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Thermal Performance of Masonry Chimneys and Fireplaces

Richard D. Peacock

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
National Engineering Laboratory
Center for Fire Research
Gaithersburg, MD 20899

April 1987

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NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

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Thermal Performance of Masonry Chimneys and Fireplaces

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Abstract

A series of tests was conducted in a masonry chimney and a masonry fireplace both constructed to current national standards in order to evaluate the effectiveness of recent changes to the building code requirements for residential masonry construction. Firing rates typical of normal homeowner use and of an overfire condition resulted in temperature levels close to recommended limits established in nationally recognized standards for properly constructed solid fuel heating systems. In addition, several lining techniques for the masonry chimney and for the fireplace chimney connected to solid fuel burning fireplace inserts showed reductions in thermal hazard to exposed combustible construction when compared to the masonry construction alone.

The results of these tests point out some areas where the codes and standards could be updated to provide for safer masonry chimneys and fireplaces.

Key Words: Chimneys; fireplaces; fire safety; fire tests; flues; heating equipment; masonry; stoves; wood.

1. INTRODUCTION

The U.S. Consumer Product Safety Commission (CPSC), as part of a program to investigate fire safety risks involved with the use of solid fuel burning appliances, have sponsored experimental research at the Center for Fire Research at the National Bureau of Standards to identify hazards associated with solid fuel heating. The studies were conducted to provide information to improve safety practices for the use of the appliances, and to provide data upon which to base further improvements in codes and standards. The overall

objective of CPSC in the area of solid fuel heating is to reduce the number of house fires caused by solid fuel burning appliances and their exhaust systems. Reports on a number of issues are available:

- Clearances needed between wood burning appliances and combustible construction materials.[1]
- Creosote buildup and burnout.[2]
- Protective barriers to allow reduced clearances of appliances to combustible walls.[3]
- Safe methods of joining a chimney connector to a masonry chimney through a combustible wall.[4]
- Theoretical prediction of appliance / wall heat transfer with arbitrary wall protection.[5]

This paper presents the results of another portion of that research program. In these tests, particular emphasis was placed on:

- determination of typical operating temperatures during operation of a

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[1] Peacock, R. D., Ruiz, E., and Torres-Pereira, R., Fire Safety of Wood Burning Appliances, Part 1: State of the Art Review and Fire Tests, Volume I and II, Nat. Bur. Stand. (U.S.), NBSIR 80-2140 (November 1980).

[2] Peacock, R. D., Intensity and Duration of Chimney Fires in Several Chimneys, Nat. Bur. Stand. (U.S.), NBSIR 83-2771 (December 1983).

[3] Loftus, J. J., and Peacock, R. D., Clearances and Methods of Protection for Wall and Ceiling Surfaces Exposed to Radiant Heating Appliances, Nat. Bur. Stand. (U.S.), NBSTN 1205 (December 1984).

[4] Loftus, J. J., and Peacock, R. D., Evaluation of Thimble - Chimney Connector (Wall-Pass Through) Systems for Solid Fuel Burning Appliances, Nat. Bur. Stand. (U.S.), NBSIR 84-2969 (November 1984).

[5] Peacock, Richard D., STOVE: A Predictive Model for Heat Transfer from Solid-Fuel Appliances, Nat. Bur. Stand (U. S.), NBSIR 86-3300 (May 1986).

masonry chimney and a masonry fireplace constructed to the requirements of NFPA 211-1984,[6]

- masonry chimney relining techniques, and
- techniques for interconnection of fireplace inserts to masonry fireplace chimneys.

This paper describes the results of this research and provides recommendations for updating the codes to improve the safety of masonry chimneys and fireplaces, particularly in the areas of relining and interconnection.

2. REVIEW OF PREVIOUS WORK

2.1 Fire Incidents Involving Wood Burning Appliances

Recent statistics on fires and injuries related to wood burning appliances are alarming:[7,8,9]

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[6] NFPA 211, Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances, 1984, National Fire Protection Association, Quincy, Massachusetts (1984).

[7] Kale, D. Fires in Woodburning Appliances, U.S. Consumer Product Safety Commission (December 1982).

[8] Harwood, B. and Kale. D., Fires Involving Fireplaces, Chimneys and Related Appliances, U.S. Consumer Product Safety Commission (September 1982).

[9] Harwood, B. and Kluge, P., Hazards Associated with the Use of Wood or Coal-Burning Stoves or Free-Standing Fireplaces, U.S. Consumer Product Safety Commission (February 1980).

Year	Fires	Percent Change from Previous Year	Deaths	Property Damage (unadjusted)
1978	66,800		290	$134 million
1979	70,700	+6%	210	$178 million
1980	112,000	+58%	350	$245 million
1981	130,100	+16%	290	$265 million
1982	139,800	+7%	250	$257 million
1983	140,600	+0.6%	280	$296 million
1984	125,600	-11%	140	$257 million

Source: U.S. Consumer Product Safety Commission

This marked increase in fires is attributed to the growing number of installations and expanded use of wood burning stoves in homes throughout the United States and the fact that most homes are made of combustible construction. Clearly, accidental fires from wood burning systems are an important problem.

An analysis by the U. S. Consumer Product Safety Commission of national statistics collected in 1983 by the U.S. Fire Administration attribute 140,600 residential fires to solid fuel burning equipment, and report 280 deaths and 2550 injuries due to these fires. These fires accounted for over 65 percent of all residential heating equipment fires. Fire incidence from the use of solid fuel burning equipment rose from 66,800 to 130,100 between 1978 to 1981. This trend slowed from 1981 to 1982 to slightly less than a 7 percent increase. The frequency of fire incidence stabilized between 1982 and 1983 (increasing during this time less than 1 percent) and actually decreased in 1984 (dropping nearly 11 percent). Positive actions by the Center for Fire Research (CFR) at the National Bureau of Standards (NBS) and others are

believed responsible for improving the safety of these appliances and, thus, reversing an increasing fire incidence rate. New technical information to supplant out-of-date research, along with code changes based upon the research, have provided a new and safer set of installation and operation guidelines to reduce the fire risk of solid fuel heating.

2.2 Clearances in Existing Codes and Standards

Minimum acceptable clearances to combustible materials for the installation of chimney, chimney connectors, and appliances are specified in the various model building codes and recommended practices manuals. Reference 1 is typical of the specifications found in the codes. For simplicity, a single, hopefully conservative clearance is given for each type of appliance installed without protection. No allowance is made for the size, heat output, heat transfer characteristics or other features unique to individual models. Similarly, only a few, specific methods of protection are recommended to allow reduction of these clearances.

Typically, 0.91 m of clearance is specified between radiant heaters and unprotected combustible construction. For residential solid fuel chimneys, 51 mm of clearance is required. Chimney connectors for solid fuel burning residential appliances require a clearance of at least 0.46 m from combustible materials. However, as with appliances, these clearances may be reduced by the use of appropriate protection applied either to the appliance or to the combustible surface.

Several experimental studies have been carried out to determine minimum acceptable clearances to combustible materials. Voigt,[10] in a 1933 publication, recommends a minimum clearance of 0.30 m for chimney connectors 0.23 m in diameter. A more extensive study, performed by Underwriters Laboratories in 1943,[11] presents minimum safe clearances for both unprotected surfaces and surfaces protected by various methods. Distances at which a maximum temperature rise of 50°C above room temperature is reached are presented as a function of the temperature of the exposed face of a heat producing appliance. The relative protection afforded by various materials used as heat barriers between the appliance and combustible surfaces is also examined. Lawson, Fox, and Webster[12] and Lawson and Simms[13] have studied the heating of wall panels and wood by radiation. With experimentation and theoretical predictions, they present safe clearances between flue pipes and wall surfaces as a function of the pipe diameter and the pipe surface temperature. To maintain a maximum wall temperature of 100°C, a 0.15 m diameter pipe should not exceed 350°C in surface temperature at a clearance of 0.46 m.[12] Loftus and Peacock[3] present the results of a study on clearances and methods of protection for wall and ceiling surfaces exposed to radiant heating appli-

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[10] Voigt, G. Q., Fire Hazard of Domestic Heating Installations, Nat. Bur. Stand. (U.S.), NBS Research Paper RP596 (September 1933).

[11] Neale, J. A., Clearances and Insulation of Heating Appliances, Underwriters Laboratories, Inc., UL Bulletin of Research No. 27 (February 1943).

[12] Lawson, D. I., Fox, L. L., and Webster, C. T., The Heating of Panels by Flue Pipes, Fire Research Special Report No. 1, Fire Protection Association, London, England (March 1952).

[13] Lawson, D. I., and Simms, D. L., The Ignition of Wood by Radiation, British Journal of Applied Physics, Vol 3, 288-292 (September 1952).

ances with surface temperatures from 300 to 450°C. A number of methods to reduce temperatures on combustible wall and ceiling surfaces to acceptable levels were recommended.

These experimental studies established limits for two important parameters: appliance surface temperatures and clearances from combustibles for unprotected and protected surfaces. The maximum established limit for appliance surface temperatures for the appliances studied ranged from 300 to 450°C, whereas the average limit for appliance surface temperatures was between 200 and 250°C. Minimum safe wall clearances for unprotected surfaces ranged from 0.31 to 0.91 m.

2.3 Temperatures Developed in Heating Systems

Tests made with prefabricated porcelain-enameled metal chimneys for solid or liquid fuel furnaces[14,15] established a limiting temperature rise of 190°C on the outer surface of the chimney for a flue gas temperature of 537°C. With this limitation, wood framing spaced 51 mm or more away from the chimney was considered safe. Satisfactory insulation of the chimneys to reduce the outer surface temperatures to acceptable levels was obtained with asbestos paper plies totalling about 45 mm in thickness. In the same study,

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[14] Shoub, H., Survey of Literature on the Safety of Residential Chimneys and Fireplaces, Nat. Bur. Stand. (U.S.), NBS Misc. Pub. 252 (December 1963).

[15] Prefabricated Metal Chimneys, National Bureau of Standards, Fire Research Section, unpublished reports to the Federal Public Housing Authority (1941-1945).

some asbestos cement pipe coverings were also found to reduce heat transmission to the extent required for safety of nearby combustibles.

To establish performance requirements for lightweight prefabricated chimneys, tests were conducted with lined and unlined masonry chimneys having 102 mm thick walls.[16,17] Hazardous conditions on wood framing spaced 51 mm away from the chimney were noted when the continuous flue gas temperature of the unlined chimney reached 482°C and that of the lined chimney reached 592°C. However, these hazardous conditions were not reached in the lined chimney tests until after 13 hours. In order to study operating conditions with typical fuels, a number of firing tests[18] were conducted with wood and soft coal fuels in heating appliances known to give high flue gas temperatures. With a coal-fired, jacketed type heater, gas temperatures ranging from 648 to 704°C were measured for an hour or more in the flue at the ceiling level above the heater.

Lawson, Fox, and Webster[12] measured surface temperature of flue pipes in a variety of flue systems using solid fuels -- mostly coal and coke -- and found temperatures of about 150°C under "normal" conditions and temperatures as high as 815°C for overfire conditions.

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[16] Thulman, R. K., Temperatures Developed in Chimneys for Low Cost Houses, Nat. Bur. Stand. (U.S.), Tech. News. Bull. 328 (August 1944).

[17] Thulman, R. K., Performance of Masonry Chimneys for Houses, Housing and Home Finance Agency (U. S.), Housing Research Paper No. 13 (November 1952).

[18] Fox., L. L., and Whittaker, D., Some Measurements of Temperatures of Metal Flues of Domestic Heating Appliances, Journal of the Institution of Heating and Ventilation Engineers, Vol. 23, 183-192 (August 1955).

Fox and Whittaker[18] report temperatures on metal flues of several heating appliances operated over a range likely to be encountered in normal use. Maximum flue pipe surface temperatures ranged from 704 to 815°C at the appliance flue outlet, 360 to 510°C at a distance of 0.91 m from the appliance flue outlet, and 287 to 326°C at a distance of 1.8 m from the appliance flue outlet.

Shoub[14] concluded that combustible materials will ignite if maintained in continued contact with a masonry chimney that has a wall 120 mm thick and a flue gas temperature of 400°C.

In tests for the Department of Energy,[1] temperatures ranging from 297 to 436°C during normal operation and 377 to 693°C during overfire conditions were noted on the surfaces of several wood burning appliances when tested by prescribed test methods.[19] A total of 11 different short term tests, ranging from 1.9 to 25.6 hours duration, were conducted to establish normal firing conditions in wood burning appliances.[20] The data from these tests show spikes occurring at the beginning and end of tests and, apparently, whenever the door to the stove was opened. These sharp increases in temperature were attributed to a "high fire" in the morning and to the rapid increase in active flaming when the door was opened for refueling the fire. The average temperature rise during normal burning ranged from 177 to 218°C on the stove

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[19] Standard for Room Heaters, Solid Fuel Type -- UL 1482, First Edition, Underwriters Laboratories, Inc., Northbrook, IL (August 1979).

[20] Loftus, J. J., Evaluation Tests on Metal Factory-Built Insulated Chimneys Used for Venting Solid Fuel Burning Appliances, Nat. Bur. Stand. (U.S.), letter report to the U. S. Consumer Product Safety Commission (April 1985).

surface ; that of the flue gases rose from 140 to 269°C; that of the inner chimney wall surface rose 119 to 241°C; and that of the outer chimney wall surface rise was 14 to 48°C.

2.4 Temperatures Developed in Fireplaces

Although more than 40 years old, the U. S. Department of Agriculture publication on fireplace and chimneys[21] still provides excellent guidelines on the proper construction of fireplaces and chimneys. Topics covered include design, construction, testing, and cleaning of chimneys and fireplaces. Many parts of current codes covering masonry construction can be traced to this publication. Some limitations, however, arising from the age of the publication are apparent. No discussion of chimney lining is included since recommendations for chimney lining stem from more recent research.[22] A more recent update of the USDA publication is available.[23]

Underwriters' Laboratories[24,25] investigated temperatures developed on masonry

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[21] Fireplaces and Chimneys, U. S. Department of Agriculture, Farmers Bulletin No. 1888 (1941).

[22] Mitchell, N. D., Fire Hazard Tests With Masonry Chimneys, NFPA No. Q 43-7, National Fire Protection Association, Boston, Massachusetts (October 1949).

[23] Biggs, A. A., Fireplaces and Chimneys, U. S. Department of Agriculture, Farmers Bulletin No. 1889 (September 1963).

[24] Fact-Finding Report on Masonry Fireplace, File USNC24, Contract to the Federal Housing Administration, Underwriters' Laboratories, Northbrook, Illinois (June 1962).

fireplace surfaces and on combustible and non-combustible materials in contact with or closely adjacent to masonry fireplaces and chimneys constructed according to the requirements in building codes in 1962. Several different tests were conducted in the fireplace: 1) brand fire tests in which specially constructed wood brands were added to the fire at 7.5 minute intervals for 4 hours, 2) charcoal fire tests in which charcoal briquettes were added every 7.5 minutes for 4 hours or 12 hours, and 3) log fire tests in which seasoned and split oak logs were added at a rate of 4.5 to 12 kg/hr for a 12 hour period. Some of the maximum temperatures recorded are shown below.

Maximum Temperatures Recorded During Fireplace Tests[24,25]

Fuel	Firing Rate (kg/hr)	Combustible Enclosure In Contact With Brick (°C)	Combustible Enclosure With Air Space (°C)
Brands	14.5	178	160
Charcoal	12.7	246	--
	8.8	218	132
	4.5	138	82
Logs	11.8	196	--
	9.1	141	85
	4.5	118	74

An air space clearance of just 20 mm between the outer brick surface to a combustible enclosure was shown to reduce temperatures significantly compared to combustibles in contact with the brick surface.

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[25] Fact-Finding Report on Masonry Fireplace, File USNC24, Contract to the Federal Housing Administration, Underwriters' Laboratories, Northbrook, Illinois (October 1962).

In more recent tests for the U.S. Department of Energy, a number of experiments were conducted to study the thermal performance of factory-built and masonry fireplaces with and without fireplace inserts installed.[26,27] A summary of maximum temperatures from some of the more than 30 tests is shown below.

Maximum Temperatures During Tests of Masonry Fireplaces and Inserts

Location	Log Tests		Brand Tests	
	Without Insert (°C)	With Insert (°C)	Without Insert (°C)	With Insert (°C)
Enclosure	--	63	52	79
Masonry	--	148	499	88
Damper	--	188	422	297
Chimney	--	118	153	330

For the brand fire tests, specially constructed wood brands were added to the fire every 7.5 minutes for approximately 16 hours. During the brand fire tests, temperatures on the masonry of the fireplace were lower with an insert than without. Conversely, temperatures on the chimney were higher with the insert. Since no data were presented for the log tests without an insert, no comparison could be made.

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[26] Terpstra, W. R., Jorgenson, M. L., and Dosedlo, L. J., Investigation of Fire Hazards of Fireplace Inserts in Factory-Built and Masonry Fireplaces, Contract to the Nat. Bur. Stand. (U.S.), NBSGCR-82-368 (August 1981).

[27] Maxwell, T. T., Dyer, D. F., Maples, G., and Burch, T., An Investigation of Creosoting and Fireplace Inserts, Contract to Nat. Bur. Stand. (U.S.), NBSGCR 81-365 (December 1981).

2.5 Limiting Safe Temperatures on Combustible Surfaces

Listings of heat producing appliances and methods for setting clearances between appliances and combustible surfaces are based upon Underwriters Laboratories tests.[19] They have recommended the following limiting safe temperatures for heat producing appliances:

- maximum temperature rise of 65°C above room temperature on exposed surfaces; and
- maximum temperature rise of 50°C above room temperature on unexposed surfaces, such as beneath the appliance, floor protector, or wall mounted protective device.

These recommendations are based upon the fact that while the ignition temperature of wood products is generally quoted to be on the order of 200°C,[28] wood that is exposed to constant heating over a period of time may undergo a chemical change resulting in a much lowered ignition temperature and increased potential for self-ignition.

Mitchell[29] found the prolonged exposure of wood fiberboard exposed to

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[28] Schaffer, E. L., Smoldering Initiation in Cellulosics Under Prolonged Heating, Fire Technology, Vol. 16, No. 1, 22-28 (February 1980).

[29] Mitchell, N. D., New Light on Self-Ignition, NFPA Quarterly, Vol. 45, No. 2, 165-172 (October, 1951).

temperatures as low as 109°C that resulted in ignition. MacLean[30,31] reports charring of wood samples at temperatures as low as 93°C. He concludes that wood should not be exposed to temperatures appreciably higher than 66°C for long periods. McGuire[32] suggests that the maximum safe temperature on the surface of a combustible material adjacent to a constant heat source is 100°C.

Clearly, the ignition of wood at moderately elevated temperatures is a complex reaction in which the time of exposure is an important parameter.[33,34] While exact limits recommended in the literature vary due to exposure time and details of the tests conducted, the numerous documented fires involving the ignition of wood members near low pressure steam pipes[35] suggest an upper temperature limit for wood exposed to long-term low-level heating should not be appreciably higher than 100°C.

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[30] Maclean, J. D., Effect of Heat on Properties and Serviceability of Wood: Experiments on Thin Wood Specimens, Forest Products Laboratory Report No. R1471, Madison, WI (1945).

[31] Maclean, J. D., Rate of Disintegration of Wood Under Different Heating Conditions, American Wood-Preservers Association (1951).

[32] McGuire, J. H., Limiting Safe Temperature of Combustible Materials, Fire Technology, Vol 5, No. 3 (August 1969).

[33] Ignition and Charring Temperatures of Wood, Forest Products Laboratory Report No. 1464, Madison, WI (January 1958).

[34] Shelton, J. W., Wood Heat Safety, Garden Way Publishing, Charlotte, VT (September 1979).

[35] Matson, A. F., Dufori, R. E., and Breen, J. F., Performance of Type B Gas Vents for Gas-Fired Appliances, Part II, Survey of Available Information on Ignition of Wood Exposed to Moderately Elevated Temperatures, Underwriters Laboratories, Inc., UL Bulletin of Research No. 51, Northbrook, IL (May 1959).

Nearby combustible materials other than wall and ceiling surfaces, such as chairs or draperies, must also be kept a sufficient distance from hot surfaces to prevent ignition. The testing standards and model codes apply with the same requirements to all combustibles. Thus, the 0.91 m clearance requirements in NFPA 211 and maximum temperature rise requirements in the Underwriters Laboratories testing standards apply equally well to other combustibles as well. Similarly, a temperature limit of 100°C is more than adequate to protect most combustibles used in furnishings.

3. CHIMNEY AND FIREPLACE CONSTRUCTION AND INSTRUMENTATION

3.1 Masonry Construction Details

The chimneys and fireplace were constructed to conform to the requirements in NFPA 211-1984.[6] For the current studies, the construction, shown in figures 1 and 2, can be summarized as follows:

1. The fireplace and the chimneys (for the free standing chimney and for the fireplace) were constructed of solid masonry units, 102 mm in thickness, laid with full, push-filled, head and bed, mortar joints. For the free standing chimney, the chimney height was 4.5 m. The overall height of the fireplace and chimney system was 4.8 m.

2. The chimney was lined with fire clay flue lining (ASTM C315 or equivalent), 16 mm in thickness. The flue liner was installed with refractory mortar (ASTM C105, medium duty), with close fitting joints left smooth on the inside.

3. The flue lining was separated from the chimney wall by a 25 mm air space. The air space was not filled and only enough mortar was used to make a good joint and hold the liners in position.

4. The flue lining started at a point 0.76 m below the chimney connector entrance and extended the entire length of the chimney to a level 51 mm above the splay or wash at the top of the chimney.

5. Minimum clearances to combustibles surrounding the chimney were maintained at.51 mm surrounding the lower 2.4 m of the chimney. Minimum clearances to combustibles surrounding the fireplace were maintained at 51 mm at the front and sides of the fireplace and 102 mm at the back of the fireplace.

6. The fireplace was constructed of solid masonry units with a low duty firebrick firebox lining to a nominal thickness of 0.2 m. The firebox measured 1.04 m wide by 0.58 m deep by 0.91 m high.

3.2 Appliances

For the masonry chimney study, a listed solid fuel burning appliance was connected to the chimney through a 0.19 m single wall chimney connector sized to fit the flue outlet of the appliance. The stove measured 0.60 x 0.60 x 0.50 m and could accommodate logs 0.4 m in length. The fire chamber's back wall and bottom had a fire brick lining. The stove was vented at its top through a 0.15 m opening and had a sheet steel heat shield attached to its back side. Clearance to the floor was 0.26 m. The door front was glass with a porcelain accent frame.

For the fireplace insert study, two different inserts were selected. Both fireplace inserts were of box-in-box construction with a firebrick lined sheet steel firebox encased in a sheet steel outer cabinet with fan-forced air circulation between the two walls. The two inserts differed mainly in firebox size with Insert #1 measuring 0.48 m wide by 0.43 m deep by 0.58 m high and with Insert #2 measuring 0.64 x 0.36 x 0.58 m.

3.3 Instrumentation

Temperatures were monitored on appliance surfaces, fireplace and chimney surfaces, on the face of combustible surfaces adjacent to the fireplace and chimneys, and in the flue gas. Instrumentation locations are shown in figures 1 and 2. In the chimneys, thermocouples were placed in the flue gas, on the inside wall of the chimney, on the outside wall of the chimney, and at four locations on the enclosure approximately every 0.3 m for the entire height of each chimney. In the firebox of the fireplace, thermocouples were placed on the inner brick surface, on the outer surface of the inner course of bricks, on the outer surface of the fireplace, and at numerous locations on the enclosure. In addition, temperatures were monitored in the throat of the fireplace near the fireplace damper and on the brick surface near the fireplace mantel. Data was collected continuously over the period of the test to allow characterization of the temperature environment of the chimneys over the entire period of the test, typically for at least a 24 hour period.

4. MASONRY CHIMNEY RELINING TECHNIQUES

Several different alternate lining systems for masonry chimneys were investigated to compare the effectiveness of commercially available lining materials for masonry chimneys with that of traditional fire clay flue linings. One sample of each alternative chimney liner type was used to line a

masonry chimney. The tests used to evaluate present code specified materials were applied to chimneys with alternative liners. The effectiveness of these chimneys in venting modern wood burning appliances during normal and overfire use was studied to determine if they provided adequate protection for adjacent combustible construction materials and if they would contain the flue gases without structural failure.

4.1 Relining Tests Conducted

Three different configurations of chimney linings were studied -- a traditional fire clay flue lining, a stainless steel relining, and a poured masonry relining system. It was hoped, with these choices, a representative sample of lining systems would be covered. Each relining system was used in a professionally constructed masonry chimney built to the requirements of NFPA 211-1984 and installed as recommended by the manufacturer. With a listed wood burning appliance, three different tests were run in each configuration-- (1) a brand fire test modeled after the requirements of UL 1482, Standard for Room Heaters -- Solid Fuel Type,[19] (2) an overfire test where oak cordwood was used as a fuel and fired at the highest firing rate allowed by the appliance connected to the chimney, and (3) a normal firing test where oak cordwood was used as a fuel and fired at firing rates more typical of homeowner use. For the brand tests, specially constructed brands were added at 7.5 minute intervals after ignition. The brands were prepared with strips of dry douglas fir finished to 19 x 19 mm, spaced 25 mm on center, and laid in two layers sized to have an area equal to 1/3 of the hearth area of the

appliance. For the log tests, seasoned oak cordwood is added at regular intervals to maintain the fire in the insert. For all tests but the normal firing tests, the fueling door of the appliance was closed and any combustion air inlets were fully opened. Two different firing rates were used during the tests, a normal firing rate and an overfire. The normal firing tests were conducted in order to simulate "typical" operations a homeowner might use throughout the day, with the following fuel burning activity was used for the wood burning stove: (a) every morning, for 1/2 hour, the damper was set at the wide open position; (b) for the rest of an eight hour working day, the damper was open to medium position; and (c) for overnight use, the damper was set at the low position. For each overfire test, seasoned oak cordwood was used as a fuel and added to the stove as necessary to maintain as high a temperature in the flue gas at the base of the chimney as possible.

No attempt was made in this limited study to determine the long term durability of the various relining techniques investigated. After allowing the masonry systems to fully cure, testing was limited to several 24 hour tests for each of the relining techniques.

With the above considerations, the following tests were conducted:

Test	Lining System	Fuel Used	Firing Rate
MC002	Fire Clay	Logs	Normal
MC011	Fire Clay	Brands	
MC012	Fire Clay	Logs	Overfire
MC102	Flexible Stainless	Logs	Normal
MC111	Flexible Stainless	Brands	
MC112	Flexible Stainless	Logs	Overfire
MC211	Poured Masonry	Brands	
MC212	Poured Masonry	Logs	Overfire

4.2 Discussion of Chimney Relining Data

Figures 3 through 7 present some of the data from the masonry relining tests. Table 1 and figure 8 show the maximum temperatures (or temperature rise for enclosures) in the flue gas and on the surfaces of the flue liner, inner brick, outer brick, and enclosure.

From figure 8 and table 1, it is apparent that the chimney relining systems tested (a stainless steel lining and a poured masonry lining) improve the thermal performance of the chimney system by reducing temperatures on combustible surfaces compared to a code specified fire clay flue lining. Both the stainless steel lining system, and the poured masonry lining system showed reduced temperatures on the chimney exterior and enclosure surfaces during both normal and overfire conditions. From the log fire tests presented in figure 8, it is apparent that regardless of the flue gas temperature measured, the enclosure temperature is lower for the alternate lining systems than for

the conventional fire clay liners. For the brand fire tests, the effect is not so clear and probably within experimental error. While flue gas temperatures measured during tests of the stainless steel relining or the poured masonry relining are in some cases higher and in some cases lower than similar measurements during tests of the fire clay lining, temperature levels on the combustible enclosure were nearly always lower for the alternate lining systems. For the log tests, the enclosure surface temperature rise was 119, 50, and 20 °C for the fire clay, stainless steel, and poured masonry lining systems respectively. For the brand fire tests, they were 48, 46, and 44 °C for the three systems, quite similar levels (probably within experimental error) even though flue gas temperatures for the stainless steel and poured masonry lining systems were significantly higher than for the fire clay flue lining. Understandably, the poured masonry system, with its higher mass, exhibited the lower temperature levels on surrounding combustibles.

Figure 9 shows temperatures measured during the tests of the relined chimneys normalized by the temperatures for the fire clay lined chimney. With this normalization, the following properties hold:

Normalized temperature > 1.0: Temperature levels for the alternate lining system are higher than for the fire clay lining.

Normalized temperature = 1.0: Temperature levels for the alternate lining system are equal to the fire clay lining.

Normalized temperature < 1.0: Temperature levels for the alternate lining system are lower than for the fire clay lining.

In all cases, the thermal protection afforded by the alternate lining systems (as exhibited by a reduction in temperature on the alternate lining system compared to the fire clay lined chimney) is at least as good as the fire clay lined chimney system.

From these tests, both the stainless steel and the poured masonry lining systems are appropriate alternatives for the traditional fire clay flue lining in residential chimneys from a thermal performance standpoint. Of course, no attempt was made to study the long term durability of any of the three alternatives explored. The reader is referred to the literature for information on the durability of solid fuel heating systems. Day[36] presents a literature review of durability designed to indicate where information related to product durability in wood-fueled heating appliances might be found. More than 70 references are cited in the review from a wide range of books and periodicals.

5. FIREPLACE INSERTS / CHIMNEY INTERCONNECTION

One of the key issues in the installation of fireplace inserts into masonry fireplaces is the technique used for interconnection between the insert and the fireplace / chimney system. Currently, NFPA 211-1984 has the following requirements for connection of solid-fuel burning appliances to masonry fireplaces:

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[36] Day, B., Wood Stove Durability: A Literature Review, Western Solar Utilization Network, WSUN-27, Portland Oregon (August 1980).

- There has to be a connection which extends from the appliance to the flue liner.
- The cross sectional area of the flue has to be no more than 3 times the cross sectional area of the flue collar of the appliance.
- If the appliance vents directly through the chimney wall above the smoke chamber, there shall be a noncombustible seal below the entry point of the connector.
- The installation shall be such that the chimney can be inspected and cleaned.
- Means shall be provided to prevent dilution of combustion products in the chimney flue with air from the habitable space.

Research in this part of the program was intended to study the thermal effects of various methods of installing fireplace inserts into a code specified masonry fireplace. For each of two fireplace inserts, three different configurations were studied: (1) positioning the insert on the fireplace hearth and covering the fireplace opening with a closure panel; (2) using a direct connection from the flue gas outlet on the insert to the bottom of the chimney flue liner (the chimney base); and (3) using a direct connection from the flue gas outlet on the insert to the top of the chimney flue liner (the chimney top). The intention of the research was to provide information on the safest methods for installation of a fireplace insert into a masonry fireplace.

5.1 Insert Interconnection Tests Conducted

Both fireplace inserts were of box-in-box construction with a firebrick lined sheet steel firebox encased in a sheet steel outer cabinet with fan-forced air circulation between the two walls. The two inserts differed mainly in firebox size with Insert #1 measuring 0.48 m long by 0.43 m wide by 0.58 m high and Insert #2 measuring 0.64 x 0.36 x 0.58 m. For those configurations requiring a direct connection, custom made stainless steel sheet metal was fabricated to provide a transition from the flue outlet of the insert (usually a rectangular opening) to a commercially available 0.2 m diameter flexible stainless chimney liner. The flexible liner was carried through the smoke chamber of the fireplace to either the chimney base or the top of the chimney, depending upon the test being run.

Similar to the chimney relining study, two different fueling techniques were used during the test series -- wood brands constructed to the requirements of UL 1482 and seasoned oak cordwood. For the brand tests, specially constructed, oven-dry douglas fir brands were added at 7.5 minute intervals after ignition. For the log tests, seasoned oak cordwood was added at regular intervals to maintain as hot a fire as possible in the insert. For all tests, the fueling door of the inserts was closed and any combustion air inlets were fully opened.

With the above combinations, the following series of tests was conducted:

Test	Insert	Connection	Fuel
FI001	none	none	Brands
FI002	none	none	Logs
FI101	#1	none	Brands
FI102	#1	none	Logs
FI112	#1	to chimney base	Logs
FI122	#1	to chimney top	Logs
FI202	#2	none	Logs
FI212	#2	to chimney base	Logs
FI222	#2	to chimney top	Logs

5.2 Effect of Insert Interconnection

Test results comparing the three different interconnection techniques are shown in figures 10 through 18. For the comparisons, measurements presented include

- firebrick surface temperature (of the surface facing the fire),
- brick surface temperature between brick courses in the fireplace and on the inner brick surface facing the flue liner in the chimney,
- outer brick surface temperature on the fireplace and on the chimney,
- fireplace damper surface temperature,
- flue gas temperature in the chimney,
- flue liner surface temperature (on the outer face of the flue liner), and
- combustible enclosure surface temperature.

Tables 2 and 3 present some of the results of the tests. Table 2 and figure 19 present maximum temperatures (temperature rise for the enclosure) over the entire test period for the nine experiments. Table 3 presents an average of the maximum temperatures over the test period for the insert and damper surfaces, as well as the flue gas. Average maximum enclosure surface temperature rise is also presented in table 3.

For both inserts, the highest temperatures on the firebrick surfaces were noted without a connection to the chimney, a logical result since the flue gases of the inserts exhaust directly into the firebox when no connection is present. Closer to the chimney, similar results are noted in the damper area. As the connection is continued up the chimney from no connection to connection to the chimney base, and to the chimney top, comparable results are noted in the damper area with temperatures dropping from 221°C to 133°C for insert #1 and from 381°C to 274°C for insert #2 (table 2). Finally, on surfaces farthest removed from the firebox, the enclosure surfaces, the results are smaller in magnitude. Conversely, chimney surface temperatures rise as the connection is moved up the chimney. On the inner brick surfaces of the chimney, lower temperatures are noted for the tests with no connection than with a connection to the chimney base or chimney top.

Figure 20 shows temperatures in the flue gas and on fireplace and chimney surfaces normalized to temperatures measured without an insert in the fireplace. With this normalization, the following properties hold:

Normalized temperature > 1.0: Temperature levels for the fireplace with an insert are higher than without an insert.

