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An Analysis of Transient Film Boiling of High-Pressure Water in a Rod Bundle

D. G. Morris
C. B. Mullins
G. L. Yoder

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AN ANALYSIS OF TRANSIENT FILM BOILING OF HIGH-PRESSURE WATER IN A ROD BUNDLE

D. G. Morris C. B. Mullins
G. L. Yoder

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SUMMARY

Three mildly transient film-boiling heat transfer experiments (tests 3.03.6AR, 3.06.6B, and 3.08.6C) were performed at the Oak Ridge National Laboratory (ORNL) in the Thermal-Hydraulic Test Facility (THTF). These tests had several purposes, including obtaining transient film-boiling heat transfer data in rod bundle geometry for assessing film-boiling heat transfer correlations used in transient reactor analysis codes. The experiments were high-pressure and high-temperature transient tests with water flowing upward through an 8 x 8 rod bundle. The rod bundle used in the experiments contained four unheated rods and had a flat axial power profile. The heated pin diameter, rod pitch, and ratio of heated to unheated rods are typical of later-generation pressurized-water reactors with 17 x 17 fuel assemblies. The bundle is highly instrumented with thermocouples, and two flow measurement sites are at each end of the test section containing the rod bundle.

Equilibrium bundle fluid conditions have been calculated for the transient film-boiling experiments for use in the assessment of film-boiling heat transfer correlations. The fluid conditions were calculated from a homogeneous two-phase flow and thermodynamic equilibrium thermal-hydraulics code.

Calculated bundle fluids, level-average rod surface conditions, experimental heat transfer coefficients, and the dispersion in the experimental heat transfer coefficients are presented for all three ORNL transient tests. The burnout quality vs time is also presented for each test. These data should provide valuable input for the development of dispersed-flow film-boiling correlations.

Comparisons were made between experimentally determined heat transfer coefficients (or surface heat fluxes) and heat transfer coefficients (or surface heat fluxes) calculated using six film-boiling correlations:

1. Dougall-Rohsenow,
2. Dougall-Rohsenow (with Prandtl number evaluated at the wall temperature, as used in RELAP4-MOD7),
3. Groeneveld 5.9,
4. Groeneveld 5.7,
5. Groeneveld-Delorme, and
6. Condie-Bengston IV.

The heat transfer coefficients predicted by the Dougall-Rohsenow correlations are often high (by as much as a factor of 2.5) compared with all experimentally determined heat transfer coefficients discussed in this report. This overprediction is probably a result of the thermodynamic nonequilibrium in the flow. Since each of the Dougall-Rohsenow correlations is basically a Dittus-Boelter correlation for the vapor (ignoring the entrained dispersed droplets), the use of equilibrium quality, which is the common practice, results in an error in the vapor Reynolds number used by the correlation. Thus, the heat transfer coefficients produced are in error. The Groeneveld 5.7, Groeneveld 5.9, and Condie-Bengston IV correlation predictions tend to be in general agreement with the data, while the Groeneveld-Delorme correlation underpredicts the experimentally determined heat transfer. Analysis of data from steady-state film-boiling

experiments (THTF Test Series 3.07.9) conducted at ORNL indicates very good agreement between the steady-state results and the results of the three ORNL transient film-boiling experiments.

Uncertainties in rod surface conditions and bundle fluid conditions were calculated for test 3.06.6B, which permitted the calculation of uncertainties in correlation-predicted heat transfer and experimentally determined heat transfer. Typical uncertainties in the calculated rod surface conditions (defined as one standard deviation) are: σ (rod surface temperature) of ~5.5 to 8.3 K (10 to 15°F) and σ (heat flux) of ~15%. Typical uncertainties in the calculated fluid conditions are: σ (pressure) of ~0.14 MPa (20 psi), σ (saturated fluid temperature) of ~1.1 K (2°F), σ (equilibrium quality) of ~15%, and σ (mass flux) of ~15%. Uncertainties in correlation-predicted and experimentally determined heat transfer coefficients are on the order of 15%.

An advanced two-fluid thermal-hydraulics code was used to examine the thermodynamic nonequilibrium in the three ORNL transient tests. Significant thermodynamic nonequilibrium was calculated for tests 3.03.6AR and 3.06.6B. Significant thermodynamic nonequilibrium was not calculated for test 3.08.6C until late in the transient.

AN ANALYSIS OF TRANSIENT FILM BOILING OF HIGH-PRESSURE WATER IN A ROD BUNDLE

D. G. Morris C. B. Mullins
G. L. Yoder

ABSTRACT

The following six dispersed-flow film-boiling correlations were assessed using data from three ORNL transient film-boiling experiments conducted in the THTF:

1. Dougall-Rohsenow,
2. Dougall-Rohsenow (with Prandtl number evaluated at the wall temperature, as used in RELAP4-MOD7),
3. Groeneveld 5.9,
4. Groeneveld 5.7,
5. Groeneveld-Delorme, and
6. Condie-Bengston IV.

The correlations were evaluated with bundle fluid conditions calculated using a homogeneous two-phase flow and thermodynamic equilibrium thermal-hydraulics code.

Comparisons made between experimentally determined heat transfer coefficients and the individual correlations' heat transfer coefficients indicate that (1) the Dougall-Rohsenow correlations often overpredict the heat transfer coefficients; (2) the Groeneveld 5.7, Groeneveld 5.9, and Condie-Bengston IV correlations tend to be in general agreement with the data; and (3) the Groeneveld-Delorme correlation underpredicts the data.

Equilibrium bundle fluid conditions are reported along with fuel rod simulator surface temperature and heat flux. Calculated experimental heat transfer coefficients are also reported.

Uncertainties are reported for calculated heat transfer parameters for one of the transient tests.

Thermodynamic nonequilibrium in the three transient tests was examined with an advanced two-fluid thermal-hydraulics code.

---

1. INTRODUCTION

Three transient film-boiling heat transfer experiments have been conducted at the Oak Ridge National Laboratory (ORNL) Thermal-Hydraulic Test Facility (THTF). The purposes of the experiments were to: (1) obtain transient heat transfer data for film boiling in rod bundle geometry to be

used in assessing or developing film-boiling heat transfer correlations for use in transient reactor analysis codes, (2) obtain data in the high-flow film-boiling data ranges requested by the Nuclear Regulatory Commission (NRC) Office of Nuclear Reactor Regulation, (NRR) (Ref. 1), and (3) provide a benchmark for transient reactor analysis codes. The purpose of this report is to present an evaluation of rod bundle post-critical heat flux (CHF) heat transfer in the dispersed-flow film-boiling regime.

Dispersed-flow film boiling has been studied extensively for the past 20 years. This heat transfer regime is important in the design of steam generators and cryogenic systems, and over the past decade it has been identified as an important regime to quantify in nuclear power reactor safety. Most of the data available are from experiments employing simple geometries such as tubes or annuli.[2] Experimentation in rod bundles is much more expensive, requires extensive instrumentation of the rod bundle, and increases the risk of heater element failure. Nonetheless, film-boiling data in rod bundle geometries are needed for more accurate development of heat transfer models for use in reactor safety analyses.

In early experimental studies, the hypothesis was made that dispersed-flow heat transfer depends intimately on thermal nonequilibrium effects,[3] which are affected by mass flux, heat flux, geometry, and quality at dryout.[4] Thermodynamic nonequilibrium is characterized by droplets near or at the saturation temperature dispersed in superheated steam. This occurs because the heat transfer from the wall to the fluid is primarily to the steam, thus superheating it. For the steam to remain in thermal equilibrium with the droplets requires that all the wall heat flux go into droplet vaporization. Since this does not occur, the actual mass flow rate of steam is less than that calculated by equilibrium considerations, and the effective sink temperature or steam temperature is higher than the saturation temperature.

Collier[3] has noted that three types of correlating procedures have been adopted to account for dispersed-flow heat transfer:

1. Empirical correlations that make no assumption about the mechanisms involved in post-dryout heat transfer, but attempt a solely functional relationship between the heat transfer coefficient (assuming the coolant is at the saturation temperature) and the independent variables.
2. Correlations that recognize that departure from a thermodynamic equilibrium condition can occur and attempt to calculate the "true" quality and vapor temperature. A conventional single-phase heat transfer correlation is then used to calculate the heated wall temperature.
3. Semitheoretical models where attempts have been made to derive equations for the various individual hydrodynamic and heat transfer processes occurring in the heated channel and relate these to the heated wall temperature.

Type-1 correlations are the most commonly used in reactor safety studies. These correlations usually perform well when applied to geometries and conditions that are similar to the data base from which the correlation was regressed. When the correlations are applied outside their range of applicability, they will probably not account for shifts in the degree of thermal nonequilibrium and therefore cannot account for the heat transfer appropriately. Assessments of type-1 correlations currently in

use by the reactor safety community have been made using tube data at the Idaho National Engineering Laboratory.[5] This report presents similar assessments using 8 x 8 rod bundle data. The final analysis of these data is presented in this report, preliminary analysis having been presented earlier.[6-8] An assessment of type-1 correlations using rod bundle data from the facility at Columbia University[9] does not concur with the ORNL studies.

Type-2 correlations attempt to account for nonequilibrium more explicitly. A recent paper written by researchers at Lehigh University,[10] where actual measurements of nonequilibrium are being made, indicates that much work is needed to improve type-2 correlations. In addition, in a 1976 report by Richlen and Nelson,[11] a type-1 correlation by Groeneveld was recommended over the nonequilibrium or type-2 correlations available at the time.

A number of type-3 models have been developed at the Massachusetts Institute of Technology. These models usually give the most accurate results but are too cumbersome and involved for implementation in large reactor safety codes.

In this report, the following six correlations are evaluated:

1. Dougall-Rohsenow (Ref. 12),
2. Dougall-Rohsenow (with Prandtl number evaluated at the wall temperature as used in RELAP4-MOD7) (Ref. 13),
3. Groeneveld 5.9 (Ref. 14),
4. Groeneveld 5.7 (Ref. 14),
5. Groeneveld-Delorme (Ref. 15), and
6. Condie-Bengston IV (Ref. 16).

The experimental data were obtained from high-pressure, high-temperature mildly transient tests with water flowing upward through a rod bundle. The correlations are assessed over a range of thermal-hydraulic conditions. These conditions and the range requested by the NRC-NRR are shown in Table 1. The bundle fluid conditions used in the evaluation were calculated from a homogeneous two-phase flow thermodynamic equilibrium computer program.[17] Uncertainties are reported for calculated heat transfer

Table 1. THTF upflow film-boiling data ranges

Parameter	NRC requested	Obtained ORNL tests
Mass flux, kg/s·m² (lb_m/h·ft²)	271–4069 (2×10^5–3×10^6)	129–1090 (9.5×10^4–8×10^5)
Equilibrium quality, %	0–100	~15–150
Pressure, MPa (psia)	4.14–18.6 (600–2700)	5.17–12.4 (750–1800)
Heat flux, kW/m² (Btu/h·ft²)	31.5–3150 (10^4–10^6)	160–1100 (5×10^4–3.5×10^5)

parameters for test 3.06.6B, the most severe transient. Thermodynamic nonequilibrium in the three transient tests was calculated with an advanced two-fluid thermal-hydraulics computer code.[18]

Chapters 2 and 3 of the report contain descriptions of the THTF and the experimental procedure, respectively. The test phenomenology is presented in Chap. 4. Chapter 5 reports the results of the analysis including (1) the procedure used to calculate equilibrium bundle fluid conditions, (2) the calculation results, and (3) correlation comparisons performed with the equilibrium fluid conditions. The results of the uncertainty analysis for test 3.06.6B are also contained in Chap. 5. Lastly, Chap. 5 contains a discussion of thermodynamic nonequilibrium and the results and method used to calculate nonequilibrium bundle fluid conditions with an advanced thermal-hydraulics computer code. Report conclusions are presented in Chap. 6. Appendix A contains a typical model listing used to calculate equilibrium bundle fluid conditions. Calculated film-boiling data are contained in Appendix B. The THTF steady-state film-boiling results are presented in Appendix C. Appendix D contains a description of the method used and the uncertainties calculated for test 3.06.6B. Typical test section model listings used to calculate nonequilibrium bundle fluid conditions are presented in Appendix E.

2. FACILITY DESCRIPTION

The THTF is a highly instrumented nonnuclear pressurized-water loop containing 64 full-length [3.66-m (12-ft)] rods arranged in an 8 x 8 bundle; 60 of the rods are electrically heated. Tests 3.03.6AR and 3.06.6B were conducted with the THTF in the configuration shown in Fig. 2.1. A simplified diagram of the THTF in this configuration is provided in Fig. 2.2. The configuration used for test 3.08.6C differed slightly from that used for tests 3.03.6AR and 3.06.6B because the pressurizer was connected to the pump bypass line. This movement of the pressurizer had no significant effects on test 3.08.6C but had been done for prior ORNL steady-state tests conducted in the THTF. Figure 2.3 contains a system line drawing showing piping size and run lengths for the THTF in

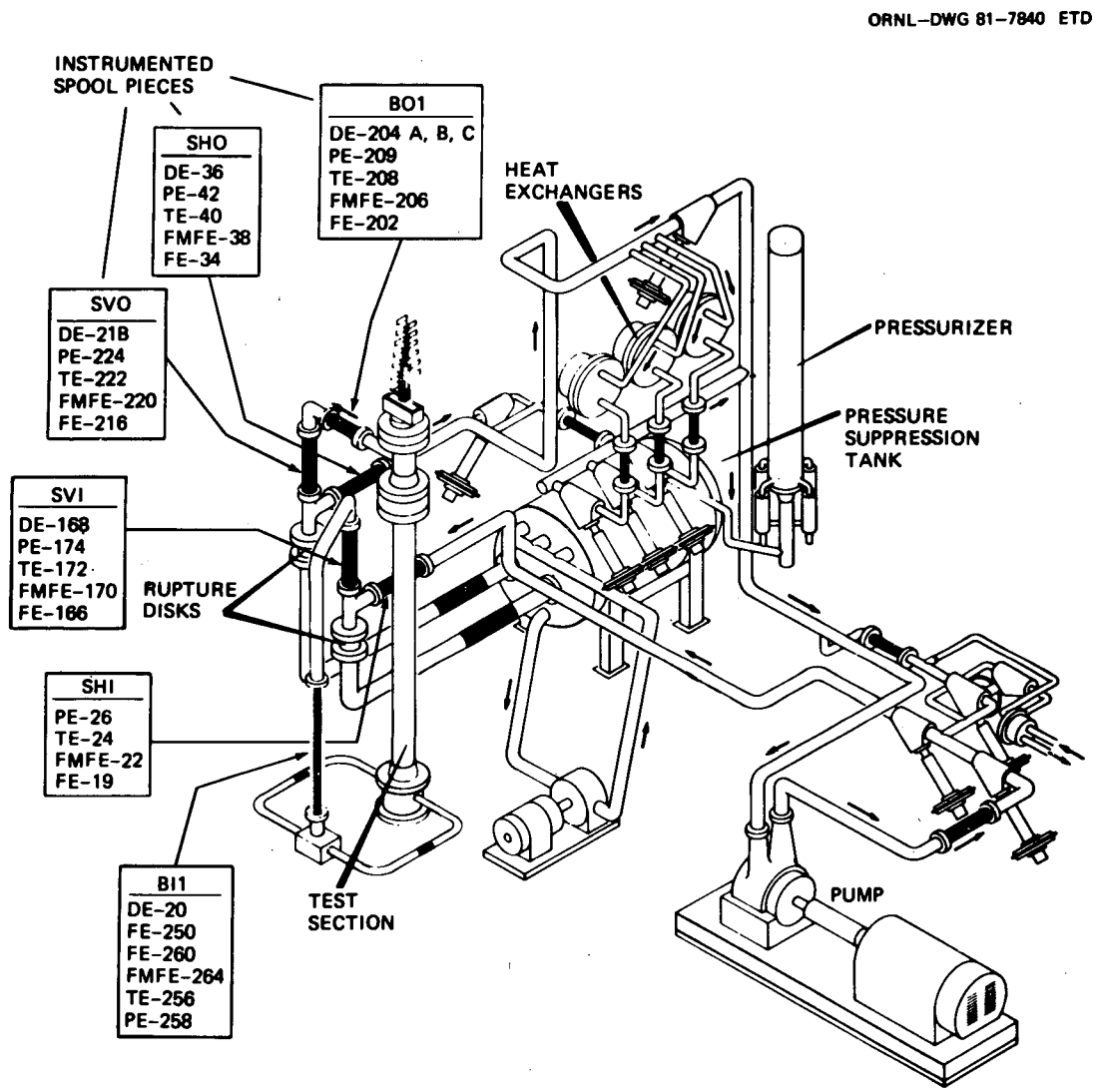

Fig. 2.1. THTF system with instrumented spool pieces labeled.

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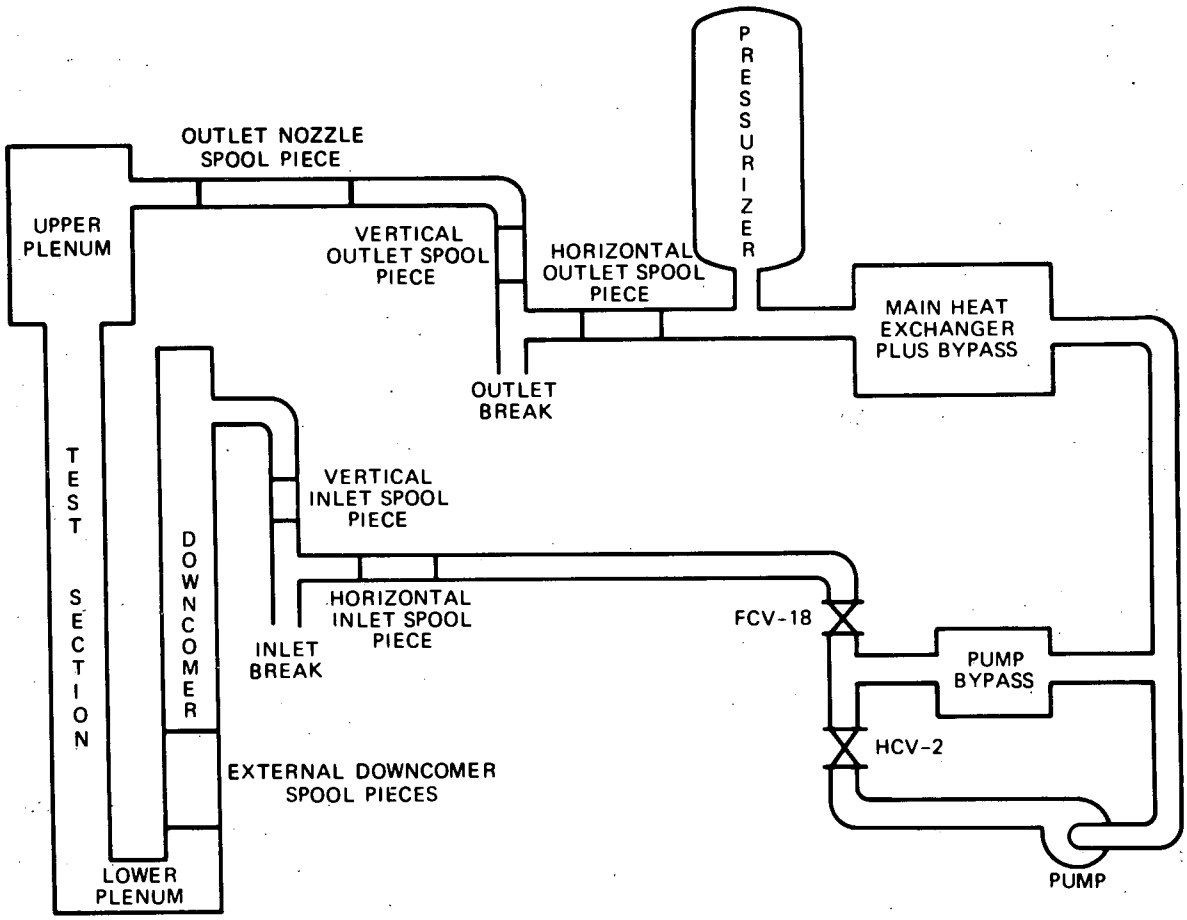

Fig. 2.2. Diagram of THTF.

standard configuration. A cross section of the portion of the THTF containing the rod bundle is shown in Fig. 2.4.

Rods 19, 22, 36, and 46 are the four unheated rods in the 8 x 8 bundle (Fig. 2.5). Rod 32, normally a heated rod, was not operable for test 3.08.6C. Rods 19 and 22 contain thermocouples that extend a short distance from the rod surface into the fluid and thus measure in-bundle fluid temperature. In-bundle fluid temperature is also measured using thermocouples mounted on the spacer grids located as shown in Fig. 2.6(a and b). The axial locations of the fuel rod simulator (FRS) thermocouples are also shown schematically in Fig. 2.6(a and b). The FRS thermocouple levels between E and F and between F and G were not present in test 3.03.6AR. The heated-pin diameter is 0.950 cm (0.374 in.), unheated-pin diameter is 1.02 cm (0.401 in.), and rod pitch is 1.27 cm (0.501 in.) on a square lattice, which is typical of later generation PWRs with 17 x 17 fuel assemblies. The bundle hydraulic and heated equivalent diameters are 1.06 and 1.38 cm (0.0348 and 0.0453 ft), respectively. The axial power profile is flat. Figure 2.7 shows a cross section of a typical FRS.

