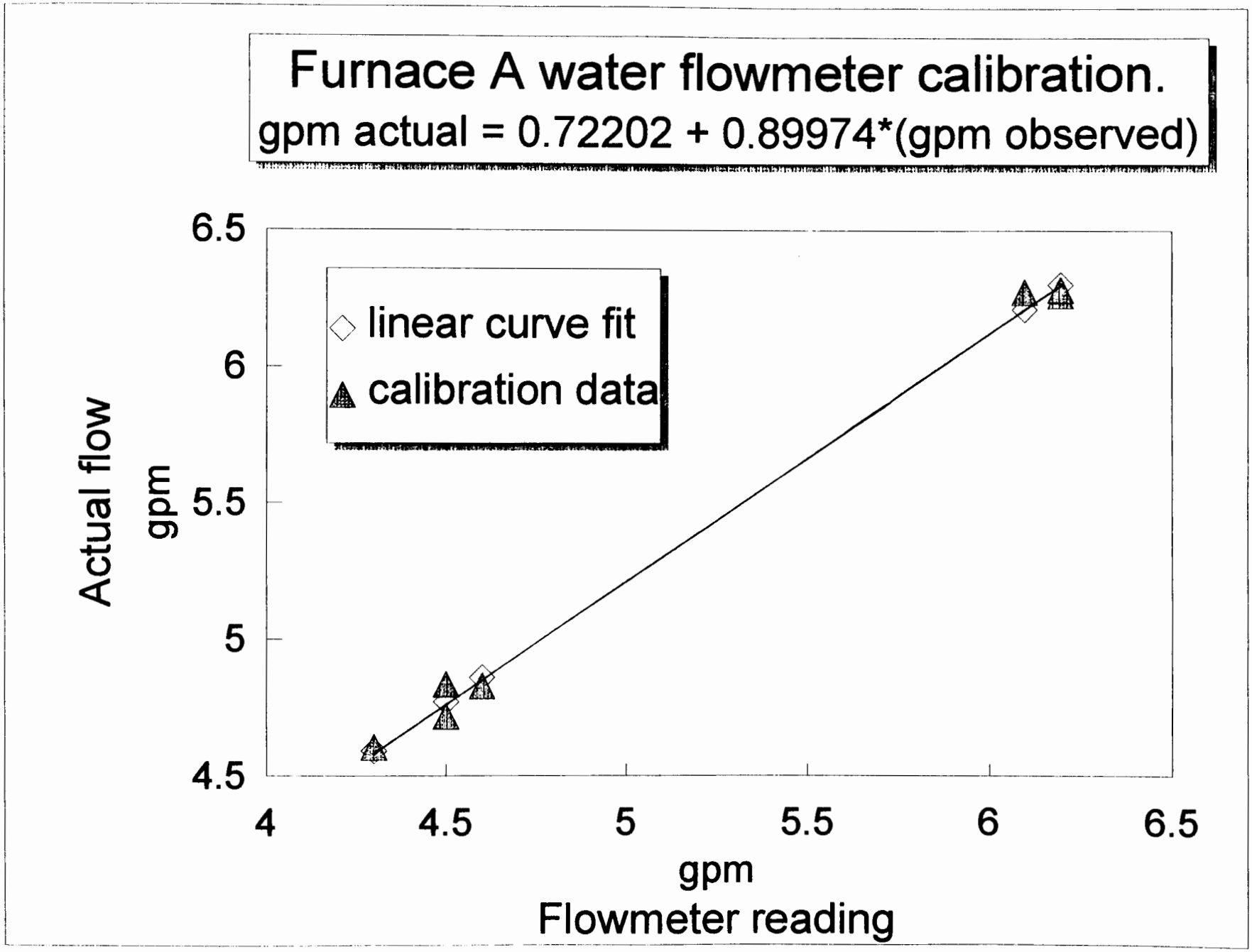
water density: at 68°F= 8.3317 lb/gal, at 150°F = 8.1818 lb/gal
water temp. during calibration = 150°F

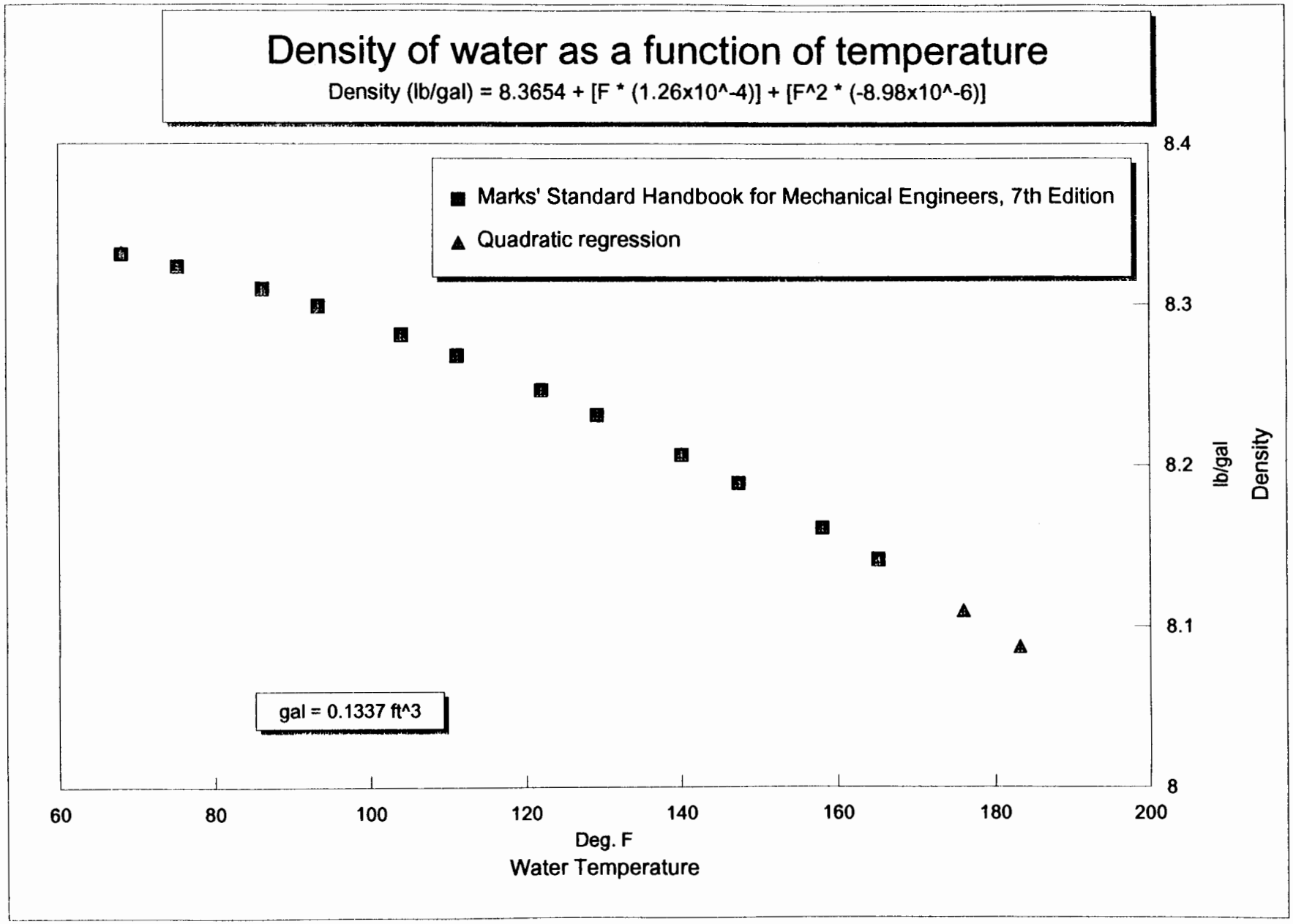
TRIAL	ROTAMETER reading, gpm	FLOW lb/min meas.	FLOW gpm calc.	% difference	Calibration factor
1	4.60	39.50	4.83	4.72	1.04951
2	4.50	39.56	4.84	6.93	1.07447
3	4.30	37.68	4.61	6.63	1.07101
4	4.50	38.60	4.72	4.62	1.04839
5	6.20	51.24	6.26	1.00	1.01010
6	6.10	51.33	6.27	2.77	1.02847
7	6.20	51.40	6.28	1.31	1.01326
				Average	**1.04217**

Furnace B water meter flow calibration.

Test laboratory water meter calibration.
Water temperature not recorded.

Calculated Gallons	Observed Weight	Assumed Density	Observed Gallons	Calibratio Factor
18.29	152.3	8.326955	20.31	0.90032
29.67	247.1	8.328278	32.59	0.91032
30.52	254.2	8.328965	33.54	0.90995
32.13	267.6	8.328665	35.46	0.90606
			Average	**0.90666**


Furnace A water flowmeter calibration.
gpm actual = 0.72202 + 0.89974*(gpm observed)
linear curve fit
calibration data
Actual flow
gpm
6.5
6
5.5
5
4.5
4
4.5
5
5.5
6
6.5
gpm
Flowmeter reading


Density of water as a function of temperature
Density (lb/gal) = 8.3654 + [F * (1.26x10^-4)] + [F^2 * (-8.98x10^-6)]
Marks' Standard Handbook for Mechanical Engineers, 7th Edition
Quadratic regression
gal = 0.1337 ft^3
8.4
8.3
8.2
8.1
8
Density
lb/gal
60
80
100
120
140
160
180
200
Deg. F
Water Temperature

Appendix D - CEM Run Data

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

15-Jun-95 Run TDD-2A Scoping test 1

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
328	137	81	114	126	195	68	151	4488	676.1	4241	18.22	2.58	603	82.5	6.7	660.4	Off	8.26	6.6
388	130	78	114	126	183	68	143	4484	449.4	4194	19.52	1.62	418	82.5	6.7	649.4	Off	8.26	6.6
448	126	77	114	126	180	68	138	6059	601.7	5011	18.77	2.37	656	82.5	6.7	665.9	Off	8.26	6.6
508	124	76	114	126	180	68	135	5998	556.5	5013	18.58	2.48	707	82	6.7	649.5	Off	8.26	6.6
568	122	76	114	126	180	68	133	5802	533	5013	18.56	2.45	607	82	6.7	655.0	Off	8.26	6.6
628	121	76	114	126	181	68	131	5782	532.7	5013	18.53	2.48	569	82	6.7	649.5	Off	8.26	6.6
688	121	76	113	125	181	68	130	5766	527	5012	18.5	2.52	523	82	6.7	666.0	Off	8.26	6.6
748	121	76	114	125	183	68	130	5741	526.5	5015	18.47	2.56	506	82	6.7	605.4	Off	8.26	6.6
808	121	76	114	125	184	68	129	5754	525.4	5015	18.45	2.57	482	81.5	6.7	610.9	Off	8.26	6.6
868	120	76	114	125	184	68	129	5802	530.4	5014	18.42	2.55	457	81.5	6.7	599.9	Off	8.26	6.6
928	120	76	113	125	185	68	129	5843	542.3	5013	18.4	2.57	444	81.5	6.7	616.5	Off	8.26	6.6
988	120	76	113	125	185	68	128	5880	548.5	5016	18.38	2.59	437	81.5	6.7	655.1	Off	8.27	6.6
1048	120	76	113	124	185	68	129	5876	550.8	5013	18.37	2.6	393	81.5	6.7	633.1	Off	8.27	6.6
1108	120	76	112	124	185	68	129	5884	553.9	5013	18.36	2.63	380	81.5	6.7	633.1	Off	8.27	6.6
1168	120	77	112	124	184	68	129	5912	559.2	5015	18.35	2.64	488	81.5	6.7	633.2	Off	8.27	6.6
1228	121	76	112	123	184	68	129	5953	564.5	5013	18.3	2.69	488	81.2	6.7	633.2	Off	8.27	6.6
1288	121	76	111	123	184	68	129	6047	576.3	5014	18.3	2.68	503	81	6.7	638.8	Off	8.27	6.6
1348	121	76	111	123	184	68	129	6124	588.1	5015	18.29	2.7	479	81	6.7	585.9	Off	8.27	6.6
1404	121	76	111	122	185	68	129	6189	597.7	5013	18.3	2.7	389	81	6.7	600.2	Off	8.27	6.6
1464	122	76	112	122	185	68	129	6287	608.7	5015	18.27	2.77	426	80.5	6.7	583.7	Off	8.27	6.6
1524	122	76	111	122	186	68	129	6352	621.1	5013	18.24	2.8	441	80.5	6.7	600.3	Off	8.27	6.6
1584	121	76	111	121	189	68	129	6364	627	5014	18.21	2.79	552	80.5	6.7	578.3	Off	8.27	6.6
1644	122	76	111	122	191	68	129	6368	622.2	5016	18.17	2.85	553	80.5	6.7	589.3	Off	8.27	6.6
1704	122	76	110	121	191	68	130	6470	648.9	5015	18.16	2.81	601	80.5	6.7	600.4	Off	8.27	6.6
1764	122	76	110	121	190	68	130	6624	667.8	5011	18.18	2.83	569	80	6.7	589.4	Off	8.27	6.6
1824	122	76	110	121	190	68	130	6685	680.2	5013	18.16	2.86	533	80	6.7	595.0	Off	8.27	6.6
1884	123	76	110	121	190	68	130	6775	687.7	5013	18.15	2.91	511	80	6.7	595.0	Off	8.27	6.6
1944	123	76	110	120	190	68	130	6873	708.7	5015	18.13	2.94	534	79.8	6.7	545.4	Off	8.27	6.6
2004	123	76	110	120	191	67	130	6978	719.4	5013	18.07	2.97	522	80	6.7	578.5	Off	8.27	6.6
2064	123	76	109	120	191	68	130	7056	733.2	5014	18.08	2.96	581	79.5	6.7	573.0	Off	8.27	6.6
2124	123	76	109	120	192	68	130	7100	741.9	5013	18.09	3	660	79.5	6.7	589.5	Off	8.27	6.6
2184	123	76	110	119	193	68	130	7182	749.5	5013	18.06	2.99	682	79.5	6.7	534.4	Off	8.27	6.6
2244	123	76	109	119	193	68	130	7316	779.6	5015	18.03	3.04	688	79	6.7	539.9	Off	8.27	6.6
2304	123	75	108	119	194	68	130	7438	803.2	5013	18.01	3.08	688	79	6.7	578.6	Off	8.27	6.6
2364	124	76	109	119	194	68	131	7694	843.6	5014	17.96	3.12	741	79	6.7	578.6	Off	8.27	6.6
2424	124	76	108	119	195	68	131	7890	872.4	5012	17.94	3.19	700	79	6.7	562.1	Off	8.27	6.6
2484	124	76	108	119	195	68	131	8085	913.1	5014	17.91	3.17	658	79	6.7	595.2	Off	8.27	6.6
2544	124	77	108	118	196	66	131	8321	955.1	5011	17.88	3.26	634	78.5	6.7	578.7	Off	8.27	6.6
2604	125	77	108	118	197	68	131	8464	976.6	5013	17.85	3.26	682	78.5	6.7	589.7	Off	8.27	6.6
2664	125	76	107	118	198	68	131	8500	988.3	5013	17.83	3.31	704	78.5	6.7	578.7	Off	8.28	6.6
2724	126	76	107	117	198	68	131	8573	999.8	5011	17.8	3.28	838	78.5	6.7	524.7	Off	8.28	6.6
2780	126	76	107	118	199	68	131	8626	1006.8	5013	17.79	3.31	905	78	6.7	573.2	Off	8.28	6.6
2840	129	77	107	117	220	68	134	8863	1041	5013	17.69	3.38	900	78	6.7	584.3	Off	8.28	6.6
2900	140	79	107	117	264	68	145	10335	1557.9	5013	16.67	4.57	854	77.5	6.7	562.3	Off	8.28	6.6
2960	151	81	107	117	322	68	157	18677	1997.6	5013	13.88	7.25	831	77	6.7	578.8	Off	8.28	6.6
3020	157	81	107	117	372	68	165	20422	2007.3	5014	12.78	8.24	1957	76.6	6.7	573.3	Off	8.28	6.6
3080	159	81	107	117	364	66	168	18412	1988.6	5013	12.9	8.03	1985	76.5	6.7	545.7	Off	8.28	6.6
3140	162	81	107	117	334	68	174	18180	2007.2	5015	13.26	7.62	1882	76	6.7	551.2	Off	8.28	6.6
3200	165	82	108	117	324	68	177	18988	2006.2	5014	13.33	7.41	1371	75.5	6.7	562.3	Off	8.28	6.6
3260	167	82	107	117	321	68	179	19255	2006.3	5012	13.35	7.37	1502	75.5	6.7	551.2	Off	8.28	6.6
3320	169	83	108	117	329	68	182	19076	2006.8	5014	13.31	7.39	1528	75	6.7	573.3	Off	8.28	6.6
3380	172	84	108	117	338	68	184	19637	2005.9	5011	13.01	7.72	1812	74.5	6.7	562.3	Off	8.28	6.6
3440	173	83	107	117	340	68	186	20837	2000.5	5015	12.58	8.14	1887	74	6.7	573.3	Off	8.28	6.6
3500	173	84	107	117	339	68	186	21358	2003.4	5013	12.51	8.19	2268	73.5	6.7	507.1	Off	8.28	6.6
3560	174	84	108	117	336	68	187	21436	1994.5	5013	12.64	8.07	2027	73	6.7	518.1	Off	8.28	6.6
3620	174	84	109	117	338	68	187	21464	2004.1	5015	12.72	7.99	2037	72.5	6.7	446.3	Off	8.27	6.6
3680	176	84	109	117	340	68	189	21240	2006.3	5017	12.74	8	1776	72	6.7	451.8	Off	8.27	6.6
3740	177	84	109	117	341	68	192	20976	2006.5	5012	12.71	7.98	1801	72	6.7	446.3	Off	8.27	6.6
3800	179	85	109	117	346	68	194	20756	2005.9	5014	12.64	8.04	1691	71.5	6.7	462.8	Off	8.27	6.6
3860	181	85	109	117	351	67	196	20830	2003.1	5014	12.54	8.09	2446	71	6.7	462.8	Off	8.27	6.6
3920	182	85	109	117	357	67	199	20715	1989.7	5014	12.43	8.2	2160	70.5	6.7	429.7	Off	8.27	6.6
3980	184	86	109	117	362	68	202	21012	1986.7	5014	12.24	8.35	1639	70	6.7	446.3	Off	8.27	6.6
4040	186	66	109	117	366	68	203	21159	1990.6	5012	12.14	8.47	1947	69.5	6.7	429.7	Off	8.27	6.6
4100	188	86	107	118	375	67	204	21407	1989.4	5014	12.01	8.63	2874	69	6.7	519.6	Off	8.28	6.6
4156	190	86	108	118	399	67	205	21631	1989.4	5014	11.92	8.67	2765	68.5	6.7	562.2	Off	8.28	6.6
4216	191	86	108	118	400	67	204	21895	1986.9	5013	11.81	8.86	2120	68	6.7	551.1	Off	8.27	6.6
4276	191	86	107	118	392	67	206	21529	2000.7	5013	11.66	8.94	2681	67.5	6.7	573.2	Off	8.28	6.6
4336	192	86	107	118	391	67	207	21018	1989.4	5014	11.69	8.87	2522	67	6.7	567.7	Off	8.28	6.6
4396	194	87	107	118	393	68	209	20915	1991	5015	11.73	8.77	3046	66.5	6.7	611.8	Off	8.28	6.6
4456	195	87	107	118	396	67	211	20882	1989.6	5013	11.75	8.74	2955	66	6.7	595.3	Off	8.28	6.6
4516	197	87	107	118	403	67	213	20992	1989.9	5014	11.65	8.89	3392	66	6.7	595.3	Off	8.28	6.6
4576	198	87	108	118	411	67	215	21159	1989.3	5014	11.49	9	3513	65.5	6.7	584.2	Off	8.27	6.6
4636	199	88	108	119	417	68	217	21281	1989.9	5012	11.33	9.14	3034	65	6.7	595.2	On	8.27	6.6
4696	201	88	108	119	419	67	219	21403	1989.9	5015	11.21	9.25	2974	64.5	6.7	589.7	On	8.27	6.6
4756	202	88	108	119	419	68	220	21566	1989.7	5013	11.1	9.33	3570	64	6.7	611.8	On	8.27	6.6
4816	202	88	108	119	419	68	220	21655	1991.4	5013	11.04	9.38	3346	63.5	6.7	622.7	On	8.27	6.6

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

15-Jun-95 Run TDD-2A Scoping test 1

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
4876	202	88	108	119	419	68	220	21399	1995.6	5015	11.02	9.4	3281	63	6.7	611.7	On	8.27	6.6
4936	201	88	109	119	421	67	221	21000	2003.4	5012	11.05	9.35	3558	62.5	6.7	578.6	On	8.27	6.6
4996	201	87	109	120	419	67	219	20752	2004.1	5012	11.07	9.37	3136	62	6.7	589.6	On	8.27	6.6
5056	198	87	109	120	430	68	216	20634	1999.5	5012	11.09	9.29	2965	61.5	6.7	595.1	On	8.27	6.6
5116	193	86	109	120	434	67	213	20508	2006	5013	11.24	9.08	2955	61	6.7	595.1	On	8.27	6.6
5176	191	86	109	120	436	68	210	20060	2006.2	5013	11.59	8.81	2794	60.5	6.7	595.0	On	8.27	6.6
5236	190	85	109	120	436	68	208	19470	2006.5	5012	11.96	8.58	2914	60	6.7	584.0	On	8.27	6.6
5296	189	85	109	120	435	68	208	18811	2005.9	5013	12.21	8.45	3084	59.7	6.7	600.6	On	8.27	6.6
5356	189	86	109	120	439	67	208	18205	2005.5	5012	12.25	8.39	3008	59.3	6.7	595.0	On	8.27	6.6
5416	190	86	109	120	443	68	210	17928	2005.9	5013	12.19	8.43	2729	59	6.7	617.1	On	8.27	6.6
5476	191	86	109	120	445	68	210		2006.7				2730	58.5	6.7	586.3	On	8.27	6.6
5532	192	86	108	120	449	68	212		2006.2				2879	58	6.7	633.7	On	8.27	6.6
5592	193	86	109	120	454	68	213		2006.5				2465	57.5	6.7	611.6	On	8.27	6.6
5652	194	87	109	120	463	68	216		2005.9				2673	57	6.7	644.7	On	8.27	6.6
5712	196	86	109	120	472	68	219	18888	2006.5	5013	13.34	9.2	2668	56.5	6.7	639.2	On	8.27	6.6
5772	197	87	108	120	476	68	221	19621	2006	5013	12.41	9.76	2769	56	6.7	655.8	On	8.27	6.6
5832	197	86	109	120	474	67	220	19320	2006.5	5013	12.67	9.5	3125	55.5	6.7	639.2	On	8.27	6.6
5892	195	86	109	121	472	67	218	19124	2006.7	5013	13.08	9.23	2618	55.5	6.7	650.2	On	8.27	6.6
5952	195	86	108	121	474	68	217	19104	2006.7	5014	11.47	9.21	2297	54.9	6.7	672.3	On	8.27	6.6
6012	195	86	109	121	474	68	217	19543	2006.8	5013	11.29	9.4	2774	54.5	6.7	666.7	On	8.27	6.6
6072	196	86	109	120	476	68	216	20085	2006.7	5013	11.11	9.6	2816	54	6.7	622.6	On	8.27	6.6
6132	197	87	109	121	498	68	217	20154	2006	5015	11	9.68	2750	53.5	6.7	650.1	On	8.27	6.6
6192	196	87	109	121	504	68	217	20475	2006	5011	10.79	9.95	2577	53	6.7	661.2	On	8.27	6.6
6252	195	86	109	121	486	68	215	20333	2006.8	5013	10.92	9.77	2564	52.5	6.7	655.7	On	8.27	6.6
6312	194	86	109	121	477	68	214	20723	2006.3	5013	11.18	9.44	2670	52	6.7	650.1	On	8.27	6.6
6372	194	86	110	121	476	68	214	21472	2007.2	5014	11.11	9.46	3306	51.5	6.7	617.0	On	8.27	6.6
6432	193	86	110	121	480	68	213	21733	2004.7	5013	11.04	9.51	2469	51	6.7	605.9	On	8.27	6.6
6492	193	66	110	121	486	67	213	22160	1994.1	5013	10.95	9.55	2436	50.5	6.7	650.1	On	8.27	6.6
6552	194	86	110	122	491	67	214	22408	1990.6	5012	10.83	9.78	3005	50	6.7	655.6	On	8.27	6.6
6612	195	86	110	122	497	67	214	22489	1989.3	5012	10.7	9.89	2728	49.5	6.7	628.0	On	8.27	6.6
6672	195	86	110	121	502	67	216	22603	1989.6	5013	10.68	9.84	3262	49.5	6.7	639.0	On	8.27	6.6
6732	196	86	110	122	501	67	217	22644	1989.7	5013	10.71	9.82	3050	49	6.7	672.1	On	8.27	6.6
6792	197	87	109	121	505	67	218	22705	1989.9	5015	10.62	9.93	2624	48.5	6.7	666.6	On	8.27	6.6
6852	198	86	110	122	511	67	219	22807	1989.4	5014	10.6	9.99	2554	48	6.7	596.4	On	8.27	6.6
6908	198	86	111	122	520	67	220	22319	1993.3	5013	10.43	10.07	2415	47.5	6.7	622.4	On	8.27	6.6
6968	199	86	110	122	524	67	221	21851	2002.9	5011	10.42	10	2806	47	6.7	661.0	On	6.27	6.6
7028	203	87	110	122	531	67	225	21472	2005.2	5015	10.26	10.2	2603	46.5	6.7	644.4	On	8.27	6.6
7088	206	88	110	122	534	67	228	21086	2005.2	5013	10	10.47	2426	46.5	6.7	688.6	On	8.27	6.6
7148	202	87	110	122	527	67	225	20915	2007.3	5014	10.42	10.02	2655	46	6.7	672.0	On	8.27	6.6
7208	197	86	110	122	518	67	220	20638	2006.2	5013	11.02	9.47	2867	45.5	6.7	661.0	On	8.27	6.6
7268	193	86	110	123	512	67	215	20190	2006.5	5013	11.44	9.17	2062	45	6.7	683.0	On	8.27	6.6
7328	189	85	110	123	508	67	212	19755	2006.3	5015	11.74	8.92	2392	45	6.7	710.6	On	8.27	6.6
7388	188	85	110	123	505	67	209	19250	2006.7	5011	11.97	8.7	2906	44.5	6.7	710.6	On	8.27	6.6
7448	186	85	110	123	504	67	207	18363	2005.9	5014	12.04	8.62	2841	44	6.7	683.0	On	8.27	6.6
7508	185	85	110	123	503	67	206	17778	2006	5013	12.11	8.56	2333	43.5	6.7	694.0	On	8.27	6.6
7568	184	84	111	123	502	67	205	17480	2005.7	5015	12.16	8.47	2476	43.5	6.7	688.5	On	8.27	6.6
7628	183	85	110	123	502	67	204	17362	2006.2	5014	12.16	6.49	2436	43	6.7	716.1	On	8.27	6.6
7688	183	84	111	123	504	67	203	17382	2006.3	5013	12.11	8.55	2458	42.5	6.7	694.0	On	8.27	6.6
7748	183	84	111	123	503	66	203	17468	2005.5	5015	12.07	8.56	2213	42	6.7	666.4	On	6.27	6.6
7808	182	84	111	123	503	67	203	17509	2006	5013	12.03	8.58	2223	41.5	6.7	682.9	On	6.27	6.6
7868	182	84	111	124	505	68	204	17391	2006.8	5014	12.06	8.55	2718	41.5	6.7	705.0	On	8.27	6.6
7928	183	84	111	123	506	68	203	17407	2006.6	5013	12.06	8.54	2144	41	6.7	688.4	On	8.27	6.6
7988	183	84	110	124	512	67	205	17334	2006	5013	12.02	8.59	2029	40.5	6.7	743.6	On	8.27	6.6
8048	184	84	111	124	521	67	206	17171	2005.7	5013	11.78	8.81	1976	40.5	6.7	705.0	On	8.27	6.6
8108	184	84	110	124	523	67	206	17285	2006.5	5014	11.72	8.8	2016	40	6.7	743.6	On	8.27	6.6
8168	184	84	110	124	523	67	206	17196	2006.7	5016	11.83	8.74	2057	40	6.7	727.1	On	8.27	6.6
8228	184	84	111	124	526	67	205	17238	2006.7	5012	11.88	8.74	2183	39.5	6.7	663.1	On	8.27	6.6
8284	184	84	111	124	526	67	205	17330	2006.2	5015	11.9	8.66	2199	39	6.7	710.5	On	8.27	6.6
8344	184	84	111	123	531	67	205	17200	2005.5	5014	11.87	8.69	2316	39	6.7	677.4	On	8.27	6.6
8404	184	84	111	124	534	67	206	17118	2005.5	5013	11.79	6.76	2476	38.5	6.7	716.0	On	8.27	6.6
8464	184	84	110	124	537	67	205	17021	2007.3	5012	11.74	8.78	1898	38	6.7	721.5	On	8.27	6.6
8524	184	84	111	124	538	67	205	16935	2006.2	5014	11.69	8.81	1939	38	6.7	727.0	On	6.27	6.6
8584	183	84	110	124	540	67	204	16866	2007.2	5014	11.67	8.85	1980	37.5	6.7	738.1	On	6.27	6.6
8644	184	84	110	124	543	67	205	16662	2005.5	5011	11.61	6.89	2230	37.2	6.7	738.1	On	8.27	6.6
8704	184	85	111	124	546	67	206	16805	2006	5015	11.55	8.67	2240	37	6.7	738.0	On	8.27	6.6
8764	185	85	111	124	550	67	207	16842	2005.9	5011	11.48	8.96	2021	36.5	6.7	727.0	On	6.27	6.6
8824	186	85	111	124	557	67	208	16854	2006	5011	11.4	8.96	2138	36.5	6.7	732.5	On	8.27	6.6
8884	188	85	111	124	568	66	211	16814	2004.1	5011	11.13	9.31	2108	36	6.7	727.0	On	8.27	6.6
8944	190	85	111	124	573	67	212	16606	2006.2	5014	10.76	9.58	1861	35.5	6.7	704.9	On	8.27	6.6
9004	190	85	111	124	576	67	213	16772	2005.9	5014	10.66	9.61	1807	35.5	6.7	749.0	On	8.27	6.6
9064	190	85	111	124	578	66	215	16968	2006.8	5014	10.6	9.71	1823	35	6.7	732.5	On	8.27	6.6
9124	191	85	111	124	580	67	215	17236	2006.3	5013	10.46	9.83	1696	34.5	6.7	743.5	On	6.27	6.6
9184	190	85	111	124	575	66	216	17371	2006.8	5012	10.39	9.87	1807	34.5	6.7	754.5	On	8.27	6.6
9244	190	86	111	125	573	66	216	17074	2006.5	5013	10.59	9.71	1831	34	6.7	749.0	On	8.27	6.6
9304	190	85	111	125	574	66	216	8354	2006.3	3191	14.64	5.16	1612	33.5	6.7	760.0	On	8.27	6.6
9364	190	85	111	125	574	67	216	12817	2005.7	4036	14.58	6.85	2022	33.5	6.7	749.0	On	8.27	6.6

D3

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

15-Jun-95 time sec	stack exit deg F	dilution deg F	Run TDD-2A H2O in deg F	Scoping test 1 H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
9424	190	85	111	125	576	67	216	14742	2006.2	5013	12.07	6.56	1962	33	6.7	759.9	On	8.27	6.6
9484	190	85	112	125	578	66	216	14746	2006.3	5014	12.06	6.47	1402	32.5	6.7	737.9	On	8.27	6.6
9544	190	85	112	125	580	66	216	14665	2006	5013	12.02	6.53	1654	32.5	6.7	754.4	On	8.27	6.6
9604	190	85	112	125	581	67	216	14632	2005.5	5012	11.99	6.56	1778	32	6.7	693.6	On	8.27	6.6
9660	190	85	112	125	582	67	216	14718	2005.9	5013	11.92	6.69	1779	31.5	6.7	737.8	On	8.27	6.6
9720	190	85	112	126	579	66	216	14600	2006.5	5013	11.95	6.6	1745	31.5	6.7	759.9	On	8.27	6.6
9780	189	85	112	126	577	66	215	14543	2005.2	5013	12.04	6.52	1742	31	6.7	743.3	On	8.27	6.6
9840	188	85	112	126	576	66	215	14526	2004.9	5013	12.05	6.47	1992	30.6	6.7	743.3	On	8.27	6.6
9900	188	85	112	126	574	66	215	14539	2006	5013	12.08	6.47	1898	30.5	6.7	754.3	On	8.27	6.6
9960	187	85	113	126	575	66	214	14543	2003.9	5015	12.07	6.51	1658	30	6.7	732.2	On	8.27	6.6
10020	188	85	112	126	576	66	214	14579	2005.2	5013	12.03	6.54	1621	30	6.7	754.3	On	8.27	6.6
10080	188	85	112	126	575	66	215	14726	2006.8	5012	11.99	6.56	1532	29.5	6.7	759.8	On	8.27	6.6
10140	188	84	112	126	577	66	215	14783	2006.3	5014	11.95	6.52	1693	29.1	6.7	776.3	On	8.27	6.6
10200	190	85	112	126	599	66	216	14624	2004.6	5014	11.98	6.55	1826	29	6.7	759.8	On	8.27	6.6
10260	192	85	112	127	646	66	219	14197	1985	5013	11.53	6.99	1806	28.5	6.7	792.8	On	8.27	6.6
10320	191	85	112	127	638	66	218	13944	1964	5014	11.43	9.05	1515	28.5	6.7	781.8	On	8.27	6.6
10380	189	84	113	127	611	66	216	13298	1898.8	5014	11.9	8.68	1774	28	6.7	770.7	On	8.27	6.6
10440	187	84	113	127	593	66	214	12887	1871.4	5013	12.25	8.35	1568	28	6.7	759.7	On	8.26	6.6
10500	186	84	113	127	586	66	213	12691	1848	5012	12.36	8.27	1449	27.5	6.7	781.7	On	8.27	6.6
10560	185	84	113	127	581	66	212	12590	1842.1	5013	12.43	8.18	1525	27	6.7	759.6	On	8.26	6.6
10620	184	83	113	127	578	66	211	12651	1845.4	5013	12.48	8.07	1482	27	6.7	765.1	On	8.26	6.6
10680	183	83	113	127	578	66	210	12679	1851.1	5013	12.47	8.09	1435	26.5	6.7	765.1	On	8.26	6.6
10740	183	83	113	127	579	66	210	12781	1858.1	5015	12.43	8.17	1524	26.5	6.7	732.1	On	8.26	6.6
10800	183	83	113	127	581	66	210	12919	1877.6	5014	12.36	8.17	1504	26	6.7	792.7	On	8.27	6.6
10860	184	83	114	127	581	66	210	13118	1901.2	5015	12.33	8.23	1438	26	6.7	754.1	On	8.26	6.6
10920	184	83	113	127	583	66	211	13212	1905.3	5014	12.3	8.2	1475	25.5	6.7	770.6	On	8.26	6.6
10980	184	83	114	127	585	66	212	13350	1919.8	5013	12.27	8.25	1507	25.5	6.7	693.5	On	8.26	6.6
11036	184	84	114	127	585	66	212	13550	1936.5	5012	12.26	8.33	1731	25	6.7	754.0	On	8.26	6.6
11096	186	83	114	127	589	66	213	13729	1956.7	5011	12.24	8.24	1570	25	6.7	748.5	On	8.26	6.6
11156	186	84	113	128	595	66	214	13627	1944.8	5012	12.12	8.41	1462	24.5	6.7	781.6	On	8.26	6.6
11216	187	84	113	128	600	66	215	13407	1924.2	5013	12	8.58	1372	24.4	6.7	781.6	On	8.26	6.6
11276	188	84	114	128	604	66	216	13257	1911	5013	11.94	8.52	1329	24	6.7	759.5	On	8.26	6.6
11336	187	83	113	128	604	66	216	13127	1903.8	5013	11.96	8.49	1322	24	6.7	792.6	On	8.26	6.6
11396	188	83	113	128	605	66	218	12878	1874.7	5013	11.95	8.53	1580	23.5	6.7	796.1	On	8.26	6.6
11456	188	84	114	128	608	66	216	12708	1862.3	5012	11.99	8.49	1306	23.5	6.7	792.6	On	8.26	6.6
11516	189	83	114	128	608	66	218	12528	1837.2	5015	12.02	8.5	1092	23	6.7	759.4	On	8.26	6.6
11576	188	84	114	128	609	66	217	12337	1804.4	5015	11.99	8.53	1166	22.5	6.7	764.9	On	8.26	6.6
11636	188	83	115	128	608	66	217	12061	1775.6	5014	12.06	8.41	1113	22.5	6.7	753.9	On	8.26	6.6
11696	187	83	114	128	608	66	216	11910	1753.9	5015	12.17	8.33	1306	22.5	6.7	775.9	On	8.26	6.6
11756	187	83	114	128	639	66	217	11747	1754.7	5014	12.26	8.24	1239	22	6.7	781.5	On	8.26	6.6
11816	187	83	115	129	662	66	217	11047	1637	5014	12.05	8.45	1030	22	6.7	759.3	On	8.26	6.6
11876	187	83	114	129	674	66	216	10758	1619.5	5013	12.04	8.34	1108	21.5	6.7	803.5	On	8.26	6.6
11936	186	83	115	129	668	67	215	10120	1483.2	5015	12.2	8.25	1198	21	6.7	764.6	On	8.26	6.6
11996	182	82	115	129	644	66	211	10421	1553.2	5015	12.6	7.85	1069	21	6.7	792.3	On	8.26	6.6
12056	179	82	115	130	618	67	208	10893	1615.2	5012	13.07	7.32	1130	21	6.7	808.6	On	8.26	6.6
12116	176	81	115	129	601	66	205	11389	1688.3	5012	13.3	7.17	1086	20.5	6.7	775.6	On	8.26	6.6
12176	175	81	115	129	589	67	202	11523	1699.5	5013	13.41	7.03	1152	20.5	6.7	775.6	On	8.26	6.6
12236	174	81	116	130	580	66	201	11637	1697.9	5012	13.4	7.13	1092	20.5	6.7	764.7	On	8.26	6.6
12296	173	81	116	130	578	66	200	11751	1720.5	5012	13.37	7.08	1031	20	6.7	753.6	On	8.26	6.6
12356	173	81	115	130	578	67	199	11812	1717.4	5014	13.31	7.11	1018	20	6.7	734.3	On	8.26	6.6
12412	172	81	115	130	580	67	199	11747	1714.5	5011	13.3	7.13	1070	19.5	6.7	792.3	On	8.26	6.6
12472	172	81	116	130	583	67	198	11572	1685.4	5015	13.32	7.04	1101	19.5	6.7	786.7	On	8.26	6.6
12532	171	81	116	130	585	66	198	11426	1660.8	5014	13.31	7.12	1015	19.5	6.7	764.7	On	8.26	6.6
12592	171	80	115	130	586	66	197	11430	1664.2	5015	13.31	7.14	1044	19	6.7	797.6	On	8.26	6.6
12652	170	81	115	130	584	67	197	11462	1674.2	5013	13.39	7.05	1175	19	6.7	803.3	On	8.26	6.6
12712	170	81	115	130	581	67	196	11560	1682.5	5012	13.53	6.98	1228	19	6.7	819.6	On	8.26	6.6
12772	171	81	116	130	583	67	197	11426	1679.9	5014	13.67	6.81	1044	19	6.7	792.2	On	8.26	6.6
12832	173	81	115	130	593	67	200	11011	1622.9	5014	13.45	7.06	1222	18.5	6.7	819.6	On	8.26	6.6
12892	174	81	115	130	594	67	202	10510	1527.5	5013	13.1	7.42	771	18.5	6.7	803.3	On	8.26	6.6
12952	175	81	115	130	594	67	203	10592	1565.4	5015	13.16	7.3	789	18.4	6.7	814.3	On	8.26	6.6
13012	175	81	115	130	593	67	203	10575	1552.6	5014	13.18	7.36	787	18	6.7	803.2	On	8.26	6.6
13072	175	81	116	130	590	67	203	10742	1577.6	5013	13.21	7.32	782	18	6.7	770.2	On	8.26	6.6
13132	175	81	115	130	598	67	204	10791	1606.1	5016	13.32	7.17	772	18	6.7	808.6	On	8.26	6.6
13192	176	82	116	130	600	67	205	9855	1428.1	5012	13.23	7.37	763	17.5	6.7	781.2	On	8.26	6.6
13252	176	81	116	130	593	67	205	9493	1369.1	5014	13.26	7.24	793	17.5	6.7	803.2	Off	8.26	6.6
13312	175	81	116	130	587	67	204	9721	1418.8	5014	13.43	7.09	785	17	6.7	764.6	Off	8.26	6.6
13372	173	81	115	130	582	67	202	9900	1452.6	5013	13.61	6.93	798	17	6.7	808.7	Off	8.26	6.6
13432	172	81	116	130	577	67	200	10146	1483.4	5013	13.67	6.86	800	17	6.7	797.7	Off	8.26	6.6
13492	171	81	115	130	573	67	199	10433	1525.9	5015	13.74	6.82	815	17	6.7	814.3	Off	8.26	6.6
13552	170	80	116	130	569	67	198	10832	1596	5012	13.78	6.8	633	16.5	6.7	786.7	Off	8.26	6.6
13612	169	80	115	130	569	67	197	10640	1584.3	5013	13.86	6.71	625	16.5	6.7	814.3	Off	8.26	6.6
13672	169	80	117	130	569	67	196	10571	1545.1	5013	13.92	6.58	793	16.5	6.7	742.5	Off	8.26	6.6
13732	168	80	115	130	568	67	195	10388	1519.9	5015	13.95	6.58	750	16.5	6.7	754.6	Off	8.26	6.6
13788	167	80	116	130	566	67	195	10335	1505.5	5013	13.93	6.6	744	16	6.7	797.7	Off	8.26	6.6
13848	167	80	116	130	564	67	194	10404	1519.4	5013	13.93	6.59	763	16	6.7	808.7	Off	8.26	6.6
13908	166	80	116	130	562	67	193	10506	1534.2	5012	13.94	6.56	765	16	6.7	803.2	Off	8.26	6.6

D4

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

15-Jun-95 Run TDD-2A Scoping test 1

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
13968	166	80	115	130	562	67	193	10624	1544.3	5015	13.9	6.61	750	16	6.7	792.2	Off	8.26	6.6
14028	166	80	115	130	561	67	193	10775	1576.3	5015	13.87	6.62	757	15.5	6.7	797.7	Off	8.26	6.6
14088	166	80	116	130	563	67	192	10693	1552.6	5015	13.8	6.72	756	15.5	6.7	803.2	Off	8.26	6.6
14148	167	80	115	130	565	67	193	10457	1519	5015	13.82	6.68	756	15.5	6.7	803.2	Off	8.26	6.6
14208	167	80	115	130	568	67	193	10502	1534.7	5013	13.8	6.72	732	15	6.7	836.3	Off	8.26	6.6
14268	166	80	115	130	570	66	193	10592	1540.5	5015	13.74	6.76	715	15	6.7	808.7	Off	8.26	6.6
14328	166	80	115	130	574	67	193	10547	1537.4	5015	13.71	6.74	711	15	6.7	830.8	Off	8.26	6.6
14388	167	80	115	130	562	67	194	10124	1474.3	5015	13.66	6.63	675	15	6.7	825.3	Off	8.26	6.6
14448	168	80	116	130	583	67	195	9493	1356.3	5012	13.63	6.67	642	14.5	6.7	808.7	Off	8.26	6.6
14508	167	80	116	130	579	67	195	9037	1284.2	5013	13.75	6.74	640	14.5	6.7	803.2	Off	8.26	6.6
14568	167	80	115	130	571	67	193	9281	1337.7	5015	13.9	6.56	690	14.5	6.7	803.3	Off	8.26	6.6
14628	165	80	115	130	563	67	192	9798	1427.9	5013	14.05	6.45	726	14.5	6.7	830.8	Off	8.26	6.6
14688	163	79	115	130	555	67	191	10270	1501.6	5013	14.17	6.33	749	14	6.7	797.8	Off	8.26	6.6
14748	163	79	115	130	551	67	190	10555	1533	5015	14.23	6.28	740	14	6.7	808.8	Off	8.26	6.6
14808	163	79	115	130	549	66	189	10465	1513	5013	14.27	6.23	728	14	6.7	819.8	Off	8.26	6.6
14868	162	79	115	130	546	67	188	10307	1474.4	5012	14.26	6.27	710	14	6.7	792.3	Off	8.26	6.6
14928	162	79	115	130	542	67	188	10303	1478.7	5013	14.31	6.2	694	13.5	6.7	830.8	Off	8.26	6.6
14988	162	79	115	130	539	67	186	10343	1488.6	5013	14.35	6.16	701	13.5	6.7	808.8	Off	8.26	6.6
15048	161	78	115	130	537	67	186	10490	1517.9	5013	14.38	6.14	733	13.5	6.7	814.3	Off	8.26	6.6
15108	160	79	115	130	535	67	186	10596	1533.2	5013	14.39	6.15	739	13.5	6.7	775.5	Off	8.26	6.6
15168	160	79	115	130	534	67	186	10628	1530.4	5015	14.37	6.17	726	13.1	6.7	819.8	Off	8.26	6.6
15224	160	79	115	130	533	67	185	10596	1531.1	5016	14.36	6.17	731	13	6.7	836.3	Off	8.26	6.6
15284	161	79	116	130	533	67	185	10583	1524.7	5011	14.38	6.16	755	13	6.7	775.7	Off	8.26	6.6
15344	161	78	115	130	531	67	185	10531	1511.9	5013	14.37	6.18	763	13	6.7	808.8	Off	8.26	6.6
15404	160	79	115	130	530	67	184	10457	1505.9	5014	14.4	6.17	761	12.5	6.7	803.3	Off	8.26	6.6
15464	160	79	115	130	528	67	184	10449	1498.5	5014	14.4	6.18	764	12.5	6.7	814.3	Off	8.26	6.6
15524	160	79	116	130	526	67	184	10376	1487.5	5013	14.41	6.16	765	12.5	6.7	786.7	Off	8.26	6.6
15584	160	78	115	130	525	66	185	10295	1472.8	5015	14.37	6.18	749	12	6.7	797.8	Off	8.26	6.6
15644	160	78	115	130	524	67	184	10229	1468.9	5014	14.36	6.2	724	12	6.7	819.9	Off	8.26	6.6
15704	160	79	115	130	524	67	184	10238	1462.1	5013	14.38	6.18	718	12	6.7	803.3	Off	8.26	6.6
15764	160	79	116	129	522	66	184	10185	1454.8	5013	14.39	6.17	723	12	6.7	731.6	Off	8.26	6.6
15824	160	79	116	130	521	67	184	10095	1441.4	5015	14.39	6.16	704	12	6.7	770.2	Off	8.26	6.6
15884	160	78	115	129	521	66	184	9989	1433.3	5014	14.41	6.14	680	11.5	6.7	792.3	Off	8.26	6.6
15944	160	78	116	129	521	66	184	10018	1436.5	5013	14.36	6.19	672	11.5	6.7	731.6	Off	8.26	6.6
16004	160	78	115	129	519	66	183	9977	1422.4	5013	14.36	6.19	677	11.5	6.7	786.8	Off	8.26	6.6
16064	160	78	115	129	518	66	183	9896	1408.2	5013	14.42	6.12	680	11.5	6.7	764.7	Off	8.26	6.6
16124	159	78	115	129	514	66	182	9949	1414.2	5013	14.46	6.07	684	11	6.7	797.9	Off	8.26	6.6
16184	159	78	115	129	513	66	182	9973	1414.4	5015	14.45	6.07	689	11	6.7	748.2	Off	8.26	6.6
16244	158	78	115	129	511	66	181	9888	1399.3	5014	14.46	6.07	700	11	6.7	748.2	Off	8.26	6.6
16304	159	78	115	129	512	66	181	9949	1421.5	5015	14.52	6.01	689	11	6.7	781.3	Off	8.26	6.6
16364	158	78	115	129	510	66	181	9892	1399.7	5016	14.57	5.96	665	10.5	6.7	770.3	Off	8.26	6.6
16424	159	78	115	129	507	66	180	9823	1389.3	5014	14.61	5.94	694	10.5	6.7	759.3	Off	8.26	6.6
16484	159	78	115	129	508	66	180	9717	1378.3	5013	14.64	5.91	675	10.5	6.7	739.6	Off	8.26	6.6
16540	159	78	114	129	509	66	180	9583	1360.7	5015	14.58	5.97	643	10.5	6.7	803.4	Off	8.26	6.6
16600	159	78	114	129	509	66	181	9440	1337.7	5014	14.56	5.99	616	10	6.7	803.5	Off	8.26	6.6
16660	158	78	114	129	509	66	181	9302	1314.3	5014	14.57	5.99	610	10.4	6.7	809.0	Off	8.26	6.6
16720	158	78	115	129	508	66	181	9139	1279.1	5014	14.54	6.05	607	10	6.7	775.9	Off	8.26	6.6
16780	158	78	114	129	507	66	181	9147	1292	5011	14.52	6.07	592	10	6.7	781.4	Off	8.26	6.6
16840	158	78	114	129	507	66	181	9224	1304.2	5013	14.53	6.06	570	10	6.7	809.0	Off	8.26	6.6
16900	158	78	114	129	506	66	181	9196	1298.7	5013	14.54	6.06	564	10	6.7	809.0	Off	8.26	6.6
16960	158	78	114	128	504	66	181	9131	1286.6	5012	14.62	5.98	555	10	6.7	781.5	Off	8.26	6.6
17020	157	78	114	129	502	66	181	9196	1296.5	5015	14.64	5.96	531	9.7	6.7	825.6	Off	8.26	6.6
17080	158	78	115	128	500	66	181	9233	1295.6	5013	14.65	5.95	513	9.5	6.7	759.4	Off	8.26	6.6
17140	157	77	114	129	499	66	181	9200	1281.4	5014	14.65	5.94	511	9.5	6.7	814.6	Off	8.26	6.6
17200	157	77	115	128	498	66	180	9155	1276.5	5013	14.65	5.95	503	9.5	6.7	748.3	Off	8.26	6.6
17260	158	77	114	129	495	66	180	9111	1270.2	5014	14.67	5.93	487	9.5	6.7	787.0	Off	8.26	6.6
17320	157	77	114	129	493	66	180	9025	1257.5	5015	14.72	5.89	470	9.3	6.7	814.6	Off	8.26	6.6
17380	156	78	114	128	492	66	180	8960	1248.9	5013	14.76	5.86	474	9	6.7	781.5	Off	8.26	6.6
17440	157	78	114	128	491	66	180	8960	1242	5015	14.74	5.89	480	9	6.7	814.6	Off	8.26	6.6
17500	157	78	114	128	490	66	180	9017	1256.6	5013	14.72	5.89	469	9	6.7	803.5	Off	8.26	6.6
17560	157	78	114	128	490	66	180	8980	1247.9	5015	14.73	5.88	459	9	6.7	798.0	Off	8.26	6.6
17620	157	77	114	128	489	66	180	8980	1245	5013	14.73	5.88	467	9	6.7	798.1	Off	8.26	6.6
17680	157	78	114	128	490	65	181	9005	1253.3	5014	14.73	5.88	468	8.6	6.7	792.6	Off	8.26	6.6
17740	157	78	114	128	490	65	180	9062	1260.9	5013	14.77	5.84	462	8.5	6.7	803.6	Off	8.26	6.6
17800	156	77	114	128	488	65	179	9216	1292	5014	14.86	5.76	469	8.5	6.7	781.5	Off	8.26	6.6
17860	155	77	114	128	486	65	179	9241	1287.4	5012	14.9	5.71	334	8.5	6.7	755.1	Off	8.26	6.6
17916	155	77	114	128	485	65	178	9172	1271.6	5014	14.91	5.66	259	8.5	6.7	770.5	Off	8.26	6.6
17976	155	77	114	128	484	66	177	9208	1268.2	5015	14.92	5.68	248	8.5	6.7	787.0	Off	8.26	6.6
18036	154	77	114	128	483	65	177	9298	1303.7	5013	14.94	5.65	242	8.5	6.7	787.1	Off	8.26	6.6
18096	154	77	114	128	482	65	176	9387	1312.2	5013	14.93	5.67	242	8	6.7	781.5	Off	8.26	6.6
18156	155	77	114	128	481	65	176	9481	1329.3	5013	14.92	5.67	247	8	6.7	781.5	Off	8.26	6.6
18216	155	77	113	128	481	65	176	9599	1351.6	5014	14.91	5.67	253	8	6.7	798.1	Off	8.26	6.6
18276	154	77	114	128	479	65	176	9709	1366	5013	14.91	5.68	262	7.9	6.7	781.5	Off	8.26	6.6
18336	154	77	114	128	478	65	176	9542	1331.4	5014	14.92	5.68	266	7.7	6.7	765.0	Off	8.26	6.6
18396	154	77	113	128	478	65	176	9416	1317.9	5012	14.91	5.7	271	7.5	6.7	820.3	Off	8.27	6.6
18456	155	77	113	128	476	65	176	9408	1318.7	5012	14.93	5.68	269	7.5	6.7	809.2	Off	8.27	6.6

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

15-Jun-95 Run TDD-2A Scoping test 1

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
18516	154	77	113	128	476	65	176	9399	1311.7	5014	14.97	5.65	262	7.5	6.7	792.6	Off	8.26	6.6
18576	154	78	113	128	476	65	176	9359	1307.9	5013	14.98	5.64	262	7.5	6.7	803.7	Off	8.27	6.6
18636	154	77	113	128	477	65	176	9147	1274.9	5013	14.96	5.67	249	7.5	6.7	814.7	Off	8.27	6.6
18696	153	77	113	127	477	65	177	9009	1242.8	5013	14.91	5.72	238	7.5	6.7	820.3	Off	8.27	6.6
18756	155	77	113	127	475	65	176	8948	1239.3	5013	14.93	5.67	236	7	6.7	809.3	Off	8.27	6.6
18816	155	77	113	127	473	65	176	9041	1251.6	5012	14.96	5.68	234	7	6.7	787.2	Off	8.26	6.6
18876	154	76	112	127	466	65	176	9090	1258	5013	14.97	5.6	232	7	6.7	814.8	Off	8.27	6.6
18936	155	77	113	127	463	65	175	8728	1193.7	5012	15.06	5.54	198	7	6.7	792.7	Off	8.27	6.6
18996	154	77	113	127	461	65	175	8565	1172.4	5017	15.09	5.51	231	7	6.7	792.7	Off	8.27	6.6
19056	154	77	113	127	458	65	174	8496	1165.4	5015	15.12	5.48	231	7	6.7	803.8	Off	8.27	6.6
19116	154	77	113	127	457	65	174	8431	1155.1	5014	15.12	5.49	227	6.5	6.7	809.3	Off	8.27	6.6
19176	154	77	112	127	456	64	174	8354	1134.9	5013	15.13	5.48	219	6.5	6.7	803.8	Off	8.27	6.6
19236	153	77	113	127	455	64	173	8362	1134.9	5014	15.13	5.49	216	6.5	6.7	745.1	Off	8.27	6.6
19292	153	77	112	127	454	64	173	8362	1137.9	5015	15.15	5.46	214	6.5	6.7	809.3	Off	8.27	6.6
19352	152	76	112	127	453	64	174	8468	1154.5	5013	15.13	5.46	210	6.5	6.7	825.9	Off	8.27	6.6
19412	152	76	112	127	453	65	173	8561	1163.7	5013	15.12	5.46	202	6.1	6.7	787.3	Off	8.27	6.6
19472	152	76	113	127	451	65	173	8521	1157.1	5015	15.13	5.47	196	6	6.7	770.7	Off	8.27	6.6
19532	152	76	112	127	451	65	173	8521	1161.8	5014	15.12	5.48	194	6	6.7	787.3	Off	8.27	6.6
19592	152	76	112	127	451	65	173	8545	1154.9	5015	15.1	5.49	189	6	6.7	803.9	Off	8.27	6.6
19652	153	76	112	127	451	65	173	8508	1151.7	5015	15.09	5.52	186	6	6.7	792.8	Off	8.27	6.6
19712	153	76	112	127	450	65	174	8549	1162.8	5015	15.1	5.5	180	6	6.7	787.3	Off	8.27	6.6
19772	153	76	112	126	450	65	173	8573	1161.8	5013	15.08	5.51	181	6	6.7	792.9	Off	8.27	6.6
19832	153	76	112	126	449	65	173	8565	1162.6	5013	15.07	5.52	175	5.5	6.7	792.9	Off	8.27	6.6
19892	152	76	112	126	447	65	174	8476	1149.6	5013	15.11	5.48	173	5.5	6.7	787.4	Off	8.27	6.6
19952	151	76	112	126	445	65	173	7874	1026	5016	15.2	5.41	165	5.5	6.7	787.4	Off	8.27	6.6
20012	151	77	112	126	443	65	173	7650	1002.6	5015	15.25	5.38	168	5.5	6.7	792.9	Off	8.27	6.6
20072	151	76	112	126	441	65	172	7703	1010.3	5013	15.26	5.35	170	5.5	6.7	792.9	Off	8.27	6.6
20132	151	76	112	126	438	65	171	7711	1016.8	5013	15.27	5.35	167	5.5	6.7	776.4	Off	8.27	6.6
20192	151	76	112	126	437	65	172	7825	1033.7	5014	15.26	5.35	171	5	6.7	787.4	Off	8.27	6.6
20252	151	76	112	126	436	65	172	7849	1040.2	5015	15.26	5.32	179	5	6.7	792.9	Off	8.27	6.6
20312	152	76	111	126	435	65	171	7739	1015.3	5015	15.3	5.32	177	5	6.7	793.0	Off	8.27	6.6
20372	152	76	111	126	434	65	171	7564	980.5	5013	15.3	5.35	173	5	6.7	793.0	Off	8.27	6.6
20432	152	75	111	126	432	65	171	7499	967.9	5015	15.32	5.32	172	5	6.7	782.0	Off	8.27	6.6
20492	152	76	111	126	431	65	170	7540	976.4	5011	15.32	5.3	176	5	6.7	782.0	Off	8.27	6.6
20552	153	76	111	126	429	65	170	7538	973.5	5013	15.34	5.29	171	4.5	6.7	776.4	Off	8.27	6.6
20612	152	75	111	125	428	65	170	7499	963.5	5013	15.34	5.29	170	4.5	6.7	719.6	Off	8.27	6.6
20668	151	75	111	125	426	65	170	7430	951.3	5015	15.36	5.27	170	4.5	6.7	787.5	Off	8.27	6.6
20728	150	75	111	125	424	65	170	7406	944.2	5015	15.39	5.24	172	4.5	6.7	787.5	Off	8.27	6.6
20788	150	76	111	125	423	65	170	7560	973	5016	15.42	5.21	177	4.5	6.7	782.0	Off	8.27	6.6
20848	150	76	111	125	422	65	170	7837	1026	5014	15.41	5.2	182	4.5	6.7	787.6	Off	8.27	6.6
20908	150	76	111	125	421	65	170	7821	1024.1	5016	15.42	5.21	187	4.5	6.7	782.0	Off	8.27	6.6
20968	150	76	111	125	420	65	169	7784	1022.9	5014	15.43	5.2	188	4.3	6.7	787.6	Off	8.27	6.6
21028	149	75	111	125	419	65	169	7751	1012	5013	15.45	5.18	187	4	6.7	760.0	Off	8.27	6.6
21088	149	75	111	125	418	65	169	7707	1007.3	5013	15.46	5.14	186	4	6.7	776.5	Off	8.27	6.6
21148	150	75	111	125	416	65	169	7703	1001.5	5014	15.54	5.09	188	4	6.7	760.0	Off	8.27	6.6
21208	150	75	111	125	414	65	167	7678	997.4	5013	15.53	5.11	188	4	6.7	787.6	Off	8.27	6.6
21268	151	74	111	125	414	65	166	7670	996.7	5013	15.52	5.1	188	4	6.7	765.6	Off	8.27	6.6
21328	150	74	111	125	411	65	166	7642	994.6	5013	15.53	5.09	185	4	6.7	771.1	Off	8.27	6.6
21388	150	74	111	124	411	64	167	7658	992.8	5013	15.52	5.1	184	4	6.7	760.1	Off	8.27	6.6
21448	148	74	110	125	411	65	167	7520	967.6	5013	15.55	5.07	184	3.5	6.7	787.7	Off	8.27	6.6
21508	148	74	110	125	410	64	167	7503	960.8	5015	15.59	5.04	180	3.5	6.7	782.1	Off	8.27	6.6
21568	148	74	110	125	408	65	166	7471	957	5015	15.6	5.02	180	3.5	6.7	787.7	Off	8.27	6.6
21628	147	74	110	124	407	65	165	7483	957	5014	15.61	5.02	178	3.5	6.7	776.7	Off	8.27	6.6
21688	147	74	110	124	406	65	165	7369	936.2	5013	15.65	4.97	175	3.5	6.7	787.7	Off	8.27	6.6
21748	147	74	110	124	407	65	165	7336	928.1	5015	15.75	4.87	171	3.5	6.7	749.1	Off	8.27	6.6
21808	147	74	110	124	406	65	165	7361	944.5	5013	15.78	4.85	167	3.5	6.7	787.7	Off	8.27	6.6
21868	147	73	110	124	404	65	165	7385	934.6	5013	15.79	4.84	166	3.2	6.7	771.2	Off	8.27	6.6
21928	147	73	110	124	404	64	165	7292	923.7	5015	15.81	4.82	165	3	6.7	776.7	Off	8.27	6.6
21988	146	73	110	124	403	64	164	7263	914.2	5014	15.83	4.81	159	3	6.7	719.6	Off	8.27	6.6
22044	146	73	109	124	403	64	164	7186	906.6	5014	15.85	4.78	154	3	6.7	782.3	Off	8.27	6.6
22104	146	74	110	124	402	64	164	7149	899.7	5015	15.86	4.78	153	3	6.7	771.2	Off	8.27	6.6
22164	146	73	109	124	401	64	164	7076	887.4	5014	15.86	4.77	150	3	6.7	776.6	Off	8.27	6.6
22224	146	74	110	123	400	64	164	7068	883	5013	15.87	4.76	144	3	6.7	754.7	Off	8.27	6.6
22284	146	73	109	123	400	64	163	7064	880.5	5015	15.87	4.76	144	3	6.7	771.3	Off	8.27	6.6
22344	145	73	109	123	399	64	163	6999	868.3	5015	15.9	4.74	142	3	6.7	771.3	Off	8.27	6.6
22404	145	73	109	123	397	64	162	6950	858.2	5014	15.9	4.75	141	2.8	6.7	765.8	Off	8.27	6.6
22464	145	73	109	123	397	64	162	6901	858.3	5015	15.92	4.73	135	2.5	6.7	760.3	Off	8.27	6.6
22524	144	73	109	123	395	64	162	6791	833	5014	15.96	4.68	133	2.5	6.7	782.4	Off	8.27	6.6
22584	144	73	109	123	394	64	161	6722	818.5	5015	16.01	4.63	130	2.5	6.7	765.8	Off	8.27	6.6
22644	144	73	109	123	392	64	160	6685	811	5013	16.01	4.63	128	2.5	6.7	776.9	Off	8.27	6.6
22704	144	73	109	123	391	64	160	6665	808.1	5014	16.02	4.63	126	2.5	6.7	771.4	Off	8.27	6.6
22764	144	73	109	123	390	64	160	6616	800.6	5015	16.04	4.62	120	2.5	6.7	776.9	Off	8.27	6.6
22824	143	73	109	122	389	64	160	6571	789.1	5013	16.06	4.59	121	2.5	6.7	754.9	Off	8.27	6.6
22884	143	73	108	122	388	64	160	6498	776.7	5015	16.07	4.59	118	2.5	6.7	771.5	Off	8.27	6.6
22944	143	73	108	122	387	64	159	6462	770.7	5015	16.08	4.58	115	2.5	6.7	771.5	Off	8.27	6.6
23004	142	72	108	122	387	64	159	6478	774.3	5014	16.09	4.56	113	2.5	6.7	760.4	Off	8.27	6.6

D6

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

15-Jun-95 Run TDD-2A Scoping test 1

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
23064	142	73	108	122	386	64	159	6486	776.7	5015	16.11	4.55	112	2.5	6.7	755.0	Off	8.27	6.6
23124	142	73	108	122	384	63	158	6498	773.4	5014	16.14	4.53	111	2	6.7	766.0	Off	8.27	6.6
23184	142	73	108	122	383	63	158	6421	763.3	5011	16.18	4.48	108	2	6.7	760.5	Off	8.27	6.6
23244	142	73	108	122	382	63	158	6356	749.2	5013	16.19	4.47	106	2	6.7	771.5	Off	8.27	6.6
23304	142	73	108	122	381	64	157	6299	734.5	5014	16.21	4.46	106	2	6.7	755.0	Off	8.27	6.6
23364	142	74	109	122	380	64	156	6209	714.8	5015	16.23	4.44	105	2	6.7	668.5	Off	8.27	6.6
23420	142	75	109	122	379	64	157	6173	708	5015	16.24	4.43	100	2	6.7	683.2	Off	8.27	6.6
23480	143	75	109	121	378	64	156	6470	769.4	5015	16.19	4.48	98	1.5	6.7	683.2	Off	8.27	6.6
23540	143	76	109	122	377	64	157	6458	758.5	5015	16.16	4.47	99	1.5	6.7	683.2	Off	8.27	6.6
23600	143	75	109	122	376	65	157	6331	738.2	5016	16.19	4.45	98	1.5	6.7	694.2	Off	8.27	6.6
23660	144	74	108	122	374	65	156	6238	721.5	5016	16.23	4.41	95	1.5	6.7	732.9	Off	8.27	6.6
23720	143	74	108	121	372	65	156	6108	700	5014	16.31	4.34	95	1.5	6.7	738.5	Off	8.27	6.6
23780	143	73	108	121	370	65	156	5989	673.2	5014	16.39	4.27	93	1.5	6.7	733.0	Off	8.27	6.6
23840	142	73	108	121	389	65	156	5904	668.1	5014	16.4	4.26	92	1.5	6.7	738.5	Off	8.27	6.6
23900	141	73	107	121	387	64	155	5843	654.1	5014	16.44	4.23	89	1.5	6.7	738.6	Off	8.28	6.6
23960	140	73	107	121	367	64	155	5762	637.7	5015	16.47	4.21	87	1.5	6.7	727.5	Off	8.28	6.6
24020	139	72	108	121	360	64	154	5713	616.3	5013	16.48	4.18	90	1.5	6.7	738.5	Off	8.28	6.6
24080	138	72	107	120	350	64	152	5673	690.1	5014	16.77	3.92	117	1.5	6.7	733.1	Off	8.28	6.6
24140	138	72	107	120	347	64	150	5657	675.6	5015	16.96	3.78	129	1	6.7	716.6	Off	8.28	6.6
24200	139	72	107	120	364	64	152	5640	635.1	5012	16.88	3.88	118	1	6.7	716.6	Off	8.28	6.6
24260	142	72	107	120	400	64	156	5009	526.9	4966	16.51	4.27	101	1	6.7	738.7	Off	8.28	6.6
24320	142	72	107	120	411	63	158	4484	411.6	4464	16.18	4.59	95	1	6.7	727.6	Off	8.28	6.6
24380	141	72	107	120	394	63	158	4504	421.2	4470	16.32	4.41	100	1	6.7	716.6	Off	8.28	6.6
24440	139	71	107	120	370	63	156	4822	475.6	4799	16.65	4.06	115	1	6.7	738.7	Off	8.28	6.6
24500	138	71	107	120	357	63	154	5119	530.6	5013	16.87	3.85	117	1	6.7	722.1	Off	8.28	6.6
24560	137	72	107	120	347	63	152	5164	527.2	5014	16.95	3.76	108	1	6.7	711.1	Off	8.28	6.6
24620	137	73	107	120	341	63	150	5172	532.2	5014	17.02	3.71	103	1	6.7	694.5	Off	8.28	6.6
24680	137	74	108	119	338	64	149	5155	526.2	5013	17.03	3.69	99	0.5	6.7	644.8	Off	8.27	6.6
24740	137	74	107	120	336	64	148	5103	517.9	5013	17.04	3.67	99	0.5	6.7	627.6	Off	8.28	6.6
24796	137	73	107	119	334	64	147	5050	509.4	5013	17.06	3.65	94	0.5	6.7	672.5	Off	8.28	6.6
24856	137	73	106	119	333	64	147	4985	502.4	4994	17.1	3.61	91	0.5	6.7	705.6	Off	8.28	6.6
24916	136	72	106	119	331	64	147	4968	496.9	4943	17.14	3.58	88	0.5	6.7	711.2	Off	8.28	6.6
24976	135	72	106	119	329	64	148	4887	490.6	4907	17.17	3.58	85	0.5	6.7	705.7	Off	8.28	6.6
25036	135	72	106	119	328	65	148	4891	485.8	4880	17.17	3.58	79	0.5	6.7	694.6	Off	8.28	6.6
25096	135	71	106	119	327	64	145	4838	478.2	4835	17.19	3.54	77	0.5	6.7	716.8	Off	8.28	6.6
25156	135	72	106	119	326	64	144	4822	475.6	4806	17.21	3.54	79	0.5	6.7	700.2	Off	8.28	6.6
25216	134	71	105	119	325	63	144	4818	476.1	4795	17.24	3.51	76	0.5	6.7	722.3	Off	8.28	6.6
25276	133	71	105	119	324	63	144	4826	475.6	4805	17.24	3.51	74	0.5	6.7	727.9	Off	8.28	6.6
25336	133	71	105	118	323	63	143	4777	465.2	4758	17.26	3.5	69	0.5	6.7	722.4	Off	8.28	6.6
25396	133	71	105	118	322	63	143	4736	457.8	4732	17.24	3.51	69	0.5	6.7	694.8	Off	8.28	6.6
25456	133	71	106	118	321	63	142	4659	440.6	4657	17.26	3.48	66	0.5	6.7	689.2	Off	8.28	6.6
25516	134	72	106	118	320	63	142	4606	431.5	4585	17.29	3.47	64	0.3	6.7	661.6	Off	8.28	6.6
25576	134	73	106	118	319	64	142	4582	430.2	4566	17.3	3.46	63	0	6.7	650.6	Off	8.28	6.6
25636																			
average	163	79	111	124	451	66	183	11496			14.27	6.38	1057.06		6.66	718.5		8.27	
25248																			
7.01333333																			
420.8000																			

Total Btu out = 303,944 , Btu/hr out = 43,338
Total Btu in = 516,041 , Btu/hr in = 73,580
Efficiency = 58.90%
Ave. water = 6.66 gpm
Burnrate = 4.14 dry kg/hr
Wood moisture 29.00%

D7

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on: 02-Apr-96

19-Jun-95 Run TTD-2B Scoping test 2

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out BTU	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
5712	128	76	143	162	227	67	136	863	310.5	829	20.22	0.72	1035	83.5	6.6	1034.5	On	8.20	6.5
5772	127	73	143	162	291	67	137	1298	334.5	1255	20.17	0.81	1498	83.5	6.6	1050.7	On	8.20	6.5
5832	127	73	142	162	319	67	138	1636	397	1639	19.81	1.13	1856	83.5	6.6	1056.1	On	8.20	6.5
5892	128	73	142	162	331	68	139	1668	397	1655	19.76	1.15	2259	83	6.6	1050.8	On	8.20	6.5
5952	130	74	142	162	340	68	139	1705	420.1	1709	19.74	1.18	2675	83	6.6	1061.5	On	8.20	6.5
6012	131	74	143	162	347	68	140	1756	426.3	1761	19.68	1.21	2983	83	6.6	1039.9	On	8.20	6.5
6072	131	73	143	162	347	69	141	1770	426.9	1757	19.67	1.23	3448	83	6.6	1056.1	On	8.20	6.5
6132	132	73	143	162	351	69	142	1839	438.8	1842	19.59	1.28	3770	83	6.6	1029.1	On	8.20	6.5
6192	133	73	143	162	353	69	142	1921	441.7	1884	19.56	1.32	4075	83	6.6	1050.7	On	8.20	6.5
6252	135	73	143	162	369	69	144	1949	476.1	1932	19.53	1.37	4420	82.5	6.6	1050.7	On	8.20	6.5
6312	137	72	142	162	377	66	145	1929	463.5	1921	19.51	1.51	4758	82.5	6.6	1061.7	On	8.20	6.5
6372	137	72	142	162	373	69	146	1982	485.2	1960	19.51	1.49	5374	82.5	6.6	1088.7	On	8.20	6.5
6432	138	72	142	162	372	68	147	2047	520.5	2033	19.5	1.49	6225	82.5	6.6	1088.8	On	8.20	6.5
6492	140	73	142	162	386	68	150	2185	613.1	2183	19.31	1.67	6695	82.5	6.6	1083.4	On	8.20	6.5
6552	141	75	142	162	390	67	153	2169	634.1	2178	19.17	1.81	6692	82	6.6	1050.8	On	8.20	6.5
6612	147	77	143	162	405	67	159	2303	746.1	2238	19.17	1.81	6694	81.9	6.6	1007.4	On	8.20	6.5
6672	153	79	145	162	429	68	166	3206	1178.9	3204	16.46	2.5	6691	81.5	6.6	899.2	On	8.19	6.5
6732	157	80	146	161	439	68	171	2958	1127.6	2968	16.5	2.42	6691	81	6.6	796.6	On	8.19	6.5
6792	161	80	148	161	449	69	175	3153	1197.1	3105	16.49	2.47	6694	81	6.6	802.0	On	8.19	6.5
6852	164	80	145	160	463	69	178	3349	1348.8	3332	16.41	2.52	6693	80.5	6.6	718.6	On	8.19	6.5
6908	166	80	144	159	473	69	180	3544	1470.1	3512	16.39	2.52	6694	80.2	6.6	791.7	On	8.20	6.5
6968	169	80	143	157	482	69	182	4045	1482.6	4021	16.03	2.92	6693	80	6.6	770.4	On	8.20	6.5
7028	171	80	142	156	491	69	185	4639	1657.6	4638	17.83	3.11	6693	79.5	6.6	786.9	On	8.20	6.5
7088	176	80	141	156	499	69	190	5123	1836.6	5011	17.57	3.33	6693	79.5	6.6	792.5	On	8.21	6.5
7148	182	81	140	155	511	69	196	4944	1882.3	4932	17.41	3.46	6693	79	6.6	792.7	On	8.21	6.5
7208	185	80	140	154	533	68	199	4683	1864.6	4725	17.4	3.42	6695	78.5	6.6	787.4	On	8.21	6.5
7268	186	80	139	154	570	68	200	4692	1911	4753	17.72	3.15	6692	78.5	6.6	782.0	On	8.21	6.5
7328	187	81	139	154	597	69	202	4252	1777.3	4302	17.58	3.3	6691	78	6.6	785.9	On	8.21	6.5
7388	188	81	139	153	614	68	203	4126	1710.3	4155	17.4	3.49	6692	77.5	6.6	760.5	On	8.21	6.5
7448	190	82	139	154	618	68	204	4415	1753.1	4439	17.16	3.71	6694	77	6.6	771.3	On	8.21	6.5
7508	189	82	140	154	616	68	204	4667	1849.9	4701	17.32	3.5	5454	77	6.7	792.7	On	8.21	6.6
7568	189	82	140	154	620	68	204	4500	1920.9	4600	17.68	3.13	2106	76.5	6.7	792.6	On	8.21	6.6
7628	188	81	140	155	617	69	203	3813	1932.1	3822	18.34	2.5	2186	76	6.7	814.5	On	8.21	6.6
7688	188	80	140	155	619	68	201	4256	1920.9	4250	18.22	2.63	2386	75.5	6.7	803.5	On	8.21	6.6
7748	188	79	140	155	648	68	200	4167	1965.8	4178	18.36	2.48	2543	75.5	6.7	798.0	On	8.21	6.6
7808	187	80	140	155	711	67	199	4472	1967.9	4471	18.22	2.66	2161	75	6.7	814.5	On	8.21	6.6
7868	193	81	140	155	782	67	202	4443	1944.7	4506	17.67	3.23	1775	74.5	6.7	825.4	On	8.21	6.6
7928	200	82	140	155	827	67	207	4305	1961.6	4314	17.45	3.36	1709	74.1	6.7	787.0	On	8.21	6.6
7988	202	84	141	155	848	67	210	4415	1961.6	4432	17.32	3.52	1556	74	6.7	776.0	On	8.20	6.6
8048	201	84	141	156	841	67	210	4325	1930.3	4363	17.25	3.52	1620	73.5	6.7	797.8	On	8.20	6.6
8108	199	84	141	158	824	67	209	4350	1955.4	4375	17.59	3.16	1763	73	6.7	808.8	On	8.20	6.6
8168	195	84	141	156	806	67	207	4411	1942.7	4377	17.76	3.02	1904	72.5	6.7	781.3	On	8.20	6.6
8228	194	84	142	156	796	68	206	4871	1939.5	4881	17.52	3.27	2101	72.4	6.7	713.9	On	8.20	6.6
8284	194	82	142	156	796	68	205	4948	1961.6	4991	17.49	3.27	2212	72	6.7	775.8	On	8.20	6.6
8344	195	82	141	156	800	68	204	4997	1985	5008	17.49	3.26	2286	71.5	6.7	825.1	On	8.20	6.6
8404	197	81	141	156	811	68	205	5037	2002.6	5011	17.43	3.33	2239	71.5	6.7	808.7	On	8.20	6.6
8464	199	81	141	156	816	68	205	5013	2005	5011	17.32	3.37	2244	71	6.7	825.1	On	8.20	6.6
8524	201	82	141	156	829	67	207	5033	2006.2	4963	17.41	3.36	2233	70.5	6.7	836.1	On	8.20	6.6
8584	204	82	141	156	830	67	209	5314	2007.3	5012	17.42	3.59	2247	70	6.7	847.0	On	8.20	6.6
8644	205	82	141	157	825	67	210	5375	2005.7	5011	17.47	3.5	2349	70	6.7	841.5	On	8.20	6.6
8704	205	83	142	157	810	67	212	5697	2005.7	5011	17.41	3.53	2556	69.5	6.7	841.4	On	8.20	6.6
8764	205	83	142	157	796	67	213	5750	2004.6	5012	17.49	3.41	2730	68.5	6.7	808.5	On	8.20	6.6
8824	205	84	142	157	790	67	214	5961	2005.9	5011	17.44	3.43	2803	68.5	6.7	830.3	On	8.20	6.6
8884	204	84	143	157	787	67	215	6156	2006.7	5010	17.27	3.56	2899	68	6.7	791.9	On	8.20	6.6
8944	203	84	143	158	774	67	214	5994	2005.2	5013	17.26	3.53	2874	67.5	6.7	813.8	On	8.20	6.6
9004	201	83	143	158	756	68	213	6079	2006	5014	17.34	3.45	2963	67	6.7	797.4	On	8.20	6.6
9064	203	83	143	158	751	68	213	5872	2006.8	5013	17.44	3.33	2950	67	6.7	813.8	On	8.20	6.6
9124	206	83	143	158	754	68	215	5843	2006	5010	17.27	3.52	2774	66.5	6.7	830.2	On	8.20	6.6
9184	208	83	143	158	756	68	216	5855	2006	5013	17.03	3.74	2769	66	6.7	819.2	On	8.20	6.6
9244	209	82	143	158	757	68	218	6002	2006	5011	17.01	3.79	2742	65.5	6.7	841.1	On	8.20	6.6
9304	210	82	143	158	758	68	218	6030	2006.2	5011	17.15	3.85	2685	65	6.7	841.1	On	8.20	6.6
9364	208	82	143	158	756	67	218	5981	2006.7	5012	17.14	3.87	2722	65	6.7	841.1	On	8.20	6.6
9424	201	81	143	159	747	67	214	6177	2005	5013	17.24	3.81	2672	64.5	6.7	852.0	On	8.20	6.6
9484	196	80	143	159	735	67	209	5663	1999.3	5013	17.52	3.56	2633	64	6.7	862.9	On	8.20	6.6
9544	191	81	144	159	734	67	205	5619	1966.6	5013	17.61	3.49	2651	64	6.7	824.5	On	8.20	6.6
9604	189	82	144	159	734	67	203	5599	1945.8	5012	17.7	3.4	2504	63.5	6.7	743.9	On	8.20	6.6
9660	189	82	144	159	734	67	203	5497	1914.1	5011	17.5	3.57	2354	63	6.7	802.5	On	8.20	6.6
9720	189	82	144	159	734	67	202	5306	1878.4	5013	17.5	3.57	2246	62.5	6.7	808.0	On	8.20	6.6
9780	191	81	144	159	734	68	202	5245	1862.8	5013	17.44	3.62	2258	62.5	6.7	824.4	On	8.20	6.6
9840	192	80	144	159	736	68	203	5160	1866.2	5012	17.48	3.59	2351	62	6.7	819.0	On	8.20	6.6
9900	194	80	144	159	739	68	203	5139	1905.4	5011	17.56	3.52	2375	61.5	6.7	846.4	On	8.20	6.6
9960	195	79	143	159	739	68	204	5318	1922.2	5012	17.42	3.67	2307	61.5	6.7	862.8	On	8.20	6.6
10020	196	79	143	159	737	67	204	5387	1908.2	5013	17.35	3.74	2395	61	6.7	857.4	On	8.20	6.6
10080	198	79	143	159	738	67	205	5444	1946.6	5011	17.38	3.69	2435	60.5	6.7	857.3	On	8.20	6.6
10140	198	79	143	159	740	67	205	5509	1972.8	5013	17.4	3.68	2454	60.5	6.7	873.8	On	8.20	6.6
10200	198	79	143	159	740	66	206	5501	1976.2	5012	17.42	3.68	2417	60	6.7	864.8	On	8.20	6.6

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on: 02-Apr-96

19-Jun-95 Run TTD-2B Scoping test 2

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out BTU	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
10260	199	80	144	159	738	67	207	5530	1968.4	5012	17.35	3.76	2428	59.9	6.7	846.4	On	8.20	6.6
10320	198	81	144	159	737	67	207	5562	1972.2	5012	17.38	3.71	2496	59.5	6.7	829.9	On	8.20	6.6
10380	199	83	144	159	749	67	206	5623	1998.5	5013	17.43	3.67	2502	59	6.7	808.0	On	8.20	6.6
10440	199	83	144	159	744	67	206	5587	2005.9	5012	17.49	3.61	2452	58.5	6.7	808.0	On	8.20	6.6
10500	198	83	144	159	732	67	206	5314	1969.1	5011	17.58	3.49	2388	58.4	6.7	807.9	On	8.20	6.6
10560	196	83	145	159	726	67	206	5013	1925.8	4989	17.72	3.34	2385	58	6.7	791.5	On	8.20	6.6
10620	196	81	145	160	721	68	205	5042	1906.1	5008	17.71	3.33	2369	57.5	6.7	824.3	On	8.20	6.6
10680	195	80	144	160	719	68	204	5090	1893.6	5014	17.7	3.33	2446	57.5	6.7	840.7	On	8.20	6.6
10740	195	79	144	160	716	68	205	5062	1915.9	5009	17.8	3.24	2453	57	6.7	868.1	On	8.20	6.6
10800	194	79	144	160	715	67	204	5241	1924.2	5014	17.69	3.33	2514	57	6.7	884.5	On	8.20	6.6
10860	194	78	144	160	714	67	204	5652	1943.4	5011	17.51	3.5	2681	56.5	6.7	851.7	On	8.20	6.6
10920	195	78	144	160	717	67	205	5623	1995.1	5012	17.59	3.44	2658	56.5	6.7	873.6	On	8.20	6.6
10980	196	79	144	160	719	67	206	5290	1988.8	5014	17.65	3.36	2655	56	6.7	779.6	On	8.20	6.6
11036	197	80	145	160	718	67	206	5640	1979.5	5012	17.39	3.61	2726	55.5	6.7	846.1	On	8.20	6.6
11096	195	80	144	160	715	67	208	5599	2003.1	5014	17.44	3.56	2708	55.3	6.7	857.1	On	8.20	6.6
11156	195	80	145	160	715	67	209	5505	2002.6	5012	17.56	3.45	2712	55	6.7	851.5	On	8.20	6.6
11216	195	80	145	160	716	67	210	5680	2005	5014	17.49	3.53	2712	54.5	6.7	818.8	On	8.20	6.6
11276	196	80	145	160	718	67	210	5461	2006.2	5013	17.62	3.39	2641	54	6.7	835.1	On	8.20	6.6
11336	198	80	145	160	711	68	210	5721	2006	5013	17.45	3.54	2585	54	6.7	851.6	On	8.20	6.6
11396	200	80	145	160	697	68	211	5542	2005.7	5012	17.52	3.44	2594	53.5	6.7	857.0	On	8.20	6.6
11456	200	79	145	160	686	67	211	5774	2005.2	5012	17.55	3.43	2655	53.5	6.7	857.0	On	8.20	6.6
11516	200	80	145	161	681	67	211	5754	2006.8	5014	17.55	3.42	2729	53	6.7	878.9	On	8.20	6.6
11576	199	80	144	161	676	67	210	5745	2006.3	5013	17.7	3.29	2738	53	6.7	884.4	On	8.20	6.6
11636	198	81	145	160	673	67	210	5941	2005.2	5012	17.61	3.38	2762	52.5	6.7	835.1	On	8.19	6.6
11696	196	82	145	161	673	67	209	6132	2005.4	5012	17.56	3.42	2776	52	6.7	851.4	On	8.19	6.6
11756	195	83	146	161	671	67	209	6148	2006.3	5013	17.61	3.39	2791	51.5	6.7	829.5	On	8.19	6.6
11816	195	83	146	161	670	67	209	6250	2006.3	5013	17.57	3.41	2725	51	6.7	834.9	On	8.19	6.6
11876	197	82	146	161	669	67	209	6014	2006.3	5013	17.61	3.39	2591	51	6.7	845.8	On	8.19	6.6
11936	199	81	145	161	669	68	209	5721	2005.5	5014	17.73	3.25	2571	50.5	6.7	851.3	On	8.19	6.6
11996	199	80	145	161	672	67	210	5756	2005	5011	17.66	3.33	2477	50.5	6.7	867.8	On	8.19	6.6
12056	200	79	145	161	674	67	210	5656	2005.7	5013	17.71	3.28	2386	50	6.7	867.9	On	8.20	6.6
12116	200	79	145	161	673	67	210	5729	2004.7	5009	17.53	3.47	2266	50	6.7	873.3	On	8.19	6.6
12176	200	79	145	161	673	67	210	5322	2003.6	5012	17.66	3.33	2163	50	6.7	878.7	On	8.19	6.6
12236	200	79	146	161	671	67	211	4749	1972.5	4781	17.92	3.08	2069	49.5	6.7	851.3	On	8.19	6.6
12296	200	80	145	161	670	67	211	4928	1956.5	4960	17.89	3.31	2006	49	6.7	856.8	On	8.19	6.6
12356	199	81	146	161	668	67	212	4891	1930.7	4910	17.68	3.33	1934	48.5	6.7	779.2	On	8.19	6.6
12412	199	82	146	161	665	67	212	4907	1918	4935	17.62	3.4	1878	48.5	6.7	840.3	On	8.19	6.6
12472	196	83	148	161	660	68	213	4761	1882	4814	17.59	3.42	1849	48	6.7	823.9	On	8.19	6.6
12532	195	83	147	162	655	67	213	4647	1856.1	4689	17.65	3.36	1837	47.5	6.7	823.8	On	8.19	6.6
12592	196	84	147	162	653	68	213	4569	1851.7	4603	17.71	3.31	1836	47.5	6.7	823.7	On	8.19	6.6
12652	196	83	147	162	650	68	213	4272	1842.3	4351	17.84	3.15	1844	47	6.7	823.7	On	8.19	6.6
12712	199	81	147	162	647	68	213	4167	1826.2	4152	17.95	3.05	1814	47	6.7	840.2	On	8.19	6.6
12772	200	80	146	162	649	68	213	4252	1796.7	4262	17.77	3.2	1774	46.5	6.7	856.6	On	8.19	6.6
12832	201	80	148	162	649	68	212	4244	1770.7	4288	17.66	3.3	1772	46.5	6.7	873.0	On	8.19	6.6
12892	200	79	146	162	650	68	212	4195	1741.5	4235	17.65	3.32	1742	46	6.6	850.4	On	8.19	6.5
12952	200	79	146	162	649	68	211	4118	1696.4	4184	17.65	3.32	1755	46	6.6	850.4	On	8.19	6.5
13012	200	79	146	162	648	68	211	3890	1690.4	3937	17.8	3.17	1741	45.5	6.6	877.4	On	8.19	6.5
13072	200	78	146	162	646	68	211	3772	1676.6	3780	17.97	3.04	1724	45.5	6.6	866.6	On	8.19	6.5
13132	201	79	146	162	648	67	211	3845	1667.6	3862	17.84	3.17	1671	45	6.6	861.2	On	8.19	6.5
13192	203	81	147	163	649	67	212	3931	1656.4	3949	17.86	3.34	1652	44.5	6.6	855.7	On	8.19	6.5
13252	202	82	147	163	650	68	212	4114	1694.3	4134	17.44	3.54	1661	44.5	6.6	828.6	On	8.19	6.5
13312	200	83	147	163	651	67	213	4313	1743.5	4299	17.43	3.53	1759	44	6.6	839.4	On	8.19	6.5
13372	200	84	148	163	653	68	214	4439	1817.4	4472	17.46	3.49	1746	43.5	6.6	812.4	On	8.19	6.5
13432	201	83	148	163	650	68	215	4399	1821.5	4436	17.46	3.47	1755	43	6.6	817.7	On	8.19	6.5
13492	203	83	148	163	649	68	215	4130	1828.8	4191	17.62	3.29	1798	43	6.6	812.3	On	8.19	6.5
13552	204	83	148	163	649	69	216	4297	1859	4315	17.67	3.27	1825	42.5	6.6	844.7	On	8.19	6.5
13612	208	82	148	163	648	68	217	4533	1881.7	4578	17.5	3.41	1856	42.5	6.6	839.3	On	8.19	6.5
13672	205	81	147	163	650	69	217	4545	1896.2	4588	17.5	3.42	1893	42	6.6	860.9	On	8.19	6.5
13732	207	80	147	164	651	69	217	4500	1910.8	4537	17.59	3.35	1906	42	6.6	818.6	On	8.19	6.5
13788	207	80	147	163	652	68	217	4472	1918.1	4520	17.61	3.35	1896	41.5	6.6	866.3	On	8.19	6.5
13848	207	80	147	164	652	68	218	4154	1915	4169	17.85	3.11	1936	41.5	6.6	877.0	On	8.19	6.5
13908	208	80	147	164	654	68	218	4553	1913.2	4593	17.56	3.43	1984	41	6.6	882.4	On	8.19	6.5
13968	208	79	147	164	653	68	219	4679	1905.1	4749	17.4	3.58	1988	40.8	6.6	877.1	On	8.19	6.5
14028	208	79	147	164	652	67	219	4586	1910	4614	17.48	3.49	1937	40.5	6.6	887.8	On	8.19	6.5
14088	209	80	148	164	649	67	220	4565	1906.2	4605	17.5	3.49	1950	40	6.6	866.1	On	8.19	6.5
14148	208	81	148	164	648	67	219	4659	1906.3	4690	17.45	3.54	2010	39.5	6.6	871.4	On	8.19	6.5
14208	207	82	148	164	648	68	220	4529	1921.9	4561	17.58	3.36	2005	39.5	6.6	866.0	On	8.19	6.5
14268	206	82	149	164	649	68	221	4655	1939.3	4696	17.55	3.44	2021	39	6.6	849.8	On	8.19	6.5
14328	207	82	148	164	649	68	222	4740	1947.9	4781	17.48	3.48	2076	38.5	6.6	860.6	On	8.19	6.5
14388	207	82	149	165	648	68	221	4806	1959.1	4823	17.57	3.39	2265	38.4	6.6	860.5	On	8.19	6.5
14448	208	83	149	165	649	68	221	4976	1999.3	4995	17.55	3.39	2192	38	6.6	865.9	On	8.19	6.5
14508	208	81	149	165	650	68	221	4801	1968.3	4866	17.45	3.49	1967	36.7	6.6	865.9	On	8.19	6.5
14568	208	80	149	165	651	68	221	4256	1883.8	4289	17.7	3.23	1942	37.5	6.6	887.5	On	8.19	6.5
14628	207	80	149	165	650	68	219	4252	1848.5	4279	17.7	3.22	1737	37.4	6.6	876.6	On	8.19	6.5
14688	205	79	149	165	648	68	218	3866	1724.4	3889	17.8	3.11	1664	37	6.7	910.5	On	8.19	6.6
14748	204	78	149	165	644	68	217	3682	1663.9	3689	17.93	3	1570	37	6.7	910.5	On	8.19	6.6

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

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19-Jun-95 Run TTD-2B Scoping test 2

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out BTU	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
14808	202	78	149	166	639	67	216	3569	1561.2	3596	17.88	3.06	1545	36.5	6.7	921.4	On	8.18	6.6
14868	201	78	149	166	634	67	214	3381	1485	3384	17.96	2.98	1515	36.5	6.7	921.4	On	8.19	6.6
14928	199	79	149	166	630	67	212	3349	1441.6	3323	18.04	2.9	1521	36	6.7	921.3	On	8.18	6.6
14988	197	79	149	166	618	67	210	3524	1475.3	3517	18	2.92	1755	36	6.7	863.0	On	8.18	6.6
15048	196	81	150	166	623	67	206	4321	1682.6	4262	18.22	2.63	2277	35.5	6.7	872.0	On	8.18	6.6
15108	193	82	150	166	630	67	205	4980	1963.5	4966	18.21	2.61	2577	35.3	6.7	803.6	On	8.18	6.6
15164	191	82	150	166	633	67	203	5245	2004.7	5013	18.22	2.61	2731	35	6.7	844.6	On	8.18	6.6
15224	190	81	150	166	635	68	202	5351	2006.2	5014	18.18	2.64	2764	34.5	6.7	882.9	On	8.18	6.6
15284	189	79	150	166	640	68	202	5383	2006	5013	18.16	2.66	2830	34.5	6.7	893.8	On	8.18	6.6
15344	189	78	150	166	643	68	201	5339	2006	5013	18.12	2.69	2722	34.1	6.7	882.9	On	8.18	6.6
15404	188	78	149	166	645	68	200	5143	2004.2	4989	18.11	2.68	2564	34	6.7	915.7	On	8.18	6.6
15464	187	77	149	166	646	68	189	4667	1969.1	4722	18.25	2.55	2414	34	6.7	904.8	On	8.18	6.6
15524	187	77	149	166	648	67	199	4622	1926.6	4647	18.19	2.61	2361	33.5	6.7	915.9	On	8.19	6.6
15584	187	76	149	166	647	67	198	4598	1898.8	4622	18.19	2.63	2305	33.5	6.7	937.6	On	8.18	6.6
15644	186	76	149	166	643	67	197	4354	1873.9	4399	18.25	2.58	2206	33	6.7	915.7	On	8.18	6.6
15704	186	77	151	166	642	67	197	3902	1829.9	3929	18.48	2.35	2162	33	6.7	844.6	On	8.18	6.6
15764	184	79	151	166	640	67	195	3918	1804.4	3926	18.52	2.36	2135	32.5	6.7	811.7	On	8.18	6.6
15824	183	79	151	166	635	67	194	4207	1777.5	4213	18.31	2.53	2151	32	6.7	806.3	On	8.18	6.6
15884	182	80	151	166	631	67	193	4293	1757.5	4332	18.24	2.62	2161	32	6.7	817.2	On	8.18	6.6
15944	182	80	151	165	626	68	192	4289	1737	4310	18.27	2.59	2183	32	6.7	779.0	On	8.18	6.6
16004	181	80	151	166	623	68	191	4032	1725.9	4058	18.44	2.44	2173	31.5	6.7	789.9	On	8.18	6.6
16064	182	79	151	165	619	68	191	4024	1711.3	4031	18.47	2.42	2190	31.5	6.7	806.4	On	8.18	6.6
16124	181	77	150	166	619	68	191	3975	1695.5	3976	18.51	2.39	2139	31	6.7	828.3	On	8.18	6.6
16184	180	76	150	165	622	68	191	3935	1692.7	3934	18.51	2.39	2251	31	6.7	822.9	On	8.18	6.6
16244	181	76	150	165	639	68	191	4240	1738.3	4262	18.36	2.54	2347	31	6.7	839.3	On	8.18	6.6
16304	182	76	149	165	654	68	191	4244	1794.9	4249	18.29	2.58	2303	30.5	6.7	855.8	On	8.18	6.6
16364	182	76	149	165	665	67	192	4289	1808.4	4294	18.22	2.62	2265	30.5	6.7	861.3	On	8.18	6.6
16424	182	77	150	165	667	68	192	4264	1814.9	4275	18.22	2.61	2281	30	6.7	817.5	On	8.18	6.6
16484	182	77	150	165	668	67	192	4256	1820.5	4274	18.27	2.56	2254	30	6.7	768.1	On	8.18	6.6
16540	181	77	150	164	666	67	192	4480	1790.4	4509	18.05	2.76	2240	29.5	6.7	801.2	On	8.18	6.6
16600	180	77	150	164	667	68	191	4313	1778.6	4294	18.17	2.64	2196	29.5	6.7	806.6	On	8.18	6.6
16660	181	77	150	164	668	68	190	4183	1763.8	4208	18.2	2.6	2174	29	6.7	801.2	On	8.18	6.6
16720	180	77	149	164	665	68	190	4325	1743.7	4363	18.07	2.74	2148	29	6.7	817.6	On	8.18	6.6
16780	179	78	150	164	665	68	189	4020	1725.9	4049	18.21	2.58	2110	28.5	6.7	795.7	On	8.18	6.6
16840	180	78	150	164	664	68	189	4085	1718.4	4099	18.2	2.6	2094	28.5	6.7	801.2	On	8.18	6.6
16900	180	78	150	164	663	68	189	3874	1702.6	3899	18.28	2.49	2075	28.5	6.7	806.6	On	8.18	6.6
16960	180	77	149	165	659	69	189	3963	1705.8	3963	18.33	2.48	2078	28	6.7	828.5	On	8.18	6.6
17020	180	76	149	164	659	69	190	4102	1709.3	4135	18.16	2.6	2045	28	6.7	839.5	On	8.18	6.6
17080	180	76	149	165	657	68	190	3784	1704.9	3808	18.33	2.43	2006	28	6.7	855.9	On	8.19	6.6
17140	179	76	149	165	656	68	189	3727	1698.6	3746	18.42	2.36	1959	28	6.7	844.9	On	8.18	6.6
17200	179	76	149	164	655	68	189	3923	1696.5	3946	18.32	2.48	1959	27.5	6.7	845.0	On	8.19	6.6
17260	179	77	149	164	654	68	189	3841	1696.3	3850	18.35	2.44	1967	27.5	6.7	823.2	On	8.18	6.6
17320	180	79	150	164	651	67	188	4000	1701	4022	18.27	2.52	1953	27	6.7	764.8	On	8.18	6.6
17380	180	79	150	165	647	67	188	3918	1704.8	3929	18.31	2.48	1925	27	6.7	812.1	On	8.18	6.6
17440	180	80	150	164	642	68	188	3768	1697.4	3748	18.39	2.37	1930	26.5	6.7	790.2	On	8.18	6.6
17500	181	80	150	164	638	67	188	3658	1701.7	3671	18.44	2.32	1936	26.5	6.7	801.2	On	8.18	6.6
17560	182	79	150	165	636	68	189	3821	1691.2	3869	18.3	2.46	1908	26	6.7	806.6	On	8.18	6.6
17620	182	78	149	164	629	68	191	3861	1683.3	3880	18.24	2.52	1823	26	6.7	812.1	On	8.18	6.6
17680	183	76	149	164	625	68	193	3727	1656.6	3710	18.22	2.52	1737	26	6.7	839.5	On	8.19	6.6
17740	183	76	149	165	622	68	194	3304	1596	3310	18.33	2.38	1672	26	6.7	839.5	On	8.18	6.6
17800	184	76	149	165	620	68	195	3320	1566.9	3326	18.3	2.44	1644	25.5	6.7	855.9	On	8.19	6.6
17860	184	76	149	165	619	68	196	3109	1535.5	3097	18.36	2.36	1587	25.5	6.7	793.7	On	8.19	6.6
17916	185	76	149	164	619	68	196	3188	1509.1	3179	18.27	2.46	1578	25	6.7	834.0	On	8.18	6.6
17976	185	78	149	164	618	68	196	3162	1481.3	3139	18.22	2.47	1611	25	6.7	834.0	On	8.18	6.6
18036	185	78	150	165	617	67	198	3300	1488.6	3303	18.17	2.56	1604	24.5	6.7	828.5	On	8.18	6.6
18096	186	78	149	165	617	68	196	3324	1493.5	3321	18.19	2.55	1611	24.5	6.7	833.9	On	8.18	6.6
18156	186	79	150	164	617	68	196	3451	1493.5	3450	18.03	2.68	1802	24	6.7	790.2	On	8.18	6.6
18216	185	78	150	165	616	68	196	3105	1490.4	3109	18.31	2.4	1612	24	6.7	817.5	On	8.18	6.6
18276	184	76	149	165	616	68	196	3410	1487	3427	18.14	2.58	1806	24	6.7	844.9	On	8.18	6.6
18336	183	76	149	165	616	67	196	3109	1483.1	3088	18.33	2.33	1552	24	6.7	866.8	On	8.18	6.6
18396	183	76	149	165	615	67	195	3129	1472.5	3130	18.38	2.34	1527	24	6.7	866.8	On	8.19	6.6
18456	182	76	149	165	615	67	194	3227	1459	3211	18.31	2.41	1499	23.5	6.7	861.3	On	8.18	6.6
18516	181	76	149	165	614	67	194	3556	1434.1	3564	17.98	2.74	1490	23.5	6.7	850.4	On	8.18	6.6
18576	181	77	150	165	613	67	193	3520	1435.5	3529	17.99	2.7	1503	23	6.7	817.4	On	8.18	6.6
18636	181	79	150	165	613	67	191	3479	1451.5	3481	18.11	2.59	1508	23	6.7	812.0	On	8.18	6.6
18696	180	79	150	165	619	67	190	3581	1448.6	3592	18.03	2.68	1520	22.8	6.7	822.9	On	8.18	6.6
18756	179	79	150	165	624	67	189	3455	1453	3440	18.15	2.53	1514	22.5	6.7	806.5	On	8.18	6.6
18816	178	79	150	165	625	67	189	3373	1430.5	3362	18.23	2.47	1499	22.5	6.7	806.5	On	8.18	6.6
18876	178	79	150	165	623	68	189	3394	1403	3376	18.2	2.5	1482	22.3	6.7	817.4	On	8.18	6.6
18936	178	78	150	165	620	68	189	3377	1384.1	3372	18.18	2.52	1475	22	6.7	828.4	On	8.18	6.6
18996	178	78	150	165	619	68	188	3190	1373.7	3192	18.27	2.41	1423	22	6.7	822.9	On	8.18	6.6
19056	178	78	150	165	618	68	189	3202	1350.1	3250	18.21	2.49	1379	21.5	6.7	811.9	On	8.18	6.6
19116	179	77	150	165	617	68	189	3194	1323.7	3222	18.15	2.56	1333	21.5	6.7	833.8	On	8.18	6.6
19176	179	76	150	165	616	68	191	3117	1286.3	3116	18.16	2.53	1341	21.5	6.7	839.3	On	8.18	6.6
19236	179	75	150	165	614	68	191	3040	1263.3	3044	18.17	2.54	1298	21.5	6.7	793.6	On	8.18	6.6
19292	180	75	149	165	615	68	191	2942	1232.1	2948	18.22	2.51	1278	21.5	6.7	861.2	On	8.18	6.6