Normalized temperature = 1.0: Temperature levels for the fireplace with an insert are equal to those without an insert.

Normalized temperature < 1.0: Temperature levels for the fireplace with an insert are lower than without an insert.

Temperatures on surfaces near the firebox are seen to be nearly always lower with an insert while temperatures in the chimney are sometimes 2 to 3 times higher with an insert. Again, this shows the heat concentrating higher in the chimney due to the interconnection of the insert directly to the chimney. Finally, figure 21 shows only temperatures in the flue gas and on the combustible enclosure for the three fireplace / insert interconnection techniques. From the flue gas measurements, it can be seen that as the connection is carried further up the chimney, the maximum flue gas temperature increases. The enclosure surface temperature measurements do not show the same trend. This may be because the enclosure surface temperatures are at such a low level and are naturally more variable when normalized, since a small change in either temperature used in the normalization will result in a (relatively) larger change in the normalized temperature than would be noticed in the flue gas readings.

5.3 Effect of Insert Size

Since only two inserts were tested in the program, definitive answers on the effect of insert size on the thermal performance of the fireplace / insert systems cannot be made. However, some trends are evident from the data presented in table 1. Not surprisingly, temperature levels were generally higher for the larger appliance, insert #2. In all comparisons, temperatures on the firebrick surface (in the fireplace near the insert) were higher for insert #2 than for insert #1. Even with similar flue gas temperatures in tests FI112 and FI212, temperature levels were nearly 100°C higher on the firebrick surface for insert #2. Comparable results can be observed on the interior and exterior brick surfaces on the fireplace and on the chimney.

For both inserts however, the temperature rise on the enclosure surface was within established limits. For the larger insert, temperature rise was lower as the lining was carried up to the top of the chimney. The same result was not noted for insert #1. Again, this may be because the temperature levels on the enclosure surfaces are inherently more variable than measurements at other locations, being directly exposed to the surroundings. Without multiple tests to ascertain whether the effect is consistent or merely a result of the test variability, the significance of the difference cannot be determined.

As with the masonry chimney lining techniques, the fireplace insert / chimney interconnection technique can have a significant effect upon the temperatures measured in and around the masonry. However, for the fireplace and insert combination, the resulting impact on safety is not so clear. Lowering the

temperature in the firebox region results in lower temperatures on combustibles around the firebox. However, since the heat must be dissipated somewhere, higher temperatures develop in the chimney. The impact on safety from this re-distribution of heat in the fireplace and chimney system depends upon the design of the system. If the chimney is over-designed relative to the fireplace (from a thermal performance standpoint), safety is enhanced. Conversely, if the fireplace provides better thermal protection than the chimney, the safety of the overall system would be degraded. With roughly equal margins of safety in the fireplace and chimney, little impact on safety would be noticed. Without the thermal performance issue providing a clear direction for the codes, other issues such as ease of cleaning of a fireplace with an insert may be more important.

6. SUMMARY AND CONCLUSIONS

A series of tests was conducted in a masonry chimney and a masonry fireplace constructed to current national standards in order to evaluate the effectiveness of recent changes in the building code requirements for residential masonry construction. Firing rates typical of normal homeowner use and of an overfire condition resulted in temperature levels close to limits recommended by Underwriters Laboratories for properly constructed solid fuel heating systems. In addition, several lining techniques for the masonry chimney and for the fireplace chimney connected to solid fuel burning fireplace inserts showed significant reductions in thermal hazard to exposed combustible construction nearby the masonry surfaces.

Current codes addressing masonry construction allow alternate lining systems with some limitations. The provisions in NFPA 211[6] are typical:

> "When masonry chimneys are relined, the liner shall be listed or of approved material that will resist corrosion, softening, or cracking from flue gases at temperatures appropriate to the class of chimney service. Listed liner systems shall be installed in accordance with the listing."

This paper has investigated two alternate lining systems for residential chimney use. Both showed reductions in temperature levels compared to a traditional fire clay lined chimney.

In a study of fireplace insert / chimney interconnection, three different techniques used to install fireplace inserts in masonry fireplaces were studied. While the interconnection technique had an effect upon temperature levels in the fireplace and chimney, safety was not clearly impacted with any of the systems. A more important issue affecting usability of the appliance along with safety may be the ease with which the insert and chimney system can be cleaned. It is in this area that the technique used for interconnection may have a significant impact.

No attempt was made in this study to address the durability of the systems investigated as alternative chimney linings or for fireplace insert / chimney interconnection. The reader is referred to other studies, available in the literature covering the durability of wood heating systems[36].

Table 1 Overall Maximum Temperatures Recorded During Several Tests of Different Masonry Chimney Relinings

Test	Lining	Fuel	Firing Rate	Flue Gas (°C)	Flue Liner Surface (°C)	Inner Brick Surface (°C)	Outer Brick Surface (°C)	Enclosure Surface[2] (°C)
MC002	Fire Clay	Logs	Normal	519	359	196	136	75
MC002[1]	Fire Clay	Logs	Normal	426	235	143	109	53
MC011	Fire Clay	Brands		327	327	139	104	48
MC012	Fire Clay	Logs	Overfire	855	478	310	203	119
MC102	Stainless	Logs	Normal	471	--[3]	35	27	35
MC111	Stainless	Brands		625	414	111	85	46
MC112	Stainless	Logs	Overfire	583	350	85	64	45
MC112[1]	Stainless	Logs	Overfire	598	357	84	67	50
MC211	Masonry	Brands		497	253	134	95	44
MC212	Masonry	Logs	Overfire	574	267	139	99	54

Notes to Table 1.

1: Repeat test.
2: Enclosure surface temperature is expressed as rise above ambient temperature.
3: Instrument malfunction prevented data collection on flue liner surface for this test.

Table 2: Overall Maximum Temperatures Recorded During Soveral Tests of Fireplace Insert / Masonry Chimney Interconnection[1]

Test	Insert	Connection	Fuel	Firebrick Surface	Interior Brick Surface	Exterior Brick Surface	Damper Surface	Flue Gas	Flue Liner Surface	Inner Chimney Surface	Outer Chimney Surface	Enclosure Surface
FI001	None	None	Brands	495	67	34	272	333	207	116	66	22
FI002	None	None	Logs	619	81	41	221	289	190	83	43	30
FI101	#1	None	Brands	382	53	41	500	819	581	351	190	46
FI102	#1	None	Logs	166	30	23	221	384	227	117	75	27
FI112	#1	To Base	Logs	165	43	33	210	762	352	224	116	31
FI122	#1	To Top	Logs	161	34	27	133	803	233	144	77	25
FI202	#2	None	Logs	354	63	46	381	735	519	223	142	50
FI212	#2	To Base	Logs	247	51	39	306	757	388	241	132	38
FI222	#2	To Top	Logs	340	54	39	274	900	306	219	121	33

Note to Table 2.

1: All temperatures are in °C. For enclosure surfaces, temperature rise above ambient is presented.

Table 3: Average Maximum Temperatures Recorded During Several Tests of Fireplace Insert / Masonry Chimney Interconnection[1]

Test	Insert Surface	Flue Gas	Damper Surface	Enclosure Surface
FI001	--[2]	232	187	9
FI002	--[2]	165	134	11
FI101	406	440	261	18
FI102	383	212	122	13
FI112	423	472	119	10
FI122	389	460	75	8
FI202	436	378	236	19
FI212	424	459	163	13
FI222	486	613	148	12

Notes to Table 3.

1: All temperatures are in °C. For enclosure surfaces, temperature rise above ambient is presented.

2: No insert for this test.

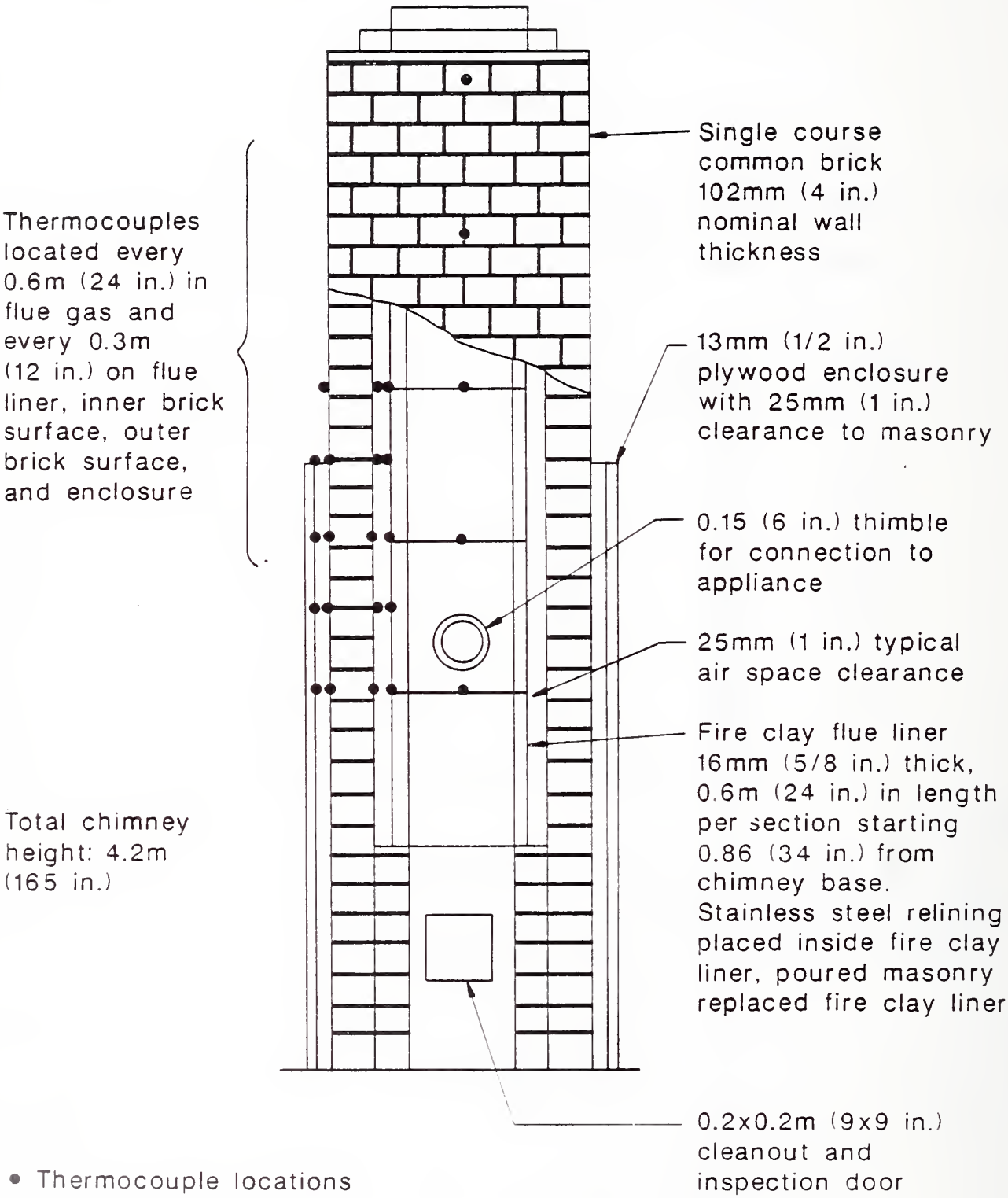
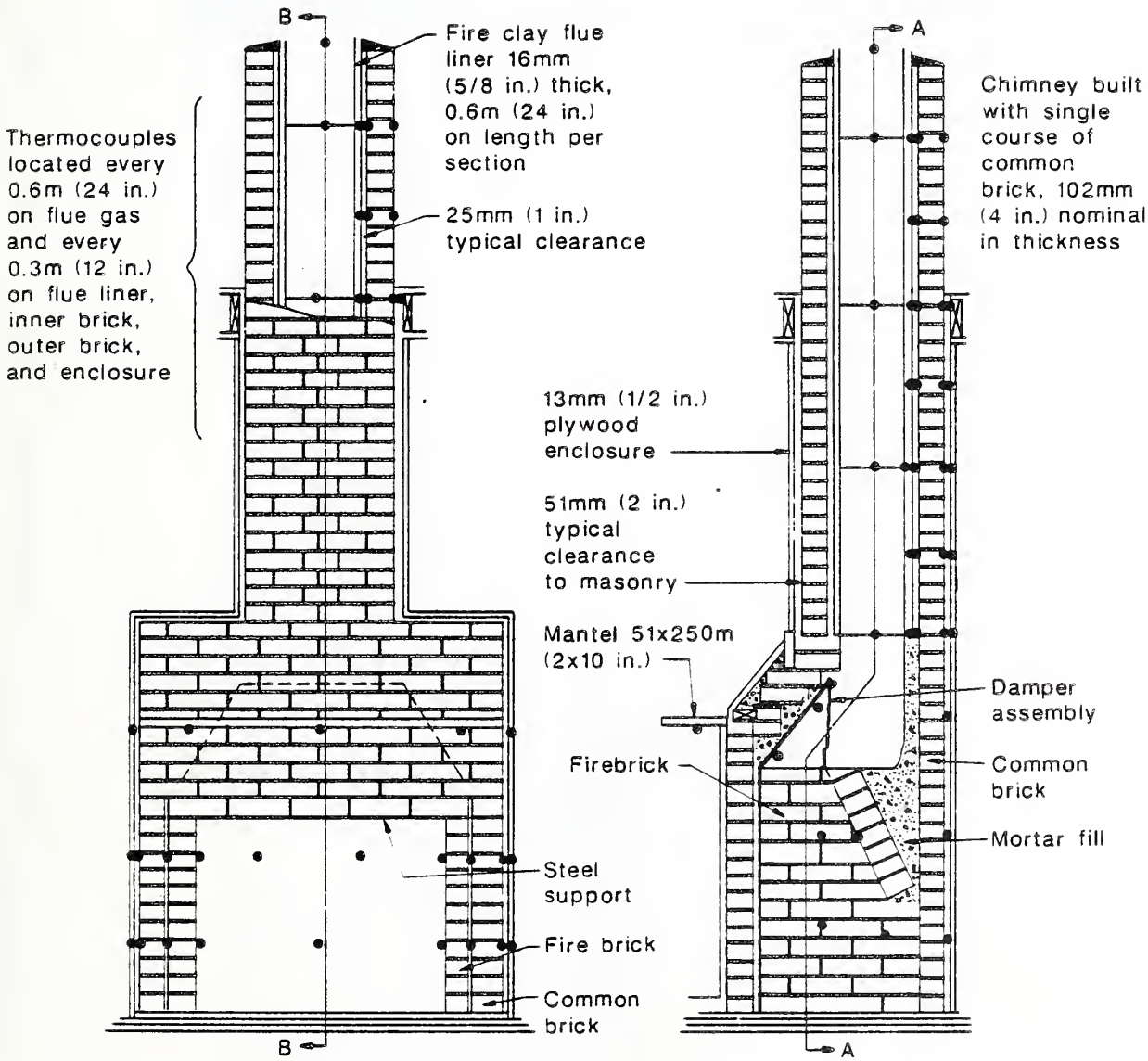


Figure 1: Masonry Chimney Design and Instrumentation



• Thermocouple locations

Fireplace built with double course of brick, firebrick inside, common brick outside

Figure 2: Masonry Fireplace Design and Instrumentation

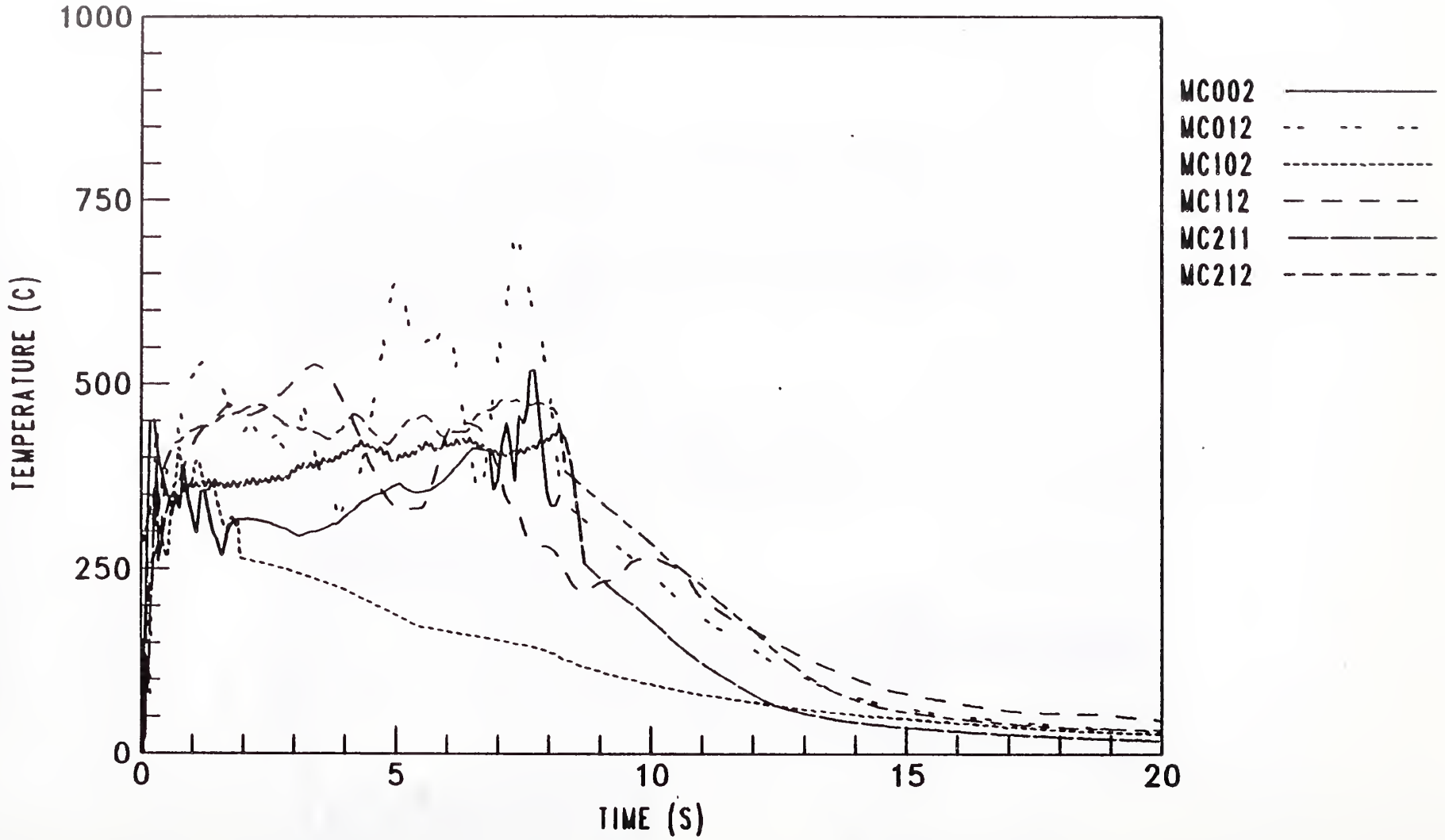


Figure 3: Flue Gas Temperatures Measured During Tests of Chimney Lining Techniques

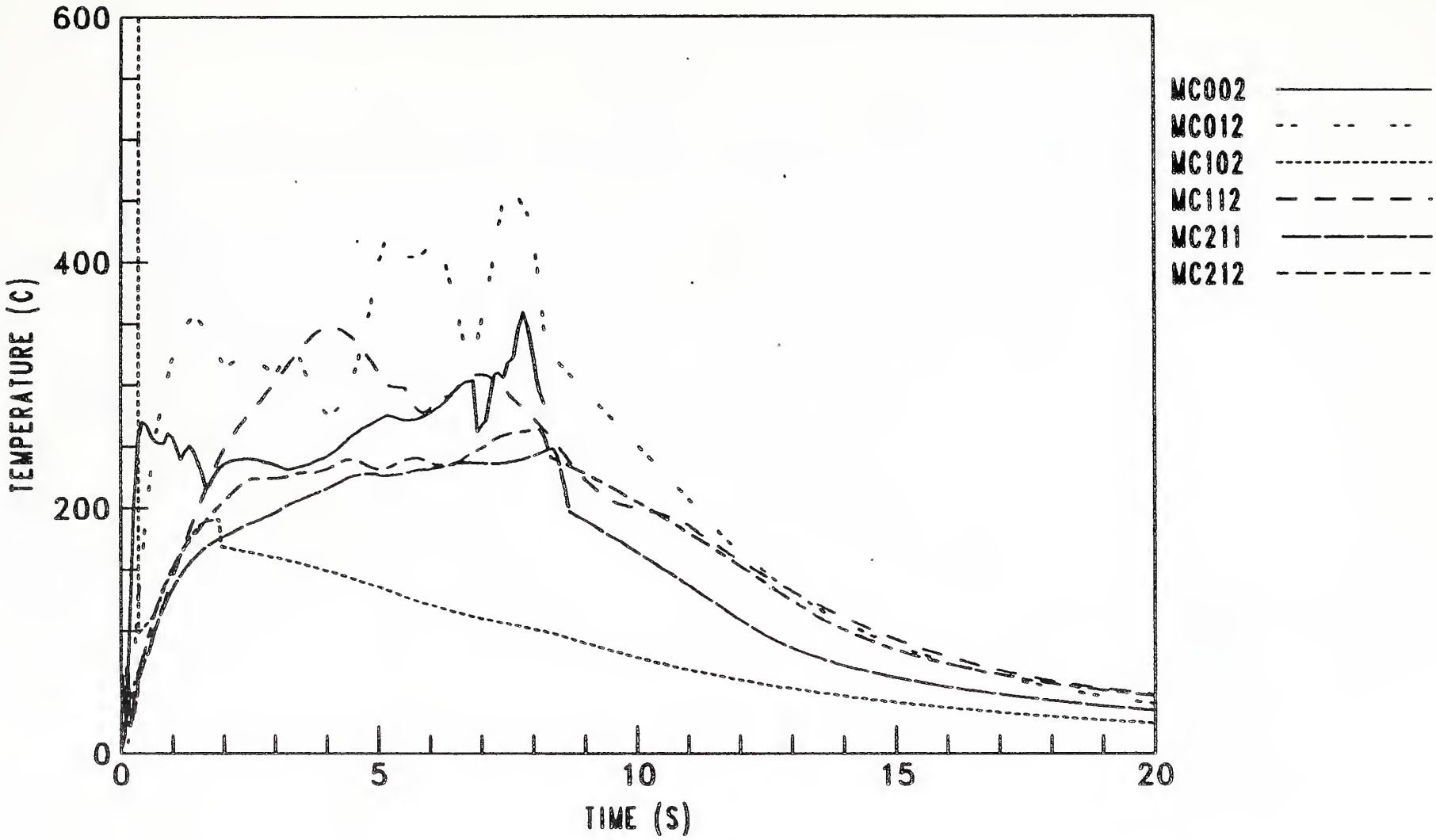


Figure 4: Flue Liner Surface Temperatures Measured During Tests of Chimney Lining Techniques

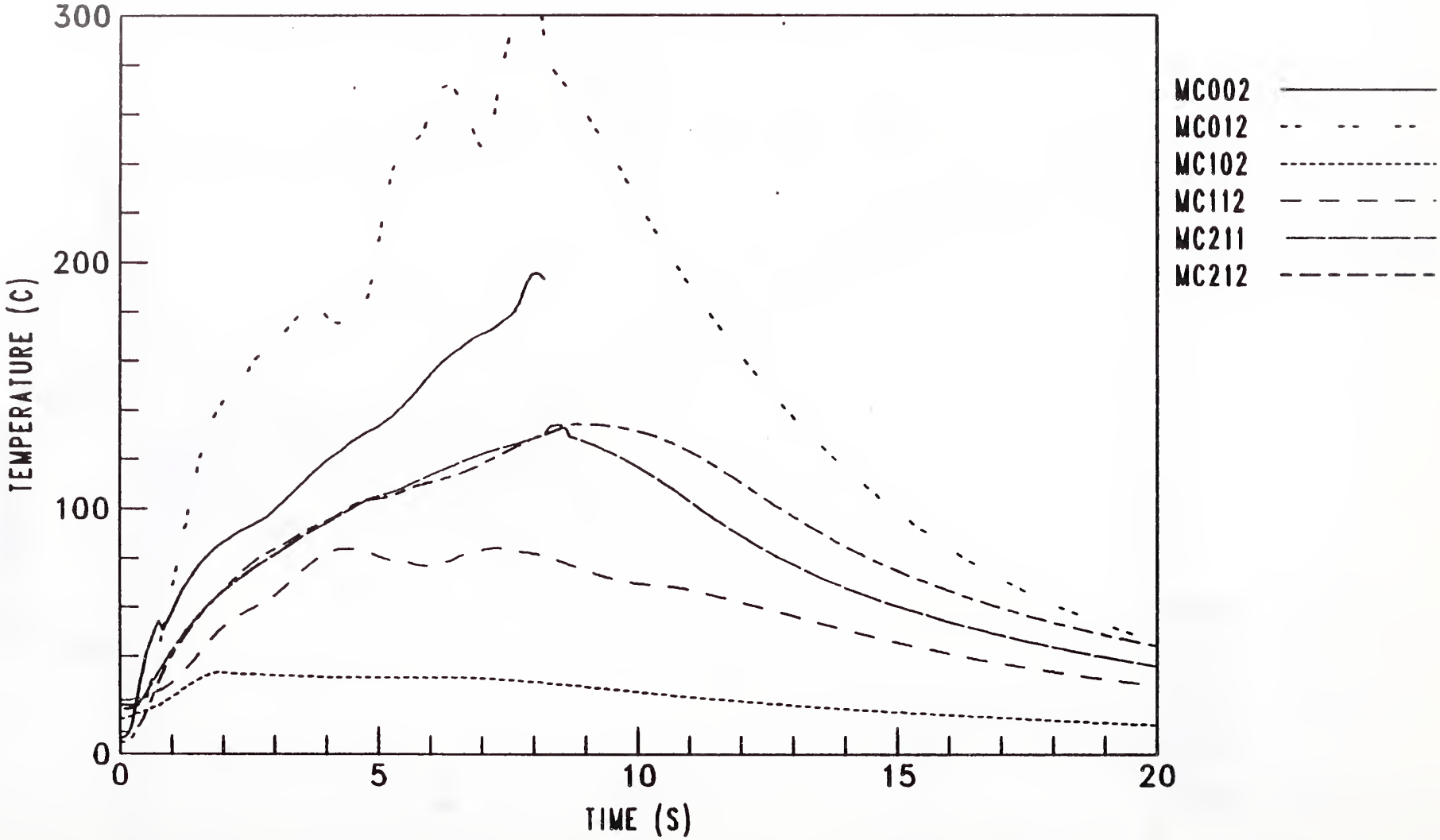


Figure 5: Inner Chimney Brick Surface Temperatures Measured During Tests of Chimney Lining Techniques

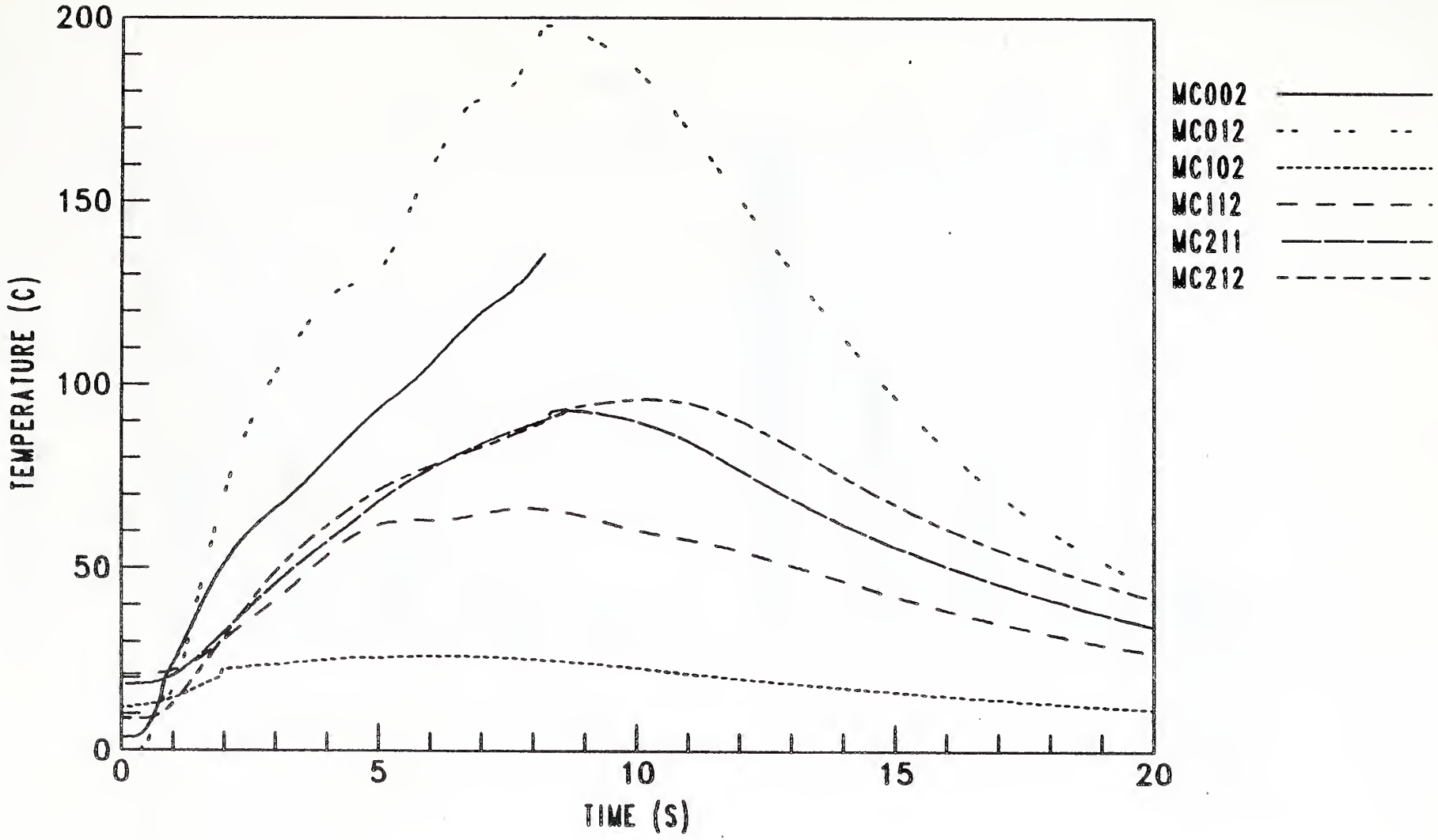


Figure 6: Outer Chimney Brick Surface Temperatures Measured During Tests of Chimney Lining Techniques

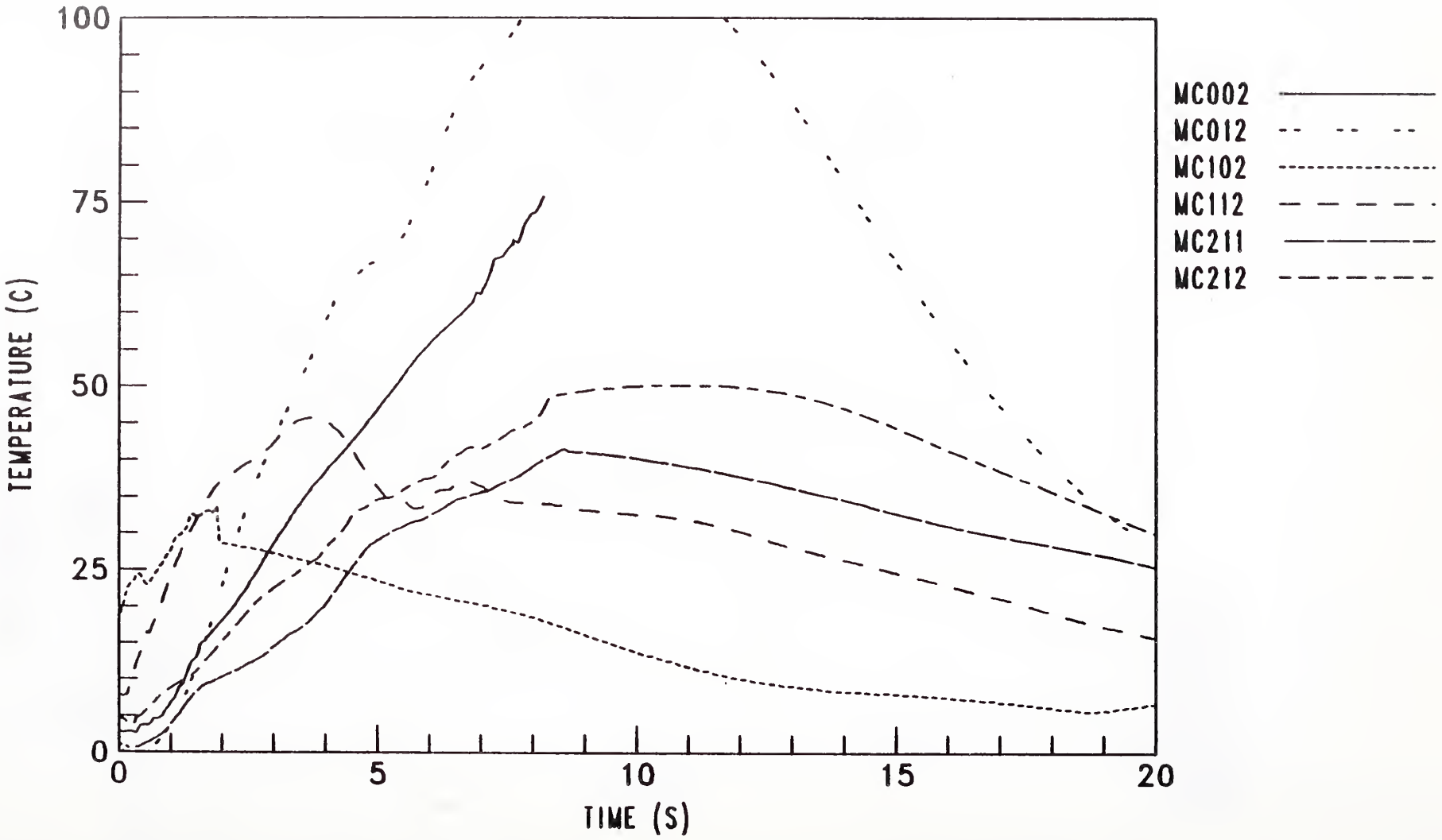


Figure 7: Enclosure Surface Temperature Rises Measured During Tests of Chimney Lining Techniques