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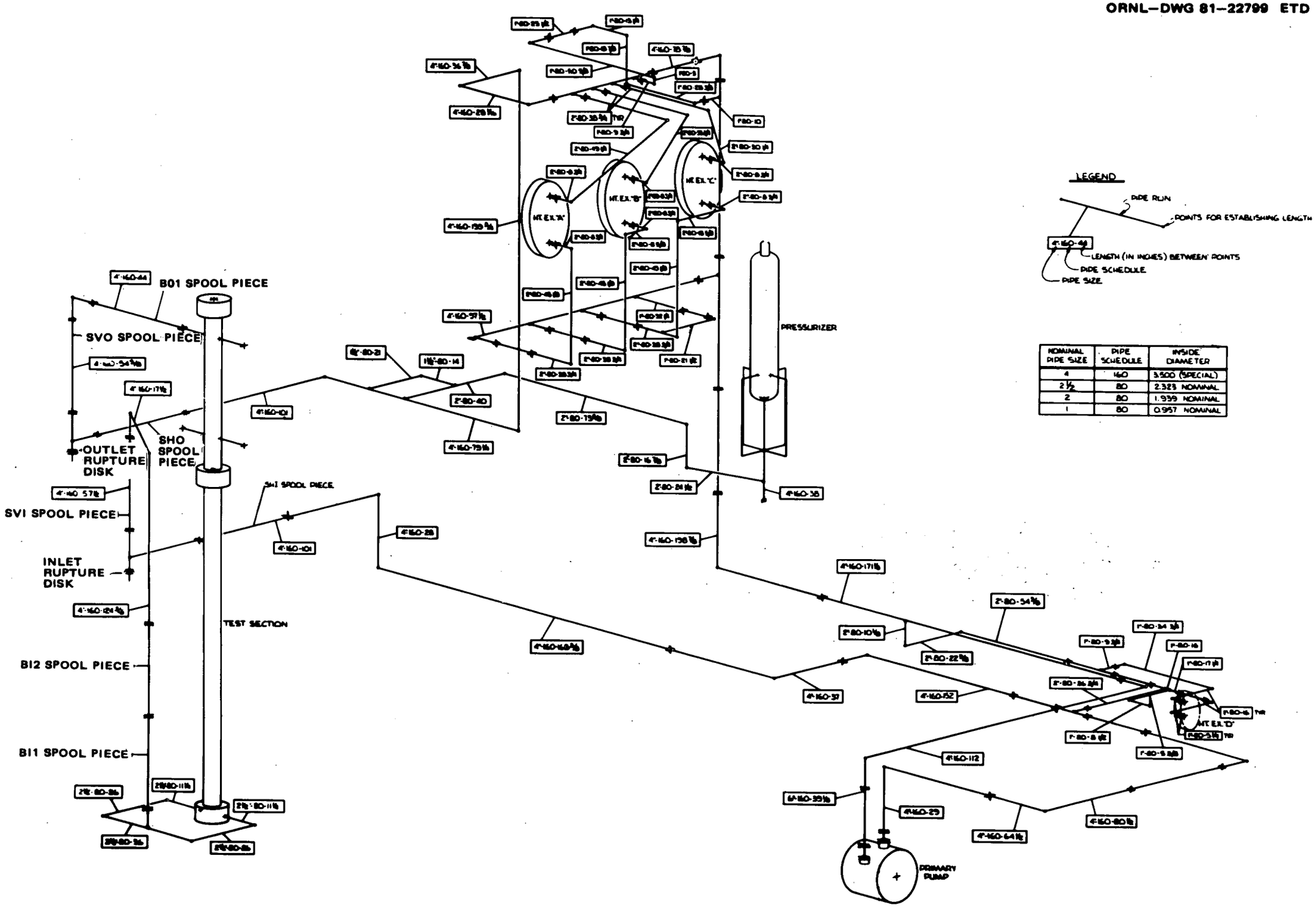

NOMINAL PIPE SIZE	PIPE SCHEDULE	INSIDE DIAMETER
4	160	3.500 (SPECIAL)
2 1/2	80	2.323 NOMINAL
2	80	1.939 NOMINAL
1	80	0.957 NOMINAL

Fig. 2.3. System line drawing showing piping size and run lengths for THTF in standard configuration.

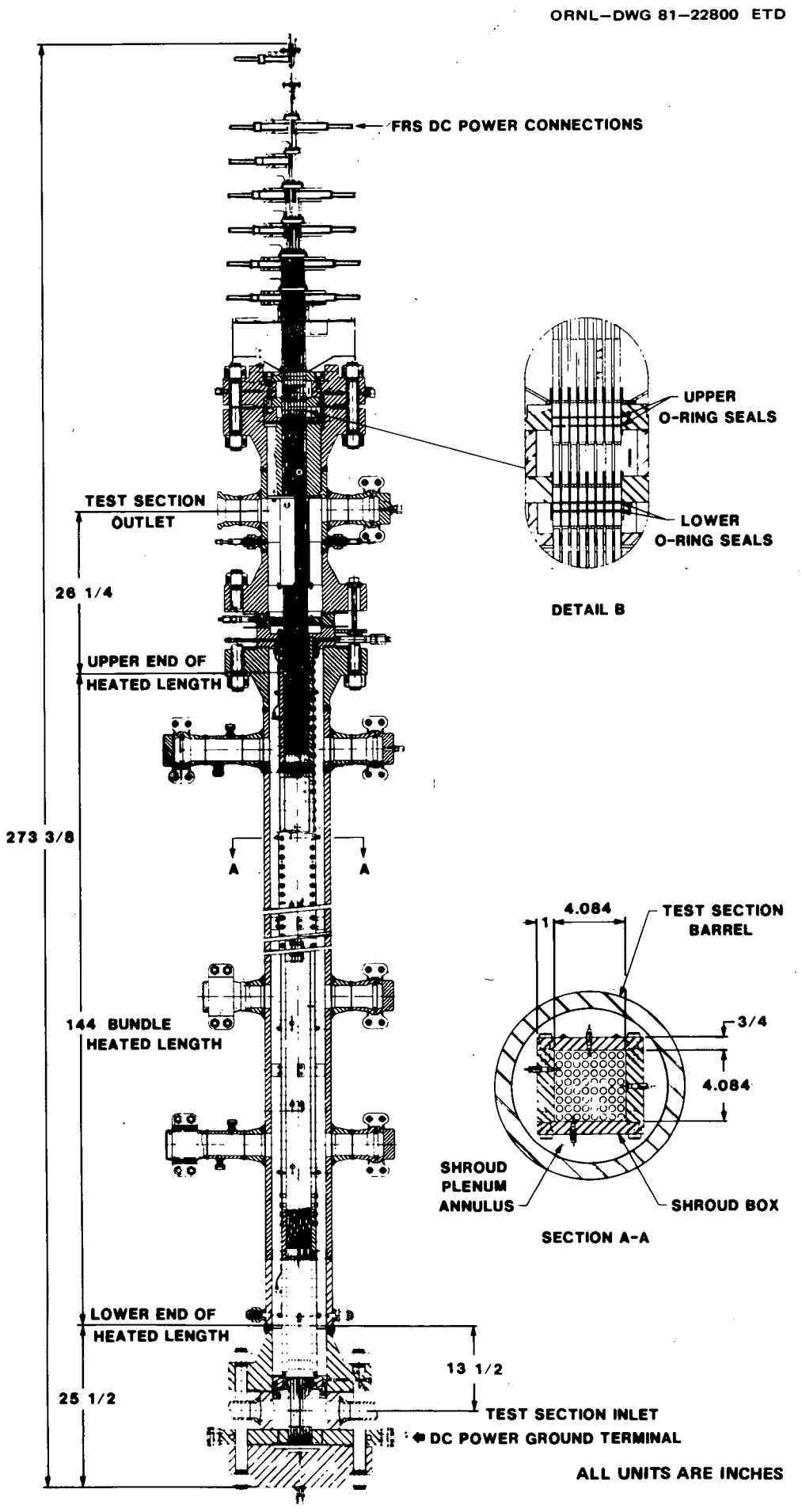

Fig. 2.4. THTF bundle cross section.

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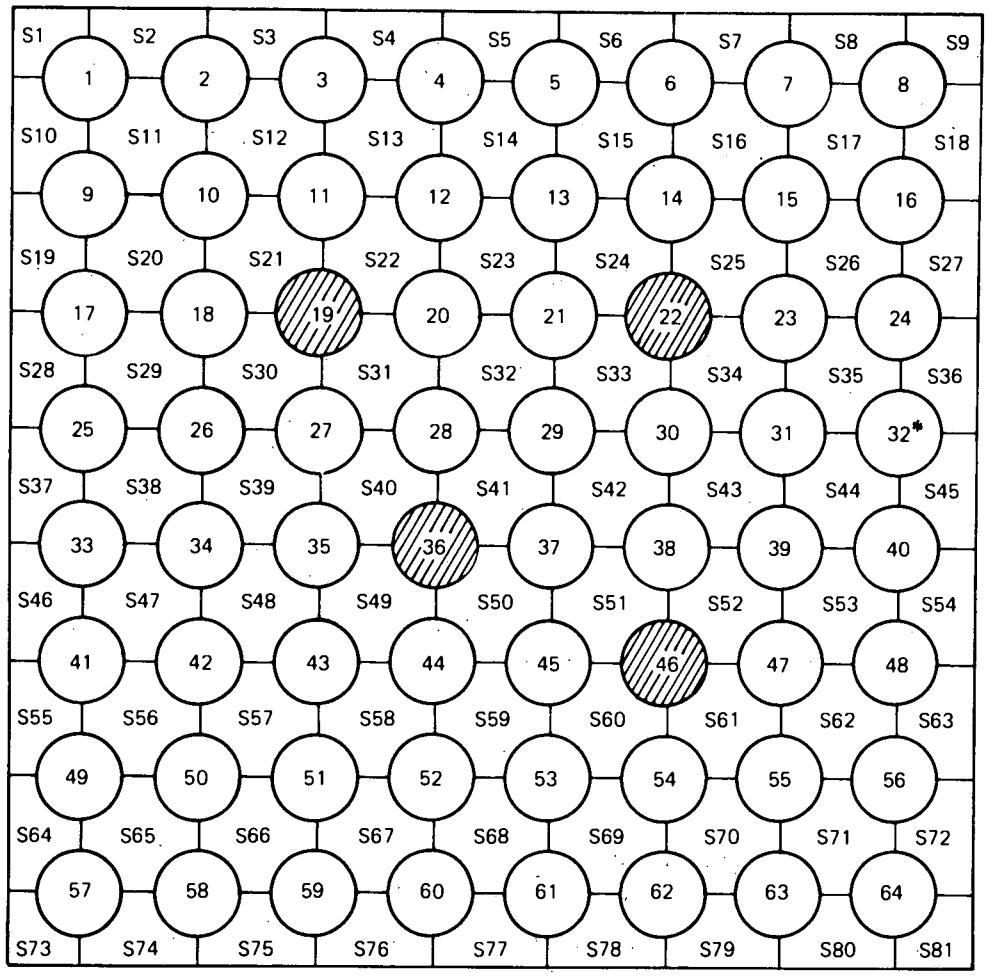

Fig. 2.5. Identification of THTF heater rods, subchannel locations, and inactive rods in THTF heater Bundle 3.

During steady-state operation of the THTF, fluid flows from the pump (Fig. 2.2) through two flow-control valves, through the horizontal inlet spool piece, past the inlet rupture disk assembly, and through a vertical spool piece before it enters the external downcomer. The fluid then passes through two spool pieces in the downcomer before it enters the test section, where it is heated as it flows past the rods. The fluid leaves the test section from the upper plenum, passes through the three outlet spool pieces, through the heat exchangers, and returns to the pump. Blowdown is initiated in the THTF by forcing the rupture disk(s) to open. Effluent passing through the rupture disk(s) enters the pressure suppression tank. In the ORNL film-boiling experiments only the outlet rupture disk assembly was opened.

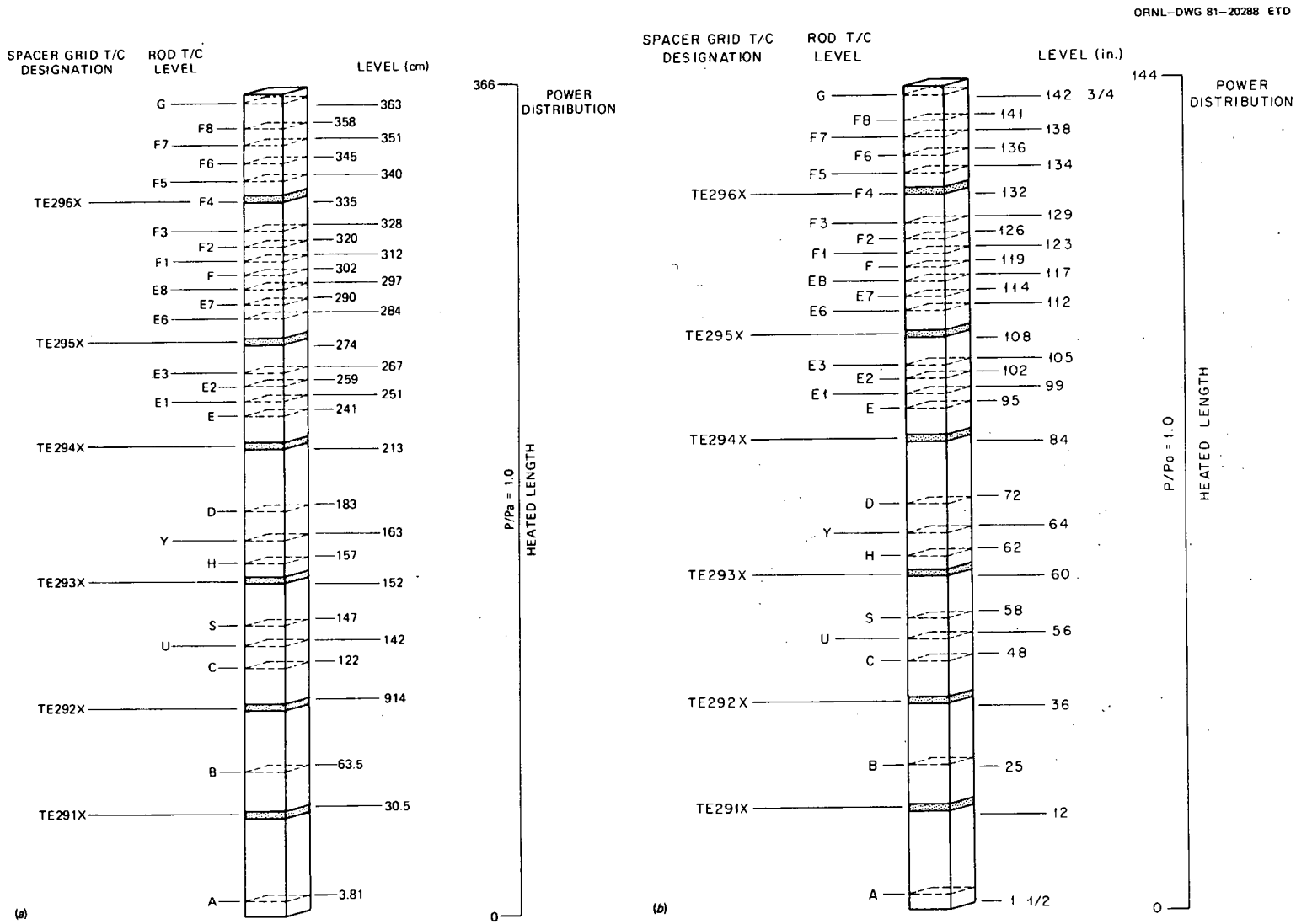

Fig. 2.6. Axial location of spacer grids and FRS thermocouples, (a) SI units and (b) English units.

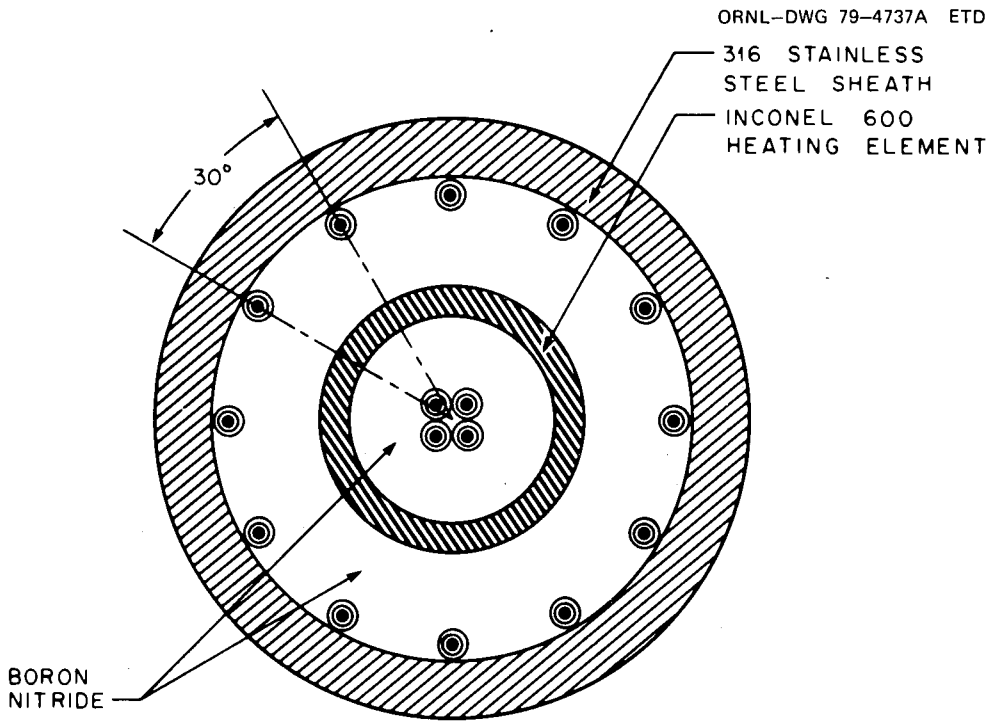

Fig. 2.7. Cross section of a typical FRS.

3. EXPERIMENTAL PROCEDURE

The first step in executing the transient film-boiling experiments was to establish the desired steady-state conditions in the THTF. Test section steady-state conditions prior to transient initiation for each of the tests are shown in Table 2. The high-pressure and -temperature conditions provided an appropriate starting point for obtaining the desired transient dispersed-flow film-boiling data. Under these steady-state conditions, no rods were in film boiling.

Table 2. Steady-state conditions prior to transient initiation

Parameter	Test		
	3.03.6AR	3.06.6B	3.08.6C
Inlet flow, m^3/s (gpm)	1.8×10^{-2} (285)	7.9×10^{-3} (125)	8.2×10^{-3} (130)
Inlet fluid temperature, K (°F)	540 (512)	547 (526)	538 (509)
Outlet fluid temperature, K (°F)	590 (602)	610 (638)	598 (618)
Bundle power, MW	4	2.3	2.4
Outlet pressure, MPa (psia)	14.1 (2065)	14.8 (2165)	12.8 (1870)

Once steady-state conditions were achieved, the transients were initiated by breaking the outlet rupture disk assembly (Fig. 2.2). An outlet break area of 3.763 cm^2 (0.583 $in.^2$) was used for tests 3.03.6AR and 3.06.6B, while an outlet break area of 3.135 cm^2 (0.486 $in.^2$) was used for test 3.08.6C. Although the THTF has a rupture disk assembly at both the outlet and inlet, unidirectional flow through the test section, inlet spool pieces, outlet-nozzle spool piece, and vertical outlet spool piece was ensured throughout the transients by breaking at the outlet only. The unidirectional flow in the instrumented spool pieces and rod bundle facilitates the calculation of accurate fluid conditions in the rod bundle during the transients.

Following the breaking of the outlet rupture disk, bundle power was ramped up from the initial levels to near maximum power levels over a short time interval (Figs. 3.1, 3.2, and 3.3). The rapid and large increase in power caused the bundle to dry out quickly. In test 3.03.6AR and 3.06.6B, the pump was tripped at transient initiation. To prolong the duration of film boiling for these tests, bundle power was maintained at high power levels for a few seconds, then reduced. In test 3.06.6B, the high-temperature rod trip subsequently shut the power off at ~10.5 s.

The pump was left on during the first ~20 s of test 3.08.6C. Bundle power was maintained at a high power level through ~21 s and then reduced slowly. This procedure resulted in a mild transient with essentially constant mass flow and heat flux through much of the first 20 s of the transient.

During the transient, data were taken by a computer-controlled data acquisition system (DAS) capable of scanning 2000 instruments at a rate of 20 data points per instrument per second.