D10

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on: 02-Apr-96

19-Jun-95 Run TTD-28 Scoping test 2

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out BTU	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
19352	179	75	149	165	614	67	191	2938	1214	2928	18.23	2.52	1267	21.5	6.7	850.3	On	8.18	6.6
19412	179	76	150	165	611	67	191	2824	1198.1	2826	18.3	2.47	1321	21	6.7	839.3	On	8.18	6.6
19472	178	77	150	165	606	67	191	3182	1357.7	3201	18.37	2.39	1542	21	6.7	822.9	On	8.18	6.6
19532	177	78	150	165	605	67	189	3743	1573.6	3780	18.34	2.38	1653	20.5	6.7	817.4	On	8.18	6.6
19592	176	79	150	165	604	68	186	3878	1644	3915	18.44	2.3	1776	20.5	6.7	828.4	On	8.18	6.6
19652	175	79	150	165	604	68	187	4004	1720.5	4033	18.5	2.24	1829	20	6.7	822.9	On	8.18	6.6
19712	175	80	150	165	604	68	186	4020	1754.1	4029	18.54	2.21	1804	20	6.7	817.4	On	8.18	6.6
19772	175	80	150	165	604	68	186	3947	1749.5	3987	18.54	2.19	1951	20	6.7	795.6	On	8.18	6.6
19832	174	79	150	165	604	68	186	4281	1779.3	4328	18.5	2.23	2016	19.5	6.7	806.5	On	8.18	6.6
19892	175	78	150	165	605	69	186	4378	1838.5	4412	18.49	2.25	1981	19.5	6.7	801.1	On	8.18	6.6
19952	174	77	150	165	605	69	186	4439	1825	4482	18.45	2.28	2123	19.5	6.7	795.6	On	8.18	6.6
20012	173	76	150	165	606	69	185	4753	1886.1	4793	18.39	2.34	2146	19.5	6.7	828.4	On	8.18	6.6
20072	172	76	150	165	607	68	185	4818	1897	4880	18.38	2.33	2047	19.5	6.7	839.4	On	8.18	6.6
20132	172	75	149	165	608	68	184	4582	1883.5	4622	18.42	2.26	1976	19	6.7	850.3	On	8.18	6.6
20192	171	74	149	165	609	68	183	4492	1875	4541	18.45	2.22	1901	19	6.7	861.3	On	8.19	6.6
20252	171	74	149	165	611	67	183	4415	1859.9	4455	18.46	2.2	1829	19	6.7	845.0	On	8.18	6.6
20312	171	75	149	164	614	67	182	4211	1857.7	4250	18.51	2.21	1733	19	6.7	855.9	On	8.19	6.6
20372	172	77	149	164	617	67	183	4159	1742.8	4198	18.47	2.38	1747	18.5	6.7	812.2	On	8.18	6.6
20432	173	78	149	164	618	67	184	4224	1718.1	4269	18.4	2.47	1622	18.5	6.7	817.6	On	8.18	6.6
20492	173	78	149	164	618	67	184	4032	1654	4063	18.45	2.5	1681	18	6.7	801.3	On	8.18	6.6
20552	175	78	149	164	620	67	184	4142	1696.1	4177	18.51	2.46	1624	18	6.7	795.8	On	8.18	6.6
20612	176	79	149	164	620	67	185	4020	1654.8	4069	18.47	2.54	1654	17.8	6.7	763.2	On	8.18	6.6
20668	177	79	149	164	624	68	187	4032	1702	4060	18.59	2.46	1633	17.5	6.7	790.4	On	8.18	6.6
20728	176	78	149	164	623	68	186	3882	1671.5	3916	18.7	2.35	1563	17.5	6.7	779.5	On	8.18	6.6
20788	174	78	149	164	617	68	185	3552	1556.2	3589	18.8	2.25	1524	17.5	6.7	790.4	On	8.18	6.6
20848	173	78	149	164	614	68	184	3528	1496.3	3545	18.71	2.3	1411	17	6.7	790.4	On	8.18	6.6
20908	172	77	149	164	612	68	184	3479	1426.3	3508	18.63	2.38	1373	17	6.7	790.4	On	8.18	6.6
20968	172	77	149	164	612	68	184	3422	1407.7	3447	18.64	2.37	1308	17	6.7	812.3	On	8.19	6.6
21028	172	75	149	164	613	68	184	3312	1387.4	3324	18.71	2.32	1251	17	6.7	790.4	On	8.18	6.6
21088	172	75	151	164	613	68	183	3215	1388	3240	18.79	2.27	1205	17	6.7	697.4	On	8.18	6.6
21148	172	74	152	164	614	68	183	3251	1387.5	3263	18.76	2.32	1165	17	6.7	648.2	On	8.18	6.6
21208	172	74	151	164	616	68	184	3361	1353.4	3365	18.65	2.44	1104	16.5	6.7	670.0	On	8.18	6.6
21268	172	75	152	164	616	68	184	3259	1305.7	3261	18.65	2.48	1095	16.5	6.7	620.8	On	8.18	6.6
21328	172	76	152	164	617	68	183	3141	1322.6	3177	18.74	2.39	1027	16.5	6.7	615.4	On	8.18	6.6
21388	173	76	152	164	621	68	184	2974	1239.6	2979	18.76	2.37	968	16	6.7	642.7	On	8.18	6.6
21448	174	76	152	164	621	68	184	2856	1165	2851	18.68	2.45	925	16	6.7	626.3	On	8.18	6.6
21508	174	77	152	163	623	68	185	2950	1141.6	2934	18.57	2.54	936	15.9	6.7	626.4	On	8.18	6.6
21568	175	77	152	163	625	68	185	4049	1142.4	3459	17.87	3.24	922	22.4	6.7	615.4	On	8.18	6.6
21628	176	77	152	164	625	68	186	10449	1133.1	5011	11.34	9.19	868	15.5	6.7	631.8	On	8.18	6.6
21688	176	77	152	164	629	68	186	11243	1098.5	5010	9.77	10.45	884	15.5	6.7	620.8	On	8.18	6.6
21748	176	77	152	164	633	68	186	11580	1114.1	5012	9.67	10.54	913	15.1	6.7	620.8	On	8.18	6.6
21808	176	77	152	164	636	69	187	11963	1187	5013	9.52	10.61	874	15	6.7	642.6	On	8.18	6.6
21868	176	76	152	164	638	68	187	11947	1173.8	5011	9.46	10.62	878	15	6.7	631.8	On	8.18	6.6
21928	175	75	152	164	638	69	187	12036	1182.3	5010	9.5	10.56	900	15	6.7	642.7	On	8.18	6.6
21988	175	74	152	164	637	68	187	12260	1212.1	5012	9.54	10.48	900	15	6.7	610.0	On	8.18	6.6
22044	175	75	152	164	637	68	187	12333	1228.5	5011	9.53	10.49	884	15	6.7	648.1	On	8.18	6.6
22104	175	76	152	164	637	68	187	12366	1234.7	5011	9.6	10.4	892	15	6.7	664.5	On	8.18	6.6
22164	175	76	152	164	639	68	186	12467	1250	5011	9.65	10.35	876	14.5	6.7	648.1	On	8.18	6.6
22224	173	77	152	164	638	68	185	12297	1225.3	5013	9.57	10.45	865	14.5	6.7	637.1	On	8.18	6.6
22284	172	78	152	164	632	68	184	12280	1220.1	5011	9.7	10.32	894	14	6.7	642.6	On	8.18	6.6
22344	172	79	153	164	628	68	184	12191	1202	5013	9.84	10.22	927	14	6.7	609.8	On	8.17	6.6
22404	172	79	153	164	627	68	184	12199	1215.8	5011	9.94	10.14	902	14	6.7	631.6	On	8.18	6.6
22464	172	77	153	165	627	68	184	11776	1164.6	5010	9.93	10.16	870	13.7	6.7	642.5	On	8.18	6.6
22524	173	76	153	165	626	68	184	11401	1112.3	5011	9.9	10.17	871	13.5	6.7	653.4	On	8.18	6.6
22584	173	75	153	165	624	68	184	11436	1109.2	5011	9.9	10.18	870	13.5	6.7	648.0	On	8.18	6.6
22644	173	75	152	165	623	68	184	11414	1108.7	5011	9.97	10.17	871	13.5	6.7	675.3	On	8.18	6.6
22704	173	74	153	165	622	68	184	11523	1122.6	5013	10.05	10.13	870	13.5	6.7	664.3	On	8.18	6.6
22764	173	74	153	165	621	68	184	11580	1126.9	5014	10.15	10.07	892	13.5	6.7	664.3	On	8.18	6.6
22824	172	75	153	165	618	68	184	11507	1120.4	5013	10.27	9.99	902	13	6.7	675.2	On	8.18	6.6
22884	171	75	153	165	616	68	183	11552	1117.7	5011	10.34	9.93	930	13	6.7	637.0	On	8.17	6.6
22944	171	76	153	165	616	67	183	11654	1138.8	5013	10.39	9.92	937	13	6.7	669.7	On	8.18	6.6
23004	171	76	153	165	615	67	183	11690	1134.3	5012	10.38	9.94	944	12.5	6.7	658.8	On	8.17	6.6
23064	171	77	153	165	614	68	183	11764	1142.6	5010	10.36	9.96	969	12.5	6.7	647.9	On	8.17	6.6
23124	170	76	153	165	613	68	183	11873	1153	5011	10.37	9.95	979	12.5	6.7	669.7	On	8.17	6.6
23184	171	77	153	165	612	68	182	12089	1192.9	5012	10.38	9.93	999	12.5	6.7	636.9	On	8.17	6.6
23244	171	77	153	165	610	68	183	12272	1202.3	5013	10.33	9.97	1011	12	6.7	642.4	On	8.17	6.6
23304	171	77	154	165	608	68	183	12341	1212.7	5012	10.38	9.92	1028	12	6.7	636.9	On	8.17	6.6
23364	171	77	153	165	606	68	183	12463	1229	5011	10.52	9.83	1037	12	6.7	614.8	On	8.17	6.6
23420	171	78	153	166	605	68	183	12207	1202.6	5013	10.59	9.78	1034	12	6.7	675.1	On	8.17	6.6
23480	171	75	153	165	604	68	183	11967	1167.5	5012	10.68	9.67	1005	12	6.7	642.4	On	8.17	6.6
23540	171	75	153	165	605	68	183	11918	1165.4	5011	10.68	9.64	968	12	6.7	664.2	On	8.17	6.6
23600	171	75	153	166	603	68	182	11694	1146	5012	10.71	9.61	942	12	6.7	686.0	On	8.17	6.6
23660	171	75	153	165	598	68	183	11190	1111.2	5013	10.76	9.54	762	11.5	6.7	669.7	On	8.17	6.6
23720	169	76	153	166	586	68	182	9603	867.8	5014	11.1	9.2	768	11.5	6.7	664.2	On	8.17	6.6
23780	167	77	154	166	581	67	180	9473	838.7	5013	11.46	8.8	793	11.4	6.7	642.3	On	8.17	6.6
23840	165	78	154	165	577	68	178	9757	875	5014	11.75	8.55	786	11	6.7	631.4	On	8.17	6.6

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on: 02-Apr-96

19-Jun-95 time sec	stack exit deg F	Run TTD-2B dilution deg F	Scoping test 2 H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out BTU	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
23900	165	78	154	166	574	68	176	9880	891.6	5012	11.93	8.34	776	11	6.7	631.3	On	8.17	6.6
23960	164	78	154	166	589	68	175	9941	901.5	5012	12.02	8.26	768	11	6.7	658.7	On	8.17	6.6
24020	163	77	154	166	585	68	175	10002	905.8	5013	12.16	8.21	756	11	6.7	658.7	On	8.17	6.6
24080	163	77	154	166	582	68	174	10034	910.8	5011	12.2	8.15	737	10.6	6.7	653.1	On	8.17	6.6
24140	162	75	154	166	562	68	174	10030	911.3	5013	12.23	8.14	725	10.5	6.7	653.2	On	8.17	6.6
24200	162	75	154	166	582	69	174	9823	891	5012	12.22	8.2	704	10.5	6.7	647.7	On	8.17	6.6
24260	162	74	153	166	559	68	174	9733	869.5	5012	12.2	8.22	680	10.5	6.7	669.6	On	8.17	6.6
24320	162	73	153	166	558	68	173	9705	870.1	5012	12.19	8.25	656	10.5	6.7	675.0	On	8.17	6.6
24380	162	73	153	166	557	68	173	9664	864.6	5011	12.15	8.28	634	10.5	6.7	658.7	On	8.17	6.6
24440	160	73	154	166	556	68	172	9644	861.8	5014	12.16	8.3	621	10.5	6.7	653.2	On	8.17	6.6
24500	160	74	154	165	556	68	172	9876	863	5011	12.18	8.33	611	10.5	6.7	647.8	On	8.17	6.6
24560	160	75	154	166	553	68	171	9489	840.7	5012	12.32	8.2	618	10	6.7	664.1	On	8.17	6.6
24620	160	76	154	165	552	68	170	9314	821.9	5013	12.54	8.01	616	10	6.7	642.3	On	8.17	6.6
24680	160	76	154	166	551	68	170	9200	810.1	5015	12.55	8	605	10	6.7	653.2	On	8.17	6.6
24740	160	76	154	165	550	68	170	9127	791	5011	12.55	8.02	601	10	6.7	574.0	On	8.17	6.6
24796	160	76	154	166	548	68	170	9029	781.4	5013	12.55	8.03	596	9.5	6.7	642.3	On	8.17	6.6
24856	159	76	153	165	547	69	171	8988	780.4	5014	12.58	8.01	597	9.5	6.7	636.9	On	8.17	6.6
24916	160	76	154	165	545	69	171	8952	770.3	5015	12.55	8.04	593	9.5	6.7	631.4	On	8.17	6.6
24976	160	75	153	166	543	69	171	8988	772.9	5013	12.53	8.05	588	9.5	6.7	658.7	On	8.17	6.6
25036	160	74	153	165	541	69	171	8944	771.6	5011	12.62	7.99	577	9.5	6.7	658.7	On	8.17	6.6
25096	160	73	153	165	540	69	171	8944	769	5013	12.65	7.96	568	9.5	6.7	658.8	On	8.17	6.6
25156	160	73	153	165	538	68	170	9233	793.6	5013	12.73	7.87	580	9.5	6.7	675.2	On	8.18	6.6
25216	160	73	153	165	533	68	170	9932	898.9	5012	12.77	7.79	596	9.5	6.7	675.2	On	8.18	6.6
25276	159	74	153	165	530	68	170	10091	933.9	5012	12.88	7.67	601	9.5	6.7	647.9	On	8.17	6.6
25336	158	74	153	165	528	68	170	10164	935.1	5014	12.92	7.65	608	9	6.7	658.8	On	8.17	6.6
25396	157	75	153	165	527	67	169	10193	937.7	5013	12.88	7.65	618	9	6.7	642.4	On	8.17	6.6
25456	157	77	153	165	525	67	168	10238	939.5	5014	12.88	7.63	633	9	6.7	631.5	On	8.17	6.6
25516	157	77	153	165	525	68	168	10234	945.6	5014	12.88	7.62	641	9	6.7	631.5	On	8.17	6.6
25576	158	76	153	165	525	68	168	10205	939.8	5013	12.88	7.61	644	8.5	6.7	626.1	On	8.17	6.6
25636	157	76	153	165	524	68	168	10160	940.3	5013	12.89	7.59	638	8.5	6.7	637.0	On	8.17	6.6
25696	158	75	153	165	525	68	168	10136	927.9	5012	12.96	7.53	641	8.5	6.7	631.5	On	8.17	6.6
25756	158	74	153	165	525	68	168	10136	926.7	5011	12.94	7.55	638	8.5	6.7	653.4	On	8.18	6.6
25816	158	73	153	165	525	68	169	10075	922.5	5011	12.97	7.53	634	8.5	6.7	664.3	On	8.18	6.6
25876	158	72	153	165	524	67	168	10107	925.1	5015	13.02	7.5	633	8.5	6.7	658.9	On	8.18	6.6
25936	157	72	152	165	524	67	168	10002	931	5014	13.07	7.47	619	8.6	6.7	669.8	On	8.18	6.6
25996	157	73	153	165	523	67	167	9548	859.4	5013	13.14	7.47	615	8.5	6.7	658.9	On	8.18	6.6
26056	157	74	153	165	523	67	167	9448	841.1	5011	13.17	7.45	620	8.5	6.7	653.4	On	8.18	6.6
26116	156	75	153	165	526	67	167	9403	834.3	5012	13.18	7.45	596	8	6.7	609.8	On	8.18	6.6
26172	157	75	153	165	527	67	167	9363	828.7	5011	13.13	7.48	597	8	6.7	648.0	On	8.18	6.6
26232	157	75	153	165	526	67	167	9314	826.3	5012	13.09	7.51	599	8	6.7	647.9	On	8.17	6.6
26292	157	75	153	164	526	67	167	9241	812.5	5013	13.12	7.48	592	8	6.7	631.6	On	8.18	6.6
26352	157	75	153	164	525	68	167	9151	803.5	5013	13.19	7.44	597	8	6.7	620.7	On	8.18	6.6
26412	157	76	153	164	525	68	167	9119	793.6	5013	13.17	7.47	590	7.5	6.7	631.7	On	8.18	6.6
26472	157	75	153	165	524	68	167	9009	784.2	5012	13.18	7.45	589	7.5	6.7	648.0	On	8.18	6.6
26532	157	75	152	164	522	68	167	8976	779	5012	13.14	7.48	577	7.5	6.7	631.7	On	8.18	6.6
26592	157	75	152	164	520	68	167	8931	770.7	5012	13.1	7.49	577	7.5	6.7	659.0	On	8.18	6.6
26652	158	73	152	164	519	68	167	8956	768.1	5013	13.08	7.46	575	7.5	6.7	642.6	On	8.18	6.6
26712	157	73	152	164	518	68	167	9021	786.3	5011	13.13	7.43	564	7.5	6.7	653.5	On	8.18	6.6
26772	157	73	152	164	517	67	167	8993	782.4	5011	13.19	7.4	554	7.5	6.7	631.8	On	8.18	6.6
26832	157	73	152	164	516	67	167	8923	774.3	5014	13.23	7.38	549	7.5	6.7	653.6	On	8.18	6.6
26892	157	74	152	164	516	67	167	8927	772.9	5014	13.21	7.43	551	7.5	6.7	642.6	On	8.18	6.6
26952	156	75	152	164	515	67	168	8903	768.6	5013	13.21	7.45	546	7.1	6.7	642.6	On	8.18	6.6
27012	155	76	152	164	513	67	166	8818	759.4	5013	13.21	7.47	552	7	6.7	615.4	On	8.18	6.6
27072	156	77	152	164	511	67	166	9025	775.4	5011	13.28	7.4	555	7	6.7	620.8	On	8.18	6.6
27132	156	77	152	164	509	67	166	9257	806.3	5012	13.34	7.32	557	7	6.7	637.2	On	8.18	6.6
27192	156	76	152	164	508	67	166	9334	828.1	5012	13.39	7.28	564	6.5	6.7	620.8	On	8.18	6.6
27252	157	75	152	164	506	68	166	9285	821.5	5013	13.38	7.29	562	6.6	6.7	637.2	On	8.18	6.6
27312	157	74	152	164	505	68	167	9318	819	5010	13.38	7.29	560	6.2	6.7	648.1	On	8.18	6.6
27372	157	73	152	163	505	67	167	9363	823.6	5014	13.37	7.27	559	7	6.7	631.8	On	8.18	6.6
27432	156	72	152	164	505	67	167	9302	821	5013	13.38	7.27	570	7	6.7	653.6	On	8.18	6.6
27492	157	72	151	164	505	67	167	9509	849.8	5012	13.24	7.38	562	7	6.7	620.3	On	8.18	6.6
27548	157	74	152	164	506	67	168	9163	821.8	5012	13.13	7.49	548	6.5	6.7	648.2	On	8.18	6.6
27608	157	75	152	163	508	67	167	8993	774.1	5012	13.01	7.61	563	6.5	6.7	620.9	On	8.18	6.6
27668	157	76	152	163	509	67	167	8993	779.9	5013	12.88	7.76	562	6.5	6.7	604.5	On	8.18	6.6
27728	158	77	152	163	510	67	167	8980	775.9	5013	12.81	7.83	573	6	6.7	593.6	On	8.18	6.6
27788	159	77	152	163	511	67	167	8980	780.4	5013	12.73	7.91	583	6	6.7	631.8	On	8.18	6.6
27848	159	78	152	163	511	67	168	8964	763.5	5011	12.69	7.94	590	6	6.7	593.6	On	8.18	6.6
27908	160	78	152	163	511	68	169	8919	771.8	5012	12.62	7.97	596	6	6.7	610.0	On	8.18	6.6
27968	160	77	152	163	512	68	170	8875	762.2	5012	12.57	8	619	6	6.7	610.0	On	8.18	6.6
28028	161	77	152	164	513	68	170	8899	765.8	5011	12.51	8.02	643	6	6.7	653.6	On	8.18	6.6
28088	161	77	152	163	513	68	171	8919	774.4	5012	12.48	7.99	665	5.5	6.7	610.0	On	8.18	6.6
28148	163	76	152	163	514	68	171	8964	775.7	5012	12.38	8	671	5.5	6.7	621.0	On	8.18	6.6
28208	163	75	151	163	513	68	172	8870	772.1	5013	12.31	7.99	671	5.5	6.7	648.3	On	8.18	6.6
28268	163	73	151	163	514	68	172	8813	760.6	5013	12.34	7.96	668	5.6	6.7	653.7	On	8.18	6.6
28328	163	73	151	163	514	67	172	8870	772.5	5012	12.38	7.91	658	6	6.7	653.8	On	8.18	6.6
28388	163	73	151	163	514	67	172	8866	771.5	5011	12.38	7.91	646	5.5	6.7	661.1	On	8.18	6.6

D12

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

Printed on: 02-Apr-96

19-Jun-95 Run TTD-2B Scoping test 2

time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out BTU	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
28448	162	74	151	163	514	67	172	8822	769.7	5012	12.37	7.92	638	5.5	6.7	648.3	On	8.18	6.6
28508	161	76	151	163	511	67	171	8757	756.8	5011	12.41	7.92	635	5.5	6.7	626.5	On	8.18	6.6
28568	161	77	151	163	510	67	170	8891	750	5013	12.43	7.9	629	5	6.7	621.0	On	8.18	6.6
28628	161	77	152	163	510	67	170	8521	725.3	5013	12.46	7.88	621	5	6.7	620.9	On	8.18	6.6
28688	161	77	151	163	509	67	170	8500	722	5014	12.85	7.91	616	5	6.7	637.3	On	8.18	6.6
28748	162	78	152	163	508	68	170	8415	707	5013	12.88	7.92	608	5	6.7	615.5	On	8.18	6.6
28808	162	77	152	163	509	68	171	8370	700.2	5013	12.89	7.9	612	4.8	6.7	604.6	On	8.18	6.6
28868	162	77	151	163	507	68	171	8301	699.5	5012	12.82	7.96	616	4.5	6.7	599.9	On	8.18	6.6
28924	163	77	152	163	507	68	172	8348	696.5	5011	12.82	7.97	618	4.5	6.7	615.5	On	8.18	6.6
28984	163	76	151	163	505	68	172	8407	706.1	5010	12.82	7.95	620	4.5	6.7	659.2	On	8.18	6.6
29044	162	74	151	163	505	68	172	8423	715.7	5012	12.84	7.95	613	4.5	6.7	653.7	On	8.18	6.6
29104	163	73	151	163	505	67	173	8394	715.2	5014	12.79	7.95	606	4.5	6.7	670.1	On	8.18	6.6
29164	163	73	151	163	505	67	173	8287	707.8	5015	12.81	7.95	599	4.8	6.7	653.8	On	8.18	6.6
29224	163	73	151	163	506	67	172	8083	689	5011	12.8	7.99	592	4.5	6.7	670.2	On	8.18	6.6
29284	163	75	151	163	508	67	172	7902	658	5010	12.78	8.02	591	4.5	6.7	659.2	On	8.18	6.6
29344	162	76	151	163	509	66	172	7922	648.4	5011	12.75	8.08	591	4.5	6.7	626.5	On	8.18	6.6
29404	162	77	151	163	508	67	171	7813	638.7	5013	12.73	8.05	583	4	6.7	626.5	On	8.18	6.6
29464	161	78	151	163	507	67	171	7776	626.6	5012	12.84	7.95	584	4	6.7	610.1	On	8.18	6.6
29524	161	78	151	163	506	67	171	7833	635.6	5012	12.89	7.94	583	4	6.7	631.9	On	8.18	6.6
29584	161	78	151	163	506	68	171	7813	637	5013	12.9	7.9	571	3.8	6.7	626.5	On	8.18	6.6
29644	162	77	151	163	505	68	171	7772	624	5012	12.91	7.91	589	3.5	6.7	631.9	On	8.18	6.6
29704	162	77	151	163	504	68	171	7837	631.2	5011	12.91	7.9	564	3.5	6.7	637.4	On	8.18	6.6
29764	162	76	151	163	505	68	171	7857	636.1	5010	12.92	7.88	554	3.5	6.7	626.5	On	8.18	6.6
29824	162	75	151	163	506	68	172	7772	634.3	5011	12.95	7.92	542	3.5	6.7	637.4	On	8.18	6.6
29884	163	74	151	163	507	68	172	7642	615.9	5013	12.94	7.91	535	3.5	6.7	637.4	On	8.18	6.6
29944	162	73	151	163	508	68	171	7670	618.3	5013	12.93	7.93	526	3.5	6.7	648.3	On	8.18	6.6
30004	162	73	150	162	508	68	171	7581	612.3	5011	12.94	7.9	518	3.5	6.7	659.3	On	8.18	6.6
30064	162	73	151	163	509	67	171	7528	607.6	5012	12.93	7.95	513	3.5	6.7	642.9	On	8.18	6.6
30124	161	75	151	162	510	67	171	7385	583.7	5014	12.83	8.04	515	3.5	6.7	632.0	On	8.18	6.6
30184	161	76	151	163	511	67	170	7442	585.1	5013	12.75	8.07	516	3	6.7	615.6	On	8.18	6.6
30244	161	77	151	163	513	68	170	7422	586.3	5011	12.73	8.06	516	3	6.7	589.8	On	8.18	6.6
30300	161	77	151	163	512	67	170	7418	580.2	5012	12.69	8.07	514	3	6.7	637.4	On	8.18	6.6
30360	162	77	151	162	513	68	170	7422	584.3	5011	12.74	8.08	514	3	6.7	626.5	On	8.18	6.6
30420	162	77	151	163	513	68	170	7491	591.6	5013	12.75	8.09	517	3	6.7	621.0	On	8.18	6.6
30480	163	77	151	163	511	68	171	7463	585.4	5013	12.72	8.08	516	3.5	6.7	637.4	On	8.18	6.6
30540	164	75	151	163	510	68	172	7406	589.5	5011	12.75	8.06	519	3	6.7	642.9	On	8.18	6.6
30600	164	74	151	162	510	68	172	7463	588.4	5013	12.67	8.12	519	3	6.7	626.5	On	8.18	6.6
30660	164	74	151	162	511	68	173	7410	586.4	5013	12.7	8.12	508	3	6.7	637.5	On	8.18	6.6
30720	164	73	151	162	513	68	173	7406	585.1	5012	12.64	8.15	497	3	6.7	632.0	On	8.18	6.6
30780	164	74	151	162	513	68	174	7239	565.3	5012	12.64	8.13	501	2.5	6.7	642.9	On	8.18	6.6
30840	163	75	151	162	513	67	173	7129	550.1	5013	12.67	8.13	516	2.5	6.7	637.5	On	8.18	6.6
30900	163	75	151	162	514	68	172	7182	551.4	5012	12.7	8.08	527	2.5	6.7	626.5	On	8.18	6.6
30960	163	75	151	163	514	68	172	7182	552.9	5011	12.71	8.09	538	2	6.7	648.4	On	8.18	6.6
31020	162	76	151	163	512	68	172	7121	545.2	5012	12.75	8.05	563	2	6.7	648.4	On	8.18	6.6
31080	163	76	151	163	509	68	173	7227	556.6	5012	12.79	8.01	573	2	6.7	632.0	On	8.18	6.6
31140	163	76	151	162	506	68	172	7345	562.2	5012	12.81	8	590	2	6.7	632.0	On	8.18	6.6
31200	163	76	151	162	504	68	172	7503	582.5	5011	12.8	7.98	606	2	6.7	642.9	On	8.18	6.6
31260	163	76	151	162	503	68	172	7515	583.6	5011	12.84	7.96	612	1.5	6.7	615.6	On	8.18	6.6
31320	163	75	151	163	504	68	172	7369	589	5010	12.83	7.97	572	1.5	6.7	632.0	On	8.18	6.6
31380	163	74	151	163	504	68	173	7174	554.4	5013	12.83	7.95	536	1.5	6.7	642.9	On	8.18	6.6
31440	163	73	151	163	503	68	172	6925	528.3	5010	12.86	7.9	492	1.5	6.7	664.7	On	8.18	6.6
31500	162	73	151	163	499	67	172	6816	509	5011	12.87	7.86	464	1.5	6.7	659.3	On	8.18	6.6
31560	162	74	151	163	497	67	171	6954	513.8	5011	12.94	7.8	440	1.5	6.7	648.4	On	8.18	6.6
31620	162	75	151	163	502	67	172	6897	531.1	5011	12.83	7.89	382	1.5	6.7	605.2	On	8.18	6.6
31676	163	76	151	163	509	67	172	6405	482.4	5012	12.39	8.12	319	1.5	6.7	632.0	On	8.18	6.6
31736	163	77	151	163	510	67	172	5900	396.3	5012	12.21	8.29	315	1.5	6.7	642.9	On	8.18	6.6
31796	163	77	151	163	508	68	171	5819	391.1	5011	12.24	8.28	310	1	6.7	632.0	On	8.18	6.6
31856	164	78	151	163	506	68	172	5823	388.8	5013	12.3	8.25	306	1	6.7	637.4	On	8.18	6.6
31916	164	77	151	163	505	68	172	5859	391	5010	12.37	8.2	305	1	6.7	631.9	On	8.18	6.6
31976	164	76	151	163	504	68	173	5904	406.4	5011	12.53	8.08	304	1	6.7	642.9	On	8.18	6.6
32036	164	74	150	163	502	68	173	5977	411.8	5014	12.51	8.12	288	1	6.7	670.2	On	8.18	6.6
32096	165	74	151	163	500	67	173	6010	410	5010	12.52	8.08	278	1	6.7	653.9	On	8.18	6.6
32156	164	73	150	163	499	67	173	5981	409.5	5013	12.57	8.05	269	1	6.7	664.8	On	8.18	6.6
32216	164	73	150	163	498	67	172	6014	417.2	5014	12.6	8.02	265	1	6.7	664.8	On	8.18	6.6
32276	163	73	151	163	496	67	172	6124	425	5010	12.6	8	262	1	6.7	653.9	On	8.18	6.6
32336	162	73	151	163	491	66	171	5953	404.6	5010	12.66	7.95	260	1	6.7	653.9	On	8.18	6.6
32396	162	75	151	163	487	67	171	5904	390.8	5011	12.86	7.73	259	0.5	6.7	659.3	On	8.18	6.6
32456	161	76	151	163	485	67	170	5868	406.1	5011	12.98	7.6	257	0.5	6.7	626.5	On	8.18	6.6
32516	161	77	151	163	483	67	169	5949	399.4	5012	12.96	7.64	251	0.5	6.7	632.0	On	8.18	6.6
32576	161	77	151	163	482	67	169	6071	415.9	5014	12.97	7.62	250	0.5	6.7	626.5	On	8.18	6.6
32636	161	78	151	163	480	67	169	6075	418	5012	12.96	7.58	249	0.5	6.7	621.0	On	8.18	6.6
32696	161	77	151	163	480	68	169	6213	433.1	5013	12.97	7.57	254	0.5	6.7	610.1	On	8.18	6.6
32756	162	77	151	163	479	68	170	6254	437.3	5012	12.96	7.57	263	0.4	6.7	621.0	On	8.18	6.6
32816	163	77	151	163	480	68	171	6401	449.7	5013	12.94	7.61	302	0	6.7	626.5	On	8.18	6.6
32876	163	76	151	163	489	68	171	6787	496.1	5014	12.85	7.72	367	0	6.7	632.0	On	8.18	6.6
32936	163	74	151	163	490	68	172	6986	534.8	5013	12.78	7.77	287	0.2	6.7	659.3	On	8.18	6.6

Printed on: 02-Apr-96

FURNACE A WITHOUT CATALYST, HIGH HEAT REMOVAL RATE

19-Jun-95		Run TTD-2B	Scoping test 2																
time sec	stack exit deg F	dilution deg F	H2O in deg F	H2O out deg F	fire box deg F	ambient deg F	stove exit deg F	CO high ppm	CO dilution ppm	CO low ppm	O2 percent	CO2 percent	THC ppm	balance lbs	Water actual flow rate gpm	heat out BTU	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
32996	163	73	151	162	489	68	171	6783	509.9	5013	12.86	7.69	250	0	6.7	589.9	On	8.18	6.6
33052	163	73	150	163	488	68	171	6698	498.5	5012	12.94	7.64	233	0.5	6.7	659.3	On	8.18	6.6
33112	162	73	150	162	486	68	171	6702	500.2	5015	12.95	7.61	222	0.5	6.7	648.4	On	8.18	6.6
33172	161	73	150	162	485	67	170	6779	505.7	5012	13	7.57	212	0.5	6.7	664.8	On	8.18	6.6
33232	160	74	151	163	484	67	169	6820	512.9	5011	13	7.55	206	0	6.7	653.9	On	8.18	6.6
33292	160	76	151	163	484	67	169	6848	514.6	5013	12.98	7.58	203	0	6.7	659.3	On	8.18	6.6
33352	160	77	151	162	483	67	168	6816	511.9	5014	12.98	7.6	201	0	6.7	632.0	On	8.18	6.6
33412																			
average	176	77	149	163	595	68	167	6248.54			15.59	5.16	1639.48		6.6	754.4		8.19	

7.67777778 test hrs
460.666667 test min.

Total Btu out =	313,424	, Btu/hr out =	40,822
Total Btu in =	538,406	, Btu/hr in =	70,125
EFFICIENCY	58.21%		
Ave. water =	6.6	gpm	
Burnrate =	3.95	dry kg/hr	
Wood moisture	25.14%		

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Jun-95 Run TTD-2C

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
3080	129	93	164	173	209	79	140	6103.5	495	4845	15.18	4.31		87.0	7.6	554.16	Off	8.14	7.6
3140	123	89	164	173	185	80	135	3068	189.8	3182	18.3	1.74		87	7.6	554.16	Off	8.14	7.6
3200	116	87	164	173	181	80	129	3177.9	57.5	3077.8	18.88	1.34		87.5	7.6	554.16	Off	8.14	7.6
3260	112	87	163	173	179	79	124	6970.2	133	4975.2	17.48	2.59		88.1	7.6	615.94	Off	8.15	7.6
3320	110	87	163	172	179	79	121	11132.8	192.1	5008.9	15.75	3.97		87	7.6	554.35	Off	8.15	7.6
3380	108	87	163	172	179	80	119	14009.6	230	5009.4	14.58	4.91		87	7.6	554.35	Off	8.15	7.6
3440	108	87	162	172	180	79	118	15893.6	253.1	5007.7	13.9	5.48		87	7.6	616.15	Off	8.15	7.6
3500	107	87	162	171	180	80	118	17077.6	269.2	5008.1	13.53	5.83		87	7.6	554.54	Off	8.15	7.6
3560	107	87	162	171	181	79	118	17806	274.7	5007.7	13.31	6.05		88.2	7.6	554.54	Off	8.15	7.6
3620	107	87	161	171	182	80	118	18208.8	282.6	5009	13.23	6.18		87	7.6	616.36	Off	8.15	7.6
3680	108	88	161	171	183	79	118	18497.7	288	5007.7	13.18	6.27		87	7.4	601.69	Off	8.15	7.4
3740	107	87	161	171	184	80	118	18839.5	286.9	5008.9	13.12	6.39		86.9	7.4	601.69	Off	8.15	7.4
3800	108	87	160	171	184	79	118	19132.5	291.3	5008.9	13.02	6.51		86.5	7.4	662.09	Off	8.16	7.4
3860	108	87	160	170	185	80	118	19409.2	299.8	5007.7	12.97	6.61		86.5	7.4	601.90	Off	8.16	7.4
3920	108	87	160	170	186	80	119	19604.5	301.6	5008.1	12.94	6.68		86.5	7.4	601.90	Off	8.16	7.4
3980	109	86	160	170	186	80	118	19836.4	309.9	5007.3	12.94	6.74		86.5	7.4	601.90	Off	8.16	7.4
4040	109	86	160	170	187	80	119	20039.9	321.9	5009	12.93	6.79		86.5	7.4	601.90	Off	8.16	7.4
4100	110	86	159	170	187	79	119	20137.5	327	5008.1	12.97	6.79		86.5	7.4	618.15	Off	8.16	7.4
4156	110	86	159	170	188	79	120	20279.9	332.8	5008.1	13	6.8		86.5	7.4	662.31	Off	8.16	7.4
4216	110	86	158	169	188	79	120	20495.6	339.7	5009	13.02	6.8		86.5	7.4	662.53	Off	8.16	7.4
4276	111	86	158	169	189	79	121	20674.6	343.9	5007.3	13.06	6.82		86.5	6.8	614.07	Off	8.16	6.8
4336	111	85	158	169	189	79	121	20867.6	353	5007.7	13.05	6.87		86.5	6.8	614.07	Off	8.16	6.8
4396	112	86	158	169	190	79	121	21301.3	357.6	5009.4	12.98	6.95		86.5	6.8	614.07	Off	8.16	6.8
4456	113	86	157	168	190	79	122	21521	363.6	5009	12.94	7		86.5	6.8	614.27	Off	8.16	6.8
4516	113	87	157	168	191	80	123	21573.9	367.8	5008.9	12.99	7		86.5	6.8	614.27	Off	8.16	6.8
4576	113	87	157	168	191	79	123	21651.2	376.5	5007.3	12.95	7.03		86.5	6.8	614.27	Off	8.16	6.8
4636	115	87	157	168	192	79	123	21716.3	377.8	5008.1	12.94	7.04		86.5	6.8	614.27	Off	8.16	6.8
4696	114	87	158	167	192	80	123	21781.4	380.4	5008.5	12.89	7.09		86.5	6.8	614.47	Off	8.17	6.8
4756	115	88	154	167	193	79	124	21647.1	384.8	5008.9	12.91	7.06		86.5	6.8	726.67	Off	8.17	6.8
4816	115	88	155	167	193	79	124	21525.1	380.2	5007.3	12.95	7.03		86.5	6.8	670.55	Off	8.17	6.8
4876	116	88	154	167	194	80	125	21679.7	384.9	5007.3	12.9	7.09		86.5	6.8	717.11	Off	8.17	6.7
4936	116	88	154	167	194	80	125	21752.9	388	5008.1	12.88	7.12		86	6.8	717.11	Off	8.17	6.7
4996	117	88	153	166	195	80	125	21712.2	392.1	5008.9	12.89	7.12		86	6.8	717.34	Off	8.17	6.7
5056	117	88	154	166	195	80	126	21667.5	394	5008.1	12.92	7.1		86	6.8	661.95	Off	8.17	6.7
5116	118	88	153	166	196	80	126	21781.4	402.3	5009	12.88	7.16		86	6.8	717.34	Off	8.17	6.7
5176	118	89	153	166	196	80	127	21785.5	405.6	5008.1	12.86	7.18		86	6.8	717.34	Off	8.17	6.7
5236	119	89	153	165	196	80	127	21867.2	410.8	5009.8	12.86	7.2		86	6.8	662.16	Off	8.17	6.7
5296	119	89	153	165	197	80	127	22106.9	410.8	5008.5	12.83	7.25		86	6.8	662.16	Off	8.17	6.7
5356	120	89	153	165	198	80	127	22168	410.6	5008.5	12.85	7.24		86	6.8	662.16	Off	8.17	6.7
5416	120	89	153	165	198	81	128	22562.7	424.5	5008.5	12.8	7.34		86	6.8	662.16	Off	8.17	6.7
5476	121	89	152	164	199	81	128	22887.8	435.7	5007.7	12.73	7.43		86	6.8	618.21	Off	8.18	6.7
5532	121	89	152	164	199	80	129	23236.1	445.6	5008.9	12.7	7.49		86	6.8	662.37	Off	8.18	6.7
5592	121	89	152	164	200	80	129	23771.2	459.1	5005.3	12.64	7.6		85.5	6.8	662.37	Off	8.18	6.7
5652	123	89	151	164	200	80	130	24308.3	471.4	5007.3	12.55	7.73		85.5	6.8	717.80	Off	8.18	6.7
5712	135	91	151	163	170	80	137	25533	981.3	5007.3	12.41	7.97		85.5	6.8	662.58	Off	8.18	6.7
5772	134	92	151	163	150	80	141	21732.6	1442.9	5007.3	13.16	6.91		85.5	6.8	662.58	Off	8.18	6.7
5832	134	93	151	163	206	81	143	18914.9	1187.8	5008.1	15.39	4.76		85	6.8	662.58	Off	8.18	6.7
5892	137	93	151	163	396	80	146	17435.7	1377.8	5007.3	15.75	4.63		84.7	6.8	662.58	Off	8.18	6.7
5952	139	93	151	162	441	81	149	17614.7	1337.7	5007.7	15.25	5.21		84.5	6.8	607.37	Off	8.18	6.7
6012	142	93	150	162	435	81	150	17374.7	1319.7	5008.5	15.17	5.33		84.5	6.8	662.79	Off	8.18	6.7
6072	144	93	150	162	426	80	152	17578.1	1356.3	5008.1	15.12	5.42		84	6.8	662.79	Off	8.18	6.7
6132	145	93	149	162	384	80	153	18033.9	1392.1	5005.3	15.05	5.49		84	6.8	718.25	Off	8.18	6.7
6192	147	93	150	161	385	80	154	18538.4	1445.1	5009.4	15	5.54		83.5	6.8	607.56	Off	8.18	6.7
6252	148	94	149	161	380	80	156	19014.5	1483.2	5007.7	14.93	5.63		83.5	6.8	663.00	Off	8.18	6.7
6312	149	94	149	160	369	81	158	19458	1518.4	5008.9	14.83	5.78		83	6.8	607.75	Off	8.18	6.7
6372	150	93	149	160	356	81	158	20084.6	1589.4	5008.9	14.64	5.92		82.5	6.8	607.75	Off	8.18	6.7
6432	151	94	148	160	335	81	158	20731.6	1639.3	5007.7	14.71	6.06		82.5	6.8	663.20	Off	8.19	6.7
6492	152	94	149	160	316	81	160	21488.4	1722.3	5008.5	14.54	6.22		82	6.8	607.75	Off	8.18	6.7
6552	154	95	148	160	308	81	161	21785.1	1738.8	5007.7	14.36	6.41		82	6.8	663.20	Off	8.19	6.7
6612	155	95	148	159	303	81	162	22216.8	1795.4	5007.3	14.14	6.64		81.5	6.8	607.94	Off	8.19	6.7
6672	156	95	148	159	306	81	164	23225.9	1932.5	5007.7	13.89	6.87		81	6.8	607.94	Off	8.19	6.7
6732	157	95	147	159	306	81	164	23807.8	1941.6	5005.7	13.67	7.06		81	6.8	663.41	Off	8.19	6.7
6792	158	95	147	159	301	81	165	24153.6	1966	5005.7	13.55	7.18		80.5	6.8	663.41	Off	8.19	6.7
6852	158	95	147	158	304	81	166	24137.4	1963.4	5008.9	13.53	7.18		80	6.8	567.58	Off	8.19	6.7
6908	159	95	147	158	314	81	167	24393.7	1999.5	5005.3	13.46	7.25		80	6.8	608.12	Off	8.19	6.7
6968	161	96	147	158	363	81	169	24226.9	1968.1	5007.3	13.33	7.38		79.5	6.8	608.12	Off	8.19	6.7
7028	163	96	147	158	474	81	171	25012.2	2002.9	5007.3	12.98	7.78		79	6.8	608.12	Off	8.19	6.7
7088	164	97	147	157	466	81	172	26110.8	2003.4	5007.3	12.5	8.2		78.5	6.8	552.84	Off	8.19	6.7
7148	165	97	146	158	421	81	174	25752.8	2003.9	5006.9	12.51	8.19		78	6.8	663.61	Off	8.19	6.7
7208	169	98	146	157	375	81	177	25341.8	2004.2	5006.1	12.34	8.48		78	6.8	608.31	Off	8.19	6.7
7268	174	99	146	157	363	81	181	28377.3	2004.2	5008.5	11.1	9.82		77.1	6.8	608.31	Off	8.19	6.7
7328	177	100	146	157	362	81	184	32421.9	2003.3	5006.9	9.92	10.94		76.6	6.8	608.31	Off	8.19	6.7
7388	180	100	146	157	367	82	186	34659.8	2003.9	5006.9	9.39	11.39		76	6.8	608.31	Off	8.19	6.7
7448	182	101	146	157	379	82	188	36433.9	2003.7	5008.1	9.21	11.68		75.5	6.8	608.31	Off	8.19	6.7
7508	184	101	145	156	394	82	190	37040.2	2004.4	5007.3	9.01	11.84		75	6.8	608.49	Off	8.19	6.7
7568	186	101	145	156	415	82	192	37744.1	2004.2	5007.7	8.86	11.98		74.3	6.8	608.49	Off	8.19	6.7

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Jun-95 Run TTD-2C

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
7628	187	102	145	156	432	82	193	38346.4	2004.7	5006.1	8.76	12.08		73.5	6.8	608.49	Off	8.19	6.7
7688	188	102	145	156	446	82	194	38167.3	2003.3	5006.5	8.7	12.18		73	6.8	608.49	On	8.19	6.7
7748	189	102	145	156	455	82	195	38118.5	2003.6	5008.5	8.71	12.18		72.1	6.8	608.49	On	8.19	6.7
7808	189	102	145	156	497	82	195	38521.3	2003.9	5005.3	8.84	12.04		71.5	6.8	608.49	On	8.19	6.7
7868	193	104	146	156	767	82	199	38391.1	2003.4	5007.3	8.76	12.14		70.7	6.8	553.01	On	8.19	6.7
7928	202	106	146	156	1128	82	207	41166.2	2004.1	5006.1	7.27	13.73		70	6.8	553.01	On	8.19	6.7
7988	209	107	145	157	1161	82	215	47721.4	2003.1	5009.4	4.73	16.13		69	6.8	663.81	On	8.19	6.7
8048	213	108	146	157	1160	82	221	49918.6	2003.4	5009.4	3.98	16.72		68	6.8	608.31	On	8.19	6.7
8108	215	108	146	157	1097	82	225	49861.7	2003.4	5006.9	3.93	16.72		67.5	6.8	608.31	On	8.19	6.7
8168	217	108	146	157	1066	82	229	49267.6	2003.7	5007.7	4	16.64		66.5	6.8	608.31	On	8.19	6.7
8228	219	108	146	157	1043	82	231	48779.3	2004.1	5006.1	4	16.67		65.5	6.8	567.76	On	8.19	6.7
8284	219	108	147	158	1021	83	232	47994	2003.7	5007.3	3.98	16.72		64.5	6.8	608.12	On	8.19	6.7
8344	220	107	147	158	1105	83	234	46838.4	2004.2	5007.7	4.01	16.74		64	6.8	608.12	On	8.19	6.7
8404	219	107	147	158	1162	82	233	47676.6	2003.7	5006.1	4.09	16.56		63	6.8	608.12	On	8.19	6.7
8464	219	107	147	159	1162	83	233	48266.9	2003.7	5006.5	4.33	16.18		62	6.8	663.41	On	8.19	6.7
8524	219	107	148	159	1162	83	233	48034.7	2003.3	5007.3	4.4	16.09		61.5	6.8	607.94	On	8.19	6.7
8584	219	107	148	159	1150	83	233	47810.9	2003.7	5006.1	4.35	16.15		60.5	6.8	607.94	On	8.19	6.7
8644	220	107	148	159	1110	83	233	47721.4	2003.9	5005.3	4.32	16.18		60	6.8	607.94	On	8.19	6.7
8704	220	108	148	160	1065	83	235	46464	2004.1	5006.1	4.16	16.43		59	6.8	663.20	On	8.19	6.7
8764	222	108	148	160	1034	83	236	45454.9	2003.4	5007.7	3.97	16.72		58	6.8	663.20	On	8.19	6.7
8824	222	108	149	160	1025	82	238	48333.8	2004.7	5006.1	3.93	18.76		57.5	6.8	607.75	On	8.18	6.7
8884	222	108	149	160	1029	83	238	47953.3	2004.1	5009.4	3.96	16.65		56.5	6.8	607.75	On	8.18	6.7
8944	223	108	149	161	1027	83	238	49263.9	2003.7	5005.3	3.97	16.55		55.5	6.8	663.00	On	8.18	6.7
9004	223	106	150	161	1029	82	239	48295.1	2004.1	5006.1	3.9	16.65		55	6.8	607.56	On	8.18	6.7
9064	223	108	149	161	1037	83	239	45768.2	2004.1	5005.7	3.82	16.84		54	6.8	663.00	On	8.18	6.7
9124	223	108	150	161	1038	83	239	44539.4	2004.2	5007.3	3.83	16.83		53.5	6.8	607.56	On	8.18	6.7
9184	223	108	150	162	1027	83	238	44869.6	2004.1	5005.3	3.83	16.79		52.5	6.8	662.79	On	8.18	6.7
9244	223	106	150	162	1005	83	237	44539.4	2002.9	5005.7	3.83	16.78		52	6.8	662.79	On	8.18	6.7
9304	222	108	150	162	991	83	238	43876.1	2004.4	5007.3	3.84	16.76		51	6.8	662.79	On	8.18	6.7
9364	221	108	150	162	978	83	238	43465.2	2003.7	5009.4	3.84	16.7		50.5	6.8	662.79	On	8.18	6.7
9424	220	108	151	162	961	83	235	43094.9	2003.4	5009.4	3.9	16.61		49.5	6.8	607.37	On	8.18	6.7
9484	220	108	151	163	949	83	235	42195.6	2004.4	5004.5	3.93	16.6		49	6.8	662.58	On	8.18	6.7
9544	220	108	151	163	945	83	238	41418.5	2004.1	5006.9	3.87	16.64		48.5	6.8	662.58	On	8.18	6.7
9604	220	106	151	163	938	83	236	40710.4	2003.3	5007.7	3.84	16.7		47.5	6.8	618.41	On	8.18	6.7
9660	220	108	151	163	930	83	236	39929.2	2003.7	5007.3	3.87	16.69		47	6.8	662.58	On	8.18	6.7
9720	219	108	152	164	933	83	235	38850.9	2003.9	5005.3	3.86	16.71		46.3	6.8	662.37	On	8.18	6.7
9780	219	108	152	164	940	83	235	38240.6	2003.7	5005.7	3.82	16.76		45.5	6.8	662.37	On	8.18	6.7
9840	218	107	152	164	947	83	235	38232.4	2004.1	5007.3	3.78	16.77		45	6.8	662.37	On	8.18	6.7
9900	218	107	153	164	958	83	234	38277.2	2004.1	5006.9	3.76	16.79		44.1	6.8	606.98	On	8.17	6.7
9960	218	107	153	165	960	83	235	38635.3	2004.1	5009.4	3.85	16.81		43.5	6.8	662.16	On	8.17	6.7
10020	218	108	153	165	960	83	235	39611.8	2004.1	5005.3	3.77	16.85		43	6.8	662.16	On	8.17	6.7
10080	217	108	153	165	957	83	236	40636.6	2003.4	5007.3	3.69	16.88		42.5	6.8	662.16	On	8.17	6.7
10140	217	107	153	165	947	83	236	41361.5	2003.9	5006.1	3.66	16.88		41.5	6.8	662.16	On	8.17	6.7
10200	217	107	153	165	934	83	235	40824.4	2003.9	5007.7	3.68	16.86		41	6.8	662.16	On	8.17	6.7
10260	217	107	153	166	919	83	235	40592.5	2004.6	5004.1	3.7	16.81		40.5	6.8	717.34	On	8.17	6.7
10320	217	107	154	166	911	84	234	41324.9	2003.6	5008.1	3.7	16.76		40	6.8	661.95	On	8.17	6.7
10380	216	107	154	166	910	84	235	42602.5	2003.9	5009	3.68	16.76		39	6.8	661.95	On	8.17	6.7
10440	217	107	154	166	914	84	235	43526.2	2004.2	5006.5	3.68	16.75		38.5	6.8	661.95	On	8.17	6.7
10500	217	107	154	166	919	84	235	44148.8	2003.6	5008.5	3.66	16.75		38	6.8	661.95	On	8.17	6.7
10560	216	107	154	166	918	84	235	44352.2	2003.7	5007.7	3.65	16.73		37.5	6.8	661.95	On	8.17	6.7
10620	216	107	155	167	912	83	236	44498.7	2003.3	5006.9	3.67	16.67		36.7	6.8	661.73	On	8.17	6.7
10680	215	107	155	167	913	83	236	44401	2003.6	5006.5	3.65	16.63		36	6.8	661.73	On	8.17	6.7
10740	215	106	155	167	928	84	236	43863.9	2004.1	5007.3	3.66	16.57		35.5	6.8	661.73	On	8.17	6.7
10800	215	106	155	168	951	83	236	43367.5	2003.9	5007.3	3.67	16.51		35	6.8	716.88	On	8.17	6.7
10860	214	106	155	168	960	83	235	43200.7	2004.1	5007.3	3.65	16.45		34.5	6.8	716.88	On	8.17	6.7
10920	213	106	155	168	958	83	234	42818.2	2004.2	5004.9	3.66	16.38		34	6.8	716.88	On	8.17	6.7
10980	213	106	156	168	944	83	234	42545.6	2003.7	5007.3	3.65	16.35		33.5	6.8	617.41	On	8.17	6.7
11036	212	106	156	168	915	83	233	42960.6	2004.6	5006.1	3.65	16.31		33	6.8	661.52	On	8.17	6.7
11096	211	106	156	169	918	83	234	43845.3	2003.3	5006.5	3.61	16.29		32.5	6.8	716.64	On	8.17	6.7
11156	212	106	156	169	950	83	234	43204.7	2004.1	5008.9	3.56	16.32		32	6.8	716.64	On	8.17	6.7
11216	211	105	157	169	955	83	234	39237.5	2003.7	5009	3.61	16.38		31.5	6.8	661.30	On	8.16	6.7
11276	210	105	157	169	954	83	233	35937.5	2003.9	5007.7	3.79	16.23		31	6.8	661.30	On	8.16	6.7
11336	210	105	157	169	955	83	231	33235.7	2004.1	5006.5	3.96	16.05		30.5	6.8	661.30	On	8.16	6.7
11396	209	105	157	170	932	83	230	31730.1	2003.7	5007.7	4	15.95		30	6.8	716.41	On	8.16	6.7
11456	210	105	157	170	1037	83	231	31848.8	2003.3	5007.3	3.87	15.93		29.5	6.8	716.41	On	8.16	6.7
11516	210	105	157	170	1090	83	232	30432.1	2003.3	5005.7	3.71	16.13		29.5	6.8	716.41	On	8.16	6.7
11576	210	105	158	171	1115	83	232	28816.7	2004.1	5006.1	3.68	16.28		29	6.8	716.17	On	8.16	6.7
11636	209	105	158	171	1111	84	231	26627.6	2003.9	5005.7	3.72	16.36		28.5	6.8	716.17	On	8.16	6.7
11696	208	104	158	171	1105	84	230	25516.8	2003.7	5007.3	3.83	16.3		28	6.8	716.17	On	8.16	6.7
11756	208	104	158	171	1106	84	228	24910.5	2003.1	5007.3	4.04	16.12		28	6.8	716.17	On	8.16	6.7
11816	208	104	158	171	1113	83	227	24532.1	2003.6	5006.5	4.18	15.88		27.5	6.8	716.17	On	8.16	6.7
11876	208	104	158	171	1097	83	226	25008.1	2003.7	5005.7	4.44	15.5		27	6.8	716.17	On	8.16	6.7
11936	207	103	159	172	1115	83	225	24698.9	1984.9	5007.7	4.75	15.14		26.5	6.8	715.93	On	8.16	6.7
11996	206	104	159	172	1126	83	223	24056	1940.8	5006.9	4.94	14.97		26.5	6.8	715.93	On	8.16	6.7
12056	205	104	159	172	1095	83	222	23966.5	1943.5	5006.1	5.07	14.85		26	6.8	715.93	On	8.16	6.7
12116	204	104	159	172	1101	83	220	23205.6	1801.3	5006.1	5.24	14.66		25.8	6.8	715.93	On	8.16	6.7

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Jun-95 Run TTD-2C

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
12176	201	103	159	172	1126	83	216	22257.5	1740.2	5009	5.58	14.3		25.5	6.8	715.93	On	8.16	6.7
12236	200	103	159	172	1146	83	216	22526	1797.5	5005.7	5.96	13.88		25	6.8	715.93	On	8.16	6.7
12296	200	103	159	173	1157	84	214	22851.6	1841.8	5007.3	5.9	13.88		25	6.8	771.00	On	8.16	6.7
12356	200	104	159	173	1163	83	214	22878	1810.9	5004.9	5.63	14.11		24.5	6.8	719.60	On	8.16	6.7
12412	200	103	159	173	1163	83	214	22819	1818.4	5005.7	5.41	14.32		24	6.8	771.00	On	8.16	6.7
12472	201	103	159	173	1129	83	215	22766.1	1821.1	5009	5.22	14.51		24	6.8	771.00	On	8.16	6.7
12532	201	103	159	173	1057	83	216	21582	1626.3	5006.5	5.06	14.66		24	6.8	771.00	On	8.16	6.7
12592	201	103	160	173	1036	83	215	20922.8	1627.1	5009.8	5.25	14.36		23.5	6.8	715.69	On	8.18	6.7
12652	197	102	160	173	1023	83	213	20312.5	1520.5	5007.3	6.01	13.66		23.5	6.8	715.69	On	8.16	6.7
12712	182	98	160	174	915	83	204	18176.3	938	5006.5	7.07	12.71		23.5	6.8	770.74	Off	8.16	6.7
12772	167	97	160	173	803	83	191	23242.2	728.5	5010.6	8.78	11.29		23.5	6.8	715.69	Off	8.16	6.7
12832	157	96	160	173	736	83	181	32181.6	868	5007.3	9.46	11.14		23	6.8	715.69	Off	8.16	6.7
12892	151	96	160	173	695	83	172	32694.5	785	5008.1	10.15	10.83		23	6.8	715.69	Off	8.16	6.7
12952	148	96	160	173	667	83	166	29618.3	674	5007.3	10.8	10.34		23	6.8	715.69	Off	8.16	6.7
13012	145	96	160	173	643	83	160	26253.3	582.2	5006.9	11.15	10		23	6.8	715.69	Off	8.16	6.7
13072	143	95	160	173	624	83	157	23453.8	513.5	5009	11.33	9.73		22.5	6.8	715.69	Off	8.16	6.7
13132	142	96	160	173	611	83	154	21167	455.7	5007.3	11.51	9.41		22.9	6.8	715.69	Off	8.16	6.7
13192	140	95	160	173	597	83	151	19335.9	411.5	5006.9	11.66	9.14		22.5	6.8	715.69	Off	8.16	6.7
13252	136	95	160	173	586	83	149	17716.5	370.4	5011	11.8	8.87		22.5	6.8	715.69	Off	8.16	6.7
13312	137	95	160	173	574	83	147	16459.1	337.2	5007.3	11.81	8.71		22.5	6.8	715.69	Off	8.16	6.7
13372	136	95	160	173	561	83	146	15348.3	308.6	5006.5	11.82	8.54		22.5	6.8	715.69	Off	8.16	6.7
13432	135	95	160	173	552	83	144	14388	284	5007.3	11.89	8.38		22.5	6.8	715.69	Off	8.16	6.7
13492	134	95	160	172	544	83	143	13606.8	264.6	5007.7	11.93	8.25		22.5	6.8	660.84	Off	8.16	6.7
13552	132	95	159	172	536	83	141	12923.2	246.4	5007.3	11.93	8.13		22.5	6.8	715.93	Off	8.16	6.7
13612	132	95	159	172	531	83	140	12430.8	235	5007.3	11.95	8.02		22.5	6.8	715.93	Off	8.16	6.7
13672	130	95	158	171	526	83	139	12052.4	225.7	5007.7	11.96	7.94		22.5	6.8	716.17	Off	8.16	6.7
13732	130	95	158	170	519	83	138	11812.3	217.6	5007.7	12	7.85		22.5	6.8	617.01	Off	8.16	6.7
13788	129	95	157	170	515	83	137	11669.9	220.7	5008.5	12.02	7.76		22.5	6.8	716.41	Off	8.16	6.7
13848	128	93	157	169	511	84	137	11584.5	217.3	5008.1	12.13	7.64		22	6.8	661.30	Off	8.16	6.7
13908	128	92	156	168	507	84	136	11584.5	217.8	5006.5	12.17	7.57		22	6.8	661.52	Off	8.17	6.7
13968	127	91	156	168	503	84	135	11600.7	215	5005.3	12.19	7.53		22	6.8	661.52	Off	8.17	6.7
14028	126	90	156	168	498	84	135	11495	210	5007.7	12.22	7.47		22	6.8	661.52	Off	8.17	6.7
14088	125	90	155	167	493	84	134	11254.9	200.4	5008.9	12.29	7.39		22	6.8	661.73	Off	8.17	6.7
14148	125	90	155	167	488	84	133	11047.4	195	5009	12.26	7.36		22	6.8	661.73	Off	8.17	6.7
14208	124	89	154	166	484	84	132	10778.8	188.8	5009	12.25	7.33		22	6.8	661.95	Off	8.17	6.7
14268	123	89	154	166	481	84	132	10384.1	178.7	5008.1	12.33	7.23		22	6.8	661.95	Off	8.17	6.7
14328	123	89	154	166	478	84	131	10087.1	172.2	5008.1	12.35	7.19		22	6.8	661.95	Off	8.17	6.7
14388	122	88	154	166	474	84	131	9847	166.2	5008.1	12.38	7.14		22	6.8	661.95	Off	8.17	6.7
14448	121	88	153	166	470	84	130	9574.4	160.2	5008.1	12.41	7.09		22	6.8	717.34	Off	8.17	6.7
14508	120	88	153	165	466	84	129	9391.3	154.3	5007.3	12.4	7.08		21.5	6.8	662.16	Off	8.17	6.7
14568	119	87	153	165	462	84	129	9261.1	151.4	5008.5	12.36	7.07		21.5	6.8	662.16	Off	8.17	6.7
14628	119	87	153	165	458	84	128	9110.5	145	5008.1	12.35	7.05		21.5	6.8	662.16	Off	8.17	6.7
14688	118	87	153	165	455	84	127	8980.3	142.7	5007.7	12.39	7.02		21.5	6.8	662.16	Off	8.17	6.7
14748	118	86	153	165	453	84	127	8817.5	139.3	5008.5	12.47	6.94		21.5	6.8	662.16	Off	8.17	6.7
14808	117	88	152	165	450	83	126	8691.4	134.4	5008.9	12.49	6.92		21.5	6.8	717.57	Off	8.18	6.7
14868	116	86	152	164	450	83	126	8703.6	134.4	5008.1	12.38	7		21.5	6.8	662.37	Off	8.18	6.7
14928	115	85	152	164	447	83	125	8589.7	131	5007.3	12.43	6.94		21.5	6.8	662.37	Off	8.18	6.7
14988	114	85	152	164	445	83	125	8512.4	129.9	5007.7	12.45	6.92		21.5	6.8	662.37	Off	8.18	6.7
15048	114	86	152	164	442	83	124	8394.4	127.3	5009	12.48	6.89		21.5	6.8	662.37	Off	8.18	6.7
15108	114	86	152	164	442	83	124	8414.7	126.8	5008.5	12.47	6.92		21.5	6.8	618.21	Off	8.18	6.7
15164	113	86	152	163	440	83	124	8349.6	123.2	5007.7	12.5	6.89		21.5	6.8	607.17	Off	8.18	6.7
15224	113	85	152	163	439	83	123	8365.9	123.4	5009.4	12.45	6.93		21.5	6.8	607.17	Off	8.18	6.7
15264	121	87	151	163	458	83	129	8797.2	457.5	5005.7	12.01	7.33		21.5	6.8	662.58	On	8.18	6.7
15344	127	88	151	163	488	83	134	7539.9	452	5007.7	13.21	6.21		21	6.8	662.58	On	8.18	6.7
15404	132	69	151	162	511	83	139	7963.1	621.6	5007.7	14.4	5.49		21	6.8	607.37	On	8.18	6.7
15464	136	89	151	162	559	83	142	10620.1	833.7	5007.3	13.57	6.44		21	6.8	607.37	On	8.18	6.7
15524	139	89	150	162	601	83	146	12923.2	962.6	5006.5	12.53	7.5		21	6.8	662.79	On	8.18	6.7
15584	141	89	150	162	646	83	148	13683.5	990.2	5007.3	11.49	8.18		21	6.8	662.79	On	8.18	6.7
15644	144	89	149	161	707	83	151	13891.6	979	5008.5	11.21	8.53		20.5	6.8	663.00	On	8.18	6.7
15704	145	89	150	161	740	83	154	13610.8	963.5	5005.3	10.85	8.87		20.5	6.8	607.56	On	8.18	6.7
15764	148	89	149	161	770	82	157	14209	1036.5	5007.3	10.29	9.36		20.5	6.8	663.00	On	8.18	6.7
15824	151	89	149	161	792	83	160	15384.9	1130.5	5007.7	9.84	9.79		20.5	6.8	663.00	On	8.18	6.7
15884	153	89	149	161	816	83	162	16300.5	1186	5006.1	9.46	10.15		20	6.8	663.00	On	8.18	6.7
15944	155	90	149	160	843	83	164	16621.3	1218.8	5009.4	9.12	10.52		20	6.8	607.75	On	8.18	6.7
16004	156	90	149	161	875	83	166	17610.7	1289.2	5008.5	8.93	10.71		20	6.8	663.00	On	8.18	6.7
16064	158	90	149	161	899	83	168	18249.5	1328.6	5006.5	8.9	10.79		20	6.8	663.00	On	8.18	6.7
16124	160	90	149	161	913	83	169	18261.7	1318.8	5006.9	8.71	11		19.5	6.8	663.00	On	8.18	6.7
16184	161	90	150	161	925	83	171	18066.4	1299	5007.7	8.55	11.19		19.5	6.8	607.56	On	8.18	6.7
16244	163	90	150	162	932	82	171	17667.6	1258.1	5008.1	8.48	11.32		19.5	6.8	662.79	On	8.18	6.7
16304	163	90	150	162	937	83	172	17439.8	1266.8	5006.5	8.47	11.36		19	6.8	662.79	On	8.18	6.7
16364	163	90	150	162	928	83	174	17745	1291.2	5006.9	8.54	11.29		19	6.8	662.79	On	8.18	6.7
16424	165	90	150	162	924	83	174	18050.1	1321.1	5008.1	8.66	11.17		19	6.8	662.79	On	8.18	6.7
16484	165	90	150	162	927	82	175	17842.6	1284.5	5007.7	8.73	11.15		19	6.8	618.60	On	8.18	6.7
16540	166	90	150	162	928	82	176	17525.2	1274.9	5007.3	8.74	11.17		18.5	6.8	662.79	On	8.18	6.7
16600	167	90	150	162	935	82	177	17504.9	1280.4	5009.4	8.62	11.33		18.5	6.8	662.79	On	8.18	6.7
16660	168	90	150	162	947	82	178	17570	1287.8	5008.1	8.49	11.49		18.5	6.8	662.79	On	8.18	6.7

D17

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Jun-95 Run TTD-2C

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
16720	169	91	150	162	964	82	180	17801.9	1313.3	5008.5	8.32	11.68		18	6.8	662.79	On	8.18	6.7
16780	174	91	150	163	977	82	185	16975.9	1228.8	5008.5	7.83	12.27		18	6.8	718.02	On	8.18	6.7
16840	179	91	150	163	962	83	190	16646.3	1270.3	5007.3	5.53	14.45		17.5	6.8	718.02	On	8.18	6.7
16900	181	91	151	163	948	82	192	17631	1295.7	5007.3	5.31	14.29		17.5	6.8	662.58	On	8.18	6.7
16960	179	91	151	164	924	82	191	14563	973	5006.9	6.12	13.6		17.5	6.8	717.80	On	8.18	6.7
17020	175	91	151	164	905	82	188	14355.5	1060.5	5008.5	8.13	11.54		17.5	6.8	717.80	On	8.18	6.7
17080	172	90	151	164	898	82	185	14624	1066.7	5007.3	9.4	10.3		17.5	6.8	717.80	On	8.18	6.7
17140	170	90	152	164	892	82	183	14579.3	1059.2	5007.3	9.7	10.03		17	6.8	662.37	On	8.18	6.7
17200	169	90	152	164	893	82	182	14900.7	1093.6	5007.3	9.77	10.03		17	6.8	662.37	On	8.18	6.7
17260	169	91	152	164	928	82	183	15148.9	1115.4	5005.7	9.64	10.27		16.5	6.8	662.37	On	8.18	6.7
17320	170	91	152	164	950	82	185	14811.2	1074.4	5008.5	8.9	11.07		16.5	6.8	662.37	On	8.18	6.7
17380	170	91	152	164	948	82	185	14864.1	1086.8	5008.1	8.52	11.46		16.5	6.8	662.37	On	8.18	6.7
17440	170	91	152	164	938	82	185	14957.7	1079.4	5008.5	8.65	11.36		16	6.8	662.37	On	8.18	6.7
17500	171	91	152	164	943	82	186	14847.8	1071.3	5008.5	8.91	11.1		16	6.8	662.37	On	8.18	6.7
17560	169	90	152	164	905	81	185	14005.5	1014	5008.1	9.02	10.99		15.5	6.8	662.37	On	8.18	6.7
17620	167	90	152	164	867	82	184	14933.3	1107.6	5008.1	9.59	10.36		15.5	6.8	662.37	Off	8.18	6.7
17680	166	90	152	164	839	82	181	16040	1185.1	5009.4	10.19	9.71		15.5	6.8	662.37	Off	8.18	6.7
17740	164	90	152	164	821	82	179	17317.7	1285.6	5005.7	10.57	9.31		15	6.8	662.37	Off	8.18	6.7
17800	164	90	152	165	828	82	178	18066.4	1328.7	5009	10.69	9.2		15	6.8	717.57	Off	8.18	6.7
17860	163	90	152	165	827	82	177	18070.5	1300	5007.3	10.53	9.37		15	6.8	669.73	Off	8.18	6.7
17916	162	90	152	164	823	82	177	18107.1	1317.2	5007.3	10.43	9.44		14.8	6.8	662.37	Off	8.18	6.7
17976	162	90	152	164	822	82	177	18426.5	1338.4	5008.1	10.44	9.42		14.5	6.8	662.37	Off	8.18	6.7
18036	163	90	152	164	830	81	177	18623.9	1366.4	5007.3	10.37	9.52		14.5	6.8	662.37	Off	8.18	6.7
18096	163	90	152	164	822	81	176	18335	1314	5007.7	10.13	9.77		14.5	6.8	662.37	Off	8.18	6.7
18156	162	90	152	164	811	81	176	18025.7	1291.7	5009.4	10.49	9.4		14.5	6.8	662.37	Off	8.18	6.7
18216	162	90	152	164	797	82	176	18719.6	1179.4	5007.7	10.73	9.19		14	6.8	662.37	Off	8.18	6.7
18276	161	90	152	164	785	82	175	18898.6	1232.3	5009	10.96	8.96		14	6.8	662.37	Off	8.18	6.7
18336	161	90	152	164	781	82	175	17513	1280.3	5007.3	11.04	8.88		14	6.8	662.37	Off	8.18	6.7
18396	161	90	152	164	773	81	174	18009.4	1310.1	5007.3	11.05	8.86		13.5	6.8	662.37	Off	8.18	6.7
18456	161	90	152	164	763	81	174	18416.3	1333.3	5007.7	11.07	8.86		13.5	6.8	662.37	Off	8.18	6.7
18516	160	90	151	164	757	82	174	18709.3	1361.3	5008.1	11.08	8.88		13.5	6.8	717.80	Off	8.18	6.7
18576	160	89	152	164	756	82	173	18880.2	1367.5	5008.1	11	8.94		13.5	6.8	662.37	Off	8.18	6.7
18636	160	89	151	163	756	82	173	19169.1	1387.9	5008.5	10.98	8.96		13.1	6.8	662.58	Off	8.18	6.7
18696	159	88	151	164	761	81	173	19458	1414.7	5009.4	11.04	8.86		13	6.8	717.80	Off	8.18	6.7
18756	159	87	151	163	757	81	172	19938.2	1454.3	5008.1	11.16	8.73		13	6.8	662.58	Off	8.18	6.7
18816	159	87	151	163	754	81	172	20487.5	1504.4	5007.7	11.14	8.74		13	6.8	662.58	Off	8.18	6.7
18876	159	86	150	163	750	80	172	20723.5	1513.8	5005.3	11.1	8.79		12.5	6.8	718.02	Off	8.18	6.7
18936	159	86	150	163	750	80	172	20747.9	1511.1	5009.4	11.03	8.9		12.5	6.8	718.02	Off	8.18	6.7
18996	158	85	150	163	757	80	172	20878.1	1524.6	5010.6	10.99	8.93		12.5	6.8	718.02	Off	8.18	6.7
19056	159	85	150	163	755	79	172	20987.6	1533.2	5007.7	10.99	8.98		12.5	6.8	718.02	Off	8.18	6.7
19116	158	84	150	163	754	79	171	21207.7	1555.2	5008.5	10.96	9.02		12	6.8	718.02	Off	8.18	6.7
19176	158	84	150	163	757	79	171	21647.1	1596.2	5007.7	10.93	9.04		12	6.8	718.02	Off	8.18	6.7
19236	158	84	150	163	749	78	171	22082.5	1629.1	5008.5	10.89	9.07		12	6.8	670.15	Off	8.18	6.7
19292	158	83	150	163	741	78	171	22355.1	1652	5008.1	10.9	9.08		12	6.8	718.02	Off	8.18	6.7
19352	158	83	150	163	741	78	171	22705.1	1684.9	5008.5	10.91	9.08		11.5	6.8	718.02	Off	8.18	6.7
19412	158	83	149	162	746	77	171	22998	1711.1	5009.8	10.87	9.14		11.5	6.8	718.25	Off	8.18	6.7
19472	158	83	150	162	744	77	171	22908.5	1685.1	5007.3	10.9	9.07		11.5	6.8	662.79	Off	8.18	6.7
19532	158	83	149	162	738	76	171	22762	1694.8	5007.7	11.32	8.71		11.5	6.8	718.25	Off	8.18	6.7
19592	158	82	149	163	730	76	170	23274.7	1744.6	5008.9	11.41	8.66		11	6.8	773.50	Off	8.18	6.7
19652	158	82	149	162	725	76	171	23783.4	1793.5	5008.1	11.42	8.66		11	6.8	718.25	Off	8.18	6.7
19712	158	82	149	162	720	76	170	24271.6	1831.1	5007.7	11.39	8.73		11	6.8	718.25	Off	8.18	6.7
19772	158	82	149	162	712	75	170	24817.5	1858.6	5008.1	11.33	8.78		10.5	6.8	718.25	Off	8.18	6.7
19832	158	82	149	162	709	76	171	24507.7	1863.8	5008.5	11.36	8.8		10.5	6.8	718.25	Off	8.18	6.7
19892	159	82	149	162	705	75	172	24755.9	1887.9	5008.1	11.32	8.85		10.5	6.8	718.25	Off	8.18	6.7
19952	159	82	149	162	701	75	172	25101.7	1917.8	5008.9	11.24	8.95		10.3	6.8	718.25	Off	8.18	6.7
20012	160	82	149	162	697	75	172	25349.9	1941.7	5007.3	11.19	9		10	6.8	718.25	Off	8.18	6.7
20072	161	82	149	162	695	74	174	25288.9	1932.3	5009	11.08	9.1		10	6.8	718.25	Off	8.18	6.7
20132	162	82	149	162	696	75	174	24918.6	1891.8	5009.4	10.88	9.32		13.5	6.8	718.25	Off	8.18	6.7
20192	162	82	149	162	695	74	175	24914.5	1899.3	5008.9	10.64	9.36		9.5	6.8	718.25	Off	8.18	6.7
20252	162	82	149	162	697	74	175	25187.2	1927.9	5009.4	10.83	9.35		9.5	6.8	718.25	Off	8.18	6.7
20312	162	82	146	161	699	74	175	25284.8	1934.8	5008.1	10.8	9.38		9.3	6.8	718.47	Off	8.19	6.7
20372	163	81	149	162	709	74	175	25622.6	1974.4	5008.5	10.77	9.41		9	6.8	718.25	Off	8.18	6.7
20432	164	82	149	161	712	74	176	25349.9	1945.3	5009	10.71	9.45		9	6.8	663.00	Off	8.18	6.7
20492	165	83	149	161	704	74	178	23974.6	1798	5007.7	10.6	9.6		9	6.8	663.00	Off	8.18	6.7
20552	165	84	149	161	697	74	178	23238.1	1746.6	5007.7	10.56	9.65		8.5	6.8	663.00	Off	8.18	6.7
20612	166	84	149	161	690	74	178	23217.8	1752.3	5008.1	10.56	9.63		8.5	6.8	618.80	Off	8.18	6.7
20668	166	84	146	161	689	74	179	23059.1	1741.5	5009.8	10.56	9.64		8.4	6.8	718.47	Off	8.19	6.7
20728	166	85	148	161	689	74	179	23014.3	1734.4	5005.3	10.58	9.6		6.5	6.8	718.47	Off	8.19	6.7
20788	166	85	149	161	689	74	179	23095.7	1746.1	5007.3	10.61	9.56		6	6.8	663.00	Off	8.18	6.7
20848	166	85	148	161	689	74	179	23453.8	1781.4	5007.7	10.62	9.56		6	6.8	718.47	Off	8.19	6.7
20908	165	85	149	161	688	74	178	23661.3	1796.9	5009	10.63	9.55		6	6.8	663.00	Off	8.18	6.7
20968	165	85	148	161	688	74	178	23897.3	1818.8	5007.3	10.63	9.55		5.5	6.8	718.47	Off	8.19	6.7
21028	166	85	148	161	687	74	178	24414.1	1873.5	5008.1	10.66	9.52		5.5	6.8	718.47	Off	8.19	6.7
21088	166	85	149	161	689	74	178	24633.8	1888.7	5005.3	10.61	9.57		5.3	6.8	663.00	Off	8.18	6.7
21148	165	85	148	161	699	74	178	25093.6	1940.3	5008.5	10.57	9.61		5	6.8	718.47	Off	8.19	6.7
21208	166	85	148	161	707	74	178	25419.1	1964	5007.7	10.43	9.74		5	6.8	718.47	Off	8.19	6.7

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Jun-95 Run TTD-2C

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
21268	168	86	148	161	707	74	179	25467.9	1967	5008.5	10.3	9.83		4.5	6.8	718.47	Off	8.19	6.7
21328	167	86	148	161	705	74	179	25341.8	1957.8	5010.2	10.25	9.91		4.5	6.8	718.47	Off	8.19	6.7
21388	167	86	148	161	706	74	179	25504.6	1967.4	5007.3	10.21	9.96		4	6.8	718.47	Off	8.19	6.7
21448	167	86	148	161	705	74	180	25459.8	1968.9	5006.9	10.15	10.02		4	6.8	718.47	Off	8.19	6.7
21508	168	86	148	161	704	74	180	25138.3	1942.9	5008.1	10.15	10.05		4	6.8	718.47	Off	8.19	6.7
21568	168	86	148	161	704	74	181	24865.7	1910.3	5006.9	10.09	10.12		3.5	6.8	718.47	Off	8.19	6.7
21628	168	86	148	161	701	74	181	24788.4	1912.8	5008.1	10.11	10.11		3.5	6.8	718.47	Off	8.19	6.7
21688	168	86	148	161	696	74	181	25024.4	1937.8	5008.5	10.15	10.09		3.4	6.8	718.47	Off	8.19	6.7
21748	169	85	148	161	690	74	181	24845.4	1930.2	5009.4	10.09	10.14		3	6.8	718.47	Off	8.19	6.7
21808	168	85	148	161	690	74	181	24532.1	1886.6	5008.5	10.19	10.04		3	6.8	718.47	Off	8.19	6.7
21868	168	85	148	161	690	74	181	24149.6	1854.8	5008.5	10.26	9.97		2.5	6.8	718.47	Off	8.19	6.7
21928	168	85	148	161	684	74	181	24141.4	1853	5007.7	10.36	9.86		2.5	6.8	718.47	Off	8.19	6.7
21988	167	85	148	161	678	74	180	24349	1867	5009.4	10.51	9.7		2.5	6.8	670.57	Off	8.19	6.7
22044	166	85	148	161	676	74	179	24910.5	1927.2	5006.5	10.67	9.54		2	6.8	718.47	Off	8.19	6.7
22104	166	85	148	161	676	74	178	25109.9	1946.3	5008.1	10.72	9.51		2	6.8	718.47	Off	8.19	6.7
22164	165	85	148	161	672	74	177	25236	1956.4	5008.1	10.85	9.38		1.5	6.8	718.47	Off	8.19	6.7
22224	164	85	148	161	671	73	177	25541.2	1964.4	5007.7	10.91	9.34		1.5	6.8	718.47	Off	8.19	6.7
22284	164	85	148	161	668	74	176	25606.3	1988.4	5009	10.91	9.32		1.5	6.8	718.47	Off	8.19	6.7
22344	163	85	148	161	684	73	176	25699.9	1986.3	5009.8	10.93	9.31		1	6.8	718.47	Off	8.19	6.7
22404	163	85	148	161	662	73	176	25895.2	2003.1	5006.5	10.93	9.33		1	6.8	718.47	Off	8.19	6.7
22464	163	85	148	161	660	73	175	25703.9	1989.3	5006.9	10.93	9.3		0.6	6.8	718.47	Off	8.19	6.7
22524	163	85	148	161	656	73	174	25663.2	1985	5008.1	10.96	9.27		0.5	6.8	718.47	Off	8.19	6.7
22584	162	85	148	161	655	73	174	25683.6	1997.6	5008.1	10.97	9.27		0.5	6.8	718.47	Off	8.19	6.7
22644	162	84	148	161	655	73	174	25724.3	1990.7	5008.5	10.96	9.26		0	6.8	718.47	Off	8.19	6.7
22704	162	85	148	161	658	73	174	25634.8	1975.9	5006.9	10.96	9.25		0	6.8	718.47	Off	8.19	6.7
22764																			
AVERAGE	164	93	152	164	676	81	176	24386.4			9.7	10.4			6.8	668.5		8.18	

5.45111111 test hrs
327.066667 test min.

Total Btu out =	219,936	, Btu/hr out =	40,347
Total Btu in =	566,588	, Btu/hr in =	103,940
EFFICIENCY ((	38.82%		
Ave. water =	6.80	gpm	
Burnrate =	5.86	dry kg/hr	
Wood moisture	23.90%		

D19

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

30-Jun-95 Run TTD-2D

time sec	stack ext F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
1464	171	94	138	153	227	73	183	9916	1008	5011	14.27	5.54		81.2	8.8	831.5	off	8.21	6.7
1524	205	99	137	153	213	73	223	5664	939	5012.6	15.12	5.24		80	6.8	887.2	off	8.21	6.7
1584	194	89	137	153	308	73	223	12724	1493	5011	12.16	8.17		80	6.8	887.2	off	8.21	6.7
1644	179	87	137	153	350	73	208	21187	1478	5009.4	11.1	9.02		80	6.8	887.2	off	8.21	6.7
1704	169	86	138	153	353	73	195	20276	1355	5011.8	11.29	8.68		79.5	6.8	831.5	off	8.21	6.7
1764	164	85	138	153	349	73	185	19804	1354	5010.2	11.63	8.31		79.5	6.8	831.5	off	8.21	6.7
1824	161	85	137	152	349	73	179	19621	1348	5010.2	11.48	8.42		79.5	6.8	831.7	off	8.21	6.7
1884	160	85	140	152	382	73	176	19771	1430	5010.2	11.4	8.61		79	6.8	664.8	off	8.21	6.7
1944	160	84	141	152	409	73	175	21021	1485	5010.2	10.95	9.17		79	6.8	609.2	off	8.20	6.7
2004	161	83	141	152	418	73	174	20868	1366	5013	10.82	9.25		78.5	6.8	609.2	off	8.20	6.7
2064	159	83	141	152	394	72	172	18860	1186	5011	10.79	9.21		78.5	6.8	609.2	off	8.20	6.7
2124	158	83	141	152	369	72	170	17505	1159	5010.2	11.51	8.44		78.5	6.8	609.2	off	8.20	6.7
2184	157	83	141	152	361	72	168	16870	1145	5011	11.52	8.43		78	6.8	609.2	off	8.20	6.7
2244	156	82	141	152	358	72	167	17082	1181	5009.4	11.44	8.48		78	6.8	609.2	off	8.20	6.7
2304	155	83	140	152	358	72	166	17696	1248	5012.2	11.66	8.22		78	6.8	664.8	off	8.21	6.7
2364	155	82	141	152	358	72	165	18425	1270	5010.6	11.81	8.08		77.5	6.8	609.2	off	8.20	6.7
2424	154	82	140	151	358	72	164	18685	1274	5010.2	11.83	8.08		77.5	6.8	609.4	off	8.21	6.7
2484	154	82	139	150	357	72	164	18632	1258	5010.2	11.72	8.19		77	8.8	609.6	off	8.21	6.7
2544	155	82	139	150	361	72	164	18347	1303	5011.4	11.56	8.39		77	6.8	609.6	off	8.21	6.7
2604	156	83	139	150	369	72	185	19401	1375	5006.9	10.93	9.25		76.5	8.8	609.6	off	8.21	6.7
2664	157	83	138	149	369	71	166	19198	1255	5009	10.17	9.79		76.5	8.8	609.7	off	8.21	6.7
2724	158	83	138	149	376	72	187	18750	1353	5007.3	10.32	9.57		76	6.8	569.1	off	8.21	6.7
2780	159	83	138	149	391	71	167	19336	1317	5011	10.33	9.74		76	6.8	609.7	off	8.21	6.7
2840	159	84	138	149	409	71	168	18608	1224	5009	10.04	10.07		75.5	6.8	609.7	off	8.21	6.7
2900	160	85	138	148	419	72	169	17590	1177	5010.6	9.74	10.33		75	6.8	554.3	off	8.21	6.7
2960	160	86	138	148	517	72	168	17155	1100	5012.2	9.71	10.21		75	6.8	554.3	off	8.21	6.7
3020	159	86	138	148	516	72	167	15210	971	5009.8	10.45	8.93		74.5	6.8	554.3	off	8.21	6.7
3080	158	84	138	148	467	73	166	14836	1103	5012.6	12.04	7.76		74.5	8.8	554.3	off	8.21	6.7
3140	160	83	138	148	463	73	168	16113	1201	5012.2	11.91	8.84		74	6.8	554.3	on	8.21	6.7
3200	162	82	137	148	484	73	169	17379	1185	5009.8	9.75	10.74		74	6.8	609.9	on	8.21	6.7
3260	164	82	138	148	462	73	171	17411	1241	5011.4	9.03	11.02		73.5	8.8	554.3	on	8.21	6.7
3320	165	82	137	148	465	73	173	18685	1483	5009	9.01	11.07		73.5	6.8	609.9	on	8.21	6.7
3380	167	81	137	148	473	73	174	21285	1477	5012.2	8.85	11.34		73.3	6.8	609.9	on	8.21	6.7
3440	168	82	137	148	481	73	175	20939	1443	5011.4	8.65	11.54		73	6.8	609.9	on	8.21	6.7
3500	169	83	137	148	486	73	176	20752	1452	5011.4	8.54	11.72		72.5	6.8	609.9	on	8.21	6.7
3560	170	84	137	148	488	72	178	20943	1549	5009.8	8.34	11.9		72.5	6.8	609.9	on	8.21	6.7
3620	171	84	138	148	488	72	178	22233	1686	5013	8.34	11.89		72	6.8	554.3	on	8.21	6.7
3680	172	85	137	149	491	72	180	23507	1780	5011.4	8.37	11.93		71.5	8.8	665.4	on	8.21	6.7
3740	175	86	138	148	507	72	181	24239	1706	5012.6	8.28	12.23		71	6.8	554.3	on	8.21	6.7
3800	176	87	138	148	513	72	183	23674	1645	5009.8	7.85	12.74		71	6.8	554.3	on	8.21	6.7
3860	176	88	138	149	510	73	183	23157	1646	5010.8	7.71	12.35		70.5	6.8	609.7	on	8.21	6.7
3920	176	88	138	149	509	73	183	22880	1636	5012.6	8.14	11.88		70	6.8	609.7	on	8.21	6.7
3980	175	87	139	149	511	73	183	22900	1677	5011.4	8.52	11.66		70.4	6.8	554.2	on	8.21	6.7
4040	175	85	138	148	513	73	182	23576	1717	5011.8	8.68	11.71		72.8	6.8	554.3	on	8.21	6.7
4100	175	84	138	149	514	73	182	24251	1737	5012.2	8.56	11.9		72.7	8.8	569.1	on	8.21	6.7
4156	174	84	138	149	514	73	182	24593	1752	5011.8	8.44	11.7		68.5	8.8	609.7	on	8.21	6.7
4216	173	83	138	149	519	73	181	24744	1816	5011.4	8.66	11.26		68	6.8	609.7	on	8.21	6.7
4276	173	83	138	149	524	73	181	25265	1870	5011.8	9.03	11.12		67.5	6.8	609.7	on	8.21	6.7
4336	174	84	138	149	527	73	181	25777	1884	5010.2	9.12	11.25		67.5	6.8	609.7	on	8.21	6.7
4396	174	84	138	149	533	73	181	25977	1899	5011	9.04	11.3		67	6.8	609.7	on	8.21	6.7
4456	174	84	138	149	535	73	181	26111	1946	5011.8	9	11.36		66.5	6.8	609.7	on	8.21	6.7
4516	174	85	138	149	543	73	181	26624	1997	5010.2	8.96	11.42		66	6.8	609.7	on	8.21	6.7
4576	174	85	138	149	550	73	182	27210	2006	5010.6	8.88	11.58		66	6.8	609.7	on	8.21	6.7
4636	175	85	138	149	554	72	182	27686	2005	5012.2	8.71	11.76		65.5	8.8	609.7	on	8.21	6.7
4696	175	85	138	149	558	72	183	27901	2004	5013.4	8.48	11.99		65	6.8	609.7	on	8.21	6.7
4756	176	85	138	149	562	72	183	27584	1979	5010.6	8.3	11.99		64.5	6.8	609.7	on	8.21	6.7
4816	176	85	138	149	563	73	183	27153	1943	5010.2	8.27	11.93		64.8	6.8	609.7	on	8.21	6.7
4876	176	85	138	149	564	73	184	26819	1956	5011.4	8.28	11.87		64	6.8	609.7	on	8.21	6.7
4936	176	85	138	149	565	72	184	26880	2003	5008.5	8.31	11.89		63.5	6.8	609.7	on	8.21	6.7
4996	176	86	138	149	566	72	184	27323	2006	5010.6	8.33	11.92		63	8.8	609.7	on	8.21	6.7
5056	177	87	139	149	570	73	184	27861	2005	5009.4	8.27	12.03		62.5	6.8	554.2	on	8.21	6.7
5116	177	87	139	149	573	72	184	28145	2006	5012.8	8.17	12.11		62	8.8	554.2	on	8.21	6.7
5176	178	88	139	149	576	73	185	28215	2006	5011	8.1	12.18		61.5	6.8	554.2	on	8.21	6.7
5236	178	87	139	149	579	73	186	28430	2005	5011.4	8.01	12.33		61	6.8	554.2	on	8.21	6.7
5296	179	86	139	149	582	73	187	28898	2006	5011.4	7.85	12.49		60.5	8.8	554.2	on	8.21	6.7
5356	179	86	139	149	587	73	188	29338	2006	5011.4	7.7	12.63		60	6.8	554.2	on	8.21	6.7
5416	180	85	138	149	592	73	189	29692	2006	5010.6	7.57	12.77		60	6.8	609.7	on	8.21	6.7
5476	180	85	138	149	597	73	189	29761	2006	5010.2	7.44	12.81		59.5	6.8	569.1	on	8.21	6.7

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

30-Jun-95 Run TTD-2D

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
5532	180	84	139	149	603	73	190	29863	2005	5008.1	7.39	12.79		59	6.8	554.2	on	8.21	6.7
5592	181	84	138	149	610	73	190	30208	2005	5010.2	7.39	12.82		58.5	6.8	609.7	on	8.21	6.7
5652	181	85	138	150	618	73	191	30233	2005	5008.5	7.36	13.03		58.5	6.8	665.2	on	8.21	6.7
5712	181	85	139	150	619	73	191	29740	2005	5008.1	7.14	13.06		58	6.8	609.6	on	8.21	6.7
5772	181	85	139	150	619	73	190	28992	2005	5011	7.02	12.84		57.5	6.8	609.6	on	8.21	6.7
5832	180	85	139	150	619	73	189	28300	2005	5011.8	7.14	12.52		57.5	6.8	609.6	on	8.21	6.7
5892	179	85	139	150	616	72	188	27865	1989	5009.8	7.45	12.31		57	6.8	609.6	on	8.21	6.7
5952	178	85	139	150	618	73	187	27275	1966	5011.4	7.76	11.96		56.5	6.8	609.6	on	8.21	6.7
6012	178	85	139	150	623	72	186	26884	1997	5008.1	8.13	11.89		56	6.8	609.6	on	8.21	6.7
6072	178	85	139	150	629	72	186	27067	2005	5010.2	8.19	12.08		56	6.8	609.6	on	8.21	6.7
6132	179	85	139	150	628	72	187	27397	2006	5011	7.96	12.54		55.5	6.8	609.6	on	8.21	6.7
6192	179	86	139	150	630	72	187	27502	1991	5011.8	7.5	12.71		55	6.8	609.6	on	8.21	6.7
6252	179	87	140	150	634	72	187	27250	1970	5009.4	7.3	12.53		54.5	6.8	554.0	on	8.21	6.7
6312	178	88	140	150	626	73	186	26921	1959	5010.6	7.5	12.32		54	6.8	554.0	on	8.21	6.7
6372	178	87	140	150	619	73	185	26615	1977	5011.8	7.71	12.06		53.5	6.8	561.4	on	8.21	6.8
6432	177	86	140	150	621	73	185	26701	1975	5010.6	8	11.84		53	6.8	561.4	on	8.21	6.8
6492	176	85	140	150	619	73	184	26847	1987	5011.4	8.23	11.79		53	6.8	561.4	on	8.21	6.8
6552	176	84	139	150	644	73	184	27303	2008	5010.2	8.65	11.82		52.5	6.8	617.7	on	8.21	6.8
6612	175	83	140	150	682	74	184	27918	1996	5009.8	8.84	11.66		52	6.8	561.4	on	8.21	6.8
6672	174	83	140	151	651	74	183	27291	1945	5011	9.18	11.29		52	6.8	617.5	on	8.21	6.8
6732	175	83	140	150	666	73	184	27026	1999	5011.4	8.97	11.48		51.5	6.8	561.4	on	8.21	6.8
6792	178	83	139	150	718	73	186	27437	1945	5010.2	8.28	12.15		51	6.8	617.7	on	8.21	6.8
6852	179	83	139	150	721	73	188	26290	1783	5008.1	7.6	12.79		51	6.8	576.5	on	8.21	6.8
6908	179	84	139	150	705	73	189	24630	1670	5009.8	7.82	12.57		50.5	6.8	617.7	on	8.21	6.8
6968	178	84	139	150	680	73	188	23767	1738	5011	8.17	12.22		50	6.8	617.7	on	8.21	6.8
7028	177	85	140	150	651	73	188	24906	1892	5010.6	8.5	11.84		50	6.8	561.4	on	8.21	6.8
7088	177	84	140	151	636	73	187	25981	1924	5011.8	8.58	11.75		49.5	6.8	617.5	on	8.21	6.8
7148	177	85	140	151	639	73	187	26595	1987	5010.2	8.31	12.02		49	6.8	617.5	on	8.21	6.8
7208	178	85	140	151	646	73	187	27189	1997	5010.2	8	12.25		48.5	6.8	617.5	on	8.21	6.8
7268	178	86	140	151	648	72	188	27474	1997	5010.6	7.95	12.29		48	6.8	617.5	on	8.21	6.8
7328	179	87	140	151	653	73	188	27637	2005	5011.4	7.86	12.38		48	6.8	617.5	on	8.21	6.8
7388	179	88	140	151	665	73	188	27677	1983	5012.2	7.7	12.54		47.5	6.8	617.5	on	8.21	6.8
7448	180	88	141	151	678	73	188	26986	1889	5010.2	7.66	12.56		47	6.8	561.2	on	8.20	6.8
7508	181	87	140	151	705	74	189	25850	1775	5010.2	7.68	12.57		46.5	6.8	617.5	on	8.21	6.8
7568	180	86	140	151	699	74	189	24842	1675	5011	7.5	12.75		46	6.8	617.5	on	8.21	6.8
7628	179	84	140	151	685	74	189	24316	1781	5011.4	7.76	12.43		45.5	6.8	617.5	on	8.21	6.8
7688	177	84	140	152	675	74	188	25029	1843	5010.6	8.24	11.99		45.5	6.8	673.7	on	8.21	6.8
7748	177	83	140	151	669	74	187	25863	1938	5011	8.38	11.82		45	6.8	617.5	on	8.21	6.8
7808	176	83	140	151	678	74	186	26762	1984	5012.6	8.41	11.78		45	6.8	617.5	on	8.21	6.8
7868	176	82	140	151	686	74	186	27035	1893	5009.4	8.37	11.83		44.5	6.8	617.5	on	8.21	6.8
7928	175	82	140	151	685	73	185	26721	1931	5009.4	8.48	11.72		44	6.8	617.5	on	8.21	6.8
7988	175	83	140	152	686	73	185	26721	1939	5010.2	8.69	11.56		44	6.8	673.7	on	8.21	6.8
8048	175	83	140	151	699	73	185	26733	1885	5011.8	8.56	11.68		43.5	6.8	617.5	on	8.21	6.8
8108	175	84	140	151	697	73	184	26351	1929	5009	8.37	11.86		43	6.8	617.5	on	8.21	6.8
8168	175	84	140	151	708	73	185	26432	1836	5011.4	8.32	11.89		43	6.8	617.5	on	8.21	6.8
8228	176	85	140	152	719	73	185	25708	1779	5010.2	8.15	12.07		42.5	6.8	628.7	on	8.21	6.8
8284	177	85	141	152	724	73	186	24882	1734	5010.6	7.96	12.24		42	6.8	617.3	on	8.20	6.8
8344	177	85	141	152	722	73	186	24259	1712	5010.2	7.84	12.33		42	6.8	617.3	on	8.20	6.8
8404	177	85	141	152	724	73	187	24097	1683	5013	7.93	12.26		41.5	6.8	617.3	on	8.20	6.8
8464	178	86	141	152	746	73	187	23645	1584	5011.8	7.87	12.37		41	6.8	617.3	on	8.20	6.8
8524	178	87	141	152	760	73	188	22616	1561	5012.6	7.82	12.64		40.5	6.8	617.3	on	8.20	6.8
8584	179	87	142	152	763	73	188	21928	1511	5009.4	7.74	12.76		40.5	6.8	561.1	on	8.20	6.8
8644	179	87	142	152	759	73	187	21619	1525	5009	7.74	12.77		40	6.8	561.1	on	8.20	6.8
8704	178	86	141	152	753	74	187	21672	1531	5009.8	8.01	12.48		39.5	6.8	617.3	on	8.20	6.8
8764	177	85	141	152	772	74	188	22095	1637	5011.4	8.29	12.17		39	6.8	617.3	on	8.20	6.8
8824	181	85	142	152	832	74	191	24089	2003	5011	7.89	12.5		38.5	6.8	561.1	on	8.20	6.8
8884	185	85	142	153	845	74	195	31690	2005	5010.2	5.57	14.66		38.5	6.8	617.2	on	8.20	6.8
8944	186	84	142	153	837	74	197	31950	2005	5009.4	4.72	15.42		38	6.8	617.2	on	8.20	6.8
9004	187	84	142	153	831	74	199	28967	1925	5007.7	4.96	15.2		37.9	6.8	617.2	on	8.20	6.8
9064	187	83	142	154	824	73	200	26912	1883	5011.8	5.18	14.93		37.5	6.8	673.3	on	8.20	6.8
9124	187	83	142	154	821	73	202	26270	1872	5012.6	5.26	14.78		37	6.8	673.3	on	8.20	6.8
9184	186	84	143	154	817	74	201	25964	1846	5012.2	5.34	14.63		37	6.8	617.0	on	8.20	6.8
9244	186	85	143	154	816	73	202	25891	1858	5010.6	5.51	14.44		36.5	6.8	617.0	on	8.20	6.8
9304	186	85	143	154	816	73	201	25883	1845	5010.2	5.79	14.18		36.5	6.8	617.0	on	8.20	6.8
9364	185	85	143	155	814	73	199	25700	1820	5010.6	6.05	13.91		36	6.8	673.1	on	8.20	6.8
9424	185	85	143	154	812	73	199	25553	1816	5009.4	6.17	13.78		35.5	6.8	617.0	on	8.20	6.8
9484	184	86	143	155	812	73	198	25407	1775	5009.4	6.34	13.64		35.5	6.8	673.1	on	8.20	6.8
9544	183	85	143	155	811	73	198	24963	1754	5010.6	6.4	13.58		35	6.8	673.1	on	8.20	6.8

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FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