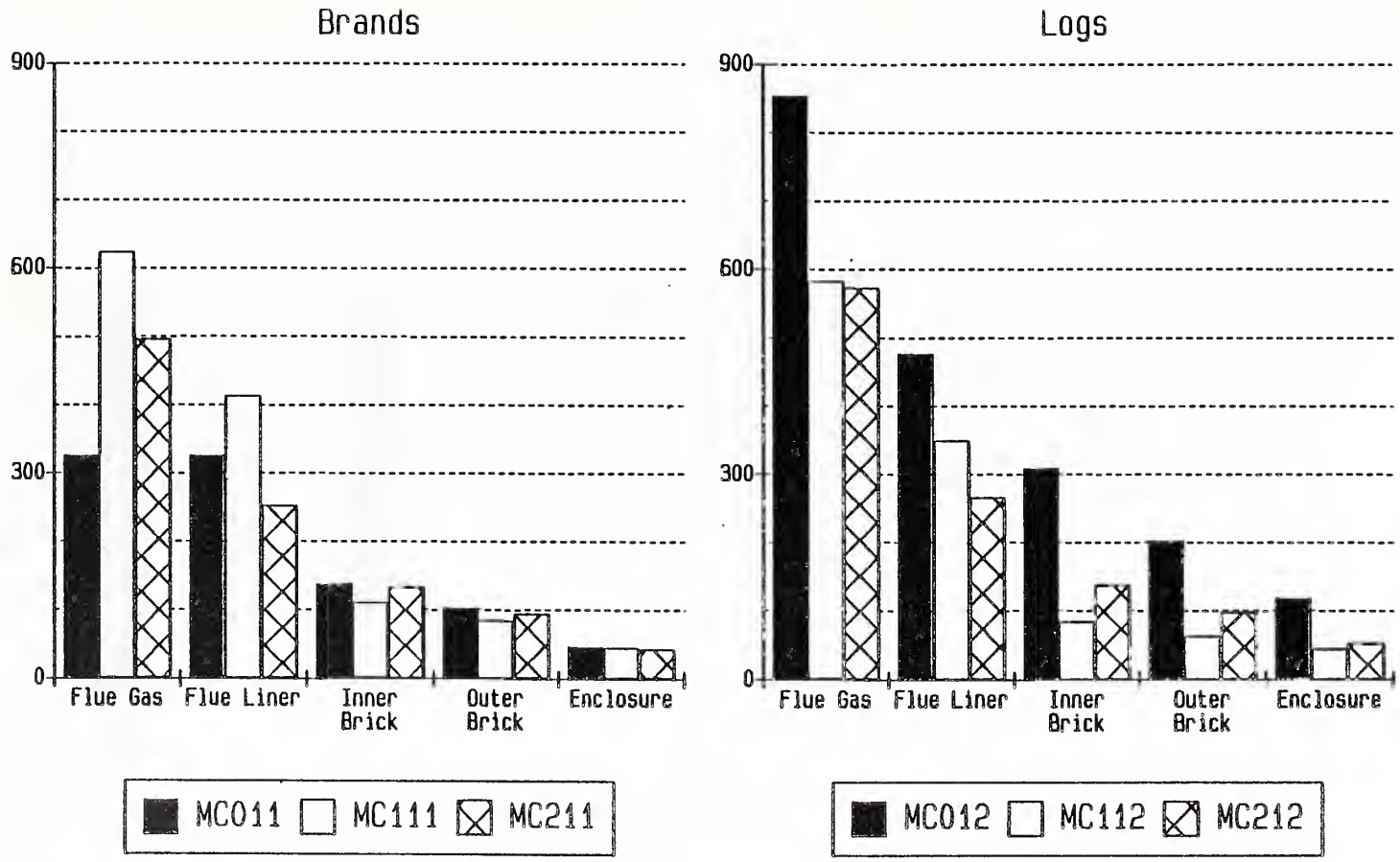


Figure 8: Maximum Temperatures Measured During Tests of Chimney Lining Techniques

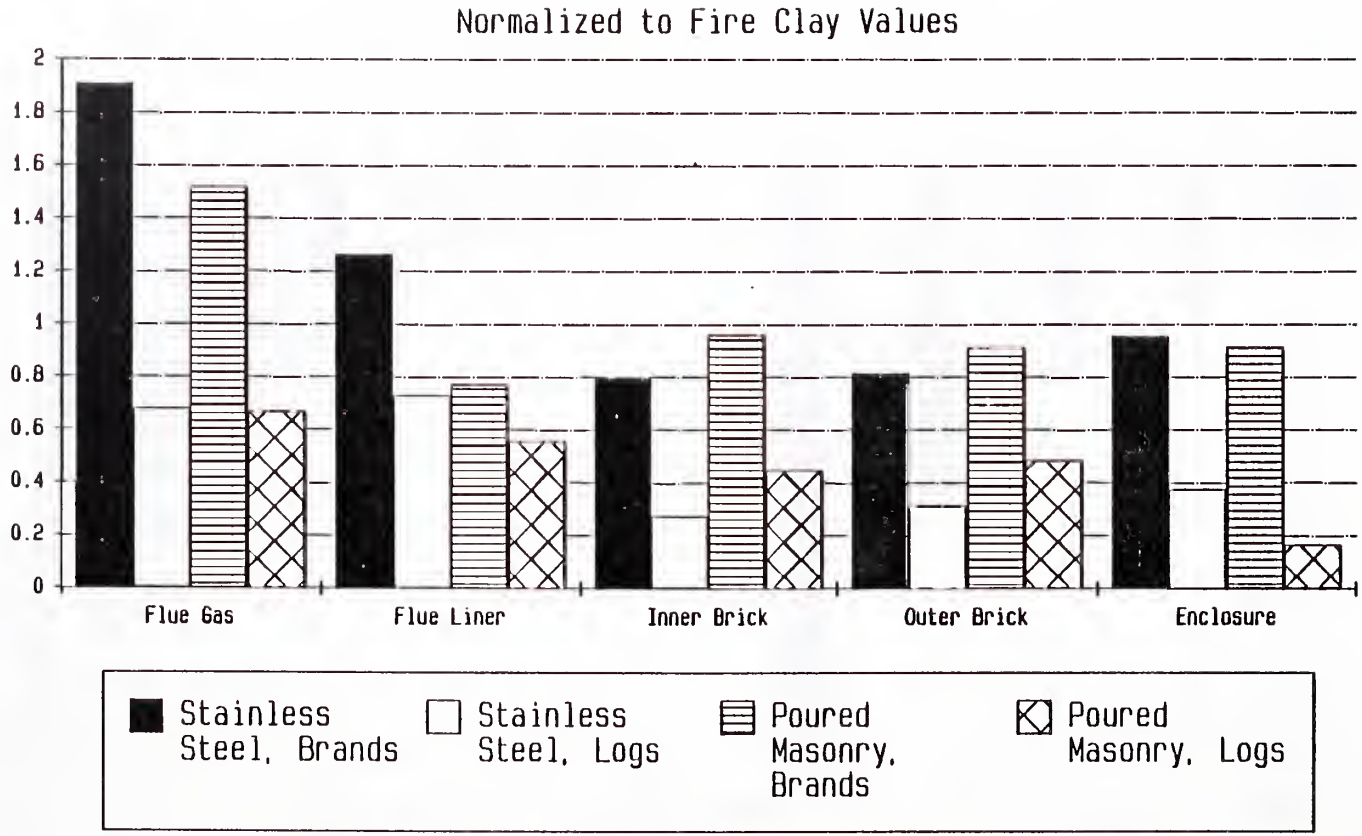


Figure 9: Maximum Temperatures Measured During Tests of Relined Chimneys Normalized to Temperatures Measured During Tests of Fire Clay Lined Chimneys

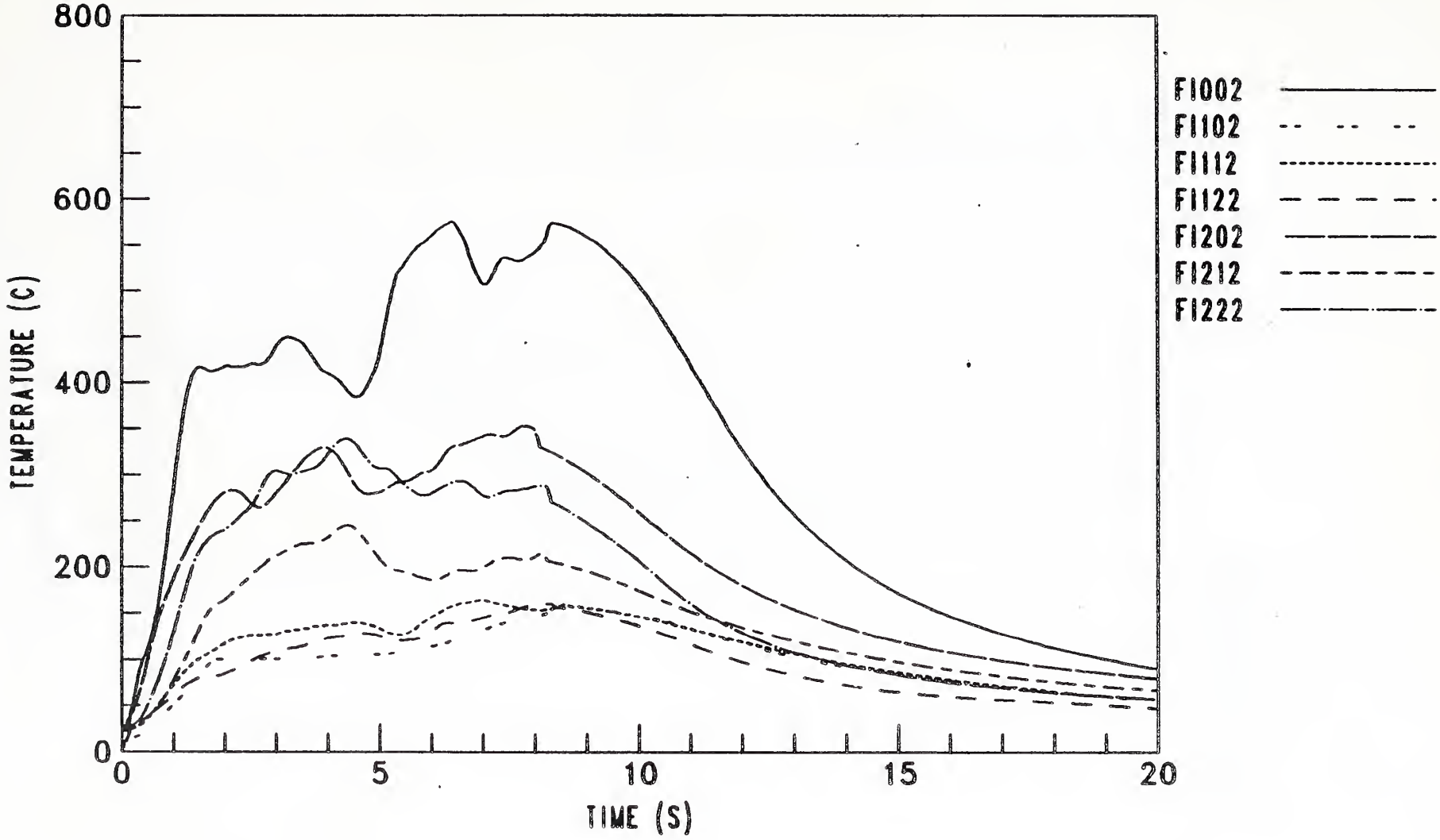


Figure 10: Fireplace Firebrick Inner Surface Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

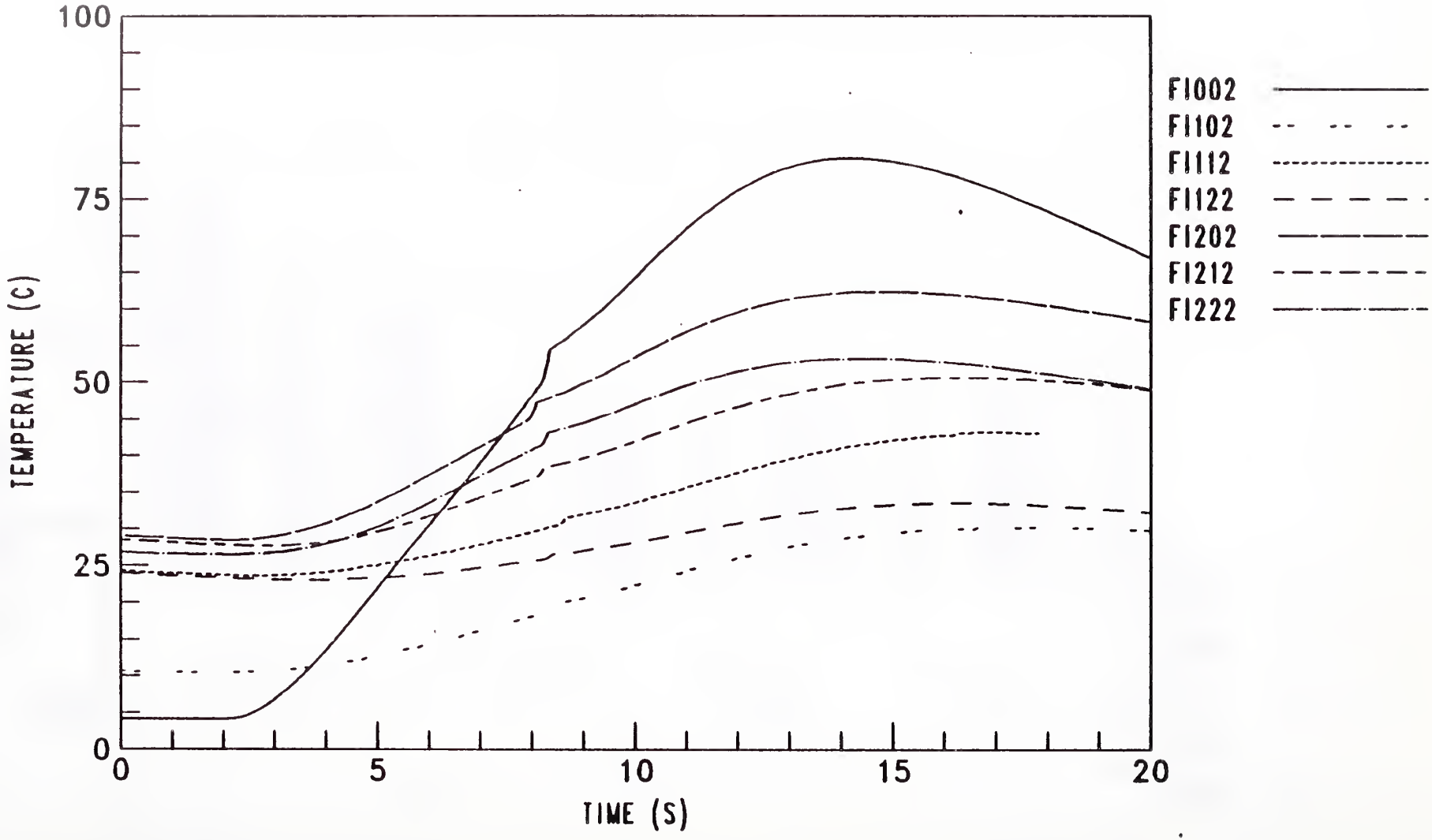


Figure 11: Fireplace Middle Brick Surface Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

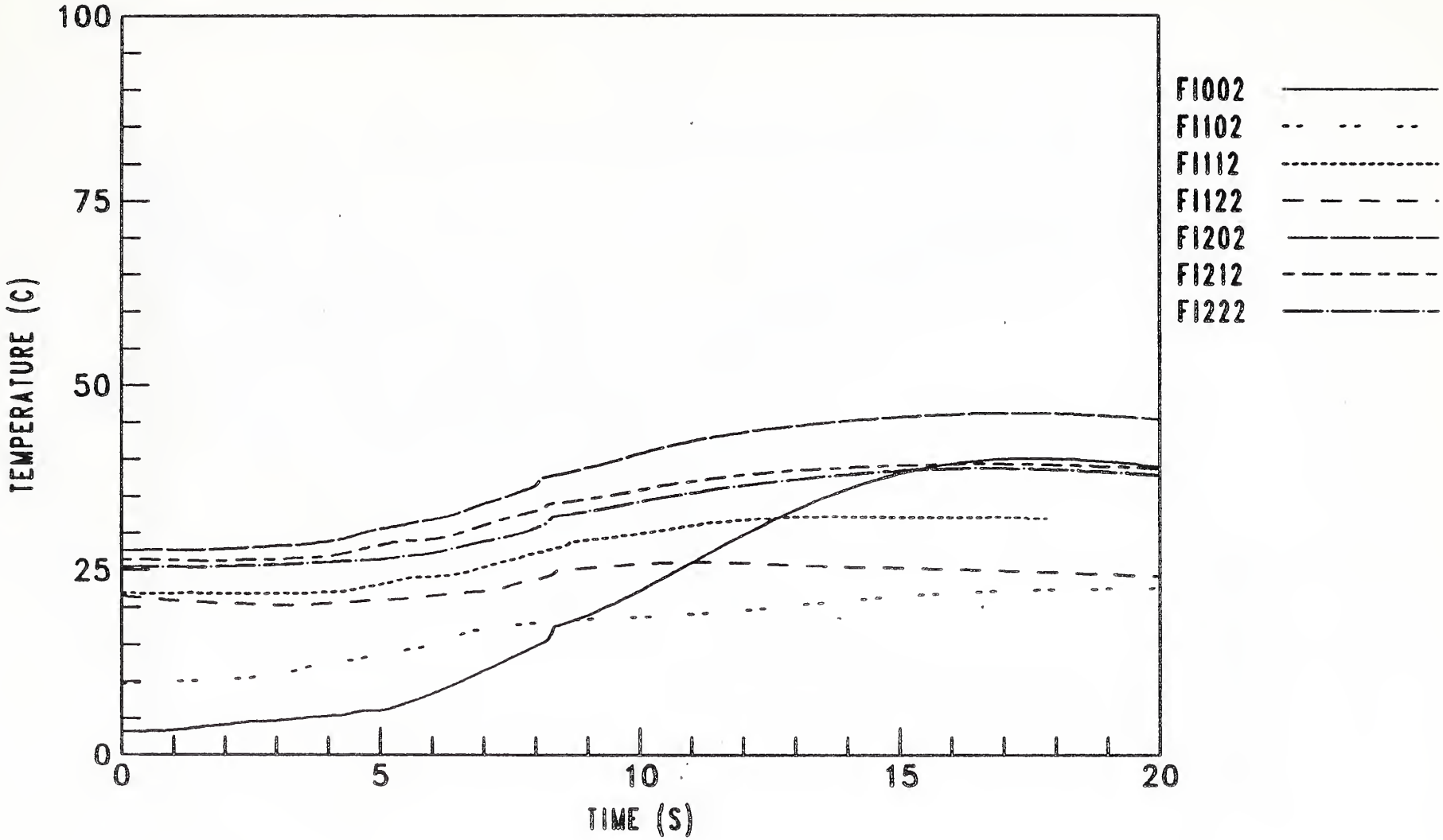


Figure 12: Fireplace Outer Brick Surface Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

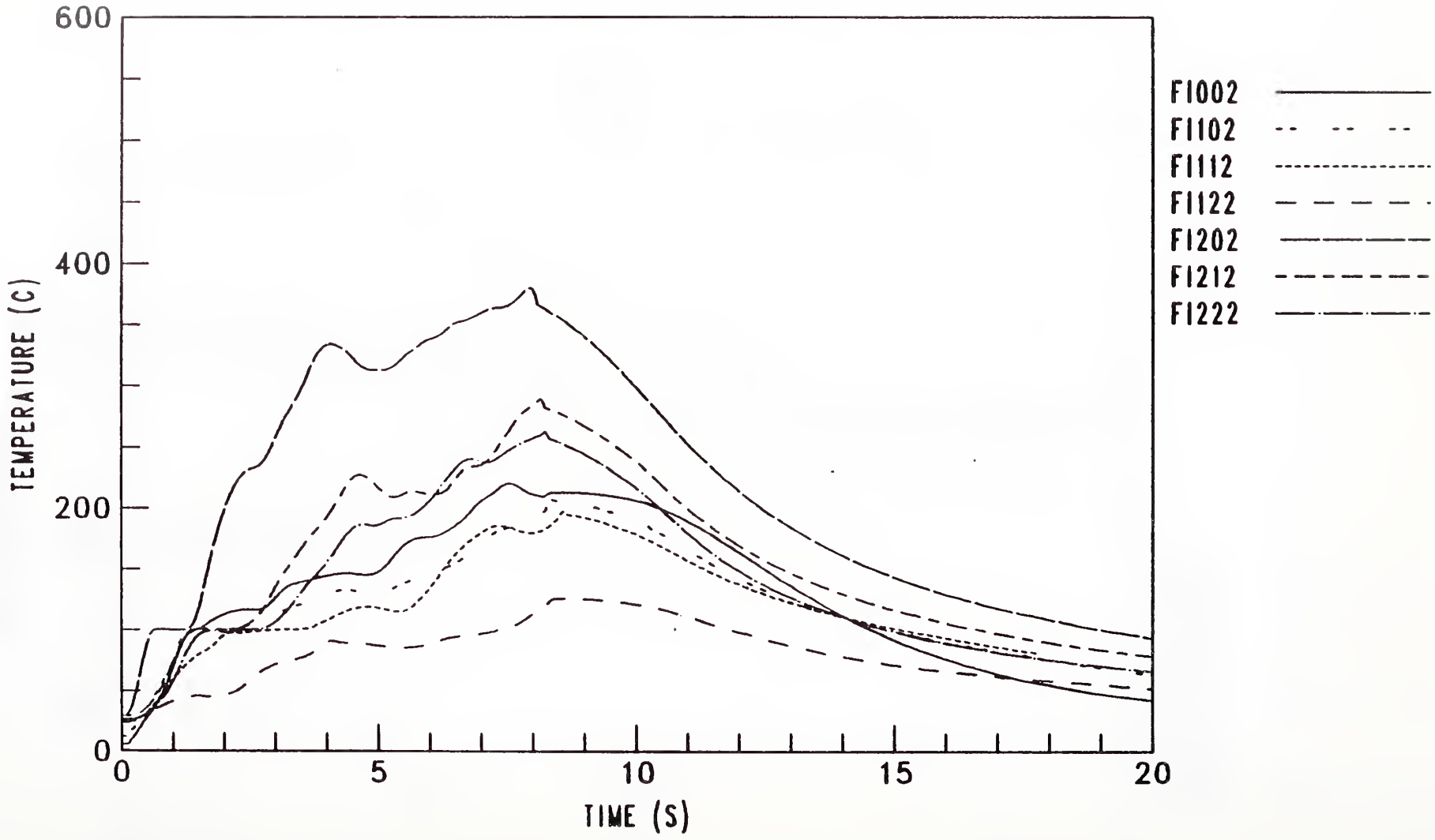


Figure 13: Fireplace Damper Surface Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

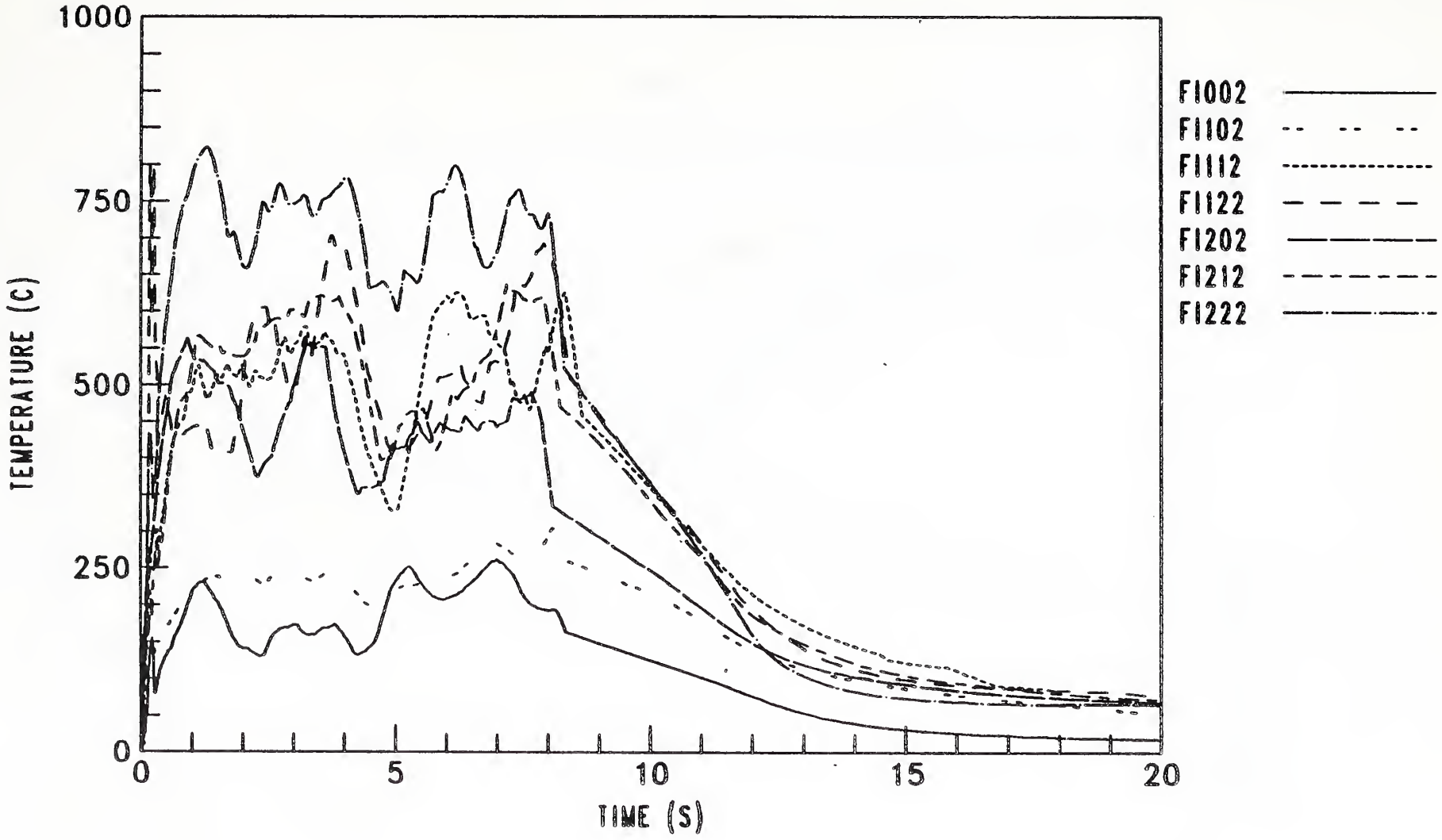


Figure 14: Flue Gas Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

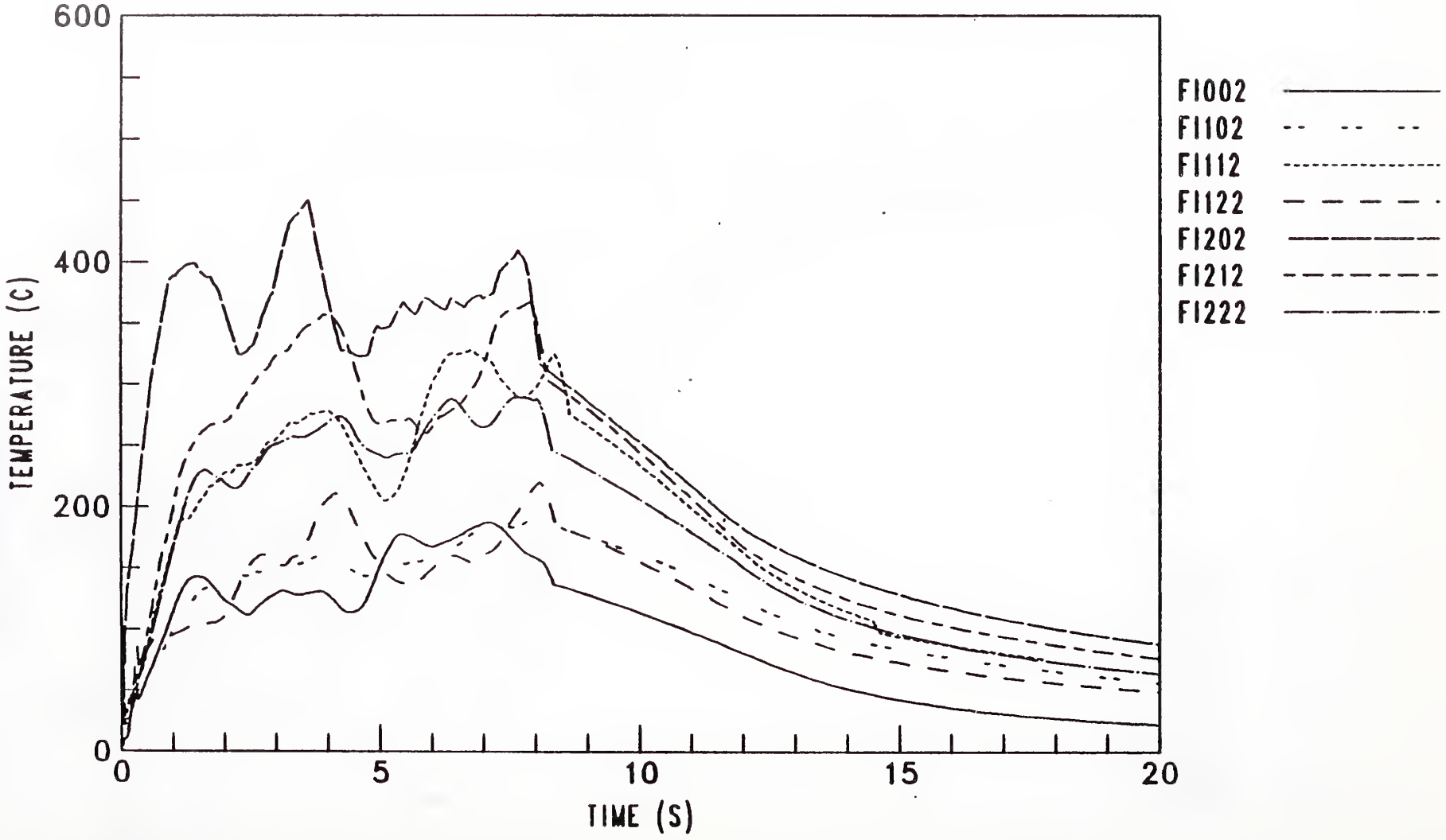


Figure 15: Fire Clay Flue Liner Surface Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

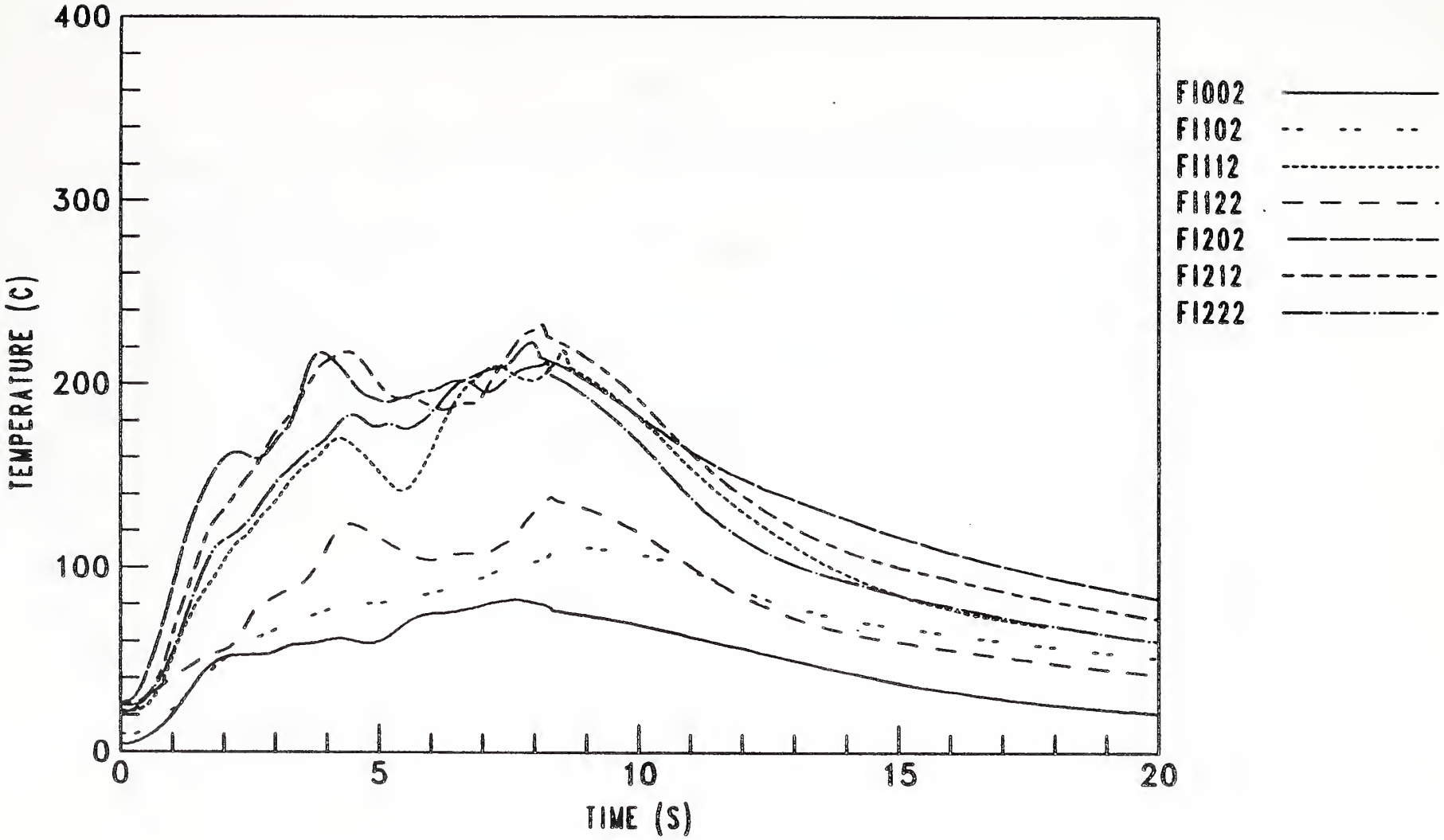


Figure 16: Inner Chimney Brick Surface Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