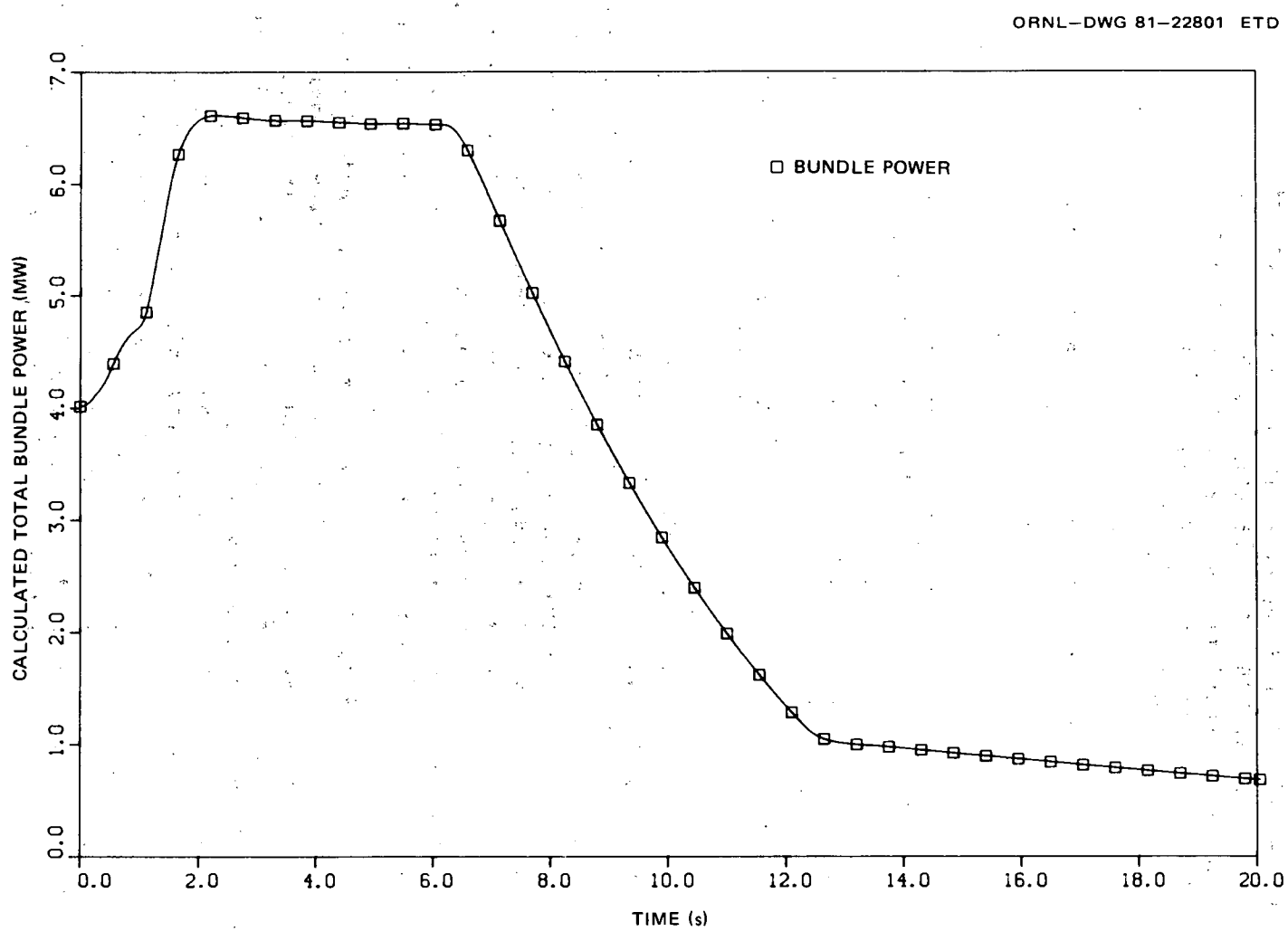

Fig. 3.1. Bundle power vs time – test 3.03.6AR.

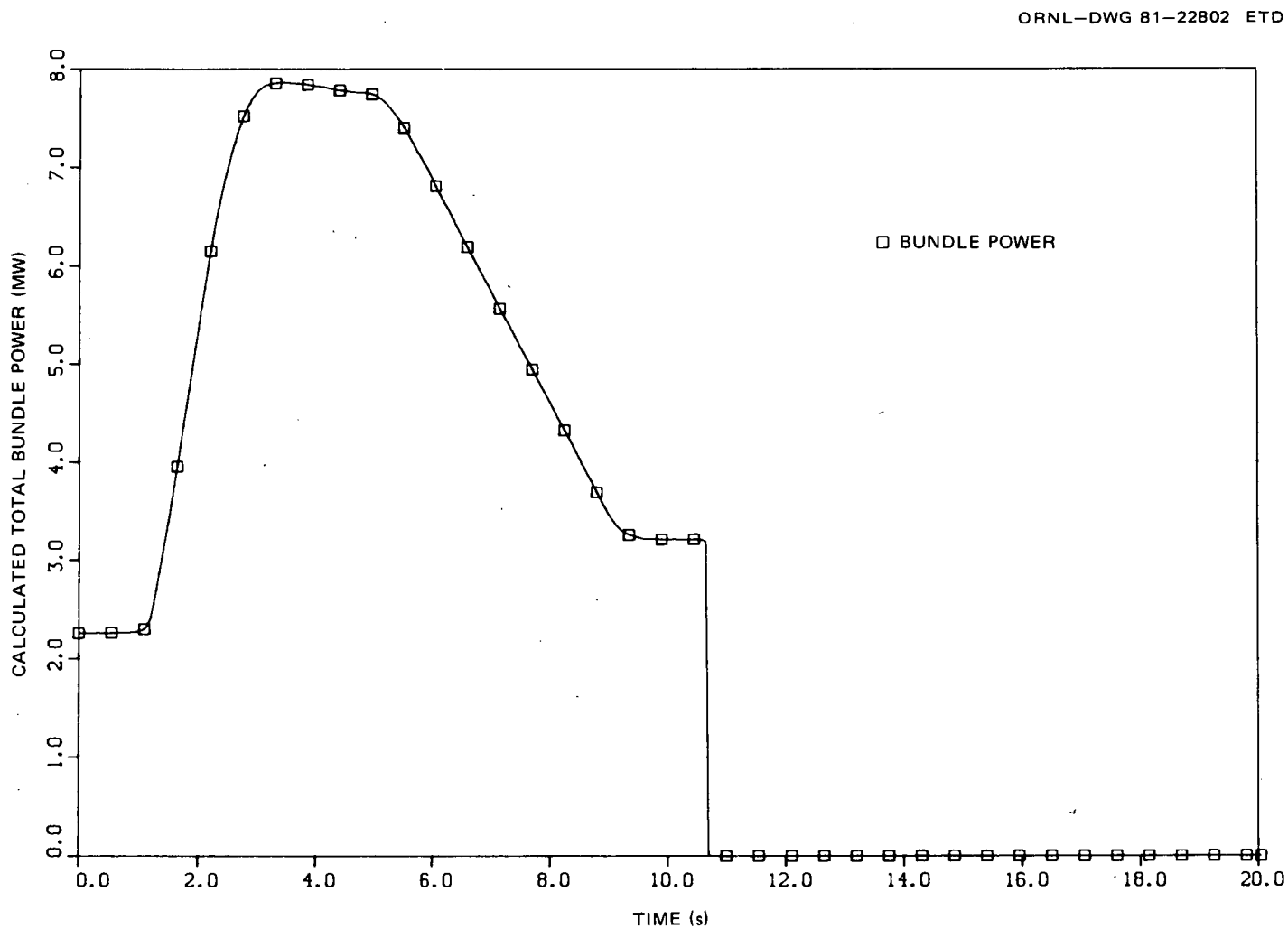

Fig. 3.2. Bundle power vs time — test 3.06.6B.

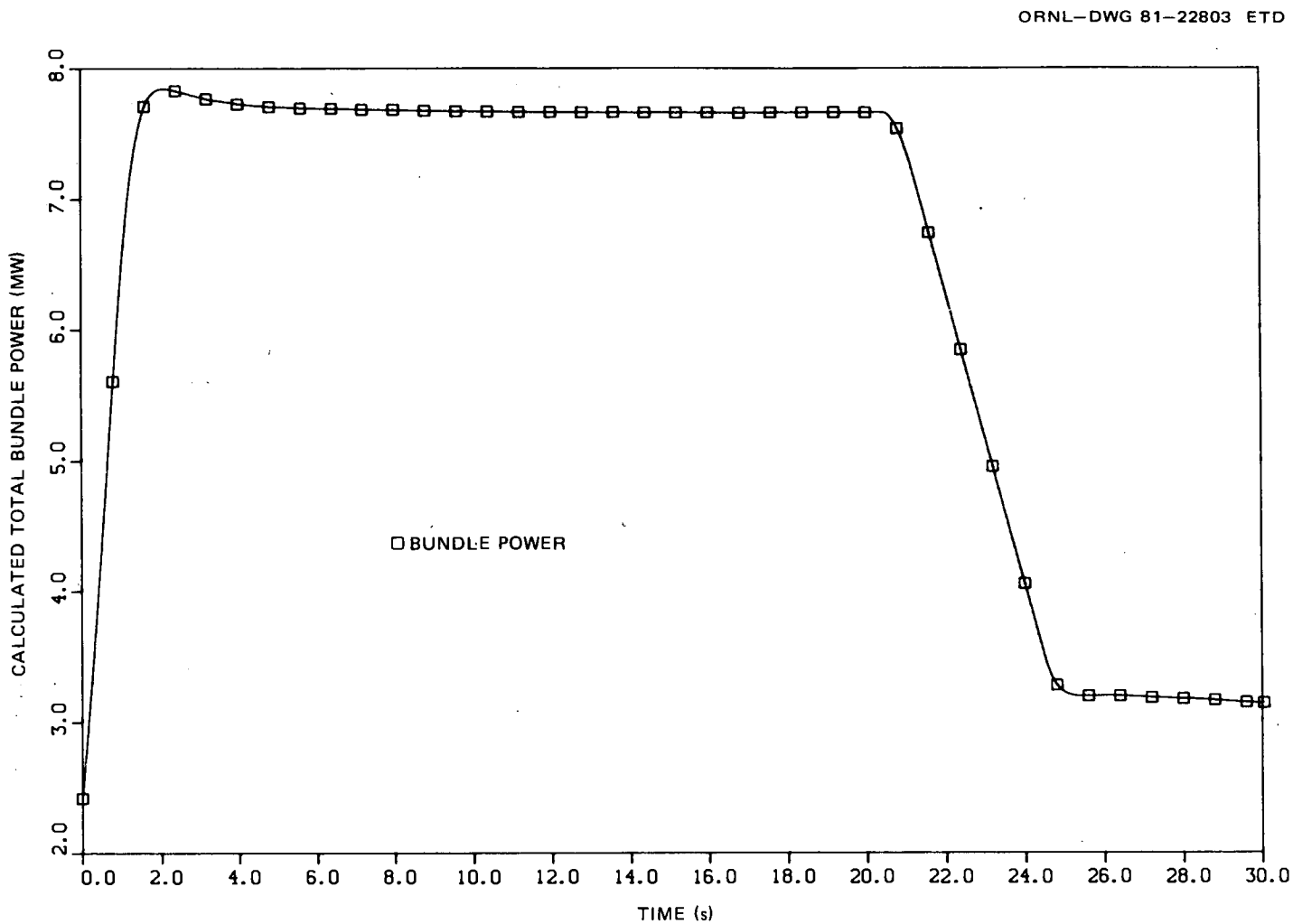

Fig. 3.3. Bundle power vs time — test 3.08.6C.

4. TEST PHENOMENOLOGY

As mentioned previously, the transients were initiated with the breaking of the outlet rupture disk (time: 0.0 s). At the initiation of the transients an almost instantaneous subcooled decompression occurred from the steady-state operating pressure to the saturation pressure corresponding to the outlet fluid temperature (Figs. 4.1–4.3). Since the break was at the outlet only, flow through the test section, outlet-nozzle spool piece, and external-downcomer spool pieces remained unidirectional throughout the transients (Figs. 4.4–4.9). A high, almost constant inlet volumetric flow rate was maintained through ~20 s of test 3.08.6C while the pump was running (Fig. 4.8). Fluid at the external-downcomer spool pieces remained subcooled through 17.5, 15, and beyond 30 s for tests 3.03.6AR, 3.06.6B, and 3.08.6C, respectively (Figs. 4.10–4.15). Fluid at the bundle outlet saturated almost instantaneously with the breaking of the outlet rupture disk (Figs. 4.16–4.21).

In test 3.03.6AR the first rod bundle temperature excursion was recorded at ~3 s in the uppermost part of the bundle [Fig. 4.22; Table 3, and Figs. 2.5 and 2.6(a and b) for thermocouple locations]. As time progressed, more of the bundle underwent departure from nucleate boiling (DNB) (Figs. 4.23 and 4.24). At the midplane of the bundle (level D)

Table 3. Rod-sheath thermocouple designations

Rod-sheath thermocouples are designated according to one of the following two schemes:

1. TE – 3 17 A D

   - D: axial thermocouple level
   - A: azimuthal thermocouple location
   - 17: rod number

2. TE – 3 54 F8

   - F8: axial thermocouple level
   - 54: rod number

Thus, this first designation refers to the sheath thermocouple in rod 17 at level D, azimuthal location A [see Figs. 2.5 and 2.6(a and b)]. If the thermocouple designation ends with a number, then this designation refers to the sheath thermocouple in rod 54 at level F8 [see Figs. 2.5 and 2.6(a and b)].

sporadic DNB and rewetting are observed after ~4.5 s (Fig. 4.25). The highest rod-sheath thermocouple temperatures [950 K (1250°F)] were observed at level G (Fig. 4.22).

In test 3.06.6B the first rod bundle temperature excursion was recorded at ~3 s at level G (Fig. 4.26). As time progressed, more of the bundle underwent DNB (Figs. 4.27–4.30). Level B sheath thermocouples indicated no film boiling (Fig. 4.31). A larger portion of the bundle experienced DNB in test 3.06.6B than in the other two transients. The highest rod-sheath thermocouple temperatures [1144 K (1600°F)] were observed at level G (Fig. 4.26).

In test 3.08.6C the first rod bundle temperature excursion was recorded at ~2.5 s at level G (Fig. 4.32). As time progressed, more of the bundle underwent DNB (Figs. 4.33 and 4.34). Thermocouples at level D indicated no DNB (Fig. 4.35). The highest rod-sheath thermocouple [1100 K (1520°F)] was observed at level E (Fig. 4.34).

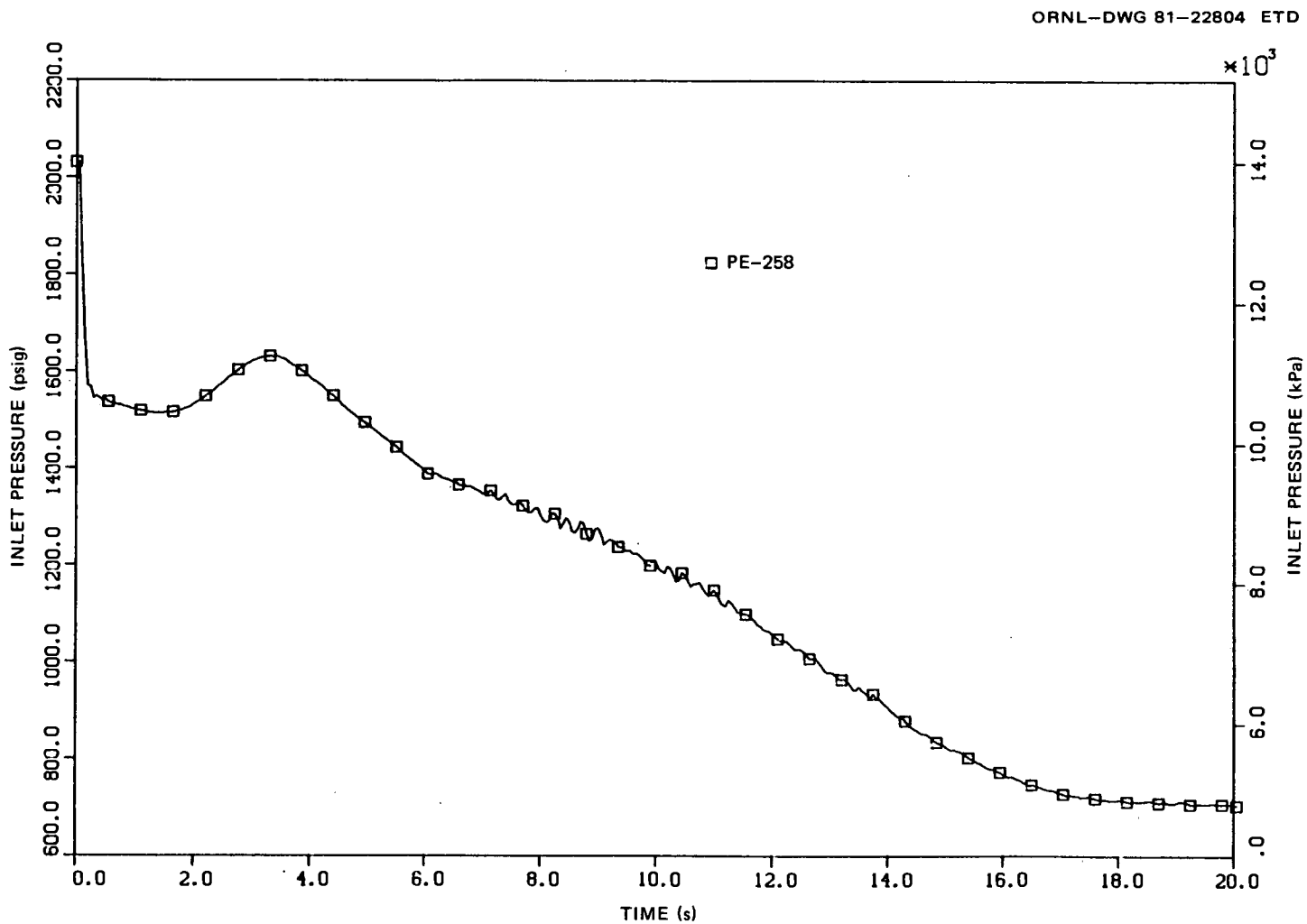

Fig. 4.1. Inlet pressure vs time — test 3.03.6AR.

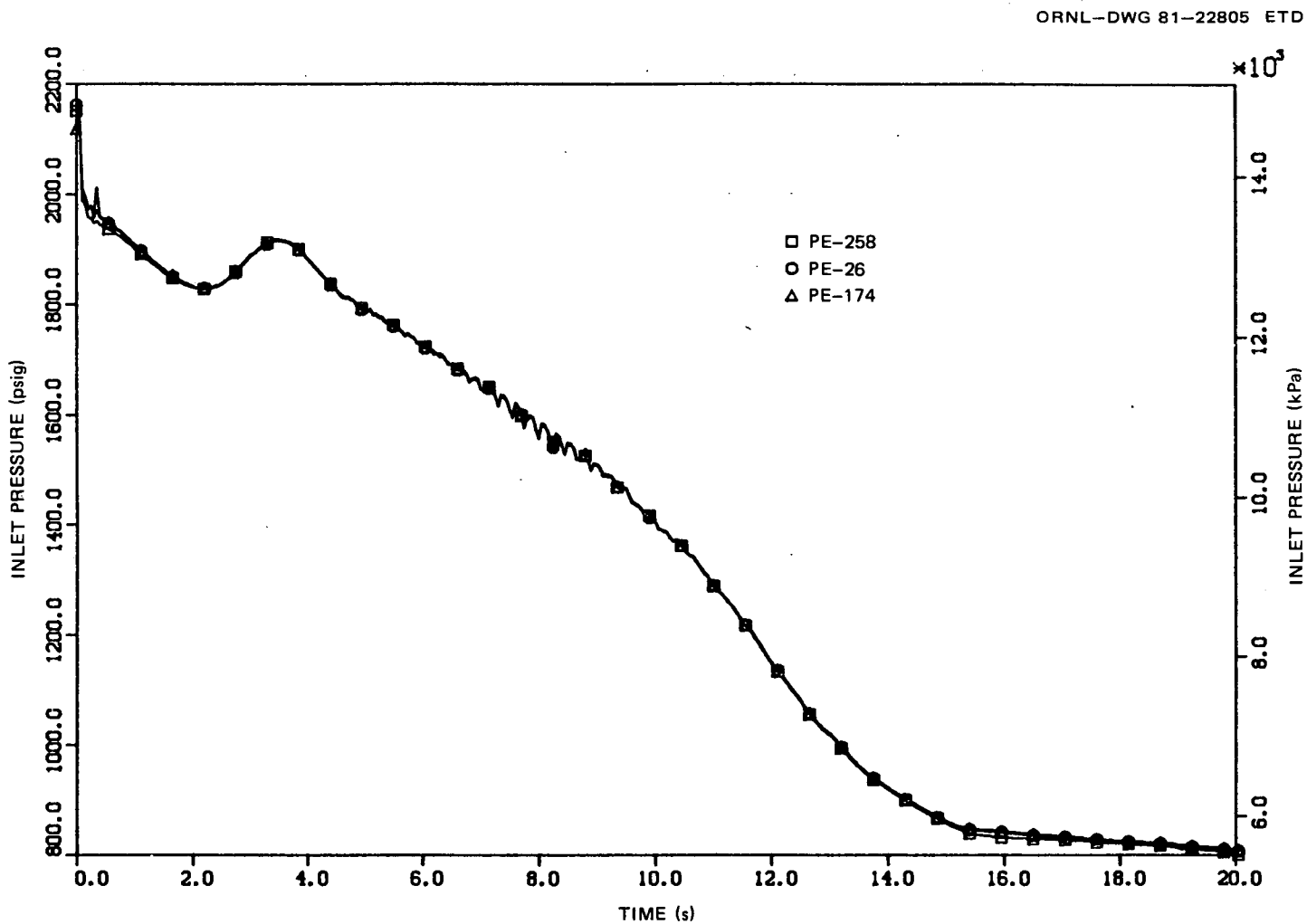

Fig. 4.2. Inlet pressure vs time — test 3.06.6B.