30-Jun-95 Run TTD-2D

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
9604	182	85	144	155	808	73	197	24723	1751	5010.6	6.42	13.54		34.5	6.8	575.7	on	8.20	6.8
9660	182	86	144	155	808	73	197	24658	1749	5010.2	6.42	13.51		34.5	6.8	616.8	on	8.20	6.8
9720	182	85	144	155	808	73	196	24715	1754	5011.8	6.48	13.44		34	6.8	616.8	on	8.20	6.8
9780	181	85	144	155	806	73	196	24756	1767	5010.2	6.56	13.37		34	6.8	616.8	on	8.20	6.8
9840	181	85	144	155	810	73	195	24780	1690	5010.2	6.56	13.36		33.5	6.8	616.8	on	8.20	6.8
9900	182	85	144	156	813	73	195	24125	1685	5010.6	6.41	13.48		33	6.8	672.9	on	8.20	6.8
9960	181	86	144	155	811	74	196	24032	1716	5011.8	6.43	13.47		33	6.8	616.8	on	8.20	6.8
10020	181	86	145	156	808	73	196	24398	1745	5011.8	6.34	13.55		32.5	6.8	616.6	on	8.19	6.8
10080	181	85	145	156	809	73	197	24646	1725	5010.6	6.2	13.65		32.5	6.8	616.6	on	8.19	6.8
10140	182	85	145	156	802	73	197	24471	1683	5010.2	6.22	13.59		32	6.8	616.6	on	8.19	6.8
10200	181	85	145	156	791	73	198	24219	1687	5012.2	6.3	13.47		32	6.8	616.8	on	8.19	6.8
10260	182	85	145	156	785	73	198	24105	1816	5010.6	6.18	13.46		31.5	6.8	616.6	on	8.19	6.8
10320	182	85	145	157	784	73	199	23181	1510	5011.4	6.1	13.45		31.5	6.8	672.7	on	8.19	6.8
10380	181	85	145	157	776	73	198	22079	1437	5010.2	6.25	13.3		31	6.8	672.7	on	8.19	6.8
10440	180	85	145	157	766	73	196	21057	1384	5009.4	6.63	13		31	6.8	672.7	on	8.19	6.8
10500	179	85	145	157	759	73	195	20337	1353	5010.2	7.04	12.67		30.5	6.8	672.7	on	8.19	6.8
10560	177	85	145	157	754	73	193	19938	1370	5011.4	7.27	12.45		30.5	6.8	672.7	on	8.19	6.8
10620	177	85	145	157	753	73	192	19885	1328	5011	7.49	12.27		30	6.8	672.7	on	8.19	6.8
10680	176	85	146	157	751	73	191	19474	1323	5011	7.57	12.21		30	6.8	616.4	on	8.19	6.8
10740	175	85	146	158	751	73	191	19401	1294	5010.6	7.61	12.15		29.5	6.6	672.5	on	8.19	6.8
10800	174	85	146	158	749	73	191	18954	1251	5010.6	7.6	12.2		29.5	6.8	672.5	on	8.19	6.8
10860	174	85	146	157	747	73	190	18469	1236	5009	7.56	12.19		29.5	6.8	618.4	on	8.19	6.8
10920	174	85	145	157	743	73	189	18054	1207	5011.8	7.59	12.2		29	6.8	672.7	on	8.19	6.8
10980	173	85	146	157	739	73	189	17782	1198	5011.8	7.61	12.2		29	6.6	575.3	on	8.19	6.8
11036	173	85	146	158	735	73	188	17603	1191	5009.8	7.58	12.23		28.5	6.8	672.5	on	8.19	6.8
11096	173	85	146	158	734	73	188	17586	1211	5011.4	7.55	12.25		28.5	6.8	672.5	on	8.19	6.8
11156	173	86	146	157	743	73	188	17712	1181	5009.8	7.54	12.27		28	6.8	616.4	on	8.19	6.8
11216	173	86	146	158	747	73	187	17147	1108	5012.2	7.58	12.24		28	6.8	672.5	on	8.19	6.8
11276	172	85	146	158	747	74	186	18301	1079	5013.8	7.76	12.07		27.5	6.8	672.5	on	8.19	6.8
11336	172	85	146	158	744	74	186	15796	1065	5011	7.94	11.9		27.5	6.8	672.5	on	8.19	6.8
11396	171	84	146	158	740	74	186	15654	1061	5011.8	8.06	11.81		27	6.8	672.5	on	8.19	6.8
11456	170	83	146	158	750	74	186	15649	1046	5012.2	8.09	11.75		27	6.8	672.5	on	8.19	6.8
11516	170	83	146	158	751	74	187	15361	1001	5011.8	8.11	11.73		27	6.8	672.5	on	8.19	6.8
11576	169	82	146	158	743	74	186	14897	999	5009.8	8.16	11.62		27	6.8	672.5	on	8.19	6.8
11636	168	82	146	158	736	74	186	14844	1010	5011.8	8.44	11.43		26.5	6.8	672.5	on	8.19	6.8
11696	166	81	146	159	730	74	184	14933	1029	5011.8	8.78	11.11		26.5	6.8	728.5	on	8.19	6.8
11756	166	81	146	158	724	74	183	15218	1050	5011.8	9	10.9		26.5	6.8	672.5	on	8.19	6.8
11816	165	81	146	158	717	74	182	15568	1064	5011	9.12	10.79		26.4	6.8	672.5	on	8.19	6.8
11876	165	82	146	158	714	73	181	15772	1074	5008.5	9.24	10.7		26	6.8	672.5	on	8.19	6.8
11936	164	82	146	158	718	73	180	15869	1067	5009.8	9.33	10.61		26	6.8	672.5	on	8.19	6.8
11996	163	83	147	159	719	73	179	15894	1076	5012.6	9.34	10.61		26	6.8	672.2	on	8.19	6.8
12056	163	83	146	159	719	73	178	18024	1084	5010.6	9.32	10.61		25.5	6.8	728.5	on	8.19	6.8
12116	163	83	147	159	718	73	177	16130	1089	5012.8	9.24	10.65		25.5	6.8	672.2	on	8.19	6.8
12176	163	83	147	159	720	73	176	16252	1097	5008.5	9.19	10.69		25.5	6.6	672.2	on	8.19	6.8
12236	163	83	147	159	722	73	176	16296	1100	5011	9.11	10.78		25	6.8	672.2	on	8.19	6.8
12296	163	83	147	159	727	73	176	16467	1128	5012.2	9.05	10.81		25	6.8	672.2	on	6.19	6.8
12356	163	84	147	159	735	73	176	16716	1125	5010.6	8.99	10.85		25	6.8	627.4	on	8.19	6.8
12412	164	83	146	158	738	73	176	16638	1094	5011	8.91	10.93		24.5	6.8	672.5	on	8.19	6.8
12472	164	84	147	159	744	73	176	16203	1095	5008.5	8.72	11.08		24.5	6.8	672.2	on	8.19	6.8
12532	165	84	146	158	770	73	177	15613	844	5013	8.54	11.23		24.5	6.8	672.5	on	8.19	6.8
12592	166	84	146	159	775	73	179	12626	796	5011	7.55	12.19		24	6.8	728.5	on	8.19	6.8
12652	166	84	147	159	767	73	179	12231	913	5012.6	7.36	12.22		24	6.8	672.2	on	8.19	6.8
12712	165	84	147	159	766	73	178	13831	1029	5009.8	8.16	11.42		24	6.8	672.2	on	8.19	6.8
12772	164	83	147	159	763	73	177	15230	1072	5011.4	9.36	10.37		23.5	6.8	672.2	on	8.19	6.8
12832	163	84	147	159	764	73	175	15910	1093	5013	9.98	9.9		23.5	6.8	672.2	on	6.19	6.8
12892	162	83	147	159	764	73	174	16239	1113	5011.8	10.02	9.89		23.5	6.8	672.2	on	8.19	6.8
12952	161	83	147	159	764	73	174	16524	1124	5011	9.91	10.01		23	6.8	672.2	on	8.19	6.8
13012	162	84	147	159	767	74	175	16598	1114	5011	9.71	10.22		23	6.8	672.2	on	8.19	6.8
13072	163	84	147	159	765	73	176	16435	1074	5013	9.2	10.74		23	6.8	672.2	on	8.19	6.8
13132	162	84	148	159	777	74	176	16451	1123	5009.4	8.82	10.9		22.5	6.8	816.0	on	8.19	6.8
13192	162	84	148	159	782	73	174	16663	1079	5011	9.4	10.27		22.5	6.8	816.0	on	6.19	6.8
13252	161	85	148	159	783	74	173	16109	1049	5012.2	9.56	10.07		22.5	6.8	616.0	on	6.19	6.8
13312	160	85	148	159	784	74	172	15690	1050	5011	9.59	10.03		22	6.8	616.0	on	8.19	6.8
13372	159	84	148	159	781	75	172	15706	1065	5011.4	9.54	10.05		22	6.8	616.0	on	8.19	6.8
13432	159	82	148	159	776	74	172	15983	1060	5012.2	9.45	10.13		22	6.8	616.0	on	6.19	6.8
13492	159	82	147	159	779	75	172	15853	1047	5011	9.33	10.21		21.5	6.8	672.2	on	8.19	6.8
13552	159	81	147	159	783	75	173	15784	1048	5011.8	9.37	10.15		21.5	6.8	672.2	on	8.19	6.8
13612	160	81	147	159	779	75	173	15772	1040	5011.8	9.35	10.17		21.5	6.8	672.2	on	8.19	6.8

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

30-Jun-95 Run TTD-2D

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
13672	160	81	147	159	775	74	174	15698	1051	5011	9.37	10.16		21.5	6.8	672.2	on	8.19	6.8
13732	160	80	147	159	772	74	174	15776	1064	5011.8	9.37	10.21		21	6.8	627.4	on	8.19	6.8
13788	160	80	147	159	767	74	175	15938	1055	5010.6	9.3	10.31		21	6.8	672.2	on	8.19	6.8
13848	161	80	147	159	766	74	175	15759	1021	5011	9.11	10.52		21	6.8	672.2	on	8.19	6.8
13908	161	80	147	159	765	74	176	15373	1012	5013	8.95	10.7		21	6.8	672.2	on	8.19	6.8
13968	161	80	147	159	762	74	176	15190	1008	5012.2	8.97	10.71		20.5	6.8	672.2	on	8.19	6.8
14028	161	81	147	159	753	74	177	15108	1006	5011	9.01	10.68		20.5	6.8	672.2	on	8.19	6.8
14088	161	82	147	159	748	74	177	15064	1008	5011.4	8.96	10.72		20.5	6.8	672.2	on	8.19	6.8
14148	162	82	147	159	743	74	176	15141	1007	5011	8.97	10.71		20.5	6.8	672.2	on	8.19	6.8
14208	161	83	147	159	738	74	177	15125	1011	5011	8.97	10.71		20.5	6.8	672.2	on	8.19	6.8
14268	160	82	147	159	740	74	176	15137	1007	5012.6	9.01	10.68		20	6.8	672.2	on	8.19	6.8
14328	160	83	147	159	739	73	176	15129	1013	5011.4	9.15	10.59		20	6.8	672.2	on	8.19	6.8
14388	160	83	147	159	738	73	176	15165	1020	5009.8	9.27	10.61		20	6.8	672.2	on	8.19	6.8
14448	160	83	147	159	739	73	176	15271	1019	5011	9.39	10.51		19.5	6.8	672.2	on	8.19	6.8
14508	160	83	148	159	739	74	176	15295	1016	5013	9.31	10.6		19.5	6.8	616.0	on	8.19	6.8
14568	161	83	148	159	740	73	176	15173	999	5011.8	9.18	10.67		19.5	6.8	616.0	on	8.19	6.8
14628	161	82	147	160	740	74	176	15055	1002	5011.8	9.04	10.75		19	6.8	728.3	on	8.19	6.8
14688	161	82	147	160	742	73	177	15064	1012	5010.6	8.93	10.83		19	6.8	728.3	on	8.19	6.8
14748	161	81	147	159	744	74	177	15198	1021	5009.4	8.82	10.93		19	6.8	672.2	on	8.19	6.8
14808	161	80	147	160	745	74	178	15287	1024	5012.2	8.77	10.96		19	6.8	728.3	on	8.19	6.8
14868	161	80	147	160	745	73	177	15474	1070	5013	8.71	11.03		18.5	6.8	728.3	on	8.19	6.8
14928	161	80	147	159	749	73	177	16056	1072	5009	8.92	10.81		18.5	6.8	672.2	off	8.19	6.8
14988	160	81	147	159	748	74	178	15995	1039	5010.8	8.92	10.82		18.5	6.8	672.2	off	8.19	6.8
15048	160	82	148	160	748	73	178	15666	1027	5012.6	8.87	10.87		18.5	6.8	672.0	off	8.19	6.8
15108	160	82	148	160	753	73	178	15426	1010	5010.2	8.85	10.87		18	6.8	627.2	off	8.19	6.8
15164	160	82	148	160	755	73	178	15230	1009	5010.2	8.94	10.8		18	6.8	672.0	off	8.19	6.8
15224	161	82	148	160	749	73	178	15002	985	5011.4	8.96	10.76		18	6.8	672.0	off	8.19	6.8
15284	161	82	147	159	756	73	177	14860	986	5011.8	8.99	10.74		18	6.8	672.2	off	8.19	6.8
15344	161	83	148	160	767	73	178	14857	964	5011.4	9.1	10.64		17.5	6.8	672.0	off	8.19	6.8
15404	161	83	148	160	763	73	177	14526	954	5010.2	9.39	10.3		17.5	6.8	672.0	off	8.19	6.8
15464	159	83	148	160	749	74	178	14303	926	5010.6	9.67	9.97		17.5	6.8	672.0	off	8.19	6.8
15524	159	83	148	160	744	74	175	13945	913	5011	9.93	9.78		17.5	6.8	672.0	off	8.19	6.8
15584	158	82	148	160	737	73	174	13745	908	5011.4	10.14	9.64		17	6.8	672.0	off	8.19	6.8
15644	157	81	148	160	732	74	173	13768	917	5010.2	10.22	9.56		17	6.8	672.0	off	8.19	6.8
15704	157	81	148	160	724	74	172	13892	934	5011.8	10.31	9.49		17	6.8	672.0	off	8.19	6.8
15764	156	80	148	160	718	74	171	14238	961	5010.2	10.48	9.36		17	6.8	672.0	off	8.19	6.8
15824	155	80	148	160	714	74	171	14543	967	5012.2	10.5	9.33		17	6.8	672.0	off	8.19	6.8
15884	155	79	148	160	714	74	170	14722	990	5008.5	10.42	9.39		16.5	6.8	672.0	off	8.19	6.8
15944	155	79	148	160	720	74	170	14925	978	5011.4	10.35	9.45		16.5	6.8	672.0	off	8.19	6.8
16004	155	80	148	160	721	73	170	14856	991	5009.8	10.33	9.48		16.5	6.8	672.0	off	8.19	6.8
16064	155	81	148	160	722	73	170	15035	1006	5010.8	10.31	9.47		16.5	6.8	672.0	off	8.19	6.8
16124	155	82	148	160	722	73	170	15194	1010	5010.2	10.25	9.5		16.5	6.8	672.0	off	8.19	6.8
16184	155	82	148	160	724	73	170	15230	1013	5011.8	10.26	9.5		16	6.8	672.0	off	8.19	6.8
16244	155	83	148	160	724	73	170	15328	1028	5011.8	10.24	9.51		16	6.8	672.0	off	8.19	6.8
16304	155	84	148	160	728	74	170	15487	1033	5012.6	10.2	9.52		16	6.8	672.0	off	8.19	6.8
16364	155	84	148	159	728	74	170	15503	1026	5011	10.18	9.52		15.5	6.8	616.0	off	8.19	6.8
16424	156	85	148	160	727	74	170	15361	1017	5011	10.17	9.51		15.5	6.8	672.0	off	8.19	6.8
16484	156	84	148	160	727	74	170	15340	1026	5009.4	10.16	9.51		15.5	6.8	627.2	off	8.19	6.8
16540	155	84	148	160	725	75	169	15468	1025	5011.8	10.14	9.47		15	6.8	672.0	off	8.19	6.8
16600	155	82	148	160	716	75	169	15613	1028	5013	10.18	9.41		15	6.8	672.0	off	8.19	6.8
16660	154	82	148	160	692	75	169	15568	1011	5010.2	10.26	9.31		15	6.8	672.0	off	8.19	6.8
16720	153	81	148	160	687	75	169	15434	1025	5012.2	10.34	9.23		15	6.8	672.0	off	8.19	6.8
16780	153	81	147	160	688	75	168	15597	1039	5013.8	10.35	9.21		14.5	6.8	728.3	off	8.19	6.8
16840	153	80	147	159	689	75	168	15751	1052	5011.8	10.29	9.19		14.5	6.8	672.2	off	8.19	6.8
16900	153	79	147	159	693	75	168	15930	1054	5010.6	10.24	9.2		14.5	6.8	672.2	off	8.19	6.8
16960	153	79	147	159	696	74	168	15951	1041	5010.2	10.24	9.23		14.5	6.8	672.2	off	8.19	6.8
17020	153	79	147	159	695	74	168	15620	1037	5010.2	10.25	9.26		14.5	6.8	672.2	off	8.19	6.8
17080	153	79	147	159	697	74	168	15787	1046	5010.2	10.26	9.28		14.5	6.8	672.2	off	8.19	6.8
17140	153	79	147	159	697	74	168	15788	1047	5008.5	10.21	9.31		14.5	6.8	672.2	off	8.19	6.8
17200	153	80	147	159	698	74	168	15881	1049	5010.2	10.17	9.36		14.1	6.8	672.2	off	8.19	6.8
17260	153	81	147	159	695	73	168	15845	1030	5010.6	10.12	9.43		14	6.8	672.2	off	8.19	6.8
17320	154	81	147	159	694	74	168	15544	1029	5011.8	10.16	9.39		14	6.8	672.2	off	8.19	6.8
17380	153	82	147	159	694	73	168	15633	1049	5010.2	10.17	9.38		14	6.8	672.2	off	8.19	6.8
17440	154	82	147	159	694	74	168	15833	1063	5011.4	10.16	9.43		13.5	6.8	672.2	off	8.19	6.8
17500	154	82	147	159	698	73	168	16024	1069	5010.6	10.16	9.44		13.5	6.8	672.2	off	8.19	6.8
17560	154	83	147	159	700	73	169	16223	1088	5011.4	10.09	9.51		13.5	6.8	672.2	off	8.19	6.8
17620	154	83	147	159	702	74	168	16435	1100	5011.4	10.05	9.56		13.5	6.8	672.2	off	8.19	6.8
17680	155	83	147	159	704	73	169	16650	1110	5009.8	9.97	9.61		13	6.8	672.2	off	8.19	6.8

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FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

30-Jun-95 Run TTD-2D

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
17740	155	83	147	159	708	73	169	16748	1111	5010.2	9.9	9.68		13	6.8	672.2	off	8.19	6.8
17800	155	83	147	159	711	73	169	16825	1127	5010.6	9.85	9.75		13	6.8	672.2	off	8.19	6.8
17860	155	83	147	159	714	73	169	17009	1130	5008.5	9.82	9.8		13	6.8	627.4	off	8.19	6.8
17916	155	83	147	159	715	74	169	16874	1096	5011	9.77	9.85		12.5	6.8	672.2	off	8.19	6.8
17976	156	83	147	159	717	73	170	16675	1121	5010.2	9.72	9.93		12.5	6.8	672.2	off	8.19	6.8
18036	156	83	147	159	721	73	170	16687	1106	5010.2	9.63	10.01		12.5	6.8	672.2	off	8.19	6.8
18096	156	83	148	159	719	73	170	16634	1096	5011.8	9.5	10.12		12	6.8	616.0	off	8.19	6.8
18156	157	82	147	159	718	74	171	16362	1056	5010.2	9.38	10.19		12	6.8	672.2	off	8.19	6.8
18216	157	81	148	159	708	74	172	15824	1029	5012.2	9.35	10.24		12	6.8	616.0	off	8.19	6.8
18276	156	81	147	159	692	74	172	15841	1069	5011.4	9.48	10.08		12	6.8	672.2	off	8.19	6.8
18336	156	81	147	159	676	74	171	16419	1094	5009.8	9.78	9.8		12	6.8	672.2	off	8.19	6.8
18396	155	80	147	159	666	74	171	16968	1159	5010.6	9.95	9.62		11.5	6.8	672.2	off	8.19	6.8
18456	155	81	147	159	666	74	171	17432	1153	5010.2	10.03	9.55		11.5	6.8	672.2	off	8.19	6.8
18516	155	80	147	159	665	74	170	17660	1165	5012.2	10.06	9.52		11.5	6.8	672.2	off	8.19	6.8
18576	154	80	148	159	666	74	170	17700	1163	5010.2	10.04	9.53		11.2	6.8	616.0	off	8.19	6.8
18636	154	80	148	159	665	74	170	17733	1165	5011.4	10	9.61		11	6.8	616.0	off	8.19	6.8
18696	154	80	147	159	665	74	171	17741	1167	5011.4	9.99	9.61		11	6.8	672.2	off	8.19	6.8
18756	154	80	148	159	666	74	171	17806	1184	5010.8	10.04	9.59		11	6.8	616.0	off	8.19	6.8
18816	154	80	148	159	666	74	170	18030	1178	5009.8	9.99	9.61		11	6.8	616.0	off	8.19	6.8
18876	154	80	147	159	664	74	171	17835	1164	5011	9.98	9.63		11	6.8	672.2	off	8.19	6.8
18936	155	80	148	159	664	75	171	17782	1193	5009.8	9.93	9.65		10.5	6.8	616.0	off	8.19	6.8
18996	154	80	147	159	667	74	171	18294	1202	5011.4	9.82	9.72		10.5	6.8	672.2	off	8.19	6.8
19056	154	80	148	159	666	74	171	18266	1199	5011.4	9.82	9.74		10.5	6.8	616.0	off	8.19	6.8
19116	155	80	147	159	666	74	172	18262	1207	5011.8	9.84	9.71		10.5	6.8	672.2	off	8.19	6.8
19176	155	80	147	159	666	74	172	18543	1226	5011	9.84	9.71		10.4	6.8	672.2	off	8.19	6.8
19236	155	80	147	159	665	75	171	18758	1233	5012.2	9.77	9.76		10	6.8	627.4	off	8.19	6.8
19292	155	80	147	160	663	74	171	18795	1227	5010.2	9.79	9.73		10	6.8	728.3	off	8.19	6.8
19352	155	80	147	159	660	75	171	18713	1229	5011.4	9.81	9.72		10	6.8	672.2	off	8.19	6.8
19412	154	80	147	159	658	74	172	18661	1222	5011	9.95	9.73		10	6.8	672.2	off	8.19	6.8
19472	155	79	147	159	657	74	172	18840	1259	5010.6	9.88	9.8		10	6.8	672.2	off	8.19	6.8
19532	155	80	147	159	654	74	172	19185	1249	5013	9.88	9.77		9.5	6.8	672.2	off	8.19	6.8
19592	155	79	147	159	654	74	172	19002	1242	5009.8	9.9	9.72		9.5	6.8	672.2	off	8.19	6.8
19652	155	79	147	159	653	74	172	18986	1251	5009.8	9.92	9.7		9.5	6.8	672.2	off	8.19	6.8
19712	155	79	147	159	651	74	172	19165	1262	5013	9.99	9.81		9.5	6.8	672.2	off	8.19	6.8
19772	155	79	147	159	648	74	171	19194	1245	5011.4	9.98	9.62		9.5	6.8	672.2	off	8.19	6.8
19832	155	81	147	159	651	74	171	18734	1191	5011	9.98	9.59		9.5	6.8	672.2	off	8.19	6.8
19892	154	81	147	159	658	74	171	18278	1196	5009.4	10.04	9.54		9	6.8	672.2	off	8.19	6.8
19952	155	82	147	159	660	74	171	17896	1126	5010.2	10.01	9.58		9	6.8	672.2	off	8.19	6.8
20012	154	82	147	159	662	74	170	17200	1118	5010.6	10.03	9.56		9	6.8	672.2	off	8.19	6.8
20072	154	82	147	159	662	74	170	17009	1114	5013.4	10.04	9.53		9	6.8	672.2	off	8.19	6.8
20132	154	82	147	159	661	74	170	16952	1112	5009.8	10.03	9.51		9	6.8	672.2	off	8.19	6.8
20192	154	82	147	159	660	74	170	16911	1110	5011.8	10.04	9.5		8.5	6.8	672.2	off	8.19	6.8
20252	153	82	147	159	659	74	169	16870	1105	5011.4	10.02	9.48		8.5	6.8	672.2	off	8.19	6.8
20312	153	81	147	159	658	74	169	16854	1103	5011.8	9.98	9.51		8.5	6.8	672.2	off	8.19	6.8
20372	154	80	147	159	658	73	169	16773	1093	5011.8	9.96	9.5		8.5	6.8	672.2	off	8.19	6.8
20432	153	80	147	159	658	74	169	16675	1072	5011.4	9.96	9.47		8.5	6.8	672.2	off	8.19	6.8
20492	153	79	147	159	657	74	169	16260	1063	5011.4	9.94	9.5		8.5	6.8	672.2	off	8.19	6.8
20552	153	79	147	159	658	74	169	16248	1085	5011.8	9.93	9.5		8	6.8	672.2	off	8.19	6.8
20612	153	79	147	159	658	73	169	16138	1044	5011.4	9.93	9.51		8	6.8	627.4	off	8.19	6.8
20668	153	81	147	159	659	73	169	15885	1043	5011	9.91	9.53		8	6.8	672.2	off	8.19	6.8
20728	153	81	147	159	658	73	169	15873	1043	5010.2	9.89	9.55		8	6.8	672.2	off	8.19	6.8
20788	153	82	147	159	657	73	169	15930	1047	5009	9.88	9.58		8	6.8	672.2	off	8.19	6.8
20848	153	82	147	159	659	73	169	15967	1046	5013.4	9.82	9.83		8	6.8	672.2	off	8.19	6.8
20908	154	82	147	159	661	73	169	15898	1030	5011	9.81	9.82		7.5	6.8	672.2	off	8.19	6.8
20968	153	82	147	159	660	73	169	15540	1008	5009.8	9.83	9.82		7.5	6.8	672.2	off	8.19	6.8
21028	153	82	147	159	651	73	169	15413	1030	5011.8	9.86	9.6		7.5	6.8	672.2	off	8.19	6.8
21088	153	82	147	159	646	73	169	15711	1029	5011	10.02	9.44		7.5	6.8	672.2	off	8.19	6.8
21148	153	82	147	159	643	73	169	15556	1013	5011	10.14	9.34		7.5	6.8	672.2	off	8.19	6.8
21208	154	82	147	159	640	74	169	15389	1000	5009.8	10.12	9.37		7.2	6.8	672.2	off	8.19	6.8
21268	154	81	147	159	638	74	169	15206	982	5011.4	10.08	9.42		7	6.8	672.2	off	8.19	6.8
21328	153	80	147	159	638	74	168	14941	963	5013	10.09	9.43		7	6.8	672.2	off	8.19	6.8
21388	153	79	147	159	638	73	168	14618	954	5009	10.13	9.4		7	6.8	672.2	off	8.19	6.8
21448	153	79	147	159	635	74	169	14510	943	5009.8	10.14	9.39		7	6.8	672.2	off	8.19	6.8
21508	153	79	147	159	633	74	169	14380	936	5013	10.13	9.41		7	6.8	672.2	off	8.19	6.8
21568	153	79	147	159	632	74	169	14266	938	5011.8	10.18	9.4		7	6.8	672.2	off	8.19	6.8
21628	153	79	147	159	631	73	169	14282	930	5012.6	10.1	9.44		7	6.8	672.2	off	8.19	6.8
21688	153	81	147	159	628	73	169	14018	905	5010.8	10.16	9.38		6.5	6.8	672.2	off	8.19	6.8
21748	153	81	147	159	624	74	169	13786	905	5011.8	10.26	9.29		6.5	6.8	672.2	off	8.19	6.8

D24

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

30-Jun-95 Run TTD-2D

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
21808	153	82	147	159	622	74	169	13770	907	5013	10.26	9.3		6.5	6.8	672.2	off	8.19	6.8
21868	154	82	147	159	620	73	169	13709	893	5011.8	10.28	9.27		6.5	6.8	672.2	off	8.19	6.8
21928	153	82	147	159	619	73	169	13550	899	5013.8	10.33	9.24		6.5	6.8	672.2	off	8.19	6.8
21988	153	82	147	159	620	73	169	13591	892	5011.4	10.34	9.23		6.5	6.8	627.4	off	8.19	6.8
22044	153	82	147	159	619	74	169	13562	898	5010.6	10.34	9.23		6	6.8	672.2	off	8.19	6.8
22104	153	82	147	159	616	74	168	13635	911	5010.2	10.38	9.17		6	6.8	672.2	off	8.19	6.8
22164	153	81	147	159	617	74	168	13806	906	5011.4	10.37	9.18		6	6.8	672.2	off	8.19	6.8
22224	153	80	147	159	616	73	168	13847	919	5012.6	10.36	9.19		6	6.8	672.2	off	8.19	6.8
22284	153	80	147	159	616	74	168	14022	928	5011.4	10.36	9.17		6	6.8	672.2	off	8.19	6.8
22344	153	79	147	159	615	73	168	14176	933	5012.6	10.4	9.13		6	6.8	672.2	off	8.19	6.8
22404	153	79	147	159	613	74	168	14193	923	5011.4	10.48	9.06		6	6.8	672.2	off	8.19	6.8
22464	152	79	147	159	612	74	168	13953	904	5011.8	10.61	8.94		5.7	6.8	672.2	off	8.19	6.8
22524	152	80	147	159	611	73	168	13810	909	5011.8	10.68	8.9		5.5	6.8	672.2	off	8.19	6.8
22584	153	81	147	159	611	73	168	13796	902	5011.8	10.69	8.86		5.5	6.8	672.2	off	8.19	6.8
22644	152	82	147	159	609	73	167	13684	905	5011.4	10.72	8.83		5.5	6.8	672.2	off	8.19	6.8
22704	152	82	147	159	606	73	167	13745	906	5011	10.73	8.82		5.5	6.8	672.2	off	8.19	6.8
22764	153	82	147	159	604	73	167	13749	909	5009	10.73	8.81		5.5	6.8	672.2	off	8.19	6.8
22824	152	82	147	159	601	74	167	13906	924	5012.6	10.73	8.82		5.5	6.8	672.2	off	8.19	6.8
22884	152	82	147	159	602	73	167	13997	915	5011.4	10.69	8.85		5	6.8	672.2	off	8.19	6.8
22944	152	82	147	159	600	74	167	13940	922	5011.4	10.69	8.83		5	6.8	672.2	off	8.19	6.8
23004	152	82	147	159	599	74	167	14022	922	5011	10.66	8.88		5	6.8	672.2	off	8.19	6.8
23064	152	81	147	159	599	73	167	14002	917	5011	10.88	8.91		5	6.8	663.4	off	8.19	6.7
23124	151	80	146	159	598	74	166	14067	930	5010.2	11.08	8.81		5	6.8	718.9	off	8.19	6.7
23184	151	80	147	159	598	74	166	14132	912	5011.4	11.23	8.67		4.9	6.8	663.4	off	8.19	6.7
23244	151	79	146	158	598	74	166	13875	905	5012.2	11.31	8.59		4.5	6.8	663.6	off	8.19	6.7
23304	151	79	146	159	598	74	166	13753	892	5010.6	11.33	8.57		4.5	6.8	718.9	off	8.19	6.7
23364	151	80	146	158	599	73	166	13578	885	5010.2	11.31	8.59		4.5	6.8	619.4	off	8.19	6.7
23420	151	81	146	158	598	73	166	13473	885	5009.4	11.3	8.57		4.5	6.8	663.6	off	8.19	6.7
23480	151	81	146	158	597	73	166	13477	884	5010.6	11.29	8.54		4.5	6.8	663.6	off	8.19	6.7
23540	151	81	146	158	594	73	166	13391	872	5011.4	11.26	8.53		4.5	6.8	663.6	off	8.19	6.7
23600	151	82	146	158	592	73	165	13261	861	5012.6	11.33	8.46		4.5	6.8	663.6	off	8.19	6.7
23660	151	82	146	158	591	73	165	13078	847	5011.4	11.4	8.39		4.5	6.8	663.6	off	8.19	6.7
23720	151	82	146	158	590	73	165	12842	832	5011	11.43	8.35		4	6.8	663.6	off	8.19	6.7
23780	150	82	146	158	590	73	165	12642	824	5011.4	11.4	8.35		4	6.8	663.6	off	8.19	6.7
23840	150	82	146	158	589	73	165	12496	815	5011.4	11.44	8.38		4	6.8	663.6	off	8.19	6.7
23900	150	82	146	158	587	73	164	12333	802	5010.6	11.46	8.39		4	6.8	663.6	off	8.19	6.7
23960	150	82	146	158	584	73	164	12223	802	5012.6	11.44	8.42		4	6.8	663.6	off	8.19	6.7
24020	150	82	146	158	583	73	164	12207	801	5011.8	11.39	8.44		4	6.8	663.6	off	8.19	6.7
24080	150	81	146	158	581	74	164	12231	797	5011.4	11.34	8.46		4	6.8	663.6	off	8.19	6.7
24140	150	80	146	158	580	73	164	12154	789	5011	11.29	8.49		3.5	6.8	663.6	off	8.19	6.7
24200	150	79	146	158	580	74	164	12052	781	5010.2	11.28	8.5		3.5	6.8	663.6	off	8.19	6.7
24260	150	79	146	158	577	73	164	11951	775	5012.6	11.27	8.47		3.5	6.8	663.6	off	8.19	6.7
24320	150	79	146	158	576	73	164	11906	780	5010.2	11.29	8.44		3.5	6.8	663.6	off	8.19	6.7
24380	150	79	146	158	573	73	164	11930	781	5011.8	11.38	8.34		3.5	6.8	663.6	off	8.19	6.7
24440	150	80	146	158	572	74	164	11943	783	5009	11.44	8.29		3.5	6.8	663.6	off	8.19	6.7
24500	150	81	146	158	572	73	164	11873	775	5009.8	11.41	8.31		3.5	6.8	663.6	off	8.19	6.7
24560	150	81	146	157	574	73	164	11812	773	5011.4	11.32	8.38		3.3	6.8	608.3	off	8.19	6.7
24620	150	81	146	158	574	73	164	11849	791	5009.8	11.28	8.44		3.2	6.8	663.6	off	8.19	6.7
24680	150	81	146	158	574	73	164	12130	811	5008.5	11.25	8.45		3	6.8	663.6	off	8.19	6.7
24740	150	81	146	158	573	73	164	12329	812	5011.8	11.2	8.46		3	6.8	619.4	off	8.19	6.7
24796	150	82	146	158	573	73	164	12370	814	5013	11.17	8.47		3	6.8	663.6	off	8.19	6.7
24856	150	82	146	158	574	73	163	12333	795	5011.4	11.16	8.49		3	6.8	663.6	off	8.19	6.7
24916	150	82	146	157	575	73	164	12069	782	5011.4	11.12	8.52		3	6.8	608.3	off	8.19	6.7
24976	150	82	146	157	578	73	164	11947	780	5011.4	11.3	8.54		3	6.8	608.3	off	8.19	6.7
25036	150	82	146	157	580	73	164	11894	779	5012.6	11.41	8.58		2.9	6.8	608.3	off	8.19	6.7
25096	150	82	146	158	581	74	164	11690	779	5010.6	11.4	8.61		2.5	6.8	663.6	off	8.19	6.7
25156	150	81	145	157	593	73	164	11882	785	5008.1	11.33	8.66		2.5	6.8	663.8	off	8.19	6.7
25216	150	80	146	157	604	74	164	12028	786	5013	11.3	8.68		2.5	6.8	608.3	off	8.19	6.7
25276	150	79	146	157	606	74	163	11983	778	5011.4	11.35	8.58		2.5	6.8	608.3	off	8.19	6.7
25336	151	79	145	157	600	73	164	11865	772	5011.4	11.41	8.47		2.5	6.8	663.8	off	8.19	6.7
25396	150	79	145	157	596	73	163	11845	765	5009.8	11.42	8.44		2.5	6.8	663.8	off	8.19	6.7
25456	150	79	145	157	593	73	163	11731	766	5013	11.52	8.36		2.5	6.8	663.8	off	8.19	6.7
25516	149	80	146	157	589	73	163	11690	758	5011.8	11.54	8.33		2.5	6.8	608.3	off	8.19	6.7
25576	150	81	146	157	588	73	163	11605	762	5010.6	11.53	8.32		2.5	6.8	608.3	off	8.19	6.7
25636	149	81	146	157	586	73	163	11585	756	5011.8	11.51	8.32		2	6.8	608.3	off	8.19	6.7
25696	149	81	145	157	586	73	163	11503	750	5011.8	11.54	8.3		2	6.8	663.8	off	8.19	6.7
25756	149	82	145	157	580	73	163	11467	757	5010.6	11.51	8.33		2	6.8	663.8	off	8.19	6.7
25816	149	82	146	157	576	73	163	11731	779	5011.4	11.54	8.3		2	6.8	608.3	off	8.19	6.7

D25

FURNACE A WITHOUT CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

30-Jun-95 Run TTD-2D

time sec	stack ext F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
25876	149	82	146	157	575	73	162	11898	775	5013	11.59	8.25		2	6.8	608.3	off	8.19	6.7
25936	149	82	146	157	574	73	163	11796	764	5011.4	11.57	8.26		1.6	6.8	608.3	off	8.19	6.7
25996	149	82	145	157	572	73	162	11682	759	5013.4	11.58	8.22		1.5	6.8	663.8	off	8.19	6.7
26056	149	82	145	157	572	73	163	11580	753	5010.2	11.58	8.21		1.5	6.8	663.8	off	8.19	6.7
26116	149	82	145	157	571	73	162	11487	746	5011	11.6	8.18		1.5	6.8	619.6	off	8.19	6.7
26172	149	82	145	157	571	73	162	11405	739	5011.8	11.57	8.21		1.5	6.8	663.8	off	8.19	6.7
26232	149	82	145	157	572	73	162	11243	727	5010.2	11.57	8.2		1.5	6.8	663.8	off	8.19	6.7
26292	149	82	146	157	573	73	162	11104	719	5011.8	11.58	8.21		1.5	6.8	608.3	off	8.19	6.7
26352	149	82	145	157	572	73	162	10962	712	5012.2	11.58	8.19		1.5	6.8	663.8	off	8.19	6.7
26412	149	82	145	157	573	73	161	10885	705	5009.6	11.57	8.19		1.5	6.8	663.8	off	8.19	6.7
26472	149	82	145	157	572	74	162	10828	705	5012.6	11.57	8.21		1	6.8	663.8	off	8.19	6.7
26532	149	82	145	157	571	73	162	10852	713	5011.4	11.57	8.2		1	6.8	663.8	off	8.19	6.7
26592	148	82	145	156	569	73	162	10917	713	5010.6	11.57	8.22		1	6.8	608.5	off	8.19	6.7
26652	148	82	145	157	570	73	161	10954	717	5012.6	11.6	8.19		1	6.8	663.8	off	8.19	6.7
26712	148	82	145	157	570	73	161	11003	721	5013	11.59	8.2		1	6.8	663.8	off	8.19	6.7
26772	148	82	145	157	592	73	161	11096	725	5012.6	11.59	8.22		1	6.8	663.8	off	8.19	6.7
26832	149	82	145	156	628	73	162	10494	605	5011.4	11.6	8.24		1	6.8	608.5	off	8.19	6.7
26892	149	82	145	158	629	73	162	9025	545	5009.8	11.55	8.31		1	6.8	608.5	off	8.19	6.7
26952	149	82	145	156	620	73	162	8529	545	5010.2	11.62	8.18		0.8	6.8	608.5	off	8.19	6.7
27012	149	81	145	157	609	73	162	8537	548	5012.2	11.62	8		0.5	6.8	663.8	off	8.19	6.7
27072	149	80	145	156	597	73	162	6696	570	5012.2	12	7.86		0.5	6.8	608.5	off	8.19	6.7
27132	149	79	144	156	587	73	161	9013	596	5011.8	12.13	7.76		0.5	6.8	664.0	off	8.20	6.7
27192	149	79	145	156	579	73	161	9371	621	5009.8	12.26	7.69		0.5	6.8	608.5	off	8.19	6.7
27252	148	79	145	156	573	73	160	9644	629	5011.8	12.34	7.65		0.5	6.8	608.5	off	8.19	6.7
27312	148	80	144	156	568	73	160	9745	635	5013.4	12.38	7.64		0.5	6.8	664.0	off	8.20	6.7
27372	147	80	145	156	565	73	160	9831	638	5011.4	12.43	7.63		0.5	6.8	608.5	off	8.19	6.7
27432	147	81	145	156	562	73	160	9851	642	5011.8	12.48	7.63		0.5	6.8	608.5	off	8.19	6.7
27492	147	81	145	156	562	73	160	9880	642	5012.2	12.48	7.65		0.5	6.8	567.9	off	8.19	6.7
27548	147	81	145	156	560	72	160	9888	639	5011	12.49	7.65		0.5	6.8	608.5	off	8.19	6.7
27608	146	82	144	156	559	73	159	9627	639	5011	12.52	7.63		0.5	6.8	664.0	off	8.20	6.7
27668	146	81	144	156	557	73	159	9802	634	5011.4	12.6	7.6		0.5	6.8	664.0	off	8.20	6.7
27728	146	81	145	156	558	73	159	9778	632	5010.6	12.62	7.58		0.5	6.8	608.5	off	8.19	6.7
27788	146	81	144	156	554	73	159	9745	630	5011.4	12.62	7.59		0.3	6.8	664.0	off	8.20	6.7
27848	146	81	144	156	553	73	159	9880	626	5010.2	12.64	7.58		0	6.8	664.0	off	8.20	6.7
27908	146	81	144	156	552	73	159	9672	634	5008.5	12.65	7.58		0	6.8	664.0	off	8.20	6.7
27968																			
AVERAGE	162	83	144	156	646	73	176	17907			9.55	10.30			6.81	646.4		8.20	
26444																			

7.3455556 test time, hrs

440.73333

Total Btu out =	286,354	Btu/hr	38,983
Total Btu in =	536,436	Btu/hr	73,029
Efficiency =	53.38%		
Water flowrate	6.81	gpm	
Burnrate =	4.11	dry kg/hr	
Wood moisture	22.14%		

D26

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
2780	161	89	144	150	323	76	186	9306	1175.8	5009.8	14.81	4.9		80.5	6.3	309.88	Off	8.20	6.2
2840	151	83	144	150	302	76	174	6482	681.3	5011.4	17.76	2.67		80.5	6.3	309.88	Off	8.20	6.2
2900	144	81	144	150	305	76	167	10990	840.5	5011.4	16.11	4.34		80.5	6.3	309.88	Off	8.20	6.2
2960	141	80	144	150	307	76	162	11633	821.8	5011.4	15.53	4.77		80.3	6.3	309.88	Off	8.20	6.2
3020	138	80	144	150	321	76	159	11808	836.3	5012.2	15.34	4.93		80	6.3	309.88	Off	8.20	6.2
3080	136	79	144	150	327	75	157	11597	819.7	5013	15.24	5.02		80	6.3	309.88	Off	8.20	6.2
3140	136	78	143	150	333	75	156	11332	790.0	5010.2	15.22	5.04		80	6.3	361.63	Off	8.20	6.2
3200	135	78	143	150	337	75	155	11251	786.3	5013	15.2	5.09		80	6.3	361.83	Off	8.20	6.2
3260	135	78	143	150	342	75	154	11222	787.6	5011.4	15.11	5.17		79.8	6.3	361.83	Off	8.20	6.2
3320	134	77	143	150	342	75	154	11169	780.8	5008.5	15.06	5.22		79.5	6.3	361.63	Off	8.20	6.2
3380	134	77	143	149	339	74	153	10942	763.5	5009.8	15.06	5.21		79.5	6.3	309.97	Off	8.20	6.2
3440	134	77	143	149	346	74	153	10917	770.8	5012.2	15.04	5.22		79.5	6.3	309.97	On	8.20	6.2
3500	134	78	143	149	346	74	154	11003	768.1	5011.8	14.97	5.33		79.5	6.3	309.97	On	8.20	6.2
3560	136	78	142	149	348	74	154	11580	822.9	5011.4	14.71	5.59		79	6.3	361.74	On	8.20	6.2
3620	137	79	143	149	363	74	155	11446	824.9	5011	14.54	5.76		79	6.3	309.97	On	8.20	6.2
3680	138	80	143	149	358	75	156	10616	746.1	5010.6	14.49	5.83		79	6.3	309.97	On	8.20	6.2
3740	139	80	142	149	356	74	156	10995	776.5	5012.6	14.39	5.92		78.5	6.3	361.74	On	8.20	6.2
3800	139	81	143	149	360	74	157	11397	815.3	5013	14.26	6.06		78.5	6.3	309.97	On	8.20	6.2
3860	141	81	143	149	362	75	157	11503	821.5	5011.8	14.22	6.1		78	6.3	309.97	On	8.20	6.2
3920	141	81	143	149	368	75	158	11536	822.8	5013.4	14.24	6.06		78	6.3	309.97	On	8.20	6.2
3980	142	81	143	149	384	75	159	11235	810.2	5009.8	14.02	6.39		78	6.3	309.97	On	8.20	6.2
4040	144	80	143	149	390	75	160	11589	831.2	5009	13.45	6.91		77.5	6.3	309.97	On	8.20	6.2
4100	144	79	142	149	394	75	160	11523	831.5	5011	13.68	6.59		77.5	6.3	337.63	On	8.20	6.2
4156	144	79	143	149	389	74	160	11332	811.4	5011	13.91	6.37		77.5	6.3	309.97	On	8.20	6.2
4218	144	79	142	149	386	74	160	11332	811.5	5008.5	14.09	6.22		77.4	6.3	361.74	On	8.20	6.2
4276	144	79	142	149	368	74	160	11385	813.6	5011.8	14.1	6.2		77	6.3	361.74	On	8.20	6.2
4336	146	81	142	149	402	74	162	12529	888.3	5011	13.79	6.64		77	6.3	361.74	On	8.20	6.2
4396	148	82	142	149	431	74	165	17049	1261.9	5011.8	12.74	7.64		76.5	6.3	361.74	On	8.20	6.2
4456	151	83	142	149	448	75	168	17704	1327.6	5012.2	12.68	8.07		76	6.3	361.74	On	8.20	6.2
4516	154	83	142	149	455	75	170	18083	1336.4	5009.8	12.51	8.25		76	6.3	361.74	On	8.20	6.2
4576	155	83	143	149	456	75	171	18986	1409.8	5011.8	12.45	8.31		75.5	6.3	309.97	On	8.20	6.2
4636	157	84	142	149	460	75	173	19450	1448.9	5011	12.39	8.36		75	6.3	361.74	On	8.20	6.2
4696	158	84	143	149	467	76	174	19682	1473.5	5009.8	12.27	8.47		74.5	6.3	309.97	On	8.20	6.2
4756	159	84	143	149	478	76	176	19796	1480.3	5009.4	12.22	8.54		74.5	6.3	309.97	On	8.20	6.2
4816	161	83	142	149	494	76	177	19918	1509.4	5011	12.12	8.67		74	6.3	361.74	On	8.20	6.2
4876	162	83	142	149	498	76	178	19421	1463.2	5010.6	12.03	8.74		74	6.3	361.74	On	8.20	6.2
4936	162	83	142	149	498	75	178	19092	1429.0	5011	12.16	8.59		73.5	6.3	361.74	On	8.20	6.2
4996	163	82	142	149	505	75	179	19771	1486.3	5009.8	12.09	8.65		73.4	6.3	361.74	On	8.20	6.2
5056	163	82	142	149	510	75	179	20402	1544.6	5007.7	11.87	8.87		73	6.3	361.74	On	8.20	6.2
5116	163	83	142	149	515	75	180	20544	1558.3	5010.6	11.64	8.92		72.5	6.3	361.74	On	8.20	6.2
5176	164	83	143	149	517	75	181	20573	1557.5	5011.4	11.61	8.94		72	6.3	309.97	On	8.20	6.2
5236	164	84	143	149	520	75	181	20488	1563.0	5010.6	11.8	8.94		72	6.3	309.97	On	8.20	6.2
5296	165	85	143	149	522	75	181	20264	1541.7	5009.8	11.8	8.94		71.5	6.3	309.97	On	8.20	6.2
5356	166	85	143	149	524	75	182	20097	1524.6	5010.6	11.77	8.95		71	6.3	309.97	On	8.20	6.2
5416	166	85	143	149	529	76	182	19967	1528.0	5012.6	11.77	8.95		70.5	6.3	309.97	On	8.20	6.2
5476	166	84	143	149	532	76	183	19190	1471.4	5011	11.82	8.89		70.5	6.3	289.31	On	8.20	6.2
5532	166	83	142	149	534	75	183	18840	1412.8	5011.8	11.81	8.92		70	6.3	361.74	On	8.20	6.2
5592	166	83	143	149	539	75	183	19157	1433.8	5010.2	11.75	8.95		69.7	6.3	309.97	On	8.20	6.2
5652	166	83	143	149	536	75	184	20058	1520.2	5009.4	11.58	9.09		69.5	6.3	309.97	On	8.20	6.2
5712	167	83	143	149	534	75	184	20308	1551.8	5011	11.57	9.09		69	6.3	309.97	On	8.20	6.2
5772	166	83	143	149	536	75	184	20333	1558.9	5011.4	11.56	9.1		69	6.3	309.97	On	8.20	6.2
5832	168	84	143	149	541	74	184	20553	1579.3	5008.1	11.5	9.17		68.5	6.3	309.97	On	8.20	6.2
5892	168	85	143	150	546	74	185	20927	1601.9	5009.8	11.41	9.25		68	6.3	361.63	On	8.20	6.2
5952	170	88	143	149	547	75	186	21041	1616.5	5010.6	11.38	9.26		67.5	6.3	309.97	On	8.20	6.2
6012	175	68	143	150	567	74	192	23645	1826.5	5011.4	10.06	10.77		67	6.3	361.63	On	8.20	6.2
8072	180	89	144	150	583	75	197	25773	2005.0	5010.2	8.44	12.18		66.5	6.3	309.88	On	8.20	6.2
8132	182	89	144	150	590	75	200	25627	2005.4	5010.2	8.33	12.18		66	6.3	309.88	On	8.20	6.2
6192	183	89	144	150	594	75	202	25061	2005.0	5010.6	8.46	11.99		65.5	6.3	309.88	On	8.20	6.2
6252	184	89	145	151	594	75	203	24972	2001.1	5010.2	8.5	11.96		65	6.3	309.79	On	8.19	6.2
6312	185	88	144	151	602	75	205	26384	2005.2	5011	8.31	12.15		64.5	6.3	361.53	On	8.20	6.2
6372	187	88	145	151	614	75	206	27718	2006.0	5013	8.03	12.41		64	6.3	309.79	On	8.19	6.2
8432	188	88	145	151	622	76	208	28345	2005.4	5012.2	7.99	12.5		63.5	6.3	309.79	On	8.19	6.2
6492	188	88	145	152	629	75	209	28646	2005.0	5012.6	7.89	12.62		63	6.3	361.42	On	8.19	6.2
6552	190	88	145	152	655	75	211	28715	2004.6	5010.2	7.83	12.67		62.5	6.3	361.42	On	8.19	6.2
6612	193	88	146	152	687	75	214	29106	2004.9	5008.5	7.56	13.06		62	6.3	309.69	On	8.19	6.2
6672	196	88	146	152	708	75	218	33561	2004.4	5010.6	6.05	14.48		61.5	6.3	309.69	On	8.19	6.2
6732	199	90	146	153	720	74	220	33699	2004.6	5011.8	5.56	15.1		61	6.3	361.31	On	8.19	6.2
6792	199	91	147	154	727	75	223	32007	2006.0	5009.4	5.56	15.09		60.5	6.3	361.20	On	8.19	6.2
6852	200	91	147	154	741	75	223	31112	2006.2	5010.6	5.59	15.05		60	6.3	337.12	On	8.19	6.2
6908	200	91	148	154	742	75	223	30082	2004.1	5008.5	5.48	15.14		59.4	6.3	309.50	On	6.19	6.2
6968	198	90	148	154	737	75	222	29224	2005.7	5009.4	6	14.57		58.5	6.3	309.50	On	8.19	6.2
7028	197	90	148	155	736	76	220	28898	2005.0	5012.6	6.46	14.13		58	6.3	361.09	On	8.19	6.2

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
7088	196	90	149	155	737	76	219	28764	2005.4	5012.2	6.62	13.78		57.5	6.3	309.41	On	8.18	6.2
7148	196	89	149	155	742	76	219	28650	2005.7	5009.8	7.05	13.56		57	6.3	309.41	On	8.18	6.2
7208	196	88	149	156	750	76	219	28886	2005.4	5010.2	7.05	13.56		56.5	6.3	360.97	On	8.16	6.2
7268	196	88	149	156	756	76	218	28874	2005.7	5010.2	7	13.55		56	6.3	360.97	On	8.18	6.2
7328	195	88	149	156	761	75	218	28569	2004.9	5011	7.15	13.42		56	6.3	360.97	On	8.18	6.2
7388	195	87	149	156	766	75	218	28341	2004.4	5007.3	7.23	13.32		55.5	6.3	360.97	On	8.18	6.2
7448	196	87	149	156	774	75	216	28373	2006.2	5011.4	7.07	13.48		55	6.3	360.97	On	8.18	6.2
7508	196	88	149	157	784	74	219	28556	2005.7	5012.2	6.81	13.7		54.5	6.3	412.54	On	8.16	6.2
7568	197	88	150	157	786	74	219	28666	2005.5	5010.6	6.64	13.85		54	6.3	360.86	On	8.18	6.2
7628	197	89	150	157	793	75	220	28988	2005.4	5011	6.48	13.98		53.5	6.3	360.86	On	8.18	6.2
7688	198	89	150	158	801	75	221	29411	2004.7	5011.4	6.12	14.35		53	6.3	412.41	On	8.18	6.2
7748	199	89	151	158	812	75	222	29346	2006.0	5010.2	5.77	14.69		52.5	6.3	360.75	On	8.16	6.2
7808	200	89	151	158	819	75	224	29557	2005.0	5009.4	5.36	15.09		51.9	6.3	360.75	On	8.18	6.2
7868	200	89	152	158	820	75	225	29815	2005.4	5011	5.11	15.27		51.5	6.3	309.11	On	8.18	6.2
7928	201	88	152	159	821	75	225	29875	2005.4	5012.2	5.23	15.09		51	6.3	360.63	On	8.18	6.2
7988	200	88	152	159	818	75	225	29496	2004.6	5010.2	5.49	14.79		50.5	6.3	360.63	On	8.18	6.2
8048	200	87	152	159	819	75	225	29130	2004.7	5011.4	5.8	14.51		50	6.3	360.63	On	8.18	6.2
8108	200	87	152	160	819	75	224	29069	2005.0	5011.4	5.78	14.52		49.5	6.3	412.15	On	8.18	6.2
8168	199	87	152	160	814	74	224	29297	2005.0	5010.6	5.77	14.49		49	6.3	412.15	On	8.18	6.2
8228	199	88	153	161	808	74	224	29952	2004.7	5011	5.79	14.45		48.5	6.3	384.55	On	8.17	6.2
8284	199	89	153	161	808	75	225	31112	2005.4	5010.2	5.76	14.45		48	6.3	412.02	On	8.17	6.2
8344	199	89	153	161	811	75	225	32039	2005.2	5011	5.56	14.63		47.5	6.3	412.02	On	8.17	6.2
8404	199	90	154	161	813	75	226	32442	2005.2	5010.6	5.41	14.75		47	6.3	360.40	On	8.17	6.2
8464	199	90	154	161	819	76	226	32320	2005.7	5010.2	5.37	14.77		46.5	6.3	360.40	On	8.17	6.2
8524	199	90	154	162	825	76	226	31527	2005.2	5010.6	5.53	14.64		46	6.3	411.89	On	8.17	6.2
8584	198	89	153	162	828	76	226	31262	2005.2	5009.4	5.56	14.59		46.5	6.3	463.52	On	8.17	6.2
8644	198	89	157	162	828	76	225	30900	2005.4	5013	5.59	14.51		45	6.3	257.18	On	8.16	6.2
8704	196	88	158	163	831	76	225	30477	2004.7	5009.8	5.66	14.37		45	6.3	257.09	On	8.16	6.2
8764	197	87	157	163	835	76	223	30892	2005.4	5009.4	6.02	13.92		44.5	6.3	308.61	On	8.16	6.2
8824	197	86	157	163	835	75	222	30225	2005.0	5009.8	6.34	13.6		44	6.3	308.61	On	8.16	6.2
8884	196	86	157	163	839	75	221	29736	2005.5	5011	6.48	13.46		43.5	6.3	308.61	On	8.16	6.2
8944	195	66	157	163	830	75	221	29358	2005.4	5007.7	6.57	13.33		43.5	6.3	308.61	On	8.16	6.2
9004	194	85	158	164	805	75	220	28296	2005.7	5010.2	6.88	13.1		43	6.3	308.51	On	8.16	6.2
9064	194	85	158	164	791	74	219	27319	2005.5	5010.2	6.88	13.12		43	6.3	308.51	On	8.16	6.2
9124	193	86	158	164	787	74	219	27926	2005.2	5011	6.68	13.31		42.5	6.3	308.51	On	8.16	6.2
9184	192	86	158	164	783	74	219	29134	2005.0	5010.6	6.55	13.41		42	6.3	308.51	On	8.16	6.2
9244	191	87	159	165	783	74	219	30017	2005.4	5010.2	6.41	13.54		41.5	6.3	308.41	On	8.16	6.2
9304	191	87	159	165	784	75	220	30290	2004.6	5009.6	6.17	13.75		41	6.3	308.41	On	8.16	6.2
9364	192	88	159	165	785	75	221	30782	2005.4	5010.6	5.82	14.06		40.5	6.3	308.41	On	8.16	6.2
9424	193	87	159	165	786	75	222	31417	2005.7	5009.6	5.64	14.2		40	6.3	308.41	On	8.16	6.2
9484	193	88	160	166	786	75	223	31865	2005.4	5009.4	5.45	14.38		39.5	6.3	308.30	On	8.16	6.2
9544	194	87	160	166	788	75	224	32178	2005.7	5010.6	5.38	14.45		39.5	6.3	308.30	On	8.16	6.2
9604	195	87	160	166	791	75	224	32528	2004.6	5010.2	5.29	14.52		39	6.3	287.75	On	8.16	6.2
9660	196	86	160	167	814	75	226	33289	2004.7	5010.2	5.18	14.61		38.5	6.3	359.69	On	8.16	6.2
9720	197	86	161	167	828	75	226	36731	2004.6	5009.8	4.99	14.69		38	6.3	308.20	On	8.15	6.2
9780	197	86	161	167	832	75	226	36975	2004.7	5009	4.94	14.67		37.5	6.3	308.20	On	6.15	6.2
9840	197	85	161	167	835	75	226	35832	2006.0	5011	5	14.62		37.5	6.3	308.20	On	8.15	6.2
9900	196	66	161	167	830	74	226	34090	2005.0	5010.2	5.08	14.55		37	6.3	308.20	On	8.15	6.2
9960	196	86	162	168	822	75	226	32951	2004.6	5010.2	5.33	14.32		36.5	6.3	308.10	On	8.15	6.2
10020	194	87	162	168	816	75	225	32157	2004.9	5011.4	5.57	14.11		36.5	6.3	308.10	On	8.15	6.2
10080	193	87	162	168	812	75	224	31490	2005.0	5011.8	5.72	13.99		36	6.3	308.10	On	8.15	6.2
10140	192	87	162	168	808	75	223	31079	2005.0	5011.8	5.82	13.63		35.5	6.3	308.10	On	8.15	6.2
10200	192	87	163	169	802	76	223	30269	2005.0	5009	5.78	13.89		35	6.3	307.99	On	8.15	6.2
10260	192	86	163	169	805	75	223	29574	2004.7	5011	5.72	13.97		34.5	6.3	307.99	On	8.15	6.2
10320	193	86	163	169	813	75	223	28577	2005.2	5010.2	5.54	14.19		34.5	6.3	307.99	On	8.15	6.2
10380	194	85	163	170	823	75	224	28556	2006.0	5008.1	5.26	14.4		34	6.3	359.32	On	8.15	6.2
10440	194	85	164	170	829	75	224	28642	2004.7	5011.4	5.2	14.43		34	6.3	307.88	On	8.14	6.2
10500	194	84	163	170	834	75	224	28048	2005.2	5011.8	5.23	14.42		33.5	6.3	359.32	On	8.15	6.2
10560	195	84	164	171	837	75	225	27344	2006.2	5011.8	5.22	14.45		33.5	6.3	359.20	On	8.14	6.2
10620	194	85	164	171	836	74	225	26851	2004.2	5009.4	5.2	14.51		33	6.3	359.20	On	8.14	6.2
10680	194	85	164	171	834	74	225	26530	2005.4	5008.5	5.29	14.55		32.5	6.3	359.20	On	8.14	6.2
10740	193	86	165	171	832	74	224	26160	2004.9	5011.4	5.44	14.4		32.5	6.3	307.78	On	8.14	6.2
10800	190	86	165	172	833	75	223	25509	2005.2	5011	5.54	14.29		32	6.3	359.07	On	8.14	6.2
10860	190	86	166	172	836	74	222	24919	1986.7	5011.4	5.64	14.18		31.5	6.3	307.67	On	8.14	6.2
10920	190	87	166	172	833	75	222	24093	1909.5	5010.2	5.75	14.05		31.3	6.3	307.67	On	8.14	6.2
10980	190	87	166	173	825	75	221	23181	1812.0	5011.6	5.8	14.02		31	6.3	335.02	On	8.14	6.2
11036	189	87	166	173	819	75	221	22660	1758.6	5011.8	5.77	14.03		30.5	6.3	358.95	On	8.14	6.2
11096	189	86	167	173	822	75	221	23413	1769.4	5010.2	5.71	14.06		30.5	6.3	307.56	On	8.14	6.2
11156	189	85	167	173	829	76	222	25842	1996.9	5009.8	5.48	14.16		30	6.3	307.56	On	8.14	6.2
11218	191	85	167	174	835	75	223	27372	2005.7	5011.4	5.18	14.32		30	6.3	358.82	On	8.14	6.2
11276	192	84	167	174	841	75	223	28235	2005.4	5013	4.99	14.47		29.5	6.3	358.82	On	8.14	6.2
11336	192	84	168	174	845	75	226	28361	2004.9	5010.6	4.75	14.7		29	6.3	307.45	On	8.13	6.2

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
11396	193	84	188	175	846	75	227	28060	2005.2	5010.2	4.62	14.89		29	6.3	358.69	On	8.13	6.2
11456	193	85	168	175	845	74	227	27230	2004.9	5009.4	4.6	14.96		28.5	6.3	358.69	On	8.13	6.2
11516	190	84	168	175	827	75	226	25387	1994.1	5010.2	4.76	14.79		28.5	6.3	358.69	Off	8.13	6.2
11576	174	80	169	176	751	74	211	22335	1176.6	5008.1	5.98	13.56		28.2	6.3	358.57	Off	8.13	6.2
11636	159	79	169	175	692	75	194	37272	918.9	5011	8.07	11.96		28	6.3	307.34	Off	8.13	6.2
11696	151	79	169	175	854	75	181	45150	1125.2	5010.6	8.89	11.65		28	6.3	307.34	Off	8.13	6.2
11756	146	79	169	176	624	75	172	41732	1003.9	5011.8	9.51	11.28		28	6.3	358.57	Off	8.13	6.2
11816	142	78	169	176	600	75	165	36467	839.2	5013	9.89	10.97		28	6.3	358.57	Off	8.13	6.2
11876	139	77	169	175	581	75	160	32483	700.7	5011.8	9.93	10.88		28	6.3	307.34	Off	8.13	6.2
11936	137	76	169	176	566	75	156	28764	597.5	5011.4	10.03	10.68		27.7	6.3	358.57	Off	8.13	6.2
11996	135	75	169	175	552	75	152	25875	511.1	5012.2	10.09	10.51		27.5	6.3	307.34	Off	8.13	6.2
12056	133	75	169	176	540	75	149	23572	460.1	5011	10.12	10.34		27.5	6.3	358.57	Off	8.13	6.2
12116	131	75	168	175	528	75	147	21639	411.6	5011.4	10.2	10.13		27.5	6.3	358.69	Off	8.13	6.2
12176	130	75	168	176	518	74	144	20113	377.8	5010.6	10.29	9.92		28	6.3	409.94	Off	8.13	6.2
12236	128	75	169	175	508	74	141	18880	342.0	5012.2	10.38	9.73		28	6.3	307.34	Off	8.13	6.2
12296	127	76	169	175	499	74	140	17753	309.7	5009.8	10.43	9.59		27.5	6.3	307.34	Off	8.13	6.2
12356	125	76	169	176	492	74	138	16728	282.9	5011.8	10.38	9.51		27.5	6.3	334.66	Off	8.13	6.2
12412	124	77	169	175	485	74	136	15772	260.1	5010.2	10.42	9.37		27.5	6.3	307.34	Off	8.13	6.2
12472	123	77	169	175	478	74	135	15084	239.9	5012.2	10.37	9.33		27.5	6.3	307.34	Off	8.13	6.2
12532	122	78	169	175	472	75	134	14518	228.4	5011.4	10.32	9.29		27.5	6.3	307.34	Off	8.13	6.2
12592	122	78	168	175	466	75	132	14022	217.8	5012.2	10.37	9.2		27.5	6.3	358.69	Off	8.13	6.2
12652	121	78	168	175	460	75	132	13717	207.5	5011.4	10.35	9.16		27	6.3	358.69	Off	8.13	6.2
12712	119	77	168	174	455	75	131	13346	200.2	5011.4	10.44	9.04		27	6.3	307.45	Off	8.13	6.2
12772	119	76	168	174	450	75	130	13159	193.2	5011	10.49	8.98		27	6.3	307.45	Off	8.13	6.2
12832	117	75	168	174	446	75	129	13082	192.2	5011.4	10.44	9.01		27	6.3	307.45	Off	8.13	6.2
12892	116	75	168	174	442	75	128	12854	191.4	5008.5	10.48	8.93		27	6.3	307.45	Off	8.13	6.2
12952	116	74	167	174	438	75	127	12602	185.4	5011.8	10.57	8.85		27	6.3	358.82	Off	8.14	6.2
13012	115	74	167	173	434	75	126	12366	184.4	5011.8	10.62	8.79		27.5	6.3	307.56	Off	8.14	6.2
13072	115	73	167	174	431	74	125	12179	180.0	5012.2	10.63	8.74		27.5	6.3	358.82	Off	8.14	6.2
13132	113	74	166	173	428	74	125	12036	177.1	5013	10.68	8.7		27.2	6.3	358.95	Off	8.14	6.2
13192	113	75	167	173	426	74	124	11841	172.7	5012.2	10.72	8.65		27.2	6.3	307.56	Off	8.14	6.2
13252	112	76	166	173	422	74	123	11825	160.5	5012.2	10.65	8.69		27	6.3	358.95	Off	8.14	6.2
13312	111	76	166	173	419	74	122	11829	155.4	5011.8	10.51	8.79		27	6.3	358.95	Off	8.14	6.2
13372	111	77	166	173	416	74	122	11719	158.1	5010.2	10.49	8.8		27	6.3	358.95	Off	8.14	6.2
13432	110	77	166	173	413	75	121	11540	152.0	5011.4	10.52	8.74		27	6.3	358.95	Off	8.14	6.2
13492	110	77	166	173	410	75	120	11361	145.5	5012.2	10.54	8.71		27	6.3	358.95	Off	8.14	6.2
13552	110	78	166	172	407	75	120	11178	143.7	5011	10.55	8.68		27	6.3	307.67	Off	8.14	6.2
13612	109	77	166	173	405	75	119	11007	137.2	5013	10.55	8.65		27	6.3	358.95	Off	8.14	6.2
13672	109	77	166	173	402	75	119	10771	135.7	5011.4	10.56	8.61		27	6.3	358.95	Off	8.14	6.2
13732	108	78	166	172	399	76	118	10618	132.8	5009.8	10.57	8.61		27	6.3	287.16	Off	8.14	6.2
13788	108	77	166	172	397	76	118	10437	130.7	5011	10.58	8.57		26.5	6.3	307.67	Off	8.14	6.2
13848	108	76	166	172	395	76	118	10266	127.1	5010.6	10.59	8.54		27	6.3	307.67	Off	8.14	6.2
13908	107	75	166	172	393	76	117	10160	122.6	5009.8	10.55	8.56		26.9	6.3	307.67	Off	8.14	6.2
13968	106	75	165	172	392	76	117	10124	121.3	5011	10.51	8.62		27	6.3	359.07	Off	8.14	6.2
14028	105	74	166	172	390	76	116	10006	118.8	5009	10.49	8.62		27	6.3	307.67	Off	8.14	6.2
14088	105	74	165	172	388	75	116	9888	121.1	5010.6	10.54	8.58		27	6.3	359.07	Off	8.14	6.2
14148	104	73	165	172	386	75	116	9745	120.9	5013	10.6	8.53		27	6.3	359.07	Off	8.14	6.2
14208	103	74	165	172	385	74	115	9554	119.0	5011.4	10.75	8.42		27	6.3	359.07	Off	8.14	6.2
14268	104	74	165	172	384	74	114	9526	116.5	5012.6	10.77	8.42		27	6.3	359.07	Off	8.14	6.2
14328	103	75	165	171	382	74	114	9607	111.8	5011	10.87	8.49		27	6.3	307.78	Off	8.14	6.2
14388	102	76	165	171	380	74	113	9603	111.2	5010.6	10.85	8.53		27	6.3	307.78	Off	8.14	6.2
14448	102	76	165	171	379	74	113	9644	110.7	5011.4	10.63	8.55		27	6.3	307.78	Off	8.14	6.2
14508	102	77	165	171	377	74	113	9676	107.1	5010.2	10.56	8.61		27	6.3	307.78	Off	8.14	6.2
14568	102	77	165	171	375	75	113	9758	108.1	5011.8	10.48	8.68		26.5	6.3	307.78	Off	8.14	6.2
14628	102	78	165	171	373	75	112	9705	106.6	5010.6	10.51	8.65		26.5	6.3	307.78	Off	8.14	6.2
14688	102	78	165	171	372	75	112	9741	105.3	5011.4	10.43	8.7		26.5	6.3	307.78	Off	8.14	6.2
14748	101	77	165	171	370	75	112	9737	107.9	5011.4	10.4	8.7		26.5	6.3	307.78	Off	8.14	6.2
14808	101	76	165	171	369	75	112	9713	106.6	5011	10.34	8.66		26.5	6.3	307.78	Off	8.14	6.2
14868	101	76	164	171	367	76	112	9676	109.0	5013.4	10.38	8.66		26.5	6.2	354.07	Off	8.14	6.1
14928	100	75	164	170	366	75	111	9591	110.2	5012.2	10.5	8.57		26.5	6.2	303.49	Off	8.14	6.1
14988	100	75	164	170	365	75	111	9570	111.2	5012.2	10.56	8.54		26.5	6.2	303.49	Off	8.14	6.1
15048	99	74	164	170	364	75	111	9534	109.2	5009.8	10.61	8.5		26.5	6.2	303.49	Off	8.14	6.1
15108	99	75	164	170	364	75	110	9530	108.1	5012.2	10.68	8.49		27	6.2	283.25	Off	8.14	6.1
15164	99	75	164	170	362	74	110	9652	100.6	5010.2	10.81	8.56		26.8	6.2	303.49	Off	8.14	6.1
15224	99	76	164	170	361	74	110	9810	101.7	5011.8	10.48	8.67		26.5	6.2	303.49	Off	8.14	6.1
15284	99	76	164	170	360	74	110	9908	104.7	5008.1	10.39	8.76		26.5	6.2	303.49	Off	8.14	6.1
15344	99	76	163	170	358	75	109	9884	103.0	5010.2	10.44	8.72		26.5	6.2	354.19	Off	8.15	6.1
15404	98	76	163	170	358	75	110	9888	104.5	5012.2	10.43	8.74		26.5	6.2	354.19	Off	8.15	6.1
15464	98	76	164	169	358	75	110	9904	99.8	5011.4	10.41	8.77		26.5	6.2	252.91	Off	8.14	6.1
15524	98	77	163	170	354	75	109	10002	100.9	5012.2	10.29	8.88		26.5	6.2	354.19	Off	8.15	6.1
15584	98	77	163	169	353	75	109	9961	99.3	5010.2	10.35	8.82		26.5	6.2	303.59	Off	8.15	6.1
15644	98	77	163	170	352	76	109	9965	103.7	5011.4	10.34	8.85		26.5	6.2	354.19	Off	8.15	6.1

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FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
15704	98	76	163	169	353	76	109	9957	107.9	5011	10.36	8.84		26.5	6.2	303.59	Off	8.15	6.1
15764	97	75	163	169	355	75	109	9880	110.0	5011.4	10.43	6.79		26.5	6.2	303.59	Off	8.15	6.1
15824	97	74	162	169	355	75	109	9717	105.1	5011	10.57	8.67		26.5	6.2	354.31	Off	8.15	6.1
15884	97	74	162	169	354	75	108	9790	107.1	5012.8	10.58	6.66		26.5	6.2	354.31	Off	8.15	6.1
15944	96	75	163	169	353	75	108	9847	101.1	5011.4	10.65	8.61		26.5	6.2	303.59	Off	8.15	6.1
16004	96	75	162	169	350	75	107	10030	102.2	5011.4	10.57	8.68		26.5	6.2	354.31	Off	8.15	6.1
16064	96	75	162	169	348	75	107	10152	102.1	5011	10.52	8.72		26.5	6.2	354.31	Off	8.15	6.1
16124	96	75	162	168	347	75	107	10254	105.1	5013.4	10.45	8.76		26.5	6.2	303.70	Off	8.15	6.1
16184	96	76	162	168	346	75	107	10319	98.5	5009.4	10.48	8.74		26.5	6.2	303.70	Off	8.15	6.1
16244	96	77	162	168	344	75	107	10494	101.4	5013	10.38	8.62		26.5	6.2	303.70	Off	8.15	6.1
16304	96	76	162	168	342	75	107	10571	97.7	5012.2	10.33	8.86		26.5	6.2	303.70	Off	8.15	6.1
16364	96	77	162	168	341	75	107	10841	103.8	5011.4	10.3	8.89		26.5	6.2	303.70	Off	8.15	6.1
16424	96	77	162	168	339	75	107	10845	103.0	5011.4	10.34	8.85		26.5	6.2	303.70	Off	8.15	6.1
16484	96	76	162	168	337	76	107	10628	106.8	5010.2	10.38	8.81		26.5	6.2	283.45	Off	8.15	6.1
16540	96	75	162	166	337	75	107	10478	108.1	5009.4	10.49	8.68		26.5	6.2	303.70	Off	8.15	6.1
16600	95	74	161	168	336	75	107	10449	103.4	5012.2	10.64	8.6		26.5	6.2	354.43	Off	8.15	6.1
16660	95	73	162	168	336	75	106	10555	109.9	5012.2	10.59	8.67		26.5	6.2	303.70	Off	8.15	6.1
16720	95	74	161	168	335	74	106	10470	111.3	5011	10.6	8.54		26.5	6.2	354.43	Off	8.15	6.1
16780	94	75	161	168	333	74	106	10555	101.2	5010.6	10.83	8.54		26.5	6.2	354.43	Off	8.15	6.1
16840	94	75	161	167	332	74	106	10759	100.4	5013.4	10.7	8.63		26.5	6.2	303.80	Off	8.15	6.1
16900	94	76	161	167	331	74	106	10921	104.0	5009.4	10.64	8.68		26.5	6.2	303.80	Off	8.15	6.1
16960	94	77	161	167	329	74	106	11007	104.3	5012.6	10.65	8.67		26.5	6.2	303.80	Off	8.15	6.1
17020	94	76	161	167	327	74	106	11084	101.9	5010.2	10.66	8.68		26	6.2	303.80	Off	8.15	6.1
17080	94	77	161	167	325	75	106	11214	102.4	5012.2	10.56	8.74		26	6.2	303.80	Off	8.15	6.1
17140	94	77	161	167	324	75	106	11243	102.9	5013	10.56	8.73		26	6.2	303.80	Off	8.15	6.1
17200	94	76	161	167	322	75	106	11340	103.2	5009	10.54	6.76		26	6.2	303.80	Off	8.15	6.1
17260	94	77	161	166	320	75	106	11405	105.3	5013	10.54	8.76		26	6.2	253.17	Off	8.15	6.1
17320	94	77	161	166	320	75	106	11414	109.0	5011	10.56	6.76		26	6.2	253.17	Off	8.15	6.1
17380	94	77	160	167	320	75	106	11316	109.5	5010.6	10.68	8.65		26	6.2	354.55	Off	8.16	6.1
17440	94	75	160	166	320	75	105	11247	108.9	5010.6	10.79	8.56		26	6.2	303.90	Off	8.16	6.1
17500	94	74	160	166	319	75	105	11320	107.6	5011.4	10.76	8.6		26	6.2	303.90	Off	8.16	6.1
17580	94	74	160	166	320	75	105	11344	116.2	5012.6	10.8	8.57		26	6.2	303.90	Off	8.16	6.1
17620	93	74	160	166	319	74	105	11324	114.4	5010.6	10.91	6.49		26.5	6.2	303.90	Off	8.16	6.1
17680	93	74	160	166	317	74	104	11483	106.3	5010.2	10.87	8.56		26.5	6.2	303.90	Off	8.16	6.1
17740	93	75	160	168	317	74	105	11658	106.4	5011.4	10.78	8.63		26	6.2	303.90	Off	8.16	6.1
17800	93	76	160	166	316	75	105	11804	113.0	5009.4	10.73	8.68		26	6.2	303.90	Off	8.16	6.1
17860	93	76	160	166	315	75	105	11629	108.6	5011.4	10.75	8.87		26	6.2	283.64	Off	8.16	6.1
17916	93	76	159	168	314	75	105	11959	110.2	5013.8	10.69	8.72		26	6.2	354.67	Off	8.16	6.1
17976	95	77	159	165	313	75	106	12032	131.5	5011.4	10.69	6.73		26	6.2	304.00	Off	8.16	6.1
18038	102	79	160	165	317	75	115	11491	705.1	5010.6	10.95	8.47		26	6.2	253.25	On	8.16	6.1
18096	107	78	159	165	337	75	124	8004	516.0	5011	14.62	5.55		26	6.2	304.00	On	8.16	6.1
18156	113	78	159	165	371	75	131	9298	671.2	5011.8	15.32	5.23		26	6.2	304.00	On	8.16	6.1
18216	117	77	159	165	406	75	136	11153	800.6	5010.6	14.81	5.74		26	6.2	304.00	On	8.16	6.1
18276	120	77	159	165	437	74	141	12390	883.0	5010.2	14.28	6.25		26	6.2	304.00	On	8.16	6.1
18336	123	77	159	165	464	74	145	13359	950.2	5010.6	13.81	6.67		26	6.2	304.00	On	8.16	6.1
18396	125	78	159	165	484	74	148	13762	980.6	5011.4	13.36	7.09		25.5	6.2	304.00	On	8.16	6.1
18456	126	79	159	165	500	74	151	12850	896.0	5013	13.23	7.21		25.5	6.2	304.00	On	8.16	6.1
18516	129	80	159	165	516	74	153	12862	899.7	5011	13.03	7.4		25.5	6.2	304.00	On	8.16	6.1
18576	131	79	159	165	535	74	155	13261	923.5	5010.2	12.76	7.64		25	6.2	304.00	On	8.16	6.1
18636	132	80	159	165	552	74	157	13814	964.8	5009.8	12.46	7.9		25	6.2	304.00	On	8.16	6.1
18696	134	81	159	165	566	75	160	14225	990.4	5012.2	12.2	8.13		25	6.2	304.00	On	8.16	6.1
18756	135	81	159	165	580	75	162	14966	1048.2	5011.4	11.88	8.44		25	6.2	304.00	On	8.16	6.1
18816	137	81	159	165	593	75	164	15304	1076.8	5011.8	11.55	8.72		25	6.2	304.00	On	8.16	6.1
18876	139	81	159	165	605	75	167	15731	1108.9	5011	11.23	8.99		24.5	6.2	304.00	On	8.16	6.1
18936	141	82	159	165	617	75	169	16069	1133.6	5010.6	10.92	9.28		24.5	6.2	304.00	On	8.16	6.1
18996	142	82	159	165	635	76	171	16272	1153.0	5011	10.76	9.41		24.5	6.2	304.00	On	8.16	6.1
19056	145	82	160	166	648	76	173	15092	1122.2	5011.4	10.46	9.69		24	6.2	303.90	On	8.16	6.1
19116	147	81	160	165	655	76	174	14628	1034.0	5012.2	10.37	9.76		24	6.2	253.25	On	8.16	6.1
19176	148	80	160	166	661	75	175	14990	1062.7	5009.6	10.42	9.69		24	6.2	303.90	On	8.16	6.1
19236	149	80	160	166	666	75	176	15226	1092.6	5009.4	10.41	9.71		24	6.2	283.64	On	8.16	6.1
19292	151	79	160	166	671	75	177	15393	1104.5	5010.2	10.43	9.71		24	6.2	303.90	On	8.16	6.1
19352	151	80	160	167	676	74	177	15332	1100.7	5011	10.39	9.79		24	6.2	354.55	On	8.16	6.1
19412	152	80	160	167	678	74	179	15511	1114.4	5011	10.26	9.9		23.5	6.2	354.55	On	8.16	6.1
19472	153	81	161	167	681	74	180	15686	1130.4	5010.2	10.17	9.99		23.5	6.2	303.80	On	8.15	6.1
19532	153	81	161	167	679	74	181	15877	1139.0	5010.2	10.08	10.08		23.5	6.2	303.80	On	8.15	6.1
19592	153	82	161	168	677	74	181	16069	1151.7	5011.4	10.19	9.95		23	6.2	354.43	On	8.15	6.1
19652	153	83	161	167	678	75	182	16309	1167.6	5011	10.12	10.01		23	6.2	303.80	On	8.15	6.1
19712	155	83	161	168	679	75	183	16459	1180.3	5011	9.99	10.09		22.9	6.2	354.43	On	8.15	6.1
19772	157	82	162	168	680	75	185	16419	1198.9	5011.8	9.95	10.13		22.5	6.2	303.70	On	8.15	6.1
19832	180	82	162	168	679	75	186	15780	1161.1	5011	9.71	10.34		22.5	6.2	303.70	On	8.15	6.1
19892	181	82	162	168	680	75	187	15361	1117.5	5009.8	9.71	10.33		22.5	6.2	303.70	On	8.15	6.1
19952	162	81	162	168	684	75	188	15230	1116.5	5010.2	9.65	10.41		22.2	6.2	303.70	On	8.15	6.1

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FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dlu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
20012	163	80	162	168	686	75	189	15238	1110.0	5011.4	9.65	10.42		22	6.2	303.70	On	8.15	6.1
20072	163	80	162	169	691	74	189	14665	1100.4	5012.8	9.55	10.58		22	6.2	354.31	On	8.15	6.1
20132	163	80	163	169	691	74	189	14437	1034.2	5011	9.48	10.86		22	6.2	303.59	On	8.15	6.1
20192	162	81	163	169	691	74	189	15039	1055.7	5011.4	9.7	10.4		21.5	6.2	303.59	On	8.15	6.1
20252	162	82	163	169	688	75	189	16056	1131.7	5012.2	9.97	10.13		21.5	6.2	303.59	On	8.15	6.1
20312	162	82	163	169	684	75	188	16642	1187.8	5011	10.06	10		21	6.2	303.59	On	8.15	6.1
20372	161	82	164	170	681	75	188	17171	1229.8	5011.4	10.16	9.9		21	6.2	303.49	On	8.14	6.1
20432	161	82	163	170	680	75	188	17346	1243.2	5011.8	10.23	9.84		21	6.2	354.19	On	8.15	6.1
20492	160	82	164	170	679	75	188	17566	1267.9	5010.6	10.34	9.77		20.5	6.2	303.49	On	8.14	6.1
20552	161	82	164	170	682	75	189	17668	1269.9	5011.8	10.28	9.8		20.5	6.2	303.49	On	8.14	6.1
20612	161	83	164	170	678	75	189	17525	1277.2	5008.1	10.23	9.86		20.5	6.2	283.25	On	8.14	6.1
20668	161	82	164	170	683	75	189	17114	1246.4	5011	10.4	9.67		20	6.2	303.49	On	8.14	6.1
20728	161	82	164	171	687	75	189	17310	1252.3	5011.8	10.26	9.83		20	6.2	354.07	On	8.14	6.1
20788	161	81	164	170	687	75	189	17167	1250.5	5010.8	10.19	9.83		20	6.2	303.49	On	8.14	6.1
20848	159	80	164	171	675	75	188	16724	1206.1	5010.6	10.77	9.22		20	6.2	354.07	On	8.14	6.1
20908	158	79	164	171	661	74	187	17277	1235.0	5011	11.11	8.95		20	6.2	354.07	On	8.14	6.1
20968	158	79	164	171	651	74	185	17753	1266.4	5010.2	11.35	8.74		19.5	6.2	354.07	On	8.14	6.1
21028	157	80	164	171	645	74	184	18075	1301.8	5009.8	11.33	8.8		19.5	6.2	354.07	On	8.14	6.1
21088	155	80	164	171	641	74	184	18624	1330.2	5011.4	11.37	8.71		19.5	6.2	354.07	On	8.14	6.1
21148	155	81	165	171	637	74	183	18595	1332.5	5009.8	11.46	8.62		19	6.2	303.38	On	8.14	6.1
21208	154	81	164	171	635	74	182	18779	1353.0	5010.6	11.4	8.66		19	6.2	354.07	On	8.14	6.1
21268	154	81	165	171	635	74	181	18697	1334.8	5009.8	11.42	8.63		19	6.2	303.38	On	8.14	6.1
21328	153	81	165	171	635	74	181	18632	1328.3	5010.2	11.38	8.62		18.5	6.2	303.38	On	8.14	6.1
21388	154	81	165	171	638	74	181	18665	1335.3	5011	11.26	8.7		18.5	6.2	303.38	On	8.14	6.1
21448	154	81	165	172	640	74	181	18608	1329.6	5011.4	11.18	8.77		18.5	6.2	353.94	On	8.14	6.1
21508	154	82	165	171	640	74	181	18453	1318.2	5011.4	11.08	8.81		18.1	6.2	303.38	On	8.14	6.1
21568	154	82	165	171	640	74	181	18241	1300.8	5010.6	11.06	8.81		18	6.2	303.38	On	8.14	6.1
21628	154	82	165	172	637	75	182	18038	1287.9	5012.2	11.06	8.8		18	6.2	353.94	On	8.14	6.1
21688	154	82	165	172	638	75	182	18132	1294.1	5010.2	11.06	8.75		18	6.2	353.94	On	8.14	6.1
21748	154	82	165	172	636	75	182	18034	1287.9	5010.2	11.22	8.78		17.5	6.2	353.94	On	8.14	6.1
21808	155	81	165	172	632	75	182	17891	1280.4	5012.2	11.23	8.78		17.5	6.2	353.94	On	8.14	6.1
21868	155	80	166	172	632	75	182	17753	1277.3	5011.8	11.32	8.67		17.5	6.2	303.28	On	8.14	6.1
21928	155	79	165	172	630	75	182	17639	1268.9	5011.4	11.29	8.66		17.5	6.2	353.94	On	8.14	6.1
21988	155	79	165	172	632	74	182	17517	1260.7	5009.8	11.25	8.67		17.5	6.2	330.35	On	8.14	6.1
22044	155	79	165	172	632	74	182	17460	1253.1	5010.6	11.17	8.7		17.5	6.2	353.94	On	8.14	6.1
22104	154	79	165	172	633	74	182	17334	1246.4	5012.6	11.13	8.74		17.5	6.2	353.94	On	8.14	6.1
22164	154	79	166	172	632	74	182	17147	1231.9	5012.6	11.09	8.74		17	6.2	303.28	On	8.14	6.1
22224	154	80	166	172	632	74	182	16935	1213.1	5011.4	11.07	8.75		17	6.2	303.28	On	8.14	6.1
22284	153	80	166	172	632	74	182	16768	1199.2	5011.4	11.03	8.78		16.5	6.2	303.28	On	8.14	6.1
22344	153	80	166	173	634	74	182	16581	1183.9	5010.6	11.02	8.75		16.5	6.2	353.82	On	8.14	6.1
22404	152	81	166	173	635	74	183	16541	1175.0	5012.2	11.06	8.74		16.5	6.2	353.82	On	8.14	6.1
22464	152	81	166	173	635	74	183	16390	1173.2	5011.4	11.07	8.73		16.5	6.2	353.82	On	8.14	6.1
22524	152	81	166	173	634	74	182	16158	1157.1	5009.4	11.06	8.72		16	6.2	353.82	On	8.14	6.1
22584	152	81	166	173	634	75	183	16052	1147.0	5010.6	11.02	8.78		16.5	6.2	353.82	On	8.14	6.1
22644	152	81	166	173	633	75	183	15995	1138.5	5011.8	11.02	8.79		16	6.2	353.82	On	8.14	6.1
22704	152	81	167	173	633	75	183	15780	1126.3	5010.2	11.02	8.8		16	6.2	303.17	On	8.14	6.1
22764	152	81	167	173	635	75	184	15556	1109.9	5011.8	11.01	8.8		16	6.2	303.17	On	8.14	6.1
22824	152	82	167	173	632	75	184	15328	1093.8	5009.8	11.01	8.81		15.5	6.2	303.17	On	8.14	6.1
22884	152	82	167	174	633	75	184	15202	1087.1	5011.8	11.05	8.76		15.5	6.2	353.70	On	8.14	6.1
22944	152	82	167	174	633	75	183	15112	1080.2	5013	11.08	8.75		15.5	6.2	353.70	On	8.14	6.1
23004	153	82	167	173	633	75	183	15047	1078.1	5011.8	11.07	8.75		15.5	6.2	303.17	On	8.14	6.1
23064	152	82	167	174	632	76	184	14893	1070.1	5010.2	11.06	8.77		15.5	6.2	353.70	On	8.14	6.1
23124	153	82	167	174	633	76	184	14811	1061.4	5010.2	11.04	8.79		15	6.2	353.70	On	8.14	6.1
23184	153	81	168	174	633	76	184	14714	1055.5	5009.8	11.02	8.81		15	6.2	303.06	On	8.13	6.1
23244	154	80	166	174	633	75	183	14624	1048.0	5011.4	11.03	8.81		15	6.2	303.06	On	8.13	6.1
23304	154	79	167	174	630	75	183	14526	1042.3	5012.6	11.05	8.77		15	6.2	353.70	On	8.14	6.1
23364	154	79	166	174	629	75	182	14559	1043.9	5012.2	11.09	8.75		15	6.2	282.86	On	8.13	6.1
23420	155	79	168	175	627	74	182	14661	1052.1	5010.6	11.09	8.76		15	6.2	353.57	On	8.13	6.1
23480	154	80	168	175	624	74	182	14783	1059.2	5012.2	11.12	8.73		15	6.2	353.57	On	8.13	6.1
23540	154	80	166	175	621	74	182	14766	1058.4	5011	11.16	8.7		14.5	6.2	353.57	On	8.13	6.1
23600	154	81	168	175	619	74	182	14746	1053.1	5010.2	11.16	8.69		14.5	6.2	353.57	On	8.13	6.1
23660	153	81	168	175	617	74	183	14693	1049.6	5012.2	11.17	8.69		14.5	6.2	353.57	On	8.13	6.1
23720	153	81	168	175	617	75	183	14632	1047.4	5010.2	11.17	8.69		14.5	6.2	353.57	On	8.13	6.1
23780	152	81	166	175	616	75	184	14608	1047.7	5012.6	11.2	8.66		14	6.2	353.57	On	8.13	6.1
23840	153	81	169	175	615	75	184	14624	1042.6	5009.8	11.19	8.67		14	6.2	302.95	On	8.13	6.1
23900	151	81	168	175	620	75	184	14657	1043.0	5013.4	11.24	8.6		14	6.2	353.57	On	8.13	6.1
23960	141	78	169	175	616	75	174	13652	765.6	5011.8	11.72	8.09		14	6.2	302.95	Off	8.13	6.1
24020	131	77	169	175	585	75	161	14290	220.9	5010.6	12.16	7.86		14	6.2	302.95	Off	8.13	6.1
24080	124	76	168	175	556	75	152	20125	293.5	5011.8	10.3	9.44		14	6.2	353.57	Off	8.13	6.1
24140	120	75	169	175	532	75	144	22367	333.7	5013	9.57	9.96		14	6.2	302.95	Off	8.13	6.1
24200	116	74	168	175	513	75	138	22115	329.3	5012.2	9.53	9.97		14	6.2	353.57	Off	8.13	6.1
24260	114	73	168	175	498	73	134	21086	323.4	5013.8	9.64	9.83		14	6.2	353.57	Off	8.13	6.1

D31

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
24320	112	73	169	175	485	74	131	19739	291.5	5013.4	9.81	9.63		14	6.2	302.95	Off	6.13	6.1
24380	111	73	168	175	474	74	128	18787	270.0	5009	9.85	9.55		14	6.2	353.57	Off	6.13	6.1
24440	109	72	168	175	464	73	127	17788	254.7	5011	9.92	9.44		14.5	6.2	353.57	Off	6.13	6.1
24500	108	72	168	176	455	73	125	16903	234.9	5011.6	9.99	9.31		14.5	6.2	404.08	Off	6.13	6.1
24560	107	72	168	175	446	72	123	16052	223.6	5013	10.07	9.17		14.5	6.2	353.57	Off	6.13	6.1
24620	105	71	168	175	439	72	122	15405	206.7	5011.8	10.11	9.09		14.5	6.2	353.57	Off	6.13	6.1
24680	104	71	168	175	432	71	120	14864	199.7	5010.6	10.11	9.05		14.5	6.2	353.57	Off	6.13	6.1
24740	104	71	168	175	427	71	119	14368	190.8	5011	10.12	8.99		14.5	6.2	330.00	Off	6.13	6.1
24796	103	71	168	175	421	71	118	13884	179.2	5010.2	10.18	8.91		14.5	6.2	353.57	Off	6.13	6.1
24856	102	70	168	175	416	70	117	13477	172.5	5011.6	10.24	8.83		14.5	6.2	353.57	Off	6.13	6.1
24916	102	71	168	175	411	70	116	13163	169.1	5010.2	10.23	8.8		14.5	6.2	353.57	Off	6.13	6.1
24976	100	70	168	175	407	70	115	12789	161.5	5011.4	10.3	8.72		14.5	6.2	353.57	Off	6.13	6.1
25036	100	70	168	175	402	70	114	12529	155.6	5012.6	10.33	8.67		14.5	6.2	353.57	Off	6.13	6.1
25096	99	70	168	175	397	69	113	12284	151.5	5013	10.35	8.64		14.5	6.2	353.57	Off	6.13	6.1
25156	99	70	168	175	393	70	113	12081	146.0	5012.6	10.4	8.58		14.5	6.2	353.57	Off	6.13	6.1
25216	98	70	167	175	389	69	112	11886	142.6	5011.6	10.41	8.54		14.5	6.2	404.22	Off	6.14	6.1
25276	97	70	167	174	385	69	111	11759	136.7	5011.8	10.41	8.52		14.5	6.2	353.70	Off	6.14	6.1
25336	96	70	167	174	382	69	111	11576	138.0	5009.4	10.46	8.45		15	6.2	353.70	Off	6.14	6.1
25396	96	71	167	174	379	69	110	11458	133.6	5010.6	10.47	8.43		15	6.2	353.70	Off	6.14	6.1
25456	95	72	167	174	375	69	109	11308	129.2	5012.2	10.51	8.38		15	6.2	353.70	Off	6.14	6.1
25516	95	72	167	174	373	69	109	11214	126.3	5011.8	10.49	8.38		15	6.2	353.70	Off	6.14	6.1
25576	94	72	167	174	370	69	108	11084	125.3	5012.2	10.55	8.33		14.7	6.2	353.70	Off	6.14	6.1
25636	94	72	166	174	368	69	106	11100	124.2	5010.2	10.5	8.36		14.5	6.2	404.37	Off	6.14	6.1
25696	93	73	166	174	365	69	107	11027	121.7	5010.2	10.49	8.35		14.6	6.2	404.37	Off	6.14	6.1
25756	93	73	166	174	363	69	106	11019	121.1	5011.4	10.47	8.38		14.5	6.2	404.37	Off	6.14	6.1
25816	93	73	166	173	361	69	106	11039	117.2	5012.2	10.39	8.43		14.5	6.2	353.82	Off	6.14	6.1
25876	92	73	166	173	359	69	106	10933	120.1	5012.2	10.45	8.37		14.5	6.2	353.82	Off	6.14	6.1
25936	91	73	166	173	357	69	106	10897	114.3	5010.2	10.45	8.36		14.8	6.2	353.82	Off	6.14	6.1
25996	91	73	166	173	355	70	105	10848	115.2	5011.6	10.47	8.34		14.5	6.2	353.82	Off	6.14	6.1
26056	90	71	166	173	354	70	106	10783	114.7	5012.2	10.51	8.31		14.5	6.2	353.82	Off	6.14	6.1
26116	90	71	166	173	353	70	106	10885	112.6	5011.6	10.43	8.37		15	6.2	330.23	Off	6.14	6.1
26172	90	71	166	173	351	70	105	10868	114.7	5010.2	10.42	8.37		15	6.2	353.82	Off	6.14	6.1
26232	90	70	165	173	349	70	105	10832	112.6	5013	10.42	8.37		15	6.2	404.51	Off	6.14	6.1
26292	90	70	165	172	348	70	105	10811	111.5	5011.8	10.42	8.36		15	6.2	353.94	Off	6.14	6.1
26352	90	70	165	172	347	70	104	10775	111.3	5011.4	10.46	8.34		15	6.2	353.94	Off	6.14	6.1
26412	90	70	165	172	346	69	104	10783	111.0	5010.6	10.47	8.34		15	6.2	353.94	Off	6.14	6.1
26472	89	69	165	172	345	69	104	10759	111.0	5012.6	10.45	8.34		15	6.2	353.94	Off	6.14	6.1
26532	89	71	165	172	344	69	103	10746	108.1	5011.4	10.42	8.33		15	6.2	353.94	Off	6.14	6.1
26592	89	72	165	172	343	69	104	10738	102.4	5011.6	10.43	8.33		15	6.2	353.94	Off	6.14	6.1
26652	89	74	165	172	341	70	103	10921	105.0	5011.4	10.25	8.47		15	6.2	353.94	Off	6.14	6.1
26712	89	75	165	172	339	70	104	10929	97.5	5010.6	10.22	8.5		14.5	6.2	353.94	Off	6.14	6.1
26772	89	76	165	172	337	70	104	11003	96.3	5010.6	10.13	8.57		14.5	6.2	353.94	Off	6.14	6.1
26832	90	76	165	171	336	70	104	11088	96.5	5011.4	10.04	8.65		14.5	6.2	303.38	Off	6.14	6.1
26892	90	75	165	171	334	70	104	11088	93.8	5011.6	10.02	8.65		14.5	6.2	303.38	Off	6.14	6.1
26952	90	75	165	171	332	71	105	11019	96.5	5011.6	9.98	8.66		14.5	6.2	303.38	Off	6.14	6.1
27012	90	75	165	171	331	71	105	10860	99.6	5013.4	10.09	8.55		14.5	6.2	303.38	Off	6.14	6.1
27072	90	75	165	171	329	72	105	10795	96.0	5010.2	10.15	8.49		14.5	6.2	303.38	Off	6.14	6.1
27132	90	75	164	171	327	72	105	10714	93.9	5012.2	10.17	8.46		14.5	6.2	354.07	Off	6.14	6.1
27192	90	75	164	171	326	72	105	10628	95.4	5011.6	10.24	8.39		14	6.2	354.07	Off	6.14	6.1
27252	90	75	164	171	325	72	105	10579	94.9	5011	10.31	8.33		14.5	6.2	354.07	Off	6.14	6.1
27312	90	75	164	171	323	72	105	10559	93.6	5012.2	10.3	8.33		14	6.2	354.07	Off	6.14	6.1
27372	90	75	164	171	323	73	105	10478	94.4	5013	10.37	8.28		14	6.2	354.07	Off	6.14	6.1
27432	90	75	164	170	321	73	105	10498	92.8	5009.6	10.37	8.26		14	6.2	303.49	Off	6.14	6.1
27492	90	75	164	170	320	73	105	10510	93.1	5011	10.35	8.29		14	6.2	283.25	Off	6.14	6.1
27546	90	75	164	170	319	73	105	10486	91.3	5010.6	10.39	8.24		14	6.2	303.49	Off	6.14	6.1
27606	90	75	164	170	317	73	105	10470	90.8	5011.4	10.41	8.26		14	6.2	303.49	Off	6.14	6.1
27666	90	75	163	170	316	73	106	10429	90.5	5010.6	10.47	8.2		14	6.2	354.19	Off	6.15	6.1
27726	90	75	164	170	315	73	105	10405	91.1	5011.8	10.51	8.16		14	6.2	303.49	Off	6.14	6.1
27786	90	75	163	169	313	74	105	10409	88.5	5010.6	10.57	8.14		14	6.2	303.59	Off	6.15	6.1
27846	90	75	163	169	311	74	105	10421	89.0	5012.2	10.53	8.16		14	6.2	303.59	Off	6.15	6.1
27906	90	74	163	169	310	74	105	10429	92.3	5009.8	10.56	8.14		14	6.2	303.59	Off	6.15	6.1
27966	90	73	163	169	309	74	105	10295	97.8	5013	10.73	8.01		14	6.2	303.59	Off	6.15	6.1
28026	90	73	163	169	308	73	104	10132	99.3	5011	10.92	7.87		14	6.2	303.59	Off	6.15	6.1
28086	90	72	162	169	306	73	104	10046	96.7	5011.4	11.05	7.78		14	6.2	354.31	Off	6.15	6.1
28146	89	72	162	169	306	73	104	9989	98.3	5010.6	11.14	7.72		14	6.2	354.31	Off	6.15	6.1
28206	89	73	162	169	306	73	103	10051	93.9	5011.6	11.18	7.7		14	6.2	354.31	Off	6.15	6.1
28266	89	73	162	169	305	72	103	10177	90.0	5011	11.13	7.76		14	6.2	354.31	Off	6.15	6.1
28326	89	74	162	169	305	72	103	10360	88.7	5011.8	11.07	7.83		14	6.2	354.31	Off	6.15	6.1
28386	88	74	162	169	304	73	103	10466	90.2	5012.6	11.02	7.89		14	6.2	354.31	Off	6.15	6.1
28446	88	75	162	168	303	73	104	10653	92.9	5011.8	10.93	7.97		14	6.2	303.70	Off	6.15	6.1
28506	88	75	162	168	303	73	104	10714	91.5	5011	10.88	8		14	6.2	303.70	Off	6.15	6.1
28566	88	74	162	168	302	73	103	10791	87.6	5008.5	10.84	8.06		14	6.2	303.70	Off	6.15	6.1