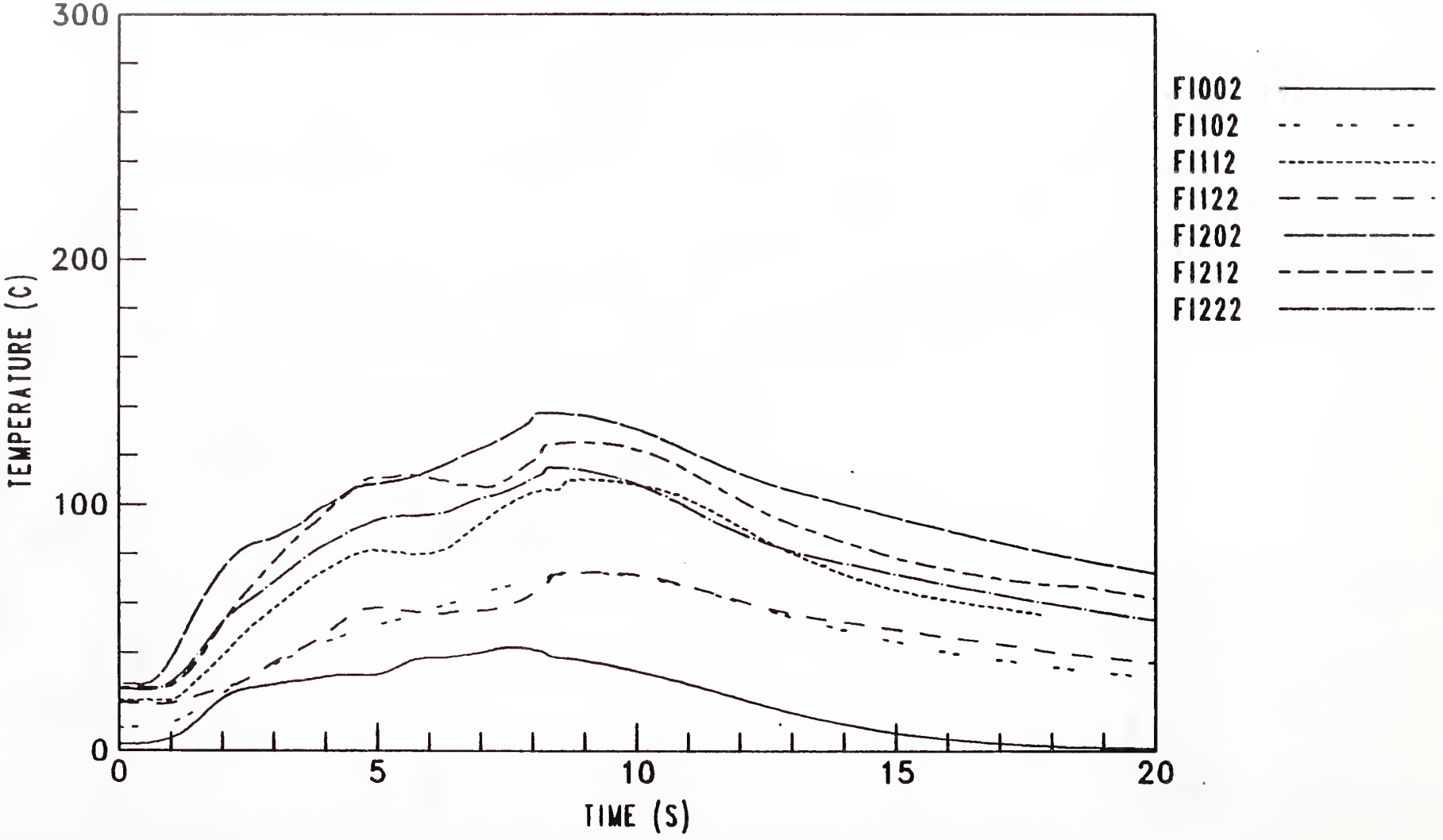


Figure 17: Outer Chimney Brick Surface Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

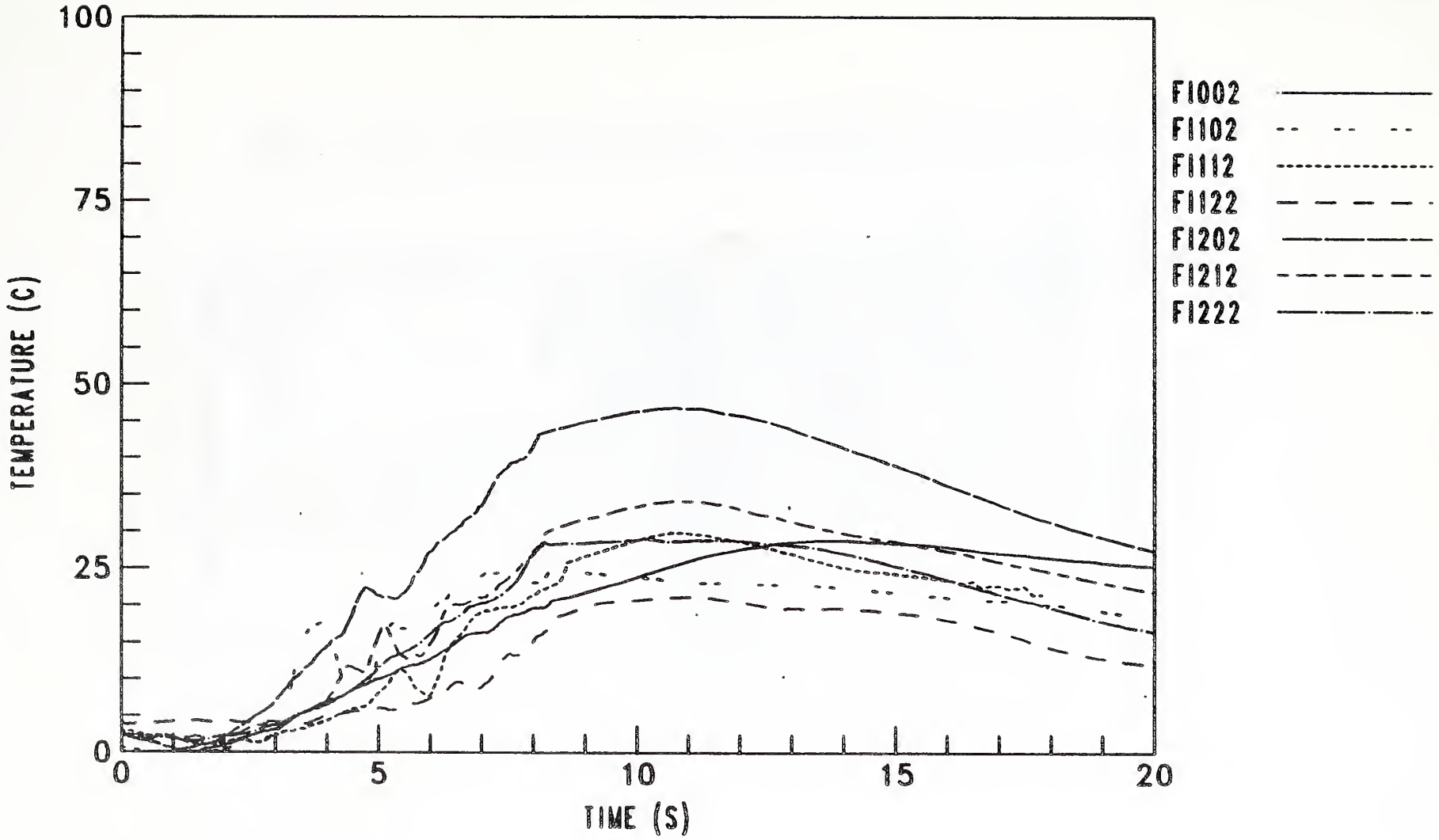


Figure 18: Enclosure Surface Temperature Rise Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

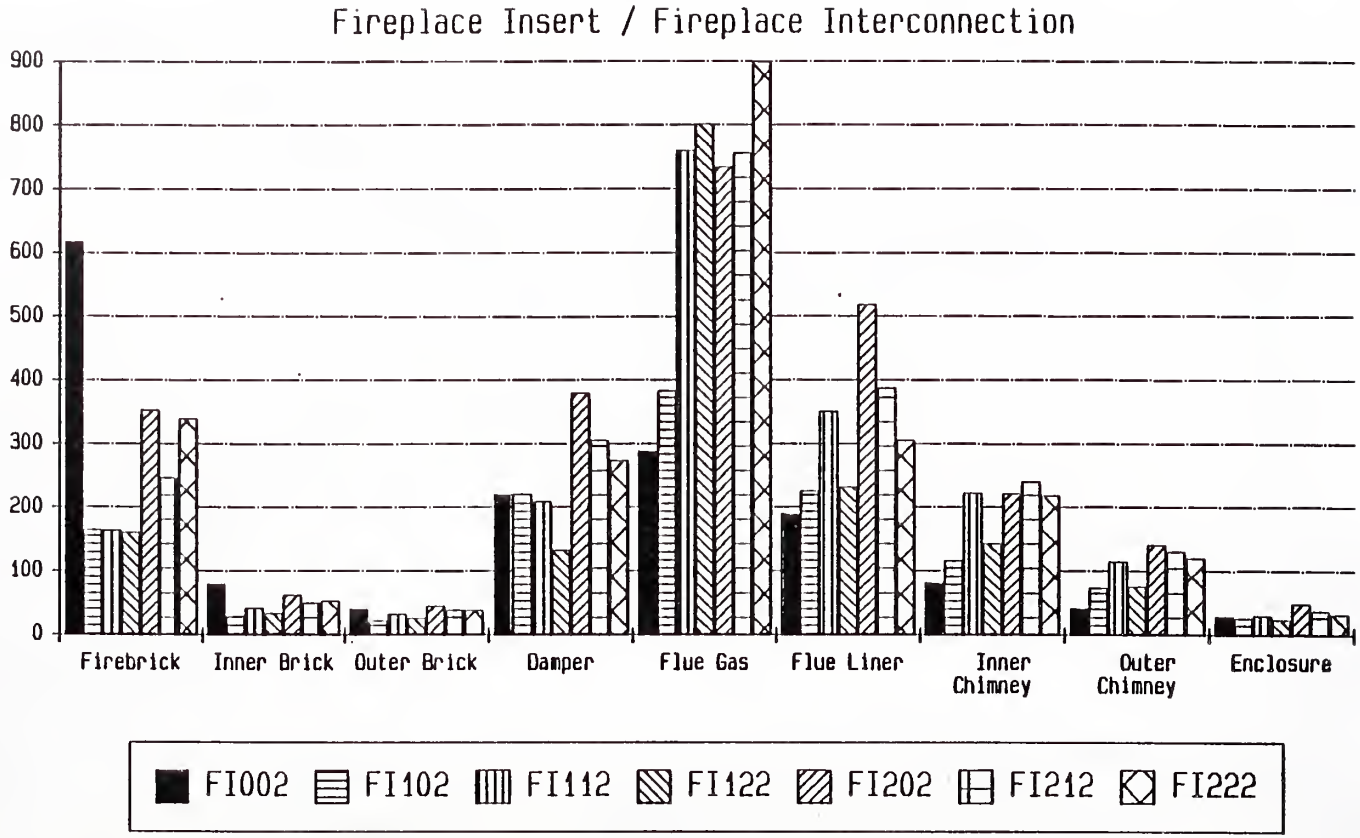


Figure 19: Maximum Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques

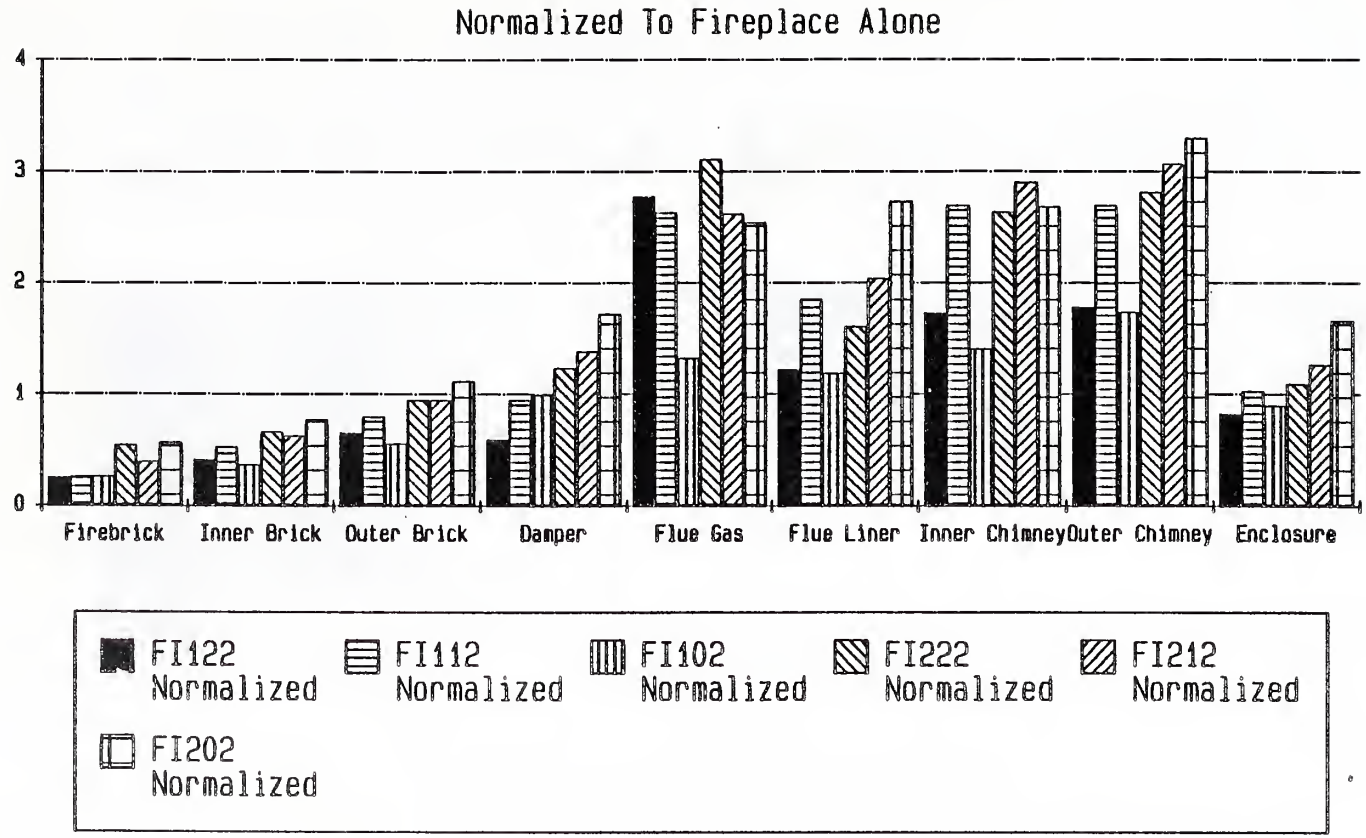


Figure 20: Maximum Temperatures Measured During Tests of Fireplace Insert / Chimney Interconnection Techniques Normalized to Temperatures Measured During Tests of Fireplace Without Fireplace Insert

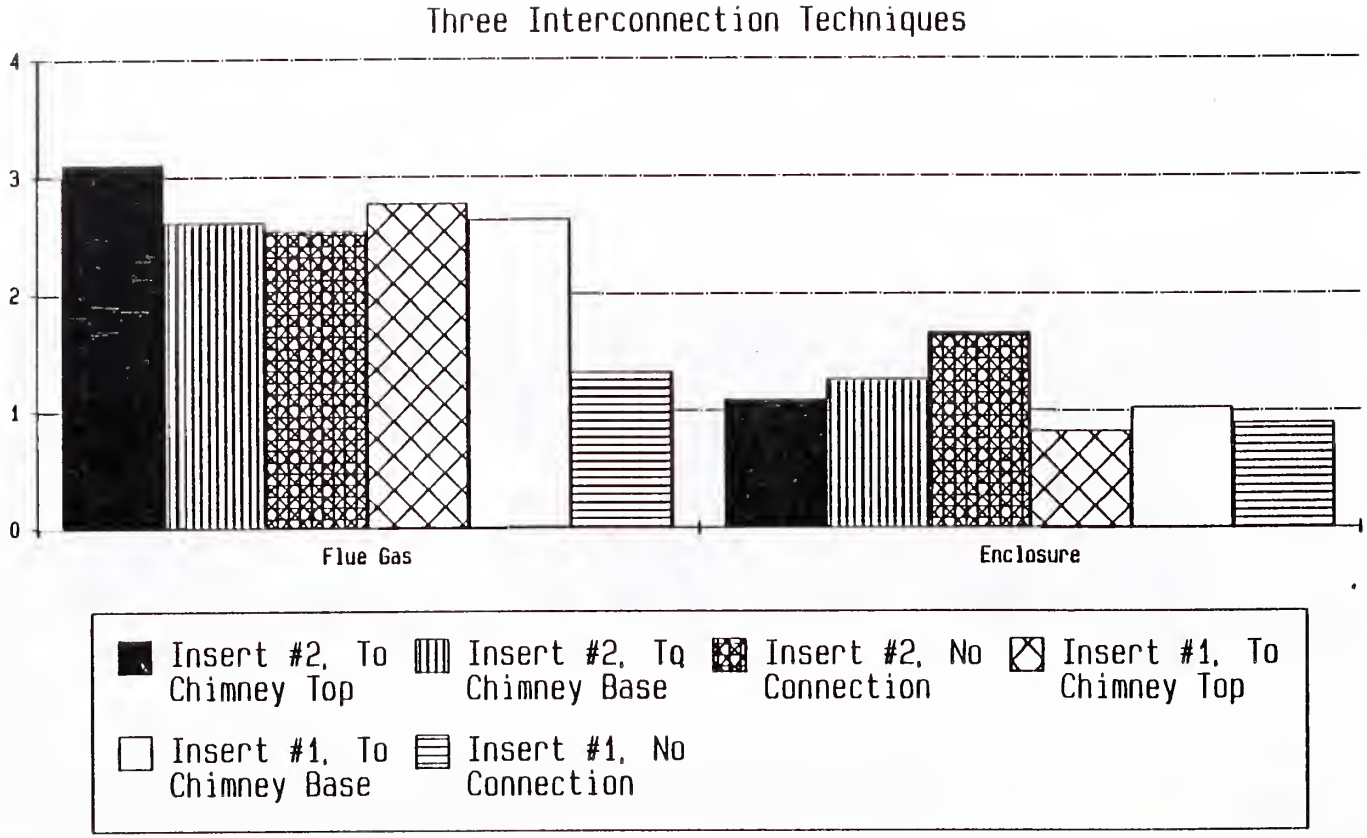


Figure 21: Maximum Temperatures for Three Fireplace / Insert Interconnection Techniques

Appendix A: Summary of Reading From All Instruments In Chimney Lining Tests

Test MC002

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	1
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	2
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	3
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	4
51	2	GAS 54	54 IN. LEVEL	5
52	2	GAS 82	82 IN. LEVEL	6
53	2	GAS106	106 IN. LEVEL	7
54	2	GAS130	130 IN. LEVEL	8
55	2	GAS154	154 IN. LEVEL	9
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	10
32	2	LIN 70	70 IN. LEVEL	11
35	2	LIN 82	82 IN. LEVEL	12
38	2	LIN 94	94 IN. LEVEL	13
41	2	LIN106	106 IN. LEVEL	14
44	2	LIN118	118 IN. LEVEL	15
47	2	LIN130	130 IN. LEVEL	16
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	17
33	2	IN 70	70 IN. LEVEL	18
36	2	IN 82	82 IN. LEVEL	19
39	2	IN 94	94 IN. LEVEL	20
42	2	IN 106	106 IN. LEVEL	21
45	2	IN 118	118 IN. LEVEL	22
48	2	IN 130	130 IN. LEVEL	23
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	24
34	2	OUT 70	70 IN. LEVEL	25
37	2	OUT 82	82 IN. LEVEL	26
40	2	OUT 94	94 IN. LEVEL	27
43	2	OUT106	106 IN. LEVEL	28
46	2	OUT118	118 IN. LEVEL	29
49	2	OUT130	130 IN. LEVEL	30
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	31
58	2	ENC 54	SOUTH SIDE	32
59	2	ENC 54	EAST SIDE	33
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	34
61	2	ENC 70	SOUTH SIDE	35
62	2	ENC 70	EAST SIDE	36
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	37
64	2	ENC 82	SOUTH SIDE	38
65	2	ENC 82	EAST SIDE	39
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	40
67	2	ENC 94	SOUTH SIDE	41
68	2	ENC 94	EAST SIDE	42
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	43
22	2	THIM 2	RIGHT	44
23	2	THIM 3	BOTTOM	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
24	2	THIM 4		LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE,	TOP	47
26	2	THIM 6		RIGHT	48
27	2	THIM 7		BOTTOM	49
28	2	THIM 8		LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER		51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS	TABLE OF ADDERS	TABLE OF POWERS
C 3= 1.000000	ADD 3= 0.000000	POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY CHIMNEY NORMAL FIRE TEST LOG TEST MC002

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.2957E+05	103	0.1521E+05	60	0.7000	1	80.80	103	40.11
20	0.8000	1	103.1	102	69.93	61	0.8000	1	79.10	103	41.61
69	-1.400	1	9.600	83	3.279	62	1.300	1	70.70	103	35.25
50	4.100	1	19.60	97	10.79	63	0.7000	1	82.70	103	40.19
51	4.300	1	238.7	99	108.3	64	0.5000	3	79.40	103	40.39
52	3.900	1	519.5	97	350.0	65	1.400	3	78.10	103	39.10
53	3.600	1	493.6	97	337.6	66	0.5000	2	76.90	103	37.13
54	2.900	1	456.6	97	316.9	67	0.4000	3	79.30	103	40.96
55	0.9000	1	441.6	97	289.4	68	1.000	3	72.70	103	36.24
29	4.400	1	172.4	100	109.5	21	4.800	1	301.9	98	192.2
32	3.900	1	359.2	98	257.9	22	4.700	1	338.8	98	223.3
35	3.800	1	334.0	98	235.8	23	5.200	1	216.0	99	126.8
38	3.400	1	295.4	99	207.4	24	5.200	1	251.2	98	142.8
41	2.500	1	282.2	99	201.0	25	4.900	1	272.0	99	175.6
44	2.200	1	279.0	98	200.0	26	4.700	1	298.0	99	197.0
47	1.600	1	272.1	99	188.0	27	5.200	1	204.2	99	119.9
30	4.000	1	105.0	102	61.88	28	5.200	1	217.9	99	126.5
33	6.200	1	160.2	100	103.1	56	0.7000	1	78.20	102	52.66
36	3.600	1	195.7	101	119.3	100	0.0000	1	8.213	103	4.224
39	2.700	1	180.6	102	108.8	101	4.300	1	519.5	97	350.1
42	0.7000	1	157.3	101	96.02	102	4.400	1	359.2	98	257.9
45	0.7000	1	161.7	101	101.9	103	6.200	1	195.7	101	120.1
48	0.3000	1	143.8	101	88.88	104	3.600	1	135.9	103	79.00
31	3.300	4	73.10	103	40.90	105	2.600	5	75.80	103	39.05
34	3.600	1	135.9	103	79.00	106	5.200	1	338.8	98	223.3
37	3.100	4	130.6	103	73.38	107	5.200	1	298.0	99	197.1
40	2.400	3	127.0	103	70.72	108	3.283	1	361.2	97	235.5
43	-.2000	1	81.40	103	44.95	109	3.114	1	283.0	98	199.9
46	-.1000	1	85.20	103	48.26	110	2.600	1	157.6	101	97.12
49	-.2000	1	81.70	103	46.95	111	1.743	2	102.1	103	57.74
57	0.9000	1	54.70	103	27.05	112	2.036	2	65.90	103	33.33
58	1.000	1	53.70	103	28.06	113	4.975	1	275.5	98	171.3
59	1.600	1	47.40	103	23.62	114	5.000	1	248.0	99	154.8

Test MC002 (Repeat)

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	1
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	2
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	3
51	2	GAS 54	54 IN. LEVEL	4
52	2	GAS 82	82 IN. LEVEL	5
53	2	GAS106	106 IN. LEVEL	6
54	2	GAS130	130 IN. LEVEL	7
55	2	GAS154	154 IN. LEVEL	8
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	9
32	2	LIN 70	70 IN. LEVEL	10
35	2	LIN 82	82 IN. LEVEL	11
38	2	LIN 94	94 IN. LEVEL	12
41	2	LIN106	106 IN. LEVEL	13
44	2	LIN118	118 IN. LEVEL	14
47	2	LIN130	130 IN. LEVEL	15
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	16
33	2	IN 70	70 IN. LEVEL	17
36	2	IN 82	82 IN. LEVEL	18
39	2	IN 94	94 IN. LEVEL	19
42	2	IN 106	106 IN. LEVEL	20
45	2	IN 118	118 IN. LEVEL	21
48	2	IN 130	130 IN. LEVEL	22
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	23
34	2	OUT 70	70 IN. LEVEL	24
37	2	OUT 82	82 IN. LEVEL	25
40	2	OUT 94	94 IN. LEVEL	26
43	2	OUT106	106 IN. LEVEL	27
46	2	OUT118	118 IN. LEVEL	28
49	2	OUT130	130 IN. LEVEL	29
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	30
58	2	ENC 54	SOUTH SIDE	31
59	2	ENC 54	EAST SIDE	32
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	33
61	2	ENC 70	SOUTH SIDE	34
62	2	ENC 70	EAST SIDE	35
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	36
64	2	ENC 82	SOUTH SIDE	37
65	2	ENC 82	EAST SIDE	38
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	39
67	2	ENC 94	SOUTH SIDE	40
68	2	ENC 94	EAST SIDE	41
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	42
22	2	THIM 2	RIGHT	43
23	2	THIM 3	BOTTOM	44
				45

OUTSIDE MASONRY CHIMNEY CHIMNEY NORMAL FIRE TEST LOG TEST MC002 (REPEAT)

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
24	2	THIM 4		LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE,	TOP	47
26	2	THIM 6		RIGHT	48
27	2	THIM 7		BOTTOM	49
28	2	THIM 8		LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER		51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS
C 3= 1.000000

TABLE OF ADDERS
ADD 3= 0.000000

TABLE OF POWERS
POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY CHIMNEY NORMAL FIRE TEST LOG TEST MC002 (REPEAT)

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.2566E+06	624	0.4100E+05	60	11.30	623	60.00	500	32.78
20	8.500	575	65.50	100	40.25	61	11.80	575	59.50	501	34.28
69	6.200	574	26.30	590	15.51	62	12.80	1	56.30	501	31.59
50	14.90	582	23.80	492	19.00	63	11.70	623	68.50	499	35.86
51	13.80	624	139.7	233	40.54	64	11.60	34	67.90	502	36.13
52	13.00	624	387.3	233	228.5	65	12.80	1	67.90	502	36.28
53	13.30	2	425.7	233	233.6	66	11.30	10	66.40	501	36.26
54	12.70	2	352.9	233	220.8	67	11.30	3	69.80	502	36.84
55	10.80	2	316.8	233	205.6	68	11.50	34	70.40	502	37.08
29	14.40	581	77.40	447	54.57	21	15.90	581	260.7	443	181.5
32	14.00	624	228.3	418	164.6	22	15.40	624	167.3	443	118.1
35	14.40	1	234.6	418	172.3	23	15.20	624	123.9	418	83.19
38	13.70	1	212.3	418	154.9	24	15.20	624	259.8	417	177.9
41	12.50	1	197.9	441	144.5	25	15.90	582	240.6	445	165.5
44	12.40	1	193.0	442	141.0	26	15.40	584	148.7	444	103.1
47	12.10	581	181.6	441	133.0	27	15.30	624	120.9	447	80.67
30	14.20	581	59.20	499	38.83	28	15.60	624	222.7	444	150.6
33	16.00	7	104.0	499	66.43	56	9.200	576	60.00	412	42.60
36	14.50	1	142.9	499	87.74	100	0.0000	1	71.28	624	11.39
39	13.50	7	137.5	499	84.32	101	14.90	582	425.7	233	233.8
42	11.40	1	115.8	499	73.08	102	14.40	581	234.6	418	172.6
45	11.50	1	117.7	469	75.71	103	16.00	7	142.9	499	88.08
48	11.30	1	104.0	499	66.09	104	14.40	11	108.8	500	60.86
31	14.20	578	51.90	500	31.93	105	-2.100	586	52.70	503	22.18
34	14.40	11	97.30	500	54.93	106	15.90	581	260.7	443	183.3
37	14.00	13	108.8	500	60.53	107	15.90	582	240.6	445	165.8
40	13.40	6	108.0	501	59.80	108	13.60	624	273.5	233	158.0
43	10.50	576	68.20	464	41.98	109	13.46	581	188.9	418	137.8
46	10.60	576	72.70	484	44.65	110	13.30	7	111.6	499	70.31
49	10.60	576	68.10	499	42.47	111	12.64	13	81.69	500	48.04
57	11.20	575	40.60	500	24.83	112	-2.764	590	42.83	501	17.94
58	11.60	575	43.60	499	26.76	113	15.42	624	202.6	443	140.2
59	12.60	34	37.70	499	24.15	114	15.63	584	183.2	446	125.0

Test MC011

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	1
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	2
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	3
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	4
51	2	GAS 54	54 IN. LEVEL	5
52	2	GAS 82	82 IN. LEVEL	6
53	2	GAS106	106 IN. LEVEL	7
54	2	GAS130	130 IN. LEVEL	8
55	2	GAS154	154 IN. LEVEL	9
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	10
32	2	LIN 70	70 IN. LEVEL	11
35	2	LIN 82	82 IN. LEVEL	12
38	2	LIN 94	94 IN. LEVEL	13
41	2	LIN106	106 IN. LEVEL	14
44	2	LIN118	118 IN. LEVEL	15
47	2	LIN130	130 IN. LEVEL	16
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	17
33	2	IN 70	70 IN. LEVEL	18
36	2	IN 82	82 IN. LEVEL	19
39	2	IN 94	94 IN. LEVEL	20
42	2	IN 106	106 IN. LEVEL	21
45	2	IN 118	118 IN. LEVEL	22
48	2	IN 130	130 IN. LEVEL	23
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	24
34	2	OUT 70	70 IN. LEVEL	25
37	2	OUT 82	82 IN. LEVEL	26
40	2	OUT 94	94 IN. LEVEL	27
43	2	OUT106	106 IN. LEVEL	28
46	2	OUT118	118 IN. LEVEL	29
49	2	OUT130	130 IN. LEVEL	30
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	31
58	2	ENC 54	SOUTH SIDE	32
59	2	ENC 54	EAST SIDE	33
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	34
61	2	ENC 70	SOUTH SIDE	35
62	2	ENC 70	EAST SIDE	36
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	37
64	2	ENC 82	SOUTH SIDE	38
65	2	ENC 82	EAST SIDE	39
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	40
67	2	ENC 94	SOUTH SIDE	41
68	2	ENC 94	EAST SIDE	42
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	43
22	2	THIM 2	RIGHT	44
23	2	THIM 3	BOTTOM	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
24	2	THIM 4		LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE,	TOP	47
26	2	THIM 6		RIGHT	48
27	2	THIM 7		BOTTOM	49
28	2	THIM 8		LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER		51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
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113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY BRAND TEST MC011

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8361E+05	567	0.2105E+05	60	15.70	32	55.00	482	34.05
20	15.60	2	85.30	438	64.14	61	15.70	37	58.40	482	34.69
69	13.30	60	19.60	479	16.97	62	14.30	52	53.90	480	32.97
50	11.80	112	27.20	428	19.10	63	15.90	37	59.50	483	36.13
51	15.40	1	74.60	383	42.89	64	14.90	54	61.70	483	36.08
52	15.40	1	327.1	404	239.5	65	12.70	67	63.70	480	37.58
53	15.50	1	318.9	315	239.5	66	14.90	37	57.40	483	35.80
54	15.50	1	296.4	315	224.8	67	15.40	38	66.10	489	36.00
55	15.40	1	272.2	315	207.1	68	15.40	49	66.10	484	38.24
29	16.10	2	80.50	468	56.28	21	1.200	237	283.0	466	186.2
32	16.30	2	224.4	442	168.9	22	16.30	2	189.3	465	127.4
35	16.30	2	231.2	466	173.8	23	16.10	2	134.2	465	93.94
38	16.40	1	213.1	466	154.8	24	16.30	3	266.3	465	189.9
41	16.00	4	199.8	467	143.6	25	16.60	3	262.5	467	167.9
44	15.90	1	195.6	410	140.6	26	16.30	2	166.9	467	110.8
47	15.60	1	178.5	465	130.6	27	16.30	2	130.7	467	90.99
30	14.90	46	62.40	470	43.83	28	16.50	2	231.7	467	159.9
33	17.70	2	102.3	476	67.00	56	14.50	538	71.30	469	52.74
36	16.40	7	138.6	476	87.20	100	0.0000	1	23.23	567	5.847
39	16.20	7	134.3	476	83.28	101	15.60	1	327.1	404	241.4
42	15.60	1	116.7	476	73.91	102	16.40	2	231.2	466	175.5
45	15.60	1	123.3	456	76.07	103	17.70	2	138.6	476	87.31
48	15.50	1	94.20	477	60.98	104	16.20	41	103.6	480	60.81
31	15.20	47	54.50	478	35.23	105	0.9000	14	47.50	489	21.92
34	12.90	46	94.10	479	55.94	106	16.70	2	283.0	466	194.8
37	16.20	38	103.6	480	60.73	107	16.60	3	262.5	467	170.9
40	15.50	39	102.9	480	59.58	108	15.47	1	216.2	315	162.1
43	15.60	27	71.20	478	44.82	109	16.23	2	188.7	467	138.4
46	15.60	1	73.20	479	45.98	110	16.26	6	109.6	471	70.33
49	15.50	1	64.40	478	41.48	111	15.56	43	80.41	480	49.11
57	11.00	104	39.90	480	27.52	112	-.7273	54	37.56	484	17.18
58	14.90	65	43.10	484	27.02	113	16.38	2	218.1	465	149.3
59	15.20	63	39.90	480	27.07	114	16.45	2	197.9	467	132.4