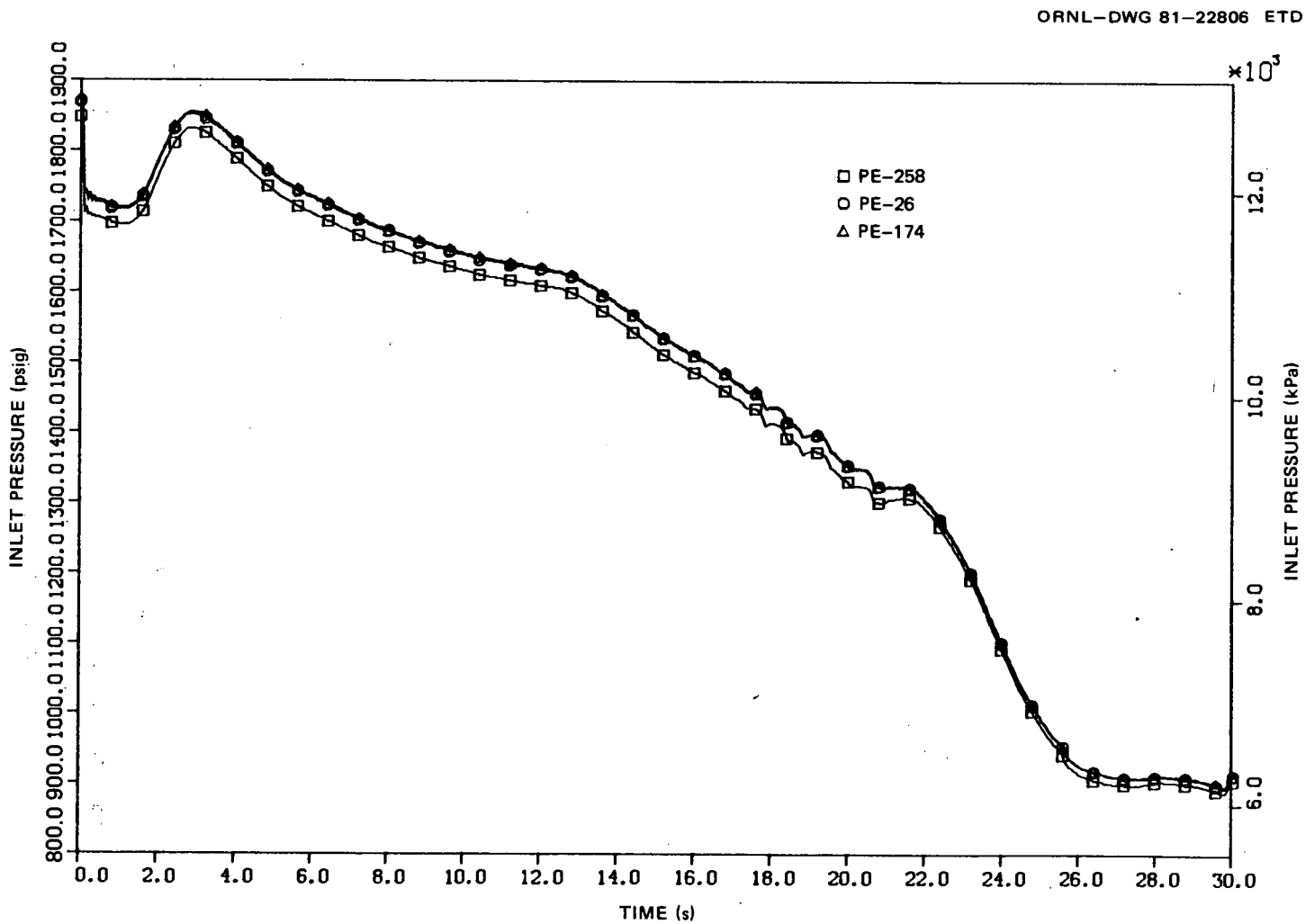

Fig. 4.3. Inlet pressure vs time — test 3.08.6C.

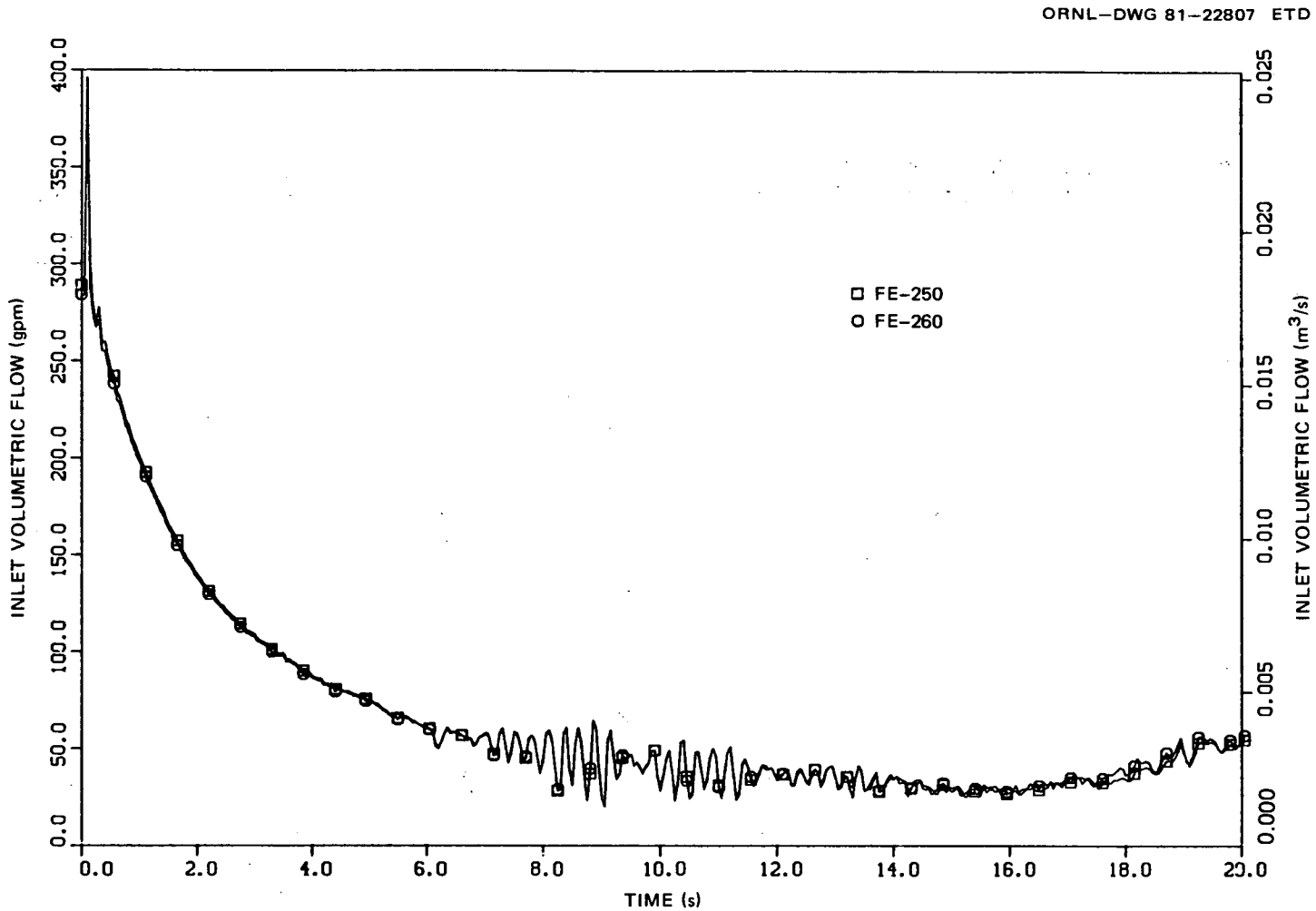

Fig. 4.4. External-downcomer spool piece volumetric flow vs time — test 3.03.6AR.

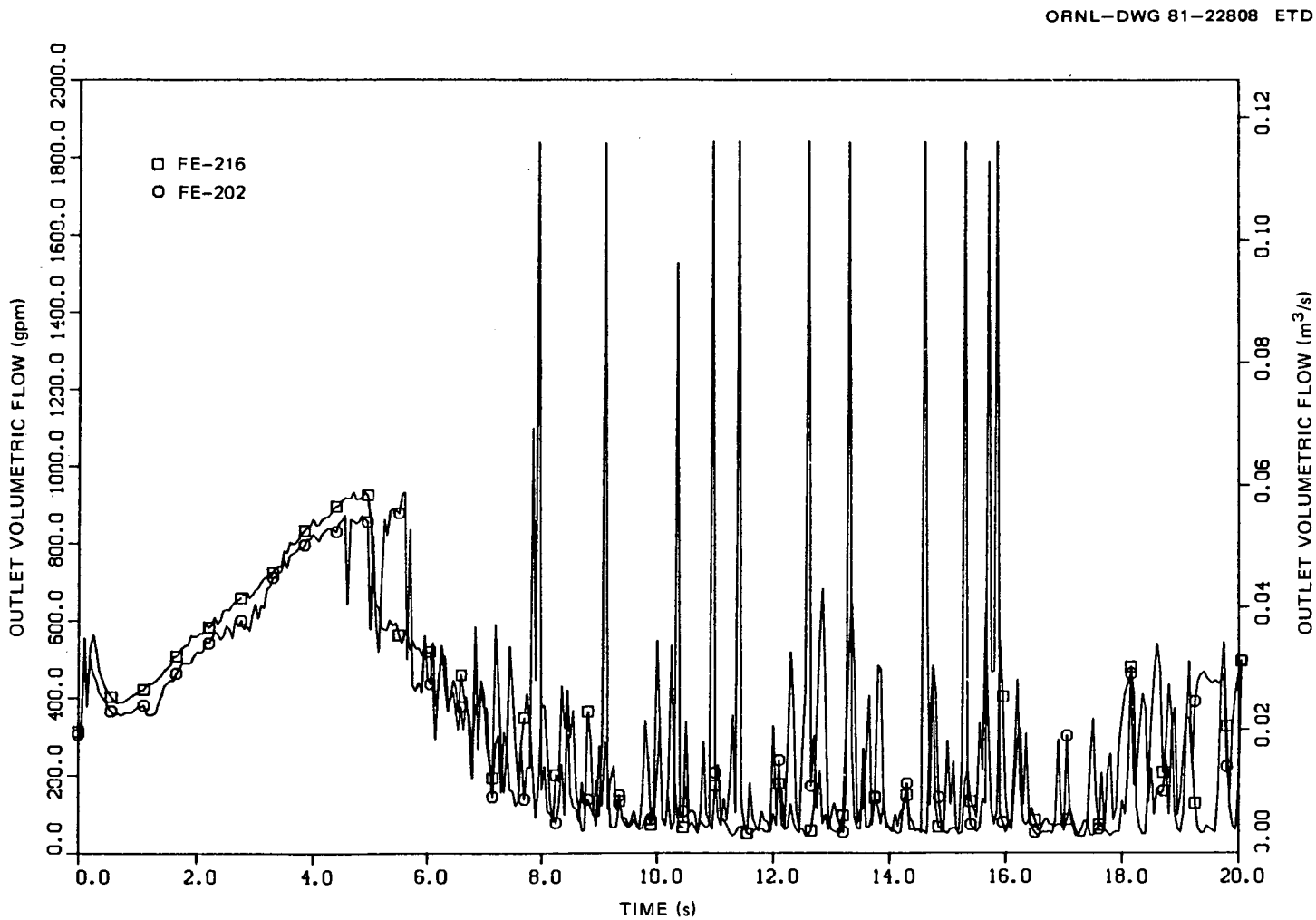

Fig. 4.5. Outlet-nozzle spool piece volumetric flow vs time — test 3.03.6AR (FE-216 and FE-202 failed at ~5 s).

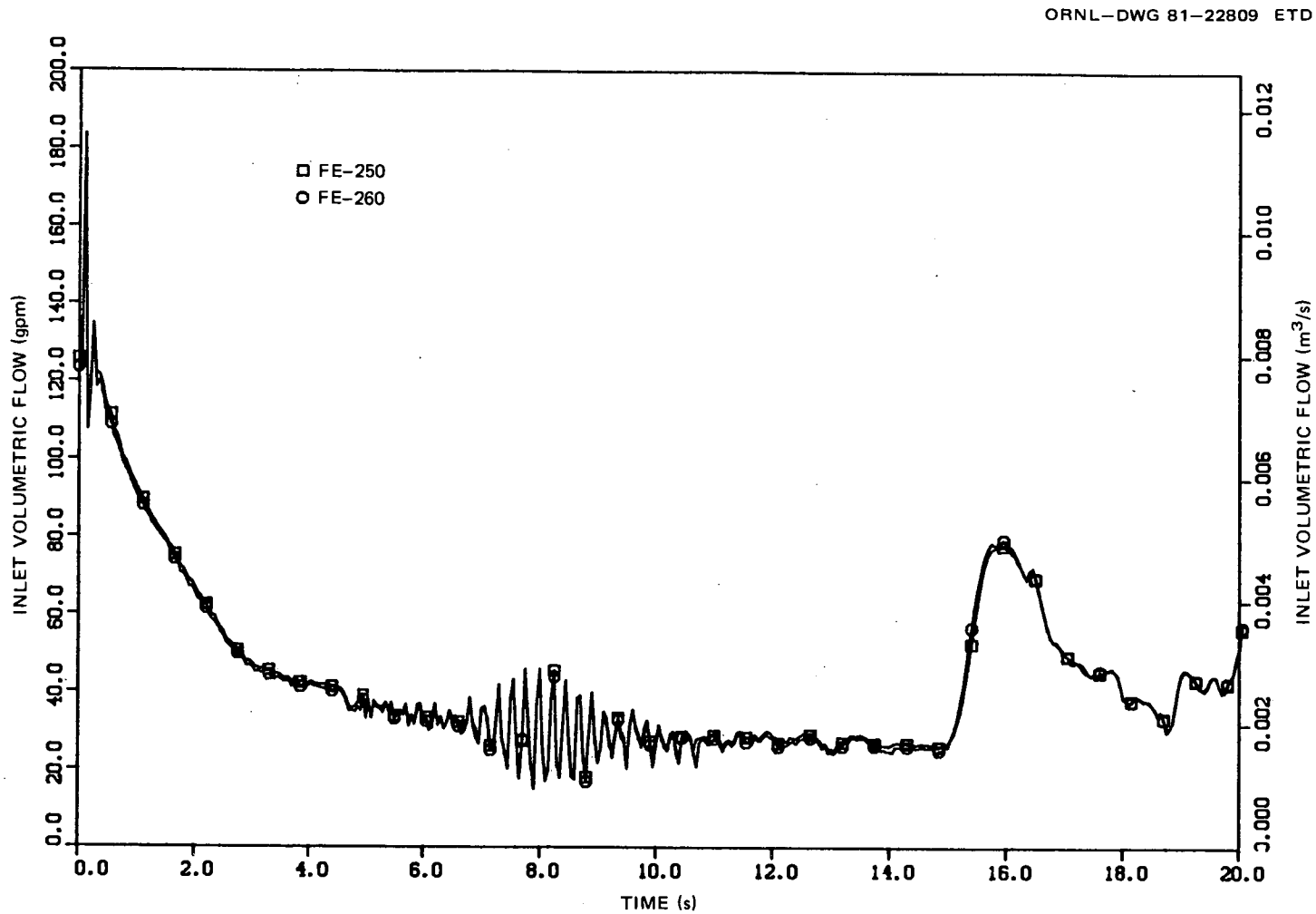

Fig. 4.6. External-downcomer spool piece volumetric flow vs time — test 3.06.6B.

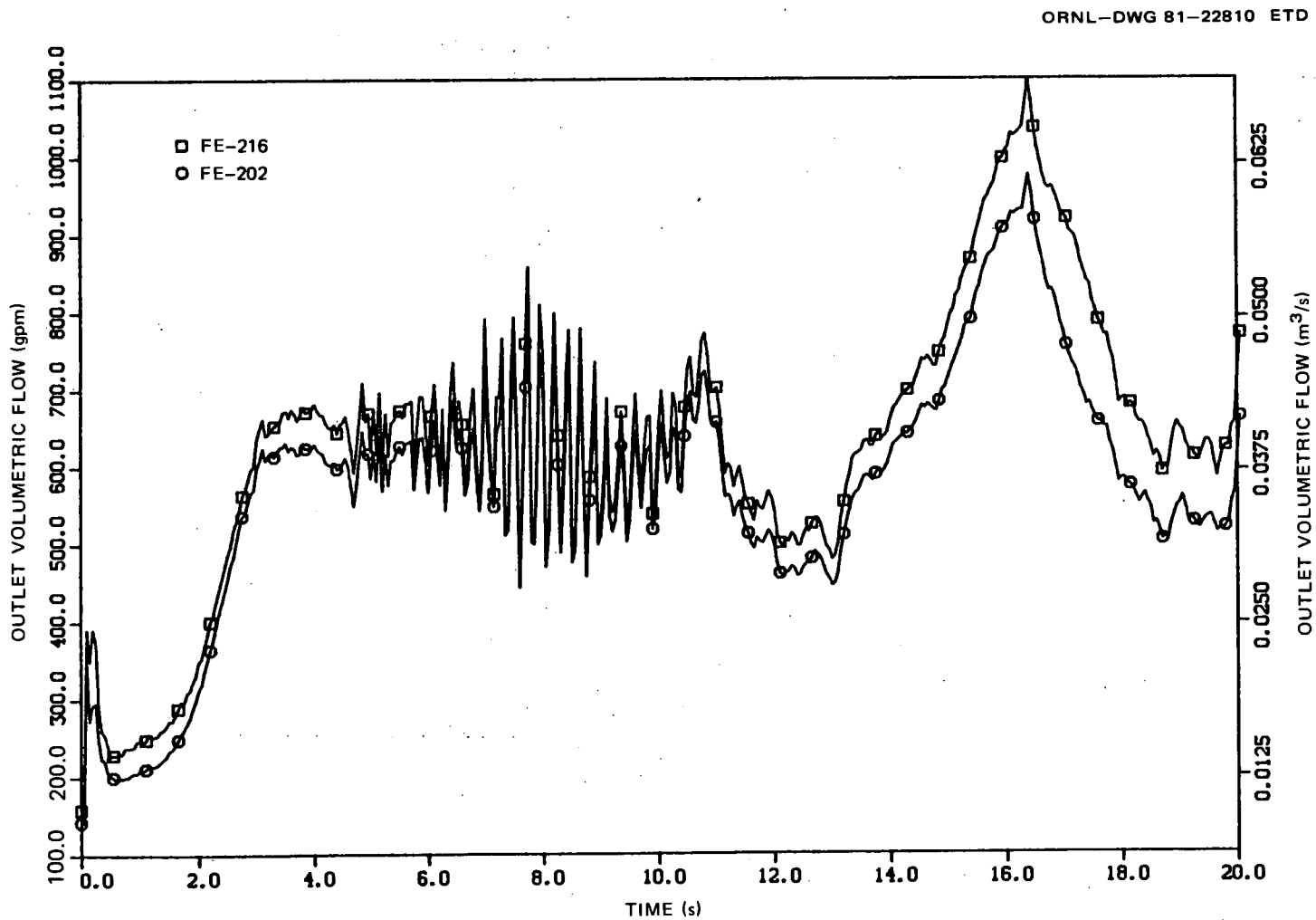

Fig. 4.7. Outlet-nozzle spool piece volumetric flow vs time — test 3.06.6B.