D32

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
28628	88	75	162	168	302	73	103	10889	90.5	5011	10.8	8.09		14	6.2	303.70	Off	8.15	6.1
28688	88	75	162	168	300	73	104	10929	90.7	5012.6	10.77	8.12		14	6.2	303.70	Off	8.15	6.1
28748	88	75	162	168	300	73	103	10970	91.5	5011.8	10.75	8.14		14	6.2	303.70	Off	8.15	6.1
28808	88	74	161	168	299	73	104	10962	95.1	5013.4	10.77	8.13		14	6.2	354.43	Off	8.15	6.1
28868	88	73	161	168	298	73	104	10881	102.1	5013	10.85	8.07		14	6.2	330.80	Off	8.15	6.1
28924	88	72	161	167	297	73	104	10673	100.9	5011.8	11.06	7.92		14	8.2	303.80	Off	8.15	6.1
28984	88	72	161	167	296	73	103	10498	101.6	5011.4	11.23	7.77		14	6.2	303.80	Off	8.15	6.1
29044	88	72	160	167	296	72	103	10490	103.0	5009.8	11.29	7.74		14	8.2	354.55	Off	8.16	6.1
29104	88	72	161	167	295	72	102	10490	100.7	5011	11.37	7.71		14	6.2	303.80	Off	8.15	6.1
29164	87	73	161	167	295	72	102	10518	90.3	5010.6	11.4	7.69		14	6.2	303.80	Off	8.15	6.1
29224	87	74	160	167	295	72	102	10669	90.8	5011.8	11.34	7.76		14	6.2	354.55	Off	8.16	6.1
29284	87	74	160	167	295	73	102	10877	92.0	5011.8	11.23	7.86		14	6.2	354.55	Off	8.16	6.1
29344	87	75	160	167	294	72	102	11084	92.1	5011.8	11.1	7.97		14	6.2	354.55	Off	8.16	6.1
29404	87	74	160	167	294	73	102	11210	91.6	5011.8	11	8.05		13.5	6.2	354.55	Off	8.16	6.1
29464	87	74	160	166	293	73	102	11332	90.5	5008.5	10.93	8.13		13.5	6.2	303.90	Off	8.16	6.1
29524	87	74	160	166	293	73	102	11340	92.4	5010.8	10.92	8.13		13.5	6.2	303.90	Off	8.16	6.1
29584	88	74	160	166	292	73	102	11377	92.6	5011.4	10.9	8.15		13.5	6.2	303.90	Off	8.16	6.1
29644	87	74	160	166	291	73	102	11357	92.0	5013	10.92	8.14		13.5	6.2	303.90	Off	8.16	6.1
29704	87	73	160	166	290	73	102	11300	93.1	5011.4	10.97	8.1		13.5	6.2	303.90	Off	8.16	6.1
29764	87	73	160	166	289	73	103	11283	101.1	5009.4	10.97	8.1		13.5	6.2	303.90	Off	8.16	6.1
29824	87	72	159	166	289	73	102	11153	100.7	5011	11.08	8.02		13.9	6.2	354.67	Off	8.16	6.1
29884	87	71	159	166	288	72	102	11011	101.6	5010.6	11.21	7.93		14	6.2	354.67	Off	8.16	6.1
29944	93	72	159	166	275	72	107	11178	375.5	5013.8	11.13	8.02		14	6.2	354.67	Off	8.16	6.1
30004	101	74	159	165	260	71	117	8142	488.6	5010.2	13.34	6.08		13.7	6.2	304.00	On	8.16	6.1
30064	107	74	159	165	257	72	125	6299	421.5	5013.8	18.35	3.98		13.5	6.2	304.00	On	8.16	6.1
30124	111	75	159	165	264	72	131	7739	547.4	5010.6	16.56	4.02		13.5	6.2	304.00	On	8.16	6.1
30184	115	75	159	165	276	72	136	9041	635.9	5011.4	18.22	4.35		13.5	6.2	304.00	On	8.16	6.1
30244	117	76	159	165	293	72	140	9904	695.5	5011	15.85	4.71		13.5	6.2	283.74	On	8.16	6.1
30300	119	76	159	165	310	72	142	10641	750.8	5010.2	15.47	5.06		13.5	6.2	304.00	On	8.16	6.1
30360	121	76	159	165	329	72	145	11320	796.7	5009.4	15.09	5.41		13.1	6.2	304.00	On	8.16	6.1
30420	123	77	158	165	348	73	147	12024	848.5	5011.4	14.71	5.76		13	6.2	354.79	On	8.16	6.1
30480	125	77	158	165	364	73	150	12622	885.7	5011.4	14.4	6.05		13	6.2	354.79	On	8.16	6.1
30540	126	77	159	165	381	73	152	12978	908.9	5011	14.11	6.3		13	6.2	304.00	On	8.16	6.1
30600	128	77	158	164	398	73	154	13188	923.3	5010.2	13.88	6.51		13	6.2	304.11	On	8.16	6.1
30660	129	77	158	164	414	73	156	13265	928.7	5010.8	13.66	6.7		13	6.2	304.11	On	8.16	6.1
30720	130	77	158	164	429	73	157	13306	930.8	5011.8	13.49	6.86		12.7	6.2	304.11	On	8.16	6.1
30780	131	77	158	164	444	73	159	13623	954.8	5012.2	13.23	7.09		12.5	6.2	304.11	On	8.16	6.1
30840	133	77	159	164	459	73	161	14160	995.1	5012.2	12.95	7.35		12.5	6.2	253.34	On	8.16	6.1
30900	134	77	158	165	473	73	163	14465	1015.0	5011	12.71	7.55		12.5	6.2	354.79	On	8.16	6.1
30960	136	78	158	165	486	73	164	14644	1027.3	5011	12.51	7.76		12.5	6.2	354.79	On	8.16	6.1
31020	137	78	158	165	497	73	165	14799	1042.2	5010.6	12.36	7.89		12.5	6.2	354.79	On	8.16	6.1
31080	138	77	158	165	507	73	166	14559	1025.4	5009.4	12.24	7.99		12.5	6.2	354.79	On	8.16	6.1
31140	139	76	158	165	517	73	167	14140	997.7	5012.2	12.18	8.06		12.5	6.2	354.79	On	8.16	6.1
31200	140	76	158	165	525	73	169	14071	998.2	5010.2	12.08	8.16		12	6.2	354.79	On	8.16	6.1
31260	141	75	159	165	531	73	169	14018	991.5	5011.8	11.95	8.29		12.5	6.2	304.00	On	8.16	6.1
31320	142	74	159	165	537	72	170	13961	983.6	5011.8	11.71	8.41		12.5	6.2	304.00	On	8.16	6.1
31380	142	75	159	165	540	72	171	13965	990.2	5010.2	11.59	8.41		12	6.2	304.00	On	8.16	6.1
31440	142	75	159	165	542	72	171	13993	988.0	5012.6	11.56	8.44		12	6.2	304.00	On	8.16	6.1
31500	143	76	159	165	543	72	172	13997	985.2	5009.8	11.57	8.44		12	6.2	304.00	On	8.16	6.1
31560	144	77	159	166	545	72	173	14063	995.8	5010.6	11.61	8.4		12	6.2	354.67	On	8.16	6.1
31620	145	77	159	166	548	72	173	13924	984.0	5010.2	11.57	8.43		11.5	6.2	331.03	On	8.16	6.1
31678	145	77	160	166	551	72	174	13847	976.4	5012.6	11.52	8.48		11.5	6.2	303.90	On	8.16	6.1
31738	146	77	160	166	555	72	174	13847	978.7	5012.2	11.47	8.49		11.5	6.2	303.90	On	8.16	6.1
31796	147	77	160	166	560	72	175	13802	977.5	5011	11.45	8.52		11.5	6.2	303.90	On	8.16	6.1
31856	147	78	160	166	564	72	176	13684	971.4	5010.8	11.43	8.53		11.5	6.2	303.90	On	8.16	6.1
31918	147	78	160	166	564	72	176	13485	959.8	5012.6	11.43	8.54		11.5	6.2	303.90	On	8.16	6.1
31976	148	78	160	167	567	72	177	13306	950.7	5013	11.41	8.56		11.5	6.2	354.55	On	8.16	6.1
32036	148	78	160	167	567	72	177	13265	940.3	5010.6	11.44	8.52		11.3	6.2	354.55	On	8.16	6.1
32096	149	78	160	167	566	72	178	13212	938.0	5011	11.49	8.46		11	6.2	354.55	On	8.16	6.1
32156	149	78	161	167	569	72	178	13180	936.7	5011.4	11.5	8.45		11	6.2	303.80	On	8.15	6.1
32216	149	78	161	167	572	72	178	13058	935.4	5010.6	11.53	8.41		11	6.2	303.80	On	8.15	6.1
32276	150	78	161	167	574	73	178	12683	912.4	5010.8	11.52	8.46		11	6.2	303.80	On	8.15	6.1
32336	151	78	161	167	575	73	179	12541	892.4	5011.4	11.54	8.43		11	6.2	303.80	On	8.15	6.1
32396	151	79	161	168	575	73	179	12496	889.2	5010.6	11.57	8.4		10.9	6.2	354.43	On	8.15	6.1
32456	151	79	161	167	573	73	179	12459	887.2	5009.4	11.82	8.37		10.5	6.2	303.80	On	8.15	6.1
32516	151	79	161	168	572	72	179	12423	885.3	5011	11.54	8.46		10.5	6.2	354.43	On	8.15	6.1
32576	151	79	162	168	571	73	179	12573	889.6	5011.8	11.81	8.39		10.5	6.2	303.70	On	8.15	6.1
32636	151	79	161	168	570	73	180	12577	899.7	5011.4	11.64	8.37		10.5	6.2	354.43	On	8.15	6.1
32696	151	79	162	168	569	73	180	12622	892.9	5012.6	11.66	8.35		10.5	6.2	303.70	On	8.15	6.1
32756	152	79	162	168	568	73	180	12781	906.4	5011	11.85	8.35		10.5	6.2	303.70	On	8.15	6.1
32816	152	79	162	168	567	73	180	12899	916.7	5010.2	11.63	8.38		10	6.2	303.70	On	8.15	6.1
32876	152	79	162	168	567	73	180	12935	925.8	5009.8	11.67	8.32		10	6.2	303.70	On	8.15	[illegible]

D33

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
32936	153	80	162	168	568	73	180	12964	927.6	5011	11.59	8.37		10	6.2	303.70	On	8.15	6.1
32996	153	80	162	169	569	74	180	12948	918.6	5009.8	11.57	8.38		10	6.2	330.69	On	8.15	6.1
33052	153	79	162	169	569	73	180	13066	925.0	5010.6	11.56	8.38		10	6.2	354.31	On	8.15	6.1
33112	153	79	162	169	570	73	181	13277	938.3	5011.8	11.53	8.41		9.5	6.2	354.31	On	8.15	6.1
33172	153	79	163	169	570	73	181	13281	947.9	5010.2	11.52	8.4		9.5	6.2	303.59	On	8.15	6.1
33232	153	79	162	169	568	73	181	13167	941.6	5011	11.53	8.4		9.5	6.2	354.31	On	8.15	6.1
33292	153	79	163	169	566	73	181	12944	926.1	5013	11.59	8.33		9.5	6.2	303.59	On	8.15	6.1
33352	153	78	163	169	565	73	181	12870	917.6	5012.2	11.65	8.29		9.5	6.2	303.59	On	8.15	6.1
33412	153	78	163	169	564	73	181	12830	917.0	5011.8	11.68	8.25		9.5	6.2	303.59	On	8.15	6.1
33472	153	77	163	170	564	73	181	12822	915.5	5011	11.71	8.23		9.5	6.2	354.19	On	8.15	6.1
33532	153	78	163	170	563	72	181	12765	917.0	5010.6	11.72	8.21		9.5	6.2	354.19	On	8.15	6.1
33592	153	78	163	170	561	72	181	12655	907.9	5011.4	11.74	8.19		9.5	6.2	354.19	On	8.15	6.1
33652	153	77	163	169	560	72	180	12732	906.6	5010.2	11.74	8.19		9.5	6.2	303.59	On	8.15	6.1
33712	153	77	163	170	559	72	180	12793	911.3	5009.8	11.73	8.19		9	6.2	354.19	On	8.15	6.1
33772	153	77	163	170	557	72	180	12797	912.4	5012.2	11.76	8.19		9	6.2	354.19	On	8.15	6.1
33832	152	77	163	170	555	72	180	12883	917.3	5010.2	11.76	8.19		9	6.2	354.19	On	8.15	6.1
33892	152	78	164	170	554	72	180	12992	923.7	5011.4	11.71	8.24		9	6.2	303.49	On	8.14	6.1
33952	152	79	164	170	554	72	181	13049	929.5	5011.8	11.67	8.29		9	6.2	303.49	On	8.14	6.1
34012	153	80	164	170	554	72	181	13058	932.1	5010.6	11.65	8.31		8.5	6.2	303.49	On	8.14	6.1
34072	154	81	164	170	554	72	182	13094	934.4	5012.8	11.59	8.37		8.5	6.2	303.49	On	8.14	6.1
34132	154	82	164	170	553	72	182	13090	936.4	5012.6	11.57	8.39		8.5	6.2	303.49	On	8.14	6.1
34192	154	82	164	170	550	73	183	12866	933.8	5011	11.63	8.35		8.5	6.2	303.49	On	8.14	6.1
34252	155	82	164	170	547	72	183	12431	901.5	5009.8	11.81	8.18		8.5	6.2	303.49	On	8.14	6.1
34312	154	83	164	170	544	73	183	12455	891.9	5008.5	11.85	8.14		8	6.2	303.49	On	8.14	6.1
34372	154	83	164	171	541	73	184	12716	910.2	5013	11.84	8.15		8	6.2	330.46	On	8.14	6.1
34428	154	83	164	171	540	73	184	12663	916.0	5011.4	11.84	8.15		8	6.2	354.07	On	8.14	6.1
34488	155	83	164	171	539	73	185	12594	908.7	5008.1	11.83	8.19		8	6.2	354.07	On	8.14	6.1
34548	156	84	165	171	538	73	185	12581	905.8	5011	11.81	8.2		8	6.2	303.38	On	8.14	6.1
34608	156	84	165	171	537	73	185	12590	906.1	5013.4	11.8	8.22		7.5	6.2	303.38	On	8.14	6.1
34668	156	84	165	171	535	73	185	12594	907.6	5010.2	11.82	8.24		7.5	6.2	303.38	On	8.14	6.1
34728	156	84	165	171	533	74	185	12549	904.6	5013	11.82	8.22		7.5	6.2	303.38	On	8.14	6.1
34788	156	84	165	171	531	74	185	12577	901.4	5009.8	11.83	8.2		7.5	6.2	303.38	On	8.14	6.1
34848	157	84	165	171	530	74	185	12504	901.9	5010.2	11.91	8.17		7.5	6.2	303.38	On	8.14	6.1
34908	157	84	165	171	528	74	185	12565	901.5	5011.4	11.92	8.15		7	6.2	303.38	On	8.14	6.1
34968	156	85	165	172	526	74	185	12557	904.8	5013	11.9	8.17		7	6.2	353.94	On	8.14	6.1
35028	156	85	165	171	524	75	185	12504	902.5	5010.2	11.94	8.14		7	6.2	303.38	On	8.14	6.1
35088	156	85	166	172	523	75	185	12354	896.2	5010.6	12.01	8.04		7	6.2	303.28	On	8.14	6.1
35148	157	85	165	172	521	75	184	12394	890.6	5012.6	12.11	7.95		7	6.2	353.94	On	8.14	6.1
35208	157	85	165	172	520	75	184	12301	888.5	5009.8	12.12	7.93		7	6.2	353.94	On	8.14	6.1
35268	156	85	165	172	519	75	184	12158	878.7	5011	12.14	7.87		6.8	6.2	353.94	On	8.14	6.1
35328	155	85	166	172	517	75	184	12048	870.4	5010.6	12.23	7.8		6.5	6.2	303.28	On	8.14	6.1
35388	156	84	165	172	515	75	184	11898	862.6	5011	12.25	7.78		6.5	6.2	353.94	On	8.14	6.1
35448	156	83	166	172	515	75	183	11808	848.6	5011	12.22	7.79		6.5	6.2	303.28	On	8.14	6.1
35508	155	82	166	172	515	75	183	11646	837.2	5012.6	12.23	7.78		6.5	6.2	303.28	On	8.14	6.1
35568	155	82	166	172	513	75	183	11605	830.6	5011.8	12.2	7.81		6.4	6.2	303.28	On	8.14	6.1
35628	155	82	166	173	513	75	182	11666	833.8	5008.5	12.2	7.81		6.1	6.2	353.82	On	8.14	6.1
35688	155	81	166	172	514	75	182	11523	829.4	5011.8	12.22	7.79		6	6.2	303.28	On	8.14	6.1
35748	155	81	166	173	513	75	182	11454	819.0	5011	12.22	7.81		6	6.2	330.23	On	8.14	6.1
35804	155	81	166	173	512	75	182	11369	811.4	5010.2	12.2	7.85		6	6.2	353.82	On	8.14	6.1
35864	155	81	166	173	512	75	182	11251	805.2	5009.4	12.17	7.87		6	6.2	353.82	On	8.14	6.1
35924	155	81	166	173	512	75	182	11108	792.6	5010.6	12.21	7.85		6	6.2	353.82	On	8.14	6.1
35984	154	80	166	173	511	75	182	11113	790.7	5011	12.19	7.85		5.5	6.2	353.82	On	8.14	6.1
36044	155	80	166	173	511	75	182	11104	793.1	5013	12.18	7.86		5.5	6.2	353.82	On	8.14	6.1
36104	154	80	166	173	512	75	182	11035	786.1	5008.5	12.21	7.85		5.5	6.2	353.82	On	8.14	6.1
36164	154	80	166	173	511	75	182	10966	783.4	5010.6	12.21	7.86		5.5	6.2	353.82	On	8.14	6.1
36224	155	80	166	173	510	75	182	10925	780.6	5009.4	12.25	7.83		5.5	6.2	353.82	On	8.14	6.1
36284	155	80	167	173	509	75	182	10925	779.1	5011	12.29	7.78		5.5	6.2	303.17	On	8.14	6.1
36344	155	81	166	173	508	75	182	10852	776.5	5011.8	12.29	7.79		5.5	6.2	353.82	On	8.14	6.1
36404	155	81	167	173	507	75	182	10909	777.5	5013.4	12.3	7.78		5.5	6.2	303.17	On	8.14	6.1
36464	155	81	167	174	505	75	182	10974	780.3	5011.8	12.28	7.81		5	6.2	353.70	On	8.14	6.1
36524	155	81	167	173	504	75	182	10938	779.0	5010.6	12.31	7.78		5	6.2	303.17	On	8.14	6.1
36584	155	81	167	174	501	74	182	10909	777.3	5010.2	12.33	7.78		5	6.2	353.70	On	8.14	6.1
36644	154	80	167	174	493	74	182	10872	768.4	5009.8	12.51	7.58		5	6.2	353.70	On	8.14	6.1
36704	154	80	167	174	490	74	181	11133	789.4	5010.6	12.78	7.33		5	6.2	353.70	On	8.14	6.1
36764	153	80	167	174	489	73	180	11243	803.9	5011.4	12.8	7.32		5	6.2	353.70	On	8.14	6.1
36824	153	80	167	174	487	73	179	11271	803.2	5011.4	12.74	7.32		5	6.2	353.70	On	8.14	6.1
36884	152	81	167	174	485	73	179	11169	797.9	5011.8	12.81	7.31		5	6.2	353.70	On	8.14	6.1
36944	151	81	167	174	485	73	180	11104	794.6	5011	12.83	7.32		5.2	6.2	353.70	On	8.14	6.1
37004	143	80	167	174	494	73	174	10860	759.0	5011	12.93	7.2		4.6	6.2	353.70	Off	8.14	6.1
37064	133	78	167	174	481	73	162	9900	220.4	5010.2	13.78	6.44		4.5	6.2	353.70	Off	8.14	6.1
37124	125	77	167	174	464	73	151	13192	155.3	5011.4	12.2	7.94		4.5	6.2	330.12	Off	8.14	6.1
37180	120	77	167	174	446	73	144	15613	194.2	5012.2	10.63	9.1		4.5	6.2	353.70	Off	8.14	6.1

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
37240	116	77	167	174	429	73	137	15999	208.7	5009.4	10.28	9.34		4.5	6.2	353.70	Off	8.14	6.1
37300	113	76	167	174	416	74	132	15418	202.5	5010.6	10.28	9.28		4.5	6.2	353.70	Off	8.14	6.1
37360	111	77	167	174	406	74	129	14628	186.0	5011.4	10.38	9.1		4.5	6.2	353.70	Off	8.14	6.1
37420	109	76	167	174	398	74	126	13790	172.7	5011.4	10.48	8.96		4.5	6.2	353.70	Off	8.14	6.1
37480	107	76	167	174	391	75	124	13078	160.8	5011.4	10.56	8.66		4.5	6.2	353.70	Off	8.14	6.1
37540	106	76	167	174	384	74	122	12419	148.6	5011	10.63	8.77		4.5	6.2	353.70	Off	8.14	6.1
37600	104	76	167	174	379	75	120	11922	139.2	5011.8	10.64	8.72		4.5	6.2	353.70	Off	8.14	6.1
37660	103	76	167	174	374	75	119	11414	129.6	5011.4	10.7	8.65		4.5	6.2	353.70	Off	8.14	6.1
37720	102	76	167	174	370	75	118	10999	124.3	5011	10.72	8.59		4.5	6.2	353.70	Off	8.14	6.1
37780	101	76	167	174	366	75	117	10579	119.0	5011.8	10.76	8.52		4.5	6.2	353.70	Off	8.14	6.1
37840	100	75	167	174	362	75	116	10291	115.7	5011.8	10.75	8.5		4.5	6.2	353.70	Off	8.14	6.1
37900	99	73	167	174	358	75	115	10038	114.1	5011.4	10.78	8.47		4.5	6.2	353.70	Off	8.14	6.1
37960	98	73	167	174	354	74	114	9701	112.5	5011.4	10.88	8.39		4.5	6.2	353.70	Off	8.14	6.1
38020	97	73	167	174	352	74	113	9424	105.8	5011	10.96	8.3		5	6.2	353.70	Off	8.14	6.1
38080	96	74	167	174	349	73	112	9261	101.2	5012.6	10.99	8.26		5	6.2	353.70	Off	8.14	6.1
38140	95	75	167	174	347	73	111	9188	95.4	5011	10.99	8.27		5	6.2	353.70	Off	8.14	6.1
38200	94	77	167	173	345	73	111	9176	91.5	5011	10.89	8.35		5	6.2	303.17	Off	8.14	6.1
38260	94	78	166	173	342	73	110	9184	89.0	5012.2	10.84	8.4		5	6.2	353.82	Off	8.14	6.1
38320	93	79	167	173	339	73	110	9151	86.9	5010.2	10.77	8.46		4.5	6.2	303.17	Off	8.14	6.1
38380	93	79	166	173	336	74	109	9151	84.1	5012.2	10.74	8.49		4.5	6.2	353.82	Off	8.14	6.1
38440	93	78	166	173	334	74	109	9180	91.0	5013.4	10.65	8.55		4.5	6.2	353.82	Off	8.14	6.1
38500	93	77	166	173	332	74	109	9009	86.4	5011.8	10.74	8.47		4.5	6.2	330.23	Off	8.14	6.1
38556	93	76	166	173	330	74	108	8972	85.4	5012.6	10.76	8.46		4.5	6.2	353.82	Off	8.14	6.1
38618	93	76	166	172	328	74	108	8919	88.9	5009	10.78	8.45		4.5	6.2	303.28	Off	8.14	6.1
38676	93	76	166	172	327	74	108	8761	85.4	5012.2	10.92	8.33		4.5	6.2	303.28	Off	8.14	6.1
38736	92	75	166	172	325	74	107	8687	86.3	5010.6	11.01	8.26		4.5	6.2	303.28	Off	8.14	6.1
38796	92	74	165	172	323	74	107	8634	83.7	5012.6	11.07	8.22		4.5	6.3	359.07	Off	8.14	6.2
38856	92	74	165	172	321	74	107	8561	86.8	5011.8	11.17	8.16		5	6.3	359.07	Off	8.14	6.2
38916	92	75	165	172	319	73	106	8553	81.4	5012.6	11.22	8.13		5	6.3	359.07	Off	8.14	6.2
38976	91	74	165	172	318	73	106	8549	84.1	5012.6	11.23	8.13		5	6.3	359.07	Off	8.14	6.2
39036	90	74	165	172	318	73	106	8521	82.4	5013.4	11.29	8.11		5	6.3	359.07	Off	8.14	6.2
39096	90	74	165	172	317	73	105	8549	79.9	5013	11.27	8.13		5	6.3	359.07	Off	8.14	6.2
39156	89	74	165	171	315	72	105	8643	81.1	5009	11.22	8.19		5	6.3	307.78	Off	8.14	6.2
39216	89	74	164	171	314	72	104	8679	80.7	5011	11.2	8.21		5	6.3	359.20	Off	8.14	6.2
39276	88	74	164	171	314	71	104	8704	81.2	5011.4	11.21	8.23		5	6.3	359.20	Off	8.14	6.2
39336	88	73	164	171	312	71	104	8712	80.6	5012.2	11.23	8.24		5	6.3	359.20	Off	8.14	6.2
39396	88	73	164	171	311	71	103	8851	81.5	5011.8	11.29	8.2		5.5	6.3	359.20	Off	8.14	6.2
39456	87	73	164	171	310	71	103	8883	81.5	5011.8	11.33	8.19		5.5	6.3	359.20	Off	8.14	6.2
39516	87	73	164	170	309	71	103	8716	79.9	5011.4	11.33	8.2		5.5	6.3	307.88	Off	8.14	6.2
39576	86	73	164	171	308	71	103	8716	80.1	5011.8	11.35	8.18		5.5	6.3	359.20	Off	8.14	6.2
39636	86	72	164	170	307	70	102	8773	79.1	5011.4	11.35	8.21		5.5	6.3	307.86	Off	8.14	6.2
39696	86	73	163	171	306	70	102	8761	81.4	5011.4	11.21	8.23		5.5	6.3	410.65	Off	8.15	6.2
39756	86	73	163	170	305	70	102	8736	81.4	5013.4	11.12	8.17		5.5	6.3	359.32	Off	8.15	6.2
39816	85	73	164	170	303	70	102	8720	77.1	5011.8	11.2	8.17		5.5	6.3	307.88	Off	8.14	6.2
39876	86	74	163	170	303	70	102	8785	72.9	5011.4	11.18	8.21		5.5	6.3	335.37	Off	8.15	6.2
39932	85	74	163	170	302	70	102	8919	72.1	5011.4	11.09	8.29		5	6.3	359.32	Off	8.15	6.2
39992	85	75	163	170	301	70	102	8976	72.8	5012.2	11.06	8.34		5	6.3	359.32	Off	8.15	6.2
40052	85	75	163	170	300	70	102	9025	74.4	5010.6	11.04	8.39		5	6.3	359.32	Off	8.15	6.2
40112	86	75	163	170	298	71	103	9017	77.5	5011	11.06	8.38		5	6.3	359.32	Off	8.15	6.2
40172	86	75	163	169	297	71	103	8927	77.5	5011.8	11.16	8.27		5.4	6.3	307.99	Off	8.15	6.2
40232	86	74	163	169	296	71	102	8785	78.1	5010.6	11.3	8.17		5.5	6.3	307.99	Off	8.15	6.2
40292	86	74	162	169	294	71	102	8748	76.5	5012.6	11.36	8.13		5.5	6.3	359.44	Off	8.15	6.2
40352	86	73	162	169	294	71	102	8744	77.5	5011	11.39	8.13		5.5	6.3	359.44	Off	8.15	6.2
40412	86	73	162	169	293	71	102	8744	76.3	5013.4	11.41	8.1		5.5	6.3	359.44	Off	8.15	6.2
40472	85	73	162	169	292	70	101	8720	78.1	5011.4	11.44	8.09		5.5	6.3	359.44	Off	8.15	6.2
40532	85	73	162	169	291	70	101	8634	80.1	5010.2	11.56	8.01		5.5	6.3	359.44	Off	8.15	6.2
40592	85	73	162	169	291	70	101	8671	68.8	5012.6	11.59	7.99		5.5	6.3	359.44	Off	8.15	6.2
40652	85	74	162	168	290	71	101	8793	71.5	5011	11.5	8.1		5.2	6.3	308.10	Off	8.15	6.2
40712	85	74	162	168	290	71	101	8907	71.0	5010.6	11.42	8.16		5	6.3	308.10	Off	8.15	6.2
40772	85	75	162	166	289	71	102	8997	71.3	5011	11.33	8.23		5	6.3	308.10	Off	8.15	6.2
40832	85	76	162	168	289	71	102	9045	69.5	5010.2	11.3	8.25		5	6.3	308.10	Off	8.15	6.2
40892	85	75	161	168	288	71	102	9111	70.6	5011	11.26	8.29		5	6.3	359.57	Off	8.15	6.2
40952	85	75	162	168	288	72	102	9045	76.2	5013.8	11.32	8.26		5	6.3	308.10	Off	8.15	6.2
41012	85	74	161	168	285	71	102	8927	76.7	5012.6	11.46	8.13		5	6.3	359.57	Off	8.15	6.2
41072	85	74	161	168	285	71	101	8875	75.2	5012.2	11.52	8.08		5.4	6.3	359.57	Off	8.15	6.2
41132	85	74	161	167	284	71	101	8789	75.7	5009.4	11.6	8.01		5.5	6.3	308.20	Off	8.15	6.2
41192	85	73	161	167	283	71	100	8728	76.3	5013.4	11.7	7.93		5.5	6.3	308.20	Off	8.15	6.2
41252	84	73	161	167	282	71	100	8724	74.5	5011.4	11.72	7.93		5.5	6.3	287.65	Off	8.15	6.2
41308	84	73	161	167	282	71	100	8740	71.1	5008.1	11.76	7.92		5.5	6.3	308.20	Off	8.15	6.2
41368	84	73	161	167	281	71	100	8757	75.0	5012.2	11.75	7.91		5.5	6.3	308.20	Off	8.15	6.2
41428	84	74	161	167	281	71	100	8793	66.7	5011.8	11.78	7.9		5.4	6.3	308.20	Off	8.15	6.2
41488	84	74	160	167	281	71	101	8927	67.9	5012.6	11.67	8		5	6.3	359.69	Off	8.16	6.2

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FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-98

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
41548	84	75	160	167	280	71	101	9033	69.2	5010.6	11.59	8.06		5	6.3	359.69	Off	8.16	6.2
41608	84	75	160	166	280	71	101	9115	70.5	5010.6	11.53	8.13		5	6.3	308.30	Off	8.16	6.2
41668	84	75	160	166	279	71	101	9135	74.5	5010.6	11.53	8.13		5	6.3	308.30	Off	8.16	6.2
41728	84	74	160	166	278	71	101	9021	77.0	5013.4	11.66	8.03		5	8.3	308.30	Off	8.16	6.2
41788	84	74	160	166	277	71	101	8960	72.8	5010.6	11.72	7.99		5	6.3	308.30	Off	8.16	6.2
41848	84	73	159	166	276	71	100	8960	77.0	5012.2	11.75	7.96		5	6.3	359.81	Off	8.16	6.2
41908	84	73	159	166	276	71	100	6854	77.5	5010.6	11.85	7.88		5	6.3	359.81	Off	8.16	6.2
41968	90	74	159	166	269	70	105	9094	288.2	5011	11.7	8.02		5.5	6.3	359.81	Off	8.16	6.2
42028	99	74	159	166	260	70	115	6722	398.8	5009	13.8	6.16		5.5	6.3	359.81	Off	8.16	6.2
42088	106	75	159	165	257	70	123	4492	281.4	4485.3	17	3.69		5.4	6.3	308.41	Off	8.16	6.2
42148	110	76	159	165	260	70	130	5001	338.2	4873.5	17.41	3.49		5	6.3	308.41	On	8.16	6.2
42208	113	76	159	166	267	70	135	6120	423.0	5012.2	17.06	3.83		5	6.3	359.81	On	8.16	6.2
42268	117	77	159	165	277	71	138	7056	490.1	5012.2	16.66	4.21		5	6.3	308.41	On	8.16	6.2
42328	119	78	159	165	288	71	142	7511	522.6	5010.6	16.36	4.46		5	6.3	308.41	On	8.16	6.2
42388	121	78	159	165	300	71	144	7910	551.1	5008.5	16.06	4.75		4.5	6.3	308.41	On	8.16	6.2
42448	124	78	159	165	313	71	147	8191	570.3	5011.4	15.76	5.03		4.5	6.3	308.41	On	8.16	6.2
42508	126	78	158	165	326	71	148	8354	586.6	5011.8	15.52	5.27		4.5	6.3	359.93	On	8.16	6.2
42568	127	78	158	165	340	71	150	8578	602.9	5011.8	15.26	5.49		4.5	6.3	359.93	On	8.16	6.2
42628	128	77	158	164	351	71	152	8797	618.3	5009.8	15.06	5.66		4.5	6.3	287.94	On	8.16	6.2
42684	130	77	158	164	361	71	153	9021	637.4	5012.2	14.89	5.81		4.5	6.3	308.51	On	8.16	6.2
42744	130	77	158	165	370	71	154	9265	654.1	5011.4	14.72	5.96		4.5	6.3	359.93	On	8.16	6.2
42804	131	76	158	164	376	70	155	9477	668.3	5010.6	14.61	6.06		4.5	6.3	308.51	On	8.16	6.2
42864	132	76	158	164	380	70	156	9570	677.1	5011.8	14.61	6.05		4.5	6.3	308.51	On	8.16	6.2
42924	133	76	158	164	387	71	156	9741	682.9	5009.8	14.56	6.11		4.5	6.3	308.51	On	8.16	6.2
42984	133	77	158	164	392	70	158	9900	689.8	5010.6	14.4	6.26		4.5	6.3	308.51	On	8.16	6.2
43044	134	77	158	164	397	70	159	9912	692.9	5011	14.27	6.38		4.5	6.3	308.51	On	8.16	6.2
43104	135	78	158	164	401	70	160	9855	689.9	5010.6	14.18	6.44		4	6.3	308.51	On	8.16	6.2
43164	136	78	158	165	405	71	161	9823	684.6	5010.6	14.12	6.49		4	6.3	359.93	On	8.16	6.2
43224	137	79	158	164	409	71	162	9831	688.2	5010.2	14.05	6.55		4	6.3	308.51	On	8.16	6.2
43284	137	79	158	165	413	71	163	9835	688.3	5011	13.99	6.61		4	6.3	359.93	On	8.16	6.2
43344	138	79	158	165	416	71	163	9835	688.2	5012.6	13.95	6.62		4	6.3	359.93	On	8.16	6.2
43404	139	80	158	165	420	71	164	9758	684.6	5013.8	13.95	6.64		4	6.3	359.93	On	8.16	6.2
43464	139	80	158	165	421	72	165	9648	679.7	5011.8	13.95	6.63		3.5	6.3	359.93	On	8.16	6.2
43524	140	79	158	165	422	72	165	9648	678.2	5010.2	13.93	6.64		3.9	6.3	359.93	On	8.16	6.2
43584	140	79	158	165	424	72	165	9786	687.8	5010.6	13.86	6.71		4	6.3	359.93	On	8.16	6.2
43644	140	78	158	165	429	71	165	9819	694.0	5009.4	13.81	6.73		4	6.3	359.93	On	8.16	6.2
43704	141	78	158	165	432	71	185	9876	698.4	5011	13.75	6.82		4	6.3	359.93	On	8.16	6.2
43764	141	78	158	165	433	71	186	9912	699.9	5012.6	13.71	6.87		4	6.3	359.93	On	8.16	6.2
43824	142	77	158	165	436	71	166	10026	704.8	5010.6	13.69	6.89		4	6.3	359.93	On	8.16	6.2
43884	142	77	159	165	435	70	167	10075	707.0	5010.6	13.7	6.89		3.6	6.3	308.41	On	8.16	6.2
43944	142	77	159	165	433	70	167	10075	707.7	5012.6	13.72	6.85		3.5	6.3	308.41	On	8.16	6.2
44004	142	78	159	165	430	71	167	10156	706.2	5012.2	13.73	6.81		3.5	6.3	287.85	On	8.16	6.2
44060	142	78	159	165	426	71	167	10169	706.2	5009.8	13.75	6.79		3.5	6.3	308.41	On	8.16	6.2
44120	142	79	159	166	424	71	166	10217	715.0	5009.4	13.73	6.79		3.5	6.3	359.81	On	8.16	6.2
44180	143	80	159	165	424	70	168	10278	717.0	5010.2	13.71	6.82		3.5	6.3	308.41	On	8.16	6.2
44240	143	80	159	168	425	71	168	10339	723.1	5011.8	13.64	6.85		3.1	6.3	359.81	On	8.16	6.2
44300	143	80	159	165	425	72	169	10380	726.7	5012.2	13.65	6.85		3	6.3	308.41	On	8.16	6.2
44360	144	80	159	166	426	71	169	10457	733.2	5012.2	13.62	6.88		3	6.3	359.81	On	8.16	6.2
44420	144	80	159	168	426	72	169	10478	733.7	5011.8	13.61	6.88		3	6.3	359.81	On	8.16	6.2
44480	145	80	159	166	427	72	169	10506	739.4	5012.6	13.6	6.88		3	6.3	359.81	On	8.16	6.2
44540	145	79	159	166	429	72	169	10567	748.4	5011.8	13.61	6.86		3	6.3	359.81	On	8.16	6.2
44600	145	79	159	166	426	72	169	10564	748.5	5011.4	13.59	6.88		3	6.3	359.81	On	8.16	6.2
44660	145	78	159	166	421	71	169	10563	748.7	5011.4	13.63	6.84		3	6.3	359.81	On	8.16	6.2
44720	145	78	159	168	421	71	169	10726	759.0	5012.2	13.66	6.82		3	6.3	359.81	On	8.16	6.2
44780	145	78	159	168	423	71	169	9208	762.7	4720.5	14.21	6.07		3	6.3	359.81	On	8.16	6.2
44840	145	78	159	166	423	71	170	9037	752.0	4083.7	15.38	5.01		2.5	8.3	359.81	On	8.16	6.2
44900	145	78	159	168	423	71	170	10661	748.4	5009.4	13.7	6.89		2.5	6.3	359.81	On	8.16	6.2
44960	145	79	160	166	425	71	171	10563	740.4	5011.4	13.66	6.91		2.5	6.3	308.30	On	8.16	6.2
45020	146	80	160	166	424	71	171	10384	733.1	5009.4	13.5	6.83		2.5	6.3	308.30	On	8.16	6.2
45080	146	80	160	166	422	71	171	10425	723.8	5011	13.48	6.88		2.3	6.3	308.30	On	8.16	6.2
45140	146	80	160	166	422	71	171	10405	727.2	5011.4	13.47	6.89		2	6.3	308.30	On	8.16	6.2
45200	146	81	160	166	423	72	171	10315	722.2	5011.4	13.48	6.88		2	6.3	308.30	On	8.16	6.2
45260	146	81	160	166	425	72	172	10319	719.6	5011	13.44	6.92		2	6.3	308.30	On	8.16	6.2
45320	147	80	160	167	427	72	172	10360	726.6	5012.2	13.43	6.93		2	6.3	359.69	On	8.16	6.2
45380	147	79	160	166	430	72	172	10449	732.9	5011.8	13.41	6.95		2	6.3	287.75	On	8.16	6.2
45436	147	79	160	167	434	72	172	10490	736.8	5010.6	13.38	6.96		2	6.3	359.69	On	8.16	6.2
45496	147	78	160	166	434	71	172	10608	744.8	5010.6	13.38	6.96		2	6.3	308.30	On	8.16	6.2
45556	146	78	160	167	435	71	172	10641	750.3	5013	13.36	6.99		2	6.3	359.69	On	8.16	6.2
45616	145	79	160	167	438	71	172	10624	745.8	5013	13.34	7.01		2	6.3	359.69	On	8.16	6.2
45676	146	79	160	167	438	71	172	10677	741.9	5008.5	13.41	6.94		1.5	6.3	359.69	On	8.16	6.2
45736	146	80	160	167	439	71	172	10722	748.7	5012.2	13.42	6.92		1.5	6.3	359.69	On	8.16	6.2
45796	146	80	161	167	439	71	172	10726	749.5	5012.6	13.33	6.93		1.5	6.3	308.20	On	8.15	6.2

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FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

28-Jun-95 Run TTD-1A

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
45858	146	81	161	167	439	72	173	10697	750.2	5010.6	13.18	6.93		1.5	6.3	308.20	On	8.15	6.2
45918	146	81	161	167	439	72	173	10657	750.0	5011	13.18	6.89		1.5	6.3	308.20	On	8.15	6.2
45978	146	81	161	167	438	72	173	10714	747.1	5011.8	13.18	6.9		1	6.3	308.20	On	8.15	6.2
46038	147	80	161	167	438	72	173	10714	755.4	5010.2	13.2	6.89		1.5	6.3	308.20	On	8.15	6.2
46098	147	80	161	167	438	72	172	10474	744.1	5011	13.25	6.87		1.5	6.3	308.20	On	8.15	6.2
46158	147	79	161	167	436	72	172	10441	733.7	5009.8	13.25	6.85		1.5	6.3	308.20	On	8.15	6.2
46218	147	79	161	167	435	71	172	10453	738.8	5010.6	13.25	6.85		1.5	6.3	308.20	On	8.15	6.2
46278	147	78	161	167	434	71	171	10445	733.1	5011.8	13.29	6.83		1.5	6.3	308.20	On	8.15	6.2
46338	147	78	161	167	433	71	171	10457	737.3	5013	13.31	6.78		1	6.3	308.20	On	8.15	6.2
46398	146	79	161	167	432	72	171	10433	734.2	5010.2	13.31	6.79		1	6.3	308.20	On	8.15	6.2
46458	145	79	161	167	432	71	171	10364	725.6	5011.4	13.3	6.79		1	6.3	308.20	On	8.15	6.2
46518	146	79	161	167	432	71	171	10201	717.3	5011.8	13.33	6.77		1	6.3	308.20	On	8.15	6.2
46578	146	80	161	168	433	71	171	10030	705.6	5009.4	13.37	6.75		1	6.3	359.57	On	8.15	6.2
46638	146	80	161	168	431	71	171	9973	693.5	5010.2	13.4	6.7		0.5	6.3	359.57	On	8.15	6.2
46698	146	81	161	168	430	71	171	9884	691.4	5011.4	13.47	6.8		0.5	6.3	359.57	On	8.15	6.2
46758	146	81	161	168	429	72	171	9770	684.7	5010.2	13.5	6.58		0.6	6.3	335.80	On	8.15	6.2
46812	146	80	161	168	428	72	171	9676	677.6	5012.6	13.52	6.55		0.5	6.3	359.57	On	8.15	6.2
46872	146	80	161	168	427	72	171	9615	673.7	5012.2	13.53	6.55		0.5	6.3	359.57	On	8.15	6.2
46932	146	79	161	168	425	72	170	9587	672.9	5011	13.54	6.52		0.5	6.3	359.57	On	8.15	6.2
46992	145	79	161	168	420	71	169	9509	667.0	5010.2	13.69	6.37		0.5	6.2	354.43	On	8.15	6.1
47052	145	78	161	168	418	72	169	9536	668.5	5012.6	13.85	6.24		0.5	6.2	354.43	On	8.15	6.1
47112	144	78	161	168	416	71	168	9591	669.3	5009.8	13.87	6.24		0.5	6.2	354.43	On	8.15	6.1
47172	144	79	161	168	415	71	168	9676	670.2	5011.4	13.81	6.27		0.5	6.2	354.43	On	8.15	6.1
47232	144	79	161	168	415	71	168	9648	671.1	5013.4	13.83	6.27		0	6.2	354.43	On	8.15	6.1
47292	143	80	162	168	414	72	168	9623	668.5	5011.8	13.84	6.25		0	6.2	303.70	On	8.15	6.1
47352	144	80	161	168	414	72	168							0	6.2	354.43	On	8.15	6.1
47412	144	80	161	168	414	72	168							0.3	6.2	354.43	On	8.15	6.1
47472	144	80	162	168	414	72	168							0	6.2	303.70	On	8.15	6.1
47532																			
AVERAGE	134	79	161	167	483	73	155	14567			11.01	8.82				330.88		8.15	

12.414444 test hrs
744.86667 test min.
12:24:52 hr:mn:sc

Total Btu out = 247,498 , Btu/hr out = 19,936
Total Btu in = 533,471 , Btu/hr in = 42,972
Efficiency = 46.39%
Water flowrate = 6.25 gpm
Burnrate = 2.42 dry kg/hr
Wood moisture = 21.76%

D37

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
1944	159	88	153	160	236	69	178	7605	1425.9	5011.8	17.07	3.23		83.0	6.3	360.5	On	8.17	6.2
2004	154	84	153	160	284	70	177	11922	1049.3	5011	15.24	5.4		83.5	6.3	360.5	On	8.17	6.2
2064	152	83	153	160	299	70	175	17167	1174.3	5010.6	13.27	7.14		83.0	6.3	360.5	On	8.17	6.2
2124	152	84	154	160	313	70	176	18451	1252.1	5011	12.56	7.79		83.0	6.3	308.9	On	8.17	6.2
2184	154	84	154	160	328	71	176	15967	1158.7	5013	12.12	8.19		83.0	6.3	308.9	On	8.17	6.2
2244	155	84	154	160	333	71	176	15845	1148.3	5013	12.05	8.17		82.5	6.3	308.9	On	8.17	6.2
2304	157	85	154	160	335	71	177	15499	1119.6	5010.8	12.26	7.95		82.5	6.3	308.9	On	8.17	6.2
2364	157	85	154	160	342	72	177	15564	1107.7	5010.2	12.26	7.92		82.0	6.3	308.9	On	8.17	6.2
2424	158	85	154	159	351	72	177	18048	1123.7	5012.2	12.27	7.89		82.0	6.3	257.4	On	8.17	6.2
2484	159	85	154	160	350	72	177	18325	1153.3	5010.8	12.36	7.81		81.5	6.3	308.9	On	8.17	6.2
2544	159	84	153	159	351	72	177	16349	1164.6	5011.8	12.15	8.02		81.5	6.3	309.0	On	8.17	6.2
2604	158	83	153	159	351	73	176	16496	1159.3	5012.2	12.39	7.62		81.0	6.3	309.0	On	8.17	6.2
2664	157	83	153	159	348	73	175	16520	1154.3	5012.6	13.02	7.13		81.0	6.3	309.0	On	8.17	6.2
2724	157	82	153	159	345	73	174	17110	1188	5009	13.08	7.12		80.5	6.3	288.4	On	8.17	6.2
2780	156	82	153	159	349	73	174	17769	1239.1	5010.6	12.99	7.23		80.5	6.3	309.0	On	8.17	6.2
2840	157	81	153	158	359	73	174	18205	1286.9	5012.6	12.88	7.34		80.0	6.3	257.5	On	8.17	6.2
2900	158	80	153	158	393	73	175	16107	1314.1	5013.4	12.78	7.64		80.0	6.3	257.5	On	8.17	6.2
2960	158	80	152	158	395	73	175	17208	1259	5011.8	12.03	8.2		79.5	6.3	309.1	On	8.16	6.2
3020	161	80	152	158	394	72	177	17114	1197.8	5012.2	12.43	8		79.5	6.3	309.1	On	8.18	6.2
3080	164	81	152	158	405	72	180	17692	1300.5	5011.4	11.04	9.61		79.0	6.3	309.1	On	8.18	6.2
3140	166	82	153	158	448	72	182	17664	1276	5011.4	10.45	9.83		78.7	6.3	257.5	On	8.17	6.2
3200	169	84	152	159	435	72	184	18420	1272.8	5010.8	10.72	9.6		78.5	6.3	360.6	On	8.18	6.2
3260	171	85	152	158	411	72	187	21847	1509.1	5010.2	9.71	11.01		78.0	6.3	309.1	On	8.18	6.2
3320	174	86	153	158	402	72	189	23584	1730.3	5009.8	8.82	11.46		77.6	6.3	257.5	On	8.17	6.2
3380	175	86	153	159	402	72	191	23315	1759.3	5011.8	8.79	11.47		77.5	6.3	309.0	On	8.17	6.2
3440	176	84	153	159	396	73	192	22607	1696.3	5011.8	8.72	11.53		77.0	6.3	309.0	On	8.17	6.2
3500	174	83	153	159	398	72	191	21749	1595.1	5012.6	9.26	10.72		76.5	6.3	309.0	On	8.17	6.2
3560	174	82	153	159	400	72	189	21867	1572.4	5011.4	9.99	10.22		76.5	6.3	309.0	On	8.17	6.2
3620	174	82	153	159	410	72	190	22119	1641.8	5012.6	9.95	10.36		76.0	6.3	309.0	On	8.17	6.2
3680	176	82	153	159	430	72	191	22306	1639.3	5011.4	9.63	10.78		75.9	6.3	309.0	On	8.17	6.2
3740	177	83	153	160	473	71	193	22876	1693.4	5010.6	9.09	11.37		75.5	6.3	360.5	On	8.17	6.2
3800	179	83	153	160	470	71	195	23881	1780.8	5010.6	8.54	11.91		75.0	6.3	360.5	On	8.17	6.2
3860	180	85	154	160	448	71	196	23488	1797.5	5011.4	8.51	11.82		74.5	6.3	308.9	On	8.17	6.2
3920	182	86	154	160	446	71	198	24422	1782.7	5012.6	8.19	12.41		74.0	6.3	308.9	On	8.17	6.2
3980	183	87	154	160	441	71	200	26929	1970.7	5011	7.35	13.22		73.5	6.3	308.9	On	8.17	6.2
4040	183	88	154	161	444	71	201	28381	2004.4	5012.2	7.09	13.01		73.1	6.3	360.4	On	8.17	6.2
4100	183	87	155	161	451	72	200	26375	2002.9	5007.3	7.89	12.05		73.0	6.3	288.2	On	8.17	6.2
4156	182	86	155	161	451	72	199	24996	1886.4	5009.8	8.57	11.49		72.5	6.3	308.6	On	8.17	6.2
4216	181	84	155	161	456	72	198	24797	1891	5011.4	8.88	11.31		72.0	6.3	308.8	On	8.17	6.2
4276	181	84	155	161	476	72	198	24040	1841.3	5011	8.94	11.26		71.5	6.3	308.8	On	8.17	6.2
4336	181	82	155	161	496	72	199	22734	1764.8	5010.2	9.07	11.13		71.5	6.3	308.8	On	8.17	6.2
4396	179	82	155	162	496	72	196	20728	1569.7	5009.8	9.38	10.71		71.0	6.3	360.3	On	8.17	6.2
4456	179	82	155	161	491	71	197	20146	1468.3	5009	9.69	10.53		70.5	6.3	308.8	On	8.17	6.2
4516	178	83	155	161	507	71	197	19836	1457.5	5010.6	9.73	10.5		70.5	6.3	308.8	On	8.17	6.2
4576	179	83	155	162	540	71	197	20658	1481.9	5011.8	9.6	10.42		70.0	6.3	360.3	On	8.17	6.2
4636	179	84	156	162	554	71	197	21432	1577.3	5011.4	9.94	10.34		69.5	6.3	308.7	On	8.17	6.2
4696	179	85	156	162	541	71	196	21741	1604	5011	9.88	10.4		69.0	6.3	308.7	On	8.17	6.2
4756	179	86	156	162	545	72	197	21916	1817.8	5011	9.92	10.39		68.5	6.3	308.7	On	8.17	6.2
4816	182	87	156	162	572	71	199	23405	1684.4	5011	9.83	10.88		68.0	6.3	308.7	On	8.17	6.2
4878	185	87	156	162	599	72	203	25435	1891.1	5009.8	9.1	11.79		67.5	6.3	308.7	On	8.17	6.2
4936	189	87	157	163	601	72	207	29704	2003.1	5008.1	8.12	12.69		67.0	6.3	308.6	On	8.16	6.2
4996	192	87	157	163	614	72	211	31567	2005.9	5010.6	7.6	13.08		66.5	6.3	308.6	On	8.16	6.2
5056	195	86	157	163	640	72	215	32174	2004.9	5011.4	7.07	13.56		66.0	6.3	308.6	On	8.16	6.2
5116	199	87	157	163	671	72	218	32629	2005.2	5011.4	8.54	14.03		65.5	6.3	308.6	On	8.16	6.2
5176	200	87	157	164	683	72	221	33370	2004.2	5010.2	6.27	14.33		65.0	6.3	360.0	On	8.16	6.2
5236	201	87	157	164	695	71	221	32967	2004.7	5008.5	6.47	14.09		64.5	6.3	360.0	On	8.16	6.2
5296	201	87	158	164	708	71	221	33256	2005.2	5011.8	6.65	13.94		64.2	6.3	308.5	On	8.16	6.2
5356	201	87	158	165	711	71	221	32894	2005.2	5011.4	6.81	13.78		63.8	6.3	359.9	On	8.16	6.2
5416	201	88	158	165	712	71	221	32418	2004.9	5011.8	7.07	13.52		63.0	6.3	359.9	On	8.16	6.2
5476	201	89	159	165	716	71	221	32263	2005.4	5010.2	7.23	13.39		62.5	6.3	287.8	On	8.16	6.2
5532	201	89	159	166	721	71	221	32487	2005.5	5011.8	7.17	13.46		62.0	6.3	359.8	On	8.16	6.2
5592	201	89	159	166	732	71	221	32467	2005.2	5011.8	7.31	13.33		61.5	6.3	359.8	On	8.16	6.2
5652	200	88	159	166	738	72	222	33000	2005.7	5011.4	7.25	13.36		61.0	6.3	359.8	On	8.16	6.2
5712	201	87	159	166	751	72	223	33350	2005.9	5009	7.23	13.39		60.5	6.3	359.8	On	8.16	6.2
5772	201	87	159	166	757	72	223	33936	2004.6	5011.4	6.96	13.64		60.0	6.3	359.8	On	8.16	6.2
5832	203	87	160	166	765	71	225	34644	2005.2	5009.8	6.71	13.85		59.5	6.3	308.3	On	8.16	6.2
5892	205	87	160	167	772	71	227	35893	2005.4	5010.2	6.27	14.27		59.0	6.3	359.7	On	8.16	6.2
5952	206	88	160	167	779	71	228	36979	2005.2	5009	5.81	14.88		58.5	6.3	359.7	On	8.16	6.2
6012	206	86	161	167	791	71	230	37150	2006	5014.2	5.39	15.03		58.0	6.3	308.2	On	8.15	6.2
6072	207	88	161	168	791	71	230	36560	2005.4	5011.4	5.25	15.06		57.5	6.3	359.6	On	8.15	6.2

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
6132	207	89	161	168	797	71	230	34900	2005.2	5009.4	5.51	14.71		57.0	6.3	359.6	On	8.15	6.2
6192	206	90	162	168	806	71	229	33492	2005.5	5012.2	5.73	14.43		56.5	6.3	308.1	On	8.15	6.2
6252	206	89	162	169	813	72	229	32865	2006.3	5011.8	5.76	14.32		56.0	6.3	359.4	On	8.15	6.2
6312	206	89	162	169	820	72	229	32577	2005.5	5011.4	5.74	14.34		55.5	6.3	359.4	On	8.15	6.2
6372	205	88	163	169	825	72	230	32402	2006.3	5012.6	5.74	14.36		55.0	6.3	308.0	On	8.15	6.2
6432	205	87	163	170	828	72	231	32259	2005.7	5010.6	5.7	14.41		54.5	6.3	359.3	On	8.15	6.2
6492	206	86	163	170	834	72	231	32227	2004.2	5011	5.64	14.48		54.0	6.3	359.3	On	8.15	6.2
6552	206	86	163	170	841	72	232	31954	2005.7	5011	5.56	14.55		53.5	6.3	359.3	On	8.15	6.2
6612	206	86	163	170	850	72	232	31926	2005.5	5010.6	5.42	14.71		53.0	6.3	359.3	On	8.15	6.2
6672	207	86	163	170	867	72	233	31995	2005.7	5010.6	5.25	14.92		53.0	6.3	359.3	On	8.15	6.2
6732	207	87	164	171	888	72	233	32837	2005.7	5011	4.88	15.29		52.5	6.3	359.2	On	8.14	6.2
6792	209	89	164	171	904	72	235	34591	2005.5	5010.2	4.41	15.8		51.5	6.3	359.2	On	8.14	6.2
6852	211	90	165	171	927	72	237	38739	2005.4	5012.6	3.87	18.33		51.0	6.3	287.3	On	8.14	6.2
6908	213	91	165	172	948	72	240	38273	2005.7	5010.2	3.5	16.69		50.5	6.3	359.1	On	8.14	6.2
6968	214	90	165	172	951	72	242	38859	2005.4	5013	3.27	16.93		50.0	6.3	359.1	On	8.14	6.2
7028	215	89	166	172	951	72	243	38135	2005	5009	3.29	16.92		49.5	6.3	307.7	On	8.14	6.2
7088	216	88	166	173	943	72	245	37634	2005	5010.2	3.21	16.97		49.0	6.3	358.9	On	8.14	6.2
7148	216	87	166	173	939	72	246	36389	2005	5009	3.16	16.96		48.5	6.3	358.9	On	8.14	6.2
7208	216	86	166	173	934	72	245	34485	2004.9	5009.8	3.29	16.76		48.0	6.3	358.9	On	8.14	6.2
7268	215	86	167	174	925	72	244	32817	2005.5	5009.4	3.57	16.44		47.8	6.3	358.8	On	8.14	6.2
7328	213	86	166	174	931	72	242	31152	2005.5	5012.2	3.91	16.08		47.5	6.3	410.2	On	8.14	6.2
7388	212	86	167	174	933	71	241	30005	2005.7	5011.4	4.14	15.83		47.0	6.3	358.8	On	8.14	6.2
7448	210	88	167	174	936	71	240	29285	2006.2	5010.6	4.34	15.59		46.5	6.3	358.8	On	8.14	6.2
7508	209	89	168	175	944	72	238	29057	2004.9	5011.4	4.57	15.32		46.0	6.3	358.7	On	8.13	6.2
7568	208	89	168	175	949	72	237	29065	2005.7	5011.8	4.67	15.17		45.5	6.3	358.7	On	8.13	6.2
7628	207	87	168	175	953	72	236	29203	2005.4	5007.3	4.74	15.04		45.0	6.3	358.7	On	8.13	6.2
7688	207	86	168	175	955	72	236	29842	2004.8	5011	4.76	14.96		44.5	6.3	358.7	On	8.13	6.2
7748	207	84	168	176	962	72	238	30168	2005.5	5013	4.73	14.92		44.5	6.3	409.9	On	8.13	6.2
7808	194	78	168	176	874	72	228	28906	1850.9	5009.8	4.7	14.89		44.0	6.3	409.9	Off	8.13	6.2
7868	177	76	169	176	751	72	211	39840	1088.9	5011.4	6.27	13.76		44.0	6.3	358.6	Off	8.13	6.2
7928	166	75	169	176	683	72	198	49784	1352.2	5010.2	8.07	12.87		44.0	6.3	358.6	Off	8.13	6.2
7988	160	75	168	176	641	72	188	45858	1173.2	5010.2	9.22	12.08		44.0	6.3	409.9	Off	8.13	6.2
8048	156	75	169	176	609	72	180	38745	927.7	5010.6	9.77	11.51		44.0	6.3	358.6	Off	8.13	6.2
8108	153	75	168	176	584	71	175	32821	757.3	5010.2	10.06	11.05		44.0	6.3	409.9	Off	8.13	6.2
8168	150	77	169	176	564	71	170	28691	633.6	5012.2	10.3	10.63		43.5	6.3	358.6	Off	8.13	6.2
8228	148	78	169	176	546	71	166	26135	558.1	5011	10.44	10.31		43.5	6.3	334.7	Off	8.13	6.2
8284	146	78	169	176	532	72	163	24174	504.6	5010.6	10.55	10.05		43.5	6.3	358.6	Off	8.13	6.2
8344	144	77	169	176	520	72	161	22262	457.8	5010.6	10.67	9.78		43.0	6.3	358.6	Off	8.13	6.2
8404	143	75	169	176	507	72	158	20882	410.6	5011.8	10.64	9.66		43.0	6.3	358.6	Off	8.13	6.2
8464	142	74	169	176	498	72	156	19482	376.1	5011.4	10.63	9.5		43.0	6.3	358.8	Off	8.13	6.2
8524	140	73	169	176	489	72	154	18250	343.6	5011.8	10.68	9.33		43.0	6.3	358.8	Off	8.13	6.2
8584	138	72	168	176	482	72	152	17159	318.2	5010.2	10.73	9.15		43.0	6.3	409.9	Off	8.13	6.2
8644	137	73	168	176	475	71	150	16382	299	5011.4	10.82	9.01		43.0	6.3	409.9	Off	8.13	6.2
8704	135	75	168	175	470	72	148	15829	281.3	5013	10.82	8.96		43.0	6.3	358.7	Off	8.13	6.2
8764	134	76	166	175	464	72	146	15373	269.9	5012.2	10.85	8.89		43.0	6.3	358.7	Off	8.13	6.2
8824	133	76	167	175	459	72	144	15141	259.8	5013.8	10.8	8.91		42.9	6.3	410.1	Off	8.14	6.2
8884	132	76	168	175	455	72	143	14775	252.9	5011.4	10.95	8.86		42.5	6.3	358.7	Off	8.13	6.2
8944	131	74	167	174	449	71	142	14433	244.1	5009	10.95	8.81		42.5	6.3	358.8	Off	8.14	6.2
9004	130	73	167	174	444	72	141	14213	235.5	5011.4	10.9	8.78		42.5	6.3	358.8	Off	8.14	6.2
9064	129	72	166	174	440	72	140	14164	232.6	5010.6	10.85	8.78		42.5	6.3	410.2	Off	8.14	6.2
9124	127	72	168	173	437	72	139	14136	228.5	5010.6	10.82	8.75		42.5	6.3	358.9	Off	8.14	6.2
9184	126	72	166	173	434	72	137	13973	226.1	5011	10.86	8.68		42.5	6.3	358.9	Off	8.14	6.2
9244	125	73	165	173	431	72	137	13940	222.2	5009.8	10.83	8.69		42.5	6.3	410.4	Off	8.14	6.2
9304	124	74	165	172	429	71	135	13900	219.8	5011.4	10.81	8.72		42.5	6.3	359.1	Off	8.14	6.2
9364	123	74	165	172	427	71	135	13973	211.3	5009.4	10.69	8.8		42.5	6.3	359.1	Off	8.14	6.2
9424	123	75	165	172	425	72	134	14038	210.9	5011.4	10.6	8.88		42.5	6.3	359.1	Off	8.14	6.2
9484	123	76	165	172	422	72	133	13985	209.8	5013.4	10.6	8.88		42.5	6.3	359.1	Off	8.14	6.2
9544	122	76	165	172	420	72	133	13997	213.7	5011	10.56	8.91		42.5	6.3	359.1	Off	8.14	6.2
9604	122	75	165	172	418	72	133	13977	211.1	5012.6	10.56	8.92		42.0	6.3	335.1	Off	8.14	6.2
9660	121	74	165	172	416	72	132	14042	209.6	5012.2	10.54	8.95		42.0	6.3	359.1	Off	8.14	6.2
9720	122	72	164	172	415	72	132	14205	208.5	5011.4	10.47	9.02		42.0	6.3	410.5	Off	8.14	6.2
9780	121	72	165	171	414	72	131	14209	212.7	5009.4	10.49	9		42.0	6.3	307.8	Off	8.14	6.2
9840	119	71	164	171	412	72	131	14282	211.3	5011	10.54	8.99		42.4	6.3	359.2	Off	8.14	6.2
9900	119	72	164	171	412	71	130	14441	211.9	5010.2	10.49	9.04		42.5	6.3	359.2	Off	8.14	6.2
9960	118	73	164	171	411	71	129	14620	215.7	5010.6	10.5	9.06		42.5	6.3	359.2	Off	8.14	6.2
10020	118	73	164	171	410	71	129	14954	217.9	5009.4	10.45	9.13		42.6	6.3	359.2	Off	8.14	6.2
10080	117	74	164	171	409	71	129	15336	214.4	5009.8	10.39	9.22		42.0	6.3	359.2	Off	8.14	6.2
10140	117	75	164	171	409	71	129	15735	219.7	5011.8	10.33	9.3		42.0	6.3	359.2	Off	8.14	6.2
10200	116	76	164	171	408	71	129	16056	222.7	5009.4	10.31	9.33		42.0	6.3	359.2	Off	8.14	6.2
10260	117	76	164	171	406	72	129	16301	230.8	5010.6	10.27	9.37		42.0	6.3	359.2	Off	8.14	6.2

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
10320	117	75	164	171	406	72	128	16378	235.5	5011	10.27	9.38		41.7	6.3	359.2	Off	8.14	6.2
10380	116	74	164	171	404	72	128	16272	232.1	5011.8	10.3	9.35		42.0	6.3	359.2	Off	8.14	6.2
10440	116	73	164	170	402	72	127	16215	229.2	5011.4	10.24	9.4		42.0	6.3	307.9	Off	8.14	6.2
10500	116	72	163	170	400	72	127	16162	224.3	5011.8	10.17	9.44		42.0	6.3	359.3	Off	8.15	6.2
10560	115	71	163	170	399	72	127	16085	225.3	5013.8	10.13	9.46		42.0	6.3	359.3	Off	8.15	6.2
10620	114	72	163	170	399	72	127	15845	220.4	5011	10.18	9.39		42.0	6.3	359.3	Off	8.15	6.2
10680	114	72	163	170	397	71	126	15731	219.8	5011.8	10.19	9.38		42.0	6.3	359.3	Off	8.15	6.2
10740	113	73	163	170	397	71	125	15723	216.6	5011.8	10.13	9.42		42.0	6.3	359.3	Off	8.15	6.2
10800	113	74	163	170	396	72	125	15702	205.2	5009.8	10.09	9.46		42.0	6.3	359.3	Off	8.15	6.2
10860	112	75	163	170	393	71	125	15706	209.8	5012.2	10.01	9.51		42.0	8.3	359.3	Off	8.15	6.2
10920	112	76	163	170	390	72	124	15877	204.8	5012.6	9.93	9.56		41.5	6.3	359.3	Off	8.15	6.2
10980	112	76	163	170	388	72	124	15967	209.3	5009.8	10	9.44		41.5	6.3	335.4	Off	8.15	6.2
11036	112	75	163	169	386	72	124	16089	211.4	5012.2	10.03	9.41		41.5	6.3	308.0	Off	8.15	6.2
11096	112	74	163	169	385	72	124	16085	213.1	5012.2	10.03	9.39		41.5	8.3	308.0	Off	8.15	6.2
11156	112	72	162	169	384	72	124	15955	212.8	5011.4	10.06	9.36		41.5	6.3	359.4	Off	8.15	6.2
11216	111	72	162	169	383	72	123	15780	209.1	5013.4	10.06	9.35		41.5	8.3	359.4	Off	8.15	6.2
11276	111	71	182	169	383	72	123	15678	209	5010.2	10.04	9.36		41.5	6.3	359.4	Off	8.15	6.2
11336	111	71	162	169	382	72	123	15519	203.8	5011.8	10.06	9.35		41.5	6.3	359.4	Off	8.15	6.2
11396	111	72	182	169	382	71	122	15430	202	5010.6	10.07	9.36		41.5	6.3	359.4	Off	8.15	6.2
11456	110	73	182	169	382	71	121	15430	202.8	5010.2	10.03	9.43		41.5	6.3	359.4	Off	8.15	6.2
11516	109	74	182	169	382	71	121	15426	195.8	5010.2	10.02	9.48		41.5	6.3	359.4	Off	8.15	6.2
11576	109	74	182	169	381	71	121	15487	186.5	5009	9.92	9.55		41.5	6.3	359.4	Off	8.15	6.2
11636	109	75	181	168	381	71	120	15592	190.8	5013	9.82	9.66		41.0	6.3	359.6	Off	8.15	6.2
11696	109	75	182	168	380	72	121	15560	195	5013.4	9.77	9.7		41.0	6.3	308.1	Off	8.15	6.2
11756	108	73	181	168	379	72	121	15397	195.3	5012.2	9.81	9.69		41.0	6.3	359.6	Off	8.15	6.2
11816	108	72	181	168	379	72	120	15422	190.3	5011.4	9.74	9.73		41.0	8.3	359.6	Off	8.15	6.2
11876	108	71	181	168	379	72	120	15210	192.9	5013	9.81	9.66		41.0	6.3	359.6	Off	8.15	6.2
11936	107	71	181	168	378	71	120	15084	187.8	5010.6	9.88	9.6		41.0	6.3	359.8	Off	8.15	6.2
11996	107	72	161	168	378	71	120	14905	188.2	5011	9.95	9.55		41.0	6.3	359.6	Off	8.15	6.2
12056	107	73	181	167	375	71	119	14905	180.2	5011.8	9.96	9.54		41.0	6.3	308.2	Off	8.15	6.2
12116	106	74	181	167	373	71	119	15055	172.7	5012.2	9.9	9.59		41.0	6.3	308.2	Off	8.15	6.2
12176	107	75	161	167	372	71	118	15076	176.9	5014.2	9.92	9.54		41.0	6.3	308.2	Off	8.15	6.2
12236	107	75	181	167	370	72	118	15084	175.8	5010.6	9.96	9.52		41.0	6.3	308.2	Off	8.15	6.2
12296	107	73	160	167	369	72	118	14994	182	5011.4	10.02	9.44		41.0	6.3	359.7	Off	8.16	6.2
12356	107	72	160	167	367	72	119	14921	180.5	5012.6	10.05	9.42		41.0	6.3	335.7	Off	8.16	6.2
12412	106	71	160	167	366	71	119	14848	181.8	5012.2	10.1	9.38		41.0	6.3	359.7	Off	8.16	6.2
12472	105	71	160	167	366	71	118	14795	179.7	5012.2	10.14	9.35		41.0	6.3	359.7	Off	8.16	6.2
12532	105	72	160	167	366	71	118	14734	180	5013	10.2	9.3		41.0	6.3	359.7	Off	8.16	6.2
12592	105	73	160	167	366	71	117	14758	177.4	5012.2	10.18	9.34		41.0	6.3	359.7	Off	8.16	6.2
12652	105	73	160	166	363	71	117	14884	168.1	5010.2	10.13	9.39		41.0	6.3	308.3	Off	8.16	6.2
12712	105	75	160	166	361	71	117	15076	170.1	5011.4	10.06	9.43		41.0	6.3	308.3	Off	8.16	6.2
12772	105	75	160	166	359	72	117	15112	169.8	5011.4	10.17	9.32		40.5	6.3	308.3	Off	8.16	6.2
12832	105	74	159	168	357	72	117	15112	171.2	5011.8	10.26	9.23		40.5	6.3	359.8	Off	8.16	6.2
12892	105	73	160	166	356	72	117	14998	179.2	5013	10.42	9.07		40.5	8.3	308.3	Off	8.16	6.2
12952	105	72	159	166	355	72	117	14946	178.4	5011	10.51	8.98		40.5	6.3	359.8	Off	8.16	6.2
13012	105	71	159	166	357	72	117	15031	179.2	5011.8	10.53	8.99		40.5	6.3	359.8	Off	8.16	6.2
13072	104	71	159	166	359	71	117	15088	181.2	5011.8	10.52	8.99		41.0	6.3	359.8	Off	8.16	6.2
13132	104	72	159	165	359	71	116	15039	180.8	5013.4	10.65	8.89		41.0	6.3	308.4	Off	8.16	6.2
13192	104	72	158	165	359	71	116	15031	178.1	5010.6	10.73	8.82		41.0	6.3	359.9	Off	8.16	6.2
13252	111	74	158	165	367	71	121	15470	327.1	5011.4	10.49	8.99		41.0	6.3	359.9	On	8.16	6.2
13312	110	75	158	165	412	70	126	13493	913.2	5009	12.59	7.09		40.5	6.3	359.9	On	8.16	6.2
13372	113	76	158	165	486	71	133	14823	905.3	5011	12.86	7.33		40.5	8.3	359.9	On	8.16	6.2
13432	120	77	158	165	564	70	141	16020	1034	5011.4	11.87	8.5		40.4	6.3	359.9	On	8.16	6.2
13492	130	78	158	165	632	71	150	15552	1109	5012.6	10.29	9.83		40.0	6.3	359.9	On	8.16	6.2
13552	141	80	159	165	685	71	160	15190	1067.5	5011	8.56	11.39		39.7	6.3	308.4	On	8.16	6.2
13812	149	81	159	165	719	71	170	16018	1085.8	5009.8	7.21	12.43		39.5	6.3	308.4	On	8.16	6.2
13672	157	82	159	166	749	71	178	17240	1144.9	5011.8	6.39	13.2		39.5	6.3	359.8	On	8.16	6.2
13732	164	83	159	166	780	71	186	19206	1278.8	5009.4	5.58	14.04		39.0	6.3	335.8	On	8.16	6.2
13788	170	83	160	167	746	72	192	20789	1433.4	5011.8	4.91	14.67		39.0	8.3	359.7	On	8.16	6.2
13848	174	84	161	167	747	71	198	20972	1503.9	5012.2	4.71	14.86		38.5	6.3	308.2	On	8.15	6.2
13908	178	85	181	168	754	71	202	21798	1507.8	5010.2	4.18	15.43		38.0	6.3	359.6	On	8.15	6.2
13968	182	85	162	166	762	72	206	22575	1614.4	5011	3.87	15.76		38.0	6.3	308.1	On	8.15	6.2
14028	185	85	182	169	767	72	210	23254	1653	5010.6	3.79	15.85		37.5	6.3	359.4	On	8.15	6.2
14088	186	85	182	169	778	72	212	23930	1738.4	5011	3.92	15.72		37.5	6.3	359.4	On	8.15	6.2
14148	188	84	162	170	791	72	214	24540	1771.5	5010.6	4.15	15.48		37.0	6.3	410.8	On	8.15	6.2
14208	189	83	163	170	820	72	216	25183	1857.7	5010.6	4.3	15.26		37.0	6.3	359.3	On	8.15	6.2
14268	189	83	163	171	845	72	216	24898	1887.2	5012.2	4.37	15.15		36.5	6.3	410.7	On	8.15	6.2
14328	191	83	164	171	860	71	217	22949	1757.6	5012.2	4.43	15.1		36.5	6.3	359.2	On	8.14	6.2
14388	191	83	164	171	868	71	219	23043	1658.9	5010.6	4.23	15.28		36.0	6.3	359.2	On	8.14	6.2
14448	193	84	164	172	879	71	221	24756	1819.2	5009	3.82	15.66		35.5	6.3	410.5	On	8.14	6.2

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
14508	195	85	165	172	886	71	223	25916	1923.3	5009.4	3.43	16		35.1	6.3	359.1	On	8.14	6.2
14568	196	86	165	172	890	71	224	27010	1995.4	5010.2	3.36	16.05		35.0	6.3	359.1	On	8.14	6.2
14628	197	86	165	173	906	72	226	26475	2005.4	5011	3.66	15.62		34.5	6.3	410.4	On	8.14	6.2
14688	198	87	166	173	946	72	228	27250	1999.8	5012.2	3.69	15.69		34.5	6.3	358.9	On	8.14	6.2
14748	198	87	166	173	940	72	228	25806	1913.2	5010.6	3.54	15.82		34.0	6.3	358.9	Off	8.14	6.2
14808	196	86	166	174	933	72	227	25456	1908.5	5009.4	4.02	15.34		33.5	6.3	410.2	Off	8.14	6.2
14868	195	85	167	174	920	72	225	24064	1797.4	5011.8	4.46	14.99		33.5	6.3	358.8	Off	8.14	6.2
14928	193	84	167	174	900	72	222	22953	1686.7	5011.4	4.86	14.66		33.5	6.3	358.6	Off	8.14	6.2
14988	192	83	167	175	897	72	220	22298	1646.5	5010.6	5.33	14.2		33.0	6.3	410.1	Off	8.14	6.2
15048	189	82	167	175	886	72	218	20911	1548	5011.4	5.74	13.81		33.0	6.3	410.1	Off	8.14	6.2
15108	187	82	167	175	878	71	216	20011	1452.8	5010.6	6.52	13.1		33.0	6.3	382.7	Off	8.14	6.2
15164	185	83	168	175	875	71	214	19380	1393.2	5011.4	7.13	12.61		32.5	6.3	358.7	Off	8.13	6.2
15224	185	83	168	175	876	71	214	18994	1371.6	5012.2	7.25	12.57		32.5	6.3	358.7	Off	8.13	6.2
15284	184	84	168	175	872	72	214	18852	1351.7	5013	7.15	12.68		32.0	6.3	358.7	Off	8.13	6.2
15344	184	85	168	176	868	71	213	18852	1334.3	5010.6	7.17	12.64		32.0	6.3	409.9	Off	8.13	6.2
15404	184	85	168	176	872	72	213	18351	1326.8	5011	7.26	12.59		31.5	6.3	409.9	Off	8.13	6.2
15464	178	82	169	176	840	72	209	17973	1295.2	5009.4	7.36	12.49		31.5	6.3	358.6	Off	8.13	6.2
15524	161	78	168	176	755	72	194	18823	894.5	5011	8.51	11.34		31.5	6.3	409.9	Off	8.13	6.2
15584	149	77	169	176	694	72	179	33757	577.6	5013	7.94	12.21		31.5	6.3	358.6	Off	8.13	6.2
15644	141	76	168	176	649	72	189	39010	772.1	5011.4	7.69	12.63		31.5	6.3	409.9	Off	8.13	6.2
15704	137	75	168	176	618	71	161	37708	737.8	5009	8.13	12.32		31.5	6.3	409.9	Off	8.13	6.2
15764	134	75	168	176	595	71	156	35820	691.4	5012.6	8.69	11.78		31.5	6.3	409.9	Off	8.13	6.2
15824	132	75	168	176	576	71	151	33256	638.8	5008.5	8.99	11.45		31.5	6.4	415.8	Off	8.13	6.3
15884	130	75	169	176	582	71	147	30770	570.1	5013	9.11	11.29		31.0	6.4	363.7	Off	8.13	6.3
15944	128	76	169	176	548	71	144	28434	512.4	5011.4	9.21	11.14		31.0	6.4	363.7	Off	8.13	6.3
16004	128	77	169	176	537	71	142	26546	460.3	5011	9.23	11.06		31.0	6.4	363.7	Off	8.13	6.3
16064	126	78	169	176	525	71	140	24793	419.9	5010.2	9.29	10.94		31.0	6.4	363.7	Off	8.13	6.3
16124	125	78	168	176	516	72	139	23348	383.3	5011.8	9.28	10.84		31.0	6.4	415.8	Off	8.13	6.3
16184	124	78	169	176	507	72	138	21936	353.4	5011	9.32	10.73		31.0	6.4	363.7	Off	8.13	6.3
16244	123	78	168	176	500	72	137	20703	325.5	5009.8	9.34	10.63		31.0	6.4	415.8	Off	8.13	6.3
16304	123	77	168	176	493	72	135	19560	305.7	5011.4	9.38	10.48		31.0	6.4	415.8	Off	8.13	6.3
16364	121	76	168	175	487	72	134	18433	281.9	5012.6	9.43	10.35		31.0	6.4	363.8	Off	8.13	6.3
16424	120	76	168	175	482	72	132	17550	265.1	5010.6	9.45	10.28		31.0	6.4	363.8	Off	8.13	6.3
16484	118	75	167	175	477	72	131	16716	242.2	5009.4	9.44	10.19		31.0	6.4	388.2	Off	8.14	6.3
16540	117	74	167	175	473	71	129	16016	231.4	5010.6	9.46	10.1		31.0	6.4	415.9	Off	8.14	6.3
16600	116	75	167	174	469	71	128	15446	220.4	5010.2	9.45	10.07		31.0	6.4	363.9	Off	8.14	6.3
16660	115	75	166	174	466	71	127	14893	208.3	5010.6	9.47	10		31.0	6.4	416.1	Off	8.14	6.3
16720	113	75	166	173	463	71	126	14482	194	5014.2	9.43	10		30.5	6.4	364.1	Off	8.14	6.3
16780	112	76	166	173	459	72	126	14172	184.1	5009.8	9.37	10		30.5	6.4	364.1	Off	8.14	6.3
16840	111	77	166	173	455	72	125	13794	178.4	5011.4	9.36	9.98		30.5	6.4	364.1	Off	8.14	6.3
16900	112	77	166	173	451	72	124	13546	170.6	5011.4	9.3	9.99		30.5	6.4	364.1	Off	8.14	6.3
16960	111	77	166	173	448	72	123	13265	165.4	5011.8	9.28	9.97		30.5	6.4	364.1	Off	8.14	6.3
17020	110	77	166	173	444	72	123	12919	165.4	5012.6	9.38	9.83		30.5	6.4	364.1	Off	8.14	6.3
17080	109	76	165	172	439	72	122	12545	155.3	5012.6	9.53	9.67		30.5	6.4	364.2	Off	8.14	6.3
17140	109	75	165	172	435	72	121	12329	153	5011.8	9.56	9.6		30.5	6.4	364.2	Off	8.14	6.3
17200	108	75	165	172	432	71	120	12166	148.8	5012.6	9.59	9.55		30.5	6.4	364.2	Off	8.14	6.3
17260	106	74	165	172	428	71	119	11991	145.3	5011.4	9.63	9.48		30.5	6.4	364.2	Off	8.14	6.3
17320	106	74	164	172	426	71	118	11902	142.3	5010.6	9.63	9.48		30.5	6.4	416.4	Off	8.14	6.3
17380	105	74	164	172	424	71	118	11816	140.1	5013.4	9.62	9.46		30.5	6.4	416.4	Off	8.14	6.3
17440	104	74	164	172	421	71	117	11812	134.4	5012.2	9.61	9.48		30.5	6.4	416.4	Off	8.14	6.3
17500	104	75	164	172	418	71	117	11755	131.7	5010.6	9.57	9.5		30.5	6.4	416.4	Off	8.14	6.3
17560	104	76	164	171	416	71	116	11764	132	5009.8	9.52	9.54		30.5	6.4	364.3	Off	8.14	6.3
17620	104	77	165	171	414	72	116	11735	128.9	5011.6	9.47	9.55		30.5	6.4	312.2	Off	8.14	6.3
17680	103	77	164	171	412	72	115	11678	128.6	5011.4	9.47	9.55		30.5	6.4	364.3	Off	8.14	6.3
17740	104	78	164	171	410	72	115	11690	126.1	5009.8	9.43	9.59		30.5	6.4	364.3	Off	8.14	6.3
17800	103	77	164	171	408	72	115	11625	126.3	5011.8	9.44	9.56		30.5	6.4	364.3	Off	8.14	6.3
17860	103	75	164	171	405	72	115	11507	128.9	5011.8	9.5	9.51		30.5	6.4	340.0	Off	8.14	6.3
17916	102	73	164	171	403	72	114	11418	127.3	5009.4	9.56	9.45		30.5	6.4	364.3	Off	8.14	6.3
17976	101	72	164	171	401	72	114	11292	127	5013.8	9.66	9.36		30.5	6.4	364.3	Off	8.14	6.3
18036	101	72	163	171	399	72	113	11198	122.2	5012.2	9.76	9.28		30.5	6.4	416.5	Off	8.15	6.3
18096	100	73	163	171	398	71	112	11169	125.3	5011	9.81	9.24		30.5	6.4	416.5	Off	8.15	6.3
18156	99	73	163	171	396	71	112	11161	116.9	5011.8	9.86	9.19		30.5	6.4	416.5	Off	8.15	6.3
18216	99	74	163	170	394	71	112	11267	117.7	5011.4	9.78	9.27		30.5	6.4	364.5	Off	8.15	6.3
18276	99	75	163	170	393	72	111	11340	116	5009.4	9.72	9.33		30.0	6.4	384.5	Off	8.15	6.3
18336	99	76	163	170	391	72	111	11349	115.4	5012.2	9.69	9.36		30.0	6.4	364.5	Off	8.15	6.3
18396	99	77	163	170	387	71	111	11401	114.9	5010.6	9.65	9.39		30.0	6.4	364.5	Off	8.15	6.3
18456	99	77	163	170	385	72	111	11344	113.3	5013	9.63	9.39		30.0	6.4	364.5	Off	8.15	6.3
18516	98	77	163	170	383	72	111	11292	114.4	5011.4	9.67	9.37		30.0	6.4	364.5	Off	8.15	6.3
18576	98	76	163	170	381	72	111	11178	116.5	5012.6	9.73	9.3		30.0	6.4	364.5	Off	8.15	6.3
18636	98	75	163	170	379	72	110	11039	113.4	5013	9.81	9.23		30.0	6.4	364.5	Off	8.15	6.3

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
18696	98	74	163	170	377	72	110	10995	112.3	5010.6	9.68	9.2		30.0	6.4	364.5	Off	8.15	6.3
18756	97	74	162	169	375	71	109	10962	111.8	5011.8	9.87	9.2		30.0	6.4	364.6	Off	8.15	6.3
18816	96	73	162	169	373	71	109	10881	111.8	5011.4	9.95	9.13		30.0	6.4	364.6	Off	8.15	6.3
18876	95	73	162	169	372	71	108	10860	110.5	5009.8	9.99	9.1		30.5	6.4	364.6	Off	8.15	6.3
18936	95	73	162	169	371	70	108	10897	109.7	5011.8	10	9.11		30.3	6.4	364.6	Off	8.15	6.3
18996	94	74	162	169	370	71	108	11003	105.1	5012.6	9.94	9.17		30.0	6.4	364.6	Off	8.15	6.3
19056	95	75	162	169	369	71	108	11137	105	5011.8	9.82	9.28		30.0	6.4	364.6	Off	8.15	6.3
19116	95	76	162	169	367	71	108	11186	105.3	5013.8	9.76	9.36		30.0	6.4	364.6	Off	8.15	6.3
19176	94	77	162	168	367	71	107	11231	103.2	5011.4	9.74	9.36		30.0	6.4	312.5	Off	8.15	6.3
19236	94	77	162	168	365	71	107	11267	103.8	5013.8	9.74	9.36		30.0	6.4	291.7	Off	8.15	6.3
19292	95	77	162	168	364	71	107	11300	104.5	5011.4	9.75	9.35		30.0	6.4	312.5	Off	8.15	6.3
19352	95	78	162	168	362	72	107	11312	102.5	5010.6	9.75	9.33		30.0	6.4	312.5	Off	8.15	6.3
19412	95	78	161	168	361	72	107	11308	102.5	5011	9.77	9.32		30.0	6.4	364.7	Off	8.15	6.3
19472	94	77	161	168	359	72	107	11239	108.7	5010.2	9.84	9.25		30.0	6.4	364.7	Off	8.15	6.3
19532	94	76	161	168	357	72	107	11100	106.1	5012.2	9.99	9.13		30.0	6.4	364.7	Off	8.15	6.3
19592	94	75	161	168	356	72	107	11084	107.1	5011.4	10.02	9.11		30.0	6.4	364.7	Off	8.15	6.3
19652	94	74	161	167	356	72	106	11084	106.6	5011	10.01	9.12		30.0	6.4	312.8	Off	8.15	6.3
19712	93	74	161	168	355	72	106	11011	103.7	5010.2	10.08	9.06		30.0	6.4	364.7	Off	8.15	6.3
19772	93	73	160	167	354	71	106	11047	103.4	5012.2	10.11	9.07		30.0	6.4	364.8	Off	8.16	6.3
19832	92	74	161	167	353	71	105	11068	108.6	5011.4	10.12	9.07		30.0	6.4	312.8	Off	8.15	6.3
19892	92	74	160	167	352	71	104	11113	99.3	5011	10.09	9.1		30.0	6.4	364.8	Off	8.16	8.3
19952	92	75	160	167	351	71	105	11218	100.8	5013	10.03	9.16		30.0	6.4	364.8	Off	8.16	6.3
20012	92	78	160	167	351	71	105	11316	99	5011.4	10	9.19		30.0	6.4	364.8	Off	8.16	6.3
20072	92	77	160	167	350	71	105	11422	99	5010.6	9.88	9.25		30.0	6.4	364.8	Off	8.16	6.3
20132	93	77	160	167	348	72	105	11471	101.4	5011.8	9.86	9.27		30.0	6.4	364.8	Off	8.16	6.3
20192	92	77	160	166	347	72	105	11499	98	5010.8	9.86	9.31		30.0	6.4	312.7	Off	8.16	6.3
20252	92	76	160	166	346	72	105	11544	100.1	5011.4	9.84	9.35		30.0	6.4	312.7	Off	8.16	6.3
20312	92	74	160	166	345	72	105	11503	104.2	5010.2	9.88	9.33		30.0	6.4	312.7	Off	8.16	6.3
20372	92	73	159	166	344	72	104	11410	108.1	5011	9.94	9.26		30.0	6.4	364.9	Off	8.16	6.3
20432	92	72	159	166	343	71	104	11235	108	5012.2	10.1	9.14		30.0	6.4	364.9	Off	8.16	6.3
20492	92	72	159	166	343	71	104	11186	100.7	5012.2	10.17	9.09		30.0	6.4	364.9	Off	8.16	6.3
20552	91	73	159	166	342	71	104	11202	108.9	5011.8	10.21	9.08		30.0	6.4	364.9	Off	8.16	6.3
20612	91	73	159	165	342	71	104	11182	99.9	5011.8	10.26	9.06		30.0	6.3	287.8	Off	8.16	6.2
20668	91	74	159	166	341	71	104	11320	99.1	5012.2	10.17	9.14		30.0	6.3	359.8	Off	8.16	6.2
20728	91	75	159	165	341	71	104	11430	97.5	5012.2	10.13	9.19		30.0	6.3	308.4	Off	8.16	6.2
20788	91	76	159	165	339	71	104	11564	96.5	5011.4	10.02	9.27		30.0	6.3	308.4	Off	8.16	6.2
20848	91	76	159	165	339	72	104	11719	96	5011	9.93	9.38		30.0	6.3	308.4	Off	8.16	6.2
20908	95	77	159	165	332	72	107	11983	147.9	5009	9.72	9.57		29.5	6.3	308.4	On	8.16	6.2
20968	102	79	158	165	340	72	118	10262	660.2	5010.2	11.39	8.08		29.5	6.3	359.9	On	8.16	6.2
21028	109	80	159	165	369	72	125	10291	664.7	5009.8	14.3	6.02		29.5	6.3	308.4	On	8.16	6.2
21088	116	80	158	165	409	72	132	11979	800.5	5010.8	14.12	6.42		29.5	6.3	359.9	On	8.16	6.2
21148	121	79	158	165	449	72	138	13070	863.6	5011.4	13.46	7.09		29.5	6.3	359.9	On	8.16	6.2
21208	126	78	158	164	473	72	142	13473	938.2	5012.6	12.83	7.54		29.5	6.3	308.5	On	8.16	6.2
21268	128	78	158	164	493	72	146	12467	845.5	5011.8	13.13	7.28		29.5	6.3	308.5	On	8.16	6.2
21328	131	78	158	164	518	72	149	12720	860.2	5011.8	12.99	7.42		29.0	6.3	308.5	On	8.16	8.2
21388	133	77	158	164	547	71	152	13131	873	5011.8	12.76	7.63		29.0	6.3	308.5	On	8.16	6.2
21448	136	78	158	164	576	71	155	13928	913.1	5012.2	12.41	7.92		29.0	6.3	308.5	On	8.16	6.2
21508	138	79	158	164	595	72	157	14535	954.3	5011.8	12.2	8.07		29.0	6.3	308.5	On	8.16	8.2
21568	139	79	158	164	611	72	159	15007	987.3	5012.6	12.07	8.16		28.5	6.3	308.5	On	8.16	6.2
21628	140	80	158	165	623	72	161	15609	1016.8	5010.6	11.94	8.27		28.5	6.3	359.9	On	8.16	6.2
21688	141	81	158	165	636	72	162	16227	1059.4	5012.2	11.79	8.4		28.5	6.3	359.9	On	8.16	6.2
21748	142	80	158	164	647	72	163	16630	1104.3	5012.2	11.71	8.47		28.5	6.3	308.5	On	8.16	6.2
21808	143	79	158	165	660	72	165	17049	1133.1	5010.2	11.64	8.54		28.5	6.3	359.9	On	8.16	6.2
21868	143	79	158	165	681	71	166	17346	1170.1	5010.2	11.53	8.61		28.5	6.3	359.9	On	8.16	6.2
21928	144	78	158	165	669	71	167	17139	1189.3	5009.4	11.47	8.68		28.5	6.3	359.9	On	8.16	6.2
21988	145	78	158	165	659	71	168	16968	1174	5012.6	11.7	8.46		28.0	6.3	335.9	On	8.16	6.2
22044	146	78	158	165	658	71	168	17745	1154.5	5011	11.8	8.34		28.0	6.3	359.9	On	8.16	6.2
22104	147	79	158	165	663	71	169	18323	1209	5011.8	11.73	8.38		28.0	6.3	359.9	On	8.16	8.2
22164	148	80	159	165	669	71	171	18661	1247.6	5011	11.64	8.5		27.5	6.3	308.4	On	8.16	6.2
22224	149	81	159	166	677	71	172	19088	1269.9	5010.2	11.52	8.61		27.5	6.3	359.8	On	8.16	6.2
22284	150	82	159	166	687	72	174	19340	1300.1	5010.2	11.38	8.72		27.3	6.3	359.8	On	8.16	6.2
22344	151	81	159	166	695	72	175	18901	1325.5	5011.4	11.29	8.82		27.0	6.3	359.8	On	8.16	6.2
22404	151	81	159	166	700	72	175	18213	1307.8	5011.8	11.36	8.71		27.0	6.3	359.8	On	8.16	6.2
22464	152	80	159	166	702	72	175	18380	1250.3	5013	11.35	8.68		27.0	6.3	359.8	On	8.16	6.2
22524	153	79	159	166	701	72	176	18713	1264.6	5009.8	11.34	8.72		27.0	6.3	359.8	On	8.16	6.2
22584	153	79	159	166	701	71	176	18974	1287.6	5011.4	11.29	8.8		27.0	6.3	359.8	On	8.16	6.2
22644	153	79	159	166	702	71	176	19214	1310.4	5010.2	11.27	8.85		26.5	6.3	359.8	On	8.16	6.2
22704	153	78	159	166	701	71	177	19169	1330.6	5012.2	11.15	8.97		26.5	6.3	359.8	On	8.16	6.2
22764	154	79	160	167	704	71	178	19242	1327.8	5009.8	11	9.11		26.5	6.3	359.7	On	8.16	6.2
22824	155	80	160	166	704	71	179	19194	1328.1	5009.4	10.96	9.18		26.0	6.3	308.3	On	8.16	6.2

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FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
22884	157	81	160	167	706	71	180	18840	1328.9	5011.4	10.86	9.31		26.0	6.3	359.7	On	8.16	6.2
22944	157	82	160	167	708	72	182	18978	1301.3	5009	10.88	9.26		25.5	6.3	359.7	On	8.16	6.2
23004	157	83	160	167	718	72	182	19177	1316.1	5009.4	10.95	9.22		25.5	6.3	359.7	On	8.16	6.2
23064	157	82	161	167	720	72	182	19251	1329.6	5011.8	11.06	9.1		25.5	6.3	308.2	On	8.15	6.2
23124	156	82	160	167	717	72	181	19198	1333.3	5011.8	11.16	9.03		25.0	6.3	359.7	On	8.16	6.2
23184	156	80	161	167	714	72	180	19267	1333.3	5013	11.18	9		25.0	6.3	308.2	On	8.15	6.2
23244	156	79	160	167	714	72	180	19352	1336.9	5009.8	11.19	8.97		25.0	6.3	359.7	On	8.16	6.2
23304	156	79	161	167	715	72	180	19413	1341.5	5011.4	11.21	8.94		25.0	6.3	308.2	On	8.15	6.2
23364	156	79	161	167	720	71	180	19198	1345.5	5010.6	11.18	8.98		25.0	6.3	287.7	On	8.15	6.2
23420	156	79	161	168	719	71	180	18608	1320.5	5010.2	11.11	9.02		24.5	6.3	359.6	On	8.15	6.2
23480	156	79	161	168	716	71	180	18534	1281.4	5009	11.17	8.97		24.5	6.3	359.6	On	8.15	6.2
23540	156	79	161	168	713	71	180	18579	1276.5	5010.2	11.24	8.85		24.5	6.3	359.6	On	8.15	6.2
23600	156	81	161	168	710	71	180	18734	1286.3	5011.8	11.31	8.77		24.0	6.3	359.6	On	8.15	6.2
23660	156	81	161	168	708	71	180	18868	1297.4	5011.8	11.33	8.71		24.0	6.3	359.6	On	8.15	6.2
23720	156	82	161	168	707	72	180	18665	1300.6	5011.4	11.3	8.75		24.0	6.3	359.6	On	8.15	6.2
23780	156	83	162	168	703	72	181	18490	1285.5	5010.6	11.26	8.76		23.5	6.3	308.1	On	8.15	6.2
23840	156	83	162	168	699	72	180	18445	1273.4	5009.8	11.29	8.72		23.5	6.3	308.1	On	8.15	6.2
23900	156	83	162	168	695	72	180	18579	1275.7	5011	11.38	8.64		23.5	6.3	308.1	On	8.15	6.2
23960	156	83	162	168	691	72	180	18583	1285.2	5011.4	11.41	8.57		23.0	6.3	308.1	On	8.15	6.2
24020	155	82	161	168	691	73	179	18644	1285	5010.6	11.46	8.51		23.0	6.3	359.6	On	8.15	6.2
24080	156	81	162	168	688	72	179	18730	1288.6	5010.2	11.48	8.49		23.0	6.3	308.1	On	8.15	6.2
24140	155	80	161	169	682	72	178	18616	1287.1	5011.8	11.47	8.48		23.0	6.3	410.9	On	8.15	6.2
24200	154	79	162	168	678	72	178	18848	1284.7	5011	11.56	8.36		23.0	6.3	308.1	On	8.15	6.2
24260	154	79	162	169	676	72	178	18962	1306	5009	11.57	8.34		22.8	6.3	359.4	On	8.15	6.2
24320	153	79	161	169	669	71	177	18917	1307.3	5012.6	11.59	8.33		22.5	6.3	410.9	On	8.15	6.2
24380	153	79	162	169	666	71	177	18579	1298.3	5010.6	11.64	8.3		22.5	6.3	359.4	On	8.15	6.2
24440	153	79	162	169	664	71	177	18368	1268.6	5010.2	11.65	8.31		22.5	6.3	359.4	On	8.15	6.2
24500	153	81	162	169	663	71	177	18298	1259.9	5008.5	11.64	8.33		22.0	6.3	359.4	On	8.15	6.2
24560	153	81	162	169	662	71	178	18127	1255.2	5012.2	11.62	8.33		22.0	6.3	359.4	On	8.15	6.2
24620	153	82	162	169	661	72	178	17957	1241.7	5012.6	11.6	8.37		22.0	6.3	359.4	On	8.15	6.2
24680	154	83	162	169	661	72	178	17851	1226.4	5011.4	11.56	8.4		21.5	6.3	359.4	On	8.15	6.2
24740	154	83	162	169	662	72	178	17651	1220.7	5011.8	11.55	8.4		21.5	6.3	335.5	On	8.15	6.2
24796	154	83	162	169	661	72	178	17574	1207.4	5009.8	11.52	8.44		21.5	6.3	359.4	On	8.15	6.2
24856	154	82	162	169	665	72	178	17505	1204.4	5012.6	11.52	8.44		21.5	6.3	359.4	On	8.15	6.2
24916	154	80	162	169	661	72	178	17582	1207.5	5012.2	11.45	8.49		21.4	6.3	359.4	On	8.15	6.2
24976	155	80	162	169	655	72	179	17623	1208.7	5011	11.32	8.64		21.0	6.3	359.4	On	8.15	6.2
25036	155	80	162	169	660	72	179	17883	1219.6	5011.4	11.06	8.85		21.0	6.3	359.4	On	8.15	6.2
25096	155	79	162	169	671	72	180	18180	1238.8	5009.8	11.05	8.84		21.0	6.3	359.4	On	8.15	6.2
25156	155	79	162	170	674	72	180	18095	1259.1	5010.6	11.17	8.73		21.0	6.3	410.8	On	8.15	6.2
25216	156	80	163	170	663	72	181	18005	1248.4	5013	11.22	8.73		20.5	6.3	359.3	On	8.15	6.2
25276	156	81	163	170	653	71	180	18201	1239.3	5011	11.16	8.79		20.5	6.3	359.3	On	8.15	6.2
25336	156	82	163	169	648	72	181	18510	1255.4	5009.4	11.15	8.83		20.5	6.3	308.0	On	8.15	6.2
25396	157	82	163	170	646	72	181	18722	1280.3	5011	11.2	8.8		20.0	6.3	359.3	On	8.15	6.2
25456	157	83	163	170	645	72	182	18876	1294.1	5009.4	11.26	8.77		20.0	6.3	359.3	On	8.15	6.2
25516	157	83	163	170	640	72	182	18996	1303.9	5010.6	11.24	8.81		19.5	6.3	359.3	On	8.15	6.2
25576	157	81	163	170	638	72	182	19047	1314	5010.6	11.22	8.85		19.5	6.3	359.3	On	8.15	6.2
25636	157	80	163	170	638	72	182	19019	1316.6	5011	11.17	8.9		19.5	6.3	359.3	On	8.15	6.2
25696	157	78	163	170	638	72	182	18815	1309.1	5013.8	11.14	8.95		19.5	6.3	359.3	On	8.15	6.2
25756	157	78	163	170	638	72	181	18791	1293.9	5012.2	11.23	8.84		19.5	6.3	359.3	On	8.15	6.2
25816	158	79	163	170	634	72	181	18835	1299.8	5009	11.28	8.81		19.5	6.3	359.3	On	8.15	6.2
25876	156	79	163	170	640	71	180	18921	1307.3	5011.8	11.29	8.8		19.0	6.3	359.3	On	8.15	6.2
25936	156	80	163	170	650	71	180	18380	1314	5009.8	11.39	8.72		19.0	6.3	359.3	On	8.15	6.2
25996	158	81	163	170	648	71	180	18648	1268.7	5010.2	11.58	8.54		19.0	6.3	359.3	On	8.15	6.2
26056	156	82	164	170	643	71	180	19214	1300.5	5011.4	11.68	8.48		18.5	6.3	307.9	On	8.14	6.2
26116	156	83	164	170	633	72	180	19450	1338.9	5011.8	11.64	8.54		18.5	6.3	287.4	On	8.14	6.2
26172	157	83	164	171	624	72	181	19535	1355.5	5010.2	11.5	8.67		18.0	6.3	359.2	On	8.14	6.2
26232	158	83	164	171	622	72	182	19405	1366.7	5012.2	11.37	8.82		18.0	6.3	359.2	On	8.14	6.2
26292	158	82	164	171	623	72	182	19202	1356.4	5011.4	11.26	8.93		17.5	6.3	359.2	On	8.14	6.2
26352	159	81	164	171	627	72	183	19047	1336.6	5010.6	11.21	8.99		17.5	6.3	359.2	On	8.14	6.2
26412	159	80	164	171	629	72	183	18681	1327.1	5011.4	11.07	9.14		17.5	6.3	359.2	On	8.14	6.2
26472	160	78	164	171	631	72	183	18351	1294.9	5014.2	10.97	9.21		17.0	6.3	359.2	On	8.14	6.2
26532	160	77	164	171	634	72	183	18164	1278.5	5010.2	10.95	9.24		17.0	6.3	359.2	On	8.14	6.2
26592	160	78	164	171	637	72	184	17839	1260.3	5011	10.83	9.36		17.0	6.3	359.2	On	8.14	6.2
26652	160	78	164	171	640	71	183	17537	1236.3	5011	10.73	9.44		17.0	6.3	359.2	On	8.14	6.2
26712	160	78	164	172	639	71	183	17326	1221.4	5010.6	10.7	9.49		17.0	6.3	410.5	On	8.14	6.2
26772	160	79	164	171	632	71	183	17249	1201.2	5011.4	10.72	9.45		16.5	6.3	359.2	On	8.14	6.2
26832	160	80	164	172	629	71	184	17680	1191.6	5010.6	10.92	9.25		16.5	6.3	410.5	On	8.14	6.2
26892	160	81	165	171	629	71	184	17896	1224.9	5011.4	10.95	9.24		16.0	6.3	307.8	On	8.14	6.2
26952	160	82	165	172	628	71	184	17835	1239.6	5011.4	10.93	9.24		16.0	6.3	359.1	On	8.14	6.2
27012	160	82	165	172	630	71	184	17839	1241.7	5013	11	9.18		16.0	6.3	359.1	On	8.14	6.2