Test MC012

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	1
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	2
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	3
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	4
51	2	GAS 54	54 IN. LEVEL	5
52	2	GAS 82	82 IN. LEVEL	6
53	2	GAS106	106 IN. LEVEL	7
54	2	GAS130	130 IN. LEVEL	8
55	2	GAS154	154 IN. LEVEL	9
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	10
32	2	LIN 70	70 IN. LEVEL	11
35	2	LIN 82	82 IN. LEVEL	12
38	2	LIN 94	94 IN. LEVEL	13
41	2	LIN106	106 IN. LEVEL	14
44	2	LIN118	118 IN. LEVEL	15
47	2	LIN130	130 IN. LEVEL	16
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	17
33	2	IN 70	70 IN. LEVEL	18
36	2	IN 82	82 IN. LEVEL	19
39	2	IN 94	94 IN. LEVEL	20
42	2	IN 106	106 IN. LEVEL	21
45	2	IN 118	118 IN. LEVEL	22
48	2	IN 130	130 IN. LEVEL	23
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	24
34	2	OUT 70	70 IN. LEVEL	25
37	2	OUT 82	82 IN. LEVEL	26
40	2	OUT 94	94 IN. LEVEL	27
43	2	OUT106	106 IN. LEVEL	28
46	2	OUT118	118 IN. LEVEL	29
49	2	OUT130	130 IN. LEVEL	30
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	31
58	2	ENC 54	SOUTH SIDE	32
59	2	ENC 54	EAST SIDE	33
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	34
61	2	ENC 70	SOUTH SIDE	35
62	2	ENC 70	EAST SIDE	36
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	37
64	2	ENC 82	SOUTH SIDE	38
65	2	ENC 82	EAST SIDE	39
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	40
67	2	ENC 94	SOUTH SIDE	41
68	2	ENC 94	EAST SIDE	42
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	43
22	2	THIM 2	RIGHT	44
23	2	THIM 3	BOTTOM	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
24	2	THIM 4		LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE,	TOP	47
26	2	THIM 6		RIGHT	48
27	2	THIM 7		BOTTOM	49
28	2	THIM 8		LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER		51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS	TABLE OF ADDERS	TABLE OF POWERS
C 3= 1.000000	ADD 3= 0.000000	POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	-.2910E+05	542	0.5670E+05	541	0.1461E+05	60	-1.600	1	119.9	501	57.26
20	-.8000	1	117.5	319	58.52	61	-1.100	1	120.7	500	59.69
69	-1.200	3	14.70	503	8.024	62	-.4000	17	113.2	502	53.21
50	0.4000	6	32.10	437	13.68	63	-1.700	1	129.1	501	59.71
51	0.4000	3	386.6	436	151.3	64	-1.700	5	128.4	503	60.41
52	-.1000	3	855.4	428	408.2	65	0.0000	1	129.8	503	60.11
53	-.8000	3	802.5	428	394.0	66	-2.200	3	130.0	501	60.77
54	-1.400	3	693.7	428	367.1	67	-1.100	1	130.3	503	59.15
55	-2.100	1	655.0	428	353.3	68	-1.100	19	132.7	504	60.48
29	0.1000	1	272.3	463	144.5	21	1.300	1	465.6	461	270.4
32	-.1000	1	473.6	442	296.1	22	0.9000	1	523.6	461	297.6
35	-.4000	4	478.1	440	287.3	23	1.000	2	350.8	472	188.8
38	-.8000	4	427.5	441	259.2	24	1.100	2	484.3	461	242.7
41	-1.600	3	413.4	441	251.9	25	1.300	1	425.6	464	249.1
44	-1.800	2	399.5	442	247.4	26	0.9000	1	462.1	464	263.7
47	-2.100	2	373.7	443	238.4	27	1.100	1	333.4	473	180.2
30	-.3000	1	155.2	483	82.88	28	1.200	1	405.9	466	209.7
33	4.700	1	239.5	476	137.9	56	-1.800	1	78.90	319	41.84
36	-.5000	4	309.9	478	171.0	100	-8.083	542	15.75	541	4.057
39	-1.200	1	291.3	483	159.5	101	0.6000	1	855.4	428	409.5
42	-2.600	2	259.2	481	142.9	102	0.1000	1	478.1	440	299.5
45	-2.700	2	266.4	476	150.1	103	4.700	1	309.9	478	171.8
48	-2.900	2	234.3	480	133.3	104	-.3000	1	203.1	498	109.7
31	-.7000	18	105.5	499	53.98	105	-.7000	38	118.5	504	55.01
34	-.4000	5	199.5	498	107.3	106	1.300	1	523.6	461	299.2
37	-.8000	17	203.1	498	106.1	107	1.300	1	462.1	464	265.6
40	-1.200	15	201.7	499	103.9	108	-.4833	4	547.7	428	281.2
43	-2.400	2	127.0	498	68.28	109	-.8714	4	402.0	442	246.4
46	-2.600	1	136.2	498	74.71	110	-.7143	1	250.6	481	139.7
49	-2.700	2	126.9	497	70.33	111	-1.414	1	157.1	498	83.51
57	-1.600	1	70.10	501	35.37	112	-1.918	43	101.0	502	46.62
58	-1.000	1	74.10	500	37.51	113	1.075	2	452.4	462	249.9
59	-.1000	1	65.40	501	32.74	114	1.125	1	404.9	466	225.7

Test MC102

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	1
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	2
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	3
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	4
51	2	GAS 54	54 IN. LEVEL	5
52	2	GAS 82	82 IN. LEVEL	6
53	2	GAS106	106 IN. LEVEL	7
54	2	GAS130	130 IN. LEVEL	8
55	2	GAS154	154 IN. LEVEL	9
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	10
32	2	LIN 70	70 IN. LEVEL	11
35	2	LIN 82	82 IN. LEVEL	12
38	2	LIN 94	94 IN. LEVEL	13
41	2	LIN106	106 IN. LEVEL	14
44	2	LIN118	118 IN. LEVEL	15
47	2	LIN130	130 IN. LEVEL	16
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	17
33	2	IN 70	70 IN. LEVEL	18
36	2	IN 82	82 IN. LEVEL	19
39	2	IN 94	94 IN. LEVEL	20
42	2	IN 106	106 IN. LEVEL	21
45	2	IN 118	118 IN. LEVEL	22
48	2	IN 130	130 IN. LEVEL	23
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	24
34	2	OUT 70	70 IN. LEVEL	25
37	2	OUT 82	82 IN. LEVEL	26
40	2	OUT 94	94 IN. LEVEL	27
43	2	OUT106	106 IN. LEVEL	28
46	2	OUT118	118 IN. LEVEL	29
49	2	OUT130	130 IN. LEVEL	30
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	31
58	2	ENC 54	SOUTH SIDE	32
59	2	ENC 54	EAST SIDE	33
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	34
61	2	ENC 70	SOUTH SIDE	35
62	2	ENC 70	EAST SIDE	36
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	37
64	2	ENC 82	SOUTH SIDE	38
65	2	ENC 82	EAST SIDE	39
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	40
67	2	ENC 94	SOUTH SIDE	41
68	2	ENC 94	EAST SIDE	42
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	43
22	2	THIM 2	RIGHT	44
23	2	THIM 3	BOTTOM	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
24	2	THIM 4	LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE, TOP	47
26	2	THIM 6	RIGHT	48
27	2	THIM 7	BOTTOM	49
28	2	THIM 8	LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER	51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY STAINLESS STEEL LINER LOG FIRING TEST MC102

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.2393E+06	1091	0.4607E+05	60	2.600	940	25.40	845	8.429
20	1.500	939	46.00	506	26.97	61	3.200	943	25.50	834	7.982
69	-.7000	940	17.50	844	3.467	62	4.400	941	18.80	845	8.134
50	6.900	980	16.40	120	11.27	63	2.700	941	25.20	845	8.855
51	8.200	1089	35.30	725	22.29	64	3.400	941	26.30	845	8.840
52	4.700	1071	470.8	396	230.6	65	4.500	941	18.80	845	9.506
53	4.300	956	468.9	395	228.4	66	2.900	941	25.90	847	10.34
54	3.000	956	429.2	395	214.7	67	3.200	941	31.40	834	9.913
55	2.800	956	364.1	277	189.1	68	4.600	942	19.80	845	11.77
29	7.900	1091	39.90	712	22.34	21	-.2147E+09	1	791.5	2	-.5905E+06
32	6.100	1089	192.0	704	101.5	22	-.2147E+09	1	328.6	12	-.1968E+07
35	4.800	963	150.0	450	85.42	23	-.2147E+09	1	1015.	10	-.1479E+07
38	4.500	957	99.20	556	56.42	24	-.2147E+09	1	152.9	44	-.8100E+07
41	3.600	958	113.2	550	64.44	25	-.2147E+09	1	668.3	56	-.1063E+08
44	3.500	954	124.7	516	71.16	26	-.2147E+09	1	165.8	27	-.1265E+08
47	17.20	948	0.3777E+05	92	3381.	27	-.2147E+09	7	0.2830E+05	81	-.1064E+08
30	5.900	956	15.40	856	9.800	28	-.2147E+09	1	0.9748E+05	91	-.1422E+08
33	5.900	961	19.80	733	12.67	56	4.500	941	17.90	846	7.697
36	5.100	958	32.50	708	19.28	100	0.0000	1	66.46	1091	12.80
39	4.400	953	33.40	705	19.22	101	8.200	1090	470.8	396	231.4
42	2.800	949	29.90	706	16.59	102	17.20	948	0.3777E+05	92	3459.
45	2.700	948	34.60	705	19.01	103	5.900	961	34.60	705	20.50
48	2.500	949	30.20	706	15.76	104	5.800	1088	26.90	730	14.71
31	5.700	951	16.10	851	9.224	105	-1.700	964	35.20	689	20.79
34	5.800	1088	17.20	850	11.00	106	-.2147E+09	1	1015.	10	-.4790E+06
37	5.200	954	25.90	731	14.14	107	-.2147E+09	8	0.9748E+05	91	-.5099E+07
40	4.600	952	26.90	730	13.86	108	5.600	956	294.3	395	149.4
43	2.200	942	25.80	845	9.150	109	7.257	1091	5450.	92	540.3
46	2.200	943	25.80	847	9.981	110	4.300	953	26.81	706	16.05
49	2.000	946	26.60	847	9.454	111	4.129	949	21.23	847	10.97
57	2.900	940	23.80	845	7.766	112	-2.264	964	11.88	850	6.966
58	3.300	942	25.40	845	7.281	113	-.2147E+09	1	53.07	44	-.3035E+07
59	1.800	940	37.60	691	23.71	114	-.2147E+09	8	0.2439E+05	91	-.1203E+08

Test MC111

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	1
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	2
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	3
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	4
51	2	GAS 54	54 IN. LEVEL	5
52	2	GAS 82	82 IN. LEVEL	6
53	2	GAS106	106 IN. LEVEL	7
54	2	GAS130	130 IN. LEVEL	8
55	2	GAS154	154 IN. LEVEL	9
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	10
32	2	LIN 70	70 IN. LEVEL	11
35	2	LIN 82	82 IN. LEVEL	12
38	2	LIN 94	94 IN. LEVEL	13
41	2	LIN106	106 IN. LEVEL	14
44	2	LIN118	118 IN. LEVEL	15
47	2	LIN130	130 IN. LEVEL	16
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	17
33	2	IN 70	70 IN. LEVEL	18
36	2	IN 82	82 IN. LEVEL	19
39	2	IN 94	94 IN. LEVEL	20
42	2	IN 106	106 IN. LEVEL	21
45	2	IN 118	118 IN. LEVEL	22
48	2	IN 130	130 IN. LEVEL	23
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	24
34	2	OUT 70	70 IN. LEVEL	25
37	2	OUT 82	82 IN. LEVEL	26
40	2	OUT 94	94 IN. LEVEL	27
43	2	OUT106	106 IN. LEVEL	28
46	2	OUT118	118 IN. LEVEL	29
49	2	OUT130	130 IN. LEVEL	30
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	31
58	2	ENC 54	SOUTH SIDE	32
59	2	ENC 54	EAST SIDE	33
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	34
61	2	ENC 70	SOUTH SIDE	35
62	2	ENC 70	EAST SIDE	36
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	37
64	2	ENC 82	SOUTH SIDE	38
65	2	ENC 82	EAST SIDE	39
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	40
67	2	ENC 94	SOUTH SIDE	41
68	2	ENC 94	EAST SIDE	42
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	43
22	2	THIM 2	RIGHT	44
23	2	THIM 3	BOTTOM	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
24	2	THIM 4		LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE,	TOP	47
26	2	THIM 6		RIGHT	48
27	2	THIM 7		BOTTOM	49
28	2	THIM 8		LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER		51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY STAINLESS STEEL LINER BRAND FIRE TEST MC111

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8543E+05	597	0.2175E+05	60	3.000	26	46.30	27	21.07
20	4.800	1	100.2	27	57.90	61	5.600	1	38.30	27	20.67
69	4.700	1	24.80	27	13.26	62	6.200	1	32.40	27	19.28
50	6.100	17	31.30	27	9.931	63	4.600	10	44.70	513	26.23
51	6.900	1	95.20	506	53.95	64	5.600	1	51.20	512	28.78
52	5.600	1	624.9	505	424.4	65	6.300	1	45.30	513	26.20
53	5.600	1	609.8	505	414.9	66	4.700	2	54.00	506	33.13
54	5.500	1	572.5	505	389.8	67	5.600	1	55.90	511	33.16
55	5.400	1	551.9	505	368.1	68	6.200	1	58.50	506	36.45
29	4.000	23	105.1	508	58.28	21	19.60	489	88.50	27	20.75
32	6.100	1	413.7	506	277.4	22	18.00	23	77.80	27	20.81
35	5.800	1	259.7	506	183.3	23	20.00	489	68.50	27	20.84
38	5.800	2	198.3	506	134.8	24	20.20	86	59.70	27	20.91
41	5.400	1	216.1	506	148.7	25	20.20	76	53.40	27	20.86
44	5.300	1	228.4	506	160.9	26	20.10	490	48.10	27	20.84
47	20.40	26	36.00	27	21.02	27	20.20	489	46.40	27	20.93
30	2.000	23	31.00	27	13.54	28	20.10	490	44.20	27	20.92
33	5.100	24	59.20	510	31.19	56	4.600	1	312.3	27	54.43
36	6.000	1	105.9	507	60.48	100	0.0000	1	23.73	597	6.041
39	5.800	1	110.5	507	63.18	101	6.900	1	624.9	505	428.4
42	5.100	3	99.80	507	58.15	102	22.60	1	413.7	506	280.4
45	5.100	1	109.6	506	65.76	103	6.200	1	110.5	507	67.32
48	5.000	1	94.00	507	56.03	104	6.100	1	84.40	510	46.33
31	5.100	23	28.90	27	12.74	105	1.200	8	93.60	27	23.45
34	4.700	24	47.90	515	24.57	106	20.20	86	88.50	27	20.97
37	4.600	23	81.10	510	44.04	107	20.20	489	53.40	27	20.96
40	-.5000	26	84.40	510	46.18	108	5.883	1	410.9	505	276.8
43	4.800	29	61.60	510	34.84	109	8.257	2	205.7	506	140.6
46	4.600	23	65.50	510	37.65	110	5.600	3	85.47	507	49.76
49	2.500	24	61.30	510	35.94	111	5.586	1	60.00	510	33.71
57	5.200	1	196.8	27	14.02	112	0.5636	10	26.29	514	11.57
58	5.700	1	118.4	27	14.79	113	19.95	489	73.63	27	20.83
59	6.200	24	70.60	27	13.31	114	20.15	490	48.02	27	20.89

Test MC112

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	1
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	2
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	3
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	4
51	2	GAS 54	54 IN. LEVEL	5
52	2	GAS 82	82 IN. LEVEL	6
53	2	GAS106	106 IN. LEVEL	7
54	2	GAS130	130 IN. LEVEL	8
55	2	GAS154	154 IN. LEVEL	9
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	10
32	2	LIN 70	70 IN. LEVEL	11
35	2	LIN 82	82 IN. LEVEL	12
38	2	LIN 94	94 IN. LEVEL	13
41	2	LIN106	106 IN. LEVEL	14
44	2	LIN118	118 IN. LEVEL	15
47	2	LIN130	130 IN. LEVEL	16
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	17
33	2	IN 70	70 IN. LEVEL	18
36	2	IN 82	82 IN. LEVEL	19
39	2	IN 94	94 IN. LEVEL	20
42	2	IN 106	106 IN. LEVEL	21
45	2	IN 118	118 IN. LEVEL	22
48	2	IN 130	130 IN. LEVEL	23
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	24
34	2	OUT 70	70 IN. LEVEL	25
37	2	OUT 82	82 IN. LEVEL	26
40	2	OUT 94	94 IN. LEVEL	27
43	2	OUT106	106 IN. LEVEL	28
46	2	OUT118	118 IN. LEVEL	29
49	2	OUT130	130 IN. LEVEL	30
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	31
58	2	ENC 54	SOUTH SIDE	32
59	2	ENC 54	EAST SIDE	33
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	34
61	2	ENC 70	SOUTH SIDE	35
62	2	ENC 70	EAST SIDE	36
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	37
64	2	ENC 82	SOUTH SIDE	38
65	2	ENC 82	EAST SIDE	39
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	40
67	2	ENC 94	SOUTH SIDE	41
68	2	ENC 94	EAST SIDE	42
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	43
22	2	THIM 2	RIGHT	44
23	2	THIM 3	BOTTOM	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
24	2	THIM 4	LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE, TOP	47
26	2	THIM 6	RIGHT	48
27	2	THIM 7	BOTTOM	49
28	2	THIM 8	LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER	51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY STAINLESS STEEL LINER LOG OVERFIRE TEST MC112

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.9835E+05	867	0.4779E+05	60	11.70	785	28.40	244	20.09
20	7.800	738	73.90	117	28.47	61	11.20	811	26.90	242	19.53
69	4.300	748	15.10	126	8.175	62	11.30	756	26.00	357	19.14
50	12.00	7	19.20	471	15.93	63	12.80	860	35.30	240	24.39
51	23.90	4	79.30	252	51.78	64	12.30	784	38.80	247	25.36
52	28.30	845	583.0	104	196.3	65	13.30	852	36.30	283	25.19
53	27.20	845	572.8	104	194.0	66	12.70	859	42.20	242	27.50
54	26.50	845	544.8	104	184.6	67	11.80	810	42.60	242	26.94
55	21.80	713	500.8	104	171.7	68	13.90	857	46.80	123	30.53
29	24.90	864	87.80	277	55.86	21	5.200	290	28.40	303	21.18
32	26.20	865	356.6	126	149.3	22	2.800	303	44.00	299	21.24
35	19.40	864	237.7	117	96.10	23	5.800	290	41.60	299	21.30
38	17.70	864	173.8	119	77.01	24	10.30	290	29.70	303	21.35
41	16.00	859	192.9	117	79.80	25	17.40	299	33.10	303	21.36
44	15.90	862	206.7	117	83.67	26	13.00	299	62.20	290	21.42
47	19.80	719	23.40	32	21.54	27	12.30	303	60.50	290	21.39
30	13.90	858	23.10	352	18.86	28	-22.30	290	23.20	27	21.25
33	16.80	864	48.90	303	33.22	56	9.900	757	16.90	155	13.76
36	16.80	867	81.20	257	47.69	100	0.0000	1	27.32	867	13.27
39	15.50	865	84.40	257	48.22	101	28.30	845	583.0	104	196.5
42	12.10	853	75.60	139	39.63	102	26.20	865	356.6	126	149.6
45	11.80	866	84.40	134	42.12	103	16.80	867	84.40	134	49.41
48	11.30	855	72.60	140	37.45	104	16.30	863	66.70	278	41.16
31	13.10	852	20.50	359	17.08	105	7.100	864	50.20	116	25.11
34	15.80	864	39.90	316	28.44	106	10.30	290	44.00	299	21.42
37	16.30	863	64.20	278	40.33	107	17.40	299	62.20	290	21.46
40	15.20	863	66.70	278	40.62	108	24.08	867	379.1	104	135.7
43	10.40	860	46.70	156	25.98	109	20.19	867	179.4	118	80.47
46	10.50	848	51.30	158	27.84	110	14.03	867	65.49	257	38.17
49	10.20	839	49.40	153	26.27	111	13.19	865	46.69	278	29.51
57	10.60	754	17.80	146	14.07	112	5.436	864	24.04	360	15.51
58	9.900	790	18.80	105	14.10	113	7.775	290	33.13	299	21.27
59	9.300	785	63.50	115	27.75	114	15.58	299	31.13	290	21.36

Test MC112 (Repeat)

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	1
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	2
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	3
51	2	GAS 54	54 IN. LEVEL	4
52	2	GAS 82	82 IN. LEVEL	5
53	2	GAS106	106 IN. LEVEL	6
54	2	GAS130	130 IN. LEVEL	7
55	2	GAS154	154 IN. LEVEL	8
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	9
32	2	LIN 70	70 IN. LEVEL	10
35	2	LIN 82	82 IN. LEVEL	11
38	2	LIN 94	94 IN. LEVEL	12
41	2	LIN106	106 IN. LEVEL	13
44	2	LIN118	118 IN. LEVEL	14
47	2	LIN130	130 IN. LEVEL	15
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	16
33	2	IN 70	70 IN. LEVEL	17
36	2	IN 82	82 IN. LEVEL	18
39	2	IN 94	94 IN. LEVEL	19
42	2	IN 106	106 IN. LEVEL	20
45	2	IN 118	118 IN. LEVEL	21
48	2	IN 130	130 IN. LEVEL	22
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	23
34	2	OUT 70	70 IN. LEVEL	24
37	2	OUT 82	82 IN. LEVEL	25
40	2	OUT 94	94 IN. LEVEL	26
43	2	OUT106	106 IN. LEVEL	27
46	2	OUT118	118 IN. LEVEL	28
49	2	OUT130	130 IN. LEVEL	29
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	30
58	2	ENC 54	SOUTH SIDE	31
59	2	ENC 54	EAST SIDE	32
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	33
61	2	ENC 70	SOUTH SIDE	34
62	2	ENC 70	EAST SIDE	35
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	36
64	2	ENC 82	SOUTH SIDE	37
65	2	ENC 82	EAST SIDE	38
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	39
67	2	ENC 94	SOUTH SIDE	40
68	2	ENC 94	EAST SIDE	41
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	42
22	2	THIM 2	RIGHT	43
23	2	THIM 3	BOTTOM	44

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
24	2	THIM 4		LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE,	TOP	47
26	2	THIM 6		RIGHT	48
27	2	THIM 7		BOTTOM	49
28	2	THIM 8		LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER		51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS	TABLE OF ADDERS	TABLE OF POWERS
C 3= 1.000000	ADD 3= 0.000000	POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY STAINLESS STEEL LINER LOG OVERFIRE TEST MC112 (REPEAT)

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	-.2454E+07	597	0.1378E+06	596	-.5581E+06	60	6.100	643	23.60	418	13.16
20	5.800	640	59.60	190	27.50	61	6.900	1	22.60	425	12.64
69	4.300	469	11.10	784	7.335	62	6.800	625	21.70	426	12.38
50	6.300	663	15.20	445	10.32	63	5.800	19	32.10	423	15.88
51	7.000	787	79.40	415	36.15	64	6.100	632	35.20	423	16.79
52	7.400	731	597.8	190	248.2	65	7.100	622	33.20	426	16.27
53	7.900	695	584.8	190	245.8	66	6.200	12	39.70	417	19.37
54	7.100	723	547.6	191	234.2	67	6.200	626	38.80	422	18.97
55	7.600	630	527.9	190	227.3	68	6.300	629	42.80	388	21.61
29	8.200	786	88.10	408	38.46	21	20.40	19	23.00	769	22.39
32	8.700	728	350.0	352	159.9	22	20.70	19	23.00	769	22.41
35	6.800	632	227.9	199	107.9	23	20.80	19	23.00	769	22.42
38	7.400	3	164.0	351	79.75	24	20.90	19	23.00	767	22.46
41	6.900	2	181.4	201	87.78	25	21.00	1	23.00	768	22.46
44	6.500	3	196.1	202	94.07	26	21.00	1	23.10	788	22.47
47	21.10	1	23.20	768	22.64	27	21.00	1	23.10	787	22.51
30	6.600	28	18.90	436	11.03	28	20.80	19	23.10	788	22.49
33	7.400	9	45.40	421	19.87	56	3.900	788	14.90	787	9.731
36	6.500	9	80.60	398	35.57	100	-681.6	597	38.27	596	-155.0
39	6.600	2	84.90	398	37.01	101	9.100	738	597.8	190	249.1
42	5.900	9	75.60	397	33.34	102	21.10	1	350.0	352	165.9
45	5.400	3	84.90	392	37.70	103	7.500	15	84.90	392	39.74
48	4.500	4	73.10	396	32.30	104	7.600	9	64.40	410	27.91
31	7.000	33	16.20	439	10.24	105	-.1000	772	45.00	325	21.68
34	7.100	9	36.60	427	16.13	106	20.90	19	23.00	767	22.47
37	7.000	3	62.00	418	26.52	107	21.00	1	23.10	787	22.51
40	4.800	15	64.40	410	27.41	108	8.167	725	386.3	190	167.0
43	5.800	24	42.40	403	19.73	109	10.24	1	173.0	350	84.36
46	5.800	4	48.50	407	21.88	110	6.729	2	65.01	397	29.55
49	5.600	7	46.20	406	20.57	111	6.557	18	43.93	409	20.35
57	6.600	16	12.20	355	9.867	112	-1.073	784	25.35	417	9.374
58	6.700	25	13.20	285	9.770	113	20.70	19	23.00	769	22.42
59	2.200	629	52.50	325	26.97	114	20.95	19	23.08	788	22.48

Test MC211

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	1
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	2
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	3
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	4
51	2	GAS 54	54 IN. LEVEL	5
52	2	GAS 82	82 IN. LEVEL	6
53	2	GAS106	106 IN. LEVEL	7
54	2	GAS130	130 IN. LEVEL	8
55	2	GAS154	154 IN. LEVEL	9
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	10
32	2	LIN 70	70 IN. LEVEL	11
35	2	LIN 82	82 IN. LEVEL	12
38	2	LIN 94	94 IN. LEVEL	13
41	2	LIN106	106 IN. LEVEL	14
44	2	LIN118	118 IN. LEVEL	15
47	2	LIN130	130 IN. LEVEL	16
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	17
33	2	IN 70	70 IN. LEVEL	18
36	2	IN 82	82 IN. LEVEL	19
39	2	IN 94	94 IN. LEVEL	20
42	2	IN 106	106 IN. LEVEL	21
45	2	IN 118	118 IN. LEVEL	22
48	2	IN 130	130 IN. LEVEL	23
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	24
34	2	OUT 70	70 IN. LEVEL	25
37	2	OUT 82	82 IN. LEVEL	26
40	2	OUT 94	94 IN. LEVEL	27
43	2	OUT106	106 IN. LEVEL	28
46	2	OUT118	118 IN. LEVEL	29
49	2	OUT130	130 IN. LEVEL	30
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	31
58	2	ENC 54	SOUTH SIDE	32
59	2	ENC 54	EAST SIDE	33
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	34
61	2	ENC 70	SOUTH SIDE	35
62	2	ENC 70	EAST SIDE	36
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	37
64	2	ENC 82	SOUTH SIDE	38
65	2	ENC 82	EAST SIDE	39
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	40
67	2	ENC 94	SOUTH SIDE	41
68	2	ENC 94	EAST SIDE	42
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	43
22	2	THIM 2	RIGHT	44
23	2	THIM 3	BOTTOM	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
24	2	THIM 4	LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE, TOP	47
26	2	THIM 6	RIGHT	48
27	2	THIM 7	BOTTOM	49
28	2	THIM 8	LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER	51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS
C 3= 1.000000

TABLE OF ADDERS
ADD 3= 0.000000

TABLE OF POWERS
POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY POURED MASONRY LINER BRAND FIRE TEST MC211

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8649E+05	615	0.2217E+05	60	10.70	606	33.80	515	23.80
20	1.600	602	65.00	514	36.10	61	10.50	606	40.50	501	28.38
69	-1.900	604	19.00	38	12.50	62	10.90	615	32.70	501	23.76
50	9.200	615	23.50	504	19.86	63	14.10	615	38.60	517	26.81
51	9.600	611	94.50	504	59.14	64	14.90	615	53.40	523	35.22
52	10.00	611	496.7	503	332.8	65	15.30	615	40.90	527	28.68
53	12.30	615	474.7	503	326.3	66	16.90	615	50.00	506	33.59
54	12.20	615	419.0	504	297.7	67	14.50	615	53.00	528	34.78
55	8.700	609	357.9	324	245.0	68	17.70	1	47.10	506	33.05
29	10.30	610	107.5	494	62.77	21	18.60	606	24.20	50	22.17
32	17.90	615	156.9	521	107.2	22	18.70	606	24.20	54	22.22
35	19.00	4	223.0	520	150.2	23	18.70	606	24.20	54	22.21
38	18.90	1	251.1	518	171.9	24	18.80	606	24.30	55	22.27
41	11.20	615	181.8	517	122.9	25	18.80	605	24.20	54	22.23
44	10.10	615	252.9	516	175.6	26	18.80	605	24.20	54	22.21
47	19.00	606	24.40	55	22.41	27	18.80	606	24.20	55	22.20
30	13.80	615	42.90	527	28.97	28	18.80	603	24.20	55	22.15
33	18.30	1	122.5	524	78.41	56	2.600	605	59.40	514	38.96
36	18.50	1	134.4	524	82.53	100	0.0000	1	24.02	615	6.159
39	18.40	1	133.6	524	82.71	101	12.30	615	496.7	503	335.3
42	10.00	615	107.4	522	69.35	102	23.60	1	252.9	516	179.4
45	8.000	615	124.0	520	80.53	103	18.50	1	134.4	524	86.27
48	7.600	615	101.1	521	64.35	104	18.20	1	94.90	527	57.11
31	12.60	615	36.10	528	25.70	105	-.4000	14	43.80	529	23.58
34	17.90	615	80.80	527	50.48	106	18.80	606	24.30	55	22.29
37	18.20	1	93.90	528	56.26	107	18.90	603	24.20	54	22.24
40	18.10	7	94.90	527	56.89	108	10.53	611	308.4	503	213.5
43	7.900	615	51.80	527	34.87	109	16.69	615	168.3	513	116.1
46	6.500	614	59.30	524	39.06	110	15.14	615	109.0	523	69.55
49	6.400	615	56.50	527	37.62	111	13.84	615	67.56	527	42.98
57	7.600	603	22.60	393	18.04	112	-.7545	14	29.31	529	15.36
58	7.900	606	26.70	282	20.72	113	18.70	606	24.23	55	22.22
59	8.200	606	20.70	501	17.70	114	18.82	605	24.20	55	22.20

Test MC212

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	SECOND	TIME IN SECONDS SINCE BEGINNING OF TEST	
20	2	ROOM	INSIDE ROOM AIR TEMPERATURE	1
69	2	OUTSID	OUTSIDE AIR TEMPERATURE	2
50	2	GAS 34	FLUE GAS TEMPERATURE, 34 IN. LEVEL	3
51	2	GAS 54	54 IN. LEVEL	4
52	2	GAS 82	82 IN. LEVEL	5
53	2	GAS106	106 IN. LEVEL	6
54	2	GAS130	130 IN. LEVEL	7
55	2	GAS154	154 IN. LEVEL	8
29	2	LIN 54	FLUE LINER OUTSIDE SURFACE, 54 IN. LEVEL	9
32	2	LIN 70	70 IN. LEVEL	10
35	2	LIN 82	82 IN. LEVEL	11
38	2	LIN 94	94 IN. LEVEL	12
41	2	LIN106	106 IN. LEVEL	13
44	2	LIN118	118 IN. LEVEL	14
47	2	LIN130	130 IN. LEVEL	15
30	2	IN 54	BRICK CHIMNEY INSIDE SURFACE, 54 IN. LEVEL	16
33	2	IN 70	70 IN. LEVEL	17
36	2	IN 82	82 IN. LEVEL	18
39	2	IN 94	94 IN. LEVEL	19
42	2	IN 106	106 IN. LEVEL	20
45	2	IN 118	118 IN. LEVEL	21
48	2	IN 130	130 IN. LEVEL	22
31	2	OUT 54	BRICK CHIMNEY OUTSIDE SURFACE, 54 IN. LEVEL	23
34	2	OUT 70	70 IN. LEVEL	24
37	2	OUT 82	82 IN. LEVEL	25
40	2	OUT 94	94 IN. LEVEL	26
43	2	OUT106	106 IN. LEVEL	27
46	2	OUT118	118 IN. LEVEL	28
49	2	OUT130	130 IN. LEVEL	29
57	2	ENC 54	ENCLOSURE SURFACE, WEST SIDE, 54 IN. LEVEL	30
58	2	ENC 54	SOUTH SIDE	31
59	2	ENC 54	EAST SIDE	32
60	2	ENC 70	WEST SIDE, 70 IN. LEVEL	33
61	2	ENC 70	SOUTH SIDE	34
62	2	ENC 70	EAST SIDE	35
63	2	ENC 82	WEST SIDE, 82 IN. LEVEL	36
64	2	ENC 82	SOUTH SIDE	37
65	2	ENC 82	EAST SIDE	38
66	2	ENC 94	WEST SIDE, 94 IN. LEVEL	39
67	2	ENC 94	SOUTH SIDE	40
68	2	ENC 94	EAST SIDE	41
21	2	THIM 1	MASONRY THIMBLE, INSIDE SURFACE, TOP	42
22	2	THIM 2	RIGHT	43
23	2	THIM 3	BOTTOM	44
				45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
24	2	THIM 4		LEFT	46
25	2	THIM 5	MASONRY THIMBLE, OUTSIDE SURFACE,	TOP	47
26	2	THIM 6		RIGHT	48
27	2	THIM 7		BOTTOM	49
28	2	THIM 8		LEFT	50
56	2	HEADER	MASONRY THIMBLE, COMBUSTIBLE HEADER		51