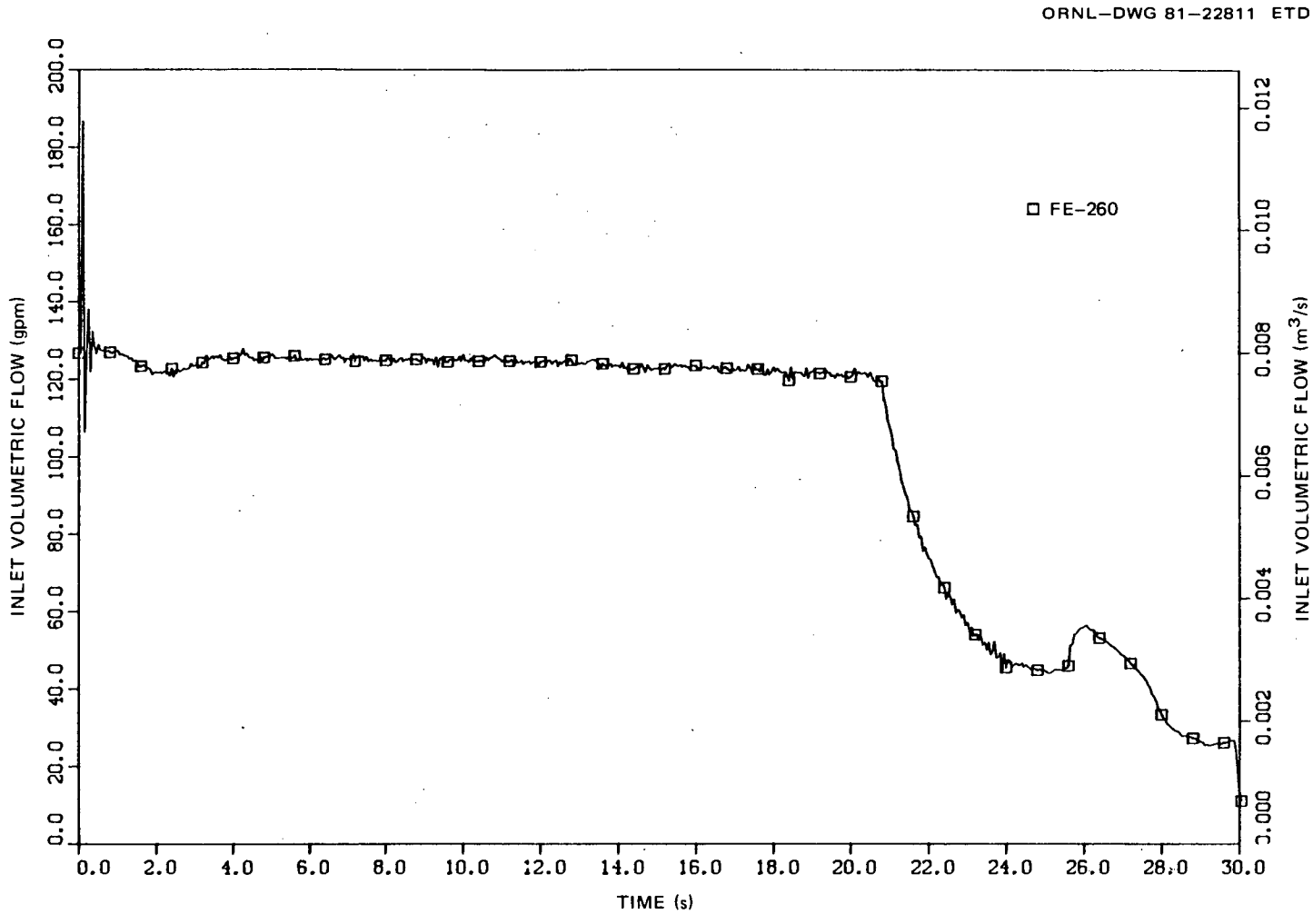

Fig. 4.8. External-downcomer spool piece volumetric flow vs time — test 3.08.6C.

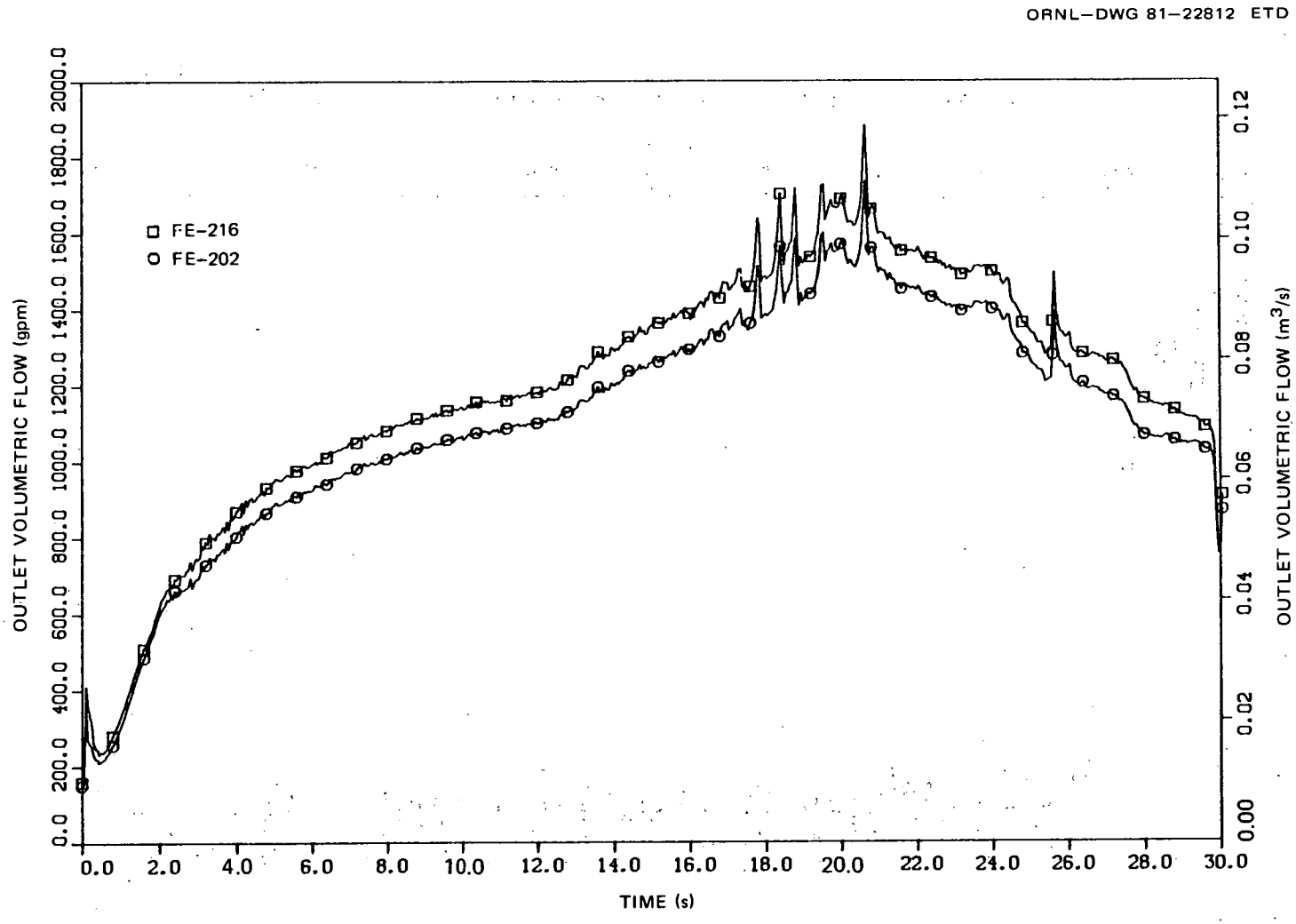

Fig. 4.9. Outlet-nozzle spool piece volumetric flow vs time — test 3.08.6C.

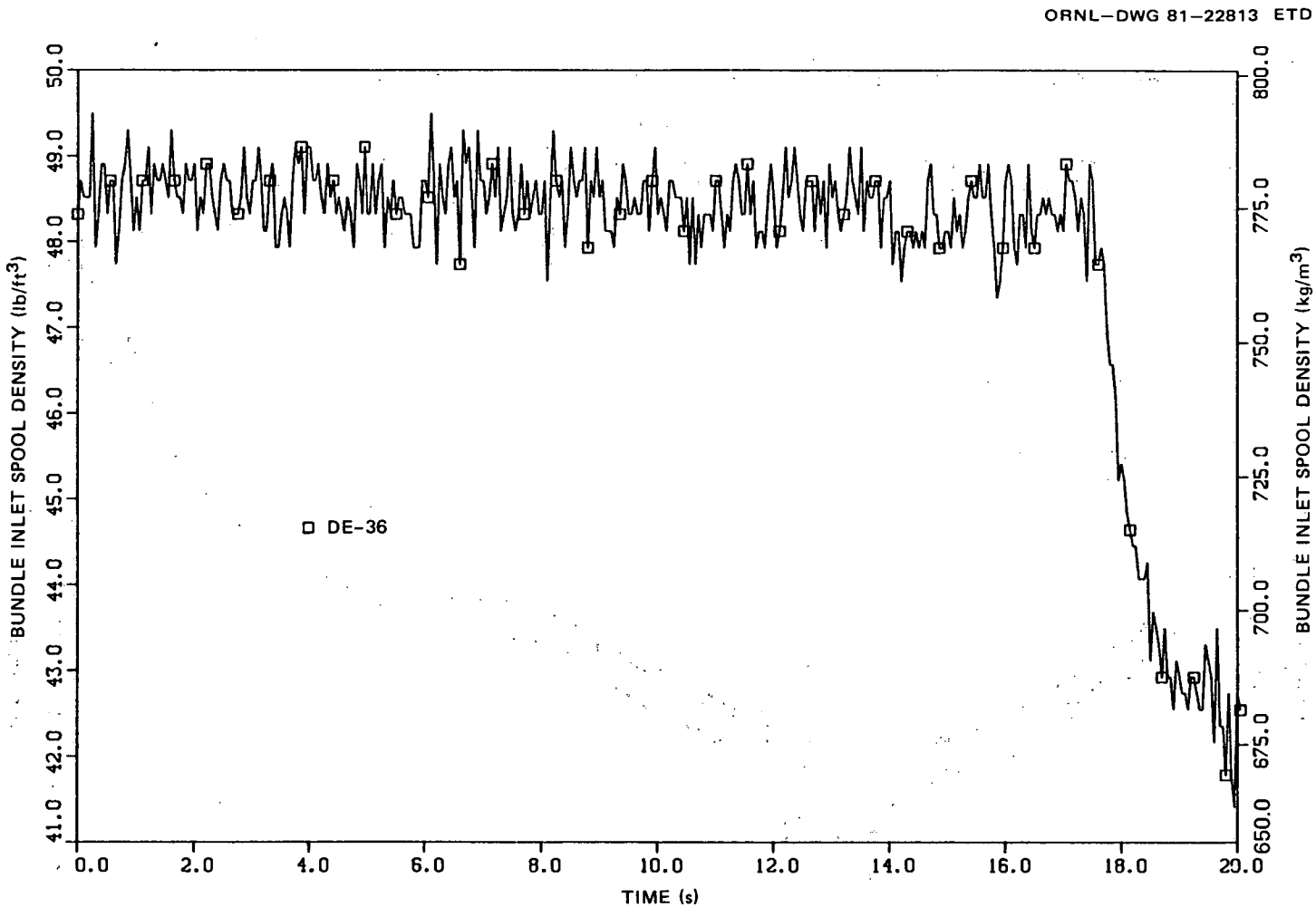

Fig. 4.10. External-downcomer spool piece density vs time — test 3.03.6AR.

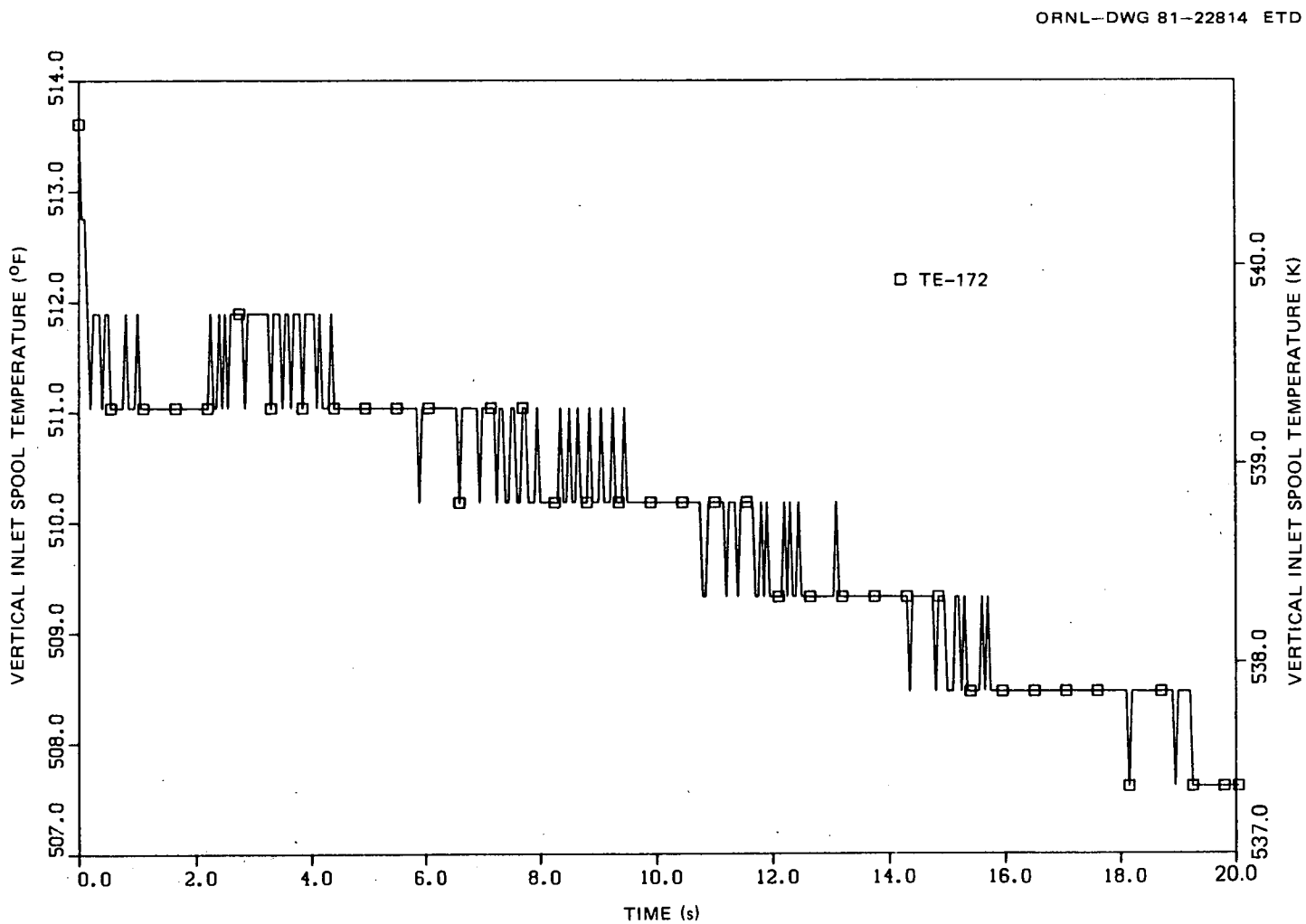

Fig. 4.11. Vertical inlet spool piece fluid temperature vs time — test 3.03.6AR.

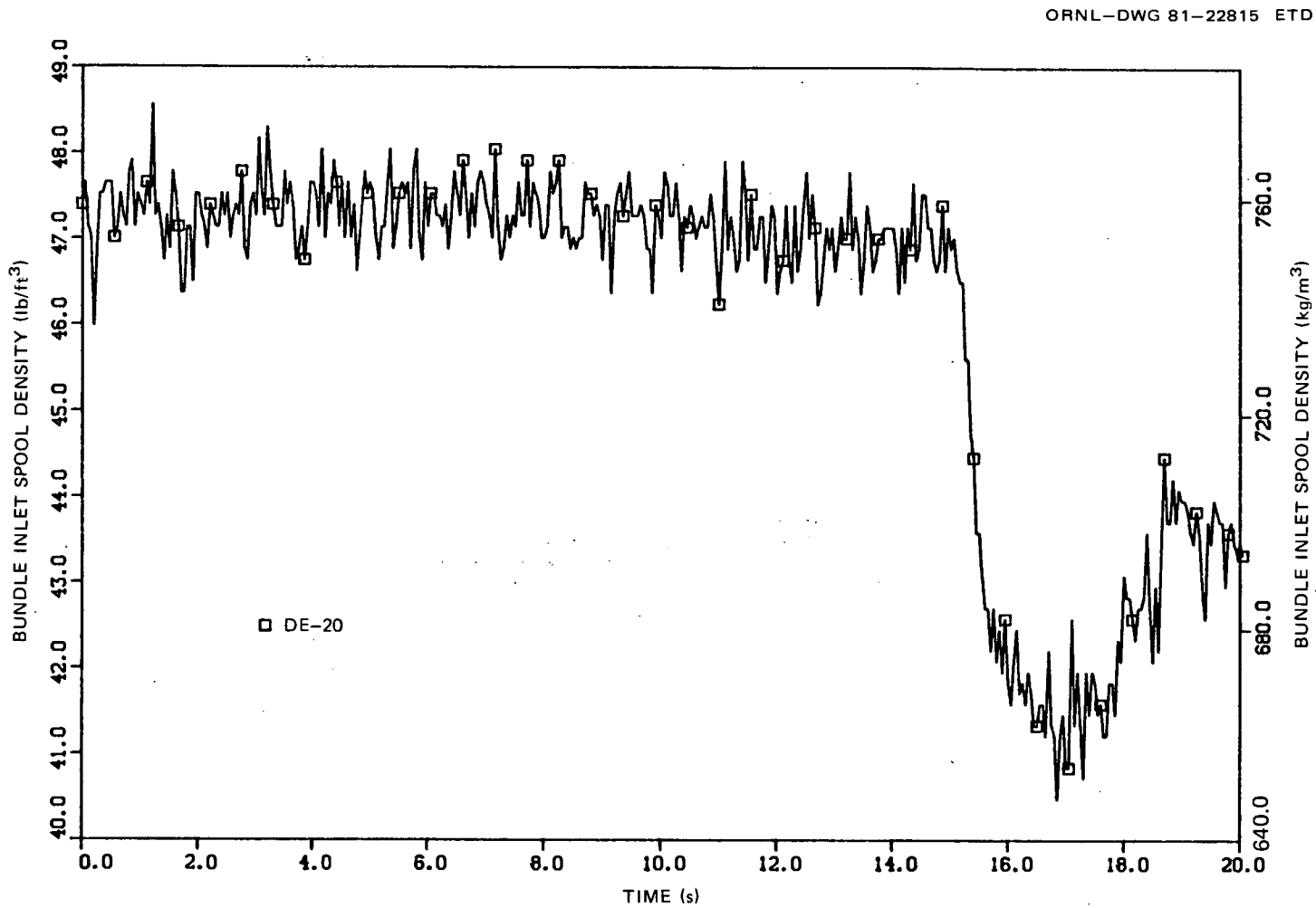

Fig. 4.12. External-downcomer spool piece density vs time — test 3.06.6B.

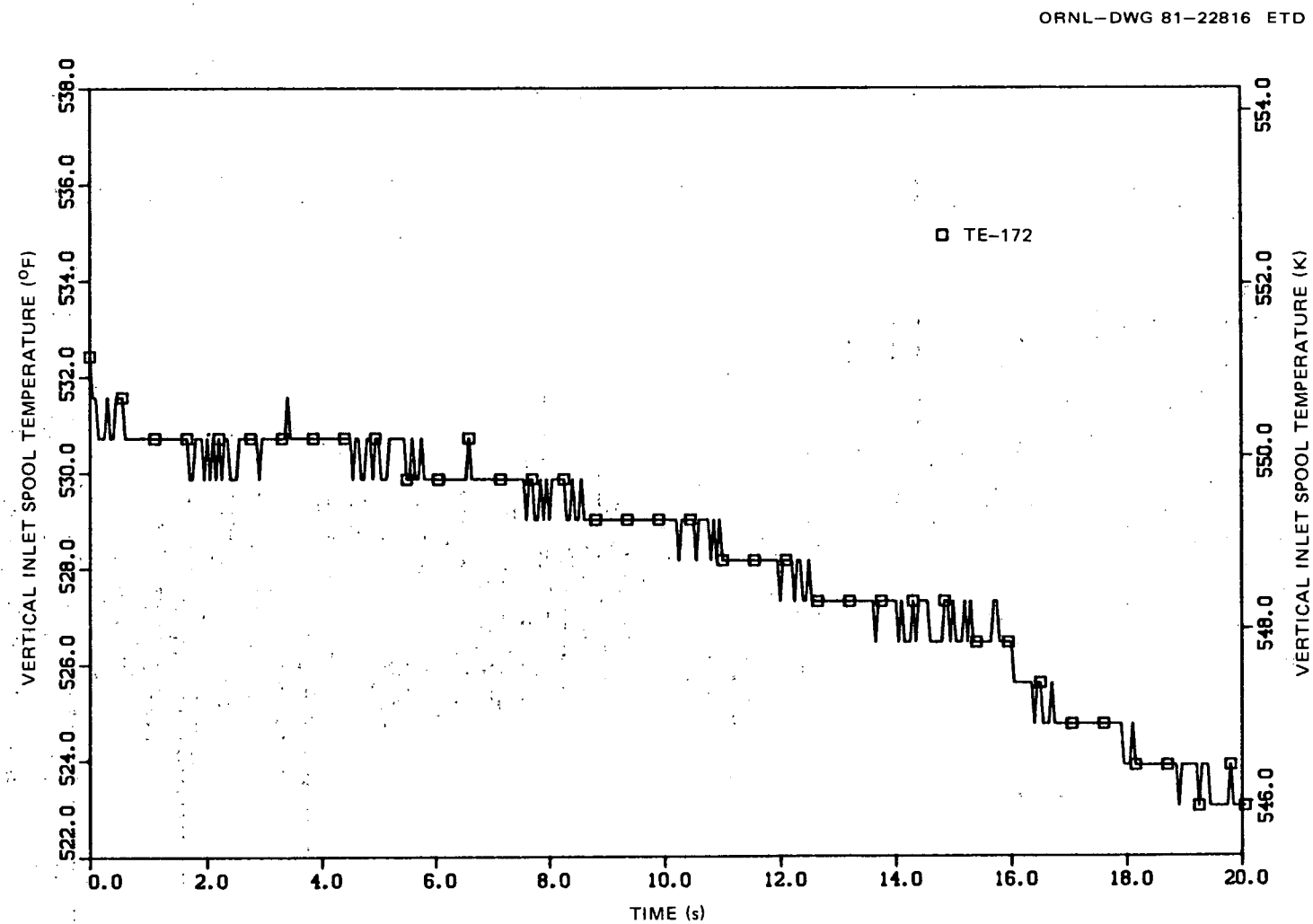

Fig. 4.13. Vertical inlet spool piece fluid temperature vs time — test 3.06.6B.