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
27072	160	83	165	172	630	72	184	17765	1242.5	5011.4	10.96	9.2		15.5	6.3	359.1	On	8.14	6.2
27132	160	83	165	172	629	72	185	17876	1231.1	5010.6	10.95	9.19		15.5	6.3	359.1	On	8.14	6.2
27192	161	84	165	172	631	72	185	17672	1229	5012.2	10.96	9.17		15.5	6.4	364.2	On	8.14	6.3
27252	161	84	165	172	633	72	185	17639	1236.7	5011.4	10.93	9.2		15.0	6.4	364.2	On	8.14	6.3
27312	161	84	165	172	640	73	185	17497	1228	5010.2	10.87	9.24		15.0	6.4	364.2	On	8.14	6.3
27372	161	84	165	172	645	73	185	17086	1217.6	5010.2	10.67	9.44		15.0	6.4	364.2	On	8.14	6.3
27432	162	83	166	172	651	73	186	16777	1188.5	5010.6	10.61	9.48		14.5	6.4	312.1	On	8.14	6.3
27492	162	83	165	173	651	72	186	16333	1166	5010.2	10.46	9.63		14.5	6.4	388.5	On	8.14	6.3
27548	161	82	166	173	652	72	185	16146	1132.2	5010.2	10.45	9.62		14.5	6.4	364.1	On	8.14	6.3
27608	161	81	166	173	656	72	185	15975	1123.9	5011	10.45	9.62		14.5	6.4	364.1	On	8.14	6.3
27668	160	80	166	173	659	72	184	15938	1115.4	5012.6	10.44	9.62		14.0	6.4	364.1	On	8.14	6.3
27728	160	80	166	173	660	71	184	15857	1109	5009.4	10.49	9.58		14.0	6.4	364.1	On	8.14	6.3
27788	160	79	166	173	658	71	184	15898	1104.3	5010.6	10.52	9.53		14.0	6.4	364.1	On	8.14	6.3
27846	160	80	166	173	654	71	184	15890	1093.6	5011.4	10.64	9.39		14.0	6.4	364.1	On	8.14	6.3
27908	160	80	166	173	648	71	184	16215	1101.7	5010.6	10.75	9.31		13.5	6.4	364.1	On	8.14	6.3
27968	160	82	166	173	645	71	184	16431	1117.8	5009.4	10.79	9.26		13.5	6.4	364.1	On	8.14	6.3
28028	160	82	166	173	643	71	184	16488	1134.1	5010.2	10.78	9.28		13.5	6.4	364.1	On	8.14	6.3
28088	160	83	166	174	644	72	184	16695	1141	5010.6	10.76	9.29		13.0	6.4	418.1	On	8.14	6.3
28148	160	83	167	174	642	72	185	16850	1159.2	5009	10.74	9.29		13.0	6.4	363.9	On	8.14	6.3
28208	161	82	167	174	644	72	185	16870	1168.6	5010.6	10.74	9.3		13.0	6.4	363.9	On	8.14	6.3
28268	161	81	166	174	643	72	185	18793	1171.9	5010.2	10.71	9.31		13.0	6.4	418.1	On	8.14	6.3
28328	161	80	167	174	641	72	185	16996	1169.1	5011.4	10.69	9.32		12.5	6.4	363.9	On	8.14	6.3
28388	160	80	167	174	645	71	185	17045	1182.9	5010.2	10.75	9.28		12.5	6.4	363.9	On	8.14	6.3
28448	160	79	167	174	644	71	185	17236	1191.9	5010.6	10.83	9.18		12.5	6.4	363.9	On	8.14	6.3
28506	159	79	167	174	636	70	184	17688	1195	5012.2	10.94	9.06		12.5	6.4	363.9	On	8.14	6.3
28568	159	80	167	174	629	70	184	18429	1225.1	5009.4	11.06	8.95		12.1	6.4	363.9	On	8.14	6.3
28628	159	80	167	174	628	70	184	18713	1279.1	5008.5	10.97	9.04		12.0	6.4	363.9	On	8.14	6.3
28688	160	81	167	174	626	70	185	19308	1292.2	5011.8	11.07	8.92		12.0	6.4	363.9	On	8.14	6.3
28746	160	82	167	174	627	71	185	19784	1333.7	5011.4	11.08	8.94		11.5	6.4	363.9	On	8.14	6.3
28808	161	83	187	174	628	71	185	19946	1371.3	5009.4	11.04	8.95		11.5	6.4	363.9	On	8.14	6.3
28868	161	83	167	175	628	71	186	20134	1388.7	5011	11.06	8.92		11.5	6.4	388.2	On	8.14	6.3
28924	160	84	167	174	632	71	186	20190	1404.1	5011.8	11.04	8.94		11.3	6.4	363.9	On	8.14	6.3
28984	161	84	167	175	637	72	186	20215	1411.6	5009.8	11.02	8.95		11.0	6.4	415.9	On	8.14	6.3
29044	162	84	168	175	639	72	187	19674	1416.7	5009.8	10.85	9.15		11.0	6.4	363.8	On	8.13	6.3
29104	162	84	168	175	635	72	187	19426	1379.2	5010.2	10.75	9.21		10.7	6.4	363.8	On	8.13	6.3
29164	162	85	168	175	638	72	187	19535	1352.1	5011.4	10.85	9.08		10.5	6.4	363.8	On	8.13	6.3
29224	162	84	168	175	638	73	187	18831	1362.6	5011	10.75	9.16		10.5	6.4	363.8	On	8.13	6.3
29284	161	83	168	175	628	73	187	18636	1311.8	5012.6	10.87	9		10.5	6.4	363.8	On	8.13	6.3
29344	161	82	188	175	636	72	187	19486	1292.6	5010.6	11	8.93		10.0	6.4	363.8	On	8.13	6.3
29404	161	81	188	175	637	72	186	18518	1360	5010.6	10.72	9.16		10.0	6.4	363.8	On	8.13	6.3
29464	160	81	168	175	832	72	187	18376	1284	5011.4	10.77	9.09		10.0	6.4	363.8	On	8.13	6.3
29524	160	80	188	175	629	72	186	18258	1275.6	5010.2	10.75	9.05		10.0	6.4	363.8	On	8.13	6.3
29584	159	80	168	175	626	71	166	18420	1266.1	5012.2	10.93	8.84		10.0	6.4	363.8	On	8.13	6.3
29644	159	80	168	175	828	71	185	19177	1276.2	5009	11.01	8.77		10.0	6.4	363.8	On	8.13	6.3
29704	160	81	168	176	633	71	186	18933	1330.4	5011.4	10.86	8.9		9.5	6.4	415.8	On	8.13	6.3
29764	155	79	168	176	644	71	183	17879	1310.2	5009.4	10.65	9.1		9.5	6.4	415.8	On	8.13	6.3
29824	143	78	169	176	614	71	173	16028	1069.5	5009.6	11.36	8.43		9.5	6.4	363.7	Off	8.13	6.3
29884	134	78	169	176	582	71	162	26042	365.4	5010.6	9.59	10.32		9.5	6.4	363.7	Off	8.13	6.3
29944	128	79	169	176	563	71	154	34436	487.8	5011.6	8.15	11.39		9.0	6.4	363.7	Off	8.13	6.3
30004	124	79	169	176	545	72	147	35026	561.2	5011.8	8.08	11.37		9.0	6.4	363.7	Off	8.13	6.3
30064	121	79	169	176	531	72	143	32971	542.8	5011	8.25	11.2		9.0	6.4	363.7	Off	8.13	6.3
30124	119	79	169	176	518	72	139	30448	493.7	5009.4	8.38	11.1		9.0	6.4	363.7	Off	8.13	6.3
30184	117	78	169	176	507	73	136	28149	444.3	5011.4	8.47	10.98		9.0	6.4	363.7	Off	8.13	6.3
30244	116	77	168	176	499	72	133	25985	403.6	5009.4	8.6	10.84		9.0	6.4	388.1	Off	8.13	6.3
30300	114	76	168	176	490	72	131	24296	368.2	5010.6	8.67	10.74		9.0	6.4	415.8	Off	8.13	6.3
30360	113	75	168	176	483	72	129	22571	331.7	5011.8	8.8	10.56		9.0	6.4	415.8	Off	8.13	6.3
30420	111	75	168	176	476	72	127	21033	301.8	5012.6	8.85	10.45		9.0	6.4	415.8	Off	8.13	6.3
30480	109	74	168	176	468	71	125	19670	274.3	5009.8	8.89	10.34		9.3	6.4	415.8	Off	8.13	6.3
30540	108	74	168	176	462	71	123	18404	250.5	5013	8.96	10.21		9.0	6.4	415.8	Off	8.13	6.3
30600	107	74	168	175	457	71	122	17415	228.7	5012.6	8.93	10.15		9.0	6.4	363.8	Off	8.13	6.3
30660	105	75	168	176	451	71	121	16642	208.3	5013.4	8.88	10.14		9.0	6.4	415.8	Off	8.13	6.3
30720	105	76	168	176	446	71	120	15975	194.3	5013.4	8.86	10.12		9.0	6.4	415.8	Off	8.13	6.3
30780	104	77	169	176	442	71	119	15470	181.6	5012.6	8.78	10.13		9.0	6.4	363.7	Off	8.13	6.3
30840	104	77	169	175	438	71	119	14913	175.5	5012.6	8.79	10.08		9.0	6.4	311.7	Off	8.13	6.3
30900	103	77	168	175	434	72	118	14587	165.7	5011.8	8.73	10.1		9.0	6.4	363.8	Off	8.13	6.3
30960	103	78	168	175	428	72	117	14217	158.4	5012.2	8.7	10.07		9.0	6.4	363.8	Off	8.13	6.3
31020	102	78	168	175	425	72	117	13884	152.2	5011.4	8.75	10.01		9.0	6.4	363.8	Off	8.13	6.3
31080	102	77	168	175	420	72	116	13615	154	5013.4	8.72	10.01		9.0	6.4	363.8	Off	8.13	6.3
31140	101	76	167	175	416	72	116	13302	147.6	5010.2	8.84	9.87		9.0	6.4	415.9	Off	8.14	6.3
31200	100	75	167	175	413	72	115	12988	147.1	5011	8.97	9.75		9.0	6.4	415.9	Off	8.14	6.3

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
31260	99	75	167	174	410	71	114	12850	144.4	5013	8.99	9.72		9.0	6.4	363.9	Off	8.14	6.3
31320	99	74	167	174	408	71	114	12813	139.2	5011.4	8.98	9.72		9.0	6.4	363.9	Off	8.14	6.3
31380	98	74	167	174	406	71	113	12691	141.3	5010.2	9.01	9.7		9.0	6.4	363.9	Off	8.14	6.3
31440	98	73	166	174	404	71	113	12614	138	5010.2	9.03	9.67		9.0	6.4	416.1	Off	8.14	6.3
31500	97	74	167	174	402	71	112	12594	132	5010.6	9.03	9.67		9.0	6.4	363.9	Off	8.14	6.3
31560	97	75	167	174	400	71	111	12655	128.4	5011	8.96	9.73		9.0	6.4	363.9	Off	8.14	6.3
31620	96	75	167	173	398	71	111	12691	127.8	5008.5	8.89	9.8		9.0	6.4	291.2	Off	8.14	6.3
31676	96	76	166	173	395	72	111	12740	126	5009	8.79	9.88		9.0	6.4	364.1	Off	8.14	6.3
31736	96	77	167	173	394	72	110	12699	124.2	5013	8.81	9.87		9.0	6.4	312.0	Off	8.14	6.3
31796	96	77	166	173	391	71	110	12614	122.4	5010.6	8.83	9.86		9.0	6.4	364.1	Off	8.14	6.3
31856	96	77	166	173	390	72	110	12581	121.7	5007.7	8.79	9.87		9.0	6.4	364.1	Off	8.14	6.3
31916	96	78	166	173	387	72	110	12524	120.4	5011	8.8	9.87		9.0	6.4	364.1	Off	8.14	6.3
31976	96	78	168	173	385	72	110	12476	117.7	5013.8	8.78	9.88		9.0	6.4	364.1	Off	8.14	6.3
32036	96	78	166	173	384	72	109	12431	116	5011.8	8.77	9.89		9.0	6.4	364.1	Off	8.14	6.3
32096	96	78	166	173	381	73	109	12321	117	5011.8	8.82	9.84		9.0	6.4	364.1	Off	8.14	6.3
32156	96	79	166	173	380	73	109	12280	113.3	5009.4	8.8	9.86		7.5	6.4	364.1	Off	8.14	6.3
32216	96	79	166	172	378	73	109	12158	113.9	5010.2	8.83	9.81		7.5	6.4	312.1	Off	8.14	6.3
32276	95	78	165	172	376	73	109	12012	120.4	5011	8.9	9.75		7.5	6.4	364.2	Off	8.14	6.3
32336	95	76	165	172	374	73	109	11792	115.2	5011.8	9.1	9.6		7.5	6.4	364.2	Off	8.14	6.3
32396	95	75	165	172	373	73	109	11621	116	5009.4	9.23	9.49		8.0	6.4	364.2	Off	8.14	6.3
32456	94	75	185	172	372	72	109	11593	117.2	5011	9.26	9.46		8.0	6.4	364.2	Off	8.14	6.3
32516	94	74	165	172	372	72	108	11560	113.4	5013	9.32	9.42		8.0	6.4	364.2	Off	8.14	6.3
32576	93	73	165	172	371	71	107	11556	114.6	5010.2	9.36	9.4		8.0	6.4	364.2	Off	8.14	6.3
32636	93	74	165	172	370	71	107	11601	114.4	5010.6	9.35	9.43		8.0	6.4	364.2	Off	8.14	6.3
32696	92	74	164	172	369	71	107	11641	108.1	5011.4	9.33	9.44		8.0	6.4	418.4	Off	8.14	6.3
32756	92	75	164	172	368	71	106	11727	105.5	5010.2	9.27	9.49		7.5	6.4	416.4	Off	8.14	6.3
32816	92	78	164	171	367	71	107	11853	105.6	5011	9.14	9.62		7.5	6.4	364.3	Off	8.14	6.3
32876	92	77	164	171	365	72	106	11947	104.2	5011.4	9.05	9.7		7.5	6.4	364.3	Off	8.14	6.3
32936	92	77	184	171	363	72	106	11943	105.3	5011.8	9.03	9.71		7.5	6.4	364.3	Off	8.14	6.3
32996	92	78	164	171	362	72	106	11979	104.7	5011.4	8.99	9.73		7.5	6.4	340.0	Off	8.14	6.3
33052	92	78	164	171	360	72	107	11979	106	5010.6	9.02	9.7		7.5	6.4	364.3	Off	8.14	6.3
33112	92	78	164	171	359	72	106	11939	104.2	5012.2	9.12	9.63		7.5	6.4	364.3	Off	8.14	6.3
33172	92	77	164	171	358	73	106	11951	106.9	5011	9.14	9.61		7.5	6.4	364.3	Off	8.14	6.3
33232	92	76	164	170	356	72	106	11808	109.7	5010.2	9.29	9.47		7.5	6.4	312.3	Off	8.14	6.3
33292	92	75	164	171	355	72	106	11711	111.2	5011.8	9.42	9.4		7.5	6.4	364.3	Off	8.14	6.3
33352	91	74	163	170	356	72	105	11694	109	5010.6	9.49	9.33		7.5	6.4	364.5	Off	8.15	6.3
33412	91	74	163	170	358	72	105	11686	109.4	5011	9.55	9.3		7.5	6.4	364.5	Off	8.15	6.3
33472	91	73	163	170	354	71	105	11707	108.9	5011.4	9.6	9.25		8.0	6.4	364.5	Off	8.15	6.3
33532	90	73	163	170	352	71	104	11759	111.3	5011.8	9.61	9.26		8.0	6.4	364.5	Off	8.15	6.3
33592	90	74	163	170	351	71	104	11808	105.3	5011.8	9.64	9.24		7.9	6.4	364.5	Off	8.15	6.3
33652	89	74	163	170	351	71	103	11926	104.5	5011.8	9.59	9.29		7.5	6.4	364.5	Off	8.15	6.3
33712	89	75	163	170	351	71	104	12040	103	5012.2	9.52	9.36		7.5	6.4	364.5	Off	8.15	6.3
33772	90	76	163	170	350	71	104	12244	100.9	5008.5	9.37	9.49		7.5	6.4	364.5	Off	8.15	6.3
33832	90	77	163	169	349	71	104	12297	102.5	5012.6	9.29	9.54		7.5	6.4	312.4	Off	8.15	6.3
33892	90	77	163	169	348	71	104	12231	101.4	5011.4	9.34	9.5		7.5	6.4	312.4	Off	8.15	6.3
33952	90	77	163	169	345	72	104	12195	99.4	5011.4	9.37	9.48		7.5	6.4	312.4	Off	8.15	6.3
34012	90	78	162	169	343	72	104	12126	100.3	5009.8	9.37	9.45		7.5	6.4	364.6	Off	8.15	6.3
34072	90	78	163	169	341	72	104	12069	99.4	5011.8	9.42	9.41		7.5	6.4	312.4	Off	8.15	6.3
34132	90	78	162	169	339	72	104	12012	97.3	5012.2	9.46	9.36		7.5	6.4	364.6	Off	8.15	6.3
34192	90	78	182	169	337	72	104	11926	97.7	5011.8	9.51	9.3		7.5	6.4	364.6	Off	8.15	6.3
34252	90	78	162	169	338	73	105	11804	97.8	5009.4	9.6	9.22		7.5	6.4	364.6	Off	8.15	6.3
34312	90	78	162	169	335	73	105	11776	97.5	5008.5	9.62	9.21		7.5	6.4	364.6	Off	8.15	6.3
34372	90	77	162	168	333	73	105	11617	110.5	5011.8	9.73	9.11		7.5	8.3	287.8	Off	8.15	6.2
34428	90	74	162	168	332	72	105	11373	101.4	5012.2	9.97	8.92		7.5	6.3	308.1	Off	8.15	6.2
34488	90	73	161	168	331	72	105	11271	104.2	5010.6	10.07	8.85		7.5	6.3	359.6	Off	8.15	6.2
34548	90	71	161	168	331	72	104	11174	104.2	5010.6	10.21	8.74		7.5	6.3	359.8	Off	8.15	6.2
34608	90	72	161	168	332	71	103	11100	103.2	5011	10.29	8.68		7.5	6.3	359.6	Off	8.15	6.2
34668	89	72	161	168	330	71	103	11125	99.1	5009.4	10.36	8.65		7.5	8.3	359.6	Off	8.15	6.2
34728	89	74	161	168	330	71	103	11287	93.9	5009.4	10.28	8.73		7.5	6.3	359.6	Off	8.15	6.2
34788	89	75	161	167	331	71	103	11511	96	5011.8	10.13	8.88		7.5	6.3	308.2	Off	8.15	6.2
34848	89	76	161	167	330	71	103	11678	96.4	5011	10	8.98		7.5	6.3	308.2	Off	8.15	6.2
34908	89	76	161	167	329	71	103	11747	95.2	5011.8	9.95	9.03		7.5	6.3	308.2	Off	8.15	6.2
34968	89	77	161	167	329	72	103	11812	95.9	5012.6	9.89	9.1		7.5	6.3	308.2	Off	8.15	6.2
35028	89	77	161	167	328	72	103	11829	95.4	5010.2	9.87	9.1		7.5	6.3	308.2	Off	8.15	6.2
35088	89	78	160	167	327	72	103	11784	93.6	5011	9.89	9.08		7.5	6.3	359.7	Off	8.16	6.2
35148	89	78	160	187	327	72	103	11739	94.1	5011.4	9.92	9.07		7.5	6.3	359.7	Off	8.16	6.2
35208	88	78	160	167	326	72	103	11768	92.9	5012.2	9.88	9.1		7.5	6.3	359.7	Off	8.16	6.2
35268	88	78	160	166	324	73	103	11764	91.5	5010.2	9.86	9.12		7.5	8.3	308.3	Off	8.16	6.2
35328	89	78	160	166	324	73	103	11735	92.1	5011.4	9.86	9.12		7.5	8.3	308.3	Off	8.16	6.2
35388	89	78	160	166	323	73	103	11739	91.5	5010.6	9.85	9.13		7.5	6.3	308.3	Off	8.16	6.2

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
35448	89	78	160	166	322	73	103	11707	89.5	5011	9.86	9.12		7.5	6.3	308.3	Off	8.16	6.2
35508	89	79	160	166	321	73	103	11678	88.9	5010.2	9.88	9.1		7.5	6.3	308.3	Off	8.16	6.2
35568	89	79	159	166	320	73	103	11658	86.1	5009.8	9.87	9.1		7.5	6.3	359.8	Off	8.16	6.2
35628	89	78	160	166	319	73	103	11515	87.4	5009	9.95	9.03		7.1	6.3	308.3	Off	8.16	6.2
35688	88	77	159	166	318	74	103	11393	90.7	5011.8	10.08	8.92		7.2	6.3	359.8	Off	8.16	6.2
35748	88	76	159	166	317	73	102	11296	90.5	5011.4	10.14	8.83		7.5	6.3	335.8	Off	8.16	6.2
35804	90	76	159	165	315	73	104	11202	105.1	5012.2	10.22	8.78		7.5	6.3	308.4	On	8.16	6.2
35864	98	77	159	165	310	73	111	10030	585.4	5011	10.83	8.12		7.5	6.3	308.4	On	8.16	6.2
35924	105	77	159	165	317	73	119	5839	340	5009.8	15.44	4.49		7.5	6.3	308.4	On	8.16	6.2
35984	110	77	159	165	331	72	126	7052	478.7	5010.6	16.44	4		7.5	6.3	308.4	On	8.16	6.2
36044	114	77	159	165	347	72	132	8675	597.5	5010.6	16.1	4.37		7.5	6.3	308.4	On	8.16	6.2
36104	118	77	158	165	363	71	136	9261	629.2	5011.4	15.73	4.69		7.5	6.3	359.9	On	8.16	6.2
36164	120	76	158	165	380	71	139	9562	645.7	5012.2	15.48	4.92		7.5	6.3	359.9	On	8.16	6.2
36224	123	77	158	165	396	71	142	9937	673	5011.8	15.24	5.14		7.0	6.3	359.9	On	8.16	6.2
36284	124	78	158	165	410	71	144	10258	693.7	5011.4	15	5.37		7.0	6.3	359.9	On	8.16	6.2
36344	126	79	158	165	423	71	146	10527	711.9	5013	14.84	5.52		7.0	6.3	359.9	On	8.16	6.2
36404	127	80	158	165	437	72	148	10909	734.7	5010.6	14.63	5.71		7.0	6.3	359.9	On	8.16	6.2
36464	128	81	158	164	448	72	150	11084	749.7	5008.5	14.5	5.83		7.0	6.3	308.5	On	8.16	6.2
36524	130	80	158	164	458	72	152	11137	754.7	5011	14.38	5.95		6.7	6.3	308.5	On	8.16	6.2
36584	131	80	158	165	467	72	154	11410	764.6	5010.6	14.23	6.09		6.5	6.3	359.9	On	8.16	6.2
36644	132	79	158	165	476	73	155	11698	783.5	5010.2	14.09	6.21		6.5	6.3	359.9	On	8.16	6.2
36704	133	78	158	164	483	72	157	12069	810.4	5009.8	13.92	6.37		6.5	6.3	308.5	On	8.16	6.2
36764	134	77	158	164	490	72	158	12398	832.2	5011.8	13.79	6.5		6.5	6.3	308.5	On	8.16	6.2
36824	135	76	158	164	496	72	159	12590	846	5011	13.66	6.61		6.5	6.3	308.5	On	8.16	6.2
36884	136	75	158	164	503	72	160	12765	863.3	5010.6	13.55	6.72		6.5	6.3	308.5	On	8.16	6.2
36944	137	76	158	164	509	71	161	12923	871.7	5009.8	13.42	6.82		6.5	6.3	308.5	On	8.16	6.2
37004	137	76	158	165	514	71	162	13159	889	5009.8	13.33	6.9		6.5	6.3	359.9	On	8.16	6.2
37064	138	76	158	165	519	71	162	13322	903.5	5010.2	13.24	6.98		6.5	6.3	359.9	On	8.16	6.2
37124	138	77	158	165	524	71	163	13497	916.3	5013	13.14	7.07		6.5	6.3	335.9	On	8.16	6.2
37180	139	77	158	165	529	70	163	13473	924	5011.4	13.13	7.08		6.5	6.3	359.9	On	8.16	6.2
37240	140	78	158	165	532	70	164	13501	920.6	5012.2	13.08	7.13		6.5	6.3	359.9	On	8.16	6.2
37300	140	79	158	165	536	70	165	13639	925.3	5008.5	13.05	7.16		6.0	6.3	359.9	On	8.16	6.2
37360	141	80	158	165	538	70	165	13688	935.1	5010.2	12.98	7.21		6.0	6.3	359.9	On	8.16	6.2
37420	141	80	158	165	541	71	166	13721	935.9	5010.6	12.87	7.32		6.0	6.3	359.9	On	8.16	6.2
37480	141	81	158	165	544	71	167	13570	934.4	5011	12.84	7.32		6.0	6.3	359.9	On	8.16	6.2
37540	143	82	159	165	546	71	167	13542	929.2	5011	12.76	7.39		5.5	6.3	308.4	On	8.16	6.2
37600	143	81	159	165	548	72	168	13517	926.8	5012.6	12.67	7.46		5.5	6.3	308.4	On	8.16	6.2
37660	144	80	158	165	552	72	169	13595	930.7	5011.4	12.53	7.6		5.5	6.3	359.9	On	8.16	6.2
37720	144	80	159	165	556	72	170	13603	937.8	5013	12.39	7.72		5.5	6.3	308.4	On	8.16	6.2
37780	145	78	159	165	559	71	170	13672	937.8	5012.6	12.33	7.76		5.5	6.3	308.4	On	8.16	6.2
37840	145	78	159	165	562	71	171	13810	944	5009.4	12.26	7.83		5.5	6.3	308.4	On	8.16	6.2
37900	146	77	159	165	566	71	171	13892	955.9	5010.2	12.15	7.94		5.5	6.3	308.4	On	8.16	6.2
37960	146	77	159	165	569	70	172	13888	958.7	5011.4	12.07	8.01		5.5	6.3	308.4	On	8.16	6.2
38020	147	77	159	165	572	70	173	13908	956.9	5013	12.01	8.06		5.5	6.3	308.4	On	8.16	6.2
38080	147	77	159	166	576	69	173	13969	959.8	5012.6	11.96	8.11		5.5	6.3	359.8	On	8.16	6.2
38140	147	77	159	166	578	69	173	13879	958.7	5011	11.93	8.14		5.0	6.3	359.6	On	8.16	6.2
38200	148	78	159	166	581	69	174	13867	950.8	5010.6	11.9	8.16		5.0	6.3	359.6	On	8.16	6.2
38260	148	80	159	166	581	70	174	13778	947.8	5011.4	11.9	8.19		5.0	6.3	359.8	On	8.16	6.2
38320	149	80	159	166	582	70	175	13741	940.1	5013	11.86	8.2		4.5	6.3	359.8	On	8.16	6.2
38380	149	81	160	166	582	70	175	13741	942.5	5011.4	11.83	8.24		4.5	6.3	308.3	On	8.16	6.2
38440	149	81	160	166	582	70	176	13684	939	5011.4	11.85	8.22		4.5	6.3	308.3	On	8.16	6.2
38500	150	82	160	166	581	71	176	13822	940.6	5009.8	11.89	8.19		4.5	6.3	287.8	On	8.16	6.2
38556	150	82	160	167	582	71	176	13953	955.6	5009.8	11.95	8.14		4.5	6.3	359.7	On	8.16	6.2
38616	150	82	160	166	581	71	176	14067	958.7	5010.6	12.21	7.89		4.5	6.3	308.3	On	8.16	6.2
38676	150	82	160	167	577	72	176	14087	971.2	5010.2	12.26	7.83		4.0	6.3	359.7	On	8.16	6.2
38736	151	83	160	167	574	72	175	13936	964.5	5010.2	12.26	7.85		4.0	6.3	359.7	On	8.16	6.2
38796	151	83	160	167	571	72	175	13770	949.7	5008.5	12.25	7.85		4.0	6.3	359.7	On	8.16	6.2
38856	150	83	160	167	570	72	175	13725	941.1	5011.4	12.24	7.85		4.0	6.3	359.7	On	8.16	6.2
38916	151	83	160	167	567	72	176	13664	941.9	5010.2	12.26	7.85		4.0	6.3	359.7	On	8.16	6.2
38976	151	83	160	167	565	73	176	13729	942.2	5011	12.23	7.88		4.0	6.3	359.7	On	8.16	6.2
39036	152	83	160	167	563	73	176	13717	943.2	5010.2	12.19	7.9		4.0	6.3	359.7	On	8.16	6.2
39096	152	83	161	167	582	73	176	13770	941.1	5011.8	12.16	7.92		4.0	6.3	308.2	On	8.15	6.2
39156	151	83	161	167	560	73	176	13855	945.3	5011.8	12.1	7.99		3.5	6.3	308.2	On	8.15	6.2
39216	152	84	161	167	558	74	176	13977	955.2	5011.8	12.09	8		3.5	6.3	308.2	On	8.15	6.2
39276	152	84	161	167	552	73	176	14412	966.5	5010.6	12.03	8.06		3.5	6.3	308.2	On	8.15	6.2
39336	153	84	161	167	554	74	177	14986	1016.9	5011	11.89	8.21		3.5	6.3	308.2	On	8.15	6.2
39396	154	84	161	167	555	74	178	14819	1032.6	5009.4	11.78	8.29		3.5	6.3	308.2	On	8.15	6.2
39456	154	84	161	168	556	74	178	14608	1011.1	5011.4	11.71	8.33		3.0	6.3	359.6	On	8.15	6.2
39516	154	84	161	167	556	73	179	14360	996.6	5010.2	11.66	8.38		3.0	6.3	308.2	On	8.15	6.2
39576	155	84	161	168	555	74	179	14233	982.9	5011.4	11.61	8.42		3.0	6.3	359.6	On	8.15	6.2

D46

FURNACE A WITHOUT CATALYST-LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

29-Jun-95 Run TTD-1B

time sec	stack exit F	dilution F	water in F	water out F	fire-box F	ambient F	stack F	CO high ppm	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Cool water density, lb/gal	Water meter reading gpm
39636	155	84	161	168	555	74	180	14087	976.1	5010.2	11.57	8.47		3.0	6.3	359.6	On	8.15	6.2
39696	156	84	161	168	555	74	180	13938	963.7	5009.8	11.59	8.46		3.0	6.3	359.6	On	8.15	6.2
39756	155	84	161	168	554	75	180	13814	956.4	5013	11.59	8.49		3.0	6.3	359.6	On	8.15	6.2
39816	156	84	161	168	553	74	180	13819	948.1	5011.4	11.61	8.45		3.0	6.3	359.6	On	8.15	6.2
39876	156	84	162	168	551	74	181	13542	932.5	5009	11.67	8.41		3.0	6.3	287.6	On	8.15	6.2
39932	156	84	162	168	549	74	181	13623	935.1	5009.8	11.67	8.41		3.0	6.3	308.1	On	8.15	6.2
39992	156	84	162	168	549	74	181	13676	942.1	5009	11.66	8.41		3.0	6.3	308.1	On	8.15	6.2
40052	156	85	162	168	548	75	181	13908	942.1	5010.6	11.64	8.41		2.5	6.3	308.1	On	8.15	6.2
40112	156	84	162	168	547	74	181	14250	972.5	5012.2	11.6	8.45		2.5	6.3	308.1	On	8.15	6.2
40172	156	85	162	168	547	75	181	14193	979.2	5009.8	11.49	8.46		2.5	6.3	308.1	On	8.15	6.2
40232	157	85	162	168	546	75	181	14103	968.4	5009.8	11.55	8.4		2.5	6.3	308.1	On	8.15	6.2
40292	157	85	162	169	544	75	182	14152	973.1	5011	11.6	8.35		2.5	6.3	359.4	On	8.15	6.2
40352	156	85	162	169	543	75	182	14099	974.1	5011.4	11.63	8.32		2.5	6.3	359.4	On	8.15	6.2
40412	156	85	162	169	542	74	181	14144	968.9	5011.8	11.76	8.21		2.2	6.3	359.4	On	8.15	6.2
40472	157	85	162	169	543	75	181	14099	973.5	5012.2	11.8	8.19		2.0	6.3	359.4	On	8.15	6.2
40532	156	85	162	169	543	75	181	14026	968.4	5010.2	11.8	8.19		2.0	6.3	359.4	On	8.15	6.2
40592	156	85	162	169	544	74	181	14010	960.1	5010.2	11.78	8.22		2.0	6.3	359.4	On	8.15	6.2
40652	156	85	182	169	543	75	180	13892	960.8	5011.4	11.81	8.18		2.0	6.3	359.4	On	8.15	6.2
40712	156	85	162	169	542	75	181	13794	951.2	5010.6	11.82	8.18		2.0	6.3	359.4	On	8.15	6.2
40772	156	85	162	169	542	75	181	13725	946.5	5012.6	11.82	8.18		2.0	6.3	359.4	On	8.15	6.2
40832	156	85	163	169	541	75	181	13623	941.7	5009.4	11.83	8.17		2.0	6.3	308.0	On	8.15	6.2
40892	157	85	163	169	540	75	181	13595	935.9	5009	11.82	8.19		1.5	6.3	308.0	On	8.15	6.2
40952	156	85	163	170	540	75	181	13615	938.5	5011	11.73	8.26		1.5	6.3	359.3	On	8.15	6.2
41012	156	85	163	170	541	75	180	13627	939.5	5009.4	11.69	8.3		1.5	6.3	359.3	On	8.15	6.2
41072	157	85	163	169	541	75	181	13391	939.3	5011.8	11.68	8.32		1.5	6.3	308.0	On	8.15	6.2
41132	157	85	163	170	540	75	181	13086	911.3	5012.2	11.62	8.39		1.5	6.3	359.3	On	8.15	6.2
41192	157	86	163	169	540	75	182	12956	698.4	5009	11.57	8.45		1.5	6.3	308.0	On	8.15	6.2
41252	158	86	163	170	540	75	183	12797	891.1	5011	11.59	8.44		1.5	6.3	335.4	On	8.15	6.2
41308	158	86	163	170	539	75	183	12785	881.7	5011	11.57	8.48		1.5	6.3	359.3	On	8.15	6.2
41368	159	86	163	170	539	75	183	12683	884.3	5013	11.59	8.49		1.0	6.3	359.3	On	8.15	6.2
41428	159	86	163	170	538	75	183	12561	871.7	5011	11.6	8.47		1.0	6.3	359.3	On	8.15	6.2
41488	159	86	163	170	538	75	184	12520	866.9	5013.4	11.49	8.51		1.0	6.3	359.3	On	8.15	6.2
41548	160	86	163	170	538	75	184							1.0	6.3	359.3	On	8.15	6.2
41608	160	86	164	170	538	75	183							1.0	6.3	307.9	On	8.14	6.2
41668	160	86	183	170	529	75	183							1.0	6.3	359.3	On	8.15	6.2
41728	160	86	184	170	523	75	184							1.0	6.3	307.9	On	8.14	6.2
41788	181	86	164	170	521	75	184							0.5	6.3	307.9	On	8.14	6.2
41848	161	85	164	171	519	75	184							0.5	6.3	359.2	On	8.14	6.2
41908	160	84	164	171	520	75	183							0.5	6.3	359.2	On	8.14	6.2
41968	159	83	164	171	516	75	183							0.5	6.3	359.2	On	8.14	6.2
42028	158	82	164	171	511	75	183							0.5	6.3	359.2	On	8.14	6.2
42088	157	81	164	171	511	74	181							0.0	6.3	359.2	On	8.14	6.2
42148	157	81	184	171	510	73	181							0.0	6.3	359.2	On	8.14	6.2
42208																			
AVERAGE	139	79	162	169	532	72	159	17519.19			10.00	9.75				350.76		8.15	

11.167778 test hrs
670.06667

Total Btu out = 236,067 , Btu/hr out = 21,138
Total Btu in = 556,252 , Btu/hr in = 49,809
Efficiency = 42.44%
Water flowrate = 6.33 gpm
Burnrate = 2.81 dry kg/hr
Wood moisture = 20.40%

D47

FURNACE A WITH CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Oct-95 time sec	stack F	Run TTCD-2 dilution F	ambient F	water-out F	water in F	stove exit F	fire-box F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
3500	123	75	67	186	170	173	237	0.5	343.7	4544.7	18.18	4.14	548	84	322	6.8	889.4	off	8.13	6.8
3560	107	71	67	183	174	149	251	0.3	99.9	3339	18.98	1.88	804	83.5	328	8.8	499.6	off	8.11	6.8
3620	101	71	67	188	166	137	255	0.6	174	4773.4	18.07	2.98	1337	83	328	8.8	1224.7	off	8.14	6.8
3680	98	72	67	188	167	132	255	0.9	212.4	5018.3	18.13	4.79	1476	83	324	6.8	1168.6	off	8.14	6.8
3740	97	74	67	188	167	132	254	0.9	207.8	5018.3	15.09	5.56	1403	83	320	6.8	1168.6	off	8.14	6.8
3800	98	75	67	188	163	132	252	0.9	195.1	5019.1	14.7	5.81	1234	83.5	315	7.2	1466.5	off	8.15	7.2
3860	98	75	68	188	171	131	251	0.9	182.8	5018.3	14.58	5.8	1061	82.5	311	7.2	994.4	off	8.12	7.2
3920	98	76	68	188	171	129	250	0.8	182.1	5017.9	14.77	5.55	940	82.5	306	7.2	994.4	off	8.12	7.2
3980	99	76	68	188	172	128	249	0.8	174.3	5017.9	15	5.28	847	84	302	7.2	935.5	off	8.12	7.2
4040	99	75	68	188	170	129	250	0.7	168.8	5016.7	15.18	5.11	756	82.5	298	7.2	1053.2	off	8.13	7.2
4100	99	74	68	188	170	129	250	0.7	169.4	5015.5	15.26	4.99	687	82.5	294	7.2	983.0	off	8.13	7.2
4158	98	74	68	188	170	129	250	0.7	171.5	5017.5	15.38	4.87	656	82.5	291	7.2	1053.2	off	8.13	7.2
4218	99	73	68	188	170	130	250	0.7	176.1	5019.1	15.56	4.73	663	82.5	288	7.2	1053.2	off	8.13	7.2
4278	99	73	67	188	170	129	250	0.7	183.1	5019.1	15.44	4.86	710	82.5	286	7.2	1053.2	off	8.13	7.2
4338	99	73	67	187	170	128	251	0.8	192.5	5016.7	15.38	4.92	758	83.2	283	7.2	994.7	off	8.13	7.2
4398	99	73	67	187	170	129	249	0.8	194.2	5020.8	15.31	4.99	787	83	281	7.2	994.7	off	8.13	7.2
4458	99	72	67	187	172	128	247	0.8	200	5019.5	15.33	5	813	83.5	279	7.2	877.1	off	8.12	7.2
4518	99	73	67	187	173	128	247	0.8	201.5	5019.5	15.25	5.07	822	83.5	277	7.2	818.3	off	8.12	7.2
4578	100	73	66	187	172	128	246	0.8	203.1	5020.3	15.26	5.08	823	83.5	274	7.2	877.1	off	8.12	7.2
4638	99	74	66	187	172	127	246	0.9	204.1	5019.1	15.16	5.17	818	83	273	7.2	877.1	off	8.12	7.2
4698	99	74	67	186	173	126	245	0.9	195	5019.1	15.23	5.12	795	83	272	7.2	759.8	off	8.12	7.2
4758	100	75	67	184	172	127	246	0.8	195	5019.9	15.28	5.09	779	83	270	7.2	701.7	off	8.12	7.2
4818	102	76	67	182	171	127	245	0.8	194.2	5018.7	15.25	5.12	766	82.5	269	7.2	643.4	off	8.12	7.2
4878	101	76	67	180	169	127	244	0.8	194.7	5018.7	15.2	5.15	741	82	268	7.2	643.9	off	8.13	7.2
4938	101	75	68	179	168	127	244	0.8	197.1	5019.9	15.32	5.06	709	81.5	267	7.2	644.1	off	8.13	7.2
4998	101	74	68	178	166	128	243	0.8	198.6	5019.1	15.43	4.95	680	81.5	266	7.2	703.2	off	8.14	7.2
5058	102	73	68	177	165	128	242	0.8	199.2	5019.9	15.54	4.86	674	81.5	265	7.2	703.4	off	8.14	7.2
5118	99	73	68	178	164	128	242	0.8	202.8	5018.3	15.55	4.86	667	81.5	265	7.2	703.7	off	8.14	7.2
5178	100	72	68	175	163	128	242	0.8	205.6	5017.9	15.72	4.75	668	82	264	7.2	703.9	off	8.15	7.2
5238	101	72	68	175	163	128	243	0.8	213.2	5019.1	15.63	4.85	676	82	264	7.2	703.9	off	8.15	7.2
5298	100	72	67	174	163	128	243	0.8	219.9	5018.3	15.57	4.91	691	82	264	7.2	645.2	off	8.15	7.2
5358	101	72	67	174	162	128	245	0.8	223.6	5019.1	15.58	4.93	688	82	263	7.2	704.1	off	8.15	7.2
5418	101	71	67	174	162	128	247	0.9	235	5019.5	15.41	5.1	703	82	263	7.2	704.1	off	8.15	7.2
5478	100	71	67	173	162	129	253	0.9	234.4	5020.3	15.34	5.18	693	84.4	263	7.2	602.4	off	8.15	7.2
5532	100	71	67	173	161	129	255	0.9	235.2	5020.8	15.38	5.13	678	82	263	7.2	704.4	off	8.15	7.2
5592	103	71	67	173	161	130	258	0.9	234.2	5019.5	15.42	5.12	670	82	263	7.2	704.4	off	8.15	7.2
5652	102	71	66	173	161	130	260	0.9	228.7	5018.3	15.28	5.25	640	82	263	7.2	704.4	off	8.15	7.2
5712	101	71	66	172	161	130	263	0.6	222.3	3546.1	16.82	3.43	605	82	263	7.2	645.7	off	8.15	7.2
5772	101	71	67	172	161	129	265	0.8	221.5	4847.4	16.16	4.77	558	82	263	7.2	645.7	off	8.15	7.2
5832	101	71	66	172	161	129	267	0.8	217	5018.7	15.47	5.07	562	82	263	7.2	645.7	off	8.15	7.2
5892	102	71	66	172	161	129	268	0.8	213.5	5018.3	15.54	5	540	81.8	263	7.2	645.7	off	8.15	7.2
5952	103	71	66	171	160	129	270	0.8	209.8	5019.1	15.54	5.01	518	82	263	7.2	645.9	off	8.16	7.2
6012	102	71	66	171	160	129	270	0.8	208.2	5020.3	15.55	5.01	476	82	264	7.2	645.9	off	8.16	7.2
6072	104	71	66	171	160	129	271	0.8	206.5	5019.1	15.55	5	462	82	264	7.2	645.9	off	8.16	7.2
6132	103	71	66	170	159	129	272	0.8	207.8	5019.1	15.47	5.09	453	82	264	7.2	646.1	off	8.16	7.2
6192	102	70	66	170	159	129	272	0.8	204.4	5019.1	15.53	5.03	437	82	264	7.2	646.1	off	8.16	7.2
6252	101	70	66	170	159	129	272	0.8	206.4	5020.3	15.64	4.94	428	81.8	264	7.2	646.1	off	8.16	7.2
6312	103	70	66	170	159	129	273	0.8	203	5019.1	15.64	4.98	413	82	264	7.2	646.1	off	8.16	7.2
6372	103	70	66	170	158	130	275	0.8	203.3	5018.7	15.52	5.09	416	82	265	7.2	705.1	off	8.16	7.2
6432	102	70	66	169	158	129	277	0.8	194.5	5020.3	15.61	5.02	411	82	266	7.2	646.3	off	8.16	7.2
6492	102	70	66	169	158	129	278	0.7	189.6	5020.3	15.74	4.95	400	81.5	266	7.2	646.3	off	8.16	7.2
6552	103	70	66	169	158	129	278	0.7	183.9	5017.9	15.7	5.01	390	81.5	265	7.2	646.3	off	8.16	7.2
6612	102	70	66	168	158	129	275	0.7	183.4	5018.7	15.73	4.97	387	81.5	265	7.2	587.6	off	8.16	7.2
6672	102	70	66	168	157	128	269	0.7	175	5020.3	15.84	4.85	389	81.5	264	7.2	646.5	off	8.16	7.2
6732	102	71	66	168	157	128	266	0.7	176.1	5017.5	15.79	4.88	378	81.5	264	7.2	646.5	off	8.16	7.2
6792	102	71	66	168	157	128	263	0.7	180.2	5019.5	15.78	4.92	357	81.5	264	7.2	646.5	off	8.16	7.2
6852	101	72	67	167	157	128	261	0.7	181.2	5018.7	15.77	4.92	366	81	264	7.2	548.6	off	8.16	7.2
6908	103	73	67	167	157	128	260	0.7	185.1	5016.3	15.75	4.99	379	81	264	7.2	587.8	off	8.16	7.2
6968	104	74	67	167	157	129	258	0.8	195.3	5018.3	15.54	5.19	402	80.5	264	7.2	587.8	off	8.16	7.2
7028	106	75	67	167	158	130	258	0.8	203.8	5017.9	15.36	5.37	419	80	264	7.2	648.8	off	8.17	7.2
7088	107	75	68	166	157	130	257	0.8	219.1	5018.7	15.23	5.49	457	79.5	263	7.2	529.0	off	8.16	7.2
7148	107	74	68	166	156	130	257	0.9	223.5	5019.5	15.15	5.56	489	79.5	263	7.2	588.0	off	8.17	7.2
7208	107	73	68	166	155	130	257	0.9	235	5017.9	15.12	5.58	528	79.5	263	7.2	647.0	off	8.17	7.2
7268	106	73	68	165	155	130	258	0.9	245	5017.5	15.08	5.63	521	79.5	263	7.2	588.2	off	8.17	7.2
7328	118	76	69	165	155	153	322	0.9	786.9	5017.5	15.03	5.69	537	79.9	265	7.2	588.2	on	8.17	7.2
7388	136	87	68	164	154	198	807	0.8	1262.7	5018.3	14.53	6.41	588	78.5	307	7.2	588.4	on	8.17	7.2
7448	144	88	68	164	154	202	1150	1.8	2007.6	5016.3	9.3	11.57	699	78	371	7.2	588.4	on	8.17	7.2
7508	154	93	68	164	154	213	1154	3.0	2008	5018.3	5.98	14.24	600	78.5	432	7.2	588.4	on	8.17	7.2
7568	165	96	68	165	154	230	1154	3.0	2008.1	5017.9	4.94	15.34	3502	75.5	492	7.2	647.2	on	8.17	7.2
7628	174	98	68	165	155	236	1154	3.0	2007.6	5018.7	4.24	18.06	5420	74.3	547	7.2	588.2	on	8.17	7.2
7688	184	100	68	166	155	254	1154	3.0	2008	5015.9	4.04	16.25	5783	73	597	7.2	647.0	on	8.17	7.2
7748	196	102	68	167	156	266	1154	3.0	2007.5	5017.9	3.74	16.53	5391	71.5	641	7.2	646.8	on	8.17	7.2
7808	212	105	69	167	157	279	1154	3.0	2007.6	5020.3	3.27	16.97	5662	70	680	7.2	587.8	on	8.16	7.2
7868	228	109	69	168	157	292	1154	3.0	2008	5017.9	2.52	17.57	5687	68.5	709	7.2	646.5	on	8.16	7.2

FURNACE A WITH CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Oct-95 Run TTCD-2

time sec	stack F	dilution F	ambient F	water-out F	water in F	stove exit F	fire-box F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
7928	242	113	69	169	158	305	1154	3.0	2008	5016.3	2.06	17.94	5503	67	735	7.2	646.3	on	8.16	7.2
7988	254	116	69	170	159	319	1154	3.0	2008.5	5018.3	1.68	18.22	5576	65.1	762	7.2	646.1	on	8.16	7.2
8048	266	121	69	171	160	333	1154	3.0	2007.6	5017.1	1.4	18.45	5155	63.5	793	7.2	645.9	on	8.16	7.2
8108	274	123	69	172	161	345	1154	3.0	2008	5016.7	1.18	18.57	5592	62	823	7.2	645.7	on	8.15	7.2
8168	281	125	69	173	161	352	1154	3.0	2008	5017.9	1.07	18.58	6030	60.5	850	7.2	704.4	on	8.15	7.2
8228	288	126	69	174	162	359	1154	3.0	2007.8	5018.3	1.08	18.54	6138	59	872	7.2	657.2	on	8.15	7.2
8284	293	127	69	175	163	363	1154	3.0	2008	5016.7	1.08	18.48	6129	57.5	891	7.2	703.9	on	8.15	7.2
8344	297	127	69	176	164	365	1154	3.0	2007.2	5016.3	1.14	18.39	5882	56	909	7.2	703.7	on	8.14	7.2
8404	296	126	69	176	164	363	1154	3.0	2007.8	5017.5	1.25	18.23	6336	54.5	919	7.2	703.7	on	8.14	7.2
8464	284	116	69	177	165	345	1154	3.0	2007.6	5017.9	1.39	18.07	6695	53	919	7.2	703.4	on	8.14	7.2
8524	231	96	70	178	166	280	1154	3.0	2008	5016.7	2.79	17.31	6695	52	875	7.2	703.2	on	8.14	7.2
8584	201	90	70	178	167	242	1006	3.0	1862.5	5015.9	6.64	14.84	6695	51.5	823	7.2	644.3	off	8.14	7.2
8644	185	87	70	178	167	220	842	3.0	1184.7	5019.1	8.57	12.45	6554	51	774	7.2	644.3	off	8.14	7.2
8704	173	85	71	178	166	206	784	2.4	860.7	5020.3	9.64	10.84	5372	50	735	7.2	703.2	off	8.14	7.2
8764	164	82	71	178	166	196	746	1.9	744.3	5018.7	10.07	10.24	4588	49.5	702	7.2	703.2	off	8.14	7.2
8824	158	81	71	178	166	189	713	1.6	695.5	5015.1	10.44	9.85	4177	49.5	678	7.2	703.2	off	8.14	7.2
8884	153	80	71	178	166	185	682	1.6	682	5019.5	10.56	9.74	3966	49.5	655	7.2	703.2	off	8.14	7.2
8944	152	79	71	178	166	181	657	1.6	673.8	5017.1	10.71	9.68	3936	49	634	7.2	703.2	off	8.14	7.2
9004	149	78	71	178	166	179	630	1.6	664.4	5015.5	10.72	9.72	4067	49	616	7.2	703.2	off	8.14	7.2
9064	146	78	71	178	166	176	611	1.6	663.1	5019.5	10.88	9.64	4007	49	602	7.2	703.2	off	8.14	7.2
9124	144	78	70	178	166	174	595	1.6	658.5	5017.9	11.09	9.52	4014	49	587	7.2	703.2	off	8.14	7.2
9184	143	78	70	178	166	172	585	1.6	660.6	5018.7	11.02	9.66	4152	49	571	7.2	703.2	off	8.14	7.2
9244	143	77	70	178	166	171	579	1.6	675.5	5017.5	11	9.75	4304	49	558	7.2	703.2	off	8.14	7.2
9304	141	77	70	178	166	170	570	1.7	694.8	5018.3	11	9.79	4487	48.5	546	7.2	703.2	off	8.14	7.2
9364	140	77	69	177	166	169	566	1.8	706.4	5016.7	10.96	9.88	4611	48.5	534	7.2	644.6	off	8.14	7.2
9424	139	76	69	177	165	167	558	1.8	710.4	5020.8	11.01	9.88	4757	48.5	523	7.2	703.4	off	8.14	7.2
9484	138	76	69	177	165	167	550	1.8	720.5	5017.9	11.01	9.92	4915	48.5	514	7.2	703.4	off	8.14	7.2
9544	138	76	69	176	165	166	544	1.8	723.3	5018.3	11.07	9.91	5018	48	505	7.2	644.8	off	8.14	7.2
9604	139	76	69	176	164	165	536	1.9	732.9	5018.3	11.01	10	5156	48	497	7.2	656.7	off	8.14	7.2
9660	137	76	69	175	164	164	528	1.9	733.1	5015.5	10.91	10.15	5236	48	491	7.2	645.0	off	8.14	7.2
9720	137	76	69	175	163	164	516	1.9	754.1	5017.5	11.05	10.03	5515	47.5	484	7.2	703.9	off	8.15	7.2
9780	136	76	69	174	163	164	515	2.0	777.7	5017.1	11.02	10.11	5705	47.5	480	7.2	645.2	off	8.15	7.2
9840	137	75	68	174	163	164	514	2.0	798.2	5017.9	11.1	10.06	5831	47.5	475	7.2	645.2	off	8.15	7.2
9900	137	75	69	174	163	163	512	2.1	823.4	5018.7	10.95	10.23	6092	47.5	471	7.2	645.2	off	8.15	7.2
9960	135	76	68	174	162	162	510	2.2	829.9	5017.1	10.89	10.27	6249	47	467	7.2	704.1	off	8.15	7.2
10020	137	75	69	173	162	162	507	2.2	828.8	5018.7	10.94	10.26	6536	47	464	7.2	645.5	off	8.15	7.2
10080	135	76	68	173	162	162	503	2.2	824.1	5017.1	10.83	10.35	6490	46.5	462	7.2	645.5	off	8.15	7.2
10140	134	76	68	173	162	162	502	2.2	827.3	5017.1	10.86	10.33	6499	46.5	460	7.2	645.5	off	8.15	7.2
10200	134	75	68	173	162	161	500	2.2	840.5	5018.3	10.88	10.33	6595	46.5	458	7.2	645.5	off	8.15	7.2
10260	134	75	69	173	162	161	499	2.2	854.5	5019.5	10.85	10.38	6685	46	456	7.2	645.5	off	8.15	7.2
10320	134	75	69	173	162	161	499	2.3	884.8	5017.9	10.77	10.46	6696	46	456	7.2	645.5	off	8.15	7.2
10380	134	75	69	173	162	161	499	2.4	897.3	5017.5	10.74	10.51	6696	45.5	454	7.2	645.5	off	8.15	7.2
10440	135	76	69	173	161	161	501	2.4	915.9	5017.9	10.71	10.56	6695	45.5	454	7.2	704.4	off	8.15	7.2
10500	133	75	68	172	161	160	502	2.5	926.9	5018.7	10.58	10.67	6695	45.5	453	7.2	645.7	off	8.15	7.2
10560	134	76	69	172	161	160	504	2.5	944	5015.1	10.66	10.58	6696	45	453	7.2	645.7	off	8.15	7.2
10620	134	76	68	172	161	160	502	2.5	954.6	5018.7	10.58	10.69	6694	45	452	7.2	645.7	off	8.15	7.2
10680	134	75	69	172	161	160	502	2.6	962.6	5016.7	10.48	10.8	6696	44.5	452	7.2	645.7	off	8.15	7.2
10740	133	75	69	172	161	160	503	2.6	975.1	5018.7	10.46	10.83	6694	44.5	452	7.2	645.7	off	8.15	7.2
10800	132	75	69	171	161	160	510	2.6	986.2	5017.1	10.57	10.69	6696	44	452	7.2	587.0	off	8.15	7.2
10860	132	75	69	171	160	160	511	2.6	976.4	5017.5	10.6	10.7	6696	44	451	7.2	645.9	off	8.16	7.2
10920	135	75	69	171	160	160	509	2.6	974.1	5017.1	10.59	10.75	6696	44	451	7.2	645.9	off	8.16	7.2
10980	133	75	69	171	160	159	511	2.7	968.9	5017.9	10.32	11.02	6696	43.5	452	7.2	602.8	off	8.16	7.2
11036	133	75	69	171	160	159	511	2.6	964.5	5017.5	10.49	10.84	6695	43.5	452	7.2	645.9	off	8.16	7.2
11096	134	75	69	171	160	159	512	2.6	970.5	5017.9	10.47	10.89	6697	43.5	452	7.2	645.9	off	8.16	7.2
11156	133	75	69	170	159	159	515	2.7	977.5	5017.5	10.34	11.02	6695	43.5	452	7.2	646.1	off	8.16	7.2
11216	133	75	69	170	160	159	512	2.7	983.6	5018.3	10.38	10.98	6697	43	452	7.2	587.2	off	8.16	7.2
11276	133	75	69	170	159	158	512	2.7	982.1	5018.7	10.29	11.05	6694	42.5	452	7.2	646.1	off	8.16	7.2
11336	133	75	69	170	159	158	513	2.7	974	5019.1	10.41	10.9	6697	42.5	452	7.2	646.1	off	8.16	7.2
11396	132	75	69	170	159	158	517	2.7	964	5017.1	10.32	11.03	6696	42.5	451	7.2	646.1	off	8.16	7.2
11456	133	74	68	170	159	158	521	2.7	966.1	5017.9	10.27	11.02	6694	42	451	7.2	646.1	off	8.16	7.2
11516	132	75	69	170	159	157	525	2.7	960.3	5016.7	10.28	11.01	6696	42	451	7.2	646.1	off	8.16	7.2
11576	131	75	69	169	159	156	528	2.7	976.2	5018.7	10.34	10.9	6695	41.5	451	7.2	587.4	off	8.16	7.2
11636	132	75	69	169	159	156	526	2.6	976.7	5016.7	10.54	10.7	6695	41.5	451	7.2	587.4	off	8.16	7.2
11696	132	75	69	169	158	156	527	2.7	987.1	5019.5	10.45	10.81	6694	41.5	452	7.2	646.3	off	8.16	7.2
11756	131	75	69	169	158	156	529	2.7	994.5	5017.1	10.39	10.86	6694	41.1	450	7.2	646.3	off	8.16	7.2
11816	130	75	69	169	158	156	533	2.8	1016.1	5019.5	10.36	10.9	6694	41	450	7.2	646.3	off	8.16	7.2
11876	131	75	69	168	158	156	536	2.6	1016.6	5018.3	10.42	10.84	6696	40.5	450	7.2	587.6	off	8.16	7.2
11936	131	75	69	168	158	156	535	2.8	1018.7	5018.7	10.43	10.83	6694	40.5	450	7.2	587.6	off	8.16	7.2
11996	129	75	69	168	157	156	536	2.8	1026	5017.5	10.45	10.82	6694	40.5	449	7.2	646.5	off	8.16	7.2
12056	131	75	69	168	158	156	537	2.8	1024.4	5018.3	10.4	10.88	6697	40	450	7.2	587.6	off	8.16	7.2
12116	131	75	69	168	157	156	540	2.8	998	5018.7	10.16	11.11	6692	40	450	7.2	646.5	off	8.16	7.2
12176	132	75	69	168	157	156	542	2.8	983.2	5019.1	10.05	11.23	6694	39.9	450	7.2	646.5	off	8.16	7.2
12236	131	75	69	168	157	156	543	2.8	975.1	5018.3	9.81	11.43	6695	39.5	450	7.2	646.5	off	8.16	7.2
12296	132	75	69	168	157	156	540	2.7	957.7	5018.3	9.91	11.3	6696	39.5	450	7.2	646.5	off	8.16	7.2

FURNACE A WITH CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Oct-95 Run TTCFI-2

time sec	stack F	dilution F	ambient F	water-out F	water in F	stove exit F	fire-box F	CO high %	CO dlu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
12356	132	76	69	167	157	155	541	2.7	956.2	5018.7	9.86	11.36	6696	39	450	7.2	548.6	off	8.16	7.2
12412	132	77	69	167	157	155	540	2.7	940.8	5017.1	9.92	11.29	6694	38.5	449	7.2	587.8	off	8.16	7.2
12472	133	76	70	167	157	155	543	2.7	933.9	5019.5	10.01	11.22	6693	38	448	7.2	587.8	off	8.16	7.2
12532	131	76	70	167	157	154	542	2.7	929	5018.3	10.18	11.03	6694	37.5	449	7.2	587.8	off	8.16	7.2
12592	130	79	70	167	157	154	541	2.6	982.9	5019.9	10.52	10.67	6696	36.5	446	7.2	587.8	off	8.16	7.2
12652	131	78	71	167	157	154	542	2.7	969.4	5018.3	10.33	10.86	6695	36	448	7.2	587.8	off	8.16	7.2
12712	130	77	71	167	156	154	542	2.7	921.1	5019.1	10.09	11.05	6695	36	447	7.2	646.8	off	8.17	7.2
12772	129	77	71	167	156	153	544	2.6	887.7	5018.7	10.04	11.06	6695	36	447	7.2	646.8	off	8.17	7.2
12832	128	76	71	166	156	153	545	2.5	848.6	5018.3	10.18	10.9	6694	36	446	7.2	588.0	off	8.17	7.2
12892	129	76	71	166	156	153	547	2.4	841.3	5019.1	10.18	10.91	6696	36	446	7.2	588.0	off	8.17	7.2
12952	128	76	70	166	156	153	546	2.4	833	5016.3	10.06	11	6693	36	446	7.2	588.0	off	8.17	7.2
13012	129	76	70	166	156	153	549	2.4	820	5016.7	10.15	10.93	6697	36	445	7.2	586.0	off	8.17	7.2
13072	145	88	70	166	155	199	709	2.4	1729.2	5018.7	9.69	11.49	5132	35.2	458	7.2	647.0	on	8.17	7.2
13132	156	92	70	166	155	232	1093	2.4	2008.6	5019.5	5.98	13.97	6597	34.5	527	7.2	647.0	on	8.17	7.2
13192	190	101	70	167	156	268	1155	3.0	2007.8	5015.9	3.25	15.12	6698	33.5	594	7.2	646.8	on	8.17	7.2
13252	223	108	70	168	157	298	1155	3.0	2007.8	5016.7	1.49	17.05	6695	32.5	658	7.2	646.5	on	8.16	7.2
13312	241	111	69	169	158	313	1155	3.0	2008	5017.1	0.89	18.03	6695	31.4	713	7.2	646.3	on	8.16	7.2
13372	251	111	70	171	159	323	1155	3.0	2007.2	5016.7	0.87	18.27	6696	30.5	753	7.2	704.9	on	8.16	7.2
13432	260	113	70	172	161	333	1155	3.0	2007.8	5018.3	1	18.26	6492	29.5	792	7.2	645.7	on	8.15	7.2
13492	268	114	70	173	161	340	1155	3.0	2007.3	5018.7	1.15	18.2	6652	28.5	823	7.2	704.4	on	8.15	7.2
13552	271	116	69	174	162	347	1155	3.0	2008	5017.5	1.37	17.9	6373	27.5	851	7.2	704.1	on	8.15	7.2
13612	277	117	70	175	163	354	1155	3.0	2007.8	5018.7	1.51	17.73	5966	26.5	881	7.2	703.9	on	8.15	7.2
13672	283	118	70	176	164	362	1155	3.0	2008.3	5015.9	1.49	17.73	5453	25.5	910	7.2	703.7	on	8.14	7.2
13732	276	111	70	177	165	352	1149	3.0	2008.6	5017.5	1.58	17.61	5064	25	934	7.2	656.5	on	8.14	7.2
13766	217	91	69	178	166	276	1141	3.0	2005	5019.1	2.95	16.1	5953	24.5	911	7.2	703.2	on	8.14	7.2
13848	179	84	70	178	166	227	1051	3.0	2007.6	5016.3	5.71	14.09	6700	24.5	859	7.2	703.2	off	8.14	7.2
13906	161	81	70	178	166	202	973	3.0	1968.3	5017.9	7.14	13.31	6696	24	809	7.2	703.2	off	8.14	7.2
13968	153	79	70	178	166	189	870	3.0	1516.9	5017.5	7.81	12.7	6698	24	764	7.2	703.2	off	8.14	7.2
14028	146	78	70	178	166	180	791	3.0	1207.2	5018.3	8.33	11.96	6617	23.5	723	7.2	703.2	off	8.14	7.2
14088	141	78	70	178	166	174	748	2.9	957.5	5016.7	9.08	11.06	5809	23.5	689	7.2	703.2	off	8.14	7.2
14148	137	77	70	178	166	169	718	2.5	784.7	5019.9	9.35	10.74	5053	23.5	662	7.2	703.2	off	8.14	7.2
14208	133	77	70	178	166	165	696	2.1	649.9	5017.9	9.62	10.49	4470	23.5	643	7.2	703.2	off	8.14	7.2
14268	131	76	70	178	166	161	680	1.8	549.6	5019.5	9.69	10.43	4132	23	630	7.2	703.2	off	8.14	7.2
14328	129	76	70	178	167	159	667	1.5	467	5017.9	9.73	10.4	3752	23	620	7.2	644.3	off	8.14	7.2
14388	126	75	70	178	166	156	654	1.3	404.3	5016.7	9.97	10.19	3435	23	605	7.2	703.2	off	8.14	7.2
14448	124	75	70	178	166	154	642	1.2	355.5	5015.1	10.24	9.99	3185	23	590	7.2	703.2	off	8.14	7.2
14508	123	75	70	178	166	153	631	1.1	321.1	5017.5	10.12	10.13	2947	23	574	7.2	703.2	off	8.14	7.2
14568	121	76	70	178	166	151	621	1.0	295.9	5017.9	10.2	10.06	2713	22.5	561	7.2	703.2	off	8.14	7.2
14628	119	77	70	178	167	149	612	0.9	273.3	5017.5	10.54	9.75	2541	22.5	548	7.2	644.3	off	8.14	7.2
14688	119	78	70	178	167	148	603	0.9	263.7	5019.9	10.63	9.72	2434	22	537	7.2	644.3	off	8.14	7.2
14748	120	79	71	177	166	147	594	0.9	255.5	5018.3	10.48	9.85	2360	21.5	527	7.2	644.6	off	8.14	7.2
14808	119	79	71	177	166	147	585	0.9	259.1	5015.9	10.26	10.07	2270	20.5	517	7.2	644.6	off	8.14	7.2
14868	119	78	72	177	165	146	579	0.9	257.2	5018.3	10.24	10.13	2195	20.5	509	7.2	703.4	off	8.14	7.2
14928	117	78	71	176	165	145	573	0.9	252.6	5018.3	10.08	10.28	2104	20.5	502	7.2	644.8	off	8.14	7.2
14988	116	77	72	176	164	144	568	0.9	248.4	5018.7	10.21	10.17	2077	21	496	7.2	703.7	off	8.14	7.2
15048	114	77	72	175	164	143	564	0.9	246.7	5018.3	10.15	10.26	2094	21	490	7.2	645.0	off	8.14	7.2
15108	114	76	72	175	164	142	560	0.9	244.3	5017.5	10.22	10.22	2120	21	485	7.2	602.0	off	8.14	7.2
15164	113	76	71	175	164	141	555	0.9	246.9	5018.7	10.09	10.36	2159	21	481	7.2	645.0	off	8.14	7.2
15224	113	76	71	175	163	141	551	0.9	245.1	5017.9	10.01	10.48	2140	21	476	7.2	703.9	off	8.15	7.2
15284	112	76	71	174	163	140	547	0.9	245.8	5019.1	9.94	10.56	2150	21	473	7.2	645.2	off	8.15	7.2
15344	111	75	71	174	163	140	544	0.9	245.1	5018.7	10	10.54	2124	21	468	7.2	645.2	off	8.15	7.2
15404	110	75	71	174	162	139	540	0.9	248.2	5018.7	10.06	10.51	2124	21	465	7.2	704.1	off	8.15	7.2
15464	111	75	71	173	162	138	536	0.9	252.1	5016.7	9.92	10.7	2324	21	482	7.2	645.5	off	8.15	7.2
15524	111	75	70	173	162	138	533	1.0	249	5016.7	9.77	10.85	2358	21	459	7.2	645.5	off	8.15	7.2
15584	109	75	71	173	162	138	531	1.0	247.2	5019.1	9.74	10.86	2300	21	456	7.2	645.5	off	8.15	7.2
15644	108	75	70	173	162	137	530	0.9	248.4	5018.3	9.98	10.63	2221	21.5	453	7.2	645.5	off	8.15	7.2
15704	108	75	70	173	162	137	526	0.9	246.4	5015.9	10.12	10.52	2180	21.5	452	7.2	645.5	off	8.15	7.2
15764	106	75	70	173	161	136	526	0.9	244.1	5017.9	10.16	10.48	2120	21	449	7.2	704.4	off	8.15	7.2
15824	107	74	70	173	161	136	525	0.9	240.1	5016.7	10.3	10.34	2056	21	447	7.2	704.4	off	8.15	7.2
15884	108	74	70	172	161	135	523	0.9	237.1	5017.5	10.07	10.59	2010	21	446	7.2	645.7	off	8.15	7.2
15944	107	75	70	172	161	135	520	0.9	236.3	5018.3	9.88	10.74	1964	21	444	7.2	645.7	off	8.15	7.2
16004	106	74	70	172	161	135	518	0.9	233.7	5016.3	9.96	10.64	1904	21	443	7.2	645.7	off	8.15	7.2
16064	106	74	70	172	161	134	517	0.9	227.2	5018.3	10.12	10.46	1871	21	441	7.2	645.7	off	8.15	7.2
16124	106	74	70	172	161	134	515	0.9	223.8	5018.7	10.11	10.49	1844	21	441	7.2	645.7	off	8.15	7.2
16184	107	74	70	172	161	134	513	0.9	223.8	5017.1	10.02	10.58	1813	21	439	7.2	645.7	off	8.15	7.2
16244	105	75	70	172	160	133	512	0.9	217.3	5017.1	9.88	10.69	1790	21	437	7.2	704.6	off	8.16	7.2
16304	104	75	70	172	161	133	509	0.9	215.8	5016.7	10.1	10.48	1780	21	436	7.2	645.7	off	8.15	7.2
16364	105	75	70	171	160	132	507	0.9	214	5017.5	10.09	10.51	1775	21	435	7.2	645.9	off	8.16	7.2
16424	104	75	70	171	160	132	507	0.9	209.8	5017.9	10.05	10.55	1748	21	432	7.2	645.9	off	8.16	7.2
16484	103	74	70	171	160	132	506	0.9	210.3	5017.1	10.07	10.54	1736	20.5	431	7.2	602.8	off	8.16	7.2
16540	102	74	70	171	160	131	506	0.9	209.5	5016.7	10.27	10.32	1724	20.5	430	7.2	645.9	off	8.16	7.2
16600	103	74	70	171	160	131	507	0.9	213.2	5018.7	10.29	10.35	1738	20.5	426	7.2	645.9	off	8.16	7.2
16660	102	75	70	170	160	131	509	0.9	210.6	5017.9	10.24	10.36	1716	20.5	427	7.2	587.2	off	8.16	7.2
16720	103	76	70	170	160	131	509	0.9	213.2	5017.1	10.44	10.11	1698	20	424	7.2	587.2	off	8.16	7.2

FURNACE A WITH CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Oct-95 Run TTCD-2

time sec	stack F	dilution F	ambient F	water-out F	water in F	stove exit F	fire-box F	CO high %	CO dlu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
16780	103	77	70	170	160	132	506	0.9	213.9	5017.1	10.45	10.12	1748	19.5	421	7.2	587.2	off	8.16	7.2
16840	104	77	71	170	160	132	505	1.0	215.3	5018.3	10.29	10.27	1760	19	418	7.2	587.2	off	8.16	7.2
16900	104	77	71	170	160	131	503	1.0	225.1	5017.5	10.13	10.41	1766	18.5	416	7.2	587.2	off	8.16	7.2
16960	104	77	71	169	159	131	503	1.0	225.1	5017.1	10.18	10.35	1738	18.5	414	7.2	587.4	off	8.16	7.2
17020	103	76	71	170	159	131	503	0.9	223.1	5017.9	10.3	10.22	1681	18.5	413	7.2	646.1	off	8.16	7.2
17080	103	75	71	169	159	130	503	0.9	217.3	5017.1	10.32	10.21	1643	19	412	7.2	587.4	off	8.16	7.2
17140	102	75	71	169	158	130	502	0.9	215.5	5019.5	10.27	10.24	1602	19	410	7.2	646.3	off	8.16	7.2
17200	103	75	71	169	158	130	501	0.9	210.3	5018.7	10.38	10.16	1574	19	407	7.2	646.3	off	8.16	7.2
17260	102	75	71	169	158	129	501	0.9	206.5	5017.9	10.33	10.21	1517	19	405	7.2	646.3	off	8.16	7.2
17320	102	75	71	168	158	128	500	0.9	203.3	5017.9	10.24	10.31	1513	19.5	402	7.2	587.6	off	8.16	7.2
17380	101	75	71	168	158	128	499	0.9	202.1	5018.3	10.07	10.49	1499	19.5	400	7.2	587.6	off	8.16	7.2
17440	100	74	71	168	157	128	498	0.9	203	5017.9	10.15	10.38	1492	19.5	398	7.2	646.5	off	8.16	7.2
17500	99	74	70	168	157	127	497	0.9	194.5	5018.7	10.34	10.21	1432	19.5	397	7.2	646.5	off	8.16	7.2
17560	98	74	70	167	157	127	494	0.8	187.3	5017.5	10.52	10.02	1355	19.5	395	7.2	587.8	off	8.16	7.2
17620	99	74	70	167	157	127	491	0.8	183.9	5017.9	10.63	9.95	1316	19.5	393	7.2	587.8	off	8.16	7.2
17680	99	74	70	167	157	126	490	0.8	181.3	5018.3	10.39	10.16	1290	19.5	392	7.2	587.8	off	8.16	7.2
17740	98	74	70	167	157	125	488	0.8	178.4	5017.9	10.4	10.12	1253	19.5	390	7.2	587.8	off	8.16	7.2
17800	97	73	70	167	156	126	488	0.8	176.3	5019.1	10.45	10.07	1225	19.5	388	7.2	646.8	off	8.17	7.2
17860	97	73	70	167	156	126	488	0.8	175.5	5019.1	10.5	10.01	1230	19.5	386	7.2	603.6	off	8.17	7.2
17916	97	74	70	167	156	126	487	0.8	173.7	5015.9	10.4	10.12	1241	19.5	384	7.2	646.8	off	8.17	7.2
17976	97	73	70	167	156	126	487	0.8	174.8	5018.3	10.26	10.26	1247	19.9	383	7.2	646.8	off	8.17	7.2
18036	97	74	70	166	156	125	485	0.8	175.1	5016.7	10.29	10.2	1244	20	380	7.2	588.0	off	8.17	7.2
18096	96	73	70	166	156	124	482	0.8	176.6	5016.7	10.46	10.02	1231	19.7	378	7.2	588.0	off	8.17	7.2
18158	102	75	69	166	155	137	479	0.8	295.7	5017.9	10.65	9.84	1252	20	374	7.2	647.0	on	8.17	7.2
18216	134	84	69	166	155	196	571	0.8	1617.2	5017.9	10.74	9.69	661	19.5	383	7.2	647.0	on	8.17	7.2
18276	156	86	69	166	156	220	737	1.1	2007.8	5017.5	11.87	8.58	656	19	413	7.2	588.0	on	8.17	7.2
18336	170	91	70	165	156	235	855	1.3	2007.8	5017.5	11.54	8.9	666	18.5	447	7.2	529.2	on	8.17	7.2
18396	182	94	70	165	156	248	924	1.4	2008	5017.9	10.69	9.73	705	18	489	7.2	529.2	on	8.17	7.2
18456	194	96	70	166	156	263	972	1.3	1974	5017.5	9.3	11.1	715	17	541	7.2	588.0	on	8.17	7.2
18516	204	100	70	166	157	276	993	1.1	1550.3	5017.5	8.18	12.08	731	16.1	599	7.2	529.0	on	8.16	7.2
18576	214	101	71	167	157	287	1003	1.0	1627	5018.3	8.35	11.97	803	16	647	7.2	587.8	on	8.16	7.2
18636	221	102	71	168	157	294	1025	1.0	1767.8	5017.9	8.29	12.03	879	15.5	675	7.2	646.5	on	8.16	7.2
18696	227	104	71	169	158	301	1062	1.0	1745.1	5017.9	8.17	12.18	892	15	696	7.2	646.3	on	8.16	7.2
18756	234	105	71	169	158	308	1073	1.1	2004.2	5016.3	7.89	12.43	926	15	711	7.2	646.3	on	8.16	7.2
18816	240	106	71	170	159	315	1054	1.2	2008.3	5017.5	7.63	12.62	1031	14.5	727	7.2	646.1	on	8.16	7.2
18876	245	107	71	170	159	320	1047	1.3	2008	5017.1	7.51	12.76	1228	14.5	748	7.2	646.1	on	8.16	7.2
18936	251	108	70	171	160	326	1057	1.3	2007.3	5015.9	7.41	12.93	1265	14	773	7.2	645.9	on	8.16	7.2
18996	256	110	70	172	161	331	1084	1.3	2007.8	5017.1	7.04	13.29	1296	13.5	793	7.2	645.7	on	8.15	7.2
19056	260	111	70	173	161	335	1118	1.3	2007.6	5016.7	6.88	13.46	1383	13.5	811	7.2	704.4	on	8.15	7.2
19116	265	112	70	173	162	339	1122	1.3	2008.5	5017.9	6.8	13.56	1376	13	826	7.2	645.5	on	8.15	7.2
19176	268	112	70	174	162	342	1114	1.2	1992.2	5018.3	6.9	13.45	1329	12.5	842	7.2	704.1	on	8.15	7.2
19236	270	113	70	174	163	344	1079	1.2	2008.1	5016.7	7.01	13.31	1308	12	852	7.2	602.2	on	8.15	7.2
19292	271	113	70	175	164	345	1060	1.2	2007.5	5017.5	7.19	13.11	1367	11.5	858	7.2	645.0	on	8.14	7.2
19352	273	113	70	176	164	346	1044	1.2	1846.8	5017.9	7.5	12.83	1362	11.5	862	7.2	703.7	on	8.14	7.2
19412	273	113	70	177	165	345	1035	1.0	1638	5016.7	7.86	12.56	1330	11	863	7.2	703.4	on	8.14	7.2
19472	228	93	70	177	165	289	1043	0.9	706.2	5018.3	8.29	12.1	1466	10.5	824	7.2	703.4	off	8.14	7.2
19532	181	84	70	177	165	230	993	2.1	1746.3	5017.9	8.6	12.01	5628	10.5	772	7.2	703.4	off	8.14	7.2
19592	159	81	70	177	165	201	958	3.0	1738.4	5017.5	7.95	12.45	6700	10.5	731	7.2	703.4	off	8.14	7.2
19652	147	80	70	178	165	184	863	3.0	1363.6	5018.3	7.95	12.15	6250	10.5	697	7.2	762.0	off	8.14	7.2
19712	140	79	70	178	165	175	743	3.0	1224.3	5018.7	8.61	11.4	6509	10.5	668	7.2	762.0	off	8.14	7.2
19772	135	78	70	178	165	169	702	3.0	1036.8	5015.1	9.68	10.44	6286	10.5	644	7.2	762.0	off	8.14	7.2
19832	132	78	69	177	165	164	678	2.8	917.6	5018.7	10.11	10.11	5898	10.5	624	7.2	703.4	off	8.14	7.2
19892	128	77	69	177	165	159	660	2.6	812.7	5020.3	10.19	10.02	5484	10.3	604	7.2	703.4	off	8.14	7.2
19952	124	76	69	177	165	156	645	2.4	708.2	5018.3	10.44	9.8	5009	10.4	588	7.2	703.4	off	8.14	7.2
20012	121	76	69	177	165	153	633	2.1	603.6	5017.9	10.58	9.62	4548	10	573	7.2	703.4	off	8.14	7.2
20072	119	76	69	177	165	150	622	1.8	492.5	5017.5	10.69	9.52	4069	10	558	7.2	703.4	off	8.14	7.2
20132	117	76	69	177	165	147	612	1.5	394	5016.3	10.64	9.54	3450	10	544	7.2	703.4	off	8.14	7.2
20192	115	75	69	177	165	145	601	1.3	330.6	5017.9	10.66	9.51	2927	10	531	7.2	703.4	off	8.14	7.2
20252	112	75	69	177	165	142	592	1.1	291.3	5017.9	10.57	9.56	2491	10	521	7.2	703.4	off	8.14	7.2
20312	110	75	69	177	165	140	583	1.0	263.2	5017.1	10.85	9.28	2137	10	512	7.2	703.4	off	8.14	7.2
20372	108	75	69	177	165	139	575	0.9	242.8	5016.3	10.94	9.22	1864	10	504	7.2	703.4	off	8.14	7.2
20432	106	75	69	177	165	137	568	0.9	227.7	5018.7	10.96	9.2	1675	10	495	7.2	703.4	off	8.14	7.2
20492	105	76	69	177	165	136	561	0.9	208.7	5017.1	11.17	8.99	1532	9.5	488	7.2	703.4	off	8.14	7.2
20552	104	77	69	176	165	135	553	0.8	195.6	5017.9	11.17	9.01	1410	9	481	7.2	644.8	off	8.14	7.2
20612	104	78	70	176	165	134	546	0.6	186.5	5017.1	11.27	8.92	1315	8.5	475	7.2	601.8	off	8.14	7.2
20668	104	78	70	176	165	134	539	0.8	183.1	5015.9	11.25	8.92	1244	7.7	469	7.2	644.8	off	8.14	7.2
20728	103	78	71	176	164	133	533	0.8	182.3	5018.7	11.26	8.92	1184	7.5	462	7.2	703.7	off	8.14	7.2
20788	102	77	71	175	164	132	526	0.7	175.1	5016.3	11.37	8.76	1097	7.5	456	7.2	645.0	off	8.14	7.2
20848	102	77	71	175	163	132	523	0.7	171.4	5019.1	11.45	8.73	1043	8	449	7.2	703.9	off	8.15	7.2
20908	101	77	71	175	163	131	520	0.7	170.7	5017.9	11.37	8.78	978	8	444	7.2	703.9	off	8.15	7.2
20968	101	76	71	174	163	130	516	0.8	171.7	5017.1	11.32	8.82	935	8.5	438	7.2	645.2	off	8.15	7.2
21028	100	76	71	174	163	129	512	0.7	168.5	5017.9	11.33	8.8	902	8.5	431	7.2	645.2	off	8.15	7.2
21088	98	75	71	174	163	128	509	0.7	168.9	5017.9	11.48	8.63	866	8.5	425	7.2	645.2	off	8.15	7.2
21148	97	75	71	174	163	128	504	0.7	167.6	5017.5	11.62	8.53	839	9	418	7.2	645.2	off	8.15	7.2

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FURNACE A WITH CATALYST-HIGH HEAT REMOVAL RATE

Printed on 02-Apr-96

27-Oct-95 Run TTCD-2

time sec	stack F	dilution F	ambient F	water-out F	water in F	stove exit F	fire-box F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
21208	97	75	70	173	162	127	499	0.7	165.4	5019.1	11.57	8.57	823	9	413	7.2	645.5	off	8.15	7.2
21268	97	75	70	173	162	127	494	0.7	165.4	5019.9	11.54	8.6	812	9	407	7.2	645.5	off	8.15	7.2
21328	96	75	70	173	162	126	490	0.7	164.6	5017.9	11.5	8.62	839	9	402	7.2	645.5	off	8.15	7.2
21388	96	74	70	173	162	125	486	0.7	163.7	5017.5	11.36	8.77	839	9.5	396	7.2	645.5	off	8.15	7.2
21448	95	74	70	172	162	125	484	0.7	166	5016.7	11.45	8.68	844	9.5	391	7.2	586.8	off	8.15	7.2
21508	95	74	70	172	161	124	483	0.8	165.5	5018.3	11.45	8.68	851	9.5	386	7.2	645.7	off	8.15	7.2
21568	94	74	70	172	161	125	482	0.8	164.9	5018.3	11.33	8.8	841	9.5	381	7.2	645.7	off	8.15	7.2
21628	93	74	69	172	161	124	481	0.8	163.4	5019.9	11.32	8.77	829	9.5	376	7.2	645.7	off	8.15	7.2
21688	93	74	68	172	161	123	479	0.8	161.5	5017.5	11.28	8.85	821	9.5	372	7.2	645.7	off	8.15	7.2
21748	93	74	69	172	161	123	479	0.8	160	5018.7	11.18	8.94	816	9.5	368	7.2	645.7	off	8.15	7.2
21808	91	74	69	172	161	123	479	0.7	158.5	5019.1	11.32	8.76	811	9.5	364	7.2	645.7	off	8.15	7.2
21868	91	73	69	171	160	123	478	0.7	156.9	5016.3	11.5	8.65	809	9.5	361	7.2	645.9	off	8.16	7.2
21928	92	74	69	171	161	123	476	0.7	150.7	5018.7	11.27	8.85	786	9.5	357	7.2	587.0	off	8.15	7.2
21988	92	75	69	171	161	124	474	0.7	141.8	5017.9	11.17	8.92	771	9	354	7.2	547.9	off	8.15	7.2
22044	91	76	69	171	161	123	470	0.7	140.5	5017.9	11.04	9.06	767	9	351	7.2	587.0	off	8.15	7.2
22104	92	76	70	171	161	124	466	0.7	138	5017.9	10.93	9.14	768	8	348	7.2	587.0	off	8.15	7.2
22164	92	77	70	170	160	124	463	0.7	143.9	5017.5	10.97	9.1	753	7.8	346	7.2	587.2	off	8.16	7.2
22224	92	76	70	170	160	123	461	0.7	142.9	5016.3	11	9.05	734	7.5	343	7.2	587.2	off	8.16	7.2
22284	92	75	70	170	159	122	459	0.7	144.9	5018.7	11.03	9.02	719	7.7	341	7.2	646.1	off	8.16	7.2
22344	92	75	70	170	159	120	458	0.7	147	5016.7	10.92	9.11	696	8	339	7.2	646.1	off	8.16	7.2
22404	92	74	70	170	159	118	458	0.7	148.9	5017.5	11.07	8.96	681	8.2	337	7.2	646.1	off	8.16	7.2
22464	92	74	70	169	159	117	456	0.7	149.7	5018.3	11.17	8.88	679	8.5	335	7.2	587.4	off	8.16	7.2
22524	91	74	70	169	159	115	455	0.7	147.5	5015.9	11.17	8.87	665	8.5	333	7.2	587.4	off	8.16	7.2
22584	90	74	70	169	158	115	454	0.7	149.1	5017.9	11.24	8.83	663	8.5	332	7.2	646.3	off	8.16	7.2
22644	90	74	70	168	158	115	452	0.7	146.3	5018.3	11.01	9.09	667	9	330	7.2	587.6	off	8.16	7.2
22704	89	74	70	169	158	116	451	0.7	147.8	5017.9	10.84	9.2	661	9	329	7.2	646.3	off	8.16	7.2
22764	89	74	69	168	157	118	450	0.7	145.8	5015.5	10.92	9.13	665	9	327	7.2	646.5	off	8.16	7.2
22824	89	73	69	168	158	119	449	0.7	146.5	5016.3	10.87	9.2	678	9	326	7.2	587.6	off	8.16	7.2
22884	89	73	69	168	157	119	446	0.7	147.5	5017.9	10.97	9.12	691	9	324	7.2	646.5	off	8.16	7.2
22944	89	73	69	168	157	120	445	0.8	149.4	5018.3	10.81	9.27	701	9.5	323	7.2	646.5	off	8.16	7.2
23004	88	73	69	168	158	120	445	0.7	148.6	5019.9	10.95	9.13	713	9.5	322	7.2	587.6	off	8.16	7.2
23064	88	73	69	167	157	120	444	0.8	152	5017.5	10.85	9.26	727	9.5	322	7.2	587.8	off	8.16	7.2
23124	88	74	69	167	157	118	443	0.7	141.4	5017.9	11.03	9.07	728	9	320	7.2	587.8	off	8.16	7.2
23184	88	75	68	167	157	118	442	0.8	138	5017.5	10.82	9.34	752	9	319	7.2	587.8	off	8.16	7.2
23244	89	75	69	167	157	120	441	0.8	134.9	5020.3	10.59	9.54	768	8.5	318	7.2	587.8	off	8.16	7.2
23304	89	76	69	167	157	120	439	0.8	134.9	5017.9	10.18	9.92	774	8	317	7.2	587.8	off	8.16	7.2
23364	89	75	70	166	157	120	437	0.8	143.7	5017.9	10.14	9.9	765	7.5	316	7.2	493.7	off	8.16	7.2
23420	89	75	70	166	156	120	436	0.8	144	5019.9	10.4	9.65	749	7.5	315	7.2	588.0	off	8.17	7.2
23480	96	76	70	166	156	133	429	0.8	287.9	5016.7	10.7	9.31	726	8	313	7.2	588.0	on	8.17	7.2
23540	130	83	70	166	156	182	460	0.7	993.2	5017.5	11.56	8.35	462	8	317	7.2	588.0	on	8.17	7.2
23600	146	88	70	166	156	200	553	0.6	1071.9	5016.3	14.54	5.81	346	8.2	333	7.2	588.0	on	8.17	7.2
23660	155	88	70	165	155	208	632	0.7	1053.7	5016.7	14.73	5.83	344	8.5	347	7.2	588.2	on	8.17	7.2
23720	161	88	69	165	155	214	661	0.7	1210.8	5017.1	14.45	6.04	347	8.5	361	7.2	588.2	on	8.17	7.2
23780	164	89	69	165	155	218	671	0.8	1314	5017.9	14.19	6.25	346	8.5	374	7.2	588.2	on	8.17	7.2
23840	169	89	69	165	155	223	686	0.6	1496.9	5017.1	14.1	6.33	366	8.5	387	7.2	588.2	on	8.17	7.2
23900	172	90	69	166	155	228	699	0.9	1630.5	5015.9	13.95	6.48	384	8.5	400	7.2	647.0	on	8.17	7.2
23960	176	91	69	166	155	232	717	1.0	1759	5017.9	13.75	6.65	395	8.5	415	7.2	647.0	on	8.17	7.2
24020	179	92	69	166	156	235	721	1.1	1887.5	5016.7	13.46	6.9	404	8	429	7.2	588.0	on	8.17	7.2
24080	183	92	68	166	156	240	724	1.2	2007.5	5016.3	13.34	7	414	8	443	7.2	588.0	on	8.17	7.2
24140	186	94	68	167	156	243	728	1.2	2008.3	5019.1	13.29	7.03	422	7.5	457	7.2	646.8	on	8.17	7.2
24200	190	95	69	166	157	247	733	1.3	2007.5	5018.3	13.18	7.1	426	7	471	7.2	529.0	on	8.16	7.2
24260	194	97	69	167	157	251	742	1.3	2008.3	5015.9	13.08	7.19	435	8.5	485	7.2	587.8	on	8.16	7.2
24320	198	97	69	167	157	254	759	1.3	2007.8	5018.7	12.99	7.26	443	5.5	499	7.2	587.8	on	8.16	7.2
24380	201	97	70	167	157	258	766	1.3	2008	5017.9	12.88	7.36	437	5.5	512	7.2	587.8	on	8.16	7.2
24440	204	98	70	168	157	261	763	1.2	1904.3	5019.1	12.94	7.28	427	5.5	521	7.2	646.5	on	8.16	7.2
24500	207	97	70	168	158	263	760	1.1	1704.9	5018.7	13.11	7.17	421	5.5	530	7.2	587.6	on	8.16	7.2
24560	209	98	70	168	158	265	765	1.0	1649.1	5016.7	13.11	7.16	421	5.5	536	7.2	587.6	on	8.16	7.2
24620	210	98	70	168	158	266	771	1.0	1478	5017.9	13.09	7.19	424	5.5	540	7.2	587.6	on	8.16	7.2
24680	212	98	70	168	158	267	774	0.9	1355.8	5018.7	13.13	7.18	405	5.5	544	7.2	587.6	on	8.16	7.2
24740	214	99	69	169	158	270	776	0.8	1241.4	5015.9	13.12	7.22	387	5.5	548	7.2	603.2	on	8.16	7.2
24796	216	99	69	169	158	271	760	0.7	1164.4	5018.7	13.06	7.34	367	5.5	549	7.2	646.3	on	8.16	7.2
24856	217	99	69	169	158	272	734	0.7	1098.1	5019.1	13.02	7.37	357	5	550	7.2	648.3	on	8.16	7.2
24916	216	99	69	169	159	271	716	0.7	1107.9	5017.5	13.12	7.28	352	5	550	7.2	587.4	on	8.16	7.2
24976	218	99	69	169	159	271	717	0.7	1055.5	5018.3	13.17	7.23	350	5	552	7.2	587.4	on	8.16	7.2
25036	217	99	68	170	159	271	722	0.6	1043.1	5019.1	13.27	7.14	343	4.5	554	7.2	646.1	on	8.16	7.2
25096	217	99	68	170	159	271	718	0.6	1016.3	5017.9	13.27	7.16	343	4.5	554	7.2	646.1	on	8.16	7.2
25156	217	99	68	170	159	271	709	0.6	1009.8	5017.9	13.31	7.14	344	4.5	555	7.2	646.1	on	8.16	7.2
25216	217	99	68	170	160	271	704	0.6	1019.5	5016.3	13.39	7.06	337	4.5	555	7.2	587.2	on	8.16	7.2
25276	218	99	68	171	160	270	694	0.6	1014.8	5018.7	13.43	7.04	341	4.5	557	7.2	645.9	on	8.16	7.2
25336	218	98	67	171	160	270	684	0.6	1024.6	5018.3	13.45	7.02	341	4.5	557	7.2	645.9	on	8.16	7.2
25396	218	99	67	171	160	270	679	0.6	1072.8	5018.7	13.49	6.99	338	4	556	7.2	645.9	on	8.16	7.2
25456	217	98	67	171	160	269	673	0.6	1065.3	5017.9	13.53	6.95	341	4	556	7.2	645.9	on	8.16	7.2
25516	217	98	67	171	160	269	681	0.6	1050	5016.3	13.58	6.89	344	4	555	7.2	645.9	on	8.16	7.2
25576	217	98	67	171	160	269	692	0.6	999.2	5017.1	13.63	6.87	348	4	554	7.2	645.9	on	8.16	7.2

D52

FURNACE A WITH CATALYST-HIGH HEAT REMOVAL RATE

27-Oct-95 Run TTCD-2

time sec	stack F	dilution F	ambient F	water-out F	water in F	stove exit F	fire-box F	CO high %	CO dilution ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
25636	217	99	67	171	160	269	709	0.6	984.2	5019.5	13.66	6.84	348	4	554	7.2	645.9	On	8.16	7.2
25696	217	98	67	172	160	269	724	0.6	976.4	5017.1	13.66	6.87	339	3.5	552	7.2	704.7	On	8.16	7.2
25756	217	98	67	172	161	268	731	0.6	983.2	5018.3	13.69	6.85	334	3.5	552	7.2	645.7	On	8.15	7.2
25816	217	98	67	172	161	268	734	0.6	966	5018.7	13.71	6.82	332	5.5	550	7.2	645.7	On	8.15	7.2
25876	217	98	67	172	161	269	732	0.6	931.8	5017.5	13.73	6.81	335	3.5	549	7.2	645.7	On	8.15	7.2
25936	217	99	67	172	161	268	723	0.6	912.1	5019.5	13.82	6.71	332	3	548	7.2	645.7	On	8.15	7.2
25996	217	100	67	172	162	267	715	0.8	956.1	5017.9	13.91	6.62	333	2.5	545	7.2	586.6	On	8.15	7.2
26056	217	100	67	173	162	267	706	0.8	1005.7	5019.1	13.95	6.55	339	2	543	7.2	645.5	On	8.15	7.2
26116	217	101	68	173	162	267	669	0.6	962.1	5017.5	14.04	6.46	349	1.5	541	7.2	624.0	On	8.15	7.2
26172	218	100	68	173	162	266	677	0.6	1022.1	5018.7	14.15	6.32	354	1	539	7.2	624.0	On	8.15	7.2
26232	217	100	68	173	162	267	677	0.6	906.9	5018.3	14.21	6.3	373	0.5	540	7.2	645.5	On	8.15	7.2
26292	217	99	69	173	162	267	668	0.5	859	5016.3	14.16	6.34	336	0.5	539	7.2	645.5	On	8.15	7.2
26352	217	99	69	173	162	267	661	0.5	858.6	5015.1	14.14	6.35	328	0.5	538	7.2	645.5	On	8.15	7.2
26412	217	99	69	174	163	266	656	0.5	891.3	5006.9	14.16	6.25	330	0.5	537	7.2	645.3	On	8.15	7.2
26472	217	99	69	174	162	265	658	0.5	925	5018.3	14.29	6.08	334	0.5	535	7.2	704.2	On	8.15	7.2
26532	216	98	68	174	163	265	667	0.6	916.9	5018.7	14.36	6.01	339	0.5	532	7.2	645.3	On	8.15	7.2
26592	214	98	68	174	163	263	669	0.6	905.8	5017.9	14.35	6.03	340	0.5	529	7.2	645.3	On	8.15	7.2
26652	214	98	68	174	163	264	668	0.6	940.1	5018.7	14.37	6	337	0.5	525	7.2	645.3	On	8.15	7.2
26712	214	98	68	174	163	263	665	0.6	969.7	5019.5	14.41	5.94	328	0.5	522	7.2	645.3	On	8.15	7.2
26772	213	98	68	174	163	262	664	0.6	980.1	5018.7	14.46	5.93	330	0.5	519	7.2	645.3	On	8.15	7.2
26832	212	97	67	174	163	261	665	0.6	993.6	5019.1	14.48	5.93	326	0.5	517	7.2	645.3	On	8.15	7.2
26892	211	98	67	175	163	260	665	0.6	993	5018.7	14.47	5.95	325	0.5	515	7.2	703.9	On	8.15	7.2
26952	211	97	67	175	163	259	663	0.6	1028.6	5017.1	14.52	5.91	314	0.5	512	7.2	703.9	On	8.15	7.2
27012	210	97	67	175	163	259	661	0.6	1088.1	5017.5	14.52	5.91	306	0.5	510	7.2	703.9	On	8.15	7.2
27072	210	97	67	175	163	259	660	0.7	1129.1	5016.7	14.55	5.88	303	0.5	508	7.2	703.9	On	8.15	7.2
27132	210	97	67	175	164	258	659	0.7	1140.6	5015.9	14.58	5.86	299	0.5	505	7.2	645.1	On	8.14	7.2
27192	209	97	67	175	164	258	658	0.7	1124.6	5017.5	14.6	5.84	293	0.5	504	7.2	645.1	On	8.14	7.2
27252	209	97	67	175	164	257	658	0.7	1103.2	5019.9	14.65	5.8	283	0.5	503	7.2	645.1	On	8.14	7.2
27312	208	96	67	175	164	257	653	0.7	1046.7	5020.6	14.72	5.74	280	0.5	501	7.2	645.1	On	8.14	7.2
27372	208	96	67	175	164	256	647	0.6	1032.1	5017.1	14.8	5.66	276	0	499	7.2	645.1	On	8.14	7.2
AVERAGE	145	83	69	172	161	183	598	1.37			11.08	9.39	2533		477	7.2	661.8		8.15	7.2

6.6311111 test hrs
397.86667 test min.
06:38:52 hr:mm:sec

Total Btu out =	264,739	Btu out/hr =	39,924
Total Btu in =	556,757	Btu in/hr =	83,961
Efficiency =	47.55%		
Water flowrate =	7.20	gpm	
Burnrate =	4.73	dry kg/hr	
Wood moisture =	21.74%		
Burn time =	6.63	hr	