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	52
101	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	53
102	3	MAXLIN	MAXIMUM FIRE CLAY FLUE LINER SURFACE TEMPERATURE	54
103	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	55
104	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	56
105	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE RISE	57
106	3	MAXINT	MAXIMUM INNER THIMBLE SURFACE TEMPERATURE	58
107	3	MAXOUT	MAXIMUM OUTER THIMBLE SURFACE TEMPERATURE	59
108	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	60
109	3	AVGLIN	AVERAGE FIRE CLAY FLUE LINER SURFACE TEMPERATURE	61
110	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	62
111	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	63
112	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE RISE	64
113	3	AVGINT	AVERAGE INNER THIMBLE SURFACE TEMPERATURE	65
114	3	AVGOUT	AVERAGE OUTER THIMBLE SURFACE TEMPERATURE	66

TABLE OF MULTIPLIERS	TABLE OF ADDERS	TABLE OF POWERS
C 3= 1.000000	ADD 3= 0.000000	POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

OUTSIDE MASONRY CHIMNEY POURED MASONRY LINER LOG OVERFIRE TEST MC212

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8582E+05	594	0.2177E+05	60	3.600	2	36.60	505	19.90
20	3.000	1	73.90	504	44.84	61	3.700	2	42.90	508	24.44
69	-1.100	548	11.80	389	6.299	62	4.300	4	36.10	508	19.58
50	3.400	1	13.70	503	9.220	63	4.600	1	42.90	516	23.75
51	4.600	2	223.4	491	54.16	64	5.200	1	57.30	508	33.44
52	3.300	1	560.0	497	383.8	65	5.800	4	46.60	510	25.97
53	2.700	1	574.0	497	385.8	66	5.200	1	57.60	506	34.47
54	2.300	1	520.3	491	355.9	67	4.900	1	59.00	516	34.08
55	1.700	1	514.2	270	306.2	68	6.100	10	55.10	511	32.31
29	4.700	2	183.4	491	61.60	21	15.80	24	19.70	515	18.80
32	6.700	6	167.7	505	110.6	22	16.40	25	19.70	515	18.91
35	8.900	1	235.5	506	157.9	23	16.30	24	19.80	515	18.95
38	8.800	1	266.5	505	184.9	24	16.80	26	19.90	515	19.11
41	3.700	1	190.2	505	128.3	25	16.80	25	19.90	515	19.12
44	3.400	1	267.4	504	191.4	26	16.80	25	19.90	515	19.15
47	16.90	25	20.20	516	19.41	27	16.90	25	19.90	515	19.18
30	5.000	7	38.20	508	21.28	28	16.80	26	19.90	505	19.15
33	7.000	6	127.5	508	77.08	56	2.400	1	69.50	504	45.96
36	8.900	8	138.6	508	82.16	100	0.0000	1	23.84	594	6.046
39	8.000	12	139.1	508	82.19	101	4.600	2	574.0	497	386.8
42	3.200	1	115.4	506	70.71	102	18.70	1	267.4	504	195.1
45	2.400	4	131.8	506	81.36	103	8.900	8	139.1	508	85.67
48	2.300	11	105.5	507	63.54	104	8.600	13	98.80	513	57.00
31	4.700	6	33.10	510	18.04	105	3.700	16	53.90	518	29.27
34	6.600	8	83.20	511	48.65	106	16.80	26	19.90	515	19.11
37	8.600	13	96.10	514	55.60	107	16.90	25	19.90	505	19.18
40	7.700	15	98.80	513	56.86	108	3.017	1	387.7	491	249.2
43	2.500	1	60.80	513	34.61	109	7.857	3	187.3	491	122.0
46	1.800	1	67.70	511	39.11	110	5.314	6	113.4	507	68.33
49	1.900	1	63.60	513	36.38	111	4.886	15	71.79	513	41.32
57	2.900	1	19.40	490	11.31	112	2.055	21	37.04	522	18.47
58	3.300	1	23.50	490	13.98	113	16.40	25	19.77	515	18.94
59	3.600	2	17.40	490	10.56	114	16.82	26	19.90	515	19.15

Appendix B: Summary of Readings From All Instruments in Fireplace Insert Tests

Test FI001

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	1
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	2
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	3
33	2	IB B16	BACK, 16 IN. FROM FLOOR	4
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	5
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	6
37	2	IB B26	BACK, 26 IN. FROM FLOOR	7
38	2	IB B26	BACK, 26 IN. FROM FLOOR	8
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	9
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	10
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	11
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	12
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	13
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	14
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	15
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	16
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	17
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	18
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	19
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	20
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	21
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	22
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	23
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	24
73	2	GAS 98	98 IN. FROM FLOOR	25
74	2	GAS122	122 IN. FROM FLOOR	26
75	2	GAS146	146 IN. FROM FLOOR	27
76	2	GAS170	170 IN. FROM FLOOR	28
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	29
45	2	LIN 85	85 IN. FROM FLOOR	30
48	2	LIN 98	98 IN. FROM FLOOR	31
51	2	LIN110	110 IN. FROM FLOOR	32
54	2	LIN122	122 IN. FROM FLOOR	33
57	2	LIN134	134 IN. FROM FLOOR	34
60	2	LIN146	146 IN. FROM FLOOR	35
63	2	LIN158	158 IN. FROM FLOOR	36
66	2	LIN170	170 IN. FROM FLOOR	37
69	2	LIN182	182 IN. FROM FLOOR	38
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	39
46	2	LIN 85	85 IN. FROM FLOOR	40
49	2	LIN 98	98 IN. FROM FLOOR	41
52	2	LIN110	110 IN. FROM FLOOR	42
55	2	LIN122	122 IN. FROM FLOOR	43
58	2	LIN134	134 IN. FROM FLOOR	44
				45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
61	2	LIN146		146 IN. FROM FLOOR	46
64	2	LIN158		158 IN. FROM FLOOR	47
67	2	LIN170		170 IN. FROM FLOOR	48
70	2	LIN182		182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE,	74 IN. FROM FLOOR	50
47	2	LIN 85		85 IN. FROM FLOOR	51
50	2	LIN 98		98 IN. FROM FLOOR	52
53	2	LIN110		110 IN. FROM FLOOR	53
56	2	LIN122		122 IN. FROM FLOOR	54
59	2	LIN134		134 IN. FROM FLOOR	55
62	2	LIN146		146 IN. FROM FLOOR	56
65	2	LIN158		158 IN. FROM FLOOR	57
68	2	LIN170		170 IN. FROM FLOOR	58
71	2	LIN182		182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE, BOTTOM		60
82	2	ENC BM	MIDDLE		61
83	2	ENC BT	TOP		62
84	2	ENC BL	LEFT		63
85	2	ENC BR	RIGHT		64
88	2	ENC LB	LEFT SURFACE, BOTTOM		65
87	2	ENC LM	MIDDLE		66
86	2	ENC LT	TOP		67
92	2	ENC LR	LEFT RAKE		68
91	2	ENC RB	RIGHT SURFACE, BOTTOM		69
90	2	ENC RM	MIDDLE		70
89	2	ENC RT	TOP		71
93	2	ENC RR	RIGHT RAKE		72
78	2	MAN L	MANTEL SURFACE, LEFT		73
79	2	MAN M	MIDDLE		74
80	2	MAN R	RIGHT		75

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	76
101	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	77
102	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	78
103	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	79
104	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	80
105	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	81
106	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	82
107	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	83
108	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	84
109	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	85
110	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	86
111	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	87
112	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	88
113	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	89
114	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	90
115	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	91
116	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	92
117	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	93
118	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	94
119	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	95
120	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	96

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE FIREPLACE ALONE BRAND TEST FI001

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.2928E+05	489	0.1464E+05	46	17.80	2	100.6	486	73.57
20	15.60	1	213.5	103	43.41	49	16.50	10	115.9	489	86.13
77	14.60	1	21.10	395	17.64	52	17.30	6	109.7	483	82.37
21	18.90	5	449.1	481	308.6	55	17.60	4	112.9	489	83.90
33	19.00	1	483.9	483	401.7	58	17.60	4	109.9	489	81.97
24	18.60	1	494.7	459	410.9	61	17.80	1	95.60	483	71.96
27	18.70	1	379.3	459	303.6	64	17.70	1	78.30	489	58.51
37	19.10	2	265.8	488	168.6	67	17.70	1	91.30	483	68.17
38	19.00	1	299.4	488	205.5	70	17.20	1	84.70	486	66.85
30	18.60	1	364.3	459	295.1	44	16.50	40	58.60	466	28.74
22	19.30	46	54.30	489	31.31	47	17.10	5	65.60	489	47.37
25	18.80	73	66.80	489	36.30	50	16.40	1	54.30	396	40.96
28	19.50	56	52.50	489	30.26	53	16.60	1	58.30	489	43.17
31	19.10	4	58.70	489	32.80	56	16.40	19	58.00	483	42.58
23	18.40	6	30.70	489	21.72	59	16.70	1	59.30	483	43.47
26	17.80	4	33.80	489	21.95	62	16.90	13	54.40	485	41.20
29	18.40	4	31.20	489	21.71	65	16.90	6	52.50	489	39.80
32	17.90	3	32.00	489	21.43	68	16.90	6	55.10	485	41.89
34	19.00	1	75.80	489	52.72	71	16.60	1	56.90	408	44.76
35	18.40	5	271.6	486	185.8	81	16.20	1	40.80	483	25.84
36	19.00	2	91.40	486	62.32	82	16.20	1	39.60	484	26.13
39	19.60	1	116.0	482	87.58	83	16.40	1	40.00	484	26.93
40	18.50	4	229.1	487	149.2	84	16.20	1	33.40	483	23.32
41	18.90	3	150.1	486	103.6	85	15.80	12	34.50	485	23.69
72	16.30	1	332.7	23	231.1	88	16.60	1	25.80	399	20.58
73	16.00	1	333.1	23	229.2	87	16.50	1	26.00	399	20.74
74	16.10	1	319.6	457	224.7	86	16.60	1	26.90	484	21.06
75	16.20	1	316.8	457	223.0	92	16.60	1	36.80	484	25.35
76	16.30	1	308.9	457	220.2	91	16.00	1	23.30	469	19.29
42	19.30	1	169.5	483	127.1	90	15.80	1	24.60	483	19.75
45	18.10	1	182.2	459	151.9	89	15.80	1	25.80	482	20.26
48	17.70	2	207.1	474	169.7	93	15.20	20	32.90	483	23.52
51	17.90	1	158.8	483	127.8	78	18.70	5	70.70	472	48.97
54	18.00	1	181.2	459	146.9	79	18.70	5	91.20	472	57.79
57	18.20	1	175.4	460	146.8	80	18.80	5	66.40	466	42.38
60	18.00	1	179.0	459	148.9	100	0.0000	1	8.133	489	4.067
63	17.90	1	163.9	460	136.5	101	19.20	1	494.7	459	417.5
66	17.80	2	148.0	460	120.5	102	19.50	56	66.80	489	36.44
69	17.60	1	164.3	459	137.6	103	18.40	15	33.80	489	22.33
43	19.60	1	96.40	489	63.58	104	19.60	1	271.6	486	187.3

MASONRY FIREPLACE FIREPLACE ALONE BRAND TEST FI001

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
105	16.30	1	333.1	23	232.3	113	18.13	15	31.93	489	21.70
106	19.30	1	207.1	474	169.7	114	18.98	5	155.6	486	106.9
107	19.60	1	115.9	489	86.42	115	16.18	1	321.4	457	225.6
108	17.40	22	65.60	489	47.72	116	18.06	2	172.5	459	141.4
109	1.100	77	21.60	484	9.404	117	17.71	6	99.39	489	73.70
110	3.800	12	72.40	472	40.33	118	16.89	23	56.55	466	41.39
111	18.90	1	383.6	481	299.2	119	0.7923	62	12.88	485	5.167
112	19.20	73	58.07	489	32.67	120	3.633	43	56.20	472	32.08

Test FI002

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	1
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	2
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	3
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	4
33	2	IB B16	BACK, 16 IN. FROM FLOOR	5
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	6
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	7
37	2	IB B26	BACK, 26 IN. FROM FLOOR	8
38	2	IB B26	BACK, 26 IN. FROM FLOOR	9
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	10
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	11
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	12
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	13
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	14
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	15
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	16
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	17
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	18
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	19
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	20
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	21
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	22
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	23
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	24
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	25
73	2	GAS 98	98 IN. FROM FLOOR	26
74	2	GAS122	122 IN. FROM FLOOR	27
75	2	GAS146	146 IN. FROM FLOOR	28
76	2	GAS170	170 IN. FROM FLOOR	29
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	30
45	2	LIN 85	85 IN. FROM FLOOR	31
48	2	LIN 98	98 IN. FROM FLOOR	32
51	2	LIN110	110 IN. FROM FLOOR	33
54	2	LIN122	122 IN. FROM FLOOR	34
57	2	LIN134	134 IN. FROM FLOOR	35
60	2	LIN146	146 IN. FROM FLOOR	36
63	2	LIN158	158 IN. FROM FLOOR	37
66	2	LIN170	170 IN. FROM FLOOR	38
69	2	LIN182	182 IN. FROM FLOOR	39
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	40
46	2	LIN 85	85 IN. FROM FLOOR	41
49	2	LIN 98	98 IN. FROM FLOOR	42
52	2	LIN110	110 IN. FROM FLOOR	43
55	2	LIN122	122 IN. FROM FLOOR	44
58	2	LIN134	134 IN. FROM FLOOR	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
61	2	LIN146		146 IN. FROM FLOOR	46
64	2	LIN158		158 IN. FROM FLOOR	47
67	2	LIN170		170 IN. FROM FLOOR	48
70	2	LIN182		182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE,	74 IN. FROM FLOOR	50
47	2	LIN 85		85 IN. FROM FLOOR	51
50	2	LIN 98		98 IN. FROM FLOOR	52
53	2	LIN110		110 IN. FROM FLOOR	53
56	2	LIN122		122 IN. FROM FLOOR	54
59	2	LIN134		134 IN. FROM FLOOR	55
62	2	LIN146		146 IN. FROM FLOOR	56
65	2	LIN158		158 IN. FROM FLOOR	57
68	2	LIN170		170 IN. FROM FLOOR	58
71	2	LIN182		182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE,	BOTTOM	60
82	2	ENC BM		MIDDLE	61
83	2	ENC BT		TOP	62
84	2	ENC BL		LEFT	63
85	2	ENC BR		RIGHT	64
88	2	ENC LB	LEFT SURFACE,	BOTTOM	65
87	2	ENC LM		MIDDLE	66
86	2	ENC LT		TOP	67
92	2	ENC LR	LEFT RAKE		68
91	2	ENC RB	RIGHT SURFACE,	BOTTOM	69
90	2	ENC RM		MIDDLE	70
89	2	ENC RT		TOP	71
93	2	ENC RR	RIGHT RAKE		72
78	2	MAN L	MANTEL SURFACE, LEFT		73
79	2	MAN M	MIDDLE		74
80	2	MAN R	RIGHT		75

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
100	3	HOURS	TIME SINCE IGNITION IN HOURS	76
101	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	77
102	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	78
103	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	79
104	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	80
105	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	81
106	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	82
107	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	83
108	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	84
109	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	85
110	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	86
111	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	87
112	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	88
113	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	89
114	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	90
115	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	91
116	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	92
117	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	93
118	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	94
119	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	95
120	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	96

TABLE OF MULTIPLIERS	TABLE OF ADDERS	TABLE OF POWERS
C 3= 1.000000	ADD 3= 0.000000	POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE FIREPLACE ALONE LOG TEST F1002

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8644E+05	596	0.2189E+05	46	1.800	1	67.70	440	39.22
20	3.100	9	53.80	510	20.78	49	0.8000	595	83.10	455	50.82
77	-8.100	564	5.800	130	0.6485	52	-1.200	594	77.70	449	45.27
21	4.000	2	441.1	503	272.4	55	-.8000	594	77.30	452	46.01
33	4.100	1	493.2	499	288.5	58	-.8000	596	73.70	453	44.09
24	3.500	2	619.2	505	393.4	61	-1.000	595	70.50	445	40.85
27	4.200	1	332.6	503	212.7	64	-1.700	595	54.60	456	31.29
37	4.700	1	218.2	509	125.7	67	-1.100	596	67.80	451	39.16
38	4.400	1	241.5	455	150.4	70	-1.400	592	75.10	455	42.94
30	3.800	2	341.8	333	215.9	44	-3.700	567	16.20	265	5.298
22	3.900	4	55.80	541	18.45	47	1.000	568	39.50	472	22.63
25	3.000	3	81.30	535	27.29	50	-3.200	563	32.20	450	19.06
28	4.100	2	52.20	546	16.68	53	-3.600	576	33.90	451	19.36
31	3.300	1	66.70	540	21.04	56	-3.000	576	33.60	450	19.36
23	3.000	2	29.80	568	9.020	59	-2.900	589	33.60	451	19.46
26	2.100	2	40.50	556	10.63	62	-2.600	589	30.90	469	17.88
29	3.200	1	29.50	559	8.933	65	-2.500	588	32.90	468	19.02
32	2.300	1	35.80	559	9.217	68	-2.400	594	35.20	469	20.15
34	4.500	1	63.60	515	30.80	71	-2.700	589	42.50	449	24.19
35	4.500	2	221.3	453	132.1	81	-.4000	2	23.80	528	10.69
36	4.200	2	60.30	516	36.06	82	0.0000	1	17.20	528	9.053
39	5.000	1	94.50	508	54.81	83	0.3000	1	17.60	511	9.956
40	4.700	1	210.3	452	121.8	84	-.1000	1	12.80	528	6.673
41	4.300	1	101.5	515	74.45	85	-.3000	1	11.20	528	6.538
72	3.400	2	278.8	314	158.2	88	0.9000	1	9.500	593	5.057
73	3.100	2	288.7	304	163.8	87	0.9000	1	9.300	593	5.014
74	3.000	2	280.7	304	161.2	86	1.000	1	7.100	326	4.832
75	3.000	2	283.8	314	161.8	92	0.7000	1	12.10	394	7.845
76	2.800	2	281.5	314	160.7	91	0.0000	1	10.00	588	3.893
42	4.400	2	133.9	442	85.16	90	0.0000	1	10.50	593	3.988
45	3.300	2	163.3	433	104.9	89	0.0000	1	9.000	595	3.993
48	2.800	1	190.4	429	121.6	93	-.1000	1	9.500	511	5.906
51	2.100	2	135.9	437	82.31	78	4.600	15	55.00	516	25.65
54	2.400	1	161.9	436	100.3	79	4.400	11	77.00	522	38.04
57	2.700	1	160.4	435	100.4	80	4.200	1	45.90	522	21.53
60	3.100	1	172.9	435	108.0	100	0.0000	1	24.01	596	6.081
63	3.000	2	151.8	435	94.90	101	4.700	1	619.2	505	393.6
66	2.800	1	131.0	443	80.63	102	4.100	2	81.30	535	27.50
69	2.200	1	156.5	435	97.14	103	3.200	1	40.50	556	11.22
43	4.100	1	67.50	509	40.40	104	5.000	1	221.3	453	133.9

MASONRY FIREPLACE — FIREPLACE ALONE — LOG TEST — FI002

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
105	3.400	2	288.7	304	164.8	113	2.650	2	33.85	559	9.450
106	4.400	2	190.4	429	123.4	114	4.533	2	121.8	506	75.01
107	4.100	1	83.10	455	53.68	115	3.060	2	281.0	314	161.1
108	1.000	568	42.50	449	24.90	116	2.880	2	155.5	435	97.54
109	-1.400	82	29.70	538	10.85	117	1.210	596	71.09	453	42.00
110	2.200	45	81.80	522	37.95	118	-2.350	568	31.93	450	18.64
111	4.100	2	368.7	503	237.0	119	-1.808	82	17.27	585	5.770
112	3.575	4	63.80	541	20.87	120	1.133	82	63.60	521	27.76

Test FI101

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	1
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	2
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	3
33	2	IB B16	BACK, 16 IN. FROM FLOOR	4
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	5
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	6
37	2	IB B26	BACK, 26 IN. FROM FLOOR	7
38	2	IB B26	BACK, 26 IN. FROM FLOOR	8
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	9
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	10
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	11
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	12
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	13
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	14
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	15
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	16
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	17
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	18
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	19
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	20
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	21
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	22
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	23
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	24
73	2	GAS 98	98 IN. FROM FLOOR	25
74	2	GAS122	122 IN. FROM FLOOR	26
75	2	GAS146	146 IN. FROM FLOOR	27
76	2	GAS170	170 IN. FROM FLOOR	28
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	29
45	2	LIN 85	85 IN. FROM FLOOR	30
48	2	LIN 98	98 IN. FROM FLOOR	31
51	2	LIN110	110 IN. FROM FLOOR	32
54	2	LIN122	122 IN. FROM FLOOR	33
57	2	LIN134	134 IN. FROM FLOOR	34
60	2	LIN146	146 IN. FROM FLOOR	35
63	2	LIN158	158 IN. FROM FLOOR	36
66	2	LIN170	170 IN. FROM FLOOR	37
69	2	LIN182	182 IN. FROM FLOOR	38
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	39
46	2	LIN 85	85 IN. FROM FLOOR	40
49	2	LIN 98	98 IN. FROM FLOOR	41
52	2	LIN110	110 IN. FROM FLOOR	42
55	2	LIN122	122 IN. FROM FLOOR	43
58	2	LIN134	134 IN. FROM FLOOR	44
				45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
61	2	LIN146		146 IN. FROM FLOOR	46
64	2	LIN158		158 IN. FROM FLOOR	47
67	2	LIN170		170 IN. FROM FLOOR	48
70	2	LIN182		182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE,	74 IN. FROM FLOOR	50
47	2	LIN 85		85 IN. FROM FLOOR	51
50	2	LIN 98		98 IN. FROM FLOOR	52
53	2	LIN110		110 IN. FROM FLOOR	53
56	2	LIN122		122 IN. FROM FLOOR	54
59	2	LIN134		134 IN. FROM FLOOR	55
62	2	LIN146		146 IN. FROM FLOOR	56
65	2	LIN158		158 IN. FROM FLOOR	57
68	2	LIN170		170 IN. FROM FLOOR	58
71	2	LIN182		182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE,	BOTTOM	60
82	2	ENC BM		MIDDLE	61
83	2	ENC BT		TOP	62
84	2	ENC BL		LEFT	63
85	2	ENC BR		RIGHT	64
88	2	ENC LB	LEFT SURFACE,	BOTTOM	65
87	2	ENC LM		MIDDLE	66
86	2	ENC LT		TOP	67
92	2	ENC LR	LEFT RAKE		68
91	2	ENC RB	RIGHT SURFACE,	BOTTOM	69
90	2	ENC RM		MIDDLE	70
89	2	ENC RT		TOP	71
93	2	ENC RR	RIGHT RAKE		72
78	2	MAN L	MANTEL SURFACE, LEFT		73
79	2	MAN M	MIDDLE		74
80	2	MAN R	RIGHT		75
94	2	FI OLB	INSERT SURFACE TEMPERATURE, OUTSIDE (ROOM),	LEFT BOTTOM	76
95	2	FI OLM		MIDDLE	77
96	2	FI OLT		TOP	78
97	2	FI OTL		TOP LEFT	79
98	2	FI OTM		MIDDLE	80
99	2	FI OTR		RIGHT	81
102	2	FI ORB		RIGHT BOTTOM	82
101	2	FI ORM		MIDDLE	83
100	2	FI ORT		TOP	84
103	2	FI ILB	INSERT SURFACE TEMPERATURE, FIREBOX,	LEFT BOTTOM	85
104	2	FI ILM		MIDDLE	86
105	2	FI ILT		TOP	87
106	2	FI ITL		TOP LEFT	88
107	2	FI ITM		MIDDLE	89
108	2	FI ITR		RIGHT	90

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
111	2	FI IRB	RIGHT BOTTOM	91
110	2	FI IRM	MIDDLE	92
109	2	FI IRT	TOP	93
112	2	FI IBB	BACK BOTTOM	94
113	2	FI IBM	MIDDLE	95
114	2	FI IBT	TOP	96.

TABLE OF MULTIPLIERS

C 1=	1.000000
C 2=	1.000000

TABLE OF ADDERS

ADD 1=	0.000000
ADD 2=	0.000000

TABLE OF POWERS

POWER 1=	1.000000
POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
200	3	HOURS	TIME SINCE IGNITION IN HOURS	97
201	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	98
202	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	99
203	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	100
204	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	101
205	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	102
206	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	103
207	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	104
208	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	105
209	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	106
210	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	107
211	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	108
212	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	109
213	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	110
214	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	111
215	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	112
216	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	113
217	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	114
218	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	115
219	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	116
220	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	117
221	3	MAXFIR	MAXIMUM INSERT SURFACE TEMPERATURE, ROOM SIDE	118
222	3	MAXFIF	MAXIMUM INSERT SURFACE TEMPERATURE, FIREBOX SIDE	119
223	3	AVGFIR	AVERAGE INSERT SURFACE TEMPERATURE, ROOM SIDE	120
224	3	AVGFIF	AVERAGE INSERT SURFACE TEMPERATURE, FIREBOX SIDE	121

TABLE OF MULTIPLIERS	TABLE OF ADDERS	TABLE OF POWERS
C 3= 1.000000	ADD 3= 0.000000	POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE INSERT 1, NO CONNECTION BRAND TEST FI101

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8585E+05	594	0.2177E+05	46	17.50	1	343.9	501	168.5
20	18.50	1	70.70	483	52.61	49	16.80	1	312.0	503	160.1
77	18.60	1	32.00	473	25.29	52	16.10	1	351.3	501	177.7
21	21.80	22	71.40	503	48.81	55	16.40	1	313.2	502	161.5
33	22.40	1	283.4	501	157.0	58	16.40	1	294.5	502	148.4
24	22.10	1	97.00	501	60.76	61	17.10	1	278.3	501	136.2
27	22.40	1	266.2	501	149.2	64	17.20	1	198.6	503	98.16
37	21.70	1	262.2	503	133.7	67	17.10	1	237.6	502	114.4
38	21.90	1	381.9	502	194.9	70	16.50	1	234.9	502	112.2
30	22.10	1	305.1	500	164.8	44	20.50	58	117.8	516	56.68
22	22.30	208	34.40	553	24.73	47	17.20	1	190.2	504	94.87
25	22.40	112	38.00	551	25.67	50	16.60	1	144.6	507	73.95
28	22.80	144	46.60	549	27.65	53	16.10	1	164.2	506	82.15
31	22.90	112	53.10	545	29.56	56	16.50	1	146.6	507	76.43
23	21.60	1	30.70	550	24.78	59	16.50	1	151.6	507	75.54
26	21.10	22	32.70	567	24.44	62	17.40	1	113.4	507	67.73
29	21.70	1	37.40	556	26.01	65	17.30	1	112.8	507	66.77
32	21.20	1	40.60	557	26.18	68	17.30	1	104.1	507	64.71
34	20.00	1	72.50	503	48.70	71	16.70	1	113.1	506	67.53
35	20.40	1	263.3	501	139.9	81	19.10	1	47.80	488	29.84
36	20.90	12	80.70	506	49.54	82	19.40	1	63.30	507	37.15
39	23.10	1	197.6	503	103.7	83	19.80	1	74.30	511	43.27
40	22.50	1	499.7	502	260.5	84	19.40	1	57.00	507	34.43
41	23.10	1	293.2	502	136.2	85	19.30	1	57.00	507	33.91
72	21.70	5	818.9	491	438.1	88	19.70	1	36.50	488	27.69
73	20.40	2	808.4	491	434.7	87	19.60	1	37.70	488	28.48
74	19.40	3	739.6	491	404.5	86	19.70	1	39.90	489	29.58
75	18.70	1	692.3	491	385.4	92	19.40	1	60.20	507	37.21
76	18.00	1	653.6	491	366.5	91	19.30	1	34.70	507	26.08
42	22.30	1	444.8	501	237.3	90	19.10	1	37.40	511	27.59
45	19.20	1	490.5	498	278.3	89	19.10	1	41.20	511	29.01
48	18.20	1	580.9	495	328.4	93	18.90	1	63.30	507	36.96
51	16.90	1	445.6	501	245.1	78	20.20	8	69.90	502	48.15
54	17.20	3	474.5	499	269.6	79	20.40	14	83.50	526	54.93
57	17.40	1	424.8	500	244.2	80	20.90	11	63.80	507	42.66
60	17.40	3	423.0	500	238.8	94	18.20	1	234.0	112	166.2
63	17.30	1	359.4	500	205.0	95	18.20	1	523.9	352	356.9
66	17.10	1	333.7	501	183.4	96	18.20	1	542.4	482	383.1
69	16.50	1	351.4	501	197.1	97	18.00	1	515.0	464	382.4
43	21.70	8	209.0	505	106.1	98	17.90	1	535.6	465	404.2

MASONRY FIREPLACE INSERT 1, NO CONNECTION BRAND TEST FI101

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
99	17.90	1	531.7	470	387.9	205	21.70	5	818.9	491	439.9
102	15.00	1	186.5	80	134.9	206	22.30	1	580.9	495	332.3
101	14.90	1	495.4	208	348.0	207	21.70	8	351.3	501	182.2
100	14.90	1	522.2	482	363.9	208	20.60	56	190.2	504	97.48
103	16.50	1	118.0	113	87.27	209	-.4000	99	45.70	523	17.99
104	16.50	1	186.0	105	122.6	210	1.200	31	58.70	531	30.35
105	16.60	1	251.7	148	182.3	211	22.09	1	236.2	501	129.9
106	16.40	1	491.3	492	331.0	212	22.63	160	42.95	550	26.90
107	15.80	1	376.1	504	261.0	213	21.43	1	35.32	561	25.35
108	16.20	1	507.2	481	203.4	214	21.68	1	232.2	502	123.1
111	16.20	1	104.3	484	76.75	215	19.66	4	742.6	491	405.8
110	16.30	1	124.7	484	91.83	216	17.95	6	431.6	500	242.7
109	16.40	1	276.2	479	152.6	217	17.29	1	275.0	502	138.3
112	17.00	7	125.4	112	94.68	218	17.28	1	134.5	507	72.64
113	17.20	3	178.3	112	129.2	219	-2.085	160	19.63	511	7.112
114	17.20	1	272.2	495	196.8	220	0.9000	31	42.30	504	23.30
200	0.0000	1	23.85	594	6.048	221	18.20	1	542.4	482	406.1
201	22.40	1	381.9	502	198.1	222	17.20	3	507.2	481	333.7
202	22.90	116	53.10	545	29.58	223	17.02	1	431.7	483	325.3
203	21.70	1	40.60	557	26.43	224	16.54	1	240.0	481	160.8
204	23.10	1	499.7	502	260.5						

Test FI102

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	1
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	2
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	3
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	4
33	2	IB B16	BACK, 16 IN. FROM FLOOR	5
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	6
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	7
37	2	IB B26	BACK, 26 IN. FROM FLOOR	8
38	2	IB B26	BACK, 26 IN. FROM FLOOR	9
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	10
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	11
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	12
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	13
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	14
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	15
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	16
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	17
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	18
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	19
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	20
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	21
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	22
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	23
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	24
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	25
73	2	GAS 98	98 IN. FROM FLOOR	26
74	2	GAS122	122 IN. FROM FLOOR	27
75	2	GAS146	146 IN. FROM FLOOR	28
76	2	GAS170	170 IN. FROM FLOOR	29
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	30
45	2	LIN 85	85 IN. FROM FLOOR	31
48	2	LIN 98	98 IN. FROM FLOOR	32
51	2	LIN110	110 IN. FROM FLOOR	33
54	2	LIN122	122 IN. FROM FLOOR	34
57	2	LIN134	134 IN. FROM FLOOR	35
60	2	LIN146	146 IN. FROM FLOOR	36
63	2	LIN158	158 IN. FROM FLOOR	37
66	2	LIN170	170 IN. FROM FLOOR	38
69	2	LIN182	182 IN. FROM FLOOR	39
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	40
46	2	LIN 85	85 IN. FROM FLOOR	41
49	2	LIN 98	98 IN. FROM FLOOR	42
52	2	LIN110	110 IN. FROM FLOOR	43
55	2	LIN122	122 IN. FROM FLOOR	44
58	2	LIN134	134 IN. FROM FLOOR	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
61	2	LIN146	146 IN. FROM FLOOR	46
64	2	LIN158	158 IN. FROM FLOOR	47
67	2	LIN170	170 IN. FROM FLOOR	48
70	2	LIN182	182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	50
47	2	LIN 85	85 IN. FROM FLOOR	51
50	2	LIN 98	98 IN. FROM FLOOR	52
53	2	LIN110	110 IN. FROM FLOOR	53
56	2	LIN122	122 IN. FROM FLOOR	54
59	2	LIN134	134 IN. FROM FLOOR	55
62	2	LIN146	146 IN. FROM FLOOR	56
65	2	LIN158	158 IN. FROM FLOOR	57
68	2	LIN170	170 IN. FROM FLOOR	58
71	2	LIN182	182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE, BOTTOM	60
82	2	ENC BM	MIDDLE	61
83	2	ENC BT	TOP	62
84	2	ENC BL	LEFT	63
85	2	ENC BR	RIGHT	64
88	2	ENC LB	LEFT SURFACE, BOTTOM	65
87	2	ENC LM	MIDDLE	66
86	2	ENC LT	TOP	67
92	2	ENC LR	LEFT RAKE	68
91	2	ENC RB	RIGHT SURFACE, BOTTOM	69
90	2	ENC RM	MIDDLE	70
89	2	ENC RT	TOP	71
93	2	ENC RR	RIGHT RAKE	72
78	2	MAN L	MANTEL SURFACE, LEFT	73
79	2	MAN M	MIDDLE	74
80	2	MAN R	RIGHT	75
94	2	FI OLB	INSERT SURFACE TEMPERATURE, OUTSIDE (ROOM), LEFT BOTTOM	76
95	2	FI OLM	MIDDLE	77
96	2	FI OLT	TOP	78
97	2	FI OTL	TOP LEFT	79
98	2	FI OTM	MIDDLE	80
99	2	FI OTR	RIGHT	81
102	2	FI ORB	RIGHT BOTTOM	82
101	2	FI ORM	MIDDLE	83
100	2	FI ORT	TOP	84
103	2	FI ILB	INSERT SURFACE TEMPERATURE, FIREBOX, LEFT BOTTOM	85
104	2	FI ILM	MIDDLE	86
105	2	FI ILT	TOP	87
106	2	FI ITL	TOP LEFT	88
107	2	FI ITM	MIDDLE	89
108	2	FI ITR	RIGHT	90