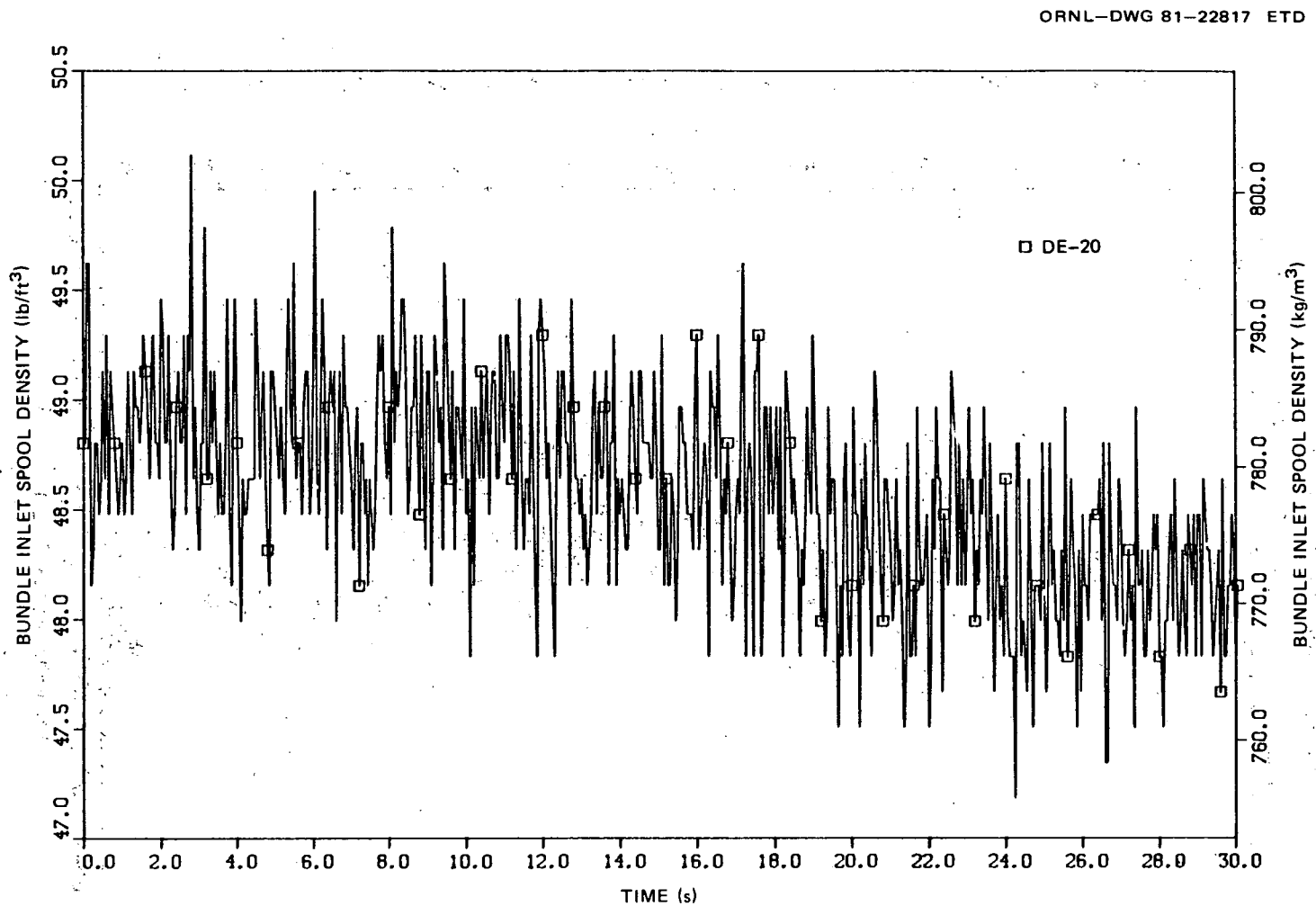

Fig. 4.14. External-downcomer spool piece density vs time — test 3.08.6C.

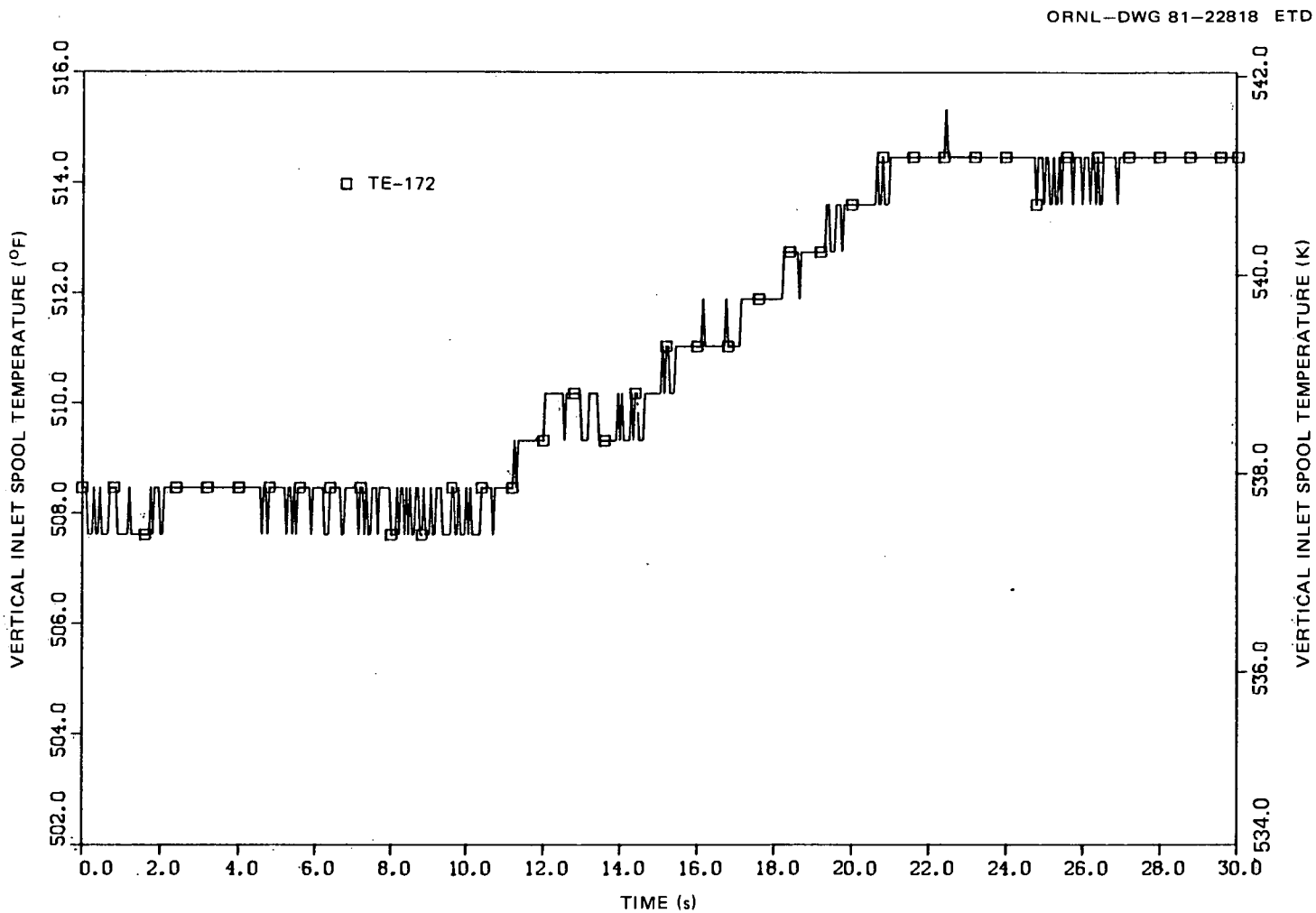

Fig. 4.15. Vertical inlet spool piece fluid temperature vs time — test 3.08.6C.

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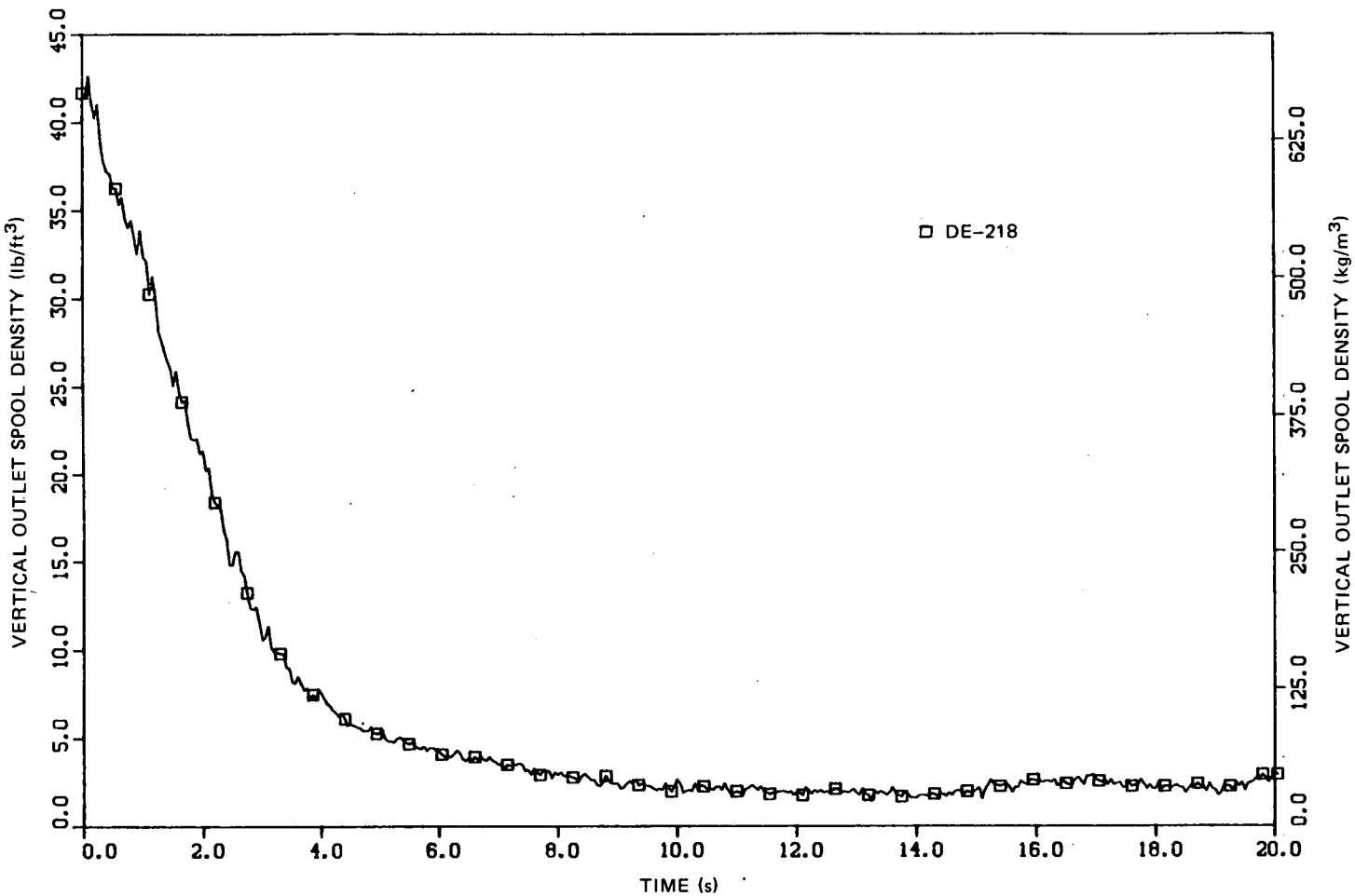

Fig. 4.16. Bundle outlet spool piece density vs time — test 3.03.6AR.

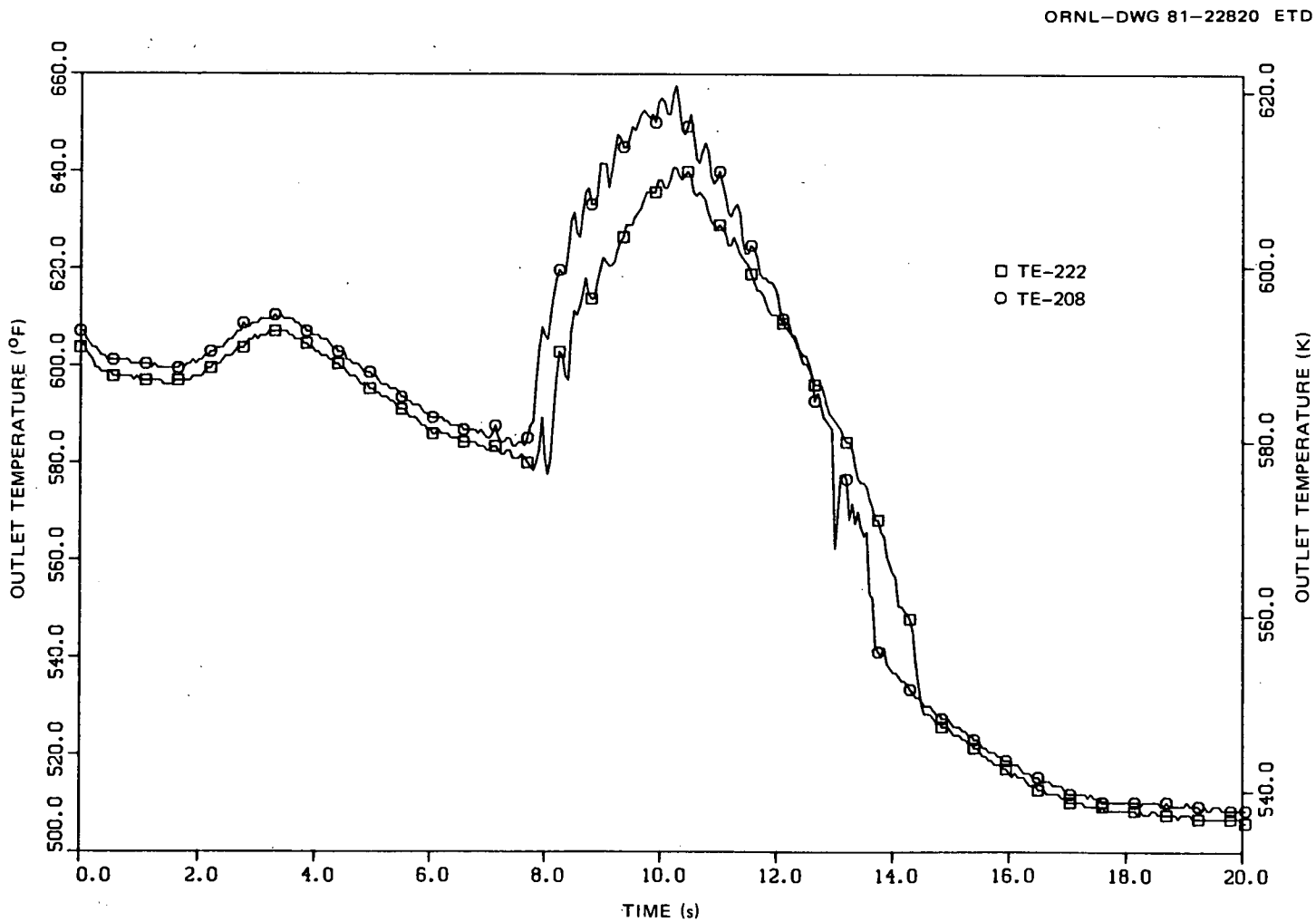

Fig. 4.17. Vertical outlet spool piece fluid temperature vs time — test 3.03.6AR.

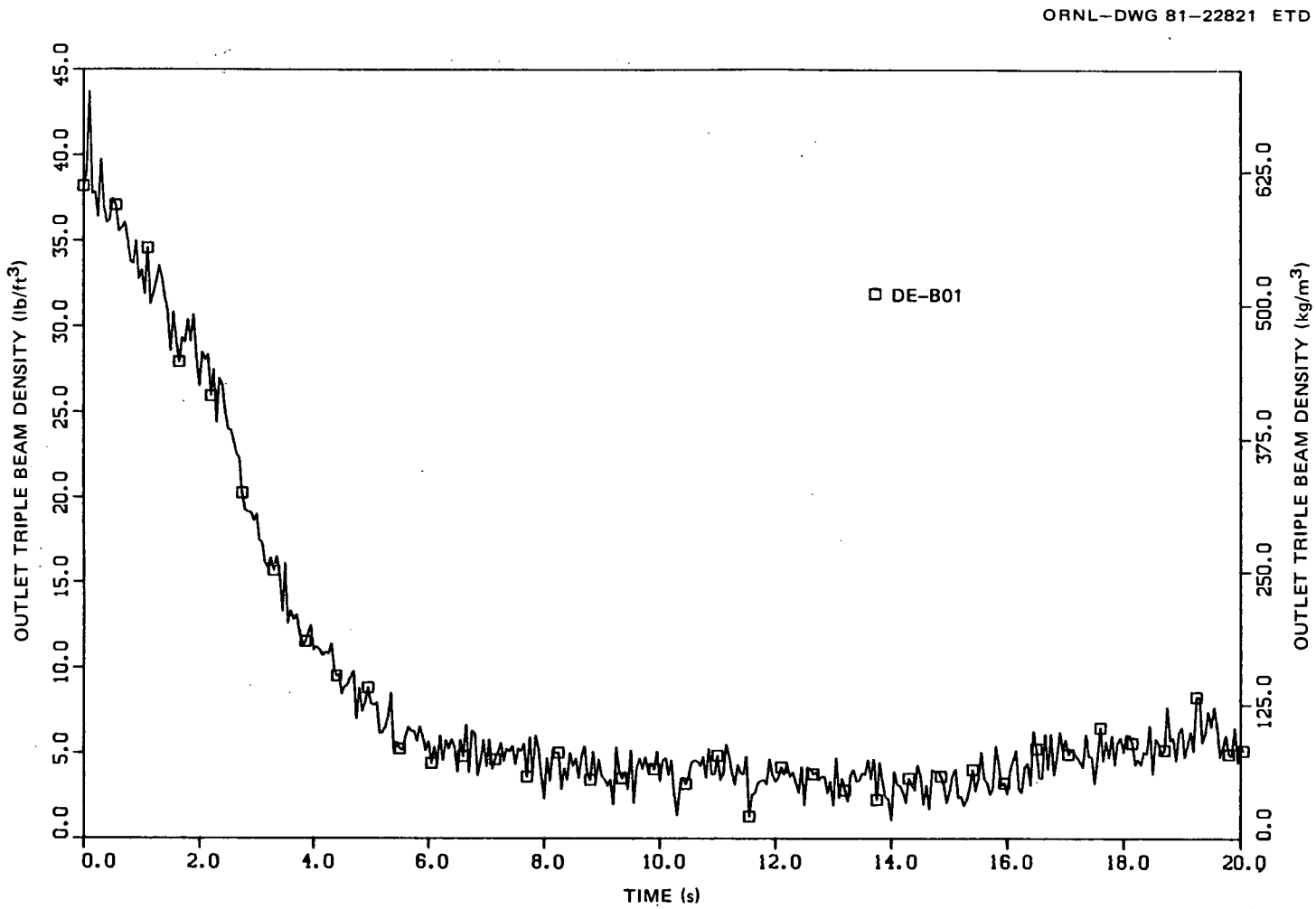

Fig. 4.18. Bundle outlet spool piece composite density vs time — test 3.06.6B.