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dlu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
5772	71	86	141	179	191	164	157	0.318	484	3177	18.96	2.13	273	87.5	252	6.4	365.2	Off	8.16	6.3
5832	72	84	141	178	214	163	157	0.263	718	2585	19.78	1.43	340	87.5	254	6.4	313.0	Off	8.16	6.3
5892	72	84	143	180	287	163	157	0.436	993	4331	18.39	2.88	290	87.5	260	6.4	313.0	On	8.16	6.3
5952	72	85	147	185	361	163	156	0.537	1091	5017	17.6	3.59	283	87.5	270	6.4	365.3	On	8.17	6.3
6012	72	86	153	191	410	163	156	0.569	1207	5017	16.97	4.25	309	87.5	283	6.4	365.3	On	8.17	6.3
6072	72	87	159	197	452	162	156	0.645	1253	5017	16.35	4.82	363	87	299	6.4	313.1	On	8.17	6.3
6132	72	88	165	205	485	163	156	0.647	1203	5017	15.85	5.32	394	86.5	317	6.4	365.3	On	8.17	6.3
6192	71	92	178	223	557	162	156	0.626	1252	5016	14.77	6.46	445	85.5	352	6.4	313.1	On	8.17	6.3
6252	71	96	189	242	791	163	156	0.783	1894	5017	11.98	9.33	512	84.5	416	6.4	365.3	On	8.17	6.3
6312	71	99	196	255	986	164	157	2.05	2007	5018	7.92	13.14	558	83.5	486	6.4	365.2	On	8.16	6.3
6372	71	101	204	268	1103	165	158	2.706	2007	5016	6.75	14.12	550	82	546	6.4	365.1	On	8.16	6.3
6432	71	103	209	277	1153	166	159	2.981	2008	5018	6.2	14.66	535	81	591	6.4	364.9	On	8.16	6.3
6492	72	104	213	285	1153	167	160	3.013	2007	5016	5.77	15.11	577	79.5	623	6.4	364.8	On	8.16	6.3
6552	71	105	216	289	1153	168	161	3.012	2007	5017	5.4	15.47	1429	78.2	645	6.4	364.7	On	8.15	6.3
6612	72	106	220	295	1153	169	161	3.014	2007	5017	5.11	15.78	2116	77	664	6.4	416.8	On	8.15	6.3
6672	72	108	228	302	1153	170	162	3.013	2007	5016	4.74	16.16	2856	75.7	681	6.4	416.7	On	8.15	6.3
6732	72	111	240	313	1153	171	163	3.012	2008	5015	4.55	16.31	3390	74.5	698	6.4	416.5	On	8.15	6.3
6792	71	115	257	325	1153	172	164	3.012	2007	5016	4.31	16.48	3758	73.5	717	6.4	416.4	On	8.14	6.3
6852	72	120	271	338	1153	173	165	3.013	2007	5017	3.94	16.76	3506	72	739	6.4	388.5	On	8.14	6.3
6908	72	123	279	344	1153	174	166	3.013	2007	5015	3.66	16.97	3274	70.5	754	6.4	416.1	On	8.14	6.3
6968	72	126	285	349	1154	175	167	3.013	2007	5016	3.55	17.04	3551	69	766	6.4	415.9	On	8.14	6.3
7028	72	128	289	352	1154	176	167	3.013	2007	5017	3.45	17.08	3894	67.5	775	6.4	467.9	On	8.14	6.3
7088	72	128	292	352	1154	176	169	3.013	2007	5016	3.38	17.09	3620	66	783	6.4	363.7	On	8.13	6.3
7148	72	102	249	295	1141	177	169	3.013	2008	5015	3.75	16.74	3663	65	771	6.4	415.6	On	8.13	6.3
7208	72	90	208	248	934	177	170	3.013	1909	5017	7.34	14.31	3078	65	730	6.4	363.6	Off	8.13	6.3
7268	72	85	186	221	806	177	170	2.964	964	5016	10.73	10.68	3251	64.5	692	6.4	363.6	Off	8.13	6.3
7328	72	82	173	205	752	177	170	1.98	594	5018	12.14	8.74	3625	64.5	658	6.4	363.6	Off	8.13	6.3
7388	72	81	166	195	711	177	170	1.247	436	5017	12.55	8.17	5022	64.5	631	6.4	363.6	Off	8.13	6.3
7448	72	80	159	188	679	177	170	0.986	361	5017	12.64	8.01	6399	64	609	6.4	363.6	Off	8.13	6.3
7508	73	78	155	183	656	177	170	0.873	346	5016	12.67	7.77	3023	64	591	6.4	363.6	Off	8.13	6.3
7568	72	78	151	179	637	178	169	0.815	323	5017	13.01	7.63	1471	64	580	6.4	467.6	Off	8.13	6.3
7628	72	77	148	176	617	177	169	0.767	308	5016	13.27	7.41	1322	64	574	6.4	415.6	Off	8.13	6.3
7688	72	77	145	174	601	177	170	0.743	300	5017	13.45	7.26	1281	64	566	6.4	363.6	Off	8.13	6.3
7748	72	77	144	172	588	177	170	0.726	296	5016	13.61	7.07	1246	63.5	552	6.4	363.6	Off	8.13	6.3
7808	72	77	143	170	575	177	170	0.743	296	5019	13.63	7.14	1222	63.5	537	6.4	363.6	Off	8.13	6.3
7868	72	77	141	169	563	177	169	0.744	297	5015	13.76	7.04	1301	63.5	524	6.4	415.6	Off	8.13	6.3
7928	72	77	140	167	551	177	170	0.748	300	5017	13.9	6.94	2273	63.5	512	6.4	363.6	Off	8.13	6.3
7988	72	76	139	166	543	177	169	0.757	306	5017	13.96	6.9	2567	63.5	501	6.4	415.6	Off	8.13	6.3
8048	72	76	137	164	534	177	169	0.778	313	5017	13.97	6.94	2561	63	491	6.4	415.6	Off	8.13	6.3
8108	72	76	137	163	527	177	169	0.805	319	5018	13.93	7.03	2651	63	483	6.4	415.6	Off	8.13	6.3
8168	72	76	137	163	520	177	169	0.823	330	5016	13.91	7.06	2572	63	475	6.4	415.6	Off	8.13	6.3
8228	72	76	137	162	514	176	169	0.827	337	5016	14.07	6.94	2559	63	469	6.4	339.4	Off	8.13	6.3
8284	72	76	137	162	509	176	168	0.862	346	5015	13.99	7.05	2613	63	463	6.4	415.8	Off	8.13	6.3
8344	72	76	136	161	505	175	166	0.891	358	5017	13.92	7.15	2669	62.5	458	6.4	363.8	Off	8.13	6.3
8404	72	76	135	161	503	175	168	0.926	369	5018	13.84	7.27	2710	62.5	453	6.4	363.8	Off	8.13	6.3
8464	72	76	135	161	498	174	167	0.956	385	5018	13.81	7.33	2770	62.5	449	6.4	363.9	Off	8.14	6.3
8524	72	76	135	160	496	174	167	0.976	398	5014	13.86	7.32	2787	62	446	6.4	363.9	Off	8.14	6.3
8584	72	76	135	160	494	174	166	1.001	417	5015	13.9	7.35	2926	62	442	6.4	416.1	Off	8.14	6.3
8644	72	77	135	160	493	174	166	1.051	445	5016	13.8	7.49	3103	61.5	438	6.4	416.1	Off	8.14	6.3
8704	72	77	136	161	495	173	166	1.123	480	5018	13.63	7.69	3360	61.2	435	6.4	364.1	Off	8.14	6.3
8764	72	77	138	161	495	173	166	1.21	519	5017	13.48	7.88	3651	61	431	6.4	364.1	Off	8.14	6.3
8824	72	77	136	161	495	173	166	1.309	561	5018	13.39	8.01	3965	60.5	429	6.4	364.1	Off	8.14	6.3
8884	72	77	136	161	495	173	166	1.423	601	5015	13.24	8.2	4370	60.5	425	6.4	364.1	Off	8.14	6.3
8944	72	77	136	161	495	173	166	1.543	645	5015	13.09	8.36	4496	60.5	423	6.4	364.1	Off	8.14	6.3
9004	72	77	139	162	496	173	165	1.648	688	5017	13.07	8.4	4657	60.5	422	6.4	416.2	Off	8.14	6.3
9064	72	77	139	162	496	172	165	1.754	710	5015	12.94	8.56	4754	60.5	421	6.4	364.2	Off	8.14	6.3
9124	72	77	138	162	498	173	165	1.805	744	5017	12.94	8.6	4913	60	421	6.4	416.2	Off	8.14	6.3
9184	72	77	139	163	500	172	165	1.875	769	5017	12.92	8.65	4864	59.5	419	6.4	364.2	Off	8.14	6.3
9244	73	77	138	163	500	172	165	1.936	793	5018	12.84	8.75	4926	59.5	419	6.4	364.2	Off	8.14	6.3
9304	73	77	138	163	502	172	165	1.957	799	5015	12.95	8.69	4986	59	418	6.4	364.2	Off	8.14	6.3
9364	72	77	138	163	504	172	165	1.99	821	5017	12.95	8.72	5105	59	418	6.4	364.2	Off	6.14	6.3
9424	73	77	138	163	506	172	165	2.044	843	5015	12.9	8.79	5459	59	418	6.4	364.2	Off	8.14	6.3
9484	73	77	138	163	507	172	165	2.104	845	5015	12.77	8.95	5404	59	417	6.4	364.2	Off	8.14	6.3
9544	73	77	139	163	509	172	165	2.15	869	5017	12.71	9.03	5371	58.5	418	6.4	364.2	Off	8.14	6.3
9604	73	76	139	163	512	172	165	2.221	896	5016	12.58	9.2	5441	58	417	6.4	339.9	Off	8.14	6.3
9660	72	75	140	163	515	172	165	2.253	917	5017	12.56	9.21	5420	58	417	6.4	364.2	Off	8.14	6.3
9720	72	74	139	163	518	172	164	2.309	939	5015	12.48	9.32	5499	58	417	6.4	416.4	Off	8.14	6.3
9780	71	73	141	164	521	172	164	2.364	969	5016	12.47	9.36	5640	58.5	417	6.4	416.4	Off	8.14	6.3
9840	69	73	140	164	523	172	164	2.471	993	5015	12.24	9.64	5861	59	417	6.4	416.4	Off	8.14	6.3
9900	68	72	140	164	525	172	164	2.531	1030	5016	12.2	9.69	6156	59	418	6.4	416.4	Off	8.14	6.3
9960	67	72	141	164	528	172	164	2.594	1054	5018	12.19	9.71	6508	59	418	6.4	416.4	Off	8.14	6.3
10020	67	72	140	164	531	172	164	2.68	1073	5019	12.07	9.89	6670	59	418	6.4	416.4	Off	8.14	6.3
10080	66	73	139	164	531	172	164	2.697	1082	5014	12.14	9.82	6428	58.5	420	6.4	416.4	Off	8.14	6.3
10140	66	74	140	165	531	172	164	2.727	1104	5015	12.24	9.75	6458	58	420	6.4	416.4	Off	8.14	6.3

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
10200	66	74	140	165	532	171	164	2.729	1132	5015	12.41	9.59	6674	57.5	420	6.4	364.3	Off	8.14	6.3
10260	66	75	141	165	536	171	164	2.788	1166	5018	12.35	9.71	6696	57.4	421	6.4	364.3	Off	8.14	6.3
10320	67	75	140	165	540	172	164	2.857	1193	5015	12.24	9.82	6694	57	421	6.4	416.4	Off	6.14	6.3
10380	67	75	141	166	545	172	164	2.924	1205	5015	12.14	9.93	6696	56.5	421	6.4	416.4	Off	8.14	6.3
10440	68	75	143	166	550	171	164	2.982	1224	5016	12.01	10.06	6697	56	422	6.4	364.3	Off	6.14	6.3
10500	68	76	144	166	555	171	164	3.012	1251	5015	11.71	10.36	6695	55.5	422	6.4	364.3	Off	6.14	6.3
10560	68	76	143	166	558	171	164	3.013	1270	5016	11.65	10.41	6693	55	422	6.4	364.3	Off	6.14	6.3
10620	69	76	143	166	560	171	164	3.013	1279	5016	11.73	10.31	6696	54.5	421	6.4	364.3	Off	8.14	6.3
10680	69	76	142	166	563	171	164	3.013	1284	5015	11.71	10.31	6696	54	420	8.4	364.3	Off	8.14	6.3
10740	69	76	140	166	567	171	164	3.012	1299	5016	11.75	10.25	6696	54	420	8.4	364.3	Off	8.14	6.3
10800	69	77	141	166	570	171	164	3.013	1303	5017	11.83	10.17	6695	53.5	420	6.4	364.3	Off	6.14	6.3
10860	70	77	141	165	573	171	164	3.012	1306	5017	11.83	10.17	6695	53	419	6.4	364.3	Off	6.14	6.3
10920	70	77	141	165	576	171	164	3.012	1306	5018	11.75	10.26	6694	53	418	6.4	364.3	Off	6.14	6.3
10980	70	76	141	165	578	171	164	3.013	1306	5016	11.75	10.25	6695	52.5	417	6.4	340.0	Off	8.14	6.3
11036	70	75	141	165	579	171	164	3.013	1299	5018	11.69	10.35	6695	52.5	417	6.4	364.3	Off	8.14	6.3
11096	69	74	142	164	582	171	163	3.013	1313	5016	11.54	10.47	6694	53	416	6.4	416.5	Off	6.15	6.3
11156	69	72	140	165	584	171	163	3.013	1336	5016	11.32	10.7	6693	53.5	416	6.4	416.5	Off	8.15	6.3
11216	68	72	140	165	586	171	163	3.012	1355	5018	11.35	10.63	6696	53.5	416	8.4	416.5	Off	8.15	6.3
11278	67	72	140	165	587	171	163	3.014	1391	5016	11.27	10.73	6694	53.5	416	6.4	416.5	Off	6.15	6.3
11336	67	73	139	164	590	171	163	3.013	1392	5015	11.28	10.71	6694	53	416	6.4	416.5	Off	6.15	6.3
11396	67	74	138	163	591	171	163	3.012	1380	5016	11.6	10.37	6695	52.6	416	6.4	416.5	Off	6.15	6.3
11458	67	74	136	163	591	171	163	3.012	1359	5016	12.02	9.96	6694	52.5	416	6.4	416.5	Off	6.15	6.3
11516	67	75	137	162	590	171	163	3.012	1329	5017	12.09	9.93	6693	52	416	6.4	416.5	Off	8.15	6.3
11576	67	75	137	162	589	171	163	3.012	1309	5016	12.03	10.01	6694	51	415	6.4	416.5	Off	8.15	6.3
11636	68	75	138	162	589	171	163	3.013	1292	5016	11.92	10.14	6696	51	415	6.4	416.5	Off	6.15	6.3
11696	68	75	137	162	590	171	163	3.013	1276	5015	11.8	10.26	6694	50.5	414	6.4	416.5	Off	6.15	6.3
11756	68	76	138	162	589	170	162	3.013	1240	5017	11.96	10.09	6689	50	415	6.4	416.7	Off	6.15	6.3
11816	69	76	138	162	590	170	163	3.013	1221	5016	11.9	10.16	6679	50	414	6.4	364.5	Off	6.15	6.3
11876	69	76	138	161	589	170	163	3.013	1199	5016	11.75	10.31	6692	49.5	414	6.4	364.5	Off	6.15	6.3
11936	69	76	137	161	589	170	163	3.012	1181	5017	11.72	10.31	6694	49.5	413	6.4	364.5	Off	8.15	6.3
11996	69	75	135	160	592	171	163	2.965	1185	5016	11.9	10.11	6650	49	413	6.4	416.5	Off	6.15	6.3
12056	69	74	134	160	594	170	163	2.96	1187	5015	11.69	10.09	6572	49	413	6.4	364.5	Off	6.15	6.3
12116	69	73	136	160	595	170	162	2.995	1203	5016	11.65	10.33	6484	49.5	413	6.4	418.7	Off	6.15	6.3
12178	68	72	134	160	599	170	162	3.013	1220	5016	11.42	10.49	6552	49.7	413	6.4	416.7	Off	6.15	6.3
12236	67	71	133	160	612	170	162	3.014	1241	5015	11.5	10.37	6493	50	415	6.4	416.7	Off	6.15	6.3
12296	67	71	134	160	619	170	162	2.954	1083	5015	11.39	10.44	6320	50	417	6.4	416.7	Off	8.15	6.3
12356	67	73	133	160	622	170	162	2.783	1031	5018	11.3	10.61	6153	49.5	416	6.4	388.9	Off	8.15	6.3
12412	67	73	133	159	623	170	163	2.676	1033	5017	11.52	10.43	6092	49	418	6.4	364.5	Off	6.15	6.3
12472	67	74	133	159	621	170	163	2.609	1006	5016	11.71	10.21	5901	48.5	418	6.4	364.5	Off	8.15	6.3
12532	67	74	134	159	620	170	163	2.56	992	5016	11.78	10.14	5750	48	416	6.4	364.5	Off	8.15	6.3
12592	67	75	132	159	619	170	162	2.583	976	5016	11.56	10.34	5672	48	417	6.4	416.7	Off	6.15	6.3
12652	68	75	131	158	619	170	162	2.513	964	5017	11.66	10.2	5703	47.5	417	6.4	416.7	Off	8.15	6.3
12712	68	75	133	158	620	170	162	2.516	960	5017	11.66	10.21	5726	47	416	6.4	416.7	Off	6.15	6.3
12772	68	75	130	158	620	170	162	2.516	963	5016	11.58	10.28	5602	47	415	6.4	416.7	Off	8.15	6.3
12832	69	75	131	157	615	170	162	2.459	1001	5015	11.67	9.93	5481	46.5	414	6.4	416.7	Off	6.15	6.3
12892	69	75	131	157	614	170	162	2.642	1049	5016	11.78	10.05	5569	46	414	6.4	416.7	Off	8.15	6.3
12952	69	75	130	157	614	170	162	2.74	1064	5018	11.72	10.03	5732	45.6	413	6.4	416.7	Off	6.15	6.3
13012	70	75	131	156	614	170	162	2.72	1064	5018	11.91	9.84	5657	45.5	413	6.4	416.7	Off	6.15	6.3
13072	70	75	131	156	614	170	162	2.793	1067	5017	11.75	10.02	5667	45	413	6.4	416.7	Off	8.15	6.3
13132	70	75	129	156	615	170	162	2.61	1056	5017	11.66	10.08	5849	44.5	413	6.4	416.7	Off	8.15	6.3
13192	70	74	130	156	614	170	162	2.793	1052	5017	11.7	10.04	5864	44	414	8.4	416.7	Off	8.15	6.3
13252	70	73	129	155	615	170	162	2.826	1050	5015	11.53	10.19	5805	44.5	414	6.4	416.7	Off	6.15	6.3
13312	69	72	128	155	615	170	162	2.808	1026	5016	11.51	10.17	5866	45	414	6.4	416.7	Off	6.15	6.3
13372	69	72	129	155	616	170	162	2.783	998	5016	11.36	10.21	5923	45.5	414	6.4	416.7	Off	6.15	6.3
13432	68	71	127	154	617	170	162	2.76	959	5017	11.2	10.36	5777	45.5	414	6.4	416.7	Off	8.15	6.3
13492	68	72	125	153	618	170	162	2.627	905	5018	11.3	10.18	5579	45	413	6.4	416.7	Off	8.15	6.3
13552	67	73	126	152	617	169	162	2.513	881	5017	11.4	10.04	5371	45	413	6.4	364.6	Off	8.15	6.3
13612	67	74	126	151	616	170	162	2.458	869	5016	11.44	9.98	5093	44	412	6.4	416.7	Off	8.15	6.3
13672	68	74	125	151	616	170	162	2.405	852	5017	11.51	9.91	4859	44	413	6.4	416.7	Off	6.15	6.3
13732	68	74	126	151	613	169	162	2.35	838	5017	11.57	9.87	4633	43.5	412	6.4	340.3	Off	8.15	6.3
13788	68	75	125	150	613	169	162	2.388	835	5016	11.37	10.07	4341	43	412	6.4	364.6	Off	8.15	6.3
13848	68	75	125	150	612	169	162	2.381	839	5017	11.33	10.09	4096	43	412	6.4	364.6	Off	8.15	6.3
13908	69	75	124	150	612	169	162	2.342	836	5015	11.47	9.93	4009	43	412	6.4	364.6	Off	8.15	6.3
13968	69	75	125	149	612	169	162	2.318	836	5015	11.56	9.86	3927	42.1	412	6.4	364.6	Off	8.15	6.3
14028	69	73	123	149	614	169	162	2.375	835	5016	11.32	10.13	3750	42.5	412	6.4	364.6	Off	8.15	6.3
14088	69	72	123	150	616	169	161	2.359	811	5018	11.22	10.2	3563	42.5	412	6.4	416.8	Off	8.15	6.3
14148	68	72	123	150	618	169	161	2.296	776	5018	11.07	10.35	3345	43	411	6.4	416.8	Off	8.15	6.3
14208	68	71	124	150	619	169	161	2.212	766	5016	11.05	10.35	3184	43.5	412	6.4	416.8	Off	6.15	6.3
14268	67	71	123	149	617	169	161	2.203	758	5019	10.93	10.46	3024	43.5	412	6.4	416.6	Off	8.15	6.3
14328	67	72	121	149	613	169	161	2.173	747	5017	11.01	10.35	3006	43	411	6.4	416.6	Off	6.15	6.3
14388	67	73	121	148	610	169	161	2.12	754	5016	11.34	10	2974	42.5	412	6.4	416.8	Off	8.15	6.3
14448	67	74	121	148	608	169	161	2.11	764	5017	11.52	9.8	2624	42	411	6.4	416.8	Off	8.15	6.3
14508	67	74	122	148	605	169	161	2.137	757	5018	11.54	9.64	2627	41.5	410	6.4	416.8	Off	8.15	6.3
14568	66	75	119	148	603	169	161	2.112	747	5017	11.53	9.83	2547	41	409	6.4	416.6	Off	8.15	6.3

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FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
14628	68	75	123	148	604	169	161	2.095	736	5017	11.58	9.85	2625	41	409	6.4	416.8	Off	8.15	6.3
14688	69	75	124	148	603	169	161	2.166	739	5017	11.17	10.26	2697	40	410	6.4	416.8	Off	8.15	6.3
14748	69	74	122	148	602	169	161	2.191	741	5017	11.04	10.38	2623	40	409	6.4	416.8	Off	8.15	6.3
14808	69	73	122	148	602	169	161	2.175	741	5017	11.05	10.35	2516	40.5	409	6.4	416.8	Off	8.15	6.3
14868	68	72	121	148	600	169	161	2.183	732	5016	11.02	10.39	2509	41	409	6.4	416.8	Off	8.15	6.3
14928	68	71	121	147	599	169	161	2.161	719	5016	11.02	10.36	2583	41.8	409	6.4	416.8	Off	8.15	6.3
14988	67	70	119	146	600	169	161	2.126	704	5018	10.97	10.37	2461	42	409	6.4	416.8	Off	8.15	6.3
15048	66	70	120	146	603	169	161	2.072	688	5015	11.02	10.28	2210	42.5	409	6.4	416.8	Off	8.15	6.3
15108	66	71	117	145	608	169	160	2.048	674	5016	10.93	10.33	2210	42	408	6.4	437.8	Off	8.16	6.3
15164	66	72	118	144	608	169	161	2	660	5017	11.1	10.13	2328	41.5	408	6.4	416.8	Off	8.15	6.3
15224	66	73	117	144	606	169	161	1.964	652	5017	11.26	9.94	2509	41.1	407	6.4	416.8	Off	8.15	6.3
15284	66	73	116	143	603	169	161	1.936	628	5015	11.28	9.9	2338	41	406	6.4	416.8	Off	8.15	6.3
15344	66	74	116	143	601	168	161	1.88	607	5017	11.34	9.8	2283	40.5	407	6.4	364.7	Off	8.15	6.3
15404	67	74	117	143	598	168	161	1.816	573	5017	11.32	9.77	2306	40.5	406	6.4	364.7	Off	8.15	6.3
15464	68	74	117	142	596	168	161	1.767	546	5016	11.18	9.9	2461	40	406	6.4	364.7	Off	8.15	6.3
15524	68	74	116	141	595	169	161	1.728	527	5018	11.06	9.98	2550	39.5	405	6.4	416.8	Off	8.15	6.3
15584	68	75	116	141	594	168	161	1.677	514	5016	11.04	9.97	2240	39.5	405	6.4	364.7	Off	8.15	6.3
15644	69	75	117	141	592	168	161	1.612	504	5017	11.16	9.86	2126	39	404	6.4	364.7	Off	8.15	6.3
15704	69	75	115	140	589	168	161	1.584	490	5015	11.17	9.85	2329	39	404	6.4	364.7	Off	8.15	6.3
15764	69	75	115	139	586	168	160	1.534	477	5018	11.25	9.76	2438	38.5	403	6.4	416.9	Off	8.16	6.3
15824	70	74	112	139	586	168	161	1.512	479	5015	11.23	9.77	2167	38	402	6.4	364.7	Off	8.15	6.3
15884	69	73	111	139	587	168	160	1.501	474	5016	11.21	9.78	2019	39	402	6.4	416.9	Off	8.16	6.3
15944	69	72	112	139	587	168	160	1.486	471	5018	11.22	9.77	1991	39.5	402	6.4	416.9	Off	8.16	6.3
16004	68	71	111	139	589	168	160	1.489	465	5017	11.08	9.87	2007	39.5	401	6.4	416.9	Off	8.16	6.3
16064	68	70	112	138	591	168	160	1.476	462	5017	11.11	9.84	1851	40	401	6.4	416.9	Off	8.16	6.3
16124	67	70	112	137	593	168	160	1.5	462	5017	10.93	10	1695	40.5	401	6.4	416.9	Off	8.16	6.3
16184	67	70	111	137	592	168	160	1.5	460	5016	10.93	10	1707	40.5	401	6.4	416.9	Off	8.16	6.3
16244	66	71	110	136	592	168	160	1.485	448	5016	11.03	9.88	1783	40	401	6.4	416.9	Off	8.16	6.3
16304	66	72	111	137	590	168	160	1.485	446	5017	11.08	9.87	1777	39.5	401	6.4	416.9	Off	8.16	6.3
16364	66	73	112	136	587	168	160	1.526	446	5017	10.88	10.07	1881	39.5	401	6.4	416.9	Off	8.16	6.3
16424	67	73	111	137	584	168	160	1.515	441	5017	10.89	10.05	1543	39	401	6.4	416.9	Off	8.16	6.3
16484	67	73	111	137	582	167	160	1.496	440	5016	10.93	10.02	1563	39	400	6.4	340.5	Off	8.16	6.3
16540	67	74	112	136	582	168	160	1.46	431	5017	11.09	9.89	1540	39	400	6.4	416.9	Off	8.16	6.3
16600	68	74	111	137	582	167	160	1.468	427	5017	10.93	10.05	1535	38.5	400	6.4	364.8	Off	8.16	6.3
16660	68	74	112	136	580	167	160	1.452	423	5017	10.95	10.03	1438	38.5	400	6.4	364.8	Off	8.16	6.3
16720	69	74	111	136	579	167	160	1.441	415	5018	10.9	10.08	1462	38.3	399	6.4	364.8	Off	8.16	6.3
16780	69	74	110	136	576	167	160	1.417	420	5016	10.98	10.02	1538	38	399	6.4	364.8	Off	8.16	6.3
16840	69	73	109	135	576	168	160	1.369	418	5017	11.2	9.8	1561	38	399	6.4	416.9	Off	8.16	6.3
16900	69	72	110	135	576	168	160	1.392	417	5016	11	9.99	1516	38.5	398	6.4	416.9	Off	8.16	6.3
16960	68	71	109	135	576	167	160	1.427	424	5015	10.78	10.19	1437	39	398	6.4	364.8	Off	8.16	6.3
17020	68	70	108	135	575	167	159	1.413	425	5017	10.95	10	1452	39.5	398	6.4	417.1	Off	8.16	6.3
17080	67	70	106	134	575	167	159	1.417	421	5018	10.95	10.02	1432	40	398	6.4	417.1	Off	8.16	6.3
17140	67	71	107	134	574	167	160	1.384	409	5015	11.13	9.84	1357	39.5	398	6.4	364.8	Off	8.16	6.3
17200	67	72	107	134	572	167	160	1.382	408	5017	11.16	9.81	1314	39	398	6.4	364.8	Off	8.16	6.3
17260	67	73	107	134	570	167	160	1.398	409	5018	11.08	9.91	1296	38.5	398	6.4	364.8	Off	8.16	6.3
17320	67	73	110	135	569	167	160	1.412	412	5017	11.02	9.97	1324	38	398	6.4	364.8	Off	8.16	6.3
17380	67	73	108	135	568	167	160	1.432	413	5017	10.89	10.09	1344	37.5	397	6.4	364.8	Off	8.16	6.3
17440	68	77	118	155	589	167	160	1.421	853	5016	10.99	9.98	1318	37.5	397	6.4	364.8	Off	8.16	6.3
17500	68	91	152	229	1014	167	159	1.496	2007	5016	9.4	11.56	1314	36	483	6.4	417.1	On	8.16	6.3
17560	69	95	172	253	1155	168	160	2.669	2007	5017	5.59	14.13	1333	35	552	6.4	416.9	On	8.16	6.3
17620	69	99	190	267	1155	169	161	3.011	2007	5015	4.49	14.13	1364	34	617	6.4	416.8	On	8.15	6.3
17680	69	95	181	257	1155	170	162	3.013	2007	5016	4.17	14.11	1300	33	648	6.4	416.7	On	8.15	6.3
17740	69	104	208	289	1155	171	163	3.014	2007	5017	4.74	13.73	1339	32.5	676	6.4	416.5	On	8.15	6.3
17800	69	107	231	312	1155	172	164	3.012	2007	5015	3.76	15.12	1391	32	719	6.4	416.4	On	8.14	6.3
17860	69	107	243	323	1155	173	165	3.011	2007	5017	3.49	15.96	1403	31.5	764	6.4	388.5	On	8.14	6.3
17916	68	108	250	331	1155	174	166	3.013	2007	5017	3.51	16.28	1318	31	795	6.4	416.1	On	8.14	6.3
17978	68	108	255	338	1155	176	167	3.014	2007	5015	3.55	16.39	1255	30.5	824	6.4	467.9	On	8.14	6.3
18036	67	103	252	331	1156	177	168	2.978	1981	5015	3.65	16.38	1235	29	846	6.4	467.8	On	8.13	6.3
18096	67	85	198	257	1156	178	169	2.865	1841	5018	4.82	15.17	1283	28	831	6.4	467.6	On	8.13	6.3
18156	67	81	166	211	1110	178	170	3.013	2007	5018	7.62	12.93	1791	27	791	6.4	415.5	Off	8.13	6.3
18216	68	79	150	188	1014	179	170	3.013	1826	5015	8.86	12.11	2255	26.5	748	6.4	467.4	Off	8.13	6.3
18276	68	78	144	177	936	179	171	3.012	1575	5016	9.32	11.53	2537	26.5	712	6.4	415.3	Off	8.12	6.3
18336	69	78	140	171	863	179	171	3.012	1290	5016	9.53	11.06	2812	26	679	6.4	415.3	Off	8.12	6.3
18396	69	77	137	167	815	179	171	3.013	1099	5017	9.59	10.74	2918	26	849	6.4	415.3	Off	8.12	6.3
18456	69	77	133	163	784	179	171	2.925	957	5017	10.1	10.17	2617	25.5	624	6.4	415.3	Off	8.12	6.3
18516	69	76	130	160	760	179	171	2.611	859	5018	10.58	9.72	2288	25.5	600	6.4	415.3	Off	8.12	6.3
18576	70	75	128	157	745	179	170	2.408	786	5016	10.72	9.6	2144	25.5	580	6.4	467.4	Off	8.13	6.3
18636	69	73	124	154	730	179	170	2.233	707	5018	10.72	9.61	2116	26	562	6.4	467.4	Off	8.13	6.3
18696	69	73	123	152	718	179	170	2.017	614	5016	10.76	9.64	2118	27	547	6.4	467.4	Off	8.13	6.3
18756	68	71	119	150	707	179	171	1.777	523	5016	10.71	9.73	3191	27.5	534	6.4	415.3	Off	8.12	6.3
18816	68	71	118	148	694	179	170	1.514	436	5016	10.78	9.72	4808	27.5	523	6.4	467.4	Off	8.13	6.3
18876	67	72	116	147	680	179	170	1.315	368	5017	10.8	9.75	4355	27	510	6.4	467.4	Off	8.13	6.3
18936	67	73	115	145	669	179	170	1.175	334	5017	10.86	9.75	3203	26.5	498	6.4	467.4	Off	8.13	6.3
18996	68	74	115	144	659	179	170	1.076	307	5015	10.98	9.65	2477	26	488	6.4	467.4	Off	8.13	6.3

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
19056	68	74	115	143	648	179	170	1.023	286	5018	10.88	9.77	2109	25.5	482	6.4	467.4	Off	8.13	6.3
19116	68	75	115	143	640	179	170	0.981	268	5017	10.74	9.9	1858	25.5	475	6.4	467.4	Off	8.13	6.3
19176	68	75	114	142	631	178	170	0.932	250	5017	10.7	9.91	1636	25	468	6.4	415.5	Off	8.13	6.3
19236	69	75	113	141	623	178	170	0.89	236	5017	10.69	9.93	1538	25	463	6.4	387.8	Off	8.13	6.3
19292	69	75	112	140	616	178	170	0.856	220	5015	10.62	9.99	1579	25	459	6.4	415.5	Off	8.13	6.3
19352	70	75	110	140	609	178	170	0.81	209	5016	10.68	9.92	1523	25	455	6.4	415.5	Off	8.13	6.3
19412	70	75	109	139	601	178	170	0.771	201	5017	10.73	9.87	1502	24.5	451	6.4	415.5	Off	8.13	6.3
19472	70	74	109	137	595	178	170	0.74	194	5017	10.78	9.83	1436	24.5	446	6.4	415.5	Off	8.13	6.3
19532	69	73	108	136	591	178	170	0.73	187	5016	10.58	9.98	1348	25	446	6.4	415.5	Off	8.13	6.3
19592	69	72	106	135	587	177	169	0.706	181	5015	10.63	9.95	1326	26	444	6.4	415.6	Off	8.13	6.3
19652	68	71	106	134	583	177	169	0.69	176	5015	10.71	9.89	1273	26.5	442	6.4	415.6	Off	8.13	6.3
19712	67	71	105	134	578	177	169	0.684	172	5017	10.56	10	1222	27	441	6.4	415.6	Off	8.13	6.3
19772	67	70	103	134	574	177	168	0.667	166	5018	10.63	9.93	1163	27	439	6.4	467.8	Off	8.13	6.3
19832	67	70	102	133	571	177	168	0.653	160	5017	10.68	9.89	1150	27	438	6.4	467.8	Off	8.13	6.3
19892	67	72	101	133	566	177	168	0.63	151	5019	10.88	9.69	1218	26.4	437	6.4	467.8	Off	8.13	6.3
19952	67	72	101	133	562	176	168	0.616	147	5016	10.89	9.68	1202	25.5	436	6.4	415.8	Off	8.13	6.3
20012	67	73	102	132	558	176	168	0.613	142	5016	10.75	9.84	1175	25	437	6.4	415.8	Off	8.13	6.3
20072	67	73	102	132	554	176	168	0.603	139	5018	10.69	9.87	1152	25	437	6.4	415.8	Off	8.13	6.3
20132	67	74	101	132	549	176	168	0.587	132	5018	10.78	9.79	1137	25	437	6.4	415.8	Off	8.13	6.3
20192	68	74	101	132	544	176	168	0.587	129	5017	10.59	9.97	1099	24.5	436	6.2	404.1	Off	8.13	6.1
20252	68	74	101	132	540	176	168	0.575	127	5016	10.58	9.96	1058	24.5	436	6.2	404.1	Off	8.13	6.1
20312	69	74	101	132	536	176	168	0.558	124	5015	10.7	9.86	1027	24.5	437	6.2	404.1	Off	8.13	6.1
20372	69	74	100	131	533	176	168	0.546	119	5017	10.74	9.81	1039	24	437	6.2	404.1	Off	8.13	6.1
20432	70	74	100	131	532	176	168	0.539	118	5015	10.77	9.78	1030	24	436	6.2	404.1	Off	8.13	6.1
20492	70	74	99	131	533	176	168	0.529	115	5017	10.81	9.72	1006	24	437	6.2	404.1	Off	8.13	6.1
20552	70	74	98	130	531	176	168	0.521	124	5014	11.08	9.42	984	24	437	6.2	404.1	Off	8.13	6.1
20612	70	72	98	129	530	176	167	0.523	128	5017	11.51	9	973	24.5	436	6.2	424.4	Off	8.14	6.1
20668	70	71	98	129	529	176	167	0.548	129	5016	11.37	9.1	958	25	437	6.2	454.8	Off	8.14	6.1
20728	69	71	97	128	526	175	167	0.56	125	5016	11.24	9.21	935	25.5	436	6.2	404.2	Off	8.14	6.1
20788	68	70	96	127	524	175	167	0.558	125	5016	11.22	9.22	919	26	437	6.2	404.2	Off	8.14	6.1
20848	68	69	96	127	523	175	167	0.553	123	5017	11.25	9.2	901	26	436	6.2	404.2	Off	8.14	6.1
20908	67	69	95	126	520	175	167	0.549	120	5018	11.25	9.21	885	26	435	6.2	404.2	Off	8.14	6.1
20968	67	70	94	126	518	175	167	0.533	111	5015	11.4	9.05	868	25.5	433	6.2	404.2	Off	8.14	6.1
21028	67	72	94	127	515	175	167	0.529	108	5017	11.42	9.08	856	25.5	429	6.2	404.2	Off	8.14	6.1
21088	67	73	94	127	512	175	167	0.524	106	5016	11.3	9.17	854	25	424	6.2	404.2	Off	8.14	6.1
21148	67	73	94	127	509	175	167	0.513	106	5017	11.39	9.1	856	24.5	417	6.2	404.2	Off	8.14	6.1
21208	67	74	94	127	507	175	167	0.5	104	5014	11.57	8.92	856	24	411	6.2	404.2	Off	8.14	6.1
21268	68	73	94	127	505	175	167	0.502	101	5017	11.54	8.96	857	24	403	6.2	404.2	Off	8.14	6.1
21328	68	74	93	126	504	175	166	0.501	103	5017	11.51	8.97	851	23.5	397	6.2	454.9	Off	8.14	6.1
21388	68	74	93	126	501	175	167	0.49	100	4960	11.72	8.79	848	23.5	391	6.2	404.2	Off	8.14	6.1
21448	69	74	93	127	500	175	167	0.495	101	5002	11.65	8.86	846	23.5	385	6.2	404.2	Off	8.14	6.1
21508	69	74	93	126	499	174	166	0.498	106	5008	11.59	8.92	840	23	379	6.2	404.4	Off	8.14	6.1
21568	70	73	93	126	498	174	166	0.49	105	4959	11.73	8.77	834	23.5	374	6.2	404.4	Off	8.14	6.1
21628	69	72	93	124	497	174	166	0.491	108	4967	11.86	8.66	822	24	369	6.2	404.4	Off	8.14	6.1
21688	68	71	92	124	496	174	166	0.503	106	5017	11.73	8.76	809	24.5	364	6.2	404.4	Off	8.14	6.1
21748	68	70	92	124	497	174	166	0.507	109	5017	11.76	8.76	801	25	360	6.2	404.4	Off	8.14	6.1
21808	67	69	92	123	496	174	165	0.52	109	5015	11.56	8.96	785	25.5	356	6.2	455.1	Off	8.14	6.1
21868	66	69	91	123	495	174	165	0.514	109	5016	11.72	8.81	766	25.5	353	6.2	455.1	Off	8.14	6.1
21928	66	70	90	123	495	174	165	0.514	106	5017	11.75	8.6	748	25.5	350	6.2	455.1	Off	8.14	6.1
21988	66	71	89	123	494	174	166	0.506	101	5016	11.93	8.64	743	25	346	6.2	377.4	Off	8.14	6.1
22044	66	72	90	124	491	174	166	0.51	101	5018	11.82	8.75	740	24.5	343	6.2	404.4	Off	8.14	6.1
22104	66	72	90	124	490	174	166	0.52	99	5018	11.63	8.95	743	24	341	6.2	404.4	Off	8.14	6.1
22164	66	73	91	124	488	174	166	0.517	99	5016	11.58	8.97	745	24	339	6.2	404.4	Off	8.14	6.1
22224	67	73	91	123	485	173	165	0.521	100	5016	11.49	9.06	749	23.5	337	6.2	404.5	Off	8.14	6.1
22284	68	74	91	122	484	173	165	0.516	97	5015	11.55	9.02	748	23.5	334	6.2	404.5	Off	8.14	6.1
22344	68	74	91	123	481	173	165	0.508	97	5018	11.86	8.91	745	23	333	6.2	404.5	Off	8.14	6.1
22404	68	74	91	124	481	173	165	0.512	101	5017	11.61	8.97	750	23	331	6.2	404.5	Off	8.14	6.1
22464	69	73	91	124	479	173	165	0.505	103	5017	11.66	8.9	757	23	330	6.2	404.5	Off	8.14	6.1
22524	69	72	91	124	479	173	165	0.509	104	5016	11.66	8.91	756	23.5	328	6.2	404.5	Off	8.14	6.1
22584	68	71	91	123	480	173	165	0.509	105	5015	11.74	8.82	740	24	326	6.2	404.5	Off	8.14	6.1
22644	68	70	90	122	482	173	164	0.511	105	5018	11.83	8.75	729	24.5	325	6.2	455.2	Off	8.14	6.1
22704	67	69	90	122	483	173	164	0.514	108	5015	11.91	8.68	726	24.5	324	6.2	455.2	Off	8.14	6.1
22764	67	70	89	122	483	173	165	0.524	104	5016	11.92	8.66	729	24.5	323	6.2	404.5	Off	8.14	6.1
22824	67	71	90	122	480	172	164	0.528	102	5015	11.98	8.63	728	24	323	6.2	404.6	Off	8.14	6.1
22884	67	72	90	122	480	172	164	0.549	102	5016	11.67	8.94	723	23.5	321	6.2	404.6	Off	8.14	6.1
22944	67	73	90	123	479	172	164	0.548	102	5018	11.61	8.95	720	23.5	320	6.2	404.6	Off	8.14	6.1
23004	67	73	91	122	476	172	164	0.55	101	5017	11.54	9.06	718	23	319	6.2	404.6	Off	8.14	6.1
23064	68	73	90	123	474	172	164	0.554	106	5017	11.41	9.16	726	23	318	6.2	404.6	Off	8.14	6.1
23124	68	72	90	123	473	172	164	0.546	106	5017	11.52	9.06	726	23	317	6.2	404.6	Off	8.14	6.1
23184	67	71	89	122	474	172	164	0.535	110	5016	11.74	8.82	722	23.5	317	6.2	404.6	Off	8.14	6.1
23244	67	70	90	122	473	172	164	0.527	109	5017	12.01	8.6	715	24	316	6.2	404.6	Off	8.14	6.1
23304	66	70	89	121	474	172	164	0.538	111	5018	11.9	8.7	711	24.5	316	6.2	404.6	Off	8.14	6.1
23364	66	70	88	121	474	171	163	0.54	111	5016	12.01	8.61	712	24.5	315	6.2	377.8	Off	8.15	6.1
23420	66	71	88	121	474	171	163	0.537	105	5017	12.12	8.48	710	24.2	314	6.2	404.8	Off	8.15	6.1

D57

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
23480	66	72	89	122	473	171	163	0.558	103	5018	11.89	8.75	716	24	313	6.2	404.8	Off	8.15	6.1
23540	66	72	89	122	471	171	163	0.573	105	5015	11.62	9	719	23.5	313	6.2	404.8	Off	8.15	6.1
23600	67	73	90	122	470	171	163	0.578	106	5017	11.48	9.11	719	23.5	312	6.2	404.8	Off	8.15	6.1
23660	67	73	90	122	470	171	163	0.574	104	5018	11.48	9.11	715	23	312	6.2	404.8	Off	8.15	6.1
23720	68	73	90	122	468	171	163	0.56	114	5015	11.67	8.93	718	23	312	6.2	404.8	Off	8.15	6.1
23780	68	72	90	122	467	171	163	0.556	109	5015	11.74	8.89	724	23.5	311	6.2	404.8	Off	8.15	6.1
23840	68	71	89	121	467	170	163	0.563	112	5018	11.68	8.93	733	24	311	6.2	354.2	Off	8.15	6.1
23900	67	70	88	121	469	170	162	0.553	117	5015	11.91	8.7	728	24.5	311	6.2	404.9	Off	8.15	6.1
23960	67	70	89	121	469	170	162	0.551	115	5015	12.1	8.56	716	24.5	311	6.2	404.9	Off	8.15	6.1
24020	67	70	89	121	469	170	162	0.572	112	5018	11.85	8.78	711	24.5	311	6.2	404.9	Off	8.15	6.1
24080	67	71	88	121	469	170	162	0.578	108	5018	11.86	8.78	700	24	311	6.2	404.9	Off	8.15	6.1
24140	67	72	89	121	469	170	162	0.596	112	5016	11.69	8.96	698	24	310	6.2	404.9	Off	8.15	6.1
24200	67	72	90	122	468	170	162	0.613	115	5016	11.46	9.17	691	23.5	310	6.2	404.9	Off	8.15	6.1
24260	67	72	89	122	466	170	162	0.611	112	5016	11.48	9.14	689	23.5	310	6.2	404.9	Off	8.15	6.1
24320	68	73	90	122	463	170	162	0.611	113	5017	11.5	9.13	689	23.5	310	6.2	404.9	Off	8.15	6.1
24380	68	73	90	123	462	170	162	0.607	110	5017	11.55	9.09	686	23.5	310	6.2	404.9	Off	8.15	6.1
24440	68	73	91	122	460	170	162	0.612	111	5017	11.48	9.15	685	23.5	309	6.2	404.9	Off	8.15	6.1
24500	69	73	90	122	458	169	162	0.612	115	5018	11.45	9.19	691	23	309	6.2	354.3	Off	8.15	6.1
24560	69	72	90	122	458	169	162	0.594	117	5016	11.73	8.91	700	23	309	6.2	354.3	Off	8.15	6.1
24620	69	71	90	123	457	169	161	0.601	119	5017	11.67	8.98	704	23	310	6.2	405.1	Off	8.15	6.1
24680	68	71	89	122	457	169	161	0.593	122	5017	11.87	8.78	695	23.5	309	6.2	405.1	Off	8.15	6.1
24740	67	70	89	121	457	169	161	0.593	124	5018	12.04	8.62	684	24	309	6.2	378.1	Off	8.15	6.1
24796	66	70	89	120	458	169	161	0.594	123	5017	12.19	8.49	684	24	310	6.2	405.1	Off	8.15	6.1
24856	66	70	88	121	458	169	161	0.609	120	5018	12.13	8.57	683	24	310	6.2	405.1	Off	8.15	6.1
24916	66	71	88	121	457	169	161	0.612	120	5016	12.2	8.52	673	23.5	310	6.2	405.1	Off	8.15	6.1
24976	66	72	89	122	456	168	161	0.632	121	5018	11.99	8.75	662	23.5	310	6.2	354.4	Off	8.15	6.1
25036	67	73	89	121	456	169	161	0.641	121	5016	11.83	8.89	661	23.5	310	6.2	405.1	Off	8.15	6.1
25096	67	73	89	121	455	168	161	0.651	122	5016	11.68	9.03	672	23	310	6.2	354.4	Off	8.15	6.1
25156	68	73	89	121	454	168	161	0.65	123	5017	11.65	9.06	675	23	310	6.2	354.4	Off	8.15	6.1
25216	68	73	90	121	454	168	161	0.644	125	5015	11.79	8.93	671	22.5	311	6.2	354.4	Off	8.15	6.1
25276	68	73	90	121	453	168	161	0.657	132	5018	11.67	9.05	672	22.5	311	6.2	354.4	Off	8.15	6.1
25336	68	71	89	121	454	168	160	0.649	132	5016	11.86	8.87	678	23	311	6.2	405.2	Off	8.16	6.1
25396	68	71	89	121	455	168	160	0.641	133	5017	12.04	8.68	680	23.5	311	6.2	405.2	Off	8.16	6.1
25456	68	70	90	121	455	168	160	0.683	135	5016	11.68	8.89	676	24	311	6.2	405.2	Off	8.16	6.1
25516	67	70	89	120	458	168	160	0.681	137	5017	11.72	9	663	24	312	6.2	405.2	Off	8.16	6.1
25576	66	70	88	120	459	168	160	0.681	134	5016	11.82	8.91	666	24	312	6.2	405.2	Off	8.16	6.1
25636	66	71	89	121	458	167	160	0.684	129	5018	11.91	8.85	669	23.5	313	6.2	354.6	Off	8.16	6.1
25696	67	72	90	121	458	167	160	0.699	130	5018	11.73	9.03	669	23.5	314	6.2	354.6	Off	8.16	6.1
25756	67	73	90	122	460	167	160	0.709	132	5017	11.56	9.17	664	23.5	314	6.2	354.6	Off	8.16	6.1
25816	67	73	90	122	460	167	160	0.703	133	5018	11.58	9.17	653	23	314	6.2	354.6	Off	8.16	6.1
25876	67	73	91	122	456	167	160	0.693	130	5017	11.68	9.06	659	23	314	6.2	354.6	Off	8.16	6.1
25936	68	73	91	123	455	167	160	0.68	128	5017	11.79	8.96	659	22.5	314	6.2	354.6	Off	8.16	6.1
25996	68	74	91	123	453	167	160	0.686	128	5017	11.65	9.07	655	22.5	315	6.2	354.6	Off	8.16	6.1
26056	69	73	91	122	450	167	159	0.686	134	5015	11.7	9.03	655	22	315	6.2	405.3	Off	8.16	6.1
26116	68	73	90	122	448	167	159	0.661	136	5016	12.03	8.68	668	22.5	315	6.2	378.3	Off	8.16	6.1
26172	69	74	95	132	447	167	159	0.657	265	5016	12.14	8.63	673	23	315	6.2	405.3	Off	8.16	6.1
26232	68	81	125	185	542	166	159	0.692	1507	5015	12.3	8.36	675	23.5	326	6.2	354.7	On	8.16	6.1
26292	68	83	146	208	673	166	159	1.026	2008	5015	13.48	7.43	676	24	351	6.2	354.7	On	8.16	6.1
26352	67	84	160	223	792	166	159	1.409	2008	5017	12.73	8.32	673	24	383	6.2	354.7	On	8.16	6.1
26412	67	86	171	235	870	167	159	1.351	2007	5016	11.84	9.21	665	23	425	6.2	405.3	On	8.16	6.1
26472	67	89	179	247	927	167	160	1.197	2007	5016	11.46	9.57	665	22.5	475	6.2	354.6	On	8.16	6.1
26532	67	92	189	258	965	168	160	1.194	2007	5018	11.02	9.92	670	21.5	535	6.2	405.2	On	8.16	6.1
26592	67	93	197	269	983	168	161	1.19	1995	5016	10.45	10.39	855	21	591	6.2	354.4	On	8.15	6.1
26652	67	95	205	277	978	169	161	1.108	1545	5018	10.22	10.56	638	20.5	640	6.2	405.1	On	8.15	6.1
26712	68	97	212	285	984	170	162	0.923	1555	5018	10.2	10.54	619	19.5	673	6.2	404.9	On	8.15	6.1
26772	68	98	219	291	992	170	163	0.934	1717	5019	9.98	10.68	589	18.5	699	6.2	354.2	On	8.15	6.1
26832	68	99	224	298	1007	171	163	0.963	1638	5015	9.75	10.89	496	18.5	724	6.2	404.8	On	8.15	6.1
26892	68	99	230	306	1026	172	164	0.936	1658	5016	9.16	11.47	495	19	748	6.2	404.6	On	8.14	6.1
26952	68	100	235	312	1028	172	164	0.979	1856	5017	8.72	11.76	492	19.5	765	6.2	404.6	On	8.14	6.1
27012	67	100	241	318	1021	173	165	1.034	1899	5016	8.75	11.73	479	19.5	783	6.2	404.5	On	8.14	6.1
27072	67	101	245	321	1019	174	166	1.08	2007	5017	8.85	11.67	482	19	796	6.2	404.4	On	8.14	6.1
27132	67	101	248	324	1024	175	166	1.106	1839	5018	8.96	11.59	499	18.5	806	6.2	454.9	On	8.14	6.1
27192	67	103	250	326	1017	175	167	1.027	1747	5016	9.12	11.46	525	18	809	6.2	404.2	On	8.14	6.1
27252	67	104	252	327	1009	176	168	0.99	1646	5017	9.22	11.38	546	17	810	6.2	404.1	On	8.13	6.1
27312	67	103	253	324	1001	177	169	0.944	1643	5015	9.49	11.14	542	16.5	809	6.2	403.9	Off	8.13	6.1
27372	68	86	208	266	948	177	169	0.923	579	5018	10.15	10.41	534	15.5	782	6.2	403.9	Off	8.13	6.1
27432	69	81	170	218	856	177	169	1.51	943	5018	10.52	10.28	527	15.5	744	6.2	403.9	Off	8.13	6.1
27492	68	79	151	190	786	177	170	2.418	992	5016	10.08	10.49	527	15.1	715	6.2	329.8	Off	8.13	6.1
27548	69	77	141	176	744	178	170	2.526	914	5017	10.4	9.99	531	15	688	6.2	403.8	Off	8.13	6.1
27608	69	76	134	166	709	178	170	2.387	783	5016	10.76	9.5	544	15.5	662	6.2	403.8	Off	8.13	6.1
27668	68	74	129	160	684	178	170	2.167	697	5016	11.01	9.25	566	16	639	6.2	403.8	Off	8.13	6.1
27728	68	73	124	155	664	178	169	2.02	624	5018	11.04	9.24	584	16.5	616	6.2	454.4	Off	8.13	6.1
27788	67	73	121	152	647	178	169	1.836	547	5017	11.23	9.1	591	16.5	597	6.2	454.4	Off	8.13	6.1
27848	67	72	117	149	631	178	170	1.651	466	5016	11.31	9.05	572	16.5	577	6.2	403.8	Off	8.13	6.1

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FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dlu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
27908	67	73	115	146	617	178	170	1.433	399	5015	11.57	8.83	544	16	559	6.2	403.8	Off	8.13	6.1
27968	67	74	114	144	604	178	170	1.276	351	5016	11.67	8.77	532	15.5	545	6.2	403.8	Off	8.13	6.1
28028	67	75	113	142	592	178	170	1.157	312	5017	11.68	8.75	531	15	532	6.2	403.8	Off	8.13	6.1
28088	66	74	112	141	581	178	170	1.062	283	5018	11.74	8.7	564	15	519	6.2	403.8	Off	8.13	6.1
28148	68	75	111	141	570	178	169	0.978	259	5018	11.91	8.54	928	15	510	6.2	454.4	Off	8.13	6.1
28208	68	75	108	139	561	178	170	0.912	242	5018	12.05	8.42	1414	14.5	501	6.2	403.8	Off	8.13	6.1
28268	69	75	108	138	550	178	170	0.868	230	5016	12.21	8.31	1620	14.5	493	6.2	403.8	Off	8.13	6.1
28328	69	75	107	137	542	178	170	0.846	223	5014	12.12	8.39	1571	14.5	484	6.2	403.8	Off	8.13	6.1
28388	69	74	105	136	535	178	170	0.825	212	5015	12.12	8.38	1487	14.5	477	6.2	403.8	Off	8.13	6.1
28448	69	73	104	136	527	178	170	0.804	207	5015	12.17	8.33	1412	15	472	6.2	403.8	Off	8.13	6.1
28508	68	72	103	134	521	178	169	0.793	202	5016	12.16	8.38	1326	15.5	466	6.2	454.4	Off	8.13	6.1
28568	68	71	102	133	515	178	169	0.778	197	5017	12.19	8.34	1206	16	459	6.2	454.4	Off	8.13	6.1
28628	68	71	101	133	510	178	169	0.783	191	5018	12.27	8.27	1075	16	453	6.2	454.4	Off	8.13	6.1
28688	67	71	99	133	505	178	169	0.74	178	5017	12.42	8.15	1005	16	448	6.2	454.4	Off	8.13	6.1
28748	67	72	100	132	500	177	169	0.728	171	5016	12.43	8.17	940	15.5	442	6.2	403.9	Off	8.13	6.1
28808	67	73	100	132	495	177	169	0.731	189	5017	12.26	8.33	867	15.5	436	6.2	403.9	Off	8.13	6.1
28868	67	73	99	131	490	177	169	0.71	164	5017	12.35	8.24	802	15.4	431	6.2	377.0	Off	8.13	6.1
28924	68	74	100	131	485	177	169	0.689	160	5015	12.48	8.13	772	15	426	6.2	403.9	Off	8.13	6.1
28984	68	74	99	131	482	177	169	0.685	155	5015	12.43	8.17	743	15	421	6.2	403.9	Off	8.13	6.1
29044	68	74	99	130	478	177	169	0.667	154	5017	12.5	8.08	712	14.6	416	6.2	403.9	Off	8.13	6.1
29104	69	73	98	129	474	177	169	0.663	150	5018	12.44	8.14	675	14.5	411	6.2	403.9	Off	8.13	6.1
29164	68	72	97	128	471	177	169	0.647	147	5017	12.51	8.06	657	15	407	6.2	403.9	Off	8.13	6.1
29224	68	71	96	127	468	177	168	0.638	145	5017	12.5	8.07	655	15.5	403	6.2	454.6	Off	8.13	6.1
29284	67	71	95	126	466	176	168	0.618	142	5016	12.64	7.92	638	16	398	6.2	404.1	Off	8.13	6.1
29344	67	70	94	126	464	176	168	0.614	139	5017	12.67	7.92	624	16	394	6.2	404.1	Off	8.13	6.1
29404	66	71	94	126	461	176	168	0.603	133	5016	12.71	7.89	621	16	390	6.2	404.1	Off	8.13	6.1
29464	66	72	93	125	457	176	168	0.597	127	5013	12.71	7.88	627	15.5	386	6.2	404.1	Off	8.13	6.1
29524	66	72	93	124	455	176	168	0.597	126	5017	12.61	7.97	619	15.5	382	6.2	404.1	Off	8.13	6.1
29584	67	73	93	124	453	176	168	0.582	123	5018	12.68	7.9	611	15.5	378	6.2	404.1	Off	8.13	6.1
29644	67	73	94	122	450	176	168	0.582	123	5016	12.58	8	604	15	374	6.2	404.1	Off	8.13	6.1
29704	67	73	94	121	448	176	168	0.574	120	5016	12.54	8.02	613	15	370	6.2	404.1	Off	8.13	6.1
29764	68	74	94	120	447	175	168	0.571	117	5017	12.51	8.05	611	15	367	6.2	353.6	Off	8.13	6.1
29824	68	74	93	120	445	175	168	0.562	115	5017	12.53	8.04	611	15	364	6.2	353.6	Off	8.13	6.1
29884	69	74	94	119	442	175	167	0.557	111	5016	12.51	8.07	611	15	361	6.2	404.2	Off	8.14	6.1
29944	69	74	93	119	439	175	168	0.554	112	5017	12.46	8.08	618	15	358	6.2	353.6	Off	8.13	6.1
30004	69	73	93	119	437	175	167	0.548	114	5015	12.46	8.09	625	14.5	355	6.2	404.2	Off	8.14	6.1
30064	69	72	93	118	437	175	167	0.536	113	5017	12.56	7.97	597	15	353	6.2	404.2	Off	8.14	6.1
30124	68	70	92	118	436	175	167	0.533	114	5018	12.63	7.92	575	15	350	6.2	404.2	Off	8.14	6.1
30184	68	70	92	117	436	175	167	0.526	112	5017	12.71	7.86	555	15.5	348	6.2	404.2	Off	8.14	6.1
30244	67	69	90	116	435	175	167	0.532	111	5017	12.62	7.94	552	16	345	6.2	377.3	Off	8.14	6.1
30300	66	69	90	115	434	174	166	0.523	106	5017	12.72	7.82	549	16	343	6.2	404.4	Off	8.14	6.1
30360	66	71	90	114	433	174	167	0.515	101	5018	12.76	7.81	564	16	341	6.2	353.7	Off	8.14	6.1
30420	66	71	90	114	431	174	166	0.528	99	5018	12.47	8.09	567	15.5	339	6.2	404.4	Off	8.14	6.1
30480	66	72	90	114	428	174	167	0.529	97	5015	12.29	8.24	568	15.5	336	6.2	353.7	Off	8.14	6.1
30540	67	73	90	114	426	174	166	0.516	97	5016	12.37	8.16	568	15.5	334	6.2	404.4	Off	8.14	6.1
30600	67	73	90	114	424	174	166	0.508	95	5017	12.45	8.1	565	15	332	6.2	404.4	Off	8.14	6.1
30660	67	73	90	114	424	174	166	0.504	96	5017	12.45	8.09	564	15	330	6.2	404.4	Off	8.14	6.1
30720	68	73	90	114	423	174	166	0.497	95	5002	12.52	8.02	562	15	329	6.2	404.4	Off	8.14	6.1
30780	68	73	90	115	422	174	166	0.49	97	4954	12.58	7.97	563	15	327	6.2	404.4	Off	8.14	6.1
30840	69	73	89	114	421	174	166	0.492	94	4966	12.57	7.98	563	15	326	6.2	404.4	Off	8.14	6.1
30900	69	73	90	114	420	174	166	0.492	93	4962	12.54	7.99	572	15	324	6.2	404.4	Off	8.14	6.1
30960	69	73	91	114	419	174	166	0.504	93	5015	12.34	8.2	570	15	322	6.2	404.4	Off	8.14	6.1
31020	69	73	90	113	417	173	166	0.497	91	5002	12.32	8.2	569	15	321	6.2	353.8	Off	8.14	6.1
31080	69	73	90	114	416	173	166	0.491	93	4964	12.39	8.15	571	15	320	6.2	353.8	Off	8.14	6.1
31140	69	71	89	114	415	173	165	0.489	95	4910	12.43	8.1	566	15	319	6.2	404.5	Off	8.14	6.1
31200	69	70	89	112	415	173	165	0.48	94	4838	12.55	7.98	562	15	318	6.2	404.5	Off	8.14	6.1
31260	68	70	88	112	415	173	165	0.478	95	4812	12.66	7.9	561	15.5	317	6.2	404.5	Off	8.14	6.1
31320	67	69	87	112	414	173	165	0.481	97	4846	12.64	7.91	556	16	316	6.2	404.5	Off	8.14	6.1
31380	66	69	87	112	414	172	165	0.479	92	4830	12.7	7.86	547	16	315	6.2	353.9	Off	8.14	6.1
31440	66	70	86	112	414	173	165	0.48	86	4836	12.72	7.86	539	16	314	6.2	404.5	Off	8.14	6.1
31500	66	71	87	111	413	173	165	0.494	87	4972	12.43	8.13	542	15.5	313	6.2	404.5	Off	8.14	6.1
31560	66	72	87	111	412	173	165	0.49	86	4926	12.39	8.15	538	15.5	312	6.2	404.5	Off	8.14	6.1
31620	66	72	87	111	410	172	165	0.49	87	4938	12.27	8.28	529	15.5	311	6.2	330.3	Off	8.14	6.1
31676	67	72	87	112	409	172	165	0.481	87	4839	12.35	8.17	525	15.5	310	6.2	353.9	Off	8.14	6.1
31736	67	72	87	111	407	172	165	0.475	86	4791	12.44	8.12	521	15.5	309	6.2	353.9	Off	8.14	6.1
31796	67	73	87	112	406	172	165	0.476	85	4783	12.4	8.14	523	15.5	308	6.2	353.9	Off	8.14	6.1
31856	68	73	88	111	406	172	165	0.476	84	4805	12.35	8.19	523	15.5	307	6.2	353.9	Off	8.14	6.1
31916	68	73	88	111	405	172	165	0.486	83	4900	12.2	8.34	523	15.5	307	6.2	353.9	Off	8.14	6.1
31976	68	73	88	111	404	172	164	0.484	84	4886	12.16	8.35	524	15.5	306	6.2	404.6	Off	8.14	6.1
32036	69	73	88	111	403	172	164	0.477	82	4813	12.26	8.26	523	15.5	305	6.2	404.6	Off	8.14	6.1
32096	69	73	88	111	402	171	164	0.474	84	4778	12.29	8.23	519	16	305	6.2	354.1	Off	8.14	6.1
32156	69	73	88	111	402	171	164	0.469	83	4723	12.36	8.17	514	16	304	6.2	354.1	Off	8.14	6.1
32216	69	73	88	111	401	171	164	0.465	84	4690	12.36	8.14	505	16	303	6.2	354.1	Off	8.14	6.1
32276	70	73	88	111	401	171	164	0.454	83	4574	12.58	7.97	506	16	303	6.2	354.1	Off	8.14	6.1

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FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
32336	70	73	88	111	400	171	164	0.455	82	4583	12.58	7.97	504	16	302	6.2	354.1	Off	8.14	6.1
32396	70	73	88	111	399	171	163	0.456	83	4589	12.58	7.98	501	16	302	6.2	404.8	Off	8.15	6.1
32456	70	73	88	111	399	171	163	0.462	81	4663	12.41	8.11	493	16	301	6.2	404.8	Off	8.15	6.1
32516	70	73	88	110	398	171	163	0.464	83	4683	12.37	8.17	494	16	301	6.2	404.8	Off	8.15	6.1
32576	70	73	88	110	398	171	163	0.461	80	4643	12.42	8.11	487	16	300	6.2	404.8	Off	8.15	6.1
32636	70	73	88	111	397	170	163	0.464	80	4683	12.35	8.19	484	16	300	6.2	354.2	Off	8.15	6.1
32696	71	73	88	111	396	170	163	0.466	79	4676	12.34	8.16	479	16	299	6.2	354.2	Off	8.15	6.1
32756	71	73	88	110	396	170	163	0.459	80	4640	12.45	8.08	477	16	299	6.2	354.2	Off	8.15	6.1
32816	71	72	87	110	395	170	163	0.458	79	4622	12.48	8.04	475	16.1	298	6.2	354.2	Off	8.15	6.1
32876	71	73	87	110	394	170	163	0.456	79	4599	12.54	8	470	16.5	298	6.2	354.2	Off	8.15	6.1
32936	71	72	88	110	394	170	163	0.46	79	4638	12.45	8.08	462	16.5	297	6.2	354.2	Off	8.15	6.1
32996	71	73	87	110	393	170	162	0.457	80	4601	12.49	8.03	461	16.5	297	6.2	377.9	Off	8.15	6.1
33052	71	73	88	110	393	170	162	0.454	80	4577	12.53	7.99	459	16.5	296	6.2	404.9	Off	8.15	6.1
33112	71	72	88	110	393	170	162	0.455	78	4576	12.53	8	452	16.5	296	6.2	404.9	Off	8.15	6.1
33172	71	72	88	110	393	170	162	0.461	79	4644	12.4	8.12	451	16.5	295	6.2	404.9	Off	8.15	6.1
33232	71	72	87	110	392	169	161	0.453	77	4580	12.52	8	445	16.5	295	6.2	405.1	Off	8.15	6.1
33292	71	72	87	110	392	169	162	0.454	78	4564	12.56	7.97	443	16.5	294	6.2	354.3	Off	8.15	6.1
33352	71	72	87	109	391	169	162	0.455	77	4587	12.46	8.06	441	16.5	294	6.2	354.3	Off	8.15	6.1
33412	71	72	87	109	391	169	161	0.457	78	4591	12.48	8.07	435	16.5	293	6.2	405.1	Off	8.15	6.1
33472	71	72	87	109	390	169	161	0.459	78	4612	12.43	8.08	438	16.5	293	6.2	405.1	Off	8.15	6.1
33532	71	72	87	109	386	169	161	0.453	78	4560	12.53	8	439	16.5	293	6.2	405.1	Off	8.15	6.1
33592	71	72	87	109	385	169	161	0.453	77	4560	12.54	7.99	442	16.5	292	6.2	405.1	Off	8.15	6.1
33652	71	72	87	109	384	169	161	0.452	79	4561	12.58	7.94	444	16.5	292	6.2	405.1	Off	8.15	6.1
33712	71	72	86	109	383	169	161	0.455	80	4581	12.66	7.86	443	16.5	291	6.2	405.1	Off	8.15	6.1
33772	72	71	86	108	382	168	161	0.456	80	4586	12.79	7.76	443	16.5	291	6.2	354.4	Off	8.15	6.1
33832	71	72	86	109	382	168	161	0.455	80	4587	12.84	7.71	440	16.5	290	6.2	354.4	Off	8.15	6.1
33892	71	72	86	110	382	168	161	0.458	82	4604	12.89	7.68	437	16.5	290	6.2	354.4	Off	8.15	6.1
33952	71	71	86	109	381	168	160	0.458	81	4607	12.89	7.68	438	16.5	289	6.2	405.2	Off	8.16	6.1
34012	71	72	86	109	381	168	160	0.469	81	4722	12.73	7.83	443	17	289	6.2	405.2	Off	8.16	6.1
34072	71	71	87	109	381	168	160	0.472	81	4747	12.65	7.9	452	17	289	6.2	405.2	Off	8.16	6.1
34132	71	71	86	108	380	168	160	0.475	79	4785	12.57	7.99	456	17	289	6.2	405.2	Off	8.16	6.1
34192	71	71	86	109	380	168	160	0.463	80	4667	12.74	7.81	458	17	288	6.2	405.2	Off	8.16	6.1
34252	71	71	86	109	380	168	160	0.468	78	4705	12.68	7.9	464	17	289	6.2	405.2	Off	8.16	6.1
34312	71	71	86	109	379	167	160	0.464	80	4673	12.72	7.83	467	17	288	6.2	354.6	Off	8.16	6.1
34372	71	71	85	109	379	167	159	0.458	78	4620	12.81	7.75	467	17.5	287	6.2	378.3	Off	8.16	6.1
34428	71	71	86	109	379	167	159	0.462	79	4655	12.74	7.82	466	17.5	287	6.2	405.3	Off	8.16	6.1
34488	71	71	86	108	379	167	159	0.465	79	4691	12.62	7.92	468	17.5	287	6.2	405.3	Off	8.16	6.1
34548	71	71	86	108	379	167	159	0.453	78	4561	12.83	7.72	470	17.5	286	6.2	405.3	Off	8.16	6.1
34608	71	72	86	108	378	167	159	0.46	77	4639	12.76	7.83	472	17.5	286	6.2	405.3	Off	8.16	6.1
34668	71	72	86	108	378	167	159	0.464	74	4665	12.67	7.9	475	17.5	286	6.2	405.3	Off	8.16	6.1
34728	71	72	86	109	378	167	159	0.463	76	4664	12.62	7.94	490	16.5	286	6.2	405.3	Off	8.16	6.1
34788	71	72	86	109	377	167	159	0.456	71	4595	12.72	7.87	503	16	285	6.2	405.3	Off	8.16	6.1
34848	72	73	86	109	378	166	159	0.463	70	4678	12.5	8.06	517	15.5	285	6.2	354.7	Off	8.16	6.1
34908	71	77	101	141	362	166	159	0.462	392	4654	12.45	8.1	525	15.5	284	6.2	354.7	Off	8.16	6.1
34968	72	83	132	185	381	166	159	0.472	999	4696	13.91	6.56	542	15	289	6.2	354.7	Off	8.16	6.1
35028	73	84	147	200	466	166	159	0.671	1348	5016	15.85	5.13	556	14	304	6.2	354.7	On	8.16	6.1
35088	72	84	155	208	534	166	159	0.621	1553	5016	15.57	5.51	498	13.5	322	6.2	354.7	On	8.16	6.1
35148	72	85	161	215	584	166	159	0.922	1660	5016	15.3	5.69	441	13.5	342	6.2	354.7	On	8.16	6.1
35208	71	85	166	221	615	166	159	0.969	1628	5015	15.1	5.81	444	13.5	361	6.2	354.7	On	8.16	6.1
35268	70	85	170	226	647	166	159	0.941	1526	5016	15.06	5.79	445	14	383	6.2	354.7	On	8.16	6.1
35328	70	85	175	231	670	166	159	0.886	1407	5017	14.89	5.95	441	14	407	6.2	354.7	On	8.16	6.1
35388	69	85	179	236	682	167	159	0.832	1373	5017	14.72	6.1	438	14.5	427	6.2	405.3	On	8.16	6.1
35448	68	86	183	240	690	167	159	0.806	1290	5017	14.65	6.13	443	14.5	444	6.2	405.3	On	8.16	6.1
35508	68	86	186	243	696	168	159	0.751	1185	5016	14.56	6.22	437	14.5	461	6.2	456.0	On	8.16	6.1
35568	67	87	189	246	700	168	160	0.69	1081	5017	14.53	6.24	431	15	473	6.2	405.2	On	8.16	6.1
35628	67	89	193	249	701	168	160	0.637	1028	5018	14.55	6.21	429	15	481	6.2	405.2	On	8.16	6.1
35688	67	91	196	251	704	168	161	0.602	971	5016	14.49	6.28	422	15.5	489	6.2	354.4	On	8.15	6.1
35748	67	92	199	253	686	168	161	0.578	969	5018	14.48	6.28	413	15.5	498	6.2	330.8	On	8.15	6.1
35804	67	93	201	254	673	169	161	0.586	1022	5018	14.62	6.13	404	15.5	504	6.2	405.1	On	8.15	6.1
35864	68	93	202	255	670	169	161	0.605	1035	5016	14.72	6.04	401	15.5	508	6.2	405.1	On	8.15	6.1
35924	68	94	204	256	669	169	161	0.613	1025	5018	14.75	6	387	15	510	6.2	405.1	On	8.15	6.1
35984	68	94	205	256	666	169	161	0.602	991	5015	14.8	5.97	376	14	511	6.2	405.1	On	8.15	6.1
36044	69	92	204	256	666	170	161	0.585	973	5018	14.86	5.88	367	13.5	512	6.2	455.7	On	8.15	6.1
36104	68	91	205	257	669	170	161	0.573	978	5018	14.9	5.86	363	13.5	513	6.2	455.7	On	8.15	6.1
36164	68	91	204	258	679	170	162	0.572	966	5016	14.89	5.88	354	13.5	514	6.2	404.9	On	8.15	6.1
36224	67	90	205	257	661	170	162	0.568	954	5018	14.87	5.92	350	14	511	6.2	404.9	On	8.15	6.1
36284	66	90	205	257	678	171	162	0.556	922	5018	14.9	5.91	354	14	509	6.2	455.5	On	8.15	6.1
36344	66	92	206	258	687	171	163	0.541	926	5015	14.91	5.91	356	14.5	509	6.2	404.8	On	8.15	6.1
36404	67	93	208	259	693	171	163	0.55	917	5017	14.82	6	356	15	510	6.2	404.8	On	8.15	6.1
36464	66	94	209	259	675	171	163	0.547	952	5018	14.85	5.97	354	15	510	6.2	404.8	On	8.15	6.1
36524	67	94	209	259	668	171	163	0.569	970	5018	14.9	5.88	351	15	511	6.2	404.8	On	8.15	6.1
36584	67	95	210	259	666	171	163	0.577	975	5016	14.91	5.89	349	14.6	512	6.2	404.8	On	8.15	6.1
36644	68	95	210	259	669	172	163	0.576	967	5016	14.94	5.87	352	15	513	6.2	455.4	On	8.15	6.1
36704	68	96	211	260	669	172	164	0.57	945	5017	14.96	5.84	345	14.5	513	6.2	404.8	On	8.14	6.1

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
36784	69	96	211	260	667	172	164	0.562	942	5017	15.03	5.76	341	14.5	515	6.2	404.6	On	8.14	6.1
36824	69	96	212	260	663	172	164	0.554	933	5018	15.09	5.72	340	14	516	6.2	404.6	On	8.14	6.1
36884	70	96	211	260	661	173	164	0.552	909	5018	15.13	5.68	339	13	515	6.2	455.2	On	8.14	6.1
36944	69	94	211	260	658	173	164	0.532	887	5015	15.16	5.65	336	12.5	515	6.2	455.2	On	8.14	6.1
37004	69	93	209	260	657	173	165	0.532	906	5018	15.19	5.61	341	12.5	513	6.2	404.5	On	8.14	6.1
37064	69	92	209	260	654	173	165	0.533	911	5017	15.23	5.57	346	12.5	511	6.2	404.5	On	8.14	6.1
37124	68	91	208	259	653	173	165	0.54	933	5016	15.24	5.57	342	12.5	508	6.2	377.5	On	8.14	6.1
37180	67	91	207	259	655	173	165	0.549	927	5017	15.26	5.55	335	12.5	506	6.2	404.5	On	8.14	6.1
37240	67	92	207	258	659	174	165	0.551	941	5018	15.31	5.53	323	13	504	6.2	455.1	On	8.14	6.1
37300	67	93	208	257	661	174	166	0.554	928	5017	15.27	5.54	315	13.5	503	6.2	404.4	On	8.14	6.1
37360	67	94	209	258	662	174	166	0.549	918	5015	15.26	5.56	313	13.5	501	6.2	404.4	On	8.14	6.1
37420	67	95	210	258	661	174	166	0.545	918	5018	15.27	5.54	310	13.5	500	6.2	404.4	On	8.14	6.1
37480	68	95	210	258	657	175	167	0.552	956	5015	15.32	5.51	304	14	499	6.2	404.2	On	8.14	6.1
37540	68	95	210	258	660	175	166	0.562	940	5018	15.32	5.5	305	13.5	499	6.2	454.9	On	8.14	6.1
37600	68	96	211	258	668	175	166	0.563	968	5015	15.31	5.5	301	13.5	498	6.2	454.9	On	8.14	6.1
37660	69	96	211	259	669	175	167	0.571	961	5016	15.27	5.54	300	13.5	497	6.2	404.2	On	8.14	6.1
37720	70	96	211	259	671	175	167	0.574	980	5015	15.24	5.58	300	13.5	496	6.2	404.2	On	8.14	6.1
37780	70	96	211	259	675	175	167	0.586	1001	5018	15.23	5.58	297	12.5	495	6.2	404.2	On	8.14	6.1
37840	70	95	210	258	672	176	167	0.59	1004	5017	15.22	5.58	299	11.5	494	6.2	454.8	On	8.14	6.1
37900	69	93	209	258	672	176	167	0.593	1003	5015	15.24	5.55	303	11.5	493	6.2	454.8	On	8.14	6.1
37960	69	80	184	227	667	176	167	0.577	429	5016	15.38	5.36	302	11.5	491	6.2	454.8	Off	8.14	6.1
38020	68	73	154	190	634	176	167	0.526	214	4956	15.99	4.86	303	11.5	479	6.2	454.8	Off	8.14	6.1
38080	67	71	138	169	602	176	168	0.831	320	5016	14.07	6.52	299	11.5	487	6.2	404.1	Off	8.13	6.1
38140	67	71	128	158	577	176	168	0.982	292	5015	13.3	6.9	304	12	455	6.2	404.1	Off	8.13	6.1
38200	66	72	121	150	557	176	168	0.917	253	5017	13.37	6.71	304	12	446	6.2	404.1	Off	8.13	6.1
38260	67	73	117	146	540	176	167	0.824	212	5018	13.32	6.69	303	12.5	437	6.2	454.8	Off	8.14	6.1
38320	67	73	114	142	527	176	168	0.72	177	5016	13.39	6.57	309	12.5	430	6.2	404.1	Off	8.13	6.1
38380	67	73	111	139	515	176	168	0.643	153	5017	13.38	6.57	322	12.5	424	6.2	404.1	Off	8.13	6.1
38440	68	73	108	136	504	176	168	0.576	135	5018	13.4	6.54	331	13	419	6.2	404.1	Off	8.13	6.1
38500	68	73	107	135	494	176	168	0.53	120	5016	13.33	6.61	325	13	415	6.2	377.1	Off	8.13	6.1
38556	68	73	105	134	487	176	168	0.49	109	4928	13.34	6.61	313	13	410	6.2	404.1	Off	8.13	6.1
38616	68	74	103	132	478	176	168	0.456	100	4570	13.42	6.55	408	13	406	6.2	404.1	Off	8.13	6.1
38676	69	74	102	131	472	176	168	0.428	93	4303	13.44	6.56	520	13	402	6.2	404.1	Off	8.13	6.1
38736	69	74	101	130	465	176	168	0.408	88	4104	13.4	6.61	506	13	397	6.2	404.1	Off	8.13	6.1
38796	70	74	100	129	459	176	167	0.39	84	3910	13.46	6.59	468	13	393	6.2	454.8	Off	8.14	6.1
38856	70	73	100	127	453	176	167	0.379	81	3802	13.45	6.61	415	13	388	6.2	454.8	Off	8.14	6.1
38916	70	72	99	124	448	176	167	0.376	81	3781	13.33	6.76	375	12.5	384	6.2	454.8	Off	8.14	6.1
38978	70	70	98	123	443	176	167	0.372	80	3734	13.28	6.8	348	12.5	379	6.2	454.8	Off	8.14	6.1
39036	69	69	95	122	439	176	167	0.361	80	3602	13.47	6.66	320	12.5	375	6.2	454.8	Off	8.14	6.1
39096	68	68	94	121	435	176	167	0.36	80	3599	13.47	6.74	302	13	371	6.2	454.8	Off	8.14	6.1
39156	67	67	93	118	431	176	167	0.356	79	3545	13.59	6.67	288	13	366	6.2	454.8	Off	8.14	6.1
39218	66	66	91	116	428	176	167	0.358	76	3569	13.55	6.72	279	13.5	362	6.2	454.8	Off	8.14	6.1
39278	66	69	90	115	425	176	167	0.347	72	3462	13.75	6.58	266	14	358	6.2	454.8	Off	8.14	6.1
39338	66	70	90	115	421	176	167	0.344	70	3438	13.73	6.63	256	14.5	354	6.2	454.8	Off	8.14	6.1
39396	66	71	90	115	417	175	167	0.349	68	3481	13.54	6.82	251	14.5	349	6.2	404.2	Off	8.14	6.1
39456	66	71	89	114	413	175	167	0.343	66	3420	13.57	6.79	245	14.5	345	6.2	404.2	Off	8.14	6.1
39518	67	71	89	115	409	175	166	0.342	65	3412	13.51	6.86	241	14.5	342	6.2	454.9	Off	8.14	6.1
39578	67	71	89	115	405	175	166	0.337	64	3371	13.48	6.9	237	14.5	338	6.2	454.9	Off	8.14	6.1
39638	67	72	89	115	402	175	166	0.33	64	3293	13.56	6.82	236	15	335	6.2	454.9	Off	8.14	6.1
39696	67	72	90	115	399	175	166	0.331	63	3303	13.53	6.87	235	14.5	332	6.2	454.9	Off	8.14	6.1
39758	68	72	90	116	396	175	166	0.328	63	3263	13.6	6.79	235	14.5	329	6.2	454.9	Off	8.14	6.1
39818	68	72	90	116	393	174	166	0.324	63	3230	13.68	6.74	238	14.5	327	6.2	404.4	Off	8.14	6.1
39878	69	72	90	116	390	174	166	0.324	63	3229	13.71	6.72	243	14.5	324	6.2	377.4	Off	8.14	6.1
39932	68	72	90	115	387	174	165	0.317	61	3169	13.82	6.62	247	14.5	322	6.2	455.1	Off	8.14	6.1
39992	69	72	90	115	385	174	166	0.321	63	3209	13.75	6.7	251	14.5	319	6.2	404.4	Off	8.14	6.1
40052	69	72	90	114	382	174	166	0.32	61	3190	13.75	6.67	253	14.5	317	6.2	404.4	Off	8.14	6.1
40112	70	72	90	114	380	174	165	0.318	61	3162	13.83	6.6	255	14.5	315	6.2	455.1	Off	8.14	6.1
40172	70	72	90	114	377	174	165	0.315	61	3131	13.9	6.55	262	14.5	313	6.2	455.1	Off	8.14	6.1
40232	70	72	90	115	375	174	165	0.314	61	3128	13.92	6.53	265	14.5	310	6.2	455.1	Off	8.14	6.1
40292	70	72	90	116	373	173	165	0.311	60	3110	13.98	6.48	272	14.5	308	6.2	404.5	Off	8.14	6.1
40352	70	72	90	115	372	173	165	0.313	61	3122	13.97	6.5	281	14.5	306	6.2	404.5	Off	8.14	6.1
40412	70	72	90	115	370	173	165	0.315	59	3141	13.96	6.51	291	14.5	305	6.2	404.5	Off	8.14	6.1
40472	71	72	90	114	368	173	165	0.316	62	3158	13.96	6.5	293	14.5	303	6.2	404.5	Off	8.14	6.1
40532	71	71	90	113	366	173	164	0.317	63	3159	13.99	6.48	294	15	302	6.2	455.2	Off	8.14	6.1
40592	71	71	90	113	365	173	164	0.315	64	3147	14.03	6.45	294	15	300	6.2	455.2	Off	8.14	6.1
40652	71	70	89	113	364	173	164	0.312	63	3114	14.14	6.34	297	15	299	6.2	455.2	Off	8.14	6.1
40712	70	70	89	112	363	173	164	0.312	63	3112	14.2	6.32	301	15	297	6.2	455.2	Off	8.14	6.1
40772	70	69	89	112	362	173	164	0.315	63	3141	14.19	6.33	302	15	296	6.2	455.2	Off	8.14	6.1
40832	70	69	89	111	361	172	163	0.318	63	3180	14.18	6.37	305	14.5	294	6.2	455.4	Off	8.15	6.1
40892	70	69	88	111	360	172	163	0.315	62	3136	14.26	6.26	309	14.5	293	6.2	455.4	Off	8.15	6.1
40952	69	69	87	111	359	172	163	0.312	62	3102	14.33	6.23	313	14.5	292	6.2	455.4	Off	8.15	6.1
41012	69	69	87	111	358	172	163	0.315	62	3146	14.21	6.35	315	14.5	291	6.2	455.4	Off	8.15	6.1
41072	69	69	87	111	357	171	163	0.313	61	3114	14.27	6.3	322	14.5	289	6.2	404.8	Off	8.15	6.1
41132	69	69	87	111	356	172	163	0.316	62	3143	14.2	6.37	325	14.5	288	6.2	455.4	Off	8.15	6.1

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
41192	69	69	87	111	356	171	163	0.316	60	3146	14.15	6.42	331	14.5	287	6.2	404.8	Off	8.15	6.1
41252	68	69	87	110	354	171	163	0.312	62	3105	14.2	6.35	335	14.5	286	6.2	377.8	Off	8.15	6.1
41308	68	68	87	111	353	171	163	0.312	62	3107	14.22	6.37	340	14.5	285	6.2	404.8	Off	8.15	6.1
41368	68	68	87	111	353	171	162	0.311	60	3099	14.19	6.39	341	16.7	284	6.2	455.5	Off	8.15	6.1
41428	68	68	87	110	352	171	162	0.316	60	3173	14.04	6.54	346	15	283	6.2	455.5	Off	8.15	6.1
41488	68	68	86	110	351	171	162	0.313	59	3134	14.09	6.49	351	15	282	6.2	455.5	Off	8.15	6.1
41548	68	68	86	110	351	171	162	0.306	59	3053	14.22	6.36	359	15	281	6.2	455.5	Off	8.15	6.1
41608	68	68	86	110	350	170	162	0.306	58	3055	14.23	6.37	365	15	280	6.2	404.9	Off	8.15	6.1
41668	68	68	86	109	350	170	162	0.306	58	3054	14.24	6.37	372	15	279	6.2	404.9	Off	8.15	6.1
41728	68	68	86	109	349	170	162	0.307	59	3055	14.2	6.39	378	15	278	6.2	404.9	Off	8.15	6.1
41788	68	68	85	109	348	170	162	0.304	59	3038	14.24	6.38	385	15	277	6.2	404.9	Off	8.15	6.1
41848	68	68	85	109	346	170	162	0.303	58	3018	14.24	6.37	392	15	276	6.2	404.9	Off	8.15	6.1
41908	68	68	85	109	344	170	161	0.302	57	3003	14.28	6.36	403	15	275	6.2	455.7	Off	8.15	6.1
41968	67	67	85	110	344	169	161	0.303	57	3021	14.24	6.4	414	15	274	6.2	405.1	Off	8.15	6.1
42028	67	66	85	110	343	169	161	0.3	57	2988	14.34	6.31	423	15	273	6.2	405.1	Off	8.15	6.1
42088	67	67	85	109	343	169	161	0.302	56	3012	14.31	6.34	436	15	272	6.2	405.1	Off	8.15	6.1
42148	67	87	85	109	342	169	161	0.307	56	3062	14.22	6.43	457	15	271	6.2	405.1	Off	8.15	6.1
42208	67	67	85	108	341	169	161	0.308	56	3075	14.16	6.47	473	15	271	6.2	405.1	Off	8.15	6.1
42268	67	67	85	108	341	169	160	0.306	56	3049	14.19	6.46	486	15	270	6.2	455.9	Off	8.16	6.1
42328	67	67	85	107	340	169	160	0.304	55	3030	14.22	6.44	502	15	269	6.2	455.9	Off	8.16	6.1
42388	67	67	84	107	339	168	160	0.301	55	2998	14.27	6.39	521	15	269	6.2	405.2	Off	8.16	6.1
42448	67	67	84	107	338	168	160	0.3	55	2992	14.3	6.38	545	15	268	6.2	405.2	Off	8.16	6.1
42508	67	67	84	108	338	168	160	0.305	55	3031	14.19	6.48	585	15	268	6.2	405.2	Off	8.16	6.1
42568	67	67	84	107	337	168	160	0.299	56	2986	14.29	6.4	649	14.5	267	6.2	405.2	Off	8.16	6.1
42628	67	67	85	107	336	168	159	0.3	56	2993	14.34	6.41	715	15	266	6.2	425.6	Off	8.16	6.1
42684	67	67	84	108	336	168	159	0.3	57	2997	14.36	6.35	750	15	266	6.2	456.0	Off	8.16	6.1
42744	66	67	84	108	336	168	159	0.302	57	3003	14.37	6.32	797	15	265	6.2	456.0	Off	8.16	6.1
42804	66	67	84	106	335	167	159	0.304	57	3038	14.35	6.34	837	15	264	6.2	405.3	Off	8.16	6.1
42864	66	67	84	107	334	167	159	0.304	57	3039	14.36	6.33	861	15	264	6.2	405.3	Off	8.16	6.1
42924	66	67	84	108	335	167	158	0.307	56	3057	14.34	6.36	881	15	264	6.2	456.2	Off	8.16	6.1
42984	66	67	84	107	334	167	159	0.307	58	3071	14.3	6.38	884	15	263	6.2	405.3	Off	8.16	6.1
43044	66	67	84	106	335	167	158	0.313	57	3121	14.25	6.44	881	15	263	6.2	456.2	Off	8.16	6.1
43104	66	67	84	107	334	167	158	0.319	57	3180	14.14	6.55	865	15	262	6.2	456.2	Off	8.16	6.1
43164	66	67	84	109	334	167	158	0.321	57	3214	14.09	6.6	846	15.1	262	6.2	456.2	Off	8.16	6.1
43224	66	73	110	153	321	166	158	0.33	437	3300	14.13	6.51	817	16	258	6.2	405.5	On	8.16	6.1
43284	66	76	132	176	326	166	158	0.347	763	3450	16.76	3.95	787	16	257	6.2	405.5	On	8.16	6.1
43344	66	78	141	182	346	166	158	0.516	1035	4856	17.67	3.14	778	16	262	6.2	405.5	On	8.16	6.1
43404	66	78	145	185	379	166	158	0.647	1186	5016	17.74	3.26	760	16	269	6.2	405.5	On	8.16	6.1
43464	66	79	148	188	413	166	157	0.735	1269	5017	17.48	3.48	739	15.5	275	6.2	456.3	On	8.16	6.1
43524	66	80	151	190	444	166	157	0.766	1258	5016	17.3	3.61	706	15.5	280	6.2	456.3	On	8.16	6.1
43584	66	80	154	192	462	166	158	0.766	1255	5016	17.21	3.67	667	15.5	284	6.2	405.5	On	8.16	6.1
43644	66	80	156	195	477	166	157	0.758	1214	5016	17.14	3.72	627	15.5	289	6.2	456.3	On	8.16	6.1
43704	66	81	159	197	493	166	157	0.722	1137	5016	17.06	3.82	595	15.5	295	6.2	456.3	On	8.16	6.1
43764	66	81	161	200	500	166	157	0.677	1050	5017	16.98	3.91	563	15.5	302	6.2	456.3	On	8.16	6.1
43824	66	82	164	203	503	166	157	0.621	974	5016	16.93	3.97	522	15.5	309	6.2	456.3	On	8.16	6.1
43884	66	82	166	206	510	166	157	0.582	938	5017	16.86	4.05	495	15.5	317	6.2	456.3	On	8.16	6.1
43944	66	83	169	209	518	166	157	0.56	918	5017	16.78	4.13	481	15.5	325	6.2	456.3	On	8.16	6.1
44004	66	83	170	211	523	166	158	0.549	902	5017	16.73	4.16	484	15.5	332	6.2	378.4	On	8.16	6.1
44060	66	83	172	213	527	166	158	0.538	882	5017	16.72	4.17	452	15	338	6.2	405.5	On	8.16	6.1
44120	66	83	173	214	528	166	158	0.526	877	5016	16.72	4.15	435	15	343	6.2	405.5	On	8.16	6.1
44180	66	84	175	216	527	166	158	0.528	888	5016	16.75	4.15	423	15	349	6.2	405.5	On	8.16	6.1
44240	66	84	176	218	524	166	158	0.519	839	5016	16.76	4.11	413	14.5	353	6.2	405.5	On	8.16	6.1
44300	66	84	178	219	523	166	158	0.5	826	5002	16.79	4.06	399	14.5	358	6.2	405.5	On	8.16	6.1
44360	65	84	178	219	522	167	158	0.492	820	4942	16.8	4.08	391	14.5	361	6.2	456.2	On	8.16	6.1
44420	66	85	179	220	522	167	158	0.49	834	4916	16.79	4.07	383	14.5	364	6.2	456.2	On	8.16	6.1
44480	66	85	179	221	523	167	158	0.498	832	5002	16.78	4.1	376	14.5	367	6.2	456.2	On	8.16	6.1
44540	66	85	180	221	525	167	158	0.494	828	4975	16.75	4.14	363	14.5	369	6.2	456.2	On	8.16	6.1
44600	65	85	181	222	526	167	158	0.493	813	4947	16.71	4.15	355	14	372	6.2	456.2	On	8.16	6.1
44660	65	85	181	223	526	167	159	0.481	793	4832	16.69	4.16	347	14	374	6.2	405.3	On	8.16	6.1
44720	65	65	182	223	528	167	159	0.473	794	4747	16.73	4.14	340	14	376	6.2	405.3	On	8.16	6.1
44780	65	85	182	224	525	167	159	0.475	781	4763	16.73	4.15	335	14	377	6.2	405.3	On	8.16	6.1
44840	65	86	182	224	522	167	159	0.458	752	4602	16.77	4.11	331	14	378	6.2	405.3	On	8.16	6.1
44900	65	85	183	224	518	167	159	0.446	732	4467	16.82	4.06	326	14	379	6.2	405.3	On	8.16	6.1
44960	65	85	183	224	515	167	159	0.437	727	4369	16.9	3.99	314	14	379	6.2	405.3	On	8.16	6.1
45020	65	85	183	224	513	167	159	0.437	728	4375	16.94	3.96	311	14	379	6.2	405.3	On	8.16	6.1
45080	65	85	183	224	512	168	159	0.434	726	4353	16.97	3.91	306	14	378	6.2	456.0	On	8.16	6.1
45140	65	85	182	223	510	168	159	0.434	723	4351	17.01	3.89	301	14	377	6.2	456.0	On	8.16	6.1
45200	66	85	182	223	507	168	159	0.436	728	4355	17.03	3.86	295	14	376	6.2	456.0	On	8.16	6.1
45260	65	85	182	222	505	168	159	0.434	714	4347	17.07	3.83	292	14	374	6.2	456.0	On	8.16	6.1
45320	65	85	182	222	503	168	159	0.426	698	4264	17.09	3.8	281	14	373	6.2	456.0	On	8.16	6.1
45380	65	85	181	222	501	168	159	0.422	705	4224	17.13	3.77	266	14	372	6.2	425.6	On	8.16	6.1
45436	65	85	181	222	499	168	159	0.424	709	4243	17.14	3.76	258	14	371	6.2	456.0	On	8.16	6.1
45496	65	85	181	221	496	168	159	0.427	708	4263	17.16	3.74	258	14	370	6.2	456.0	On	8.16	6.1
45556	65	85	181	221	493	168	159	0.416	650	4164	17.2	3.69	257	14	368	6.2	456.0	On	8.16	6.1

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
45616	65	84	181	221	488	168	159	0.391	637	3895	17.27	3.64	250	13.5	367	6.2	456.0	On	8.16	6.1
45676	65	85	180	221	485	168	160	0.386	639	3844	17.28	3.61	243	13.5	365	6.2	405.2	On	8.16	6.1
45736	65	85	180	220	482	168	160	0.383	629	3822	17.32	3.59	237	13.5	364	6.2	405.2	On	8.16	6.1
45796	66	85	179	219	482	168	159	0.376	614	3747	17.37	3.56	234	14	363	6.2	456.0	On	8.16	6.1
45856	65	84	179	219	480	168	159	0.373	608	3703	17.36	3.56	230	14	361	6.2	456.0	On	8.16	6.1
45916	65	84	179	219	478	168	159	0.369	609	3672	17.4	3.54	222	14	360	6.2	456.0	On	8.16	6.1
45976	65	84	179	218	476	168	160	0.364	592	3621	17.42	3.51	219	14	358	6.2	405.2	On	8.16	6.1
46036	65	84	178	218	471	168	159	0.358	576	3556	17.45	3.48	217	13.5	357	6.2	456.0	On	8.16	6.1
46096	65	84	178	217	466	168	159	0.349	565	3468	17.52	3.44	214	13.5	355	6.2	456.0	On	8.16	8.1
46156	65	84	177	216	462	168	160	0.344	559	3413	17.54	3.41	213	13.5	354	6.2	405.2	On	8.16	6.1
46216	65	84	177	216	457	168	159	0.338	549	3359	17.58	3.37	207	13.5	352	6.2	456.0	On	8.16	6.1
46276	65	84	176	215	454	168	160	0.334	551	3334	17.61	3.35	207	13.5	350	6.2	405.2	On	8.16	6.1
46336	65	84	176	215	452	168	159	0.335	547	3337	17.63	3.34	206	13.5	349	6.2	456.0	On	8.16	8.1
46396	65	84	176	214	449	168	159	0.333	544	3310	17.64	3.31	203	13.5	348	6.2	456.0	On	8.16	8.1
46456	65	84	176	214	448	168	160	0.334	547	3313	17.65	3.31	200	13.5	347	6.2	405.2	On	8.16	6.1
46516	65	84	175	214	448	168	160	0.335	546	3321	17.64	3.31	198	13	345	6.2	405.2	On	8.16	6.1
46576	65	83	175	214	447	168	160	0.334	544	3317	17.66	3.29	197	13	344	6.2	405.2	On	8.16	6.1
46636	65	84	175	213	445	168	160	0.337	557	3343	17.66	3.3	197	13.2	343	6.2	405.2	On	8.16	6.1
46696	65	83	175	213	443	168	160	0.342	558	3386	17.65	3.3	194	13	342	6.2	405.2	On	8.16	6.1
46756	65	83	174	212	441	168	160	0.342	554	3396	17.66	3.29	193	13.4	342	8.2	378.2	On	8.16	8.1
46812	65	83	174	212	441	168	160	0.342	561	3405	17.66	3.29	194	13	341	8.2	405.2	On	8.16	6.1
46872	65	83	174	212	444	168	160	0.345	566	3437	17.64	3.31	191	13	341	6.2	405.2	On	8.16	6.1
46932	65	83	174	212	445	168	160	0.352	589	3497	17.65	3.3	189	13	340	6.2	405.2	On	8.16	6.1
46992	64	83	174	212	444	168	160	0.358	578	3563	17.68	3.28	190	13	340	6.2	405.2	On	8.16	6.1
47052	65	83	174	212	443	168	160	0.352	568	3501	17.7	3.26	188	13	339	6.2	405.2	On	8.16	6.1
47112	64	83	173	212	442	168	160	0.346	555	3436	17.7	3.26	189	13	339	6.2	405.2	On	8.16	6.1
47172	84	83	173	212	441	168	160	0.338	543	3353	17.71	3.25	190	13	338	6.2	405.2	On	8.16	6.1
47232	64	83	173	211	440	168	160	0.333	541	3309	17.71	3.25	189	13	337	6.2	405.2	On	8.16	6.1
47292	64	83	173	211	440	168	160	0.333	541	3295	17.74	3.22	189	13	336	6.2	405.2	On	8.16	6.1
47352	64	83	173	211	438	168	160	0.333	537	3290	17.76	3.21	191	13	335	6.2	405.2	On	8.16	6.1
47412	64	83	173	211	438	168	160	0.33	534	3267	17.76	3.19	190	13	335	6.2	405.2	On	8.16	6.1
47472	64	83	173	211	436	168	160	0.326	521	3228	17.77	3.18	186	12.5	334	6.2	405.2	On	8.16	6.1
47532	64	83	172	210	433	169	161	0.32	517	3171	17.8	3.15	188	13	333	6.2	405.1	On	8.15	8.1
47592	64	83	172	210	431	168	161	0.321	521	3174	17.84	3.12	188	12.5	332	6.2	354.4	On	8.15	6.1
47652	64	83	172	210	431	169	160	0.32	510	3165	17.87	3.09	187	12.5	331	6.2	455.9	On	8.16	6.1
47712	64	83	171	209	429	168	160	0.313	506	3101	17.9	3.05	186	12.5	331	6.2	405.2	On	8.16	6.1
47772	64	83	171	209	427	169	160	0.313	495	3063	17.91	3.06	186	12.5	330	6.2	455.9	On	8.18	6.1
47832	64	83	171	208	422	168	160	0.304	482	3009	17.96	2.99	188	12.5	329	8.2	405.2	On	8.16	8.1
47892	64	82	171	207	418	168	160	0.298	469	2933	18.03	2.95	187	12.5	327	6.2	405.2	On	8.16	6.1
47952	64	82	170	207	415	169	160	0.292	460	2870	18.07	2.9	187	12.5	325	6.2	455.9	On	8.16	6.1
48012	64	82	170	206	412	169	160	0.287	448	2821	18.09	2.88	189	12.5	323	6.2	455.9	On	8.16	6.1
48072	64	82	170	205	409	169	161	0.279	440	2747	18.13	2.84	189	12.5	321	6.2	405.1	On	8.15	6.1
48132	64	82	169	205	406	168	160	0.275	433	2705	18.17	2.81	185	12.5	319	6.2	378.2	On	8.16	6.1
48188	64	82	168	204	403	168	160	0.27	427	2660	18.21	2.78	182	12.5	317	6.2	405.2	On	8.16	6.1
48248	64	81	167	203	403	169	160	0.268	436	2640	18.24	2.75	181	12.5	315	6.2	455.9	On	8.16	6.1
48308	64	81	167	203	401	169	160	0.279	457	2740	18.26	2.73	177	12	314	6.2	455.9	On	8.16	8.1
48368	64	81	167	202	401	169	161	0.287	459	2826	18.24	2.74	179	12.5	312	6.2	405.1	On	8.15	6.1
48428	64	81	166	202	401	169	161	0.288	454	2820	18.26	2.71	175	12.5	310	6.2	405.1	On	8.15	6.1
48488	64	81	166	201	400	169	161	0.285	449	2789	18.27	2.7	177	12	309	6.2	405.1	On	8.15	8.1
48548	64	81	165	200	399	169	161	0.283	454	2790	18.28	2.88	176	12	307	6.2	405.1	On	8.15	8.1
48608	64	81	165	200	400	169	161	0.289	471	2836	18.29	2.88	177	12	306	6.2	405.1	On	8.15	6.1
48668	64	81	164	199	400	169	161	0.294	464	2898	18.29	2.88	181	12	304	6.2	405.1	On	8.15	6.1
48728	64	81	164	199	398	169	160	0.292	455	2861	18.3	2.66	180	12	303	8.2	455.9	On	8.16	6.1
48788	63	81	164	198	397	169	161	0.289	455	2837	18.34	2.63	179	12	302	6.2	405.1	On	8.15	6.1
48848	64	81	163	198	395	168	160	0.285	446	2792	18.37	2.61	177	12	300	6.2	405.2	On	8.18	6.1
48908	64	80	163	197	392	168	161	0.277	432	2736	18.41	2.57	177	12.5	299	6.2	354.4	On	8.15	8.1
48968	63	80	163	197	390	168	160	0.272	426	2672	18.45	2.52	173	12.2	297	6.2	405.2	On	8.16	6.1
49028	64	80	162	196	388	168	160	0.268	427	2632	18.5	2.5	177	12.5	296	6.2	405.2	On	8.16	6.1
49088	63	80	161	195	388	168	160	0.269	427	2642	18.49	2.49	177	12.5	294	6.2	405.2	On	8.16	6.1
49148	64	80	161	195	384	168	160	0.27	429	2646	18.51	2.47	175	12.5	292	6.2	405.2	On	8.16	6.1
49208	64	80	161	194	383	169	160	0.271	430	2657	18.53	2.45	172	12.5	291	6.2	455.9	On	8.16	6.1
49268	63	80	160	194	382	168	160	0.27	428	2661	18.56	2.42	172	12.5	289	8.2	405.2	On	8.16	6.1
49328	63	80	160	193	380	168	160	0.272	434	2675	18.57	2.41	173	12	288	6.2	405.2	On	8.16	6.1
49388	63	80	160	193	372	168	160	0.273	445	2676	18.6	2.38	170	12.5	286	6.2	405.2	On	8.16	6.1
49448	63	81	161	194	357	168	160	0.282	539	2761	18.63	2.34	168	12.5	284	6.2	405.2	On	8.16	6.1
49508	63	82	181	194	356	168	160	0.314	581	3079	18.63	2.35	168	12.5	283	6.2	378.2	On	8.16	6.1
49564	63	81	162	194	357	168	160	0.33	594	3247	18.59	2.38	166	12.1	283	6.2	405.2	On	8.16	6.1
49624	64	80	161	193	358	168	160	0.336	597	3322	18.57	2.4	168	12	282	6.2	405.2	On	8.16	6.1
49684	63	81	162	194	358	166	161	0.338	594	3329	18.56	2.39	169	11.5	282	6.2	354.4	On	8.15	6.1
49744	64	81	162	193	363	168	161	0.333	569	3277	18.58	2.39	173	10.5	281	6.2	354.4	On	8.15	6.1
49804	64	81	161	193	364	168	161	0.331	560	3261	18.54	2.43	177	10	281	8.2	354.4	On	8.15	6.1
49864	64	81	161	193	364	168	161	0.328	560	3237	18.53	2.43	183	9.5	281	6.2	354.4	On	8.15	6.1
49924	64	81	162	193	360	168	161	0.325	546	3221	18.53	2.42	189	9	280	6.2	354.4	On	8.15	6.1
49984	65	81	161	193	354	168	161	0.332	603	3265	18.59	2.38	198	9	279	6.2	354.4	On	8.15	6.1

D63

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

Printed on 02-Apr-96

25-Oct-95 Run TTCD-1

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
50044	65	82	161	193	350	168	161	0.347	588	3438	18.67	2.3	201	6.5	276	6.2	354.4	On	6.15	6.1
50104	65	81	161	193	348	168	161	0.339	564	3355	18.7	2.28	207	8	278	6.2	354.4	On	6.15	6.1
50164	66	82	161	192	347	168	161	0.325	538	3230	18.69	2.26	206	7.5	277	6.2	354.4	On	6.15	6.1
50224	68	82	161	192	346	168	161	0.317	523	3125	18.71	2.25	208	7.2	276	6.2	354.4	On	6.15	6.1
50284	67	82	160	192	347	168	161	0.305	506	3019	18.71	2.24	209	7	275	6.2	354.4	On	6.15	6.1
50344	67	82	160	192	346	168	161	0.295	489	2914	18.73	2.22	218	6.5	274	6.2	354.4	On	6.15	6.1
50404	67	82	160	191	342	168	161	0.29	486	2852	18.76	2.17	229	6.5	273	6.2	354.4	On	6.15	6.1
50464	67	82	159	190	336	168	161	0.284	468	2799	18.78	2.15	232	6	271	6.2	354.4	On	6.15	6.1
50524	68	82	159	190	335	168	161	0.274	450	2699	18.84	2.11	232	6	270	6.2	354.4	On	6.15	6.1
50584	68	82	159	190	332	168	161	0.264	436	2615	18.88	2.08	234	5.5	268	6.2	354.4	On	6.15	6.1
50644	68	82	158	189	330	168	161	0.26	433	2563	18.9	2.05	233	5.5	267	6.2	354.4	On	6.15	6.1
50704	68	82	158	189	327	168	161	0.258	428	2531	18.92	2.04	231	5	265	6.2	354.4	On	6.15	6.1
50764	69	82	158	189	325	168	161	0.254	422	2500	18.94	2.02	236	5	264	6.2	354.4	On	6.15	6.1
50824	69	82	158	188	323	168	161	0.248	406	2445	18.96	1.99	235	5	262	6.2	354.4	On	6.15	6.1
50884	69	82	158	188	320	168	161	0.243	404	2396	18.99	1.97	233	4.5	261	6.2	330.6	On	6.15	6.1
50940	69	83	157	187	318	168	161	0.239	393	2362	19.01	1.95	232	4.5	260	6.2	354.4	On	6.15	6.1
51000	69	83	157	186	314	167	161	0.234	389	2312	19.04	1.93	233	4	258	6.2	303.8	On	6.15	6.1
51060	70	82	157	186	311	168	161	0.233	386	2299	19.05	1.91	235	4	257	6.2	354.4	On	6.15	6.1
51120	70	82	156	186	309	168	161	0.231	374	2269	19.06	1.91	237	4	256	6.2	354.4	On	6.15	6.1
51180	70	82	156	185	306	168	161	0.226	381	2221	19.07	1.89	236	3.5	255	6.2	354.4	On	6.15	6.1
51240	70	82	156	185	304	167	161	0.228	377	2262	19.09	1.88	235	3.5	254	6.2	303.8	On	6.15	6.1
51300	70	82	156	185	303	167	161	0.225	361	2222	19.1	1.86	236	3.5	252	6.2	303.8	On	6.15	6.1
51360	70	82	155	184	302	167	161	0.215	349	2125	19.13	1.82	237	3	250	6.2	303.8	On	6.15	6.1
51420	70	82	155	184	301	167	161	0.211	342	2073	19.17	1.8	240	3	249	6.2	303.8	On	6.15	6.1
51480	70	82	155	183	297	167	161	0.207	336	2030	19.18	1.78	241	3	248	6.2	303.8	On	6.15	6.1
51540	71	82	155	183	296	167	161	0.204	345	2026	19.18	1.78	243	2.5	246	6.2	303.8	On	6.15	6.1
51600	71	82	154	183	297	167	161	0.21	344	2075	19.17	1.8	246	2.5	246	6.2	303.8	On	6.15	6.1
51660	71	83	154	182	296	167	161	0.206	337	2045	19.18	1.79	244	2.5	244	6.2	303.8	On	6.15	6.1
51720	71	82	154	182	295	167	161	0.203	327	2004	19.21	1.75	245	2	243	6.2	303.8	On	6.15	6.1
51780	71	82	153	182	293	167	161	0.196	321	1944	19.24	1.73	244	1.5	242	6.2	303.8	On	6.15	6.1
51840	71	80	153	181	289	167	160	0.195	322	1927	19.25	1.72	244	1.5	240	6.2	354.6	On	6.16	6.1
51900	70	79	152	180	288	167	160	0.194	325	1914	19.28	1.69	241	2.5	239	6.2	354.6	On	6.16	6.1
51960	69	78	151	179	287	167	160	0.195	319	1917	19.33	1.64	237	3	237	6.2	354.6	On	6.16	6.1
52020	68	77	150	179	285	167	160	0.19	316	1882	19.34	1.63	231	3	235	6.2	354.6	On	6.16	6.1
52080	67	77	150	178	284	166	160	0.191	315	1872	19.35	1.63	228	3.5	234	6.2	303.9	On	6.16	6.1
52140	68	78	149	178	283	166	160	0.191	312	1870	19.35	1.63	225	3.5	233	6.2	303.9	On	6.16	6.1
52200	66	78	149	177	284	167	160	0.189	307	1859	19.38	1.62	221	3	232	6.2	354.6	On	6.16	6.1
52260	66	79	149	177	283	166	160	0.187	298	1829	19.37	1.61	224	2.5	230	6.2	283.8	On	6.16	6.1
52316	66	79	149	177	282	166	160	0.183	289	1792	19.37	1.6	223	2.5	230	6.2	303.9	On	6.16	6.1
52376	67	80	149	177	282	166	160	0.179	286	1756	19.39	1.59	226	2	229	6.2	303.9	On	6.16	6.1
52436	67	80	149	177	280	166	160	0.178	286	1740	19.4	1.58	226	2	228	6.2	303.9	On	6.16	6.1
52496	67	80	149	176	278	166	160	0.176	283	1731	19.41	1.58	228	1.5	227	6.2	303.9	On	6.16	6.1
52556	67	80	149	178	277	166	160	0.174	277	1710	19.43	1.55	230	1.5	226	6.2	303.9	On	6.16	6.1
52616	68	80	148	176	278	166	160	0.172	277	1684	19.44	1.54	230	1.5	226	6.2	303.9	On	6.16	6.1
52676	68	80	149	176	278	166	160	0.172	273	1678	19.43	1.56	232	1.5	225	6.2	303.9	On	6.16	6.1
52736	68	81	148	176	276	166	160	0.169	273	1666	19.44	1.56	233	1	224	6.2	303.9	On	6.16	6.1
52796	69	81	148	176	276	166	160	0.168	266	1648	19.5	1.55	233	1	224	6.2	303.9	On	6.16	6.1
52856	69	81	148	176	274	166	160	0.167	269	1636	19.5	1.54	236	1	223	6.2	303.9	On	6.16	6.1
52916	69	81	148	175	272	166	160	0.166	262	1629	19.51	1.52	237	0.5	222	6.2	303.9	On	6.16	6.1
52976	70	81	148	175	271	166	160	0.162	264	1597	19.49	1.51	238	0.5	222	6.2	303.9	On	6.16	6.1
53036	70	81	148	175	269	166	160	0.163	264	1611	19.48	1.51	238	0.5	222	6.2	303.9	On	6.16	6.1
53096	70	79	148	175	266	166	159	0.162	256	1603	19.46	1.5	237	0	221	6.2	354.7	On	6.16	6.1
53156	69	78	147	174	264	166	159	0.157	251	1552	19.52	1.46	236	0.5	220	6.2	354.7	On	6.16	6.1
53216	68	77	146	173	264	165	159	0.156	253	1535	19.55	1.44	232	1	219	6.2	304.0	On	6.16	6.1
53276	68	76	145	172	263	166	159	0.154	247	1521	19.57	1.42	230	1	217	6.2	354.7	On	6.16	6.1
53336	67	76	145	172	261	165	159	0.154	243	1501	19.58	1.42	228	1	217	6.2	304.0	On	6.16	6.1
53396	67	76	144	172	260	165	158	0.15	234	1477	19.58	1.41	227	1	216	6.2	354.8	On	6.16	6.1
53456	66	76	144	171	257	165	158	0.148	229	1448	19.59	1.41	224	1	215	6.2	354.6	On	6.16	6.1
53516	66	76	143	171	255	165	158	0.144	226	1416	19.6	1.39	222	1.5	214	6.2	354.6	On	6.16	6.1
53576	65	75	143	170	254	165	158	0.142	221	1397	19.61	1.38	217	2	213	6.2	354.8	On	6.16	6.1
53636	65	75	142	170	251	165	158	0.139	213	1351	19.63	1.35	214	2	212	6.2	331.1	On	6.16	6.1
53692	64	75	142	169	250	165	158	0.136	211	1316	19.66	1.34	209	2.5	211	6.2	354.8	On	6.16	6.1
53752	64	75	142	169	249	165	158	0.133	205	1292	19.67	1.33	207	2.5	210	6.2	354.8	On	6.16	6.1
53812	64	76	142	169	250	165	158	0.129	200	1264	19.67	1.32	204	2.5	210	6.2	354.6	On	6.16	6.1
53872	64	77	142	169	249	165	158	0.129	200	1242	19.68	1.32	204	2	209	6.2	354.8	On	6.16	6.1
53932	64	78	142	169	248	164	158	0.129	198	1249	19.68	1.31	206	1.5	209	6.2	304.1	On	6.16	6.1
53992	64	78	142	169	248	164	158	0.127	199	1240	19.68	1.31	206	1.5	208	6.2	304.1	On	6.16	6.1
54052	65	79	142	168	247	164	158	0.129	204	1260	19.69	1.31	208	1	208	6.2	304.1	On	6.16	6.1
54112	65	79	142	168	246	164	158	0.13	204	1269	19.68	1.3	207	0.5	207	6.2	304.1	On	6.16	6.1
54172	66	80	142	169	246	164	158	0.13	202	1267	19.71	1.29	209	0.2	207	6.2	304.1	On	6.16	6.1
54232	66	80	142	168	246	164	158	0.128	200	1251	19.71	1.28	210	0	206	6.2	304.1	On	6.16	6.1
54292																				
AVERAGE	68	78	132	185	517	171	163	0.95			13.52	7.32	1358		385	6.3	398.2		6.15	

13.46111 hrs run time

D64

FURNACE A WITH CATALYST- LOW HEAT REMOVAL RATE

25-Oct-95 Run TTCD-1

Printed on 02-Apr-96

time sec	ambient F	dilution F	stack F	stove F	fire-box F	water out F	water in F	CO high %	CO dilu ppm	CO low ppm	O2 %	CO2 %	JUM-THC ppm	balance lbs	catalyst F	Water actual flow rate gpm	heat out Btu/interval	Draft On/Off	Density of cool water lb/gal	Water meter reading gpm
13:27:40 hr:mmn:sc run time																Total Btu out =	322,976	Btu/hr out =	23,993	
																Total Btu in =	593,808	, Btu/hr in =	44,113	
																Efficiency =	54.39%			
																Water flowrate =	6.26	gpm		
																Burnrate =	2.48	dry kg/hr		
																Wood moisture =	18.90%			
																Burn time =	13.46	hr		

D65

Furnace B CEM test data.