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
111	2	FI IRB		RIGHT BOTTOM	91
110	2	FI IRM		MIDDLE	92
109	2	FI IRT		TOP	93
112	2	FI IBB		BACK BOTTOM	94
113	2	FI IBM		MIDDLE	95
114	2	FI IBT		TOP	96

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
200	3	HOURS	TIME SINCE IGNITION IN HOURS	97
201	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	98
202	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	99
203	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	100
204	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	101
205	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	102
206	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	103
207	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	104
208	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	105
209	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	106
210	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	107
211	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	108
212	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	109
213	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	110
214	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	111
215	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	112
216	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	113
217	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	114
218	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	115
219	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	116
220	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	117
221	3	MAXFIR	MAXIMUM INSERT SURFACE TEMPERATURE, ROOM SIDE	118
222	3	MAXFIF	MAXIMUM INSERT SURFACE TEMPERATURE, FIREBOX SIDE	119
223	3	AVGFIR	AVERAGE INSERT SURFACE TEMPERATURE, ROOM SIDE	120
224	3	AVGFIF	AVERAGE INSERT SURFACE TEMPERATURE, FIREBOX SIDE	121

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE INSERT 1, NO CONNECTION LOG TEST FI102

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8663E+05	599	0.2196E+05	46	7.100	1	107.8	508	59.43
20	9.200	1	54.40	424	40.63	49	6.600	1	116.7	510	66.72
77	9.000	1	23.50	387	16.62	52	6.100	1	114.0	508	63.75
21	10.60	2	45.00	511	32.31	55	6.200	1	113.9	509	64.33
33	10.80	1	134.7	507	83.37	58	6.200	1	105.8	510	60.52
24	10.50	1	52.10	509	37.56	61	6.700	1	92.50	508	52.95
27	11.10	1	129.0	507	80.86	64	6.800	1	78.10	510	44.54
37	11.20	4	136.5	511	83.26	67	6.600	1	83.50	509	49.33
38	11.30	1	165.6	509	98.14	70	6.200	1	84.80	509	48.79
30	10.90	5	135.2	508	85.03	44	9.000	7	51.00	396	30.36
22	10.10	47	20.60	561	12.38	47	7.300	1	75.40	512	42.16
25	9.900	22	22.30	556	12.93	50	7.200	1	67.60	512	40.12
28	10.50	21	27.00	558	14.15	53	6.800	1	72.60	512	40.51
31	10.40	24	30.40	559	15.20	56	7.000	1	70.80	512	40.64
23	9.400	2	17.30	574	12.97	59	7.000	1	72.60	512	40.89
26	9.100	18	17.80	572	12.42	62	7.200	1	62.70	512	35.29
29	9.700	3	21.10	573	14.24	65	7.200	1	63.30	512	35.89
32	9.500	1	22.60	568	13.81	68	7.000	1	62.40	512	35.80
34	10.20	4	54.60	510	35.74	71	6.900	1	64.60	510	36.89
35	10.70	3	129.4	510	79.61	81	9.200	1	33.80	432	19.66
36	10.60	3	52.90	515	31.66	82	9.300	3	38.40	432	23.21
39	11.70	1	95.30	508	60.81	83	9.700	7	47.20	433	28.52
40	11.60	1	221.2	507	121.5	84	9.300	2	35.80	433	21.53
41	11.70	1	99.90	506	73.03	85	9.200	2	35.30	432	21.44
72	10.00	4	383.5	501	211.5	88	9.300	2	27.30	413	16.94
73	8.900	4	372.3	501	209.7	87	9.400	1	29.10	390	18.86
74	8.100	3	352.7	501	200.2	86	9.500	1	29.60	390	19.86
75	7.600	4	335.7	501	193.0	92	9.500	12	42.90	414	27.17
76	7.500	3	315.8	501	184.8	91	8.900	3	21.00	415	14.75
42	10.10	1	163.9	507	93.40	90	9.200	1	23.10	432	16.35
45	8.200	1	198.8	506	120.7	89	9.300	1	24.40	433	17.36
48	7.400	1	227.4	505	135.1	93	9.300	7	34.60	507	22.17
51	6.500	1	164.6	506	97.19	78	10.60	9	54.00	511	34.86
54	6.600	2	186.0	506	112.4	79	10.70	9	64.50	516	40.02
57	6.700	1	178.3	506	110.4	80	10.70	10	48.30	519	28.26
60	7.000	4	180.7	506	107.6	94	9.400	1	177.1	429	134.0
63	6.900	1	158.2	506	96.60	95	9.400	3	496.3	426	324.6
66	6.700	1	139.9	506	85.03	96	9.500	1	478.2	452	352.4
69	6.400	1	143.4	507	93.21	97	9.500	1	468.5	390	350.6
43	9.600	6	89.00	514	54.50	98	9.400	1	531.3	454	378.8

MASONRY FIREPLACE INSERT 1, NO CONNECTION LOG TEST FI102

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
99	9.400	1	488.6	454	349.1	205	10.00	4	383.5	501	212.2
102	9.300	1	162.4	192	111.5	206	10.10	1	227.4	505	136.5
101	9.300	1	437.7	196	303.9	207	9.600	6	116.7	510	68.55
100	9.300	1	457.3	412	330.0	208	9.000	7	75.40	512	42.32
103	9.800	1	104.7	133	70.85	209	-1.100	76	27.00	434	12.97
104	9.800	1	150.7	133	97.00	210	0.8000	25	48.80	523	24.23
105	9.900	2	211.8	77	142.4	211	10.91	5	112.9	509	71.50
106	10.00	1	352.0	503	230.5	212	10.25	79	25.05	559	13.66
107	9.700	1	286.0	502	216.7	213	9.425	18	19.70	574	13.36
108	9.600	1	276.2	381	130.6	214	11.10	3	108.3	508	67.05
111	9.600	1	86.90	430	63.78	215	8.420	4	352.0	501	199.8
110	9.600	1	108.6	94	76.83	216	7.260	4	173.0	506	105.2
109	9.800	1	189.9	381	123.6	217	6.820	1	98.33	509	56.49
112	9.900	1	85.30	188	64.91	218	7.280	1	65.33	512	37.86
113	10.00	1	140.5	74	87.09	219	-3.054	171	11.92	434	3.978
114	0.0000	1	0.0000	1	0.0000	220	0.5000	35	38.60	519	17.75
200	0.0000	1	24.06	599	6.101	221	9.500	1	531.3	454	383.1
201	11.30	1	165.6	509	98.16	222	10.00	1	352.0	503	233.4
202	10.50	21	30.40	559	15.21	223	9.400	1	391.2	454	292.8
203	9.700	3	22.60	568	14.42	224	8.975	2	142.7	72	108.7
204	11.70	1	221.2	507	121.5						

Test FI112

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	1
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	2
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	3
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	4
33	2	IB B16	BACK, 16 IN. FROM FLOOR	5
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	6
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	7
37	2	IB B26	BACK, 26 IN. FROM FLOOR	8
38	2	IB B26	BACK, 26 IN. FROM FLOOR	9
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	10
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	11
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	12
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	13
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	14
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	15
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	16
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	17
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	18
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	19
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	20
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	21
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	22
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	23
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	24
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	25
73	2	GAS 98	98 IN. FROM FLOOR	26
74	2	GAS122	122 IN. FROM FLOOR	27
75	2	GAS146	146 IN. FROM FLOOR	28
76	2	GAS170	170 IN. FROM FLOOR	29
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	30
45	2	LIN 85	85 IN. FROM FLOOR	31
48	2	LIN 98	98 IN. FROM FLOOR	32
51	2	LIN110	110 IN. FROM FLOOR	33
54	2	LIN122	122 IN. FROM FLOOR	34
57	2	LIN134	134 IN. FROM FLOOR	35
60	2	LIN146	146 IN. FROM FLOOR	36
63	2	LIN158	158 IN. FROM FLOOR	37
66	2	LIN170	170 IN. FROM FLOOR	38
69	2	LIN182	182 IN. FROM FLOOR	39
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	40
46	2	LIN 85	85 IN. FROM FLOOR	41
49	2	LIN 98	98 IN. FROM FLOOR	42
52	2	LIN110	110 IN. FROM FLOOR	43
55	2	LIN122	122 IN. FROM FLOOR	44
58	2	LIN134	134 IN. FROM FLOOR	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
61	2	LIN146		146 IN. FROM FLOOR	46
64	2	LIN158		158 IN. FROM FLOOR	47
67	2	LIN170		170 IN. FROM FLOOR	48
70	2	LIN182		182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE,	.74 IN. FROM FLOOR	50
47	2	LIN 85		85 IN. FROM FLOOR	51
50	2	LIN 98		98 IN. FROM FLOOR	52
53	2	LIN110		110 IN. FROM FLOOR	53
56	2	LIN122		122 IN. FROM FLOOR	54
59	2	LIN134		134 IN. FROM FLOOR	55
62	2	LIN146		146 IN. FROM FLOOR	56
65	2	LIN158		158 IN. FROM FLOOR	57
68	2	LIN170		170 IN. FROM FLOOR	58
71	2	LIN182		182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE, BOTTOM		60
82	2	ENC BM	MIDDLE		61
83	2	ENC BT	TOP		62
84	2	ENC BL	LEFT		63
85	2	ENC BR	RIGHT		64
88	2	ENC LB	LEFT SURFACE, BOTTOM		65
87	2	ENC LM	MIDDLE		66
86	2	ENC LT	TOP		67
92	2	ENC LR	LEFT RAKE		68
91	2	ENC RB	RIGHT SURFACE, BOTTOM		69
90	2	ENC RM	MIDDLE		70
89	2	ENC RT	TOP		71
93	2	ENC RR	RIGHT RAKE		72
78	2	MAN L	MANTEL SURFACE, LEFT		73
79	2	MAN M	MIDDLE		74
80	2	MAN R	RIGHT		75
94	2	FI OLB	INSERT SURFACE TEMPERATURE, OUTSIDE (ROOM), LEFT BOTTOM		76
95	2	FI OLM	MIDDLE		77
96	2	FI OLT	TOP		78
97	2	FI OTL	TOP LEFT		79
98	2	FI OTM	MIDDLE		80
99	2	FI OTR	RIGHT		81
102	2	FI ORB	RIGHT BOTTOM		82
101	2	FI ORM	MIDDLE		83
100	2	FI ORT	TOP		84
103	2	FI ILB	INSERT SURFACE TEMPERATURE, FIREBOX, LEFT BOTTOM		85
104	2	FI ILM	MIDDLE		86
105	2	FI ILT	TOP		87
106	2	FI ITL	TOP LEFT		88
107	2	FI ITM	MIDDLE		89
108	2	FI ITR	RIGHT		90

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
111	2	FI IRB	RIGHT BOTTOM	91
110	2	FI IRM	MIDDLE	92
109	2	FI IRT	TOP	93
112	2	FI IBB	BACK BOTTOM	94
113	2	FI IBM	MIDDLE	95
114	2	FI IBT	TOP	96

TABLE OF MULTIPLIERS

C 1=	1.000000
C 2=	1.000000

TABLE OF ADDERS

ADD 1=	0.000000
ADD 2=	0.000000

TABLE OF POWERS

POWER 1=	1.000000
POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
200	3	HOURS	TIME SINCE IGNITION IN HOURS	97
201	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	98
202	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	99
203	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	100
204	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	101
205	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	102
206	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	103
207	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	104
208	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	105
209	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	106
210	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	107
211	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	108
212	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	109
213	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	110
214	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	111
215	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	112
216	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	113
217	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	114
218	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	115
219	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	116
220	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	117
221	3	MAXFIR	MAXIMUM INSERT SURFACE TEMPERATURE, ROOM SIDE	118
222	3	MAXFIF	MAXIMUM INSERT SURFACE TEMPERATURE, FIREBOX SIDE	119
223	3	AVGFIR	AVERAGE INSERT SURFACE TEMPERATURE, ROOM SIDE	120
224	3	AVGFIF	AVERAGE INSERT SURFACE TEMPERATURE, FIREBOX SIDE	121

TABLE OF MULTIPLIERS	TABLE OF ADDERS	TABLE OF POWERS
C 3= 1.000000	ADD 3= 0.000000	POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE INSERT 1, TO CHIMNEY BASE LOG TEST FI112

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.6417E+05	576	0.1869E+05	46	15.50	8	145.1	522	53.09
20	15.70	2	59.60	468	45.46	49	17.00	1	183.2	523	111.9
77	11.60	574	28.40	366	21.56	52	16.60	1	224.2	521	139.2
21	21.60	20	67.10	531	51.56	55	16.50	3	211.4	522	129.8
33	23.30	1	165.4	417	123.5	58	16.60	1	210.7	522	127.1
24	21.60	1	69.90	527	54.62	61	16.90	4	206.3	520	126.8
27	22.70	1	139.0	522	100.3	64	16.70	1	156.9	523	95.55
37	22.40	3	101.7	529	72.23	67	16.60	6	179.9	522	111.6
38	22.50	1	117.5	528	80.24	70	15.90	6	167.4	522	104.4
30	22.10	1	150.5	522	108.6	44	20.50	28	75.10	538	35.74
22	22.90	213	33.70	570	24.58	47	16.60	1	93.90	525	55.81
25	23.10	142	36.00	571	25.29	50	15.60	1	95.10	528	54.91
28	23.40	182	39.50	571	25.86	53	15.50	1	116.9	528	66.84
31	23.70	122	43.20	569	26.90	56	15.60	1	105.2	528	61.63
23	21.70	28	29.80	542	23.79	59	15.70	1	111.9	528	66.09
26	21.50	69	30.10	543	22.90	62	16.20	1	101.2	524	61.18
29	21.80	27	31.70	545	24.18	65	16.20	1	102.7	524	61.86
32	21.40	142	32.60	544	23.39	68	16.10	1	100.0	526	60.80
34	19.30	3	59.70	525	42.44	71	15.50	1	95.90	524	60.02
35	20.20	1	106.7	526	71.19	81	17.60	1	47.00	528	26.27
36	20.80	20	60.40	532	39.96	82	17.70	1	52.30	532	28.35
39	23.80	8	84.90	525	55.23	83	18.00	1	58.50	532	30.87
40	22.20	1	209.8	522	118.5	84	17.80	1	48.30	532	27.06
41	23.80	6	91.10	525	61.78	85	17.40	1	48.00	532	26.78
72	20.80	4	479.6	508	317.8	88	18.30	1	34.00	469	25.24
73	18.60	4	705.0	178	470.9	87	18.10	1	33.90	469	25.20
74	19.10	4	761.9	458	383.6	86	18.10	1	33.60	470	25.25
75	19.10	4	669.3	459	352.4	92	17.80	1	49.40	524	29.88
76	18.70	4	583.7	459	319.9	91	17.90	1	31.90	540	21.93
42	22.80	3	203.4	521	125.3	90	17.30	1	32.80	540	22.09
45	19.80	5	254.7	519	168.7	89	17.50	1	34.20	540	22.48
48	19.10	1	352.0	510	230.4	93	16.70	1	45.80	528	25.58
51	17.40	1	296.9	521	194.6	78	19.60	14	56.20	526	40.36
54	17.80	2	337.3	517	225.3	79	19.70	17	68.20	533	43.23
57	17.90	1	315.9	517	213.6	80	21.10	19	51.70	535	35.01
60	18.00	1	290.8	518	197.4	94	17.00	1	230.7	526	165.8
63	17.60	5	266.1	518	177.7	95	16.70	2	490.1	429	361.7
66	17.20	6	249.6	520	164.9	96	16.60	2	522.1	425	389.2
69	16.60	3	258.0	518	175.8	97	16.60	1	494.5	243	391.7
43	21.90	20	108.7	527	63.25	98	16.70	1	538.5	522	415.6

MASONRY FIREPLACE INSERT 1, TO CHIMNEY BASE LOG TEST FI112

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
99	16.90	1	511.7	467	404.7	205	20.80	4	761.9	458	471.7
102	14.50	3	224.5	527	147.9	206	22.80	3	352.0	510	235.0
101	14.10	1	533.0	467	372.8	207	21.90	20	224.2	521	139.7
100	13.90	1	511.8	466	382.0	208	20.50	28	116.9	528	68.14
103	14.90	1	128.2	132	93.55	209	-.3000	79	31.40	535	10.21
104	14.80	1	214.2	72	142.2	210	2.800	41	44.50	548	22.82
105	15.00	1	260.5	127	192.9	211	22.34	4	113.7	522	84.42
106	15.40	1	365.7	412	283.1	212	23.32	182	38.10	571	25.66
107	14.80	4	471.7	412	371.9	213	21.63	142	31.00	543	23.56
108	15.30	4	377.7	415	298.4	214	21.72	8	100.9	523	64.85
111	15.60	1	108.5	128	84.39	215	19.26	4	582.6	458	368.9
110	15.30	1	219.7	72	147.3	216	18.47	3	280.9	518	187.4
109	15.10	1	256.2	223	201.2	217	17.07	6	178.4	522	106.3
112	16.10	6	128.8	528	93.28	218	16.38	1	96.86	528	58.49
113	16.40	5	180.4	72	128.3	219	-.8923	79	14.66	535	4.366
114	16.40	4	251.3	72	193.8	220	2.367	41	34.90	553	17.98
200	0.0000	1	17.82	576	5.192	221	17.00	1	538.5	522	422.8
201	23.30	1	165.4	417	123.5	222	16.50	5	471.7	412	371.9
202	23.70	122	43.20	569	26.90	223	15.90	2	424.1	467	336.8
203	21.80	27	32.60	544	24.24	224	15.51	4	231.4	74	185.9
204	23.80	8	209.8	522	118.5						

Test FI122

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	1
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	2
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	3
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	4
33	2	IB B16	BACK, 16 IN. FROM FLOOR	5
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	6
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	7
37	2	IB B26	BACK, 26 IN. FROM FLOOR	8
38	2	IB B26	BACK, 26 IN. FROM FLOOR	9
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	10
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	11
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	12
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	13
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	14
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	15
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	16
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	17
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	18
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	19
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	20
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	21
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	22
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	23
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	24
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	25
73	2	GAS 98	98 IN. FROM FLOOR	26
74	2	GAS122	122 IN. FROM FLOOR	27
75	2	GAS146	146 IN. FROM FLOOR	28
76	2	GAS170	170 IN. FROM FLOOR	29
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	30
45	2	LIN 85	85 IN. FROM FLOOR	31
48	2	LIN 98	98 IN. FROM FLOOR	32
51	2	LIN110	110 IN. FROM FLOOR	33
54	2	LIN122	122 IN. FROM FLOOR	34
57	2	LIN134	134 IN. FROM FLOOR	35
60	2	LIN146	146 IN. FROM FLOOR	36
63	2	LIN158	158 IN. FROM FLOOR	37
66	2	LIN170	170 IN. FROM FLOOR	38
69	2	LIN182	182 IN. FROM FLOOR	39
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	40
46	2	LIN 85	85 IN. FROM FLOOR	41
49	2	LIN 98	98 IN. FROM FLOOR	42
52	2	LIN110	110 IN. FROM FLOOR	43
55	2	LIN122	122 IN. FROM FLOOR	44
58	2	LIN134	134 IN. FROM FLOOR	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
61	2	LIN146		146 IN. FROM FLOOR	46
64	2	LIN158		158 IN. FROM FLOOR	47
67	2	LIN170		170 IN. FROM FLOOR	48
70	2	LIN182		182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE,	74 IN. FROM FLOOR	50
47	2	LIN 85		85 IN. FROM FLOOR	51
50	2	LIN 98		98 IN. FROM FLOOR	52
53	2	LIN110		110 IN. FROM FLOOR	53
56	2	LIN122		122 IN. FROM FLOOR	54
59	2	LIN134		134 IN. FROM FLOOR	55
62	2	LIN146		146 IN. FROM FLOOR	56
65	2	LIN158		158 IN. FROM FLOOR	57
68	2	LIN170		170 IN. FROM FLOOR	58
71	2	LIN182		182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE,	BOTTOM	60
82	2	ENC BM		MIDDLE	61
83	2	ENC BT		TOP	62
84	2	ENC BL		LEFT	63
85	2	ENC BR		RIGHT	64
88	2	ENC LB	LEFT SURFACE,	BOTTOM	65
87	2	ENC LM		MIDDLE	66
86	2	ENC LT		TOP	67
92	2	ENC LR	LEFT RAKE		68
91	2	ENC RB	RIGHT SURFACE,	BOTTOM	69
90	2	ENC RM		MIDDLE	70
89	2	ENC RT		TOP	71
93	2	ENC RR	RIGHT RAKE		72
78	2	MAN L	MANTEL SURFACE, LEFT		73
79	2	MAN M	MIDDLE		74
80	2	MAN R	RIGHT		75
94	2	FI OLB	INSERT SURFACE TEMPERATURE, OUTSIDE (ROOM),	LEFT BOTTOM	76
95	2	FI OLM		MIDDLE	77
96	2	FI OLT		TOP	78
97	2	FI OTL		TOP LEFT	79
98	2	FI OTM		MIDDLE	80
99	2	FI OTR		RIGHT	81
102	2	FI ORB		RIGHT BOTTOM	82
101	2	FI ORM		MIDDLE	83
100	2	FI ORT		TOP	84
115	2	FI OFL		FRONT LEFT	85
116	2	FI OFR		RIGHT	86
103	2	FI ILB	INSERT SURFACE TEMPERATURE, FIREBOX,	LEFT BOTTOM	87
104	2	FI ILM		MIDDLE	88
105	2	FI ILT		TOP	89
106	2	FI ITL		TOP LEFT	90

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
107	2	FI ITM	MIDDLE	91
108	2	FI ITR	RIGHT	92
111	2	FI IRB	RIGHT BOTTOM	93
110	2	FI IRM	MIDDLE	94
109	2	FI IRT	TOP	95
112	2	FI IBB	BACK BOTTOM	96
113	2	FI IBM	MIDDLE	97
114	2	FI IBT	TOP	98

TABLE OF MULTIPLIERS

C 1=	1.000000
C 2=	1.000000

TABLE OF ADDERS

ADD 1=	0.000000
ADD 2=	0.000000

TABLE OF POWERS

POWER 1=	1.000000
POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
200	3	HOURS	TIME SINCE IGNITION IN HOURS	99
201	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	100
202	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	101
203	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	102
204	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	103
205	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	104
206	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	105
207	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	106
208	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	107
209	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	108
210	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	109
211	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	110
212	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	111
213	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	112
214	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	113
215	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	114
216	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	115
217	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	116
218	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	117
219	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	118
220	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	119
221	3	MAXFIR	MAXIMUM INSERT SURFACE TEMPERATURE, ROOM SIDE	120
222	3	MAXFIF	MAXIMUM INSERT SURFACE TEMPERATURE, FIREBOX SIDE	121
223	3	AVGFIR	AVERAGE INSERT SURFACE TEMPERATURE, ROOM SIDE	122
224	3	AVGFIF	AVERAGE INSERT SURFACE TEMPERATURE, FIREBOX SIDE	123

TABLE OF MULTIPLIERS	TABLE OF ADDERS	TABLE OF POWERS
C 3= 1.000000	ADD 3= 0.000000	POWER 3= 1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE INSERT 1, CONNECTION TO TOP LOG TEST FI122

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8857E+05	602	0.2231E+05	46	11.90	594	29.80	529	19.09
20	13.30	600	47.50	450	36.52	49	17.10	6	134.7	509	79.47
77	8.200	583	22.70	449	15.81	52	16.90	3	144.3	506	83.10
21	22.20	6	60.30	512	43.47	55	17.00	1	120.9	508	69.92
33	21.40	2	160.7	505	104.8	58	16.90	9	112.6	509	65.04
24	21.30	4	56.90	497	41.69	61	16.60	11	93.00	506	56.32
27	22.30	3	133.4	505	85.96	64	16.20	12	79.50	509	47.64
37	22.40	10	99.50	511	61.33	67	19.20	591	23.20	448	22.10
38	21.50	7	101.4	511	67.50	70	15.30	602	72.40	507	44.08
30	21.30	1	120.6	492	77.62	44	19.00	39	58.80	519	33.42
22	22.50	218	28.80	545	23.71	47	15.90	17	76.30	511	42.48
25	22.10	214	27.10	544	23.09	50	13.90	594	67.10	513	36.71
28	23.00	200	33.70	549	25.06	53	14.50	26	77.00	513	41.35
31	22.60	203	32.70	546	24.61	56	14.00	594	67.20	513	35.56
23	20.10	195	25.10	520	21.25	59	14.30	595	68.30	513	35.58
26	19.10	313	21.80	519	19.89	62	14.90	601	55.40	513	33.51
29	20.20	194	26.60	520	21.88	65	14.90	601	52.50	513	32.43
32	19.20	296	23.80	520	20.31	68	14.70	595	53.00	513	32.40
34	19.70	602	48.30	511	36.03	71	13.60	594	48.60	513	29.62
35	20.40	5	88.30	512	56.16	81	14.40	589	38.10	513	20.37
36	20.50	22	45.10	517	31.56	82	15.60	60	43.10	517	22.83
39	23.70	1	72.00	512	46.81	83	15.30	59	46.10	516	23.75
40	21.60	1	132.2	509	75.01	84	15.50	48	40.00	513	21.54
41	22.80	9	84.20	509	53.11	85	15.60	44	40.60	516	21.72
72	17.10	2	803.4	12	456.5	88	13.60	589	30.70	502	19.37
73	17.20	2	788.0	139	454.0	87	14.60	589	31.40	502	20.49
74	17.60	2	697.6	131	401.6	86	15.80	589	31.10	502	20.81
75	17.40	2	682.6	130	385.3	92	15.40	59	38.10	511	21.95
76	17.40	2	667.6	130	380.0	91	12.10	589	21.60	513	16.58
42	22.00	1	182.5	505	108.8	90	12.90	589	23.80	513	17.04
45	19.30	1	233.2	505	135.4	89	13.90	589	24.40	513	17.24
48	17.60	9	160.3	507	91.02	93	14.10	69	28.40	518	18.50
51	17.80	2	194.1	505	115.3	78	20.60	16	46.00	512	34.38
54	17.90	2	182.8	505	107.8	79	20.30	21	54.60	520	35.83
57	18.20	3	183.2	505	110.2	80	21.00	19	41.50	519	30.09
60	16.90	2	158.4	505	96.05	94	17.80	1	176.4	441	132.9
63	17.40	2	154.9	505	93.78	95	17.60	1	525.8	433	333.9
66	17.00	2	138.6	505	82.80	96	17.50	1	496.6	433	362.2
69	16.50	2	149.3	505	89.76	97	17.40	1	484.3	455	365.9
43	20.90	2	83.50	513	50.00	98	17.30	1	536.1	345	378.4

MASONRY FIREPLACE INSERT 1, CONNECTION TO TOP LOG TEST FI122

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
99	17.40	1	496.6	357	362.4	204	23.70	1	132.2	509	75.06
102	14.70	1	154.3	258	109.7	205	17.60	2	803.4	12	460.4
101	14.20	1	502.9	244	318.5	206	22.00	1	233.2	505	137.7
100	14.10	1	524.4	433	343.7	207	21.60	2	144.3	506	85.00
115	0.0000	0	0.0000	0	0.0000	208	19.00	39	77.00	513	44.27
116	0.0000	0	0.0000	0	0.0000	209	3.200	196	25.00	519	8.176
103	16.10	3	102.7	91	72.76	210	7.900	1	38.20	533	20.84
104	16.20	1	193.6	80	115.8	211	21.83	3	104.0	508	68.90
105	16.20	2	241.0	437	167.0	212	22.57	218	30.57	549	24.12
106	14.40	2	352.8	483	260.0	213	19.82	218	24.33	520	20.83
107	13.00	2	444.1	461	326.6	214	21.62	8	77.93	511	49.78
108	14.20	2	350.4	366	250.0	215	17.34	2	713.7	139	415.5
111	14.80	1	69.90	465	51.90	216	18.08	2	173.4	505	103.1
110	14.30	1	111.7	370	81.03	217	17.26	9	88.35	508	53.68
109	14.20	1	209.7	369	143.3	218	15.27	26	62.12	513	35.31
112	16.30	6	91.90	99	70.40	219	1.538	255	11.50	513	4.358
113	16.00	1	156.6	96	99.75	220	7.567	21	30.60	533	17.62
114	15.50	1	221.5	424	153.5	221	17.80	1	536.1	345	389.0
200	0.0000	1	24.60	602	6.199	222	16.50	1	444.1	461	326.6
201	22.50	2	160.7	505	104.8	223	16.44	1	414.8	435	300.8
202	23.00	200	33.70	549	25.06	224	15.16	2	200.5	426	149.3
203	20.20	194	26.60	520	21.88						

Test FI202

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	1
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	2
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	3
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	4
33	2	IB B16	BACK, 16 IN. FROM FLOOR	5
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	6
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	7
37	2	IB B26	BACK, 26 IN. FROM FLOOR	8
38	2	IB B26	BACK, 26 IN. FROM FLOOR	9
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	10
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	11
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	12
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	13
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	14
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	15
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	16
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	17
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	18
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	19
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	20
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	21
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	22
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	23
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	24
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	25
73	2	GAS 98	98 IN. FROM FLOOR	26
74	2	GAS122	122 IN. FROM FLOOR	27
75	2	GAS146	146 IN. FROM FLOOR	28
76	2	GAS170	170 IN. FROM FLOOR	29
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	30
45	2	LIN 85	85 IN. FROM FLOOR	31
48	2	LIN 98	98 IN. FROM FLOOR	32
51	2	LIN110	110 IN. FROM FLOOR	33
54	2	LIN122	122 IN. FROM FLOOR	34
57	2	LIN134	134 IN. FROM FLOOR	35
60	2	LIN146	146 IN. FROM FLOOR	36
63	2	LIN158	158 IN. FROM FLOOR	37
66	2	LIN170	170 IN. FROM FLOOR	38
69	2	LIN182	182 IN. FROM FLOOR	39
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	40
46	2	LIN 85	85 IN. FROM FLOOR	41
49	2	LIN 98	98 IN. FROM FLOOR	42
52	2	LIN110	110 IN. FROM FLOOR	43
55	2	LIN122	122 IN. FROM FLOOR	44
58	2	LIN134	134 IN. FROM FLOOR	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
61	2	LIN146		146 IN. FROM FLOOR	46
64	2	LIN158		158 IN. FROM FLOOR	47
67	2	LIN170		170 IN. FROM FLOOR	48
70	2	LIN182		182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE,	74 IN. FROM FLOOR	50
47	2	LIN 85		85 IN. FROM FLOOR	51
50	2	LIN 98		98 IN. FROM FLOOR	52
53	2	LIN110		110 IN. FROM FLOOR	53
56	2	LIN122		122 IN. FROM FLOOR	54
59	2	LIN134		134 IN. FROM FLOOR	55
62	2	LIN146		146 IN. FROM FLOOR	56
65	2	LIN158		158 IN. FROM FLOOR	57
68	2	LIN170		170 IN. FROM FLOOR	58
71	2	LIN182		182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE,	BOTTOM	60
82	2	ENC BM		MIDDLE	61
83	2	ENC BT		TOP	62
84	2	ENC BL		LEFT	63
85	2	ENC BR		RIGHT	64
88	2	ENC LB	LEFT SURFACE,	BOTTOM	65
87	2	ENC LM		MIDDLE	66
86	2	ENC LT		TOP	67
92	2	ENC LR	LEFT RAKE		68
91	2	ENC RB	RIGHT SURFACE,	BOTTOM	69
90	2	ENC RM		MIDDLE	70
89	2	ENC RT		TOP	71
93	2	ENC RR	RIGHT RAKE		72
78	2	MAN L	MANTEL SURFACE, LEFT		73
79	2	MAN M	MIDDLE		74
80	2	MAN R	RIGHT		75
94	2	FI OLB	INSERT SURFACE TEMPERATURE, OUTSIDE (ROOM),	LEFT BOTTOM	76
95	2	FI OLM		MIDDLE	77
96	2	FI OLT		TOP	78
97	2	FI OTL		TOP LEFT	79
98	2	FI OTM		MIDDLE	80
99	2	FI OTR		RIGHT	81
102	2	FI ORB		RIGHT BOTTOM	82
101	2	FI ORM		MIDDLE	83
100	2	FI ORT		TOP	84
115	2	FI OFL		FRONT LEFT	85
116	2	FI OFR		RIGHT	86
103	2	FI ILB	INSERT SURFACE TEMPERATURE, FIREBOX,	LEFT BOTTOM	87
104	2	FI ILM		MIDDLE	88
105	2	FI ILT		TOP	89
106	2	FI ITL		TOP LEFT	90