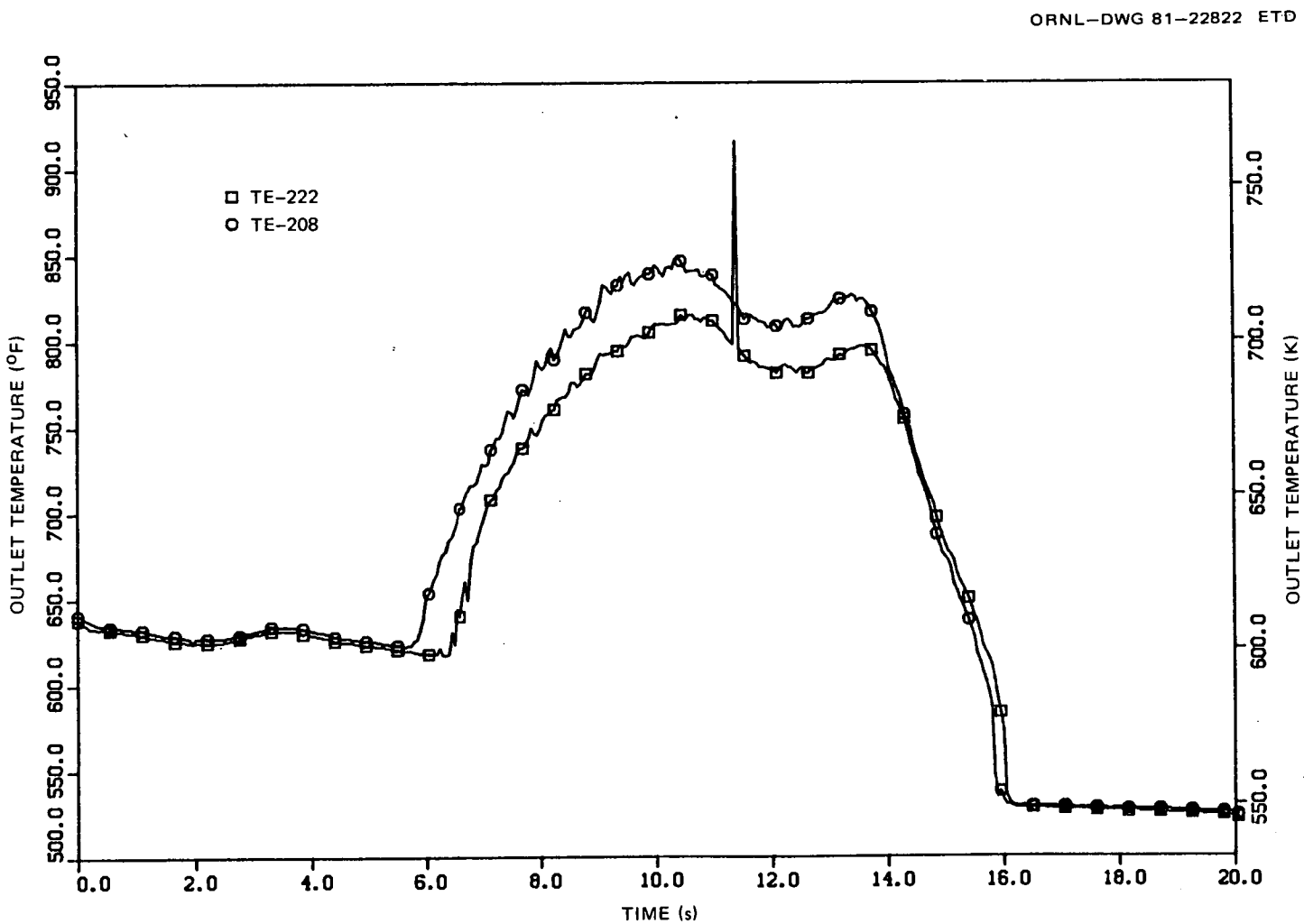

Fig. 4.19. Vertical outlet spool piece fluid temperature vs time — test 3.06.6B.

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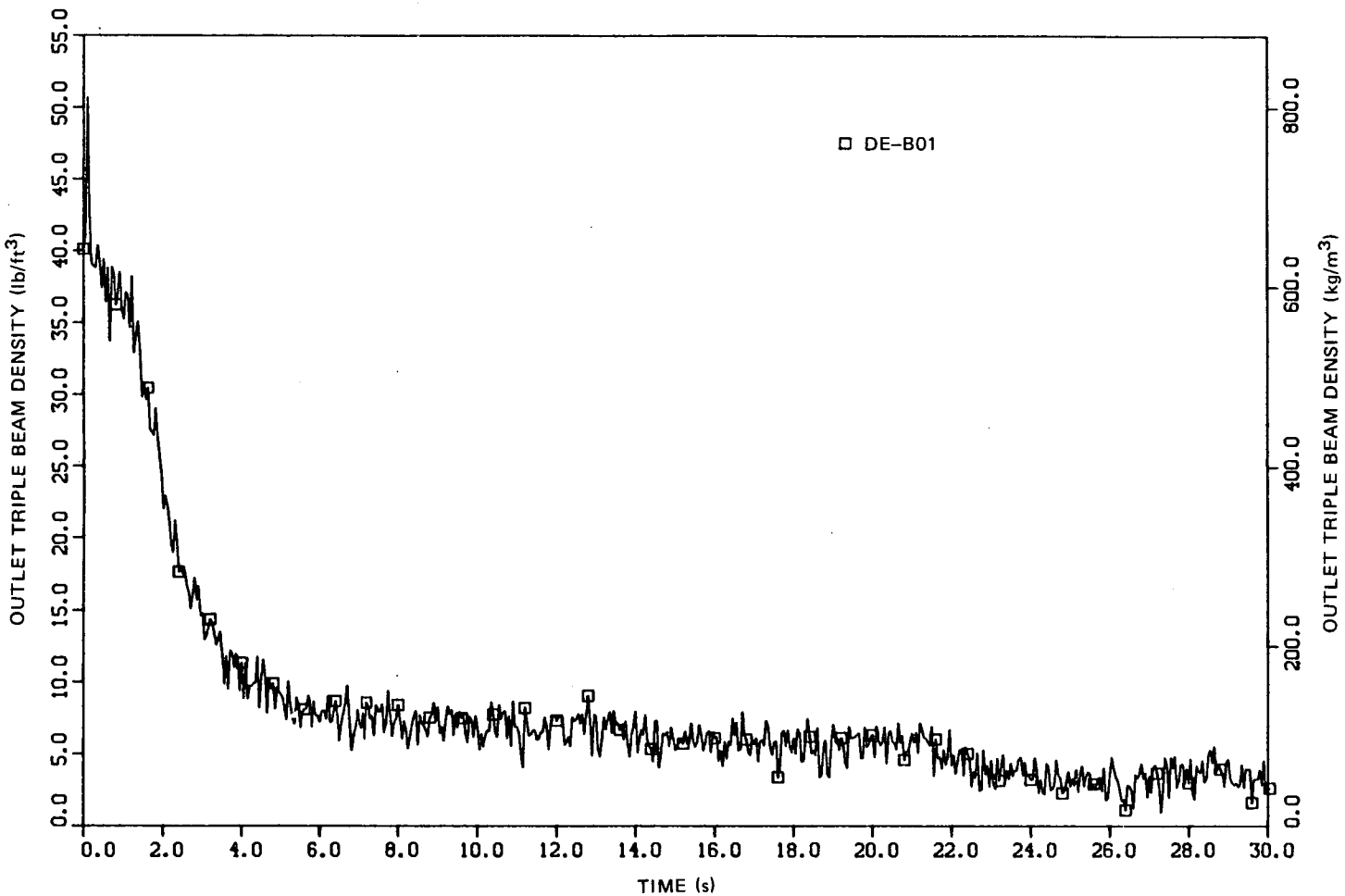

Fig. 4.20. Bundle outlet spool piece composite density vs time — test 3.08.6C.

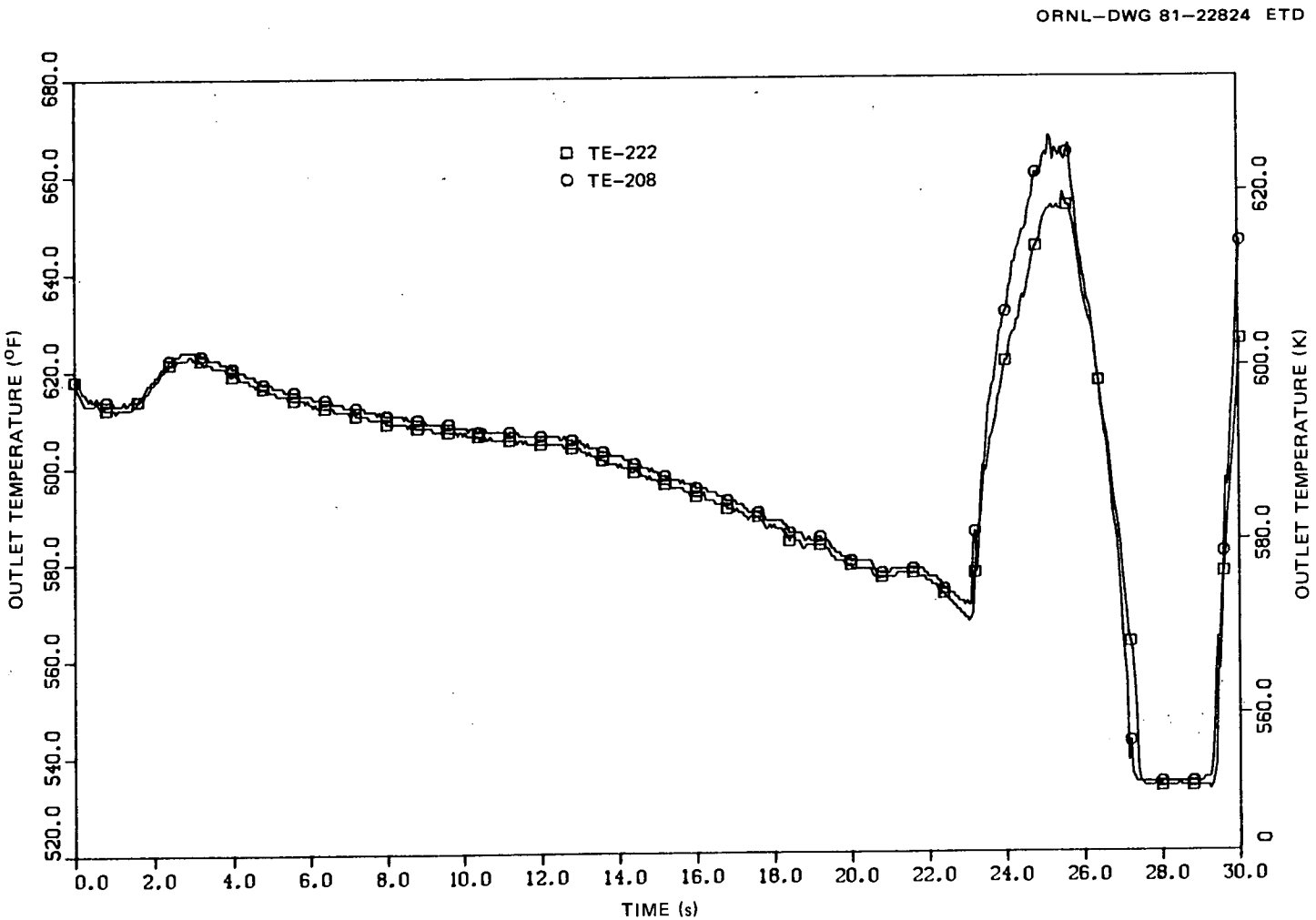

Fig. 4.21. Vertical outlet spool piece fluid temperature vs time — test 3.08.6C.

ORNL–DWG 81–22825 ETD

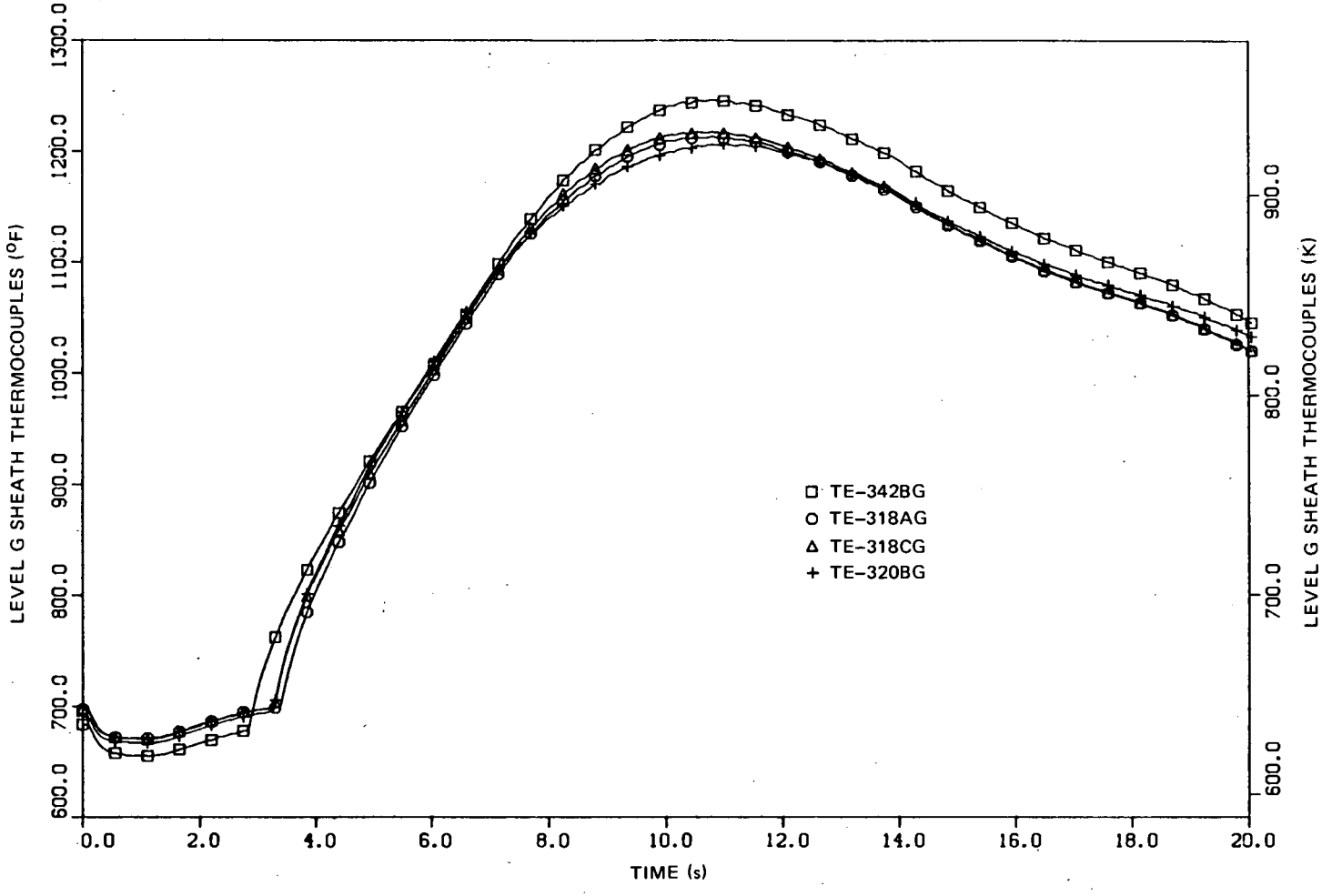

Fig. 4.22. FRS inner-sheath temperatures at level G vs time — test 3.03.6AR.

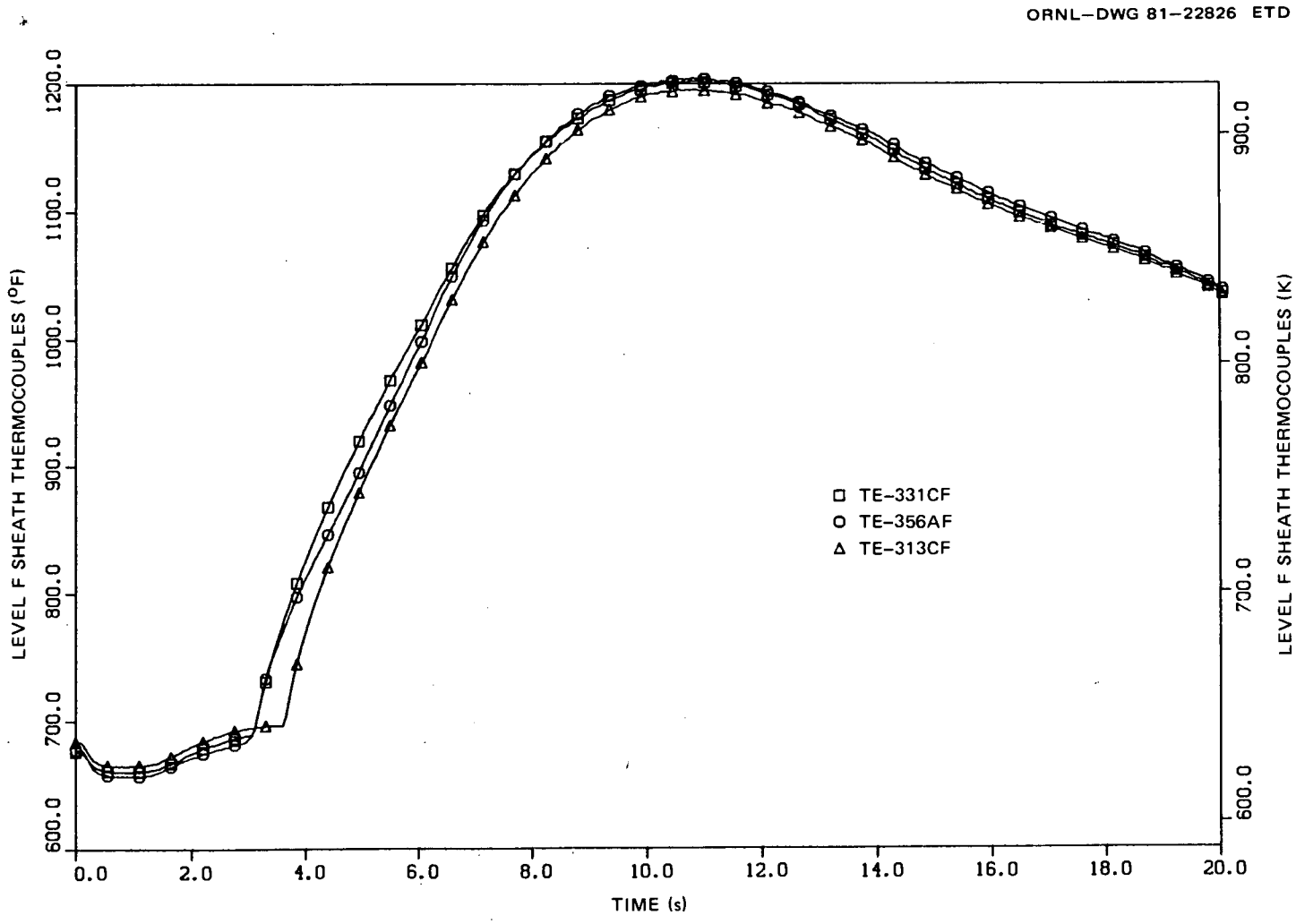

Fig. 4.23. FRS inner-sheath temperatures at level F vs time — test 3.03.6AR.

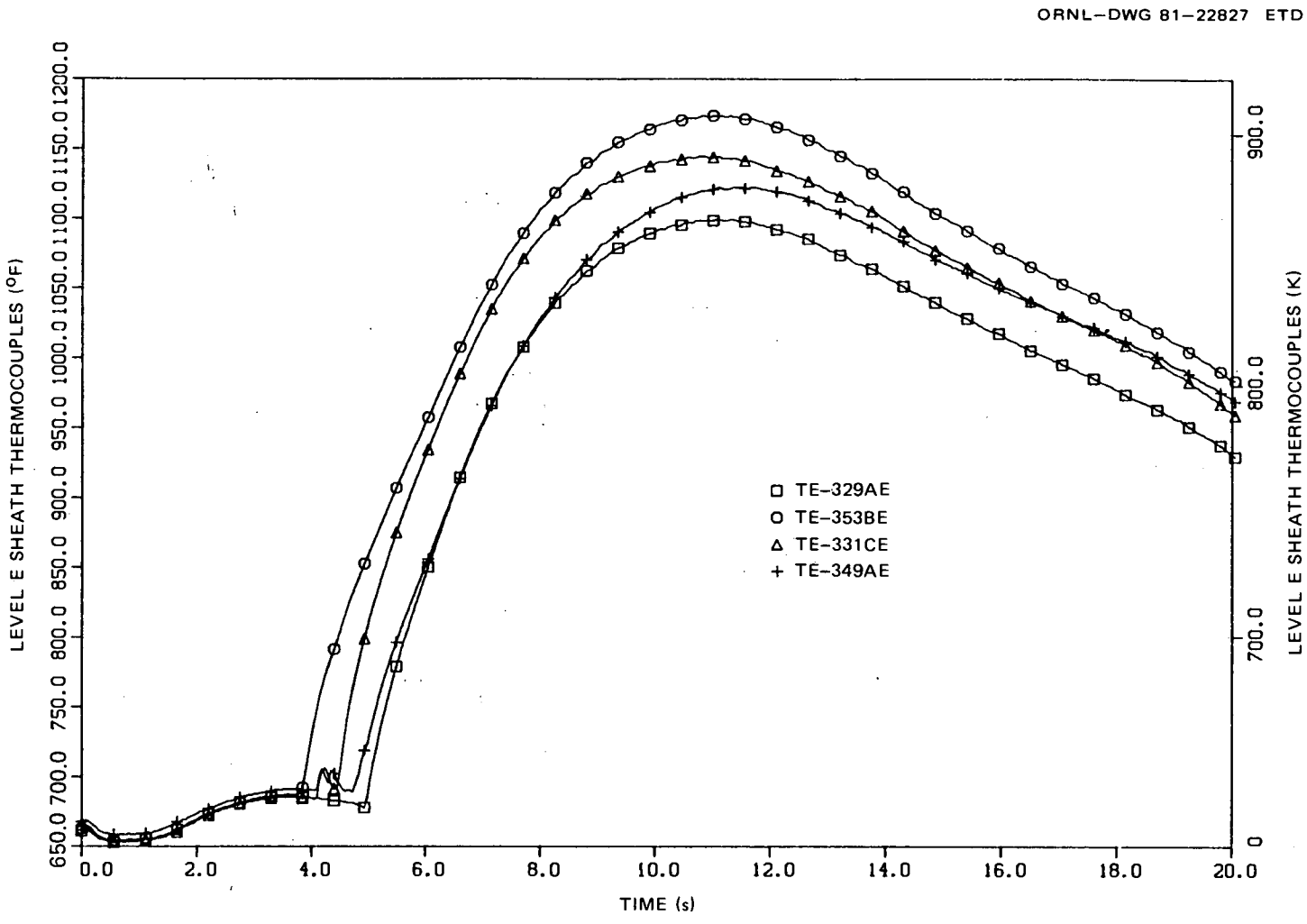

Fig. 4.24. FRS inner-sheath temperatures at level E vs time — test 3.03.6AR.