Elapsed time, min.	Test #1 O2, %	Test #1 CO2, %	Test #1 CO, %	Test #1 Draft on Elapsed min.	Test #1 Draft off Elapsed min.	Test #2 O2, %	Test #2 CO2, %	Test #2 CO, %	Test #2 Draft on Elapsed min.	Test #2 Draft off Elapsed min.	Test #3 O2, %	Test #3 CO2, %	Test #3 CO, %	Test #3 Draft on Elapsed min.	Test #3 Draft off Elapsed min.	Test #4 O2, %	Test #4 CO2, %	Test #4 CO, %	Test #4 Draft on Elapsed min.	Test #4 Draft off Elapsed min.
0	17.11	3.37	0.82			16.06	3.18	0.91	9		17.56	2.8	0.46	0		16	3.85	1.45	0	8
10	18	3.61	1.63			16.42	3.41	1.23		18	10.67	9.19	3.1		17	10.05	9.85	3.26		
20	17.87	2.76	0.89			15.26	8	3.35			17.43	4.1	2.06			16.93	2.95	1.02		
30	17.73	2.67	0.75			17.85	2.21	0.6			18.42	2	0.4			16.6	3	0.86	32	
40	17.3	2.83	0.71	46		17.63	2.09	0.44			18.19	2.28	0.43	48		4.23	14.3	7.68		42
50	18.12	2.24	0.61		55	12.14	6.42	1.05	44		15.52	4.21	0.91		56	17.66	3.01	1.18		
60	17.93	3.96	1.81			17.82	4.05	1.58		57	17.63	4.56	2.26			17.42	2.41	0.53	63	
70	18.12	2	0.4			17.8	1.83	0.38			18.34	2.01	0.43			7.55	11.61	2.33		72
80	17.82	2.31	0.37			17.68	17.92	0.39	88		18.27	2.06	0.29			17.55	3.95	1.79		
90	17.41	2.68	0.48			14.78	3.08	0.92			17.81	2.51	0.35			17.53	2.38	0.57		
100	17.3	2.82	0.53			4.01	4.73	9.92		100	17.54	2.81	0.46			17.41	2.39	0.54	100	108
110	17.12	3.03	0.58	111	119	17.92	3.43	1.16			17.35	2.94	0.51	118		12.69	8.71	9.25		
120	5.3	3.48	7.01			17.95	2.06	0.48			15.2	3.88	0.76		128	17.35	3.87	1.63		
130	17.95	2.86	0.71			17.89	1.94	0.39	131		4.83	13.27	8.29			17.42	2.76	0.78	138	
140	17.63	2.53	0.43			6.07	12.79	3.27		141	18.22	2.69	0.92			18.18	2.19	0.47		146
150	17.71	2.47	0.37			17.52	4.92	2.15			18.52	1.71	0.33			16.61	5.57	3.57		
160	17.26	2.81	0.42			17.5	2.91	0.73			18.23	1.95	0.29	164		17.48	3.36	1.17		
170	17.17	2.92	0.45			17.44	2.55	0.545	176		11.99	7.75	1.21		173	17.2	2.96	0.74	172	
180	16.91	3.12	0.5	189		14.61	4.99	1.2		185	17.65	4.54	2.22			16.18	4.06	1.04		182
190	16.65	3.35	0.54		198	16.77	5.14	3.32			18.37	2.31	0.6			16.03	4.75	2.79		
200	11.84	8.73	6.65			16.93	3.38	0.92			18.27	1.95	0.37			16.83	3.63	1.22	205	
210	17.43	3.58	1			16.72	3.1	0.55			18.15	2.13	0.35			16.54	3.41	0.8		215
220	17.33	2.97	0.64			16.35	3.31	0.53	223		17.3	2.76	0.45			14.48	5.63	1.3		
230	17.22	2.89	0.51			9.39	10.22	0.7		232	17.08	3.01	0.54			16.35	4.54	2.12		
240	17.1	2.8	0.42			16.51	3.91	0.06			16.92	3.19	0.63	240		16.68	3.81	1.13		
250	16.71	3.22	0.42			16.2	3.65	0.61			15.6	5.98	4.7		247	16.25	3.67	0.82	253	
260	16.59	3.34	0.44			15.68	3.94	0.58	261		17.67	3.32	1.27			17.08	7.44	1.3		263
270	16.33	3.58	0.5	273		9.54	9.98	0.93		271	17.84	2.41	0.56			16.38	4.64	2.13		
280	18.02	2.66	0.54		286	16.6	3.91	1.23			17.7	2.32	0.4			16.43	4.06	1.22		
290	16.56	5.43	3.76			16.18	3.81	0.67			17.16	2.64	0.41			16.04	4.04	0.88	292	
300	17.27	3.34	0.9			15.69	4.03	0.57	302		17.11	2.78	0.42			7.38	11.43	1.6		300
310	17.18	2.87	0.51			10.74	9	0.89		311	16.57	3.27	0.49	311	318	16.22	4.31	1.37		
320	17.25	2.69	0.4			16.56	4.01	1.38			14.98	5.28	2.41			16.17	3.98	0.86	328	
330	16.86	2.99	0.4			15.91	4.22	0.81			17.14	3.3	1.01			12.56	6.69	1.23		338
340	16.79	3.07	0.38			15.72	4.09	0.59	343		17.3	2.81	0.57			14.5	5.37	1.44		
350	16.5	3.25	0.42			12.71	7.23	0.81		354	16.73	3.05	0.55			16.5	4.2	1.27		
360	16.43	3.42	0.46	365		16.18	4.14	1.41			16.35	3.38	0.56			15.9	4.11	0.85	368	
370	14.24	6.07	1.07		374	15.91	4.06	0.77			16.39	3.35	0.56	378		15.51	3.87	0.65		378
380	16.42	4.13	1.92			15.45	4.2	0.58	383		16.02	3.32	0.6		387	15.12	5.2	2.13		
390	16.94	3.27	0.77			13.43	6.38	1.15		395	15.95	5.08	3.21			16.53	4.25	1.47		
400	16.86	3	0.47			16.29	4.29	1.68			16.88	3.69	1.26			16.18	3.95	0.93	409	
410	16.31	3.4	0.44			15.77	4.15	1.1			16.93	3.26	0.75			14.54	5.93	1.04		
420	16.27	3.41	0.41			15.76	3.97	0.7	428		16.61	3.41	0.63			12.09	7.67	1.49		421
430	16.01	3.67	0.45			16.81	3.48	0.53			15.89	3.78	0.59			16.25	4.45	1.63		
440	15.77	4.04	0.5			12.44	7.17	1.57		442	15.57	4.03	0.6			16.16	3.83	0.9		
450	15.05	4.3	0.52	457		16.28	4.45	1.74			15.11	4.41	0.63	455		15.68	4.03	0.67	455	
460	15.61	4.95	0.71		463	15.94	3.89	0.93			14.64	5.26	1.29		465	14.76	5.27	1.15		467
470	16.28	4.17	1.96			15.55	4.11	0.69	474		16.91	4.54	2.47			15.8	4.73	1.56		
480	16.41	3.75	0.95			14.94	4.89	1.08		489	17.02	3.39	1			16.01	4.36	1.22		
490	16.29	3.7	0.69			11.79	5.66	0.86			16.55	3.29	0.65			15.78	4.14	0.8		
500	15.87	4.03	0.64			16.43	4.57	1.76			16.59	3.15	0.51			15.28	4.43	0.68	505	
510	15.88	3.95	0.59			16.08	4.05	1.1			16.15	3.56	0.51			14.5	5.69	0.8		519
520	15.3	4.41	0.68			15.75	3.92	0.73	527		16.2	3.47	0.51	529		13.7	6.33	1.51		
530	15.32	4.4	0.68	535		16.65	3.48	0.71			14.3	5.81	0.82		538	16.05	4.73	1.5		
540	14.06	6.14	1.02		543	10.96	8.78	1.53		541	14.71	5.77	3.8			16	4.08	0.9		
550	16.19	4.45	2.02			16.66	4.32	1.75			16.97	4.02	1.59			15.22	4.35	0.75	555	
560	16.58	3.59	0.87			16.48	3.73	1.07			17.12	3.21	0.95			15.53	4.61	1.1		
570	16.28	3.45	0.56			16.1	3.52	0.72	576		16.76	3	0.64			11.78	8.25	1.24		571
580	16.01	3.73	0.17			16.25	3.87	0.69		589	16.29	3.25	0.55			16.51	4.94	2.08		
590	15.33	4.09	0.55			12.02	7.49	1.14			16.01	3.45	0.54	596		16.51	3.78	1.05		
600	15.58	4.18	0.61			15.88	3.93	1.17			13.89	5.76	1.22		604	15.48	4	0.78		
610	14.69	4.72	0.75			15.67	3.91	0.72			16.12	4.25	2.34			15.25	4.11	0.63	610	
620	11.82	8.03	0.75	623		15.31	4.01	0.6	621		16.57	3.63	1.15			13.93	5.74	1.45		624
630	16.13	3.91	1.35		631	13.5	6.06	1.3		637	16.23	3.56	0.83			16.09	4.75	2.27		
640	16	3.95	0.75			16.05	4.11	1.6			16.06	3.52	0.72			16.07	4.29	1.24		
650	15.6	4.06	0.59			16.21	3.82	1.02			15.48	3.96	0.71			15.41	4.11	0.78		

Furnace B CEM test data.

Elapsed time, min.	Test #1 O2, %	CO2, %	CO, %	Draft on Elapsed min.	Draft off Elapsed min.	Test #2 O2, %	CO2, %	CO, %	Draft on Elapsed min.	Draft off Elapsed min.	Test #3 O2, %	CO2, %	CO, %	Draft on Elapsed min.	Draft off Elapsed min.	Test #4 O2, %	CO2, %	CO, %	Draft on Elapsed min.	Draft off Elapsed min.
660	15.49	4.31	0.61			15.54	3.8	0.72			15.73	3.83	0.66	663		14.98	4.23	0.59	664	
670	15.24	4.46	0.67			15.74	3.68	0.56	670		15.2	6.47	0.81		672	15.14	4.77	1.09		680
680	15.41	4.46	0.7			13.81	5.8	1.32		687	15.89	4.32	1.9			11.29	8.51	1.21		
690	15.24	4.62	0.76	690	698	16.4	3.81	1.27			15.85	3.95	1.04			15.96	4.92	1.77		
700	16.17	3.99	1.46			16.26	3.71	1.1			15.9	3.75	0.66			15.92	4.01	0.87		
710	16.1	3.88	1.01			15.92	3.69	0.73			15.61	3.83	0.58			15.47	4.06	0.62		
720	15.9	3.79	0.62			15.46	3.98	0.59	721		14.9	4.33	0.62	729		14.81	4.48	0.57	721	
730	15.57	4.09	0.57			14.46	5.33	1.01		738	14.78	5.41	0.73			14.04	5.88	1.05		736
740	15.16	4.35	0.6			16.64	3.65	1.05			11.14	8.44	1.14		740	15.84	4.52	1.71		
750	15.08	4.41	0.67			16.16	3.82	1.16			15.93	4.08	1.57			16.03	4.16	1.02		
760	15.22	4.35	0.69	761		15.66	3.85	0.7	768		15.64	3.95	1			15.49	4.08	0.65		
770	13.06	6.52	0.95		778	17.37	2.83	0.45			15.7	3.76	0.75			14.88	4.37	0.55		
780	16.01	3.87	1.08			14.17	5.58	0.93		785	15.21	4.16	0.71			16.57	3.56	0.68	786	
790	16.06	3.62	0.62			16.01	3.93	1.28			14.51	4.65	0.77	797		13.24	6.52	1.29		793
800	15.89	3.76	0.57			15.88	3.89	0.8			15.7	4.43	0.76		807	16.1	4.35	1.82		
810	15.78	3.8	0.57			15.67	3.79	0.6	816		16.25	4.27	1.83			15.85	4.12	1.04		
820	15.75	3.89	0.59			16.53	3.67	0.61			16.13	3.76	0.97			15.41	3.93	0.63		
830	15.63	4.05	0.62	831		13.95	5.73	0.92		834	16.22	3.4	0.65			15.03	4.11	0.54	837	
840	11.48	7.51	0.94		841	16.39	3.7	1.08			15.92	3.6	0.54			16.27	3.23	0.39		
850	16.48	3.45	0.92			15.98	3.67	0.68			15.16	4.18	0.6			13.87	5.94	1.14		856
860	16.19	3.48	0.61			15.82	3.68	0.54	864		15.14	4.13	0.57	863		15.87	4.36	1.85		
870	15.91	3.59	0.55			16.1	3.93	0.72			14.15	5.38	1.06		876	15.9	4.03	1		
880	15.92	3.66	0.55			15.47	4.48	0.7			16.01	4.2	1.71			15.62	3.84	0.67		
890	15.68	3.81	0.6								16.11	3.76	1			15.31	3.88	0.56	897	
900	15.72	3.85	0.63	903		15.38	4.63	1.10	averages		15.76	3.59	0.68			17.49	2.72	0.52		
910	14.66	5.03	1.24		915						15.79	3.54	0.5			13.86	5.87	1.06		916
920	16.37	3.84	1.44								15.32	3.82	0.51			15.78	4.26	1.47		
930	16.26	3.58	0.84								14.96	4.17	0.56	934		15.97	3.94	0.95		
940	16.24	3.23	0.58								15.72	4.1	0.89		949	15.62	3.76	0.63		
950	16.17	3.41	0.59								16.05	4.2	1.76			15.49	3.79	0.55	951	
960	15.96	0.6	0.59								16.12	3.85	1.17			15.05	4.85	0.97		962
970	15.44	4.02	0.7	976							15.93	3.63	0.87			13.96	5.81	1.05		
980	16.52	3.74	0.85		989						15.58	3.73	0.77			16.07	4.05	1.26		
990	15.44	3.84	0.8								15.23	3.93	0.76			15.7	3.9	0.79		
1000	16.66	3.63	1.15								15.03	4.19	0.79			15.88	3.51	0.56	1005	
1010	16.48	3.32	0.76								14.63	4.45	0.82	1016		16.56	3.63	0.64		
1020	16.56	3.16	0.69								15.85	4.4	0.81		1024	14.24	5.6	0.88		1022
1030	16.64	3.17	0.68	1034							16.11	4.3	1.96			16.39	3.8	1.09		
1040	16.74	3.19	0.7		1046						16.13	3.86	1.17			16.18	3.63	0.78		
1050	16.83	3.18	0.68								15.79	3.84	0.78			16.2	3.32	0.54	1057	
1060	16.93	3.19	0.68								15.68	3.8	0.63			17.66	2.7	0.47		
1070	16.17	4.36	1.72								15.48	4.01	0.63			16.15	3.94	0.72		
1080	16.79	3.33	0.99								15.1	4.28	0.64							
1090	16.66	3.12	0.64								13.61	6.46	0.86	1090	1098	15.40	4.68	1.27	averages	
1100	16.12	3.47	0.63								15.96	4.22	1.74							
1110	16.09	3.47	0.61								16.24	4.09	1.36							
1120	15.45	3.93	0.71								16.14	3.72	0.81							
1130	15.39	4.04	0.71								15.53	3.97	0.65							
1140	16.78	3.37	0.61	1140	1147						15.16	4.09	0.59							
1150	16.51	3.72	1.24								14.92	4.38	0.59							
1160	16.75	3.32	0.86								14.58	4.69	0.62	1164						
1170	16.42	3.35	0.64								15.18	5.04	0.62		1175					
1180	16.02	3.64	0.61								16.17	4.19	1.87							
1190	15.94	3.64	0.6								16.28	3.73	1.15							
1200	16.04	3.57	0.6	1208							15.82	3.63	0.76							
1210	15.08	4.24	0.71								15.83	3.58	0.61							
1220	15.23	3.57	0.6								15.22	3.95	0.64							
1230	12.16	7.7	0.54		1230						14.94	4.21	0.66	1238						
1240	16.42	3.85	1.24								16.08	3.06	0.51		1248					
1250	16.25	3.63	0.84								16.54	3.67	0.92							
1260	16	3.74	0.72								15.93	4.03	1.25							
1270	15.6	3.91	0.74								15.47	3.92	0.77							
1280	15.63	3.91	0.69								14.75	4.46	0.68							
1290	15.68	3.88	0.68	1298							14.83	4.39	0.59							
1300	16.94	2.7	0.58		1308						14.49	4.69	0.61							
1310	14.72	4.04	0.43								14.57	4.61	0.6	1311						

Furnace B CEM test data.

Elapsed time, min.	Test #1 O2, %	Test #1 CO2, %	Test #1 CO, %	Test #1 Draft on Elapsed min.	Test #1 Draft off Elapsed min.	Test #2 O2, %	Test #2 CO2, %	Test #2 CO, %	Test #2 Draft on Elapsed min.	Test #2 Draft off Elapsed min.	Test #3 O2, %	Test #3 CO2, %	Test #3 CO, %	Test #3 Draft on Elapsed min.	Test #3 Draft off Elapsed min.	Test #4 O2, %	Test #4 CO2, %	Test #4 CO, %	Test #4 Draft on Elapsed min.	Test #4 Draft off Elapsed min.
1320	16.34	3.86	1.1								14.58	5.15	0.76		1324					
1330	15.96	3.91	0.78								15.96	4.19	1.65							
1340	15.6	4.02	0.66								16.05	3.8	1							
1350	15.68	3.89	0.57								15.61	3.76	0.73							
1360	14.87	4.42	0.62								15.3	3.96	0.61							
1370	14.94	4.37	0.6	1374							15.01	4.22	0.6							
1380	17.14	3.05	0.48		1389						14.66	4.47	0.62							
1390	13.26	6.44	0.65								14.08	4.92	0.7	1392						
1400	16.13	3.83	1.07								15.99	3.94	0.83		1409					
1410	16.18	3.69	0.68								15.92	4.31	1.58							
1420	15.41	4.08	0.63								15.73	4.01	1.11							
1430	15.59	3.93	0.56								15.84	3.54	0.65							
1440	15.17	4.28	0.58								15.44	3.7	0.56							
1450	15.18	4.4	0.56	1458							14.8	4.23	0.6							
1460	17.02	2.75	0.42								15.06	4.12	0.56							
1470	15.86	4.19	0.57		1474						14.51	4.69	0.64							
1480	16.55	3.79	1.14								16.31	3.67	0.73							
1490	16.59	3.55	0.96								13.07	6.53	0.85							
1500	16.47	3.38	0.69								16	3.89	1.19							
1510	16.19	3.47	0.6								15.56	3.72	0.74							
1520	15.85	3.74	0.61								15.34	3.83	0.58							
1530	15.55	3.98	0.64								15.18	4.02	0.53							
1540	15.31	4.17	0.69	1540							14.56	4.36	0.6							
1550	16.48	3.54	0.59		1558						14.34	4.66	0.66							
1560	17.33	2.4	0.44								14.18	4.87	0.68	1560						
1570	16.09	3.84	0.97								14.46	5.23	0.71		1574					
1580	15.87	3.67	0.69								16.09	3.72	1.22							
1590	15.89	3.55	0.57								15.88	3.64	0.8							
1600	15.81	3.73	0.57								15.69	3.57	0.56							
1610	15.46	4	0.61								15.16	3.98	0.52							
1620	15.86	3.74	0.58	1624							14.85	4.21	0.54							
1630	17.59	2.63	0.51								14.87	4.29	0.58							
1640	16.01	3.85	0.71		1646						14.67	4.47	0.61	1643						
1650	16.7	3.31	0.74								16.02	3.88	0.72		1658					
1660	16.22	3.47	0.65								17.88	2.37	0.28							
1670	16.43	3.17	0.47								15.84	3.82	0.93							
1680	16.47	3.14	0.47								15.83	3.62	0.65							
1690	16.18	3.4	0.51								15.59	3.63	0.54							
1700	16.37	3.3	0.49	1705							15.41	3.81	0.56							
1710	18.84	1.55	0.28								15.35	3.91	0.59							
1720	17.32	2.75	0.5								14.97	4.14	0.65	1725						
1730	16.73	3.21	0.7		1738						17.99	2.18	0.46		1738					
1740	16.95	2.6	0.57								14.82	4.76	0.89							
1750	16.37	3.36	0.57								15.9	3.89	1.09							
1760	16.42	3.11	0.46								15.69	3.7	0.75							
1770	16.68	2.94	0.43								15.32	3.76	0.6							
1780	16.33	3.31	0.49								15	3.84	0.58							
1790	16.55	3.17	0.49								15.01	4.04	0.64							
1800	16.18	3.52	0.59	1804							12.54	4.13	0.67	1802						
1810	17.28	3.14	0.23								16.16	5.4	0.92							
1820											15.82	3.55	0.85							
1830	16.09	3.71	0.78	averages							15.57	3.9	0.86							
											15.76	4.01	0.93	averages						

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Appendix E - Method 5G Meter Box Data

Method 5G Sample Box Data

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 15-Jun-95
TEST No.: TD-MM5G-2A Furnace A, scoping test 1.
DATA TAKEN EVERY: 00:30 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
14:38	77	0.140	0.050	115.001	55	73	77	86	6.6
15:08	70	0.140	0.050	119.1	56	79	95	88	6.6
15:38	70	0.140	0.050	121.7	46	83	98	87	6.6
16:08	71	0.135	0.050	124.4	50	85	100	88	6.6
16:38	70	0.135	0.050	127.1	44	85	100	87	6.6
17:08	70	0.135	0.050	129.9	47	85	100	85	6.6
17:38	70	0.135	0.050	132.5	51	85	99	86	6.6
18:08	69	0.135	0.050	135.2	54	85	100	83	6.6
18:38	69	0.137	0.050	138.0	56	85	99	82	6.6
19:08	68	0.138	0.050	140.8	56	85	100	80	6.6
19:38	67	0.138	0.050	143.6	56	85	99	79	6.6
20:08	66	0.139	0.050	146.5	56	84	99	78	6.6
20:38	66	0.139	0.050	149.2	57	84	98	76	6.6
21:08	66	0.139	0.050	152.0	57	83	98	76	6.6
21:38	66	0.139	0.050	154.8	57	85	98	76	6.6
21:42	end of run			155.288					
07:04	run time								

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 19-Jun-95
TEST No.: TD-MM5G-2B Furnace A, scoping test 2.
DATA TAKEN EVERY: 00:30 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
14:15	70	0.138	0.050	164.002	36	97	81	72	6.5
14:45	70	0.136	0.050	166.1	32	100	85	83	6.6
15:15	70	0.140	0.050	167.9	32	86	100	86	6.6
15:45	70	0.137	0.050	169.7	32	86	100	80	6.6
16:15	71	0.128	0.050	171.7	32	86	100	84	6.5
16:45	70	0.128	0.050	173.6	32	86	100	84	6.6
17:15	70	0.130	0.050	175.8	32	85	100	79	6.6
17:45	70	0.128	0.050	177.9	32	85	100	80	6.6
18:15	70	0.128	0.050	179.9	32	87	102	80	6.6
18:45	70	0.130	0.050	182.3	31	87	102	77	6.6
19:15	70	0.130	0.050	184.1	31	86	100	79	6.6
19:45	70	0.130	0.050	186.2	32	86	100	78	6.6
20:15	70	0.125	0.050	188.3	33	87	100	79	6.6
20:45	70	0.130	0.050	190.4	33	88	103	77	6.6
21:15	70	0.135	0.050	192.4	34	89	103	76	6.6
21:45	70	0.133	0.050	194.5	35	87	102	79	6.6
21:02	end of run			195.300					

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34877
TEST No.: TD-MM5G-2C Furnace A, high heat removal.
DATA TAKEN EVERY: 00:10 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
11:50	79	0.135	0.02	201.501	28	84	94	90	7.6
12:00	79	0.135	0.03	201.9	30	85	97	90	7.4
12:10	79	0.135	0.025	202	32	87	100	88	6.8
12:20	80	0.135	0.025	202.8	33	88	101	90	6.7
12:30	80	0.135	0.03	203.3	35	89	102	90	6.7
12:40	80	0.135	0.025	203.8	36	89	103	95	6.7
12:50	80	0.135	0.04	204.2	36	90	104	97	6.7
13:00	81	0.135	0.03	204.7	36	91	105	100	6.7
13:10	82	0.135	0.03	205.2	39	91	105	104	6.7
13:20	83	0.135	0.03	205.7	40	91	106	109	6.7
13:30	84	0.135	0.03	206.2	38	91	106	110	6.7
13:40	84	0.135	0.03	206.6	38	92	106	109	6.7
13:50	85	0.135	0.03	207.1	41	92	106	108	6.7
14:00	84	0.135	0.04	207.6	46	93	106	107	6.7
14:10	84	0.135	0.03	208.1	46	93	106	107	6.7
14:20	84	0.135	0.03	208.6	50	93	107	105	6.7
14:30	84	0.135	0.04	209.1	49	93	107	105	6.7
14:40	84	0.135	0.03	209.5	49	93	107	98	6.7
14:50	84	0.135	0.03	210	48	93	107	95	6.7
15:00	84	0.135	0.03	210.5	51	93	107	91	6.7
15:10	83	0.14	0.03	211	55	94	107	88	6.7
15:20	83	0.135	0.03	211.4	56	94	108	91	6.7
15:30	83	0.135	0.03	211.9	56	94	108	92	6.7
15:40	83	0.136	0.03	212.3	58	94	108	93	6.7
15:50	83	0.14	0.03	212.8	59	95	109	93	6.7
16:00	83	0.138	0.03	213.3	58	95	109	92	6.7
16:10	83	0.138	0.03	213.8	58	95	109	89	6.7
16:20	80	0.14	0.03	214.2	56	94	107	85	6.7
16:30	80	0.14	0.03	214.7	55	94	107	84	6.7
16:40	77	0.141	0.03	215.2	55	94	107	86	6.7
16:50	76	0.141	0.03	215.6	55	94	107	88	6.7
17:00	76	0.141	0.03	216.3	58	93	106	88	6.7
17:10	76	0.141	0.03	216.7	59	93	106	87	6.7
17:19	end of run			217.1					

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34880
TEST No.: TD-MM5G-2D Furnace A, high heat removal.
DATA TAKEN EVER' 00:10 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
10:20	76	0.13	0.03	289.001	32	75	79	92	6.7
10:30	76	0.135	0.025	290.3	31	77	86	86	6.7
10:40	75	0.135	0.025	290.9	31	79	91	85	6.7
10:50	75	0.133	0.025	291.5	31	81	95	85	6.7
11:00	75	0.135	0.025	292	33	83	98	90	6.7
11:10	76	0.135	0.028	292.5	35	84	99	86	6.7
11:20	76	0.135	0.028	293	40	85	100	89	6.7
11:30	76	0.135	0.028	293.5	42	86	100	89	6.8
11:40	76	0.135	0.03	294	42	86	101	89	6.8
11:50	76	0.135	0.03	294.5	45	87	101	85	6.8
12:00	76	0.135	0.03	295	48	87	101	86	6.8
12:10	76	0.135	0.03	295.6	48	87	101	86	6.8
12:20	76	0.135	0.03	296.1	44	87	101	88	6.8
12:30	76	0.135	0.03	296.6	50	87	101	87	6.8
12:40	76	0.135	0.03	297.1	51	87	101	87	6.8
12:50	76	0.135	0.025	297.6	52	87	101	87	6.8
13:00	76	0.135	0.03	298.1	52	87	101	88	6.8
13:10	76	0.135	0.025	298.6	52	87	101	84	6.8
13:20	76	0.135	0.025	299.1	53	87	101	85	6.8
13:30	76	0.135	0.03	299.6	53	87	101	86	6.8
13:40	76	0.135	0.03	300.1	53	87	101	83	6.8
13:50	76	0.135	0.03	300.7	30	87	101	83	6.8
14:00	76	0.135	0.025	301.2	31	87	101	83	6.8
14:10	76	0.135	0.03	301.7	33	87	101	85	6.8
14:20	76	0.135	0.025	302.2	35	87	101	82	6.8
14:30	76	0.135	0.025	302.7	36	87	101	85	6.8
14:40	76	0.135	0.025	302.2	40	87	101	81	6.8
14:50	75	0.135	0.025	303.7	44	87	101	85	6.8
15:00	75	0.135	0.025	304.2	43	87	101	83	6.8
15:10	75	0.135	0.03	304.7	46	87	101	82	6.8
15:20	76	0.135	0.025	305.2	46	88	102	82	6.8
15:30	76	0.135	0.03	305.7	46	88	101	84	6.8
15:40	76	0.135	0.03	306.2	46	88	101	84	6.8
15:50	76	0.135	0.03	306.7	46	87	100	82	6.8
16:00	76	0.135	0.03	307.2	46	87	101	85	6.8
16:10	76	0.135	0.03	307.9	46	87	107	84	6.8
16:20	76	0.135	0.03	308.5	46	87	100	83	6.7
16:30	76	0.135	0.03	309.1	49	87	100	85	6.7
16:40	76	0.135	0.03	309.6	52	87	101	83	6.7
16:50	76	0.135	0.03	310.3	53	87	101	85	6.7
17:00	76	0.135	0.03	310.8	52	87	101	84	6.7
17:10	76	0.135	0.03	311.5	53	87	101	84	6.7
17:20	76	0.135	0.03	312	54	87	101	84	6.7
17:30	76	0.135	0.03	312.5	54	87	100	84	6.7
17:38	end of run			313.145					

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34878
TEST No.: TD-MM5G-1A Furnace A, low heat removal
DATA TAKEN EVERY: 00:10 hr:min.

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
12:20	79	0.12	0.03	217.203	33	77	81	84	6.2
12:30	79	0.125	0.03	218.1	32	78	86	80	6.2
12:40	78	0.124	0.03	218.7	33	81	94	83	6.2
12:50	78	0.122	0.03	219.3	34	83	97	85	6.2
13:00	78	0.122	0.03	220	35	86	99	86	6.2
13:10	78	0.124	0.03	220.5	36	87	100	86	6.2
13:20	78	0.123	0.03	221	37	88	101	90	6.2
13:30	79	0.123	0.03	221.4	39	89	102	91	6.2
13:40	78	0.123	0.03	221.8	39	90	103	91	6.2
13:50	78	0.123	0.03	222.5	40	90	103	90	6.2
14:00	78	0.123	0.03	223.1	43	90	103	88	6.2
14:10	78	0.123	0.03	223.6	39	90	102	89	6.2
14:20	78	0.123	0.03	223.9	43	90	102	88	6.2
14:30	78	0.123	0.03	224.6	44	90	103	86	6.2
14:40	78	0.123	0.03	225.2	47	90	103	87	6.2
14:50	78	0.125	0.03	225.7	46	90	103	80	6.2
15:00	78	0.125	0.03	226.2	45	90	103	78	6.2
15:10	78	0.125	0.03	226.7	48	90	103	76	6.2
15:20	76	0.125	0.04	227.3	43	90	103	80	6.2
15:30	77	0.125	0.03	227.8	46	90	103	76	6.1
15:40	77	0.125	0.03	228.1	46	90	103	77	6.1
15:50	77	0.125	0.03	228.8	43	91	103	79	6.1
16:00	78	0.125	0.03	229.4	43	90	103	78	6.1
16:10	76	0.125	0.03	229.9	46	91	103	76	6.1
16:20	76	0.125	0.03	230.5	46	91	103	76	6.1
16:30	76	0.125	0.03	231	43	91	104	78	6.1
16:40	76	0.125	0.03	231.5	43	91	104	81	6.1
16:50	77	0.125	0.03	232	44	91	104	84	6.1
17:00	76	0.125	0.03	232.5	42	91	104	85	6.1
17:10	76	0.125	0.03	232.9	44	91	104	84	6.1
17:20	77	0.125	0.03	233.4	46	91	104	81	6.1
17:30	77	0.125	0.03	233.9	44	91	105	84	6.1
17:40	77	0.125	0.03	234.6	46	91	106	81	6.1
17:50	77	0.125	0.03	335.2	46	91	105	83	6.1
18:00	77	0.125	0.03	235.7	48	91	105	82	6.1
18:10	77	0.125	0.03	236.2	48	91	105	82	6.1
18:20	77	0.125	0.03	236.7	45	92	104	74	6.1
18:30	76	0.125	0.03	237.3	46	91	104	72	6.1
18:40	75	0.125	0.03	237.8	46	91	103	75	6.1
18:50	74	0.125	0.03	238.3	46	90	102	72	6.1
19:00	74	0.125	0.03	238.9	41	90	102	79	6.1
19:10	74	0.125	0.03	239.4	42	90	103	78	6.1
19:20	74	0.125	0.03	239.9	46	91	104	74	6.1
19:30	75	0.125	0.03	240.5	43	91	104	76	6.1
19:40	75	0.125	0.03	241.1	43	90	104	76	6.1
19:50	75	0.125	0.03	241.5	46	90	104	76	6.1
20:00	75	0.125	0.03	242	45	91	104	79	6.1

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34878
TEST No.: TD-MM5G-1A Furnace A, low heat removal
DATA TAKEN EVERY: 00:10 hr:min.

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
20:10	75	0.125	0.03	242.5	47	91	104	76	6.1
20:20	75	0.125	0.03	243.1	43	91	103	79	6.1
20:30	75	0.124	0.03	243.6	43	91	104	81	6.1
20:40	75	0.124	0.03	244.1	46	91	104	81	6.1
20:50	75	0.124	0.03	244.6	48	91	104	81	6.1
21:00	75	0.124	0.03	245.1	44	90	103	85	6.1
21:10	75	0.12	0.03	245.6	47	91	103	86	6.1
21:20	76	0.122	0.03	246.2	47	91	104	85	6.1
21:30	76	0.124	0.03	246.7	23	90	104	82	6.1
21:40	75	0.12	0.03	247.2	30	91	104	83	6.1
21:50	76	0.122	0.03	247.8	30	91	104	79	6.1
22:00	76	0.122	0.03	248.3	31	91	104	77	6.1
22:10	76	0.122	0.03	248.8	31	91	104	79	6.1
22:20	76	0.125	0.03	249.4	33	90	104	77	6.2
22:30	75	0.125	0.03	249.9	35	90	103	75	6.2
22:40	74	0.125	0.03	250.4	36	89	102	77	6.2
22:50	74	0.125	0.03	250.9	34	88	102	77	6.2
23:00	74	0.125	0.03	251.4	35	88	102	77	6.2
23:10	74	0.125	0.03	252	43	88	101	77	6.2
23:20	74	0.123	0.03	252.5	43	88	101	80	6.2
23:30	73	0.123	0.03	253.1	41	87	101	81	6.2
23:40	73	0.123	0.03	253.6	43	87	100	80	6.2
23:50	74	0.122	0.03	254.1	48	87	100	81	6.1
00:00	73	0.123	0.03	254.6	45	87	100	83	6.2
00:10	74	0.123	0.03	255.2	46	87	100	81	6.2
00:20	73	0.122	0.03	255.7	49	87	100	81	6.2
00:30	74	0.122	0.03	256.2	51	87	100	81	6.2
00:38	end of run			256.651					

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34879
TEST No.: TD-MM5G-1B Furnace A, low heat removal.
DATA TAKEN EVER' 00:10 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
11:50	74	0.13	0.03	256.727	35	75	78	90	6.2
12:00	74	0.13	0.03	257.7	33	75	83	88	6.2
12:10	75	0.13	0.03	258.3	33	77	90	83	6.2
12:20	74	0.13	0.03	258.8	34	80	95	85	6.2
12:30	75	0.13	0.03	259.3	34	81	97	86	6.2
12:40	74	0.13	0.03	259.8	34	84	98	90	6.2
12:50	75	0.13	0.03	260.3	35	85	99	92	6.2
13:00	75	0.13	0.03	260.7	35	85	99	92	6.2
13:10	75	0.13	0.03	261.2	35	86	99	89	6.2
13:20	75	0.13	0.03	261.7	36	86	100	88	6.2
13:30	75	0.135	0.03	262.2	40	86	100	77	6.2
13:40	75	0.135	0.03	262.7	43	86	100	75	6.2
13:50	75	0.135	0.03	263.2	50	87	100	75	6.2
14:00	75	0.135	0.03	263.7	50	87	100	74	6.2
14:10	74	0.134	0.03	264.1	46	87	100	77	6.2
14:20	74	0.133	0.03	264.6	47	87	100	78	6.2
14:30	75	0.133	0.03	265.1	52	87	100	76	6.2
14:40	74	0.133	0.03	265.6	49	87	101	78	6.2
14:50	74	0.135	0.03	266.1	52	87	100	77	6.2
15:00	74	0.135	0.03	266.6	50	87	100	82	6.2
15:10	74	0.133	0.03	267.1	52	87	100	87	6.2
15:20	74	0.13	0.03	267.5	53	87	100	88	6.3
15:30	74	0.13	0.03	268	53	87	100	75	6.3
15:40	74	0.13	0.03	268.5	54	86	100	77	6.3
15:50	74	0.134	0.03	269.1	54	87	100	77	6.3
16:00	73	0.134	0.03	269.5	53	87	100	80	6.3
16:10	73	0.131	0.03	270	40	87	100	80	6.3
16:20	73	0.131	0.03	270.5	40	87	100	80	6.3
16:30	72	0.132	0.03	270.9	41	82	100	76	6.3
16:40	72	0.13	0.03	271.3	40	80	100	87	6.3
16:50	72	0.134	0.03	271.9	40	80	100	86	6.2
17:00	72	0.131	0.03	272.4	42	76	100	87	6.2
17:10	73	0.131	0.03	272.8	45	77	100	81	6.2
17:20	73	0.131	0.03	273.3	45	87	100	81	6.2
17:30	73	0.131	0.03	273.8	45	87	100	80	6.2
17:40	73	0.131	0.03	274.3	44	87	100	85	6.2
17:50	73	0.131	0.03	274.8	46	84	100	87	6.2
18:00	73	0.131	0.03	275.3	45	84	100	87	6.2
18:10	73	0.13	0.03	275.8	48	85	100	87	6.2
18:20	73	0.13	0.03	276.2	47	84	100	87	6.2
18:30	73	0.131	0.03	276.7	47	84	100	87	6.2
18:40	73	0.131	0.03	277.2	50	87	100	80	6.3
18:50	73	0.131	0.03	277.7	50	86	100	86	6.3
19:00	73	0.131	0.03	278.2	52	87	100	82	6.3
19:10	73	0.131	0.03	278.7	52	87	100	82	6.3
19:20	73	0.131	0.03	279.2	50	86	100	86	6.3

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34879
TEST No.: TD-MM5G-1B Furnace A, low heat removal.
DATA TAKEN EVER' 00:10 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
19:30	73	0.131	0.03	279.7	50	86	100	86	6.3
19:40	73	0.131	0.03	280.2	53	86	100	77	6.3
19:50	73	0.131	0.03	280.6	35	86	100	79	6.3
20:00	73	0.131	0.03	281.1	36	86	100	76	6.3
20:10	73	0.131	0.03	281.6	39	86	100	80	6.3
20:20	73	0.132	0.03	282.1	40	86	100	77	6.3
20:30	73	0.134	0.03	282.5	42	86	100	75	6.3
20:40	73	0.131	0.03	283	41	86	100	80	6.2
20:50	73	0.131	0.03	283.5	44	86	100	74	6.2
21:00	73	0.131	0.03	284	45	86	100	74	6.2
21:10	73	0.13	0.03	284.5	48	87	100	79	6.2
21:20	73	0.131	0.03	285	45	87	100	81	6.2
21:30	73	0.131	0.03	285.5	49	87	100	78	6.2
21:40	73	0.131	0.03	285.9	49	86	100	83	6.2
21:50	73	0.131	0.03	286.5	49	86	100	80	6.2
22:00	73	0.131	0.03	286.9	49	86	100	85	6.2
22:10	73	0.131	0.03	287.4	49	86	100	86	6.2
22:20	73	0.13	0.03	288	49	86	100	87	6.2
22:30	73	0.13	0.03	288.5	49	86	100	87	6.2
22:40	74	0.13	0.03	289.3	50	87	101	88	6.2
22:45	end of run			289.423					

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34996
TEST No.: TD-MM5G-2 Furnace A with catalyst, high heat output
DATA TAKEN EVERY: 00:10 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
11:55	70	0.13	0.03	313.381	30	70	78	75	6.6
12:05	69	0.132	0.03	314.1	29	70	85	79	6.8
12:15	69	0.132	0.03	314.9	31	74	95	76	7.2
12:25	69	0.132	0.03	315.8	31	74	100	77	7.2
12:35	68	0.132	0.03	316.4	31	79	101	73	7.2
12:45	68	0.132	0.03	317.2	33	80	101	73	7.2
12:55	68	0.132	0.03	317.9	33	80	101	77	7.2
13:05	70	0.125	0.03	318.6	35	81	101	102	7.2
13:15	71	0.122	0.03	319.2	36	82	101	124	7.2
13:25	71	0.135	0.03	319.5	38	82	101	80	7.2
13:35	70	0.135	0.03	320	38	79	101	79	7.2
13:45	70	0.135	0.03	320.5	40	78	101	78	7.2
13:55	70	0.135	0.03	321.3	40	77	101	77	7.2
14:05	70	0.135	0.03	321.5	30	77	101	77	7.2
14:15	70	0.135	0.03	322.5	30	77	101	77	7.2
14:25	70	0.135	0.03	322.9	32	80	101	80	7.2
14:35	70	0.135	0.03	323.4	38	85	101	109	7.2
14:45	70	0.135	0.03	324.1	39	82	101	85	7.2
14:55	70	0.135	0.03	324.5	40	79	101	85	7.2
15:05	70	0.135	0.03	325	42	79	101	86	7.2
15:15	70	0.135	0.03	325.6	42	77	101	86	7.2
15:25	70	0.135	0.03	325.9	42	76	101	86	7.2
15:35	70	0.135	0.03	326.2	43	79	101	86	7.2
15:45	70	0.135	0.03	327	44	77	101	86	7.2
15:55	70	0.135	0.03	327.6	46	76	101	86	7.2
16:05	70	0.127	0.03	328.1	48	76	101	101	7.2
16:15	71	0.125	0.03	328.7	47	86	101	112	7.2
16:25	71	0.135	0.03	329.2	47	86	101	79	7.2
16:35	70	0.135	0.03	329.8	48	86	101	77	7.2
16:45	69	0.135	0.03	330.3	49	86	101	78	7.2
16:55	69	0.135	0.03	330.8	48	86	101	76	7.2
17:05	69	0.135	0.03	331.4	49	86	101	79	7.2
17:15	70	0.135	0.03	331.9	49	86	101	75	7.2
17:25	70	0.135	0.03	332.2	49	86	101	85	7.2
17:35	70	0.125	0.03	333	49	86	101	92	7.2
17:45	70	0.125	0.03	333.6	50	87	101	98	7.2
17:55	70	0.125	0.03	334	50	86	101	99	7.2
18:05	70	0.125	0.03	334.7	50	86	101	99	7.2
18:15	70	0.125	0.03	335.2	50	86	101	100	7.2
18:25	70	0.13	0.03	335.8	50	86	101	98	7.2
18:35	70	0.13	0.03	336.3	51	86	101	97	7.2
18:36	end of run			336.351					

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34997
TEST No.: TD-MM5G-1 Furnace A with catalyst, low heat removal.
DATA TAKEN EVERY: 00:10 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
10:45	70	0.12	0.03	336.551	40	68	72	83	6.3
10:55	70	0.12	0.03	337.4	33	70	78	98	6.3
11:05	75	0.13	0.03	338.3	33	74	86	120	6.3
11:15	74	0.13	0.03	339.3	33	77	91	79	6.3
11:25	71	0.13	0.03	340.3	33	80	94	78	6.3
11:35	71	0.13	0.03	341.1	34	81	97	78	6.3
11:45	71	0.13	0.03	341.6	34	83	97	79	6.3
11:55	70	0.13	0.03	342.1	36	83	98	75	6.3
12:05	69	0.13	0.03	342.8	37	82	97	78	6.3
12:15	70	0.132	0.03	343.3	40	83	97	78	6.3
12:25	69	0.13	0.03	343.9	39	83	97	78	6.3
12:35	69	0.13	0.03	344.5	40	83	97	75	6.3
12:45	68	0.135	0.03	345.2	40	84	97	77	6.3
12:55	67	0.135	0.03	345.8	42	84	98	74	6.3
13:05	68	0.135	0.03	346.4	42	84	98	76	6.3
13:15	69	0.135	0.03	347	42	84	98	77	6.3
13:25	69	0.135	0.03	347.6	41	84	98	75	6.3
13:35	70	0.135	0.03	348.2	43	85	99	75	6.3
13:45	69	0.135	0.03	348.9	42	85	98	76	6.3
13:55	70	0.135	0.03	349.5	42	85	98	76	6.3
14:05	70	0.13	0.03	350.1	42	85	99	98	6.3
14:15	71	0.133	0.03	350.7	34	85	99	80	6.3
14:25	69	0.135	0.03	351.3	35	86	99	74	6.3
14:35	70	0.135	0.03	352	36	86	100	74	6.1
14:45	70	0.135	0.03	352.6	36	86	99	76	6.1
14:55	70	0.135	0.03	353.1	36	86	99	76	6.1
15:05	70	0.135	0.03	353.9	38	85	99	77	6.1
15:15	70	0.135	0.03	354.1	38	85	99	77	6.1
15:25	70	0.135	0.03	354.9	38	85	99	77	6.1
15:35	70	0.135	0.03	355.6	39	85	99	73	6.1
15:45	70	0.135	0.03	356.2	39	85	99	75	6.1
15:55	70	0.135	0.03	356.8	37	85	99	75	6.1
16:05	70	0.135	0.03	357.5	39	85	99	75	6.1
16:15	70	0.135	0.03	358.1	39	85	98	72	6.1
16:25	70	0.135	0.03	358.7	40	85	98	80	6.1
16:35	70	0.128	0.03	359.3	41	85	99	99	6.1
16:45	70	0.128	0.03	359.9	40	85	98	88	6.1
16:55	70	0.134	0.03	360.5	40	85	99	76	6.1
17:05	70	0.134	0.03	361.1	40	85	98	73	6.1
17:15	70	0.134	0.03	361.8	40	85	98	74	6.1
17:25	69	0.134	0.03	362.4	40	84	98	76	6.1
17:35	69	0.134	0.03	363	40	84	98	75	6.1
17:45	70	0.134	0.03	363.6	40	84	98	75	6.1
17:55	69	0.134	0.03	364.2	40	84	98	74	6.1
18:05	70	0.134	0.03	364.8	40	84	98	75	6.1
18:15	69	0.134	0.03	365.5	40	84	98	75	6.1
18:25	69	0.134	0.03	366.1	40	84	98	75	6.1
18:35	69	0.13	0.03	366.7	41	84	98	74	6.1

WOODSTOVE TEST DATA

NAME: Russell Logan and Joey Valenti
DATE: 34997
TEST No.: TD-MM5G-1 Furnace A with catalyst, low heat removal.
DATA TAKEN EVERY: 00:10 hr:min

TIME	Tfilt	DP	DH	METER	Tcond	Tin	Tout	Tdil	WATER FLOW
18:45	69	0.134	0.03	367.4	32	84	98	74	6.1
18:55	69	0.134	0.03	368.2	32	84	98	74	6.1
19:05	70	0.126	0.03	368.6	34	85	99	95	6.1
19:15	69	0.126	0.03	369.2	34	84	98	95	6.1
19:25	69	0.126	0.03	369.8	35	84	98	93	6.1
19:35	69	0.126	0.03	370.4	34	84	97	98	6.1
19:45	69	0.13	0.03	371	35	84	98	75	6.1
19:55	69	0.132	0.03	371.6	35	84	98	76	6.1
20:05	67	0.132	0.03	372.3	35	83	97	74	6.1
20:15	67	0.13	0.03	372.8	35	83	98	75	6.1
20:25	67	0.133	0.03	373.4	35	84	98	72	6.1
20:35	66	0.135	0.03	374.1	36	84	98	71	6.1
20:45	66	0.135	0.03	374.7	36	83	97	70	6.1
20:55	65	0.135	0.03	375.3	36	83	97	70	6.1
21:05	65	0.135	0.03	375.9	36	81	97	69	6.1
21:15	65	0.13	0.03	376.5	36	82	96	83	6.1
21:25	65	0.13	0.03	377.1	36	82	96	86	6.1
21:35	64	0.128	0.03	377.8	36	81	96	81	6.1
21:45	64	0.128	0.03	378.4	40	81	96	87	6.1
21:55	64	0.13	0.03	379	40	81	95	86	6.1
22:05	63	0.13	0.03	379.7	40	80	95	86	6.1
22:15	63	0.13	0.03	380.2	40	80	94	85	6.1
22:25	63	0.13	0.03	380.8	41	79	94	85	6.1
22:35	62	0.13	0.03	381.5	40	79	93	83	6.1
22:45	62	0.13	0.03	382.1	40	79	92	79	6.1
22:55	62	0.135	0.03	382.7	38	79	93	79	6.1
23:05	63	0.135	0.03	383.3	39	80	94	84	6.1
23:15	66	0.131	0.03	384	41	81	96	84	6.1
23:25	67	0.131	0.03	384.5	41	82	97	82	6.1
23:35	68	0.135	0.03	385.2	42	83	98	81	6.1
23:45	69	0.135	0.03	385.8	42	82	98	83	6.1
23:55	69	0.135	0.03	386.4	45	84	98	78	6.1
00:05	68	0.135	0.03	387	42	84	98	81	6.1
00:11	end of run			387.44					

Furnace B Modified Method 5G Meter Box Data for Run 1
Date: [redacted] June 1995
13

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water temperature inlet °F	Water temperature outlet °F
0	125.34	115.	88	567.5	30	81	81	77	944.6	30	77	80	78	.267	.025	174	179
10	118.00	150.	94	568.0	30	83	82	79	945.1	30	81	80	80	.264	.023	179	185
20	117.50	125	90	568.5	30	83	82	78	945.7	30	82	81	79	.269	.019	177	182
30	117.00	119	90	569.0	30	85	83	79	946.2	30	82	81	79	.265	.018	176	181
40	116.5	116	88	569.5	30	84	83	79	946.7	30	82	81	79	.265	.015	174	179
50	115.5	179	99	570.1	30	85	84	79	947.2	30	82	82	80	.265	.040	173	178
60	104.5	154	94	570.6	30	85	84	79	947.7	30	83	82	79	.268	.029	180	186
70	103.5	133	91	571.1	30	86	85	78	948.2	30	84	83	79	.268	.025	179	184
80	103.0	124	82	571.7	30	86	85	78	948.7	30	85	83	79	.272	.020	177	182
90	102.5	119	90	572.2	30	87	86	79	949.2	30	85	84	79	.268	.019	176	181
100	102.0	117	89	572.7	30	87	86	79	949.7	30	85	84	79	.269	.018	175	180
110	101.5	115	81	573.7	30	87	86	78	950.2	30	85	84	79	.268	.017	174	178
120	94.0	290	81	573.2	30	88	87	81	950.7	30	86	85	81	.264	.032	180	185
130	92.0	138	91	574.2	30	88	87	74	951.2	30	86	85	74	.266	.025	180	185
140	91.5	129	90	574.7	30	89	88	79	951.7	30	87	86	80	.265	.030	179	184
150	91.0	122	90	575.2	30	89	88	74	952.2	30	87	86	80	.270	.020	178	183
160	90.5	119	90	575.2	30	89	88	79	952.7	30	87	86	80	.265	.018	176	182
170	90.0	116	90	576.2	30	89	89	79	953.2	30	87	86	80	.268	.015	176	180
180	90.0	115	90	576.2	30	90	80	80	953.7	30	87	86	80	.265	.015	175	180
190	89.5	134	94	577.2	30	89	80	80	954.2	30	87	87	80	.265	.022	173	178
200	82.5	149	99	577.7	30	90	80	80	954.7	30	88	87	80	.263	.030	180	186
210	81.0	135	91	578.0	30	89	89	80	955.0	30	88	87	80	.265	.025	180	185
220	80.5	128	91	578.5	30	91	90	80	955.5	30	88	88	81	.260	.020	179	184
230	80.0	121	90	579.0	30	90	90	80	956.0	30	88	87	80	.263	.020	178	183
240	79.5	117	90	579.6	30	91	90	81	956.6	30	88	87	80	.260	.020	178	182
250	79.5	114	89	580.0	30	91	90	80	957.1	30	88	88	81	.263	.015	176	181
260	79.0	112	89	580.7	30	90	90	80	957.6	30	88	87	80	.265	.015	175	180
270	79.0	111	89	581.3	30	90	90	80	958.2	30	88	87	80	.265	.015	174	179
280	78.5	170	97	581.9	30	91	90	80	958.7	30	88	87	80	.260	.025	173	178
290	72.0	159	94	582.4	30	90	90	81	959.2	30	88	87	81	.263	.028	180	186
300	71.5	130	90	582.9	30	91	90	81	959.6	30	88	88	81	.265	.023	180	186
310	71.0	123	89	583.5	30	91	90	80	960.1	30	89	88	80	.265	.030	179	185
320	70.5	118	89	584.1	30	91	90	80	960.6	30	89	88	80	.265	.018	178	183
330	70.5	114	89	584.6	30	91	91	81	961.1	30	89	88	81	.265	.015	177	183
340	70.0	111	88	585.2	30	91	91	80	961.6	30	89	88	81	.263	.015	176	181
350	70.0	110	88	585.8	30	91	90	80	962.2	30	89	88	80	.265	.015	175	180
360	69.5	109	87	586.3	30	91	90	80	962.7	30	88	88	80	.265	.013	174	179
370	68.5	223	104	586.9	30	91	90	81	963.3	30	89	88	81	.260	.040	173	178
380	64.5	137	90	587.4	30	91	90	82	963.8	30	89	88	82	.268	.020	180	186
390	64.5	123	88	588.0	30	91	91	82	964.4	30	89	88	82	.268	.020	179	185
400	64.0	117	87	588.6	30	92	91	83	964.9	30	90	89	83	.265	.020	178	183
410	63.5	113	87	589.2	30	92	91	83	965.5	30	90	89	83	.265	.018	176	182

Furnace B Modified Method 5G Meter Box Data for Run 1
Date: 13 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water temperature inlet °F	outlet °F
420	63.5	110	87	589.8	30	92	92	83	966.1	30	90	89	83	.265	.015	176	181
430	63.5	109	86	590.4	30	92	92	84	966.6	30	90	90	83	.265	.015	175	180
440	63.0	108	86	591.1	30	93	92	84	967.3	30	91	90	84	.265	.015	174	179
450	63.0	107	86	591.6	30	93	92	84	967.9	30	91	90	84	.265	.015	173	178
460	67.5	231	104	592.1	20	93	92	84	968.3	20	91	90	84	.260	.050	173	178
470	67.5	130	88	592.2	30	93	93	82	968.5	30	91	90	84	.265	.020	179	185
480	58.5	119	87	592.7	30	93	93	84	969.0	30	91	90	83	.267	.018	178	184
490	58.5	115	87	593.3	30	93	93	85	969.5	30	91	90	84	.267	.017	177	182
500	58.0	111	86	593.8	30	93	92	86	970.0	30	91	90	84	.267	.016	176	181
510	58.0	109	86	594.4	30	93	93	85	970.5	30	91	90	84	.267	.015	175	180
520	57.5	108	86	594.9	30	93	93	86	971.1	30	91	90	84	.268	.015	174	179
530	57.5	107	85	595.4	30	93	93	85	971.6	30	91	90	84	.267	.014	173	178
540	56.5	251	107	596.0	30	93	93	86	972.1	30	91	90	85	.261	.050	173	179
550	54.0	130	87	596.5	30	93	93	85	972.6	30	91	91	85	.270	.021	179	185
560	53.5	116	86	597.0	30	93	93	85	973.2	30	91	91	85	.268	.019	178	184
570	53.5	112	86	597.5	30	93	93	85	973.7	30	91	91	85	.269	.017	177	183
580	53.5	109	85	598.1	30	93	93	85	974.2	30	91	91	84	.268	.016	176	181
590	53.5	107	85	598.6	30	93	93	85	974.7	30	91	90	84	.267	.015	175	180
600	53.0	107	85	599.2	30	93	93	85	975.3	30	91	91	84	.270	.015	174	179
610	53.0	106	84	599.7	30	93	93	85	975.8	30	91	90	84	.271	.014	173	178
620	51.0	299	116	600.2	30	93	93	85	976.3	30	91	91	85	.263	.042	176	181
630	50.0	122	86	600.7	30	93	93	85	976.8	30	91	91	84	.270	.020	178	184
640	50.0	113	85	601.3	30	93	93	85	977.3	30	91	90	84	.270	.018	177	183
650	50.0	110	85	601.8	30	93	93	85	977.9	30	91	90	84	.269	.015	176	182
660	50.0	108	84	602.3	30	93	93	84	978.3	30	91	91	84	.270	.015	175	181
670	49.5	108	84	602.8	30	93	93	84	978.8	20	91	91	83	.270	.015	174	180
680	49.5	107	84	603.4	30	94	93	84	979.4	30	91	91	83	.268	.014	174	179
690	49.0	137	89	603.9	30	93	92	83	979.9	30	91	91	83	.266	.022	173	178
700	47.0	158	88	604.4	30	93	93	82	980.4	30	91	90	83	.268	.021	179	184
710	46.5	115	84	605.0	30	91	92	82	980.9	30	89	90	82	.270	.017	178	184
720	46.5	110	84	605.5	30	89	90	83	981.4	30	89	88	82	.269	.016	177	182
730	46.0	108	83	606.1	30	87	89	82	982.0	30	88	88	82	.269	.015	176	181
740	46.0	107	83	606.6	30	85	87	81	982.5	30	86	87	82	.270	.014	175	181
750	46.0	106	83	607.2	30	85	86	81	983.0	30	85	86	82	.270	.013	174	180
760	46.0	106	83	607.7	30	84	85	80	983.6	30	84	85	81	.270	.012	174	178
770	44.0	275	110	608.2	30	83	84	80	984.1	30	83	84	82	.263	.043	177	182
780	43.5	119	84	608.8	30	82	83	80	984.6	30	83	83	81	.220	.016	179	184
790	43.0	111	84	609.3	30	82	83	80	985.2	30	82	83	81	.279	.014	177	183
800	43.0	108	83	609.9	30	82	82	80	985.7	30	83	83	81	.271	.012	177	182
810	43.0	106	83	610.4	30	82	82	80	986.2	30	82	83	80	.272	.011	175	181
820	43.0	106	83	611.0	30	81	81	79	986.8	30	82	82	80	.272	.011	175	180
830	43.0	125	86	611.5	30	81	81	79	987.3	30	82	82	80	.270	.019	173	179

Furnace B Modified Method 5G Meter Box Data for Run 1
Date: 19 June 1995
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Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water temperature inlet °F	Water temperature outlet °F
840	40.5	333	110	612.1	30	81	81	79	987.8	30	82	82	80	.270	.023	179	185
850	40.0	120	84	612.6	30	81	81	79	988.3	30	82	82	80	.270	.014	179	185
860	40.0	111	83	613.2	30	80	81	79	988.9	30	82	81	80	.270	.014	178	184
870	40.0	108	83	613.7	30	81	81	79	989.4	30	81	81	79	.271	.011	177	182
880	40.0	107	83	614.3	30	81	81	78	989.9	30	81	81	79	.270	.011	176	181
890	40.0	106	82	614.8	30	80	80	78	990.5	30	81	81	78	.272	.011	175	180
900	39.5	104	82	615.4	30	80	80	78	991.0	30	81	81	78	.272	.011	173	179
910	38.5	245	103	615.9	30	80	80	78	991.5	30	81	81	79	.267	.034	174	180
920	37.0	132	85	616.4	30	80	80	78	992.0	30	81	81	79	.272	.017	179	185
930	36.5	114	83	617.0	30	80	80	78	992.6	30	81	81	79	.271	.014	178	184
940	36.5	108	82	617.5	30	80	80	78	993.1	30	81	81	78	.272	.012	176	182
950	36.5	106	82	618.1	30	80	80	78	993.6	30	81	81	78	.273	.011	176	182
960	36.5	105	82	618.6	30	80	80	78	994.2	30	81	81	78	.270	.011	175	180
970	36.0	105	82	619.2	30	80	80	78	954.7	30	81	81	78	.275	.011	174	180
980	36.5	200	94	619.7	30	81	80	78	995.2	30	81	81	78	.270	.029	173	179
990	33.0	195	84	620.3	30	80	80	78	995.7	30	80	80	73	.272	.021	179	185
1000	33.0	119	84	620.8	30	82	81	77	996.3	30	81	81	78	.274	.016	180	185
1010	32.5	111	83	621.4	30	82	81	76	996.8	30	81	81	77	.274	.014	178	184
1020	32.5	108	83	621.9	30	83	82	77	997.3	30	82	81	77	.275	.013	178	183
1030	32.0	106	82	622.4	30	84	83	76	997.8	30	82	82	77	.275	.012	176	182
1040	32.0	105	83	623.0	30	84	83	77	998.4	30	83	82	77	.275	.012	175	181
1050	31.5	104	82	623.5	30	85	84	77	998.9	30	83	82	77	.275	.012	175	180
1060	30.5	203	96	624.1	30	85	85	77	999.4	30	83	83	78	.272	.030	175	180
1070	28.0	146	86	624.6	30	86	85	78	1000.0	30	83	83	78	.274	.020	180	186
1080	27.5	116	83	625.2	30	86	86	78	1000.5	30	83	83	78	.275	.019	180	185
1090	27.5	110	82	625.7	30	87	86	77	1001.0	30	86	85	77	.277	.015	178	184
1100	27.5	106	82	626.2	30	88	87	77	1001.5	30	87	86	77	.274	.015	178	183
1110	27.5	104	86	626.7	30	89	88	78	1002.1	30	89	87	77	.273	.015	177	182
1120	27.5	104	83	627.3	30	89	88	78	1002.6	30	89	88	77	.272	.014	174	181
1130	27.0	104	83	627.8	30	90	89	77	1003.1	30	90	88	77	.270	.013	175	180
1140	26.5	194	95	628.3	30	87	88	78	1003.6	30	87	88	77	.267	.030	173	179
1150	24.0	151	87	628.8	30	84	86	79	1004.1	30	85	86	77	.271	.020	179	186
1160	24.0	116	84	629.3	30	83	83	77	1004.6	30	84	85	78	.268	.015	179	185
1170	24.0	110	84	629.8	30	82	83	78	1005.1	30	83	84	78	.274	.015	178	183
1180	23.5	108	84	630.3	30	82	82	78	1005.6	30	82	83	78	.269	.013	177	182
1190	23.5	107	84	630.8	30	81	81	78	1006.1	30	82	83	78	.273	.011	176	181
1200	23.5	106	84	631.3	30	81	81	77	1006.6	30	82	82	77	.276	.011	175	180
1210	23.0	106	84	631.8	30	80	81	77	1007.1	30	81	82	77	.272	.010	175	180
1220	23.0	154	91	632.3	30	80	80	77	1007.6	30	81	81	77	.267	.019	173	178
1230	20.5	278	102	652.8	30	80	80	77	1008.1	30	81	81	78	.270	.022	179	184
1240	20.5	121	86	633.3	30	80	80	77	1008.6	30	81	81	77	.270	.015	179	185
1250	20.0	113	86	633.8	30	80	80	77	1009.1	30	81	81	77	.271	.014	178	183

Furnace B Modified Method 5G Meter Box Data for Run 1
Date: 13 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water temperature inlet °F	Water temperature outlet °F
1260	20.0	110	86	634.3	30	80	80	76	1009.6	30	81	81	76	.268	.013	177	182
1270	19.5	108	85	634.8	30	80	80	75	1010.1	30	81	81	76	.272	.011	176	181
1280	19.5	107	86	635.3	30	80	80	76	1010.6	30	81	81	76	.270	.011	175	180
1290	19.5	108	86	635.8	30	80	80	75	1011.1	30	81	81	76	.270	.011	174	179
1300	19.0	162	93	636.3	30	80	80	76	1011.6	30	81	81	76	.267	.023	173	178
1310	17.0	188	92	636.8	30	80	80	76	1012.1	30	81	81	76	.267	.020	179	185
1320	16.5	117	87	637.3	30	80	80	75	1012.6	30	81	81	76	.269	.015	179	184
1330	16.5	113	87	637.8	30	81	80	75	1013.1	30	81	81	76	.269	.013	177	183
1340	16.0	111	88	638.3	30	82	81	77	1013.6	30	82	82	77	.269	.012	177	182
1350	16.0	110	87	638.8	30	83	82	77	1014.1	30	83	82	77	.268	.011	176	182
1360	16.0	109	87	639.3	30	83	82	77	1014.6	30	83	82	77	.267	.011	175	180
1370	16.0	109	87	639.8	30	85	84	77	1015.1	30	84	83	77	.270	.010	175	180
1380	15.58	184	97	640.3	30	85	84	77	1015.6	30	84	83	78	.268	.025	174	179
1390	13.50	211	95	640.8	30	85	84	77	1016.1	30	84	83	78	.269	.021	179	185
1400	13.50	122	89	641.3	30	86	85	78	1016.6	30	85	84	78	.268	.015	179	185
1410	13.00	114	89	641.8	30	86	85	78	1017.1	30	84	84	78	.269	.014	178	184
1420	13.00	112	88	642.3	30	85	85	78	1017.6	30	84	83	78	.269	.014	177	183
1430	13.00	111	89	642.8	30	86	85	78	1018.1	30	84	83	78	.270	.012	176	182
1440	13.00	110	88	643.3	30	84	84	78	1018.6	30	84	83	78	.268	.011	175	180
1450	12.50	109	87	643.8	30	83	83	78	1019.1	30	83	83	78	.269	.010	174	179
1460	12.50	155	93	644.3	30	83	83	78	1019.6	30	83	83	78	.267	.019	173	178
1470	11.00	237	108	644.8	30	83	83	78	1020.1	30	83	83	79	.262	.031	175	180
1480	10.00	132	90	645.3	30	83	82	78	1020.6	30	83	83	79	.268	.016	179	184
1490	09.50	117	90	645.8	30	83	82	78	1021.1	30	83	83	79	.270	.014	178	183
1500	09.50	113	89	646.3	30	82	82	78	1021.6	30	82	82	79	.266	.013	177	182
1510	09.50	111	89	646.8	30	82	82	77	1022.1	30	82	82	78	.266	.011	176	181
1520	09.50	110	90	647.3	30	82	82	78	1022.6	30	83	82	78	.269	.010	175	180
1530	09.40	110	90	647.8	30	82	82	77	1023.1	30	82	82	78	.269	.010	174	179
1540	09.50	117	91	648.3	30	82	82	77	1023.6	30	82	82	78	.266	.015	173	178
1550	08.00	201	102	648.8	30	82	82	77	1024.1	30	82	82	78	.268	.025	174	179
1560	07.00	175	95	649.3	30	82	82	77	1024.6	30	82	82	78	.269	.019	178	184
1570	06.50	120	91	649.8	30	82	82	77	1025.1	30	82	82	78	.266	.015	179	183
1580	06.50	114	91	650.3	30	82	82	78	1025.6	30	82	82	78	.268	.013	177	182
1590	06.50	113	91	650.8	30	82	82	77	1026.1	30	82	82	78	.274	.011	177	181
1600	06.50	112	91	651.3	30	82	82	78	1026.6	30	82	82	78	.270	.010	176	181
1610	06.50	111	91	651.8	30	82	82	78	1027.1	30	82	82	78	.266	.010	175	180
1620	06.50	110	91	652.3	30	82	82	78	1027.6	30	82	82	78	.269	.011	174	179
1630	06.00	175	99	652.8	30	82	82	78	1028.1	30	83	83	79	.265	.020	173	178
1640	05.00	213	105	653.3	30	82	82	78	1028.6	30	83	82	79	.364	.025	175	181
1650	04.00	136	93	653.8	30	82	82	78	1029.1	30	83	83	79	.268	.014	179	184
1660	04.00	118	92	654.3	30	82	82	78	1029.6	30	83	82	79	.271	.013	178	183
1670	04.00	114	91	654.8	30	82	82	78	1030.1	30	83	83	79	.271	.011	177	182

Furnace B Modified Method 5G Meter Box Data for Run 1
Date: 13 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water temperature inlet °F	Water temperature outlet °F
1680	04.00	112	91	655.3	30	82	82	78	1030.6	30	83	83	79	.368	.011	176	181
1690	04.00	111	90	655.8	30	82	82	78	1031.1	30	83	82	79	.270	.011	175	180
1700	03.50	110	90	656.3	30	82	82	78	1031.6	30	83	83	79	.270	.011	174	179
1710	03.50	158	96	656.8	30	82	83	78	1032.1	30	83	83	79	.268	.016	173	178
1720	03.00	184	100	657.3	30	82	82	78	1032.6	30	83	83	75	.270	.021	173	179
1730	02.00	207	104	657.8	30	83	83	78	1033.1	30	83	83	80	.267	.026	176	181
1740	01.00	175	95	658.3	30	83	83	78	1033.6	30	83	83	79	.269	.019	179	184
1750	01.00	122	91	658.8	30	83	83	79	1034.1	30	83	83	79	.271	.014	179	184
1760	01.00	115	90	659.3	30	83	83	79	1034.6	30	83	83	79	.270	.012	178	183
1770	01.00	110	90	659.8	30	83	83	78	1035.2	30	83	83	79	.270	.011	177	182
1780	01.00	111	90	660.3	30	83	83	78	1035.7	30	83	83	79	.271	.011	176	181
1790	01.00	110	89	660.8	30	83	82	78	1036.3	30	83	83	79	.271	.010	175	180
1800	00.50	109	89	661.3	30	82	82	78	1036.7	30	83	83	79	.270	.010	174	178
1810	00.00	261	100	661.8	30	83	83	78	1037.2	30	83	83	78	.270	.019	173	179

Furnace B Modified Method 5G Meter Box Data for Run 2
Date: 15 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
0	132.81	112	87	661.9	30	82	81	76	37.3	30	80	80	78	.261	.013	173	182
10	131.5	154	95	662.4	30	82	82	76	37.8	30	80	80	78	.258	.022	170	178
20	115.00	213	101	662.9	30	83	82	77	38.3	30	81	80	82	.260	.031	176	185
30	114.50	137	90	663.5	30	83	82	77	38.8	30	81	80	78	.260	.024	173	182
40	114.0	127	89	664.0	30	83	83	77	39.3	30	82	81	77	.264	.020	171	180
50	111.5	272	121	664.5	30	84	83	77	39.8	30	83	82	81	.253	.051	170	179
60	97.0	162	94	665.0	30	85	84	78	40.3	30	84	82	80	.260	.030	177	187
70	96.0	142	90	665.5	30	85	84	77	40.8	30	84	82	78	.261	.026	174	184
80	95.0	133	90	666.0	30	85	84	77	41.3	30	84	83	78	.263	.023	172	181
90	94.5	167	97	666.5	30	85	85	78	41.8	30	84	83	78	.258	.027	168	177
100	81.5	307	126	667.0	30	86	85	79	42.3	30	85	83	82	.248	.041	174	185
110	78.5	149	91	667.5	30	86	85	78	42.8	30	85	83	78	.260	.035	173	185
120	77.5	138	90	668.1	30	86	85	78	43.4	30	84	83	78	.260	.025	171	182
130	77.0	128	89	668.7	30	86	86	78	43.9	30	85	84	78	.262	.021	168	179
140	72.5	379	148	669.2	30	86	86	78	44.4	30	84	84	79	.248	.063	179	181
150	66.0	155	92	669.7	30	85	85	79	44.9	30	84	84	78	.263	.029	174	186
160	65.0	139	90	670.2	30	84	84	79	45.4	30	84	83	79	.259	.023	171	183
170	64.5	129	89	670.8	30	83	83	78	46.0	30	83	83	79	.260	.020	169	180
180	63.0	229	105	671.3	30	82	83	79	46.5	30	83	83	79	.257	.039	167	177
190	57.5	157	92	671.8	30	82	83	85	47.0	30	82	83	89	.260	.025	174	186
200	56.5	134	89	672.4	30	83	83	80	47.6	30	83	83	90	.263	.020	172	183
210	56.5	125	89	672.9	30	82	82	78	48.1	30	83	82	89	.264	.019	171	181
220	56.0	120	89	673.4	30	82	82	78	48.6	30	82	82	86	.265	.017	169	179
230	54.0	307	117	674.0	30	82	82	84	49.2	30	82	82	83	.255	.046	170	180
240	52.0	134	90	674.5	30	83	82	89	49.7	30	82	83	89	.260	.030	173	183
250	52.0	124	90	675.0	30	82	82	89	50.2	30	82	83	89	.264	.017	171	180
260	52.0	119	90	675.5	30	82	82	88	50.7	30	82	83	89	.260	.015	169	179
270	49.5	333	125	676.1	30	82	82	89	51.3	30	82	82	89	.257	.048	171	182
280	48.5	134	91	676.6	30	82	82	89	51.8	30	82	82	89	.264	.020	173	184
290	48.0	123	90	677.1	30	82	83	89	52.3	30	82	83	90	.261	.017	170	182
300	47.5	119	90	677.7	30	82	82	90	52.9	30	82	82	89	.263	.015	169	179
310	45.5	317	123	678.2	30	82	82	87	53.4	30	82	82	90	.260	.045	170	181
320	44.5	134	92	678.7	30	82	82	83	53.9	30	82	82	87	.261	.019	172	183
330	44.5	123	91	679.2	30	82	81	88	54.4	30	82	82	89	.261	.015	171	181
340	44.0	118	91	679.8	30	82	82	87	55.0	30	82	81	89	.259	.014	169	179
350	43.0	274	113	680.3	30	81	81	83	55.5	30	82	82	89	.256	.039	169	179
360	41.5	142	93	680.9	30	81	81	90	56.0	30	82	81	89	.262	.020	172	183
370	41.5	124	91	681.4	30	81	81	85	56.5	30	82	82	88	.261	.017	170	181
380	41.5	120	91	681.9	30	82	82	89	57.0	30	82	82	89	.260	.013	168	179
390	40.5	259	112	682.5	30	82	82	87	57.5	30	82	82	88	.257	.035	168	178
400	38.0	152	95	683.0	30	82	82	83	58.1	30	82	82	85	.250	.019	173	184
410	38.0	127	92	683.6	30	82	82	81	58.6	30	82	82	83	.260	.015	171	182

Furnace B Modified Method 5G Meter Box Data for Run 2
Date: 19 June 1995
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Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
420	38.0	120	92	684.1	30	82	82	80	59.1	30	82	82	81	.260	.013	169	180
430	37.5	180	100	684.7	30	82	82	79	59.7	30	82	82	80	.255	.025	168	178
440	35.0	285	119	685.2	30	82	82	80	60.2	30	82	82	90	.250	.038	170	181
450	34.0	138	93	685.7	30	82	82	90	60.7	30	82	82	90	.255	.020	172	183
460	33.5	124	92	686.3	30	82	82	90	61.2	30	82	82	90	.258	.015	170	181
470	33.5	120	91	686.8	30	82	82	89	61.8	30	82	82	89	.260	.013	169	179
480	32.5	217	105	687.3	30	82	82	89	62.3	30	82	82	89	.255	.028	167	178
490	30.0	248	102	687.9	30	82	82	90	62.8	30	82	82	90	.255	.025	173	185
500	29.0	134	92	688.4	30	82	82	90	63.2	30	82	82	90	.260	.018	173	184
510	28.5	125	92	688.9	30	82	82	90	63.7	30	82	82	90	.265	.015	171	182
520	28.5	120	91	689.4	30	82	82	89	64.2	30	82	82	90	.260	.013	169	180
530	28.0	185	100	690.0	30	82	82	85	64.8	30	82	82	87	.260	.025	167	178
540	25.0	344	133	690.5	30	82	82	90	65.3	30	82	82	90	.250	.033	171	182
550	23.5	138	93	691.1	30	82	82	90	65.8	30	82	82	90	.260	.020	173	184
560	23.0	126	81	691.6	30	82	82	89	66.3	30	83	83	90	.260	.015	171	182
570	23.0	120	91	692.1	30	83	83	89	66.8	30	83	82	90	.258	.015	169	180
580	22.5	222	105	692.7	30	82	82	90	67.3	30	82	82	90	.255	.030	167	178
590	20.0	270	104	693.2	30	82	82	90	67.8	30	83	82	90	.250	.023	173	183
600	20.0	132	92	693.2	30	82	82	81	67.9	30	82	82	79	.260	.015	172	183
610	19.5	122	91	693.7	30	82	82	81	68.3	30	82	82	79	.260	.015	170	181
620	19.5	118	90	684.2	30	82	82	80	68.9	30	82	82	78	.260	.013	168	179
630	18.0	265	113	694.7	30	82	82	80	69.3	30	82	82	78	.255	.038	168	178
640	16.0	170	95	695.3	30	82	82	79	69.8	30	82	82	79	.258	.020	173	184
650	16.0	128	90	695.8	30	82	82	79	70.3	30	83	82	78	.260	.015	172	183
660	15.5	121	90	696.3	30	82	82	78	70.8	30	83	82	78	.260	.015	170	181
670	15.5	117	89	696.8	30	82	82	78	71.3	30	82	83	78	.260	.020	168	179
680	14.5	269	113	697.4	30	82	82	79	71.8	30	83	83	79	.255	.038	168	179
690	12.0	189	95	698.0	30	82	82	79	72.4	30	83	83	79	.260	.020	173	184
700	11.5	129	90	698.5	30	82	82	79	73.0	30	82	83	79	.262	.016	172	183
710	11.5	120	89	699.1	30	82	82	79	73.5	30	82	82	75	.262	.014	170	181
720	11.5	117	88	699.6	30	82	83	79	74.0	30	83	82	79	.262	.010	168	179
730	10.5	266	112	700.2	30	82	82	80	74.5	30	82	82	79	.257	.040	167	178
740	08.5	218	98	700.7	30	82	83	81	70.0	30	83	82	79	.226	.026	173	184
750	08.0	130	90	701.2	30	82	83	80	75.5	30	82	82	79	.230	.016	172	183
760	08.0	120	88	701.7	30	82	82	80	76.0	30	83	82	79	.230	.012	169	180
770	08.0	143	98	702.3	30	82	83	81	76.6	30	82	82	79	.225	.030	166	178
780	06.0	302	122	708.8	30	82	83	81	77.1	30	82	82	79	.224	.043	169	180
790	04.5	149	90	703.4	30	82	82	80	77.6	30	82	82	79	.228	.017	173	184
800	04.5	125	88	705.9	30	83	82	80	78.1	30	82	82	79	.242	.015	171	182
810	04.5	118	87	704.4	30	82	83	80	78.6	30	82	82	79	.231	.013	169	180
820	04.5	203	100	705.0	30	82	83	80	79.2	30	82	82	79	.227	.028	167	178
830	02.5	294	121	705.5	30	82	83	82	79.6	30	83	83	80	.223	.041	170	181

Furnace B Modified Method 5G Meter Box Data for Run 2

Date: 19 June 1995
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Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
840	01.0	141	89	706.0	30	83	83	80	80.3	30	83	83	79	.229	.019	173	184
850	01.0	122	87	706.6	32	82	82	79	80.7	30	83	82	78	.229	.015	171	182
860	01.0	117	87	707.1	30	82	83	79	81.2	30	82	83	78	.230	.014	169	180
870	00.5	223	103	707.7	30	82	82	79	81.7	30	82	82	78	.225	.030	167	178
872	0	239	107	707.8	30	82	82	78	81.8	30	83	82	78	.225	.034	167	178

Furnace B Modified Method 5G Meter Box Data for Run 3
Date: 19 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
0	139.52	116	92	707.8	30	83	82	78	82.3	30	80	80	79	.257	.011	172	177
10	131.00	234	116	708.4	30	84	83	84	82.9	30	81	80	83	.251	.010	172	177
20	128.00	175	98	708.9	30	84	83	81	83.4	30	82	81	82	.210	.025	177	183
30	127.50	133	94	708.5	30	84	84	79	83.9	30	83	82	79	.270	.019	175	181
40	127.00	125	93	710.0	30	85	84	78	84.4	30	84	82	79	.257	.019	173	179
50	126.50	154	98	710.5	30	85	85	79	84.9	30	84	82	80	.253	.021	171	177
60	119.0	163	97	711.0	30	86	85	80	85.5	30	84	83	81	.258	.055	181	185
70	119.5	138	95	711.5	30	87	86	78	86.0	30	85	84	79	.262	.021	179	184
80	119.0	129	93	712.0	30	84	84	78	86.5	30	83	84	80	.259	.019	177	182
90	118.5	124	93	712.6	30	83	83	80	87.0	32	83	83	80	.259	.017	175	180
100	118.0	121	93	713.1	30	82	83	80	87.5	30	83	83	81	.257	.015	175	179
110	117.5	120	93	713.6	30	82	82	81	88.0	30	83	83	81	.263	.015	173	178
120	117.5	144	98	714.1	30	82	82	82	88.6	30	83	83	82	.256	.020	171	176
130	107.5	228	106	714.6	30	82	82	85	89.1	30	83	83	85	.256	.029	177	183
140	106.0	142	95	715.1	30	82	82	81	89.6	30	83	83	83	.256	.021	170	182
150	105.5	132	95	715.6	30	82	82	83	90.1	30	83	83	83	.256	.019	173	179
160	104.5	126	94	716.1	30	82	82	83	90.6	30	83	83	83	.257	.018	171	178
170	102.5	256	117	716.6	30	81	82	84	91.1	30	82	83	85	.250	.040	172	177
180	096.0	151	96	717.1	30	82	82	82	91.5	30	82	83	82	.257	.023	179	185
190	095.0	138	95	717.6	30	82	82	83	92.0	30	82	83	83	.256	.020	178	183
200	094.5	129	95	718.1	30	82	82	84	92.5	30	83	83	83	.257	.019	177	182
210	094.5	125	95	718.6	30	82	82	84	93.0	30	83	83	83	.256	.016	175	181
220	094.0	122	95	719.2	30	82	82	84	93.5	30	83	83	84	.259	.015	174	180
230	093.5	120	95	719.7	30	82	82	84	94.0	30	83	83	83	.255	.015	173	178
240	093.5	135	98	720.2	30	82	82	84	94.5	30	83	83	84	.255	.019	172	177
250	088.0	172	99	720.7	30	82	83	83	95.0	30	83	84	84	.255	.013	178	183
260	087.0	138	96	721.2	30	82	83	84	95.5	30	84	84	84	.255	.020	178	183
270	086.5	129	96	721.7	30	83	83	84	96.0	30	84	84	84	.280	.018	176	181
280	086.5	123	95	722.2	30	83	83	84	96.5	30	83	84	84	.250	.015	175	180
290	086.0	120	95	722.7	30	83	82	84	97.1	30	83	84	84	.255	.015	174	179
300	086.0	119	95	723.3	30	83	83	84	97.6	30	84	84	84	.255	.013	173	178
310	086.0	117	95	723.8	30	83	83	85	98.2	30	84	84	85	.260	.018	172	177
320	082.5	190	100	724.3	30	83	83	85	98.7	30	84	84	85	.260	.020	178	184
330	082.0	131	96	724.8	30	83	83	85	99.2	30	84	84	85	.258	.018	177	183
340	082.0	125	96	725.4	30	83	83	85	99.8	30	84	84	85	.258	.018	176	181
350	081.5	121	96	725.9	30	83	83	85	100.3	30	84	84	85	.260	.015	175	180
360	081.5	119	95	726.5	30	83	83	85	100.9	30	84	84	85	.258	.013	173	179
370	081.0	118	95	727.0	30	83	83	85	101.4	30	84	84	85	.258	.013	172	178
380	080.5	156	100	727.5	30	83	83	85	101.9	30	84	84	85	.255	.019	171	177
390	077.5	166	99	728.0	30	83	83	85	102.4	30	84	84	85	.255	.023	178	183
400	077.0	132	96	728.6	30	83	83	85	102.9	30	84	84	85	.260	.019	177	182

Furnace B Modified Method 5G Meter Box Data for Run 3
Date: 19 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
410	076.5	126	95	729.1	30	84	84	85	103.5	30	85	85	85	.260	.015	176	181
420	076.0	122	94	729.6	30	83	83	85	104.0	30	84	84	85	.258	.015	175	180
430	076.0	119	94	730.1	30	83	83	85	104.5	30	84	85	85	.256	.015	174	179
440	075.5	117	94	730.7	30	83	83	85	105.1	30	84	85	85	.258	.013	173	178
450	075.5	116	94	731.2	30	83	83	85	105.6	30	84	84	85	.258	.013	172	177
460	074.5	206	105	731.7	30	83	83	.85	106.1	30	84	84	85	.255	.030	172	177
470	071.0	151	97	723.3	30	83	83	86	106.6	30	84	84	85	.258	.020	174	184
480	070.0	130	94	732.8	30	83	83	86	107.2	30	84	84	85	.258	.018	177	183
490	070.0	124	94	733.4	30	83	83	85	107.7	30	84	84	85	.260	.015	176	182
500	069.5	120	93	733.9	30	83	83	85	108.2	30	84	84	85	.258	.015	175	181
510	069.5	118	93	734.5	30	83	83	85	108.7	30	84	84	85	.260	.015	174	180
520	069.5	115	93	735.0	30	83	83	85	109.3	30	84	84	85	.260	.013	172	178
530	069.0	149	97	735.6	30	83	83	85	109.8	30	84	84	85	.258	.020	171	177
540	065.0	211	100	736.1	30	83	83	86	110.3	30	84	84	85	.258	.023	177	184
550	064.5	135	94	736.7	30	83	83	85	110.9	30	84	84	85	.262	.018	177	184
560	063.5	127	93	737.3	30	83	83	85	111.5	30	83	84	85	.255	.015	176	182
570	063.5	122	93	737.8	30	82	83	85	112.0	30	83	84	84	.256	.015	174	181
580	063.5	118	93	738.4	30	82	83	85	112.5	30	83	84	84	.256	.013	173	179
590	063.0	116	92	739.0	30	82	83	85	113.1	30	83	83	84	.255	.013	171	178
600	062.0	229	107	739.6	30	82	82	85	113.7	30	83	83	84	.247	.031	171	177
610	059.0	148	95	740.1	30	82	82	85	114.2	30	83	83	84	.255	.020	178	185
620	058.5	128	93	740.6	30	82	82	85	114.7	30	83	83	84	.257	.016	177	184
630	058.5	123	92	741.2	30	82	82	85	115.3	30	83	83	84	.258	.014	175	182
640	058.0	119	92	741.7	30	82	82	85	115.8	30	83	83	84	.255	.012	174	180
650	050.0	116	92	742.3	30	82	82	84	116.4	30	83	83	84	.257	.011	172	179
660	058.0	114	91	742.9	30	82	82	84	117.0	30	83	83	84	.256	.011	171	178
670	056.5	258	112	743.4	30	82	82	84	117.5	30	83	83	83	.252	.032	172	178
680	054.5	142	93	744.0	30	82	82	84	118.0	30	83	83	84	.256	.019	177	184
690	054.0	125	92	744.5	30	82	82	84	118.5	30	83	83	84	.257	.015	176	182
700	054.0	119	91	745.1	30	81	82	84	119.1	30	83	83	84	.257	.013	175	181
710	053.5	117	91	745.6	30	82	82	84	119.6	30	83	83	83	.257	.012	174	180
720	053.5	115	91	746.2	30	82	82	84	120.2	30	82	83	83	.255	.016	172	179
730	053.5	149	96	746.7	30	81	82	84	120.7	30	82	83	83	.255	.016	171	177
740	051.0	307	124	747.3	30	81	82	85	121.3	30	83	83	84	.254	.040	175	182
750	050.0	132	92	747.8	30	81	82	84	121.8	30	83	83	84	.257	.016	176	183
760	050.0	123	91	748.4	30	81	82	84	122.3	30	83	83	83	.257	.014	175	182
770	049.5	118	91	748.9	30	81	82	84	122.9	30	83	83	83	.257	.012	174	181
780	049.5	116	91	749.5	30	81	81	83	123.4	30	82	83	83	.258	.011	173	179
790	049.5	115	90	750.1	30	81	81	83	124.0	30	82	82	83	.256	.011	172	178
800	049.0	221	105	750.6	30	81	81	83	124.5	30	82	83	83	.252	.025	171	177
810	046.5	149	93	751.6	30	81	81	84	124.1	30	82	83	83	.257	.019	178	184