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
107	2	FI ITM	MIDDLE	91
108	2	FI ITR	RIGHT	92
111	2	FI IRB	RIGHT BOTTOM	93
110	2	FI IRM	MIDDLE	94
109	2	FI IRT	TOP	95
112	2	FI IBB	BACK BOTTOM	96
113	2	FI IBM	MIDDLE	97
114	2	FI IBT	TOP	98

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
200	3	HOURS	TIME SINCE IGNITION IN HOURS	99
201	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	100
202	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	101
203	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	102
204	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	103
205	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	104
206	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	105
207	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	106
208	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	107
209	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	108
210	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	109
211	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	110
212	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	111
213	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	112
214	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	113
215	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	114
216	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	115
217	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	116
218	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	117
219	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	118
220	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	119
221	3	MAXFIR	MAXIMUM INSERT SURFACE TEMPERATURE, ROOM SIDE	120
222	3	MAXFIF	MAXIMUM INSERT SURFACE TEMPERATURE, FIREBOX SIDE	121
223	3	AVGFIR	AVERAGE INSERT SURFACE TEMPERATURE, ROOM SIDE	122
224	3	AVGFIF	AVERAGE INSERT SURFACE TEMPERATURE, FIREBOX SIDE	123

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE INSERT 2, NO CONNECTION LOG TEST FI202

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8612E+05	613	0.2055E+05	46	25.00	1	215.5	507	133.7
20	23.80	1	69.20	500	51.63	49	24.40	1	212.2	520	140.4
77	22.10	598	38.00	522	29.57	52	24.10	2	223.1	508	149.5
21	27.10	41	87.40	521	59.76	55	24.20	1	206.4	519	134.7
33	27.70	1	353.9	498	238.6	58	24.20	1	202.2	519	129.5
24	27.20	1	94.20	465	70.07	61	24.30	1	179.5	509	116.7
27	27.70	1	286.6	499	187.8	64	24.30	1	141.6	520	90.69
37	26.90	1	252.7	520	149.6	67	24.20	11	156.5	519	101.3
38	26.90	1	339.5	510	206.3	70	23.90	1	150.3	519	96.72
30	27.40	1	292.6	494	200.1	44	26.80	63	115.6	533	64.55
22	27.90	168	41.00	560	30.62	47	24.70	1	142.4	523	85.43
25	27.80	114	45.20	558	31.90	50	24.10	1	119.3	524	73.00
28	28.40	161	55.60	560	34.45	53	24.00	1	130.6	524	80.01
31	28.40	94	62.70	556	36.94	56	24.10	1	118.8	524	72.66
23	27.40	64	35.80	534	30.17	59	24.10	5	122.9	524	74.57
26	27.00	64	37.60	576	29.79	62	24.30	1	98.20	523	68.03
29	27.70	1	42.80	567	31.78	65	24.20	5	97.20	523	66.98
32	27.30	41	46.30	568	31.85	68	24.20	1	93.20	523	65.49
34	25.70	41	59.30	523	42.49	71	23.90	34	93.60	521	66.54
35	25.50	1	223.2	503	139.4	81	25.90	1	55.90	522	35.21
36	26.20	47	75.00	528	49.94	82	26.10	1	72.50	528	43.11
39	28.20	1	177.9	521	110.6	83	26.30	1	83.40	528	47.99
40	27.30	1	381.1	510	235.8	84	26.10	2	64.90	522	39.88
41	27.90	1	252.2	510	148.3	85	26.00	1	64.50	522	39.61
72	26.50	7	691.9	230	370.3	88	26.10	1	42.60	501	32.75
73	26.40	7	735.1	230	376.7	87	26.10	1	44.40	522	33.65
74	26.20	1	623.0	232	339.3	86	26.10	1	46.90	522	34.79
75	26.00	1	639.4	232	343.7	92	26.10	1	71.00	522	44.63
76	25.70	1	608.8	232	332.0	91	26.20	1	39.50	528	30.53
42	27.80	1	301.1	503	199.7	90	26.10	1	42.40	528	32.13
45	25.80	1	358.7	246	227.1	89	26.10	1	44.80	528	33.21
48	25.20	6	518.7	235	305.6	93	26.00	1	66.70	528	40.50
51	24.50	1	308.2	254	200.6	78	25.80	35	65.20	522	47.51
54	24.80	1	337.5	249	218.0	79	25.80	3	88.40	538	58.32
57	24.80	1	310.5	249	204.6	80	26.20	51	65.90	535	45.03
60	24.70	1	291.3	248	187.9	94	24.20	1	239.5	503	156.1
63	24.60	2	262.5	249	172.9	95	24.20	1	357.6	503	224.1
66	24.50	2	241.0	248	158.7	96	24.30	1	355.9	501	231.3
69	24.10	1	263.9	250	175.6	97	24.00	1	578.6	458	397.9
43	27.50	41	173.4	524	102.7	98	24.00	1	646.0	457	434.1

MASONRY FIREPLACE INSERT 2, NO CONNECTION LOG TEST FI202

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
99	24.00	1	592.2	458	411.3	204	28.20	1	381.1	510	235.8
102	21.10	1	251.8	159	162.7	205	26.50	7	735.1	230	378.1
101	21.10	1	350.5	519	216.7	206	27.80	1	518.7	235	309.5
100	21.20	1	342.0	221	223.9	207	27.50	41	223.1	508	153.8
115	0.0000	0	0.0000	0	0.0000	208	26.80	63	142.4	523	87.93
116	0.0000	0	0.0000	0	0.0000	209	-.3000	106	50.20	528	18.58
103	22.10	1	111.7	173	79.44	210	1.700	45	62.10	545	29.18
104	22.30	1	242.4	503	166.3	211	27.29	1	241.9	504	158.9
105	22.40	1	413.0	496	268.0	212	28.15	161	51.10	560	33.48
106	21.60	1	602.2	246	433.9	213	27.35	64	40.50	568	30.90
107	21.40	2	676.1	262	486.3	214	26.83	1	193.1	519	121.1
108	21.60	1	638.7	235	456.6	215	26.16	7	658.6	232	352.4
111	22.00	11	112.9	263	82.25	216	25.09	2	311.6	247	205.1
110	22.00	11	305.0	262	198.2	217	24.62	13	185.1	519	119.6
109	22.30	1	418.7	141	274.7	218	24.50	5	112.6	524	71.73
112	22.80	1	89.70	124	68.23	219	-.6692	106	22.65	528	7.969
113	22.90	1	190.8	264	139.5	220	1.500	45	43.47	545	20.72
114	22.80	1	402.8	262	270.6	221	24.30	1	646.0	457	436.3
200	0.0000	1	23.92	613	5.709	222	22.90	1	676.1	262	489.1
201	27.70	1	353.9	498	241.1	223	23.12	1	395.3	498	273.1
202	28.40	161	62.70	556	37.01	224	22.22	2	335.3	249	243.7
203	27.70	1	46.30	568	32.21						

Test FI212

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	1
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	2
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	3
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	4
33	2	IB B16	BACK, 16 IN. FROM FLOOR	5
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	6
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	7
37	2	IB B26	BACK, 26 IN. FROM FLOOR	8
38	2	IB B26	BACK, 26 IN. FROM FLOOR	9
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	10
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	11
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	12
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	13
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	14
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	15
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	16
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	17
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	18
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	19
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	20
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	21
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	22
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	23
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	24
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	25
73	2	GAS 98	98 IN. FROM FLOOR	26
74	2	GAS122	122 IN. FROM FLOOR	27
75	2	GAS146	146 IN. FROM FLOOR	28
76	2	GAS170	170 IN. FROM FLOOR	29
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	30
45	2	LIN 85	85 IN. FROM FLOOR	31
48	2	LIN 98	98 IN. FROM FLOOR	32
51	2	LIN110	110 IN. FROM FLOOR	33
54	2	LIN122	122 IN. FROM FLOOR	34
57	2	LIN134	134 IN. FROM FLOOR	35
60	2	LIN146	146 IN. FROM FLOOR	36
63	2	LIN158	158 IN. FROM FLOOR	37
66	2	LIN170	170 IN. FROM FLOOR	38
69	2	LIN182	182 IN. FROM FLOOR	39
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	40
46	2	LIN 85	85 IN. FROM FLOOR	41
49	2	LIN 98	98 IN. FROM FLOOR	42
52	2	LIN110	110 IN. FROM FLOOR	43
55	2	LIN122	122 IN. FROM FLOOR	44
58	2	LIN134	134 IN. FROM FLOOR	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
61	2	LIN146		146 IN. FROM FLOOR	46
64	2	LIN158		158 IN. FROM FLOOR	47
67	2	LIN170		170 IN. FROM FLOOR	48
70	2	LIN182		182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE,	74 IN. FROM FLOOR	50
47	2	LIN 85		85 IN. FROM FLOOR	51
50	2	LIN 98		98 IN. FROM FLOOR	52
53	2	LIN110		110 IN. FROM FLOOR	53
56	2	LIN122		122 IN. FROM FLOOR	54
59	2	LIN134		134 IN. FROM FLOOR	55
62	2	LIN146		146 IN. FROM FLOOR	56
65	2	LIN158		158 IN. FROM FLOOR	57
68	2	LIN170		170 IN. FROM FLOOR	58
71	2	LIN182		182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE, BOTTOM		60
82	2	ENC BM	MIDDLE		61
83	2	ENC BT	TOP		62
84	2	ENC BL	LEFT		63
85	2	ENC BR	RIGHT		64
88	2	ENC LB	LEFT SURFACE, BOTTOM		65
87	2	ENC LM	MIDDLE		66
86	2	ENC LT	TOP		67
92	2	ENC LR	LEFT RAKE		68
91	2	ENC RB	RIGHT SURFACE, BOTTOM		69
90	2	ENC RM	MIDDLE		70
89	2	ENC RT	TOP		71
93	2	ENC RR	RIGHT RAKE		72
78	2	MAN L	MANTEL SURFACE, LEFT		73
79	2	MAN M	MIDDLE		74
80	2	MAN R	RIGHT		75
94	2	FI OLB	INSERT SURFACE TEMPERATURE, OUTSIDE (ROOM),	LEFT BOTTOM	76
95	2	FI OLM		MIDDLE	77
96	2	FI OLT		TOP	78
97	2	FI OTL		TOP LEFT	79
98	2	FI OTM		MIDDLE	80
99	2	FI OTR		RIGHT	81
102	2	FI ORB		RIGHT BOTTOM	82
101	2	FI ORM		MIDDLE	83
100	2	FI ORT		TOP	84
115	2	FI OFL		FRONT LEFT	85
116	2	FI OFR		RIGHT	86
103	2	FI ILB	INSERT SURFACE TEMPERATURE, FIREBOX,	LEFT BOTTOM	87
104	2	FI ILM		MIDDLE	88
105	2	FI ILT		TOP	89
106	2	FI ITL		TOP LEFT	90

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
107	2	FI ITM	MIDDLE	91
108	2	FI ITR	RIGHT	92
111	2	FI IRB	RIGHT BOTTOM	93
110	2	FI IRM	MIDDLE	94
109	2	FI IRT	TOP	95
112	2	FI IBB	BACK BOTTOM	96
113	2	FI IBM	MIDDLE	97
114	2	FI IBT	TOP	98

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
200	3	HOURS	TIME SINCE IGNITION IN HOURS	99
201	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	100
202	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	101
203	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	102
204	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	103
205	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	104
206	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	105
207	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	106
208	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	107
209	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	108
210	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	109
211	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	110
212	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	111
213	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	112
214	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	113
215	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	114
216	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	115
217	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	116
218	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	117
219	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	118
220	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	119
221	3	MAXFIR	MAXIMUM INSERT SURFACE TEMPERATURE, ROOM SIDE	120
222	3	MAXFIF	MAXIMUM INSERT SURFACE TEMPERATURE, FIREBOX SIDE	121
223	3	AVGFIR	AVERAGE INSERT SURFACE TEMPERATURE, ROOM SIDE	122
224	3	AVGFIF	AVERAGE INSERT SURFACE TEMPERATURE, FIREBOX SIDE	123

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE INSERT 2, TO CHIMNEY BASE LOG TEST FI212

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8543E+05	588	0.2162E+05	46	21.90	6	192.4	497	77.09
20	21.70	1	64.10	473	47.94	49	22.10	1	212.7	498	131.4
77	18.90	578	35.40	500	27.23	52	21.70	1	241.2	497	152.7
21	26.00	1	57.70	501	45.72	55	21.90	1	227.1	497	146.1
33	27.40	1	246.9	263	164.4	58	21.80	1	222.4	497	141.9
24	25.80	1	67.70	283	53.42	61	22.00	1	218.6	496	137.6
27	27.30	1	194.2	264	132.3	64	21.90	1	168.9	498	105.5
37	27.70	1	180.8	499	110.5	67	21.80	1	192.5	497	120.3
38	27.20	1	187.7	499	105.8	70	21.00	1	174.7	497	106.9
30	27.10	1	202.6	265	135.0	44	25.60	38	96.30	509	46.73
22	26.90	191	37.30	549	28.89	47	22.60	3	126.0	501	74.91
25	26.60	157	39.60	543	29.47	50	21.30	1	115.6	504	68.27
28	27.70	149	47.50	548	31.80	53	21.20	1	132.7	501	80.13
31	27.60	125	50.80	539	32.90	56	21.40	1	122.7	504	75.14
23	25.80	83	33.60	514	28.33	59	21.40	1	129.8	501	78.41
26	25.30	12	33.80	516	27.47	62	21.70	4	114.9	501	71.77
29	26.20	82	38.20	539	29.58	65	21.70	1	116.5	501	72.66
32	25.80	1	39.40	540	29.09	68	21.60	1	112.8	501	70.48
34	24.80	1	57.90	505	41.32	71	21.00	1	102.9	501	67.45
35	25.50	2	183.6	497	112.1	81	23.20	1	52.00	507	31.84
36	25.70	28	68.10	507	44.69	82	23.60	1	62.80	507	36.54
39	28.90	2	112.5	500	75.94	83	23.80	1	70.90	507	39.91
40	27.60	1	305.7	497	163.1	84	23.50	1	57.00	507	34.18
41	28.20	5	121.0	499	79.75	85	23.30	1	56.30	507	34.04
72	26.10	3	462.0	455	306.9	88	23.60	1	40.20	469	30.59
73	24.10	3	756.8	413	458.7	87	23.60	1	40.90	478	31.10
74	24.30	3	733.0	413	375.9	86	23.70	1	41.60	478	31.65
75	24.10	3	636.2	216	347.0	92	23.70	1	59.70	500	38.47
76	23.70	3	550.3	217	316.4	91	23.00	1	37.20	507	27.49
42	27.50	1	262.6	496	163.1	90	23.10	1	39.80	507	28.93
45	24.80	1	297.1	496	196.3	89	23.20	1	41.00	507	29.72
48	23.80	1	387.8	493	252.4	93	22.90	7	57.00	507	33.59
51	22.30	1	309.3	496	204.7	78	25.30	14	61.10	506	42.77
54	22.70	1	338.1	496	231.6	79	25.40	24	78.80	508	50.83
57	22.60	2	314.8	496	216.5	80	25.70	11	58.80	510	38.67
60	22.70	1	297.8	496	202.7	94	22.30	1	214.9	496	149.4
63	22.50	1	274.0	496	183.9	95	22.50	1	339.8	496	212.9
66	22.20	1	259.6	496	172.8	96	22.50	1	353.5	496	218.2
69	21.40	1	263.5	496	179.5	97	22.60	1	567.4	495	393.9
43	26.80	6	143.0	501	85.55	98	22.70	1	573.8	498	421.4

MASONRY FIREPLACE INSERT 2, TO CHIMNEY BASE LOG TEST FI212

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
99	22.70	1	517.2	83	382.0	204	28.90	2	305.7	497	163.1
102	19.50	1	240.7	496	153.4	205	26.10	3	756.8	413	458.7
101	19.50	1	325.6	445	200.2	206	27.50	1	387.8	493	254.8
100	19.60	1	301.9	445	195.9	207	26.80	6	241.2	497	155.0
115	0.0000	0	0.0000	0	0.0000	208	25.60	38	132.7	501	82.46
116	0.0000	0	0.0000	0	0.0000	209	1.200	33	37.50	508	13.19
103	20.00	1	77.60	215	59.70	210	2.800	33	49.10	514	23.91
104	20.00	1	169.6	215	114.8	211	26.93	1	155.0	496	106.7
105	20.30	1	313.2	189	207.6	212	27.23	157	43.75	544	30.76
106	20.00	1	550.1	261	391.5	213	25.78	89	36.15	540	28.62
107	19.90	1	567.6	260	416.8	214	26.80	6	139.7	497	86.15
108	20.10	1	477.7	265	335.6	215	24.46	3	609.0	217	361.0
111	20.10	1	93.10	268	70.19	216	23.26	1	299.9	496	200.3
110	20.30	1	251.2	271	159.6	217	22.30	6	198.4	497	120.5
109	20.40	1	339.7	269	214.9	218	21.99	1	113.6	504	70.60
112	20.30	1	72.30	215	56.25	219	0.2692	196	17.29	508	5.696
113	20.40	1	154.7	105	100.6	220	2.667	33	36.93	514	16.86
114	20.60	1	295.9	202	187.8	221	22.70	1	573.8	498	423.5
200	0.0000	1	23.73	588	6.006	222	20.60	1	567.6	260	417.4
201	27.70	1	246.9	263	165.8	223	21.54	1	377.0	496	258.6
202	27.70	149	50.80	539	32.96	224	20.20	1	271.0	263	193.0
203	26.20	82	39.40	540	29.74						

Test FI222

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
999	1	TIME	TIME SINCE STOVE IGNITION	1
20	2	RMTEMP	INSIDE AMBIENT AIR TEMPERATURE	2
77	2	OUTSID	OUTSIDE AMBIENT AIR TEMPERATURE	3
21	2	IB L16	FIREPLACE INSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	4
33	2	IB B16	BACK, 16 IN. FROM FLOOR	5
24	2	IB R16	RIGHT, 16 IN. FROM FLOOR	6
27	2	IB L26	LEFT, 26 IN. FROM FLOOR	7
37	2	IB B26	BACK, 26 IN. FROM FLOOR	8
38	2	IB B26	BACK, 26 IN. FROM FLOOR	9
30	2	IB R26	RIGHT, 26 IN. FROM FLOOR	10
22	2	MB L16	FIREPLACE BETWEEN BRICK COURSES, LEFT, 16 IN. FROM FLOOR	11
25	2	MB R16	RIGHT, 16 IN. FROM FLOOR	12
28	2	MB L26	LEFT, 26 IN. FROM FLOOR	13
31	2	MB R26	RIGHT, 26 IN. FROM FLOOR	14
23	2	OB L16	FIREPLACE OUTSIDE BRICK SURFACE, LEFT, 16 IN. FROM FLOOR	15
26	2	OB R16	RIGHT, 16 IN. FROM FLOOR	16
29	2	OB L26	LEFT, 26 IN. FROM FLOOR	17
32	2	OB R26	RIGHT, 26 IN. FROM FLOOR	18
34	2	DMP LB	FIREPLACE DAMPER, BOTTOM SURFACE, LEFT, 37.5 IN. FROM FLOO	19
35	2	DMP MB	MIDDLE, 37.5 IN. FROM FLOO	20
36	2	DMP RB	RIGHT, 37.5 IN. FROM FLOO	21
39	2	DMP LT	TOP SURFACE, LEFT, 39.5 IN. FROM FLOO	22
40	2	DMP MT	MIDDLE, 37.5 IN. FROM FLOO	23
41	2	DMP RT	RIGHT, 37.5 IN. FROM FLOO	24
72	2	GAS 74	FIREPLACE CHIMNEY FLUE GAS, 74 IN. FROM FLOOR	25
73	2	GAS 98	98 IN. FROM FLOOR	26
74	2	GAS122	122 IN. FROM FLOOR	27
75	2	GAS146	146 IN. FROM FLOOR	28
76	2	GAS170	170 IN. FROM FLOOR	29
42	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE, 74 IN. FROM FLOOR	30
45	2	LIN 85	85 IN. FROM FLOOR	31
48	2	LIN 98	98 IN. FROM FLOOR	32
51	2	LIN110	110 IN. FROM FLOOR	33
54	2	LIN122	122 IN. FROM FLOOR	34
57	2	LIN134	134 IN. FROM FLOOR	35
60	2	LIN146	146 IN. FROM FLOOR	36
63	2	LIN158	158 IN. FROM FLOOR	37
66	2	LIN170	170 IN. FROM FLOOR	38
69	2	LIN182	182 IN. FROM FLOOR	39
43	2	LIN 74	FIREPLACE CHIMNEY INNER BRICK SURFACE, 74 IN. FROM FLOOR	40
46	2	LIN 85	85 IN. FROM FLOOR	41
49	2	LIN 98	98 IN. FROM FLOOR	42
52	2	LIN110	110 IN. FROM FLOOR	43
55	2	LIN122	122 IN. FROM FLOOR	44
58	2	LIN134	134 IN. FROM FLOOR	45

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION		COLUMN
61	2	LIN146		146 IN. FROM FLOOR	46
64	2	LIN158		158 IN. FROM FLOOR	47
67	2	LIN170		170 IN. FROM FLOOR	48
70	2	LIN182		182 IN. FROM FLOOR	49
44	2	LIN 74	FIREPLACE CHIMNEY FLUE LINER SURFACE,	74 IN. FROM FLOOR	50
47	2	LIN 85		85 IN. FROM FLOOR	51
50	2	LIN 98		98 IN. FROM FLOOR	52
53	2	LIN110		110 IN. FROM FLOOR	53
56	2	LIN122		122 IN. FROM FLOOR	54
59	2	LIN134		134 IN. FROM FLOOR	55
62	2	LIN146		146 IN. FROM FLOOR	56
65	2	LIN158		158 IN. FROM FLOOR	57
68	2	LIN170		170 IN. FROM FLOOR	58
71	2	LIN182		182 IN. FROM FLOOR	59
81	2	ENC BB	FIREPLACE ENCLOSURE,BACK SURFACE,	BOTTOM	60
82	2	ENC BM		MIDDLE	61
83	2	ENC BT		TOP	62
84	2	ENC BL		LEFT	63
85	2	ENC BR		RIGHT	64
88	2	ENC LB	LEFT SURFACE,	BOTTOM	65
87	2	ENC LM		MIDDLE	66
86	2	ENC LT		TOP	67
92	2	ENC LR	LEFT RAKE		68
91	2	ENC RB	RIGHT SURFACE,	BOTTOM	69
90	2	ENC RM		MIDDLE	70
89	2	ENC RT		TOP	71
93	2	ENC RR	RIGHT RAKE		72
78	2	MAN L	MANTEL SURFACE, LEFT		73
79	2	MAN M	MIDDLE		74
80	2	MAN R	RIGHT		75
94	2	FI OLB	INSERT SURFACE TEMPERATURE, OUTSIDE (ROOM),	LEFT BOTTOM	76
95	2	FI OLM		MIDDLE	77
96	2	FI OLT		TOP	78
97	2	FI OTL		TOP LEFT	79
98	2	FI OTM		MIDDLE	80
99	2	FI OTR		RIGHT	81
102	2	FI ORB		RIGHT BOTTOM	82
101	2	FI ORM		MIDDLE	83
100	2	FI ORT		TOP	84
115	2	FI OFL		FRONT LEFT	85
116	2	FI OFR		RIGHT	86
103	2	FI ILB	INSERT SURFACE TEMPERATURE, FIREBOX,	LEFT BOTTOM	87
104	2	FI ILM		MIDDLE	88
105	2	FI ILT		TOP	89
106	2	FI ITL		TOP LEFT	90

TABLE OF INSTRUMENTS

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
107	2	FI ITM	MIDDLE	91
108	2	FI ITR	RIGHT	92
111	2	FI IRB	RIGHT BOTTOM	93
110	2	FI IRM	MIDDLE	94
109	2	FI IRT	TOP	95
112	2	FI IBB	BACK BOTTOM	96
113	2	FI IBM	MIDDLE	97
114	2	FI IBT	TOP	98

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 1=	1.000000	ADD 1=	0.000000	POWER 1=	1.000000
C 2=	1.000000	ADD 2=	0.000000	POWER 2=	1.000000

TABLE OF CHANNELS CREATED FOR REDUCED DATA

KH	ITYPE	I.D.	INSTRUMENT DESCRIPTION	COLUMN
200	3	HOURS	TIME SINCE IGNITION IN HOURS	99
201	3	MAX FB	MAXIMUM FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	100
202	3	MAX MB	MAXIMUM BRICK SURFACE TEMPERATURE BETWEEN COURSES	101
203	3	MAX OB	MAXIMUM BRICK SURFACE TEMPERATURE ON FIREPLACE	102
204	3	MAXDMP	MAXIMUM DAMPER TEMPERATURE IN FIREPLACE	103
205	3	MAXGAS	MAXIMUM FLUE GAS TEMPERATURE IN CHIMNEY	104
206	3	MAXLIN	MAXIMUM FLUE LINER TEMPERATURE	105
207	3	MAXINB	MAXIMUM INNER BRICK SURFACE TEMPERATURE	106
208	3	MAXOUB	MAXIMUM OUTER BRICK SURFACE TEMPERATURE	107
209	3	MAXENC	MAXIMUM ENCLOSURE SURFACE TEMPERATURE	108
210	3	MAXMAN	MAXIMUM MANTEL SURFACE TEMPERATURE	109
211	3	AVG FB	AVERAGE FIREBRICK SURFACE TEMPERATURE IN FIREPLACE	110
212	3	AVG MB	AVERAGE BRICK SURFACE TEMPERATURE BETWEEN COURSES	111
213	3	AVG OB	AVERAGE BRICK SURFACE TEMPERATURE ON FIREPLACE	112
214	3	AVGDMP	AVERAGE DAMPER TEMPERATURE IN FIREPLACE	113
215	3	AVGGAS	AVERAGE FLUE GAS TEMPERATURE IN CHIMNEY	114
216	3	AVGLIN	AVERAGE FLUE LINER TEMPERATURE	115
217	3	AVGINB	AVERAGE INNER BRICK SURFACE TEMPERATURE	116
218	3	AVGOUB	AVERAGE OUTER BRICK SURFACE TEMPERATURE	117
219	3	AVGENC	AVERAGE ENCLOSURE SURFACE TEMPERATURE	118
220	3	AVGMAN	AVERAGE MANTEL SURFACE TEMPERATURE	119
221	3	MAXFIR	MAXIMUM INSERT SURFACE TEMPERATURE, ROOM SIDE	120
222	3	MAXFIF	MAXIMUM INSERT SURFACE TEMPERATURE, FIREBOX SIDE	121
223	3	AVGFIR	AVERAGE INSERT SURFACE TEMPERATURE, ROOM SIDE	122
224	3	AVGFIF	AVERAGE INSERT SURFACE TEMPERATURE, FIREBOX SIDE	123

TABLE OF MULTIPLIERS		TABLE OF ADDERS		TABLE OF POWERS	
C 3=	1.000000	ADD 3=	0.000000	POWER 3=	1.000000

INTERPRETATION OF CHANNEL ID'S CREATED BY THIS PROGRAM:

COMP - THE RESULT OF AVERAGING, MULTIPLYING, DIVIDING, ADDING, AND/OR SUBTRACTING VALUES IN HIERARCHICAL ORDER

MASONRY FIREPLACE INSERT 2, CONNECTION TO TOP LOG TEST FI222

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
999	0.0000	1	0.8510E+05	592	0.2163E+05	46	24.00	1	189.9	501	53.78
20	21.60	589	61.30	469	45.43	49	22.40	1	191.8	503	120.8
77	18.90	581	28.60	501	24.50	52	22.20	1	219.2	502	137.3
21	25.10	1	92.10	315	62.80	55	22.20	1	170.1	503	103.8
33	25.70	1	340.2	263	230.5	58	22.30	1	168.7	503	101.2
24	24.90	8	107.7	270	73.21	61	22.30	1	165.5	502	102.9
27	25.50	1	264.1	264	176.8	64	22.30	1	130.5	504	82.07
37	25.00	9	161.5	504	98.24	67	22.60	590	25.50	463	23.86
38	24.50	1	196.7	503	110.6	70	21.60	1	134.3	503	85.03
30	25.40	1	267.8	265	178.5	44	24.90	17	89.00	512	51.23
22	25.80	152	36.00	542	28.15	47	22.90	1	120.8	505	72.80
25	25.80	133	40.40	532	29.93	50	22.60	1	96.00	507	61.85
28	26.20	130	47.10	538	31.23	53	22.40	1	116.5	505	70.83
31	26.50	84	53.50	532	33.71	56	22.50	1	89.80	502	57.86
23	24.90	55	30.50	536	26.35	59	22.50	1	94.00	508	60.82
26	25.00	69	32.80	539	27.00	62	22.40	1	90.00	508	57.91
29	25.20	10	36.00	546	27.59	65	22.40	1	91.00	507	57.81
32	25.40	1	38.90	548	28.41	68	22.30	1	86.10	508	57.05
34	24.30	1	56.40	504	40.84	71	21.80	1	84.40	507	57.39
35	23.40	6	141.6	503	90.15	81	24.40	1	46.90	502	29.57
36	24.40	28	56.80	510	40.77	82	24.60	1	55.10	502	33.63
39	26.30	1	106.3	505	72.42	83	24.70	1	60.80	502	36.54
40	24.40	1	274.0	503	148.1	84	24.60	1	49.80	502	31.23
41	25.30	1	134.5	504	82.20	85	24.50	1	50.20	502	31.14
72	23.00	1	899.2	69	613.2	88	22.70	1	35.00	502	25.97
73	23.00	1	838.4	69	575.4	87	23.00	4	36.10	502	26.80
74	23.20	1	749.8	69	516.6	86	23.40	2	37.10	502	27.40
75	23.10	1	747.9	69	509.8	92	22.80	4	51.30	502	30.87
76	23.00	1	736.3	69	503.1	91	23.10	584	34.20	502	27.38
42	25.70	1	278.6	502	177.3	90	24.60	1	35.80	502	28.38
45	23.50	1	306.1	501	211.3	89	24.70	1	36.50	502	28.70
48	22.50	1	211.8	502	137.1	93	23.60	1	49.10	502	32.47
51	22.40	1	271.5	502	179.9	78	24.20	1	67.40	319	50.56
54	22.50	1	229.1	502	150.2	79	24.00	1	71.70	511	51.52
57	22.60	1	249.3	501	171.8	80	24.60	1	52.00	517	38.50
60	22.30	1	230.8	501	157.4	94	22.90	1	258.1	287	170.9
63	22.50	1	219.1	501	149.3	95	22.90	1	354.4	152	243.5
66	22.20	1	205.3	502	139.0	96	22.90	1	376.0	284	259.4
69	21.90	1	222.1	501	154.0	97	22.60	1	626.9	283	457.4
43	25.40	1	133.3	506	78.19	98	22.60	1	687.1	462	485.6

MASONRY FIREPLACE INSERT 2, CONNECTION TO TOP LOG TEST FI222

CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE	CHANNEL	MINIMUM	AT SCAN	MAXIMUM	AT SCAN	AVERAGE
99	22.60	1	626.9	464	461.3	204	26.30	1	274.0	503	148.1
102	19.80	1	291.3	242	189.7	205	23.20	1	899.2	69	613.4
101	19.80	1	353.2	265	246.4	206	25.70	1	306.1	501	214.6
100	19.70	2	364.8	264	255.8	207	25.40	1	219.2	502	139.6
115	0.0000	0	0.0000	0	0.0000	208	24.90	17	120.8	505	74.81
116	0.0000	0	0.0000	0	0.0000	209	1.100	79	32.80	502	12.06
103	20.30	1	140.2	171	86.93	210	1.700	19	46.10	527	29.85
104	20.30	1	273.0	169	171.2	211	25.19	1	184.1	267	133.0
105	20.30	1	441.0	158	284.7	212	26.10	133	44.23	538	30.76
106	19.20	2	622.5	244	459.7	213	25.13	69	34.55	548	27.34
107	19.00	3	662.6	246	492.0	214	24.70	6	127.8	503	79.08
108	19.10	1	561.5	175	407.5	215	23.06	1	794.3	69	543.6
111	20.40	1	152.5	112	93.57	216	22.81	1	241.6	502	162.7
110	20.40	1	349.6	262	217.2	217	22.79	1	149.6	501	88.89
109	20.40	1	485.3	261	303.7	218	22.68	1	95.21	507	60.56
112	20.90	2	150.4	174	89.97	219	0.3077	85	16.45	502	5.502
113	21.00	1	287.1	171	167.3	220	1.433	19	34.67	506	22.36
114	20.90	1	489.7	169	302.0	221	22.90	1	687.1	462	486.4
200	0.0000	1	23.64	592	6.007	222	21.00	1	662.6	246	492.9
201	25.70	1	340.2	263	230.5	223	21.76	2	414.5	267	307.8
202	26.50	84	53.50	532	33.71	224	20.18	3	373.8	261	256.3
203	25.40	1	38.90	548	28.41						

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5. AUTHOR(S) Richard D. Peacock

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NATIONAL BUREAU OF STANDARDS
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GAITHERSBURG, MD 20899

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U. S. Consumer Product Safety Commission
Bethesda, MD 20207

10. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

A series of tests was conducted in a masonry chimney and a masonry fireplace both constructed to current national standards in order to evaluate the effectiveness of recent changes to the building code requirements for residential masonry construction. Firing rates typical of normal homeowner use and of an overfire condition resulted in temperature levels close to recommended limits established in nationally recognized standards for properly constructed solid fuel heating systems. In addition, several lining techniques for the masonry chimney and for the fireplace chimney connected to solid fuel burning fireplace inserts showed reductions in thermal hazard to exposed combustible construction when compared to the masonry construction alone.

The results of these tests point out some areas where the codes and standards could be updated to provide for safer masonry chimneys and fireplaces.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

Chimneys; fireplaces; fire safety; fire tests; flues; heating equipment; masonry; stoves; wood.

13. AVAILABILITY

XX Unlimited

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