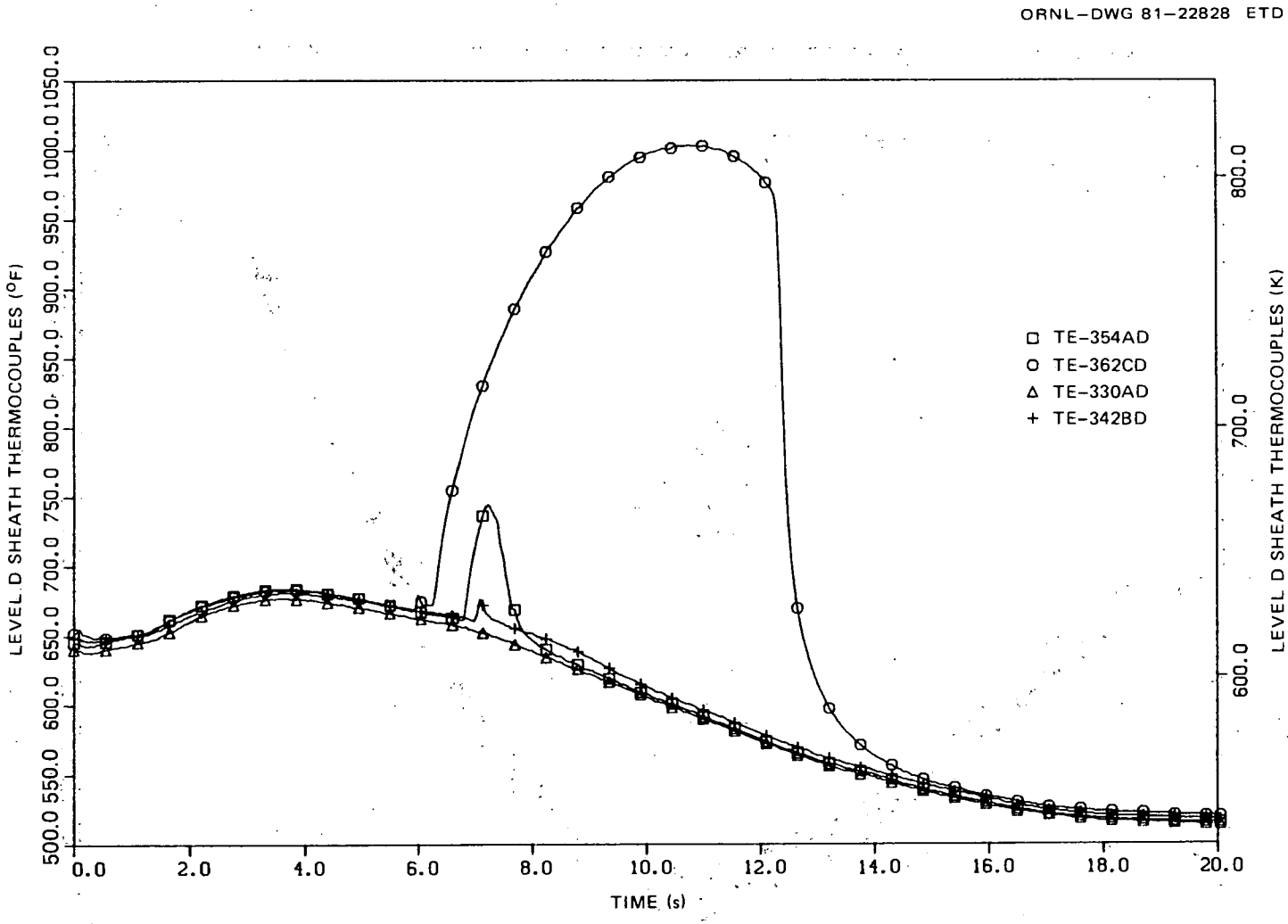

Fig. 4.25. FRS inner-sheath temperatures at level D vs time — test 3.03.6AR.

ORNL–DWG 81–22829 ETD

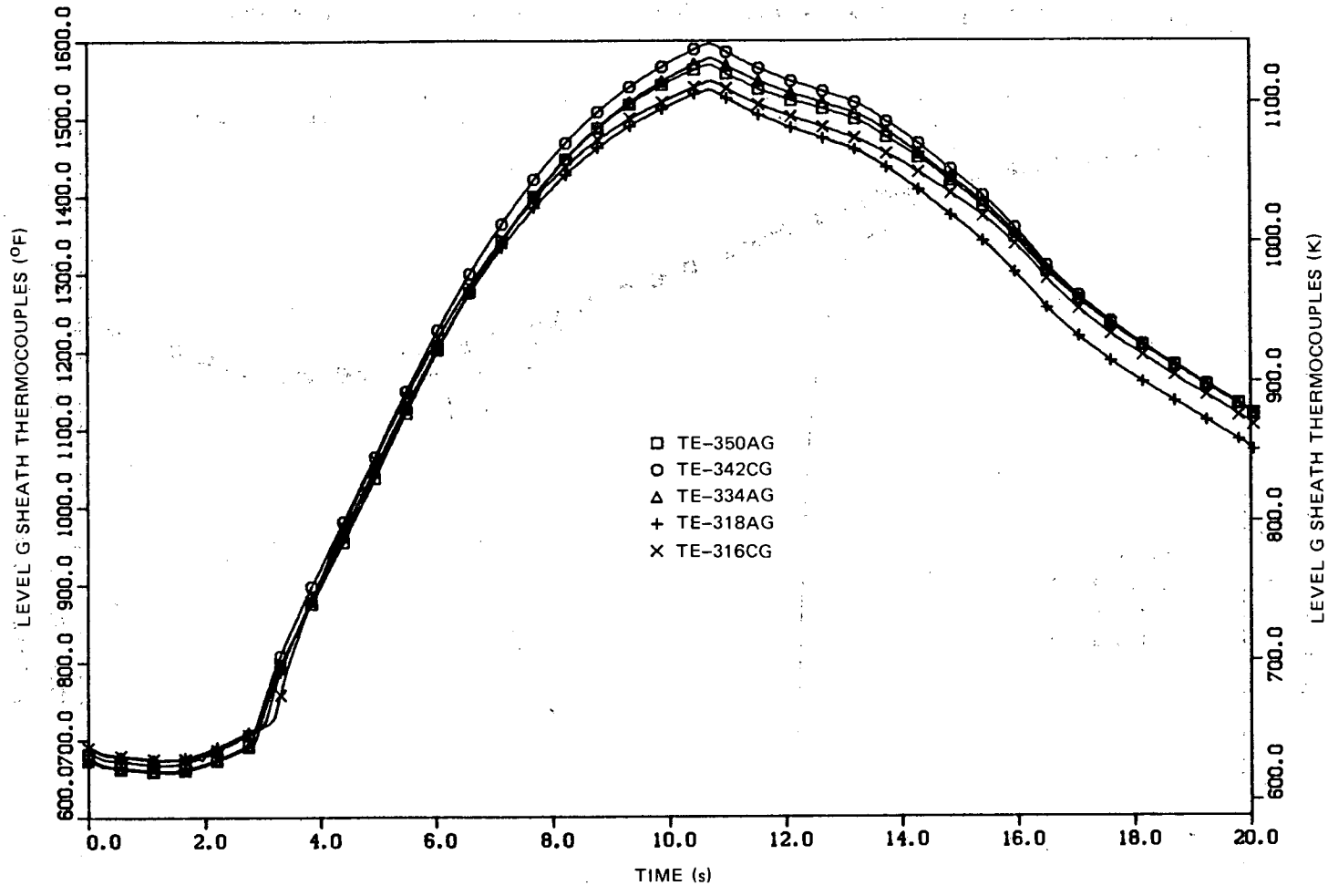

Fig. 4.26. FRS inner-sheath temperatures at level G vs time — test 3.06.6B.

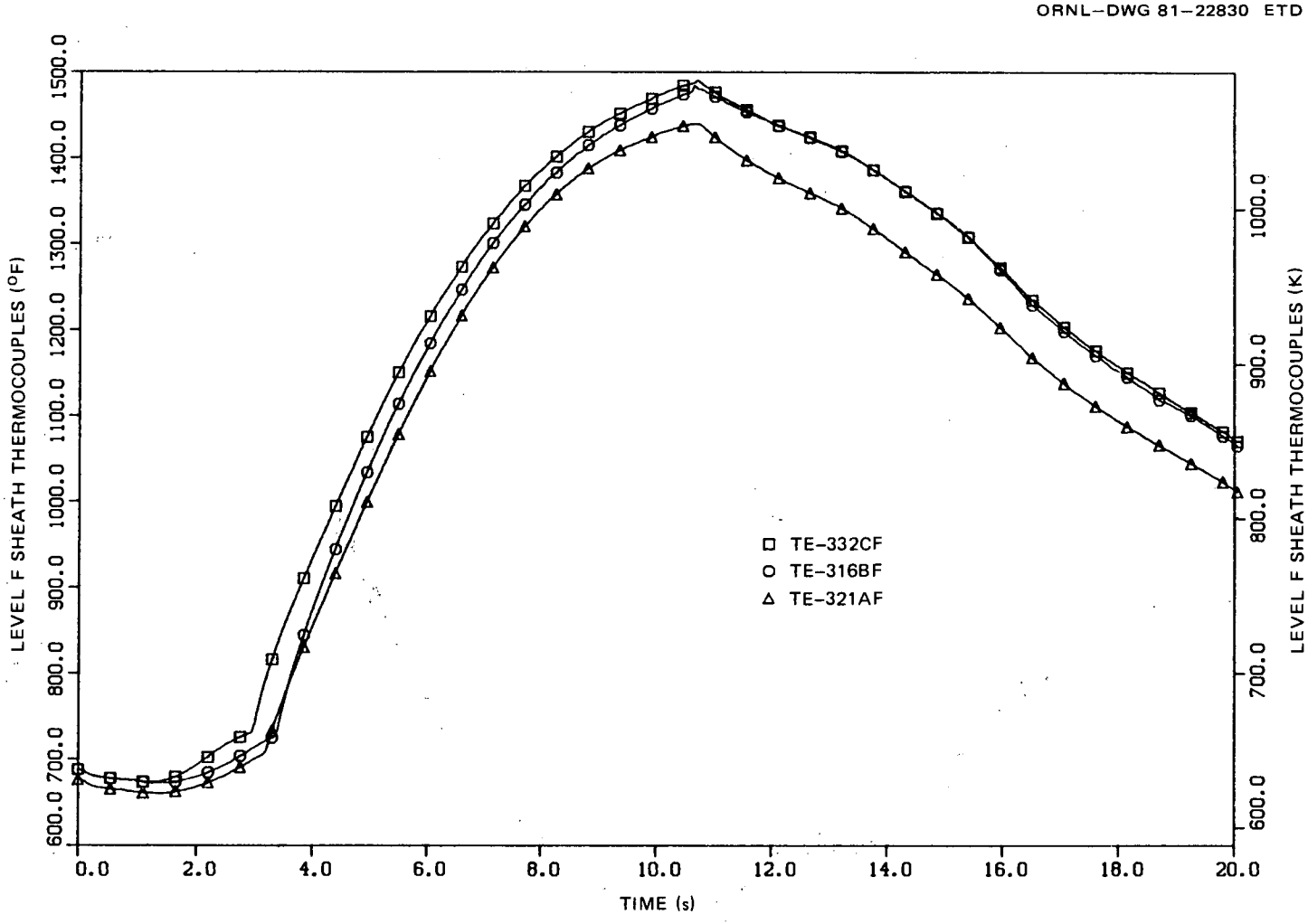

Fig. 4.27. FRS inner-sheath temperatures at level F vs time — test 3.06.6B.

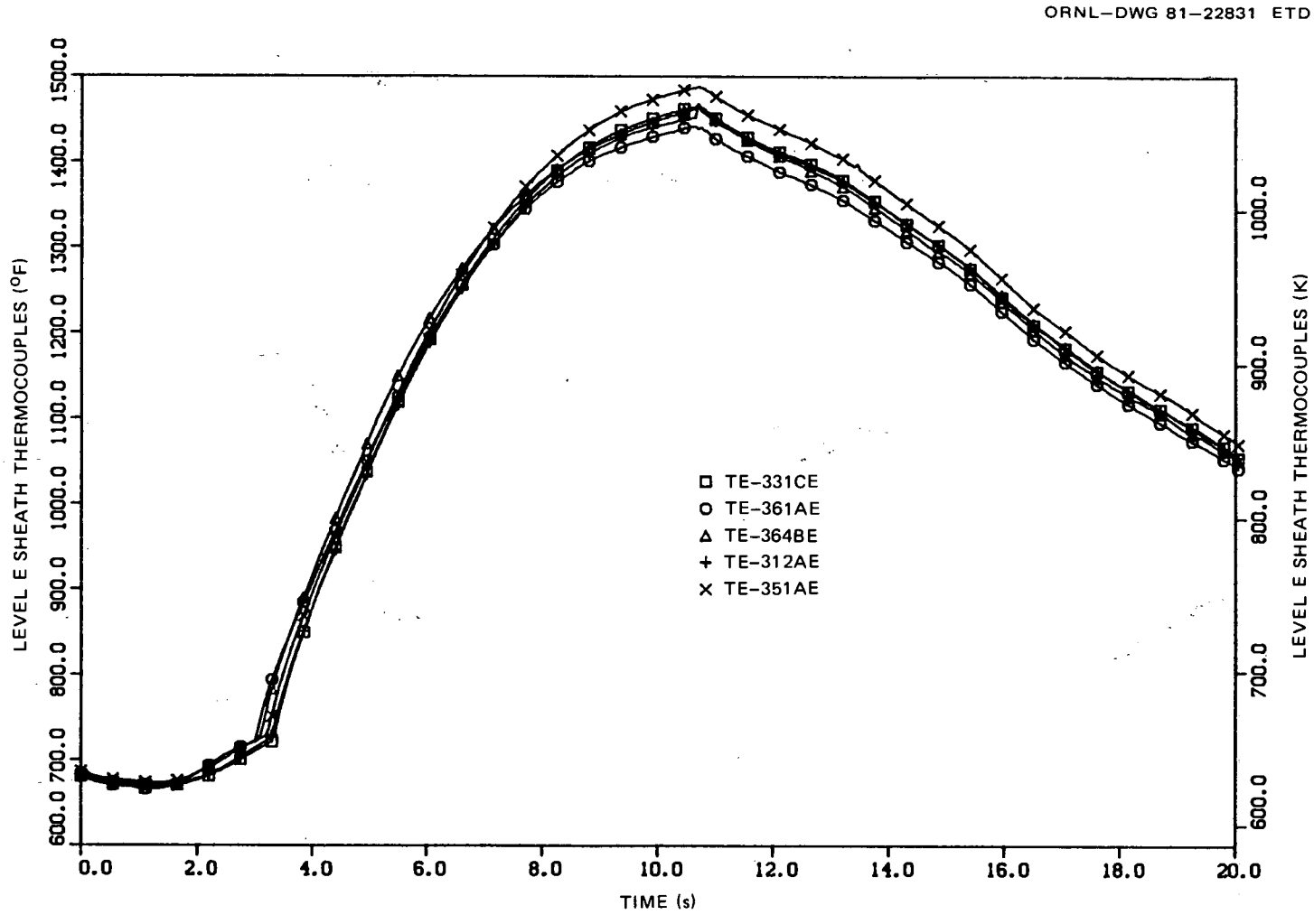

Fig. 4.28. FRS inner-sheath temperatures at level E vs time — test 3.06.6B.

ORNL-DWG 81-22832 ETD

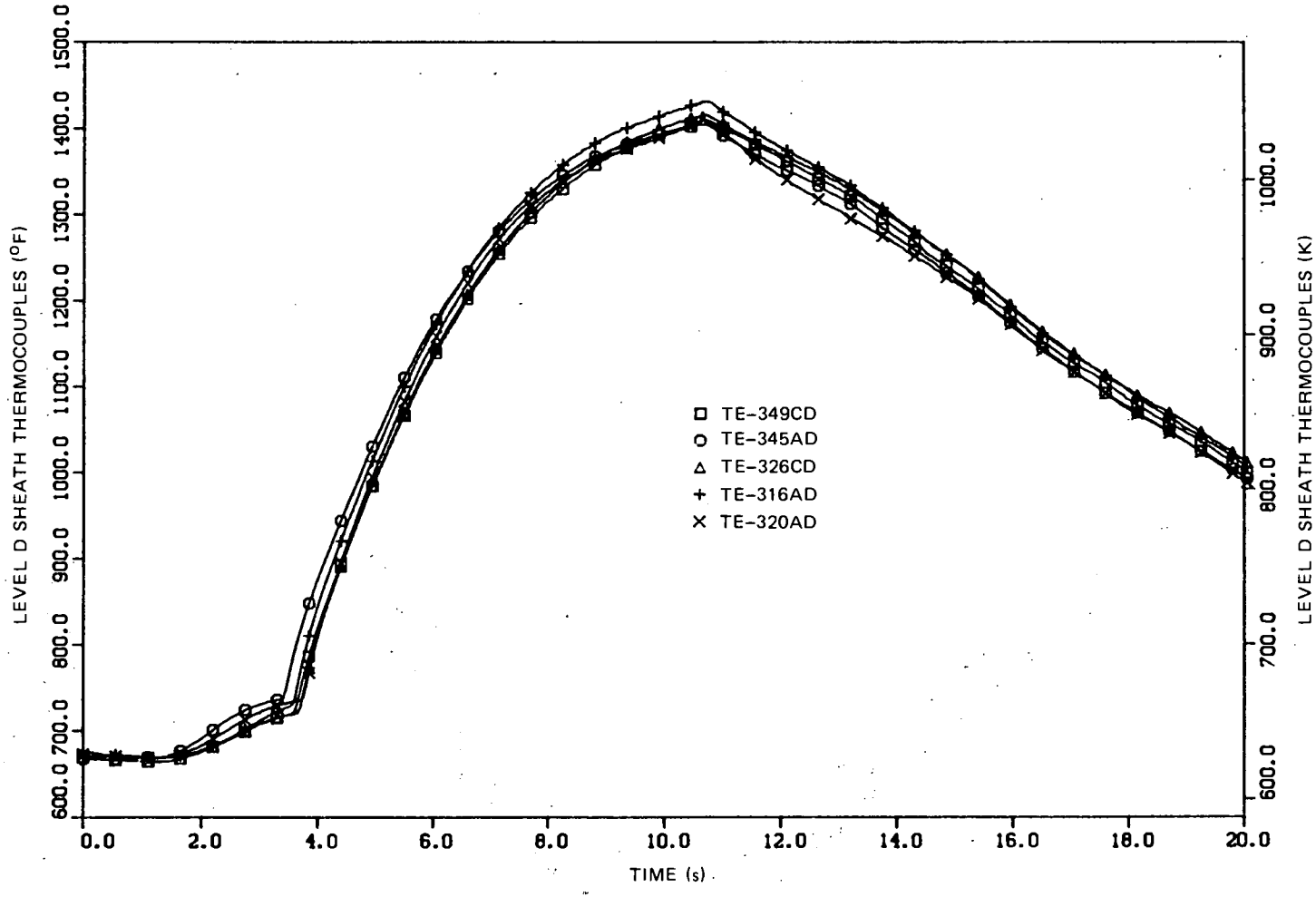

Fig. 4.29. FRS inner-sheath temperatures at level D vs time — test 3.06.6B.

ORNL-DWG 81-22833 ETD