Furnace B Modified Method 5G Meter Box Data for Run 3
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Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
820	045.5	126	91	751.7	30	81	82	84	125.6	30	82	83	83	.255	.015	177	183
830	045.5	120	91	752.3	30	81	81	83	126.2	30	82	82	83	.256	.013	175	181
840	045.5	116	90	752.9	30	81	81	83	126.7	30	82	82	83	.257	.012	174	180
850	045.5	115	90	753.4	30	81	81	83	127.2	30	82	82	83	.256	.011	173	179
860	045.0	115	90	754.0	30	81	81	83	127.8	30	82	82	82	.258	.010	172	178
870	044.0	231	106	754.5	30	81	81	83	128.3	30	82	82	82	.252	.027	171	178
880	042.0	151	93	755.0	30	81	81	83	128.9	30	82	82	83	.257	.020	177	183
890	041.5	125	91	755.5	30	81	81	83	129.4	30	82	82	83	.256	.015	176	183
900	041.5	119	90	756.1	30	80	81	83	130.0	30	82	82	82	.258	.014	175	182
910	041.5	116	90	756.7	30	81	81	83	130.8	30	82	82	82	.256	.012	174	180
920	041.5	114	89	757.3	30	81	81	83	131.0	30	82	82	82	.257	.011	173	179
930	041.0	114	89	757.8	30	80	81	83	131.5	30	82	82	82	.258	.010	172	178
940	040.5	207	102	758.3	30	80	81	83	132.0	30	82	82	82	.262	.022	171	177
950	037.5	177	94	758.8	30	81	81	83	132.5	30	82	82	82	.261	.020	178	184
960	037.5	127	90	759.3	30	81	81	83	133.0	30	82	82	82	.263	.011	177	184
970	037.0	120	89	759.8	30	81	81	83	133.5	30	82	82	82	.263	.014	177	182
980	037.0	117	89	700.4	30	81	81	82	134.1	30	81	82	82	.268	.012	176	181
990	036.5	115	88	760.9	30	80	81	82	134.6	30	81	81	82	.263	.011	175	180
1000	036.5	113	88	761.4	30	80	80	82	135.2	30	81	81	81	.263	.011	174	179
1010	036.5	113	88	763.0	30	80	80	82	135.7	30	81	81	81	.265	.011	172	178
1020	035.5	243	107	762.5	30	80	80	82	136.3	30	81	81	81	.258	.038	172	177
1030	033.5	143	90	763.1	30	81	80	82	136.8	30	81	81	81	.262	.017	178	184
1040	033.0	123	88	763.6	30	80	80	82	137.3	30	81	81	81	.264	.014	177	183
1050	033.0	118	88	764.2	30	80	80	81	137.9	30	80	81	81	.264	.013	176	182
1060	032.5	114	88	764.7	30	80	80	81	138.4	30	80	81	81	.262	.012	175	180
1070	032.5	113	88	765.2	30	80	80	81	138.9	30	80	81	80	.262	.012	174	179
1080	032.5	112	87	765.8	30	79	80	81	139.5	30	80	80	80	.262	.011	173	179
1090	32.5	143	92	766.4	30	80	80	81	140.1	30	80	81	80	.261	.018	172	177
1100	029.5	194	94	766.8	30	80	80	81	140.6	30	81	81	81	.262	.021	179	185
1110	029.0	126	89	767.4	30	80	80	81	141.1	30	80	80	80	.262	.015	178	184
1120	029.0	119	81	767.9	30	80	80	81	141.6	30	80	80	80	.262	.014	177	183
1130	029.0	115	88	768.5	30	80	80	81	142.2	30	80	81	81	.262	.012	175	181
1140	029.0	113	88	769.0	30	79	79	80	142.7	30	80	81	81	.261	.011	175	181
1150	028.5	112	88	769.5	30	79	80	81	143.2	30	80	80	80	.261	.010	174	179
1160	028.5	111	88	770.1	30	80	80	80	143.8	30	80	81	80	.260	.011	173	178
1170	028.0	221	104	770.6	30	80	80	81	144.3	30	81	81	81	.256	.031	172	178
1180	025.5	152	93	771.1	30	80	80	81	144.8	30	81	81	81	.259	.018	179	185
1190	025.5	124	90	771.7	30	80	80	81	145.3	30	81	81	81	.260	.016	177	184
1200	025.5	118	90	772.2	30	80	80	81	145.8	30	81	81	81	.259	.014	176	182
1210	025.5	115	90	772.7	30	80	80	81	146.4	30	81	81	81	.258	.014	175	181
1220	025.5	114	90	773.3	30	80	80	81	147.0	30	81	81	81	.259	.012	174	180

Furnace B Modified Method 5G Meter Box Data for Run 3
Date: 19 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
1230	025.5	113	90	773.8	30	80	80	81	147.5	30	81	81	81	.258	.011	172	178
1240	025.0	159	97	774.4	30	80	80	81	148.0	30	81	81	81	.256	.021	171	177
1250	022.5	194	97	774.9	30	81	80	82	148.5	30	81	82	81	.256	.019	178	184
1260	022.0	128	92	775.4	30	81	80	82	149.0	30	81	81	81	.258	.015	177	183
1270	022.0	120	92	778.0	30	81	80	82	149.5	30	81	81	82	.257	.014	176	181
1280	021.5	117	92	776.5	30	81	81	82	150.1	30	81	81	82	.259	.012	175	180
1290	021.5	116	92	777.0	30	81	81	82	150.6	30	81	81	82	.260	.012	174	179
1300	021.5	115	92	777.6	30	81	80	82	151.1	30	81	81	82	.256	.011	173	179
1310	021.5	115	92	778.1	30	81	81	82	151.7	30	82	82	82	.256	.011	172	178
1320	020.0	250	112	778.6	30	81	81	83	152.2	30	82	82	82	.251	.034	173	179
1330	018.5	146	95	779.2	30	81	81	83	152.7	30	82	82	83	.256	.018	178	184
1340	018.5	125	93	779.7	30	82	81	82	153.2	30	82	82	82	.255	.015	177	183
1350	018.0	120	93	780.2	30	82	81	83	153.7	30	82	82	82	.255	.013	176	182
1360	018.0	118	93	780.7	30	81	81	83	154.3	30	82	82	82	.254	.012	175	181
1370	018.0	117	93	781.3	30	82	82	83	154.8	30	82	82	83	.260	.012	174	180
1380	017.5	117	93	781.8	30	81	81	83	155.3	30	82	82	83	.255	.011	173	178
1390	017.5	116	94	782.4	30	82	82	83	155.8	30	82	82	83	.255	.010	171	177
1400	016.5	220	109	782.9	30	82	82	83	156.4	30	82	82	83	.250	.031	172	178
1410	014.5	158	97	783.4	30	82	82	84	156.9	30	83	82	83	.256	.020	178	184
1420	014.5	127	95	783.9	30	82	82	84	157.4	30	83	83	83	.255	.015	177	183
1430	014.5	122	95	784.5	30	82	82	83	157.9	30	83	83	83	.258	.014	176	182
1440	014.5	119	95	785.1	30	83	82	84	158.5	30	83	83	84	.255	.013	176	181
1450	014.0	118	94	785.6	30	83	82	84	159.0	30	83	83	84	.257	.012	174	180
1460	014.0	118	95	786.1	30	82	83	84	159.5	30	83	84	84	.253	.010	173	179
1470	014.0	115	95	786.6	30	83	83	84	160.1	30	83	84	84	.254	.011	172	177
1480	013.5	194	108	787.1	30	83	83	84	160.6	30	83	83	84	.254	.023	171	177
1490	011.5	244	104	787.6	30	83	83	85	161.0	30	84	84	84	.253	.021	177	183
1500	011.0	132	96	788.2	30	83	83	85	161.6	30	84	84	84	.253	.015	177	183
1510	011.0	123	95	788.8	30	83	83	84	162.1	30	84	84	84	.255	.014	176	182
1520	011.0	121	95	789.3	30	83	83	84	162.6	30	84	84	83	.254	.013	175	181
1530	011.0	119	95	789.8	30	84	84	83	163.2	30	85	84	82	.255	.011	174	180
1540	011.0	119	96	790.3	30	84	84	83	163.7	30	85	85	82	.254	.011	174	179
1550	011.0	118	96	790.8	30	85	85	83	664.2	30	86	85	81	.254	.016	172	178
1560	011.0	139	99	791.4	30	86	86	82	164.7	30	87	85	81	.256	.016	171	176
1570	010.0	267	88	791.8	30	86	86	83	165.2	30	87	86	82	.250	.039	173	178
1580	008.5	147	98	792.2	30	86	86	84	165.7	30	87	86	83	.256	.019	177	183
1590	008.5	127	97	792.9	30	86	86	84	166.3	30	87	87	83	.255	.015	177	182
1600	008.5	123	97	793.5	30	86	86	84	166.8	30	87	87	84	.256	.014	176	181
1610	008.5	121	96	744.0	30	85	85	84	167.4	30	85	85	84	.255	.013	175	180
1620	008.0	119	96	794.5	30	84	85	85	167.9	30	84	85	84	.256	.013	174	179
1630	008.0	118	96	795.1	30	84	84	85	168.4	30	84	84	85	.255	.011	173	178

Furnace B Modified Method 5G Meter Box Data for Run 3
Date: 19 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
1640	008.0	118	96	795.6	30	84	84	85	169.0	30	84	84	85	.255	.011	172	177
1650	007.5	207	109	796.1	30	84	84	86	169.5	30	83	84	85	.250	.029	171	176
1660	005.5	202	103	796.6	30	84	84	86	170.0	30	83	84	86	.252	.020	177	183
1670	005.5	131	98	797.1	30	84	83	86	170.5	30	83	84	86	.254	.018	177	182
1680	005.5	125	97	797.7	30	84	83	86	171.0	30	83	83	86	.255	.015	176	181
1690	005.5	122	97	798.2	30	83	83	86	171.5	30	83	83	86	.253	.012	175	180
1700	005.5	120	97	798.8	30	83	83	86	172.1	30	83	83	86	.252	.013	174	179
1710	005.5	119	97	799.3	30	83	84	86	172.6	30	83	84	86	.255	.011	173	178
1720	005.0	119	97	799.9	30	84	83	86	173.2	30	83	84	86	.256	.011	171	177
1730	005.0	173	104	800.4	30	83	83	87	173.7	30	83	84	86	.253	.020	171	176
1740	003.5	241	116	800.9	30	84	83	87	174.2	30	83	84	86	.251	.030	173	179
1750	002.5	144	99	801.5	30	84	84	87	174.7	30	83	84	87	.255	.016	177	183
1760	002.5	126	98	802.2	30	84	83	87	175.3	30	83	84	87	.257	.015	176	181
1770	002.5	122	97	802.5	30	85	84	86	175.8	30	84	84	85	.256	.013	175	181
1780	002.5	121	98	803.1	30	85	85	85	176.4	30	86	86	85	.256	.012	174	179
1790	002.5	120	98	803.7	30	86	86	85	177.0	30	87	86	84	.255	.011	173	179
1800	002.5	119	97	804.2	30	87	86	84	177.5	30	88	87	84	.256	.011	172	177
1810	002.5	153	102	804.7	30	87	87	84	178.0	30	88	88	84	.256	.018	171	176
1820	001.5	206	109	805.2	30	88	87	84	178.5	30	88	88	84	.253	.026	172	177
1830	000.5	229	114	805.7	30	88	87	84	178.0	30	88	88	84	.253	.030	175	180
1833	000.0	197	103	805.8	30	87	87	84	179.0	30	88	88	84	.255	.020	178	182

Furnace B Modified Method 5G Meter Box Data for Run 4
Date: 19 June 1995
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Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
0	136.86	133	91	806.0	30	78	78	74	179.1	30	78	78	76	.262	.015	170	179
10	127.00	221	100	806.6	30	78	78	79	179.6	30	78	78	79	.257	.026	173	183
20	126.50	136	92	806.1	30	77	78	77	180.2	30	77	78	77	.258	.020	171	181
30	126.50	128	91	807.6	30	76	77	76	180.7	30	77	77	76	.259	.016	169	178
40	119.50	304	134	808.2	30	75	76	85	181.2	30	76	77	85	.248	.048	168	180
50	113.50	150	93	808.7	30	75	76	78	181.7	30	76	76	78	.257	.023	171	182
60	113.00	136	92	809.2	30	76	76	77	182.2	30	76	76	77	.258	.020	168	178
70	109.50	292	127	809.8	30	77	76	80	182.8	30	77	77	81	.248	.049	167	179
80	102.00	153	94	810.3	30	78	77	77	183.3	30	78	77	77	.261	.025	172	183
90	101.00	138	93	810.8	30	79	78	76	183.8	30	78	78	76	.251	.021	169	180
100	100.50	148	99	811.4	30	77	78	77	184.3	30	78	78	78	.252	.025	168	178
110	092.00	216	102	811.9	30	76	77	78	184.9	30	78	78	79	.255	.029	173	184
120	090.50	146	93	812.4	30	76	77	76	185.4	30	78	78	77	.258	.020	171	182
130	090.00	135	43	813.0	30	76	77	76	185.9	30	78	78	77	.260	.020	170	180
140	089.00	165	100	813.5	30	76	77	77	186.5	30	78	78	78	.258	.024	167	177
150	083.50	164	96	814.0	30	76	76	77	187.0	30	78	78	78	.255	.024	173	184
160	082.50	140	93	814.6	30	76	76	77	187.5	30	78	78	78	.257	.020	171	181
170	082.00	130	43	815.1	30	76	77	78	188.0	30	78	79	78	.256	.019	169	179
180	081.00	188	102	815.7	30	76	77	78	188.5	30	78	78	78	.254	.024	167	177
190	077.50	160	96	816.2	30	76	76	78	189.0	30	78	78	78	.258	.020	173	183
200	077.00	134	94	816.8	30	76	76	78	189.6	30	78	78	78	.258	.018	170	180
210	076.50	126	93	817.3	30	76	77	78	190.1	30	78	79	78	.257	.016	168	178
220	075.50	222	107	817.9	30	77	77	78	190.6	30	79	79	78	.256	.029	167	177
230	073.00	156	96	818.4	30	77	77	79	191.1	30	79	79	79	.259	.030	172	183
240	072.50	133	94	819.0	30	77	77	79	191.7	30	79	79	79	.260	.016	170	180
250	072.00	126	94	819.5	30	77	77	79	192.2	30	79	79	79	.263	.015	168	178
260	070.50	260	113	820.0	30	77	77	79	192.7	30	79	79	79	.259	.034	168	179
270	068.00	146	96	820.6	30	77	77	79	193.3	30	79	79	80	.258	.019	172	183
280	067.50	132	95	821.2	30	77	77	79	193.8	30	79	80	79	.262	.016	169	180
290	067.50	126	94	821.7	30	77	77	79	194.3	30	79	80	79	.259	.015	167	177
300	064.50	311	112	822.3	30	77	78	80	194.9	30	80	80	81	.257	.022	173	183
310	064.00	138	96	822.9	30	77	78	79	195.5	30	80	80	80	.261	.018	171	182
320	063.50	129	95	823.4	30	81	79	80	196.0	30	81	80	81	.260	.015	169	179
330	063.00	163	101	823.9	30	82	81	81	196.5	30	82	81	81	.257	.020	167	177
340	060.00	212	102	824.5	30	83	82	81	197.1	30	82	81	82	.264	.022	173	184
350	059.50	136	96	825.0	30	84	83	82	197.6	30	83	82	83	.260	.019	171	181
360	050.00	128	96	825.6	30	85	84	82	198.1	30	84	83	83	.261	.016	169	179
370	058.50	166	101	826.1	30	81	83	81	198.6	30	82	83	82	.260	.021	167	177
380	055.50	207	102	826.7	30	80	82	81	199.1	30	81	82	82	.257	.022	173	184
390	054.50	137	97	827.3	30	80	81	82	199.7	30	81	82	82	.267	.019	171	181
400	054.50	128	96	827.8	30	79	80	82	200.2	30	81	81	82	.260	.015	169	179
410	054.00	160	102	825.3	30	79	79	82	200.8	30	80	81	82	.256	.020	167	177

Furnace B Modified Method 5G Meter Box Data for Run 4
Date: 21 June 1995

Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
420	051.50	300	125	828.9	30	80	80	83	201.3	30	81	81	83	.255	.042	179	180
430	050.50	143	98	829.5	30	82	81	84	201.8	30	82	82	82	.259	.020	172	182
440	050.00	130	97	830.0	30	81	81	83	202.3	30	82	82	82	.257	.016	179	180
450	050.0	125	97	830.5	30	84	82	83	202.8	30	84	83	83	.258	.015	169	178
460	049.00	221	110	831.1	30	86	84	84	203.3	30	84	83	83	.255	.030	168	176
470	046.50	191	102	831.6	30	85	84	84	203.9	30	84	84	83	.260	.025	174	183
480	046.00	132	98	832.2	30	86	85	84	204.4	30	85	84	83	.255	.018	172	181
490	046.0	129	98	832.7	30	87	85	84	204.9	30	85	84	83	.255	.016	171	179
500	046.0	124	98	833.2	30	88	86	84	205.5	30	86	85	83	.255	.015	168	178
510	045.0	235	113	833.8	30	86	86	85	206.0	30	85	85	84	.252	.035	168	176
520	042.0	231	107	834.3	30	85	86	85	206.5	30	85	85	85	.250	.025	173	182
530	041.5	140	100	834.9	30	82	84	84	207.0	30	83	84	84	.256	.020	171	181
540	041.5	130	99	835.4	30	84	83	84	207.6	30	84	84	84	.260	.018	170	180
550	041.0	126	99	836.0	30	83	83	84	208.1	30	83	84	84	.260	.015	169	178
560	040.5	206	109	836.5	30	82	83	84	208.6	30	83	83	84	.245	.028	167	176
570	037.0	321	134	837.1	30	82	83	85	209.2	30	84	84	86	.243	.048	172	181
580	035.0	150	100	837.6	30	83	83	84	209.7	30	85	84	85	.250	.020	173	183
590	035.0	135	100	838.2	30	83	83	84	210.2	30	85	84	84	.250	.018	172	181
600	034.5	122	99	838.7	30	83	83	83	210.7	30	85	85	84	.250	.015	170	179
610	034.5	123	98	839.3	30	83	83	83	211.3	30	85	85	84	.250	.015	168	177
620	033.5	251	117	839.8	30	83	83	84	211.8	30	85	85	85	.248	.033	167	177
630	030.0	184	103	840.4	30	83	83	84	212.4	30	85	85	85	.248	.023	174	184
640	030.0	139	99	840.9	30	83	83	83	212.9	30	85	85	85	.255	.020	171	182
650	029.5	129	99	841.5	30	83	83	83	213.4	30	85	85	84	.253	.015	170	180
660	029.5	124	98	842.0	30	83	83	83	213.9	30	85	85	84	.250	.015	168	178
670	029.0	218	111	842.5	30	83	83	83	214.5	30	85	85	84	.250	.029	167	176
680	026.0	360	142	843.1	30	82	83	84	215.0	30	84	84	85	.248	.030	172	182
690	025.0	146	100	843.6	30	82	83	83	215.5	30	84	84	84	.252	.020	172	183
700	024.5	132	98	844.2	30	82	83	83	216.0	30	84	84	84	.250	.018	171	180
710	024.5	125	97	844.7	30	82	82	83	216.6	30	83	84	84	.252	.015	169	179
720	024.5	122	97	845.3	30	82	83	83	217.1	30	84	84	84	.253	.013	167	177
730	023.0	255	116	845.8	30	83	83	84	217.6	30	84	84	84	.248	.035	167	176
740	021.0	184	101	846.4	30	82	83	84	218.2	30	84	84	84	.250	.023	173	183
750	020.5	136	97	846.9	30	82	83	83	218.7	30	84	84	84	.253	.018	171	182
760	020.5	127	96	847.5	30	83	83	83	219.2	30	83	84	83	.253	.015	170	180
770	020.5	122	95	848.0	30	83	83	83	219.7	30	84	84	84	.250	.013	168	178
780	020.5	194	105	848.5	30	83	83	83	220.3	30	84	84	84	.250	.025	166	176
790	019.0	300	125	949.1	30	83	83	84	220.8	30	84	84	85	.245	.033	169	179
800	017.0	163	99	849.7	30	82	83	84	221.4	30	84	84	84	.253	.021	173	183
810	016.5	133	97	850.2	30	83	83	84	221.9	30	84	84	84	.253	.017	173	182
820	016.5	126	96	850.8	30	82	83	83	222.4	30	84	84	84	.254	.015	171	180
830	016.5	122	95	851.3	30	82	83	83	222.9	30	84	84	84	.255	.012	169	178

Furnace B Modified Method 5G Meter Box Data for Run 4
Date: [redacted] June 1995
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Elasped Time Min.	Weight Remain Lb	Flue Gas Temp °F	Tunnel Temp °F	DGM #1 Read ft^3	ROTO 1 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	DGM #2 Read ft^3	ROTO 2 Read	DGM Temp Inlet °F	DGM Temp Outlet °F	Filter Temp °F	Tunnel Velocity ΔP in.H_2O	Draft in.H_2O	Water Temperature Inlet °F	Water Temperature Outlet °F
840	016.5	173	102	851.8	30	82	83	83	223.5	30	84	84	84	.252	.020	167	176
850	015.0	272	118	852.4	30	82	82	83	224.0	30	83	83	84	.249	.031	167	177
860	012.5	177	99	852.9	30	82	82	84	224.5	30	83	83	84	.253	.024	173	184
870	012.5	135	96	853.4	30	82	82	83	225.1	30	83	84	83	.256	.017	173	182
880	012.0	128	95	854.0	30	82	82	82	225.6	30	83	83	83	.256	.014	171	180
890	012.0	122	94	854.5	30	82	82	82	226.1	30	83	83	83	.262	.014	168	179
900	011.5	178	101	855.0	30	84	83	82	226.6	30	84	82	82	.261	.022	166	176
910	010.0	283	119	855.5	30	85	84	83	227.1	30	85	84	83	.257	.039	167	178
920	008.5	180	98	856.1	30	87	85	83	227.7	30	86	85	84	.262	.032	173	183
930	008.0	135	95	856.6	30	88	87	84	228.2	30	88	87	84	.259	.018	172	182
940	008.0	125	94	857.2	30	88	86	82	228.7	30	87	86	83	.259	.016	169	180
950	008.0	120	93	857.7	30	84	85	82	229.3	30	84	85	82	.261	.014	167	177
960	007.5	239	110	858.2	30	82	83	82	229.8	30	83	84	82	.256	.042	166	177
970	005.5	301	124	858.8	30	82	82	83	230.3	30	83	83	82	.255	.040	169	180
980	004.5	152	95	859.3	30	81	82	82	230.8	30	82	83	82	.261	.020	172	183
990	004.5	130	93	859.8	30	81	81	82	231.4	30	82	83	82	.260	.016	170	181
1000	004.5	123	93	860.4	30	80	81	82	231.9	30	82	82	82	.265	.015	168	179
1010	004.0	205	104	860.9	30	81	81	82	232.4	30	82	82	82	.260	.028	166	176
1020	002.5	294	120	861.4	30	80	81	82	232.9	30	82	82	83	.258	.040	168	179
1030	001.0	177	96	862.0	30	80	80	82	233.5	30	81	82	82	.260	.021	172	183
1040	001.0	132	93	862.5	30	81	81	82	234.0	30	82	82	81	.262	.016	170	181
1050	001.0	123	92	863.0	30	81	81	81	234.5	30	82	82	81	.261	.015	169	179
1060	000.5	177	100	863.6	30	82	81	81	235.0	30	82	82	81	.259	.023	166	177
1063	000.0	213	105	863.7	30	81	80	81	235.2	30	82	81	80	.255	.029	166	176

Appendix F - Method 5G Summary Data

WOODSTOVE TEST INFORMATION

NAME: Russell Logan and Joey Valenti
DATE: 06/15/95
TEST No.: TD-MM5G-2A
DESCRIPTION: Modified Method 5G Testing of Furnace A @ High Heat Removal Rate

CONDITIONS

Ambient Temp.:	66.09	F
Barometric Press.:	30.02	in Hg
Humidity:	29.89	%

FUEL INFORMATION

TYPE:	Red Oak	
CHARGE WEIGHT:	82.50	lbs
MOISTURE:	29.03	%
HEATING VALUE:	8069.0	Btu/ dry lbs of fuel

PRELIMINARY VELOCITY TRAVERSE

Dist (in)		Temp (F)
0.4	0.125	81
1.5	0.135	81
4.5	0.140	81
5.6	0.126	81

GENERAL

Pre-Test Leak:	0.13	cfm
Post-Test Leak:	0.163	cfm
Total Time:	424	min
AVERAGE HEAT OUTPUT	43,338	Btu/hr

MM5G WEIGHTS (grams)

FILTER A		FILTER B		PAN RINSE	
FINAL:	0.7688	FINAL:	0.6236	FINAL:	2.6529
TARE:	0.6194	TARE:	0.6231	TARE:	2.6438
NET:	0.1494	NET:	0.0005	NET:	0.0091

CEM VALUES

	PRE-TEST ZERO	PRE-TEST SPAN	POST-TEST ZERO	POST-TEST SPAN	ACTUAL SPAN
O2:	0.00	9.70	0.00	9.70	9.70 %
CO2:	0.00	6.48	-0.10	6.50	6.50 %
CO:	6.10	20058.00	8.40	20002.00	20100.00 ppm
CO dilu:	2.10	2006.50	1.30	2006.50	2070.00 ppm

JUM-THC: out of service

TIME:	0.672222222222		TIME:	0.81806		AVERAGES	
O2:	13.34	%	O2:	14.92	%	O2:	14.34 %
CO2:	9.20	%	CO2:	5.68	%	CO2:	6.33 %
CO:	18888	ppm	CO:	9542	ppm	C0:	11413.6 ppm
CO dilu:	2006.5	ppm	CO dilu:	1331.4	ppm	CO dilu:	1393.73 ppm
						JUM-THC:	n/a

RESULTS

Flow:	146	cfm
Fire rate:	4.104	dry kg/hr
Particulate:	35.10	g/hr
	8.55	g/dry kg of fuel
	0.48	mg/Btu
EFFICIENCY:		
TOTAL	303,944	Btu output
TOTAL	516,041	Btu input
(output/input)	58.90%	

TEST No.: TD-MM5G-2B
DESCRIPTION: Modified Method 5G Testing of Furnace A @ High Heat Removal Rate

NAME: Russell Logan and Joey Valenti
DATE: 34869
TEST No.: TD-MM5G-2A
DESCRIPTION: Modified Method 5G Testing of Furnace A @ High Heat Removal Rate

CONDITIONS

Ambient Temp.:	67.62	F
Barometric Press.:	30.00	in Hg
Humidity:	29.89	%

FUEL INFORMATION

TYPE:	Red Oak	
CHARGE WEIGHT	83.50	lbs
MOISTURE:	25.14	%
HEATING VALUE:	8069.0	Btu/ dry lbs of fuel

PRELIMINARY VELOCITY TRAVERSE

Dist (in)		Temp (F)
0.4	0.100	73
1.5	0.140	74
4.5	0.140	74
5.6	0.120	73

GENERAL

Pre-Test Leak:	0.04	cfm
Post-Test Leak:	0.035	cfm
Total Time:	457	min
AVERAGE HEAT OUTPUT:	40,822	Btu/hr

MM5G WEIGHTS (grams)

FILTER A		FILTER B		PAN RINSE	
FINAL:	0.7165	FINAL:	0.6300	FINAL:	2.6135
TARE:	0.6258	TARE:	0.629	TARE:	2.5974
NET:	0.0907	NET:	0.0010	NET:	0.0161

CEM VALUES

	PRE-TEST		POST-TEST			
	ZERO	SPAN	ZERO	SPAN	ACTUAL SPAN	
O2:	-0.09	9.71	-0.06	9.70	9.70	%
CO2:	0.00	6.48	0.00	6.56	6.50	%
CO:	0.00	19902.00	6.10	19880.00	20100.00	ppm
CO dilu:	2.40	2006.80	1.20	2005.10	2070.00	ppm

JUM-THC: out of service

TIME:	0.67708333333		TIME:	0.802083		AVERAGES		
O2:	17.44	%	O2:	12.02	%	O2:	15.59	%
CO2:	3.54	%	CO2:	8.26	%	CO2:	5.16	%
CO:	4114	ppm	CO:	9941	ppm	C0:	6248.54	ppm
CO dilu:	1694.3	ppm	CO dilu:	901.5	ppm	CO dilu:	1301.4	ppm
						JUM-THC:	n/a	

RESULTS

Flow:	146	cfm
Fire rate:	3.97	dry kg/hr
Particulate:	49.90	g/hr
	12.56	g/dry kg of fuel
	0.71	mg/Btu
EFFICIENCY:		
TOTAL	313,424	Btu output
TOTAL	538,406	Btu input
(output/input)	58.21%	

NAME: Russell Logan and Joey Valenti
DATE: 06/27/95
TEST No.: TD-MM5G-2C
DESCRIPTION: Modified Method 5G Testing of Furnace A @ High Heat Removal Rate

CONDITIONS

Ambient Temp.:	80.63	F
Barometric Press.:	30.03	in Hg
Humidity:	84	%

FUEL INFORMATION

TYPE:	Red Oak	
CHARGE WEIGHT	87.0	lbs
MOISTURE:	23.90	%
HEATING VALUE:	8069.0	Btu/ dry lbs of fuel

PRELIMINARY VELOCITY TRAVERSE

Dist (in)		Temp (F)
0.4	0.145	77
1.5	0.145	77
4.5	0.140	77
5.6	0.125	77

GENERAL

Pre-Test Leak:	0.008	cfm
Post-Test Leak:	0.009	cfm
Total Time:	329	min
AVERAGE HEAT OUTPUT:	40,347	Btu/hr

MM5G WEIGHTS (grams)

FILTER A		FILTER B		PAN RINSE	
FINAL:	0.7640	FINAL:	0.6305	FINAL:	2.6365
TARE:	0.6269	TARE:	0.6298	TARE:	2.6226
NET:	0.1371	NET:	0.0007	NET:	0.0139

CEM VALUES

	PRE-TEST ZERO	PRE-TEST SPAN	POST-TEST ZERO	POST-TEST SPAN	ACTUAL SPAN	
O2:	-0.27	9.56	-0.03	9.72	9.70	%
CO2:	-0.02	6.80	0.02	6.43	6.50	%
CO:	57.00	39034.00	57.00	38606.80	40000.00	ppm
CO dilu:	0.00	2004.60	4.20	2004.70	2070.00	ppm

JUM-THC: out of service

TIME:	0.65277777778		TIME:	0.6875			AVERAGES	
O2:	7.57	%	O2:	11.08	%	O2:	9.552	%
CO2:	12.00	%	CO2:	9.00	%	CO2:	10.305	%
CO:	14221	ppm	CO:	25330	ppm	C0:	17906.6	ppm
CO dilu:	1064	ppm	CO dilu:	1948	ppm	CO dilu:	1224.325	ppm
						JUM-THC:	n/a	

RESULTS

Flow:	243	cfm
Fire rate:	5.81	dry kg/hr
Particulate:	143.20	g/hr
	24.65	g/dry kg of fuel
	1.39	mg/Btu
EFFICIENCY:		
TOTAL	219,936	Btu output
TOTAL	566,588	Btu input
(output/input)	38.82%	

WOODSTOVE TEST INFORMATION

NAME: Russell Logan and Joey Valenti
DATE: 06/30/95
TEST No.: TD-MM5G-2D
DESCRIPTION: Modified Method 5G Testing of Furnace A @ High Heat Removal Rate

CONDITIONS

Ambient Temp.:	73.28	F
Barometric Press.:	30.03	in Hg
Humidity:	84	%

FUEL INFORMATION

TYPE:	Red Oak	
CHARGE WEIGHT	81.2	lbs
MOISTURE:	22.14	%
HEATING VALUE:	8069.0	Btu/ dry lbs of fuel

PRELIMINARY VELOCITY TRAVERSE

Dist (in)		Temp (F)
0.4	0.115	85
1.5	0.135	85
4.5	0.135	84
5.6	0.125	84

GENERAL

Pre-Test Leak:	0.01	cfm
Post-Test Leak:	0.005	cfm
Total Time:	438	min
AVERAGE HEAT OUTPUT:	38,983	Btu/hr

MM5G WEIGHTS (grams)

FILTER A		FILTER B		PAN RINSE	
FINAL:	0.7296	FINAL:	0.6348	FINAL:	2.6479
TARE:	0.6338	TARE:	0.6353	TARE:	2.6408
NET:	0.0958	NET:	-0.0005	NET:	0.0071

CEM VALUES

	PRE-TEST ZERO	PRE-TEST SPAN	POST-TEST ZERO	POST-TEST SPAN	ACTUAL SPAN	
O2:	-0.08	9.70	0.00	9.44	9.70	%
CO2:	0.00	6.40	0.01	6.41	6.50	%
CO:	92.80	39383.90	105.80	39253.70	40000.00	ppm
CO dilu:	2.60	2006.30	3.60	2005.40	2070.00	ppm

JUM-THC: out of service

TIME:	0.49305555556		TIME:	0.581944		AVERAGES		
O2:	7.84	%	O2:	9.28	%	O2:	9.699	%
CO2:	12.50	%	CO2:	10.64	%	CO2:	10.423	%
CO:	24902	ppm	CO:	15381	ppm	C0:	24386.4	ppm
CO dilu:	1665	ppm	CO dilu:	1016	ppm	CO dilu:	1340.21	ppm
						JUM-THC:	n/a	

RESULTS

Flow:	241	cfm
Fire rate:	4.13	dry kg/hr
Particulate:	61.00	g/hr
	14.77	g/dry kg of fuel
	0.83	mg/Btu
EFFICIENCY:		
TOTAL	286,354	Btu output
TOTAL	536,436	Btu input
(output/input)	53.38%	

WOODSTOVE TEST INFORMATION

NAME: Russell Logan and Joey Valenti
DATE: 06/28/95
TEST No.: TD-MM5G-1A
DESCRIPTION: Modified Method 5G Testing of Furnace A @ Low Heat Removal Rate

CONDITIONS

Ambient Temp.:	73.38	F
Barometric Press.:	30.09	in Hg
Humidity:	75	%

FUEL INFORMATION

TYPE:	Red Oak	
CHARGE WEIGHT	80.5	lbs
MOISTURE:	21.76	%
HEATING VALUE:	8069.0	Btu/ dry lbs of fuel

PRELIMINARY VELOCITY TRAVERSE

Dist (in)		Temp (F)
0.4	0.100	85
1.5	0.135	86
4.5	0.145	87
5.6	0.125	87

GENERAL

Pre-Test Leak:	0.005	cfm
Post-Test Leak:	0.005	cfm
Total Time:	738	min
AVERAGE HEAT OUTPUT:	19,936	Btu/hr

MM5G WEIGHTS (grams)

FILTER A		FILTER B		PAN RINSE	
FINAL:	0.7305	FINAL:	0.6281	FINAL:	2.6461
TARE:	0.628	TARE:	0.6291	TARE:	2.6388
NET:	0.1025	NET:	-0.0010	NET:	0.0073

CEM VALUES

	PRE-TEST ZERO	PRE-TEST SPAN	POST-TEST ZERO	POST-TEST SPAN	ACTUAL SPAN
O2:	-0.26	9.20	0.38	8.38	9.70 %
CO2:	0.00	6.44	0.02	6.46	6.50 %
CO:	36.60	39172.40	85.40	39152.00	40000.00 ppm
CO dilu:	1.60	2005.20	2.00	2003.70	2070.00 ppm

JUM-THC: out of service

TIME:	0.57638888889		TIME:	0.654167			AVERAGES	
O2:	5.83	%	O2:	10.5	%	O2:	10.92	%
CO2:	14.48	%	CO2:	8.54	%	CO2:	8.74	%
CO:	29236	ppm	CO:	9521	ppm	C0:	14458.1	ppm
CO dilu:	2002	ppm	CO dilu:	112	ppm	CO dilu:	755.19	ppm
						JUM-THC:	n/a	

RESULTS

Flow:	231	cfm
Fire rate:	2.44	dry kg/hr
Particulate:	38.50	g/hr
	15.79	g/dry kg of fuel
	0.89	mg/Btu
EFFICIENCY:		
TOTAL	247,498	Btu output
TOTAL	533,471	Btu input
(output/input)	46.39%	

WOODSTOVE TEST INFORMATION

NAME: Russell Logan and Joey Valenti
DATE: 06/29/95
TEST No.: TD-MM5G-1B
DESCRIPTION: Modified Method 5G Testing of Furnace @ Low Heat Removal Rate

CONDITIONS

Ambient Temp.:	71.82	F
Barometric Press.:	30.08	in Hg
Humidity:	82	%

FUEL INFORMATION

TYPE:	Red Oak	
CHARGE WEIGHT	83.0	lbs
MOISTURE:	20.40	%
HEATING VALUE:	8069.0	Btu/ dry lbs of fuel

PRELIMINARY VELOCITY TRAVERSE

Dist (in)		Temp (F)
0.4	0.110	85
1.5	0.137	84
4.5	0.135	84
5.6	0.117	82

GENERAL

Pre-Test Leak:	0.005	cfm
Post-Test Leak:	0.005	cfm
Total Time:	655	min
AVERAGE HEAT OUTPUT:	21,138	Btu/hr

MM5G WEIGHTS (grams)

FILTER A		FILTER B		PAN RINSE	
FINAL:	0.7344	FINAL:	0.6327	FINAL:	2.6574
TARE:	0.6293	TARE:	0.6328	TARE:	2.6508
NET:	0.1051	NET:	-0.0001	NET:	0.0066

CEM VALUES

	PRE-TEST ZERO	PRE-TEST SPAN	POST-TEST ZERO	POST-TEST SPAN	ACTUAL SPAN
O2:	-0.19	10.32	0.15	10.87	9.70 %
CO2:	0.00	6.45	0.00	6.40	6.50 %
CO:	93.60	39278.20	69.20	39160.20	40000.00 ppm
CO dilu:	1.80	2005.50	4.40	2005.00	2070.00 ppm

JUM-THC: out of service

TIME:	0.65416666667		TIME:	0.85625		AVERAGES	
O2:	9.12	%	O2:	9.61	%	O2:	9.92 %
CO2:	11.28	%	CO2:	9.23	%	CO2:	9.608 %
CO:	31006	ppm	CO:	11719	ppm	C0:	17524.6 ppm
CO dilu:	562	ppm	CO dilu:	110	ppm	CO dilu:	839.26 ppm
						JUM-THC:	n/a

RESULTS

Flow:	238	cfm
Fire rate:	2.86	dry kg/hr
Particulate:	48.60	g/hr
	16.97	g/dry kg of fuel
	0.95	mg/Btu
EFFICIENCY:		
TOTAL	236,067	Btu output
TOTAL	556,252	Btu input
(output/input)	42.44%	

WOODSTOVE TEST INFORMATION

NAME: Russell Logan and Joey Valenti
DATE: 10/24/95
TEST No.: TD-MM5G-2
DESCRIPTION: Modified Method 5G Testing of Furnace A with Catalyst @ High Heat Output

CONDITIONS

Ambient Temp.:	67.94	F
Barometric Press.:	30.21	in Hg
Humidity:	74	%

FUEL INFORMATION

TYPE:	Red Oak	
CHARGE WEIGHT	84.0	lbs
MOISTURE:	21.74	%
HEATING VALUE:	8069.0	Btu/ dry lbs of fuel

PRELIMINARY VELOCITY TRAVERSE

Dist (in)		Temp (F)
0.4	0.090	73
1.5	0.141	73
4.5	0.140	72
5.6	0.125	73

GENERAL

Pre-Test Leak:	0.015	cfm
Post-Test Leak:	0.018	cfm
Total Time:	401	min
AVERAGE HEAT OUTPUT:	39,922	Btu/hr

MM5G WEIGHTS (grams)

FILTER A		FILTER B		PAN RINSE	
FINAL:	0.7093	FINAL:	0.6325	FINAL:	2.6327
TARE:	0.6302	TARE:	0.632	TARE:	2.6234
NET:	0.0791	NET:	0.0005	NET:	0.0093

CEM VALUES

	PRE-TEST		POST-TEST		
	ZERO	SPAN	ZERO	SPAN	ACTUAL SPAN
O2:	-0.27	14.83	-0.27	14.89	15.00 %
CO2:	0.05	15.04	0.05	15.43	15.00 %
CO:	0.01	2.06	0.01	2.07	2.01 %
CO dilu:	4.88	2006.84	4.88	2006.84	2070.00 ppm
JUM-THC:	6.1	81.2	12.21	73.24	80.9 ppm

TIME:	0.6		TIME:	0.686111		AVERAGES	
O2:	9.8	%	O2:	11.32	%	O2:	11.087 %
CO2:	10.64	%	CO2:	8.84	%	CO2:	9.377 %
CO:	0.923	%	CO:	0.754	%	C0:	13681 ppm
CO dilu:	507	ppm	CO dilu:	173	ppm	CO dilu:	775.97 ppm
						JUM-THC:	2527.43 ppm

RESULTS

Flow:	239	cfm
Fire rate:	4.68	dry kg/hr
Particulate:	53.80	g/hr
	11.49	g/dry kg of fuel
	0.65	mg/Btu
EFFICIENCY:		
TOTAL	264,724	Btu output
TOTAL	556,757	Btu input
(output/input)	47.55%	

WOODSTOVE TEST INFORMATION

NAME: Russell Logan and Joey Valenti
DATE: 10/25/95
TEST No.: TD-MM5G-1
DESCRIPTION: Modified Method 5G Testing of Furnace A with Catalyst @ Low Heat Output

CONDITIONS

Ambient Temp.:	67.93	F
Barometric Press.:	30.19	in Hg
Humidity:	61	%

FUEL INFORMATION

TYPE:	Red Oak	
CHARGE WEIGHT	87.5	lbs
MOISTURE:	18.90	%
HEATING VALUE:	8069.0	Btu/ dry lbs of fuel

PRELIMINARY VELOCITY TRAVERSE

Dist (in)		Temp (F)
0.4	0.100	67
1.5	0.135	67
4.5	0.135	67
5.6	0.115	67

GENERAL

Pre-Test Leak:	0.01	cfm
Post-Test Leak:	0.013	cfm
Total Time:	806	min
AVERAGE HEA	23,993	Btu/hr

MM5G WEIGHTS (grams)

FILTER A		FILTER B		PAN RINSE	
FINAL:	0.7364	FINAL:	0.6150	FINAL:	2.6418
TARE:	0.6129	TARE:	0.6139	TARE:	2.6318
NET:	0.1235	NET:	0.0011	NET:	0.0100

CEM VALUES

	PRE-TEST		POST-TEST		ACTUAL SPAN
	ZERO	SPAN	ZERO	SPAN	
O2:	-0.09	15.08	-0.09	15.14	15.00 %
CO2:	0.00	15.45	0.00	14.94	15.00 %
CO:	0.00	2.11	0.00	2.07	2.01 %
CO dilu:	0.00	2009.28	4.88	2009.28	2070.00 ppm
JUM-THC:	0	79.35	12.21	99.38	80.9 ppm

TIME:	0.51041666667		TIME:	0.686111		AVERAGES		
O2:	11.63	%	O2:	11.84	%	O2:	13.52	%
CO2:	10.42	%	CO2:	9.25	%	CO2:	7.323	%
CO:	3.018	%	CO:	1.428	%	C0:	0.9501	ppm
CO dilu:	1298	ppm	CO dilu:	2006	ppm	CO dilu:	540.912	ppm
						JUM-THC:	1358.32	ppm

RESULTS

Flow:	238	cfm
Fire rate:	2.485	dry kg/hr
Particulate:	37.80	g/hr
	15.21	g/dry kg of fuel
	0.86	mg/Btu
EFFICIENCY:		
TOTAL	322,976	Btu output
TOTAL	593,808	Btu input
(output/input)	54.39%	

SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer:	
Model:	
Date:	6/13/95
Run:	1
Project #:	
Test Duration: (minutes)	1810

RESULTS

AVERAGE ADJUSTED EMISSION RATE:	16.585
Burn Rate (Dry kg/hr):	1.524

PRESSURE FACTOR:	0.97309
TEMPERATURE FACTORS	
DGM #1:	0.96776
DGM #2:	0.96912
VOLUMES SAMPLED	
DGM #1:	90.01393
DGM #2:	88.21459
TOTAL TUNNEL VOLUME (scf):	660202.891
SAMPLE RATIOS	
Sample Train 1:	7334.453
Sample Train 2:	7484.056
TOTAL EMISSIONS	
Sample Train 1 (g):	436.3999
Sample Train 2 (g):	428.0880
EMISSION RATES	
Sample Train 1 (g/hr):	14.4663
Sample Train 2 (g/hr):	14.1908
ADJUSTED EMISSION RATES	
Sample Train 1 (g/hr):	16.7174
Sample Train 2 (g/hr):	16.4527
DEVIATION:	1.60%

BAROMETRIC PRESSURE		
	Average:	29.115
	Start:	29.11
	End:	29.12
DRY GAS METER VALUES		
DGM #1	Final:	661.836
	Initial:	567.534
DGM #2	Final:	1037.190
	Initial:	944.693
TEMPERATURES (DEG. RANKIN)		
	DGM #1:	545.591
	DGM #2:	544.824
CALIBRATION FACTORS		
	DGM #1:	1.0136
	DGM #2:	1.0113
TUNNEL FLOW RATE:		364.753
PARTICULATE CATCH (mg)		
	Sample Train 1	59.5
	Sample Train 2	57.2

SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer:	
Model:	
Date:	6/15/95
Run:	2
Project #:	
Test Duration: (minutes)	872

RESULTS

AVERAGE ADJUSTED EMISSION RATE:	36.009
Burn Rate (Dry kg/hr):	3.352

PRESSURE FACTOR:	0.97727
TEMPERATURE FACTORS	
DGM #1:	0.97327
DGM #2:	0.97362
VOLUMES SAMPLED	
DGM #1:	44.20632
DGM #2:	42.83355
TOTAL TUNNEL VOLUME (scf):	314536.353
SAMPLE RATIOS	
Sample Train 1:	7115.190
Sample Train 2:	7343.225
TOTAL EMISSIONS	
Sample Train 1 (g):	557.8309
Sample Train 2 (g):	502.2766
EMISSION RATES	
Sample Train 1 (g/hr):	38.3829
Sample Train 2 (g/hr):	34.5603
ADJUSTED EMISSION RATES	
Sample Train 1 (g/hr):	37.5756
Sample Train 2 (g/hr):	34.4422
DEVIATION:	8.70%

BAROMETRIC PRESSURE		
	Average:	29.24
	Start:	29.24
	End:	29.24
DRY GAS METER VALUES		
DGM #1	Final:	707.779
	Initial:	661.926
DGM #2	Final:	81.840
	Initial:	37.326
TEMPERATURES (DEG. RANKIN)		
	DGM #1:	542.500
	DGM #2:	542.303
CALIBRATION FACTORS		
	DGM #1:	1.0136
	DGM #2:	1.0113
TUNNEL FLOW RATE:		360.707
PARTICULATE CATCH (mg)		
	Sample Train 1	78.4
	Sample Train 2	68.4

SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer:	
Model:	
Date:	6-19-95
Run:	3
Project #:	
Test Duration: (minutes)	1833

RESULTS

AVERAGE ADJUSTED EMISSION RATE:	17.676
Burn Rate (Dry kg/hr):	1.677

PRESSURE FACTOR:	0.97376
TEMPERATURE FACTORS	
DGM #1:	0.97358
DGM #2:	0.97243
VOLUMES SAMPLED	
DGM #1:	94.17376
DGM #2:	92.67136
TOTAL TUNNEL VOLUME (scf):	665485.824
SAMPLE RATIOS	
Sample Train 1:	7066.574
Sample Train 2:	7181.138
TOTAL EMISSIONS	
Sample Train 1 (g):	469.2205
Sample Train 2 (g):	476.1095
EMISSION RATES	
Sample Train 1 (g/hr):	15.3591
Sample Train 2 (g/hr):	15.5846
ADJUSTED EMISSION RATES	
Sample Train 1 (g/hr):	17.5693
Sample Train 2 (g/hr):	17.7832
DEVIATION:	1.21%

BAROMETRIC PRESSURE		
	Average:	29.135
	Start:	29.22
	End:	29.05
DRY GAS METER VALUES		
DGM #1	Final:	805.843
	Initial:	707.840
DGM #2	Final:	179.098
	Initial:	82.325
TEMPERATURES (DEG. RANKIN)		
	DGM #1:	542.330
	DGM #2:	542.970
CALIBRATION FACTORS		
	DGM #1:	1.0136
	DGM #2:	1.0113
TUNNEL FLOW RATE:		363.058
PARTICULATE CATCH (mg)		
	Sample Train 1	66.4
	Sample Train 2	66.3

SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer:	
Model:	
Date:	6-21-95
Run:	4
Project #:	
Test Duration: (minutes)	1063

RESULTS

AVERAGE ADJUSTED EMISSION RATE:	36.951
Burn Rate (Dry kg/hr):	2.834

PRESSURE FACTOR:	0.97343
TEMPERATURE FACTORS	
DGM #1:	0.97606
DGM #2:	0.97434
VOLUMES SAMPLED	
DGM #1:	55.50534
DGM #2:	53.77269
TOTAL TUNNEL VOLUME (scf):	381915.228
SAMPLE RATIOS	
Sample Train 1:	6880.693
Sample Train 2:	7102.401
TOTAL EMISSIONS	
Sample Train 1 (g):	644.0329
Sample Train 2 (g):	688.9329
EMISSION RATES	
Sample Train 1 (g/hr):	36.3518
Sample Train 2 (g/hr):	38.8861
ADJUSTED EMISSION RATES	
Sample Train 1 (g/hr):	35.9177
Sample Train 2 (g/hr):	37.9840
DEVIATION:	5.59%

BAROMETRIC PRESSURE		
	Average:	29.125
	Start:	29.11
	End:	29.14
DRY GAS METER VALUES		
DGM #1	Final:	863.730
	Initial:	806.095
DGM #2	Final:	235.200
	Initial:	179.138
TEMPERATURES (DEG. RANKIN)		
	DGM #1:	540.949
	DGM #2:	541.907
CALIBRATION FACTORS		
	DGM #1:	1.0136
	DGM #2:	1.0113
TUNNEL FLOW RATE:		359.281
PARTICULATE CATCH (mg)		
	Sample Train 1	93.6
	Sample Train 2	97.0

SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer:	
Model:	
Date:	6-26-95
Run:	5
Project #:	
Test Duration: (minutes)	300

RESULTS

AVERAGE ADJUSTED EMISSION RATE:	0.014
Burn Rate (Dry kg/hr):	0.000

PRESSURE FACTOR:	0.96741
TEMPERATURE FACTORS	
DGM #1:	0.98159
DGM #2:	0.98050
VOLUMES SAMPLED	
DGM #1:	15.15868
DGM #2:	14.88113
TOTAL TUNNEL VOLUME (scf):	111186.872
SAMPLE RATIOS	
Sample Train 1:	7334.866
Sample Train 2:	7471.667
TOTAL EMISSIONS	
Sample Train 1 (g):	0.0073
Sample Train 2 (g):	0.0224
EMISSION RATES	
Sample Train 1 (g/hr):	0.0015
Sample Train 2 (g/hr):	0.0045
ADJUSTED EMISSION RATES	
Sample Train 1 (g/hr):	0.0081
Sample Train 2 (g/hr):	0.0205
DEVIATION:	86.60%

BAROMETRIC PRESSURE		
	Average:	28.945
	Start:	28.94
	End:	28.95
DRY GAS METER VALUES		
DGM #1	Final:	879.547
	Initial:	863.798
DGM #2	Final:	250.758
	Initial:	235.245
TEMPERATURES (DEG. RANKIN)		
	DGM #1:	537.903
	DGM #2:	538.500
CALIBRATION FACTORS		
	DGM #1:	1.0136
	DGM #2:	1.0113
TUNNEL FLOW RATE:		370.623
PARTICULATE CATCH (mg)		
	Sample Train 1:	0.0010
	Sample Train 2:	0.0030

If deviation is greater than 7.5% due to low particulate catch
The two emission rates shall not differ by 7.5%
of the weighted average emission rate limit (4.1 or 7.5) (5g-3)

Use the following:

Catalytic units 7.5% of 4.1 g/hr	0.30%
Non catalytic units 7.5% of 7.5 g/hr	0.16%

Appendix G - Organic Analyses Data Sheets.

January 26, 1996

Joey Valenti
Acurex Environmental
4915 Prospectus Dr. Suite F
Durham, NC 27713

Dear Mr. Valenti,

The Lab has completed the analysis of the MM5 train samples that were submitted under the Emissions from Wood-Fired Residential Furnaces Project. Details of the various sections of analytical work are detailed below. Analytical results for each sample and other support documentation are detailed on the following sheets.

Receiving:

The following samples were received. Three sets of data have been combined in this report. The first set is the data from the tests done on Furnace A in June of 1995. The second set is the data from the June testing on Furnace B and the third from the October testing of A .. The descriptions of the samples are detailed on attached sheets.

The samples from Furnace B were not accompanied by a Chain-of-Custody. A sample inventory was taken when the samples were received and that has been used in lieu of a COC.

Extraction:

Generally, the filter and the rinses were each extracted together for a specific train and the XAD separately, for Furnace A samples. The B samples were extracted separately as filter pairs, rinses and XAD. The solvent was Methylene Chloride. Surrogates were not spiked due to the use of the extracts for other analyses as well as PAHs. The final extract volume was 5ml.

A pair of blank XAD spikes were extracted with this project. They are detailed on the attached sheets.

A glassware blank extraction was performed. It was clean and it's data is included before the set 1 test data. (WSGB725.D)

Analysis:

XAD samples were spiked with internal standards separately and then injected separately. The Filter and Rinse samples were, usually, composited with equal portions, then the composite spiked with internal standards and injected.

The injected samples were analyzed for Polynuclear Aromatic Hydrocarbon. The specific targets are listed on the attached sample summary sheets.

The GC/MS was tuned each day with perfluorotributylamine by the MS's data system.

Samples from the June testing were analyzed well outside the method specified hold times due to the stop work order that was put into effect. The October testing samples were analyzed within hold time.

The B series of samples had a "Side A" and a "Side B" for each of the first two tests. The four XAD extracts were each analyzed twice to demonstrate the instrument precision on real samples. The analysis of the duplicates was on different days than the initial analysis. The results were surprisingly good with RPDs around 5%.

Data:

Each of the analyzed fractions were compared with the target analyte list (see attached sheets). If a peak was detected for the target ion inside the retention time window it was compared with the reference spectra for the target compound. If the spectra matched, the peak was reported.

If any internal standards were outside the 8270 criterion it is noted on the sample summary sheet.

The standard PAH target list was supplemented with four additional compounds, 2-Methylnaphthalene, Dibenzofuran, 7,12-Dimethylbenz(a)anthracene and 3-Methylcholanthrene. Many on the samples had significant amounts of the first two supplemental compounds.

In many of the samples the Naphthalene level was above the calibration level. Generally the level was less than double the highest calibrated point. Please notify me if the further expenditure of funds to rerun these samples diluted is needed.

If you have any questions on the data please feel free to call me.

Semi-Volatile Standard Workup Criteria

Tuning

In order to achieve maximum broad range sensitivity, the mass spectrometer was computer tuned with perfluorotributylamine instead of the method specified decafluorotriphenylphosphine.

Calibration Check

The method specified checks are evaluated and the check sample rerun if problems are detected.

Target Analysis

The calibrated range was 10 to 160 µg/ml of extract. Any target analyte detected between 1 and 10 µg/ml were flagged "J" as estimated. Any target analyte detected above 160 µg/ml were flagged "E" as estimated. A 1 ml final extract volume is assumed unless otherwise stated. Units on the quantitation report are in µg/ml of extract and dilution factors accounted for on the summary report. Units on the summary report are in µg per train fraction. A 1µl injection was used.

EPA/AEERL ONSITE LABORATORY SUPPORT CONTRACT
SAMPLE CHAIN OF CUSTODY RECORD
rev. 11/94

Facility of Origin: WOODSTOVE LAB

Facility of Destination: EPA/AEERL ONSITE LAB

OSL Project #:

Project: EMISSIONS FROM WOOD-FIRED RESIDENTIAL HEATING FURNACE A

Request Results By:

Report Results To: JOEY VALENTI

Samples Collected By: RUSSELL LOGAN AND JOEY VALENTI

For Problems Contact (Name/Phone #): JOEY VALENTI 541-4380 / 1847

Analyses Requested

Field Sample ID	Sample Description:	Date and Time	PAH	GRAV	TCO						Remarks:	Lab ID:
T·D·MM5G·PR·1A	ACETONE RINSE - LOW BURN (A)	6/28/95	x	x	x							
T·D·MM5G·F·1A	FILTER - LOW BURN (A)	6/28/95	x	x	x							
T·D·MM5G·F2·1A	FILTER 2 - LOW BURN (A)	6/28/95	x	x	x							
T·D·MM5G·X·1A	XAD - LOW BURN (A)	6/28/95	x	x	x							
T·D·MM5G·PR·2A	ACETONE RINSE - HIGH BURN (A)	6/15/95	x	x	x							
T·D·MM5G·F·2A	FILTER - HIGH BURN (A)	6/15/95	x	x	x							
T·D·MM5G·F2·2A	FILTER 2 - HIGH BURN (A)	6/15/95	x	x	x							
T·D·MM5G·X·2A	XAD - HIGH BURN (A)	6/15/95	x	x	x							
T·D·MM5G·PR·1B	ACETONE RINSE - LOW (B)	6/29/95	x	x	x							
T·D·MM5G·F·1B	FILTER - LOW (B)	6/29/95	x	x	x							
T·D·MM5G·F2·1B	FILTER 2 - LOW (B)	6/29/95	x	x	x							
T·D·MM5G·X·1B	XAD - LOW (B)	6/29/95	x	x	x							

Comments:

Relinquished By (1):

Date/Time (1):

Received By (1):

Date/Time (1):

Relinquished By (2):

Date/Time (2):

Received By (2):

Date/Time (2):

Disposal Information (Include Date, Time, Custodian, and Comments):

EPA/AEERL ONSITE LABORATORY SUPPORT CONTRACT
SAMPLE CHAIN OF CUSTODY RECORD
rev. 11/94

Facility of Origin:	Facility of Destination:	OSL Project #:
WOODSTOVE LAB	EPA/AEERL ONSITE LAB	

Analyses Requested

Project: EMISSIONS FROM WOOD-FIRED RESIDENTIAL HEATING FURNACE A

Request Results By:

Report Results To: JOEY VALENTI

Samples Collected By: RUSSELL LOGAN AND JOEY VALENTI

For Problems Contact (Name/Phone #): JOEY VALENTI 541-4380

Field Sample ID	Sample Description:	Date and Time	PAH	GRAV	TCO						Remarks:	Lab ID:
T.D.MM5G.PR.2B	ACETONE RINSE - HIGH (B)	6/19/95	x	x	x							
T.D.MM5G.F.2B	FILTER - HIGH (B)	6/19/95	x	x	x							
T.D.MM5G.F2.2B	FILTER 2 - HIGH (B)	6/19/95	x	x	x							
T.D.MM5G.X.2B	XAD - HIGH (B)	6/19/95	x	x	x							
T.D.MM5G.PR.2C	ACETONE RINSE - HIGH (C)	6/27/95	x	x	x							
T.D.MM5G.F.2C	FILTER - HIGH (C)	6/27/95	x	x	x							
T.D.MM5G.F2.2C	FILTER 2 - HIGH (C)	6/27/95	x	x	x							
T.D.MM5G.X.2C	XAD - HIGH (C)	6/27/95	x	x	x							
T.D.MM5G.PR.2D	ACETONE RINSE - HIGH (D)	6/30/95	x	x	x							
T.D.MM5G.F.2D	FILTER - HIGH (D)	6/30/95	x	x	x							
T.D.MM5G.F2.2D	FILTER 2 - HIGH (D)	6/30/95	x	x	x							
T.D.MM5G.X.2D	XAD - HIGH (D)	6/30/95	x	x	x							

Comments:

Relinquished By (1):

Date/Time (1):

Received By (1):	Date/Time (1):	Relinquished By (2):	Date/Time (2):	Received By (2):	Date/Time (2):

Disposal Information (Include Date, Time, Custodian, and Comments):

EPA/AEERL ONSITE LABORATORY SUPPORT CONTRACT
SAMPLE CHAIN OF CUSTODY RECORD
rev. 11/94

Facility of Origin:	Facility of Destination:	Analyses Requested	OSL Project #:
WOODSTOVE LAB	EPA/AEERL ONSITE LAB		

Project: EMISSIONS FROM WOOD - FIRED RESIDENTIAL HEATING FURNACE A

Request Results By:

Report Results To: JOEY VALENTI

Samples Collected By: RUSSELL LOGAN AND JOEY VALENTI

For Problems Contact (Name/Phone #): JOEY VALENTI 541-4380

Field Sample ID	Sample Description:	Date and Time	PAH	GRAV	TCO						Remarks:	Lab ID:
T.D.MM5G.PR.5	ACETONE RINSE - BLANK	6/13/95	x	x	x							
T.D.MM5G.F.5	FILTER - BLANK	6/13/95	x	x	x							
T.D.MM5G.F2.5	FILTER 2 - BLANK	6/13/95	x	x	x							
T.D.MM5G.PR.0	ACETONE BLANK	6/30/95	x	x	x							

Comments:

Relinquished By (1):

Date/Time (1):

Received By (1):	Date/Time (1):	Relinquished By (2):	Date/Time (2):	Received By (2):	Date/Time (2):

Disposal Information (Include Date, Time, Custodian, and Comments):

Furnace B

Table 1: How to Analyze Probe and Filter Samples for PAH

Combine 1 ml from each of these well mixed, correct volume extracts together and mix well before PAH analysis. Retain the ballance of the extracts separately.	Multiply the final concentration in ug/ml by this factor to derive the final mass on the filter and probe	Test and System Number	
filter 53-54 filter 57-58 Dish 1 (probe A) Dish 3 (probe C) (note: Furnace B. report shows this probe as probe E in two places however two Acurex personnel on separate occasions observed the label to be Probe C. Based on other identifying information we are assuming probe C=probe E).	20 ml	Test 1 System 1	11/28
filter 55-56 filter 59-60 Dish 2 (probe B) Dish 4 (probe D)	20	Test 1 System 2	11/28
filter 65-66 filter 69-70 Dish 5 (probe G) ✓ Dish 7 (probe I)	20	Test 2 System 1	11/27
Filter 67-68 Filter 71-72 Dish 6 (Probe H) ✓ Dish 8 (probe J)	20	Test 2 System 2	11/27
Filter 61-62 Dish 9 (Probe A)	10	Test 3 System 1	11/28
Filter 63-64 Dish 10 (probe B)	10	Test 3 System 2	11/28
Filter 77-78 Filter 81-82 Dish 11 (Probe G) ✓ Dish 13 (Probe I) on Run log as 12	20	Test 4 System 1	11/27
Filter 79-80 Filter 83-84 ✓ Dish 12 (Probe H) Dish 14 (Probe J)	20	Test 4 System 2	11/27
Filter 85-86	5	Test 5 System 1	11/28
Filter 87-88	5	Test 5 System 2	11/28

Sarah Brubakers Table in Lieu
OF Custody Sheet For Reference only

TEST	Sample Type	ID	Location of Test	Date	System	Filter Numbers	Probe
1	XAD	side A	Furnace B	6/(13-14)/95			
1	XAD	side B		6/(13-14)/95			
2	XAD	side A		6/15/95			
2	XAD	side B		6/15/95			
3	XAD			6/20/95	1		
3	XAD			6/20/95	2		
4	XAD			6/21/95	1		
4	XAD			6/21/95	2		
5	XAD	blank		6/26/95	1		
5	XAD			6/26/95	2		
1	filter			6/16/95	1	53-54 ✓	
1	filter			6/16/95	2	55-56 ✓	
1	filter			6/16/95	1	57-58 ✓	
1	filter			6/16/95	2	59-60 ✓	
2	filter			6/20/95	1	65-66 ✓	
2	filter			6/20/95	2	67-68 ✓	
2	filter			6/20/95	1	69-70 ✓	
2	filter			6/20/95	2	71-72 ✓	
3	filter			6/20/95	1	61-62 ✓	
3	filter			6/20/95	2	63-64 ✓	
4	filter			6/20/95	1	77-78 ✓	
4	filter			6/20/95	2	79-80 ✓	
4	filter			6/20/95	1	81-82 ✓	
4	filter			6/20/95	2	83-84 ✓	
5	filter			6/20/95	2	87-88 ✓	
5	Filter				1	85-86 ✓	
2	woodsample			6/15/95			
4	woodsample						
1	dish 1				1	✓	A
1	dish 2				2	✓	B
1	dish 3				1	✓	C
1	dish 4				2	✓	D
2	dish 5				1	✓	G
2	dish 6				2	✓	H
2	dish 7				1	✓	I
2	dish 8				2	✓	J
3	dish 9				1	✓	A
3	dish 10				2	✓	B
4	dish 11				1	✓	G
4	dish 12				2	✓	H
4	dish 13				1	✓	I
4	dish14				2	✓	J

Sheet1

RECIEVED	SAMPLE CUST ID	DESCRIPTION	COLLECTED	EXTRACTED	CAPPED	CHECKED OUT FOR GRAV/TCO	GC/MS	REPORTED
10/31/95	TCD-MM5G-2-F2	HIGH BURN-BACK	10/25/95	11/1/95	11/2/95	11/8/95		
10/31/95	TCD-MM5G-2-F1	HIGH BURN-FRONT	10/25/95	11/1/95	11/2/95	11/9/95		
10/31/95	TCD-MM5G-2-PR	HIGH BURN-PAN	10/25/95	11/6/95	11/6/95	11/10/95		
10/31/95	TCD-MM5G-X-2	XAD HIGH BURN	10/25/95	11/2/95	11/3/95	11/11/95		
10/31/95	TCD-MM5G-X-1	XAD LOW BURN	10/26/95	11/2/95	11/3/95	11/12/95		
10/31/95	TCD-MM5G-FA1-	LOW BURN RATE-FRONT	10/26/95	11/1/95	11/2/95	11/13/95		
10/31/95	TCD-MM5G-FB1-	LOW BURN RATE-BACK	10/26/95	11/1/95	11/2/95	11/14/95		
10/31/95	TCD-MM5G-PR1-	LOW BURN RATE-PAN	10/26/95	11/6/95	11/6/95	11/15/95		
10/31/95	BLANK	XAD	10/26/95	11/2/95	11/3/95	11/16/95		
10/31/95	ACETONE ONLY		10/26/95	11/6/95	11/6/95	11/17/95		
10/31/95	TCD-MM5G-FA-5	FRONT HALF FILTER-BLANK	10/26/95	11/2/95	11/3/95	11/18/95		
10/31/95	TCD-MM5G-FB-5	BACK HALF FILTER-BLANK	10/26/95	11/1/95	11/2/95	11/19/95		
10/31/95	TCD-MM5G-PR-5	PAN RINSE BLANK	10/26/95	11/6/95	11/6/95	11/20/95		

1 WSTCD2F2.D 11/22/95
combine 2 ~~WSTCDX2~~ WS2F12PR.D 11/29/9
11/24/95
3 WSTCDX2.D 11/24/95
4 WSXIDIL.D
combine 5 WSRABPID.D 11/24/95
11/24/95
6 WS MM5GBK.D 11/24/95
7 WS MM5GAB.D
combine 8 WSFAPB5.D 11/22/95

8 ANALYSES

~~ACETONE BLANK 11/24/95~~
~~MM5G BBlank 11/24/95~~

G10

Samples for The Emissions from Wood-Fired Residential Furnaces Project

Furnace A

Sample ID.	Date Sampled	Compositing	Date Analyzed	MS File ID
TD-MM5G-PR-1A	6/28/95	with F and F2		
TD-MM5G-F-1A	6/28/95	with PR and F2	1/25/96	WSCOMP1A.D
TD-MM5G-F2-1A	6/28/95	with PR and F		
TD-MM5G-X-1A	6/28/95	none	1/17/96	WSTDX1A.D
TD-MM5G-PR-2A	6/15/95	with F and F2		
TD-MM5G-F-2A	6/15/95	with PR and F2	12/9/95	WSTD2A.D
TD-MM5G-F2-2A	6/15/95	with PR and F		
TD-MM5G-X-2A	6/15/95	none	12/14/95	WSTDX2AD.D
TD-MM5G-PR-1B	6/29/95	with F and F2		
TD-MM5G-F-1B	6/29/95	with PR and F2	12/8/95	WSTDFP1B.D
TD-MM5G-F2-1B	6/29/95	with PR and F		
TD-MM5G-X-1B	6/29/95	none	12/13/95	WSTDX1BD.D
TD-MM5G-PR-2B	6/19/95	with F and F2		
TD-MM5G-F-2B	6/19/95	with PR and F2	12/11/95	WSTD2B.D
TD-MM5G-F2-2B	6/19/95	with PR and F		
TD-MM5G-X-2B	6/19/95	none	12/12/95	WSTDX2B.D
TD-MM5G-PR-2C	6/27/95	with F and F2		
TD-MM5G-F-2C	6/27/95	with PR and F2	12/9/95	WSTD2C.D
TD-MM5G-F2-2C	6/27/95	with PR and F		
TD-MM5G-X-2C	6/27/95	none	12/12/95	WSTDX2C.D
TD-MM5G-PR-2D	6/30/95	with F and F2		
TD-MM5G-F-2D	6/30/95	with PR and F2	12/9/95	WSTD2D.D
TD-MM5G-F2-2D	6/30/95	with PR and F		
TD-MM5G-X-2D	6/30/95	none	12/12/95	WSTDX2D.D
TD-MM5G-PR-5	6/13/95	with F and F2		
TD-MM5G-F-5	6/13/95	with PR and F2	12/11/95	WSTD5D.D
TD-MM5G-F2-5	6/13/95	with PR and F		
TD-MM5G-PR-0	6/30/95	none	12/8/95	WSTDPR0A.D

SAMPLE: WS PAH Blank Resin Spike			
MS FILE :WSPAHMS.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces -			
ANALYST: Bill Preston	Extract		
	Volume	1	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 29 Nov 95 12:30			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
			amount (μg)
Target Compounds	MDL	PQL	and % rec.
Naphthalene	1.21		88
2-methylnaphthalene		10	NS
Acenaphthylene	1		86
Acenaphthene	0.79		89
Dibenzofuran	0.86		NS
Fluorene	0.83		81
Phenanthrene	0.55		83
Anthracene	0.59		82
Fluoranthene	0.32		87
Pyrene	0.33		88
Chrysene	0.23		86
Benzo(a)anthracene	0.24		85
Benzo(b)fluoranthene	0.52		86
7,12-Dimethylbenz(a)anthracene			NS
Benzo(k)fluoranthene	0.7		86
Benzo(a)pyrene	0.28		95
3-methylcholanthrene			NS
Indeno(1,2,3-cd)pyrene	0.62		82
Dibenz(a,h)anthracene	0.64		86
Benzo(ghi)perylene	0.52		101

SAMPLE: WS PAH Blank Resin Spike Duplicate			
MS FILE :WSPAHMSD.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	1	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 29 Nov 95 1:30			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
			amount (μg)
Target Compounds	MDL	PQL	and % rec.
Naphthalene	1.21		92
2-methylnaphthalene		10	NS
Acenaphthylene	1		91
Acenaphthene	0.79		94
Dibenzofuran	0.86		NS
Fluorene	0.83		84
Phenanthrene	0.55		87
Anthracene	0.59		85
Fluoranthene	0.32		95
Pyrene	0.33		94
Chrysene	0.23		89
Benzo(a)anthracene	0.24		89
Benzo(b)fluoranthene	0.52		87
7,12-Dimethylbenz(a)anthracene			NS
Benzo(k)fluoranthene	0.7		82
Benzo(a)pyrene	0.28		99
3-methylcholanthrene			NS
Indeno(1,2,3-cd)pyrene	0.62		102
Dibenz(a,h)anthracene	0.64		85
Benzo(ghi)perylene	0.52		99

SAMPLE:WS Glassware Blank			
MS FILE :WSGB725.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 28 Nov 95 8:55			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		ND
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: TD-MM5G-(PR+F+F2)-1A Composite of extracts			
MS FILE :WSCOMP1A.D			
PROJECT: Emissions from Wood-Fired Residential Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X
ACQUIRED: 25 Jan 96 2:32			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		ND
Acenaphthene	11.85		ND
Dibenzofuran	12.9		ND
Fluorene	12.45		22 J
Phenanthrene	8.25		120 J
Anthracene	8.85		33 J
Fluoranthene	4.8		65 J
Pyrene	4.95		62 J
Chrysene	3.45		22 J
Benzo(a)anthracene	3.6		30 J
Benzo(b)fluoranthene	7.8		20 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		ND
Benzo(a)pyrene	4.2		24 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		22 J
Dibenz(a,h)anthracene	9.6		25 J
Benzo(ghi)perylene	7.8		29 J

SAMPLE: Acurex TD-MM5G-X-1A			
MS FILE :WSTDX1A.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 17 Jan 96 14:29			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		814 E
2-methylnaphthalene		50	176
Acenaphthylene	5		150
Acenaphthene	3.95		15 J
Dibenzofuran	4.3		35 J
Fluorene	4.15		23 J
Phenanthrene	2.75		6.9 J
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene		50	ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene		50	ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: TD-MM5G-(PR+F+F2)-2A Composite of extracts			
MS FILE :WSTD2A.D			
PROJECT: Emissions from Wood-Fired Residential Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X
ACQUIRED: 9 Dec 95 4:21			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		ND
Acenaphthene	11.85		ND
Dibenzofuran	12.9		ND
Fluorene	12.45		26 J
Phenanthrene	8.25		155
Anthracene	8.85		33 J
Fluoranthene	4.8		54 J
Pyrene	4.95		69 J
Chrysene	3.45		20 J
Benzo(a)anthracene	3.6		20 J
Benzo(b)fluoranthene	7.8		17 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		ND
Benzo(a)pyrene	4.2		20 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		ND
Dibenz(a,h)anthracene	9.6		ND
Benzo(ghi)perylene	7.8		ND

SAMPLE: TD-MM5G-X-2A XAD High Burn Dup			
MS FILE :WSTDX2AD.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 14 Dec 95 16:30			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		1210 E
2-methylnaphthalene		50	258
Acenaphthylene	5		167
Acenaphthene	3.95		15 J
Dibenzofuran	4.3		30 J
Fluorene	4.15		16 J
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: TD - MM5G-(F+F2+PR)-1B Rinse and Filters from Test 1B at Acurex			
MS FILE :WSTDFP1B.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X (Composite)
ACQUIRED: 8 Dec 95 12:36			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		ND
Acenaphthene	11.85		ND
Dibenzofuran	12.9		ND
Fluorene	12.45		ND
Phenanthrene	8.25		80 J
Anthracene	8.85		20 J
Fluoranthene	4.8		38 J
Pyrene	4.95		42 J
Chrysene	3.45		ND
Benzo(a)anthracene	3.6		ND
Benzo(b)fluoranthene	7.8		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		ND
Benzo(a)pyrene	4.2		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		ND
Dibenz(a,h)anthracene	9.6		ND
Benzo(ghi)perylene	7.8		ND

SAMPLE: TD-MM5G-X-1B			
MS FILE :WSTDX1BD.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 13 Dec 95 11:11			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		925 E
2-methylnaphthalene		50	178
Acenaphthylene	5		130
Acenaphthene	3.95		13 J
Dibenzofuran	4.3		30 J
Fluorene	4.15		17 J
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: TD-MM5G-(PR+F+F2)-2B Composite of extracts			
MS FILE :WSTD2B.D			
PROJECT: Emissions from Wood-Fired Residential Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X
ACQUIRED: 11 Dec 95 3:58			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		ND
Acenaphthene	11.85		ND
Dibenzofuran	12.9		ND
Fluorene	12.45		18 J
Phenanthrene	8.25		136 J
Anthracene	8.85		28 J
Fluoranthene	4.8		55 J
Pyrene	4.95		53 J
Chrysene	3.45		17 J
Benzo(a)anthracene	3.6		17 J
Benzo(b)fluoranthene	7.8		16 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		ND
Benzo(a)pyrene	4.2		17 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		ND
Dibenz(a,h)anthracene	9.6		ND
Benzo(ghi)perylene	7.8		ND

SAMPLE: TD-MM5G-X-2B			
MS FILE :WSTDX2B.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 12 Dec 95 10:52			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		700
2-methylnaphthalene		50	107
Acenaphthylene	5		82.2
Acenaphthene	3.95		10 J
Dibenzofuran	4.3		30 J
Fluorene	4.15		12 J
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: TD-MM5G-(PR+F+F2)-2C Composite of extracts			
MS FILE :WSTD2C.D			
PROJECT: Emissions from Wood-Fired Residential Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X
ACQUIRED: 9 Dec 95 3:29			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		34 J
Acenaphthene	11.85		ND
Dibenzofuran	12.9		24 J
Fluorene	12.45		61 J
Phenanthrene	8.25		242
Anthracene	8.85		55 J
Fluoranthene	4.8		96 J
Pyrene	4.95		110 J
Chrysene	3.45		24 J
Benzo(a)anthracene	3.6		29 J
Benzo(b)fluoranthene	7.8		31 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		ND
Benzo(a)pyrene	4.2		34 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		ND
Dibenz(a,h)anthracene	9.6		ND
Benzo(ghi)perylene	7.8		18 J

SAMPLE: TD-MM5G-X-2C			
MS FILE :WSTDX2C.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 12 Dec 95 2:55			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		1640 E
2-methylnaphthalene		50	270
Acenaphthylene	5		228
Acenaphthene	3.95		20 J
Dibenzofuran	4.3		30 J
Fluorene	4.15		21 J
Phenanthrene	2.75		5 J
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: TD-MM5G-(PR+F+F2)-2D Composite of extracts			
MS FILE :WSTD2D.D			
PROJECT: Emissions from Wood-Fired Residential Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X
ACQUIRED: 9 Dec 95 2:42			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		ND
Acenaphthene	11.85		ND
Dibenzofuran	12.9		ND
Fluorene	12.45		ND
Phenanthrene	8.25		104 J
Anthracene	8.85		25 J
Fluoranthene	4.8		48 J
Pyrene	4.95		59 J
Chrysene	3.45		ND
Benzo(a)anthracene	3.6		16 J
Benzo(b)fluoranthene	7.8		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		ND
Benzo(a)pyrene	4.2		17 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		ND
Dibenz(a,h)anthracene	9.6		ND
Benzo(ghi)perylene	7.8		ND

SAMPLE: TD-MM5G-X-2D			
MS FILE :WSTDX2D.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 12 Dec 95 1:55			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		867 E
2-methylnaphthalene		50	182
Acenaphthylene	5		134
Acenaphthene	3.95		11 J
Dibenzofuran	4.3		23 J
Fluorene	4.15		15 J
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: TD-MM5G-(PR+F+F2)-5D Composite of extracts			
MS FILE :WSTD5D.D			
PROJECT: Emissions from Wood-Fired Residential Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X
ACQUIRED: 11 Dec 95 5:10			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		ND
Acenaphthene	11.85		ND
Dibenzofuran	12.9		ND
Fluorene	12.45		ND
Phenanthrene	8.25		ND
Anthracene	8.85		ND
Fluoranthene	4.8		ND
Pyrene	4.95		ND
Chrysene	3.45		ND
Benzo(a)anthracene	3.6		ND
Benzo(b)fluoranthene	7.8		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		ND
Benzo(a)pyrene	4.2		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		ND
Dibenz(a,h)anthracene	9.6		ND
Benzo(ghi)perylene	7.8		ND

SAMPLE: TD - MM5G-PR-0 Acetone Blank			
MS FILE :WSTDPR0A.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 8 Dec 95 10:35			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		ND
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

Samples for The Emissions from Wood-Fired Residential Furnaces Project

Furnace B

Sample ID.	Date on Sample	Compositing	Date Analyzed	MS File ID
1- -X-Side A	6/13-14/95	none	12/6/95 1/25/96	WSICBXDA.D WST1SADP.D
1- -X-Side B	6/13-14/95	none	12/6/95 1/16/96	WSICBXDB.D WST1SBXD.D
1-1-F-53,54 1-1-F-57,58 1-1-D-1 1-1-D-3	6/16/95 6/16/95	Both Filters and Dishes	11/28/95	WST1S1.D
1-2-F-55,56 1-2-F-59,60 1-2-D-2 1-2-D-4	6/16/95 6/16/95	Both Filters and Dishes	11/28/95	WST1S2.D
2- -X-Side A	6/15/95	none	12/8/95 1/16/96	WSIT2XDA.D WST2SAXD.D
2- -X-Side B	6/15/95	none	12/6/95 1/17/96	WSIT2XDB.D WST2SBXD.D
2-1-F-65,66 2-1-F-69,70 2-1-D-5 2-1-D-7	6/20/95 6/20/95	Both Filters and Dishes	11/27/95	WST2S1.D
2-2-F-67,68 2-2-F-71,72 2-2-D-6 2-2-D-8	6/20/95 6/20/95	Both Filters and Dishes	11/27/95	WST2S2.D
3-1-X	6/20/95	none	12/13/95	WSTT3S1.D
3-1-F-61,62 3-1-D-9	6/20/95	Filter and Dish	11/28/95	WST3S1.D
3-2-X	6/20/95	none	12/13/95	WSTT3S2.D
3-2-F-63,64 3-2-D-10	6/20/95	Filter and Dish	11/28/95	WST3S2.D

Samples for The Emissions from Wood-Fired Residential Furnaces Project

Furnace B

Sample ID.	Date on Sample	Compositing	Date Analyzed	MS File ID
4-1-X	6/21/95	none	1/22/96	WST4SYS1.D
4-1-F-77,78 4-1-F-81-82 4-1-D-11 4-1-D-13	6/20/95 6/20/95	Both Filters and Dishes	11/27/95	WST4S1.D
4-2-X	6/21/95	none	12/14/95	WSTDT4S2.D
4-2-F-79,80 4-2-F-83,84 4-2-D-12 4-2-D-14	6/20/95 6/20/95	Both Filters and Dishes	11/27/95	WST4S2.D
5-1-X-blank	6/26/95	none	1/17/96	WST5BKS1.D
5-1-F-85,86	6/20/95	none	11/28/95	WST5S1.D
5-2-X	6/26/95	none	12/14/95	WSTDT5S2.D
5-2-F-87,88	6/20/95	none	11/28/95	WST5S2.D

Sample ID is the Test-System-Type-Number(s) from the inventory of samples received from Inchcape.

SAMPLE:	Test 1 XAD Side A		
MS FILE :WSICBXDA.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 6 Dec 95 12:24			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		839 E
2-methylnaphthalene		50	128
Acenaphthylene	5		288
Acenaphthene	3.95		18 J
Dibenzofuran	4.3		44 J
Fluorene	4.15		64.0
Phenanthrene	2.75		70.0
Anthracene	2.95		14 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:	Test 1 XAD Side A		
MS FILE :WST1SADP.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 25 Jan 96 3:54			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		769
2-methylnaphthalene		50	121
Acenaphthylene	5		260
Acenaphthene	3.95		18 J
Dibenzofuran	4.3		43 J
Fluorene	4.15		61.6
Phenanthrene	2.75		67.9
Anthracene	2.95		13 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: Test 1 Side B XAD			
MS FILE :WST1SBXD.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 16 Jan 96 15:16			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		511
2-methylnaphthalene		50	86.0
Acenaphthylene	5		210
Acenaphthene	3.95		14 J
Dibenzofuran	4.3		29 J
Fluorene	4.15		41 J
Phenanthrene	2.75		44 J
Anthracene	2.95		8.6 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene		50	ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene		50	ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:	Test 1 XAD Side B		
MS FILE :WSICBXDB.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 6 Dec 95 2:13			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		538
2-methylnaphthalene		50	91.2
Acenaphthylene	5		213
Acenaphthene	3.95		13 J
Dibenzofuran	4.3		60 J
Fluorene	4.15		45 J
Phenanthrene	2.75		46 J
Anthracene	2.95		9 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS Filters 53,54,57 and 58 Dishes 1 and 3 (Composite of four Extracts			
MS FILE :WST1S1.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	4	X
ACQUIRED: 28 Nov 95 12:53			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	24.2		ND
2-methylnaphthalene		200	ND
Acenaphthylene	20		ND
Acenaphthene	15.8		ND
Dibenzofuran	17.2		ND
Fluorene	16.6		ND
Phenanthrene	11		43 J
Anthracene	11.8		ND
Fluoranthene	6.4		71 J
Pyrene	6.6		103 J
Chrysene	4.6		ND
Benzo(a)anthracene	4.8		21 J
Benzo(b)fluoranthene	10.4		28 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	14		ND
Benzo(a)pyrene	5.6		27 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	12.4		ND
Dibenz(a,h)anthracene	12.8		ND
Benzo(ghi)perylene	10.4		21 J

SAMPLE:WS Filters 55,56,59 and 60 Dishes 2 and 4 Composite of four Extracts)			
MS FILE :WST1S2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	4	X
ACQUIRED: 28 Nov 95 1:48	QSs 1,4,5 and 6 were just below 5		
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	24.2		ND
2-methylnaphthalene		200	ND
Acenaphthylene	20		ND
Acenaphthene	15.8		ND
Dibenzofuran	17.2		ND
Fluorene	16.6		ND
Phenanthrene	11		30 J
Anthracene	11.8		ND
Fluoranthene	6.4		58 J
Pyrene	6.6		89 J
Chrysene	4.6		ND
Benzo(a)anthracene	4.8		ND
Benzo(b)fluoranthene	10.4		22 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	14		ND
Benzo(a)pyrene	5.6		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	12.4		ND
Dibenz(a,h)anthracene	12.8		ND
Benzo(ghi)perylene	10.4		ND

SAMPLE:	Test 2 XAD Side A		
MS FILE :WSIT2XDA.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 8 Dec 95 1:36			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		872 E
2-methylnaphthalene		50	129
Acenaphthylene	5		318
Acenaphthene	3.95		20 J
Dibenzofuran	4.3		32 J
Fluorene	4.15		64.7
Phenanthrene	2.75		125
Anthracene	2.95		30 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: Test 2 Side A XAD			
MS FILE :WST2SAXD.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 16 Jan 96 16:12			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		896 E
2-methylnaphthalene		50	136
Acenaphthylene	5		333
Acenaphthene	3.95		21 J
Dibenzofuran	4.3		34 J
Fluorene	4.15		69 J
Phenanthrene	2.75		133
Anthracene	2.95		32 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene		50	ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene		50	ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: Test 2 XAD Side B			
MS FILE :WSIT2XDB.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 6 Dec 95 4:04			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		1000 E
2-methylnaphthalene		50	162
Acenaphthylene	5		406
Acenaphthene	3.95		26 J
Dibenzofuran	4.3		45 J
Fluorene	4.15		95.8
Phenanthrene	2.75		118
Anthracene	2.95		27 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: Test 2 Side B XAD			
MS FILE :WST2SBXD.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 17 Jan 96 10:28			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		988 E
2-methylnaphthalene		50	159
Acenaphthylene	5		404
Acenaphthene	3.95		27 J
Dibenzofuran	4.3		43.7
Fluorene	4.15		90.9
Phenanthrene	2.75		114
Anthracene	2.95		26 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene		50	ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene		50	ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS MM5G Filters 65,66,69,70 dishes 5,7 (Composite of four Extracts)			
MS FILE :WST2S1.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	4	X
ACQUIRED: 27 Nov 95 4:07			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	24.2		ND
2-methylnaphthalene		200	ND
Acenaphthylene	20		ND
Acenaphthene	15.8		ND
Dibenzofuran	17.2		ND
Fluorene	16.6		ND
Phenanthrene	11		29 J
Anthracene	11.8		ND
Fluoranthene	6.4		106 J
Pyrene	6.6		161 J
Chrysene	4.6		27 J
Benzo(a)anthracene	4.8		37 J
Benzo(b)fluoranthene	10.4		51 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	14		21 J
Benzo(a)pyrene	5.6		45 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	12.4		29 J
Dibenz(a,h)anthracene	12.8		ND
Benzo(ghi)perylene	10.4		38 J

SAMPLE:WS MM5G Filters 67,68,71,72 dishes 6,8 (composite of four extracts)			
MS FILE :WST2S2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	4	X
ACQUIRED: 27 Nov 95 6:02			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	24.2		ND
2-methylnaphthalene		200	ND
Acenaphthylene	20		ND
Acenaphthene	15.8		ND
Dibenzofuran	17.2		ND
Fluorene	16.6		ND
Phenanthrene	11		ND
Anthracene	11.8		ND
Fluoranthene	6.4		68 J
Pyrene	6.6		110 J
Chrysene	4.6		25 J
Benzo(a)anthracene	4.8		32 J
Benzo(b)fluoranthene	10.4		44 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	14		ND
Benzo(a)pyrene	5.6		45 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	12.4		23 J
Dibenz(a,h)anthracene	12.8		ND
Benzo(ghi)perylene	10.4		31 J

SAMPLE: Test 3 System 1 XAD			
MS FILE :WSTT3S1.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 13 Dec 95 11:52			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		841 E
2-methylnaphthalene		50	128
Acenaphthylene	5		299
Acenaphthene	3.95		21 J
Dibenzofuran	4.3		48 J
Fluorene	4.15		76.5
Phenanthrene	2.75		178
Anthracene	2.95		40 J
Fluoranthene	1.6		7.8 J
Pyrene	1.65		6.6 J
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS Filters 61 and 62 Dish 90 (Composite of Two Extracts)			
MS FILE :WST3S1.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	2	X
ACQUIRED: 28 Nov 95 10:57	QS # 6 just below 50% Criterion		
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	12.1		ND
2-methylnaphthalene		100	ND
Acenaphthylene	10		ND
Acenaphthene	7.9		ND
Dibenzofuran	8.6		ND
Fluorene	8.3		ND
Phenanthrene	5.5		21 J
Anthracene	5.9		ND
Fluoranthene	3.2		85 J
Pyrene	3.3		143
Chrysene	2.3		25 J
Benzo(a)anthracene	2.4		32 J
Benzo(b)fluoranthene	5.2		45 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	7		17 J
Benzo(a)pyrene	2.8		43 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	6.2		28 J
Dibenz(a,h)anthracene	6.4		ND
Benzo(ghi)perylene	5.2		38 J

SAMPLE:	Test 3 System 2 XAD		
MS FILE :WSTT3S2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 13 Dec 95 13:44			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		1260 E
2-methylnaphthalene		50	180
Acenaphthylene	5		414
Acenaphthene	3.95		30 J
Dibenzofuran	4.3		64.2
Fluorene	4.15		102
Phenanthrene	2.75		202
Anthracene	2.95		47 J
Fluoranthene	1.6		14 J
Pyrene	1.65		12 J
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS Filters 63 and 64 Dish 10 (Composite of Two Extracts)			
MS FILE :WST3S2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	2	X
ACQUIRED: 28 Nov 95 11:58			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	12.1		ND
2-methylnaphthalene		100	ND
Acenaphthylene	10		ND
Acenaphthene	7.9		ND
Dibenzofuran	8.6		ND
Fluorene	8.3		ND
Phenanthrene	5.5		21 J
Anthracene	5.9		ND
Fluoranthene	3.2		55 J
Pyrene	3.3		103
Chrysene	2.3		17 J
Benzo(a)anthracene	2.4		22 J
Benzo(b)fluoranthene	5.2		28 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	7		12 J
Benzo(a)pyrene	2.8		26 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	6.2		17 J
Dibenz(a,h)anthracene	6.4		ND
Benzo(ghi)perylene	5.2		21 J

SAMPLE: Test 4 System 1 XAD			
MS FILE :WST4SYS1.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 22 Jan 96 2:41			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		969 E
2-methylnaphthalene		50	144
Acenaphthylene	5		350
Acenaphthene	3.95		23 J
Dibenzofuran	4.3		43 J
Fluorene	4.15		67.6
Phenanthrene	2.75		69.3
Anthracene	2.95		15 J
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: WS MM5G Filters 77,78,81,82 and dishes 11 and 13 (Composite of Fo			
MS FILE :WST4S1.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	4	X
ACQUIRED: 27 Nov 95 2:01			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	24.2		ND
2-methylnaphthalene		200	ND
Acenaphthylene	20		ND
Acenaphthene	15.8		ND
Dibenzofuran	17.2		ND
Fluorene	16.6		ND
Phenanthrene	11		69 J
Anthracene	11.8		ND
Fluoranthene	6.4		94 J
Pyrene	6.6		133 J
Chrysene	4.6		28 J
Benzo(a)anthracene	4.8		34 J
Benzo(b)fluoranthene	10.4		36 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	14		ND
Benzo(a)pyrene	5.6		37 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	12.4		ND
Dibenz(a,h)anthracene	12.8		ND
Benzo(ghi)perylene	10.4		26 J

SAMPLE: Test 4 System 2 XAD			
MS FILE :WSTDT4S2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 14 Dec 95 11:54			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		1110 E
2-methylnaphthalene		50	157
Acenaphthylene	5		352
Acenaphthene	3.95		24 J
Dibenzofuran	4.3		47 J
Fluorene	4.15		71.0
Phenanthrene	2.75		67.8
Anthracene	2.95		15 J
Fluoranthene	1.6		5.4 J
Pyrene	1.65		5.4 J
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS MM5G Filters 79, 80, 83, 84 Dishes 12,14 (Composite of Four Extr			
MS FILE :WST4S2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	4	X
ACQUIRED: 27 Nov 95 3:01			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	24.2		ND
2-methylnaphthalene		200	ND
Acenaphthylene	20		ND
Acenaphthene	15.8		ND
Dibenzofuran	17.2		ND
Fluorene	16.6		ND
Phenanthrene	11		71 J
Anthracene	11.8		21 J
Fluoranthene	6.4		104 J
Pyrene	6.6		145 J
Chrysene	4.6		24 J
Benzo(a)anthracene	4.8		31 J
Benzo(b)fluoranthene	10.4		39 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	14		ND
Benzo(a)pyrene	5.6		39 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	12.4		23 J
Dibenz(a,h)anthracene	12.8		ND
Benzo(ghi)perylene	10.4		31 J

SAMPLE: Test 5 System 1 XAD Blank			
MS FILE :WST5BKS1.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 17 Jan 96 15:29			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		ND
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene		50	ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene		50	ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS Filters 85 and 86			
MS FILE :WST5S1.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 28 Nov 95 2:37	QSs 1,3 and 4 were just below 50		
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		ND
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: Test 5 System 2 XAD			
MS FILE :WSTDT5S2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 14 Dec 95 14:35			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	NS	21-100
D6-Phenol(surr#2)	Not Spiked	NS	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	NS	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	NS	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	NS	10-123
D14-Terphenyl(surr#6)	Not Spiked	NS	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		ND
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS Filters 87 and 88			
MS FILE :WST5S2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 28 Nov 95 3:24	QSs 1,3 and 4 were just below 50		
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		ND
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

Samples for The Emissions from Wood-Fired Residential Furnaces Project

Furnace A with Catalyst

Sample ID.	Date Sampled	Compositing	Date Analyzed	MS File ID
TCD-MM5G-X-1	10/26/95	none	11/24/95	WSX1DIL.D
TCD-MM5G-FA1-1	10/26/95	Filters		
TCD-MM5G-FB1-1	10/26/95	and	11/24/95	WSFABP1D.D
TCD-MM5G-PR1-1	10/26/95	Rinse		
TCD-MM5G-2-F2	10/25/95	none	11/22/95	WSTCD2F2.D
TCD-MM5G-2-F1	10/25/95	Filter and	11/27/95	WS2F12PR.D
TCD-MM5G-2-PR	10/25/95	Rinse		
TCD-MM5G-X-2	10/25/95	none	11/21/95	WSTCDX2.D
Blank XAD	10/26/95	none	11/24/95	WSMM5GBK.D
Blank Acetone	10/26/95	none	11/24/95	WSMM5GAB.D
TCD-MM5G-FA-5	10/26/95	Filters		
TCD-MM5G-FB-5	10/26/95	and	11/22/95	WSFAPB5.D
TCD-MM5G-PR-5	10/26/95	Rinse		

SAMPLE: WS MM5G XAD Low Burn X1			
MS FILE :WSX1DIL.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	10	X
11/24/95 5:20			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL*	amount (μg)
Naphthalene	60.5		4960
2-methylnaphthalene		500	650
Acenaphthylene	50		1100
Acenaphthene	39.5		64 J
Dibenzofuran	43		100 J
Fluorene	41.5		98 J
Phenanthrene	27.5		ND
Anthracene	29.5		ND
Fluoranthene	16		ND
Pyrene	16.5		ND
Chrysene	11.5		ND
Benzo(a)anthracene	12		ND
Benzo(b)fluoranthene	26		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	35		ND
Benzo(a)pyrene	14		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	31		ND
Dibenz(a,h)anthracene	32		ND
Benzo(ghi)perylene	26		ND

SAMPLE: WS XAD High Burn MM5G			
MS FILE :WSTCDX2.D			
PROJECT: Woodstove			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	4	X
ACQUIRED: 21 Nov 95 5:02			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	24.2		2370
2-methylnaphthalene		200	321
Acenaphthylene	20		461
Acenaphthene	15.8		25 J
Dibenzofuran	17.2		30 J
Fluorene	16.6		26 J
Phenanthrene	11		ND
Anthracene	11.8		ND
Fluoranthene	6.4		ND
Pyrene	6.6		ND
Chrysene	4.6		ND
Benzo(a)anthracene	4.8		ND
Benzo(b)fluoranthene	10.4		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	14		ND
Benzo(a)pyrene	5.6		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	12.4		ND
Dibenz(a,h)anthracene	12.8		ND
Benzo(ghi)perylene	10.4		ND

SAMPLE: WS MM5G Low Burn FA, FB and PR-1			
MS FILE : WSFABP1D.D			
PROJECT: Emissions from Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X
ACQUIRED: 24 Nov 95 3:09			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		ND
Acenaphthene	11.85		ND
Dibenzofuran	12.9		ND
Fluorene	12.45		68 J
Phenanthrene	8.25		653
Anthracene	8.85		168
Fluoranthene	4.8		318
Pyrene	4.95		457
Chrysene	3.45		82 J
Benzo(a)anthracene	3.6		94 J
Benzo(b)fluoranthene	7.8		105 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		41 J
Benzo(a)pyrene	4.2		104 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		51 J
Dibenz(a,h)anthracene	9.6		ND
Benzo(ghi)perylene	7.8		78 J

SAMPLE: WS MM5G High Burn Back MeCl2 Extract			
MS FILE :WSTCD2F2.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 22 Nov 95 11:04			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		ND
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		5 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		5 J
Benzo(a)pyrene	1.4		6 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		7 J
Dibenz(a,h)anthracene	3.2		6 J
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS MM5G High Burn Front, Pan			
MS FILE :WS2F12PR.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	2	X
ACQUIRED: 27 Nov 95 11:51			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	12.1		ND
2-methylnaphthalene		100	ND
Acenaphthylene	10		16 J
Acenaphthene	7.9		ND
Dibenzofuran	8.6		ND
Fluorene	8.3		38 J
Phenanthrene	5.5		346
Anthracene	5.9		77 J
Fluoranthene	3.2		138
Pyrene	3.3		247
Chrysene	2.3		46 J
Benzo(a)anthracene	2.4		50 J
Benzo(b)fluoranthene	5.2		61 J
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	7		20 J
Benzo(a)pyrene	2.8		55 J
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	6.2		34 J
Dibenz(a,h)anthracene	6.4		ND
Benzo(ghi)perylene	5.2		41 J

SAMPLE:WS MM5G Blank			
MS FILE :WSMM5GBK.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 24 Nov 95 6:17			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		8 J
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE:WS MM5G Acetone Blank			
MS FILE : WSMM5GAB.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	1	X
ACQUIRED: 24 Nov 95 4:11	All Internal Standards Below 50%		
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	6.05		ND
2-methylnaphthalene		50	ND
Acenaphthylene	5		ND
Acenaphthene	3.95		ND
Dibenzofuran	4.3		ND
Fluorene	4.15		ND
Phenanthrene	2.75		ND
Anthracene	2.95		ND
Fluoranthene	1.6		ND
Pyrene	1.65		ND
Chrysene	1.15		ND
Benzo(a)anthracene	1.2		ND
Benzo(b)fluoranthene	2.6		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	3.5		ND
Benzo(a)pyrene	1.4		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	3.1		ND
Dibenz(a,h)anthracene	3.2		ND
Benzo(ghi)perylene	2.6		ND

SAMPLE: WS MM5G Front, Back and Pan Rinses MecL2 Extract			
MS FILE :WSFAPB5.D			
PROJECT: Emissions From Wood-Fired Residential Heating Furnaces			
ANALYST: Bill Preston	Extract		
	Volume	5	ml
ANALYTICAL METHOD: SW-846-8270			
	Dilution	3	X
ACQUIRED: 22 Nov 95 11:51			
System Monitoring Compounds	%Recovery	P/F	LIMITS
2-Fluorophenol(surr#1)	Not Spiked	F	21-100
D6-Phenol(surr#2)	Not Spiked	F	10-94
D5-Nitrobenzene(surr#3)	Not Spiked	F	35-114
2-Fluorobiphenyl(surr#4)	Not Spiked	F	43-116
2,4,6-tribromophenol(surr#5)	Not Spiked	F	10-123
D14-Terphenyl(surr#6)	Not Spiked	F	33-141
Target Compounds	MDL	PQL	amount (μg)
Naphthalene	18.15		ND
2-methylnaphthalene		150	ND
Acenaphthylene	15		ND
Acenaphthene	11.85		ND
Dibenzofuran	12.9		ND
Fluorene	12.45		ND
Phenanthrene	8.25		ND
Anthracene	8.85		ND
Fluoranthene	4.8		ND
Pyrene	4.95		ND
Chrysene	3.45		ND
Benzo(a)anthracene	3.6		ND
Benzo(b)fluoranthene	7.8		ND
7,12-Dimethylbenz(a)anthracene			ND
Benzo(k)fluoranthene	10.5		ND
Benzo(a)pyrene	4.2		ND
3-methylcholanthrene			ND
Indeno(1,2,3-cd)pyrene	9.3		ND
Dibenz(a,h)anthracene	9.6		ND
Benzo(ghi)perylene	7.8		ND

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/R-98-017	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Emissions from Outdoor Wood-burning Residential Hot Water Furnaces		5. REPORT DATE February 1998
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Joseph C. Valenti and Russell K. Clayton		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Acurex Environmental Corporation P.O. Box 13109 Research Triangle Park, North Carolina 27709		10. PROGRAM ELEMENT NO.
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15. SUPPLEMENTARY NOTES APPCD project officer is Robert C. McCrillis, Mail Drop 61, 919/541-2733.

16. ABSTRACT The report gives results of measurements of emissions from a single-pass and a double-pass furnace at average heat outputs of 15,000 and 30,000 Btu/hr (4.4 and 8.8 kW) while burning typical oak cordwood fuel. One furnace was also tested once at each heat output while fitted with a prototype catalytic unit installed in the combustion chamber. Emissions measured included: EPA Method 5G particulate, semivolatile and condensible organics, 20 target polycyclic aromatic hydrocarbon (PAH) compounds, and carbon monoxide. Emission results are presented in terms of rate per hour, quantity per unit weight of wood burned, and quantity per unit of heat delivered. Delivered efficiencies are also presented. Compared to a wide range of residential heating options, these furnaces' emissions were of the same order as other stick wood burning appliances. (NOTE: Modern outdoor residential wood-burning hot water furnaces are freestanding units situated outside the envelope of the structure to be heated. They typically consist of a firebox and water reservoir, assembled in a horizontal configuration. Hot combustion gases flow from the firebox at one end, through channels or tubes in the water reservoir, to the stack. The gases may pass through the water reservoir once to the stack at the end opposite the firebox (one phase), or they may make two passes through the water reservoir.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group	
Pollution	Measurement	Pollution Control	13B	
Hot Water Heating	Catalysis	Stationary Sources	13A	07D
Residential Buildings			13M	
Oak Wood			11L	
Combustion			21B	
Emission			14G	

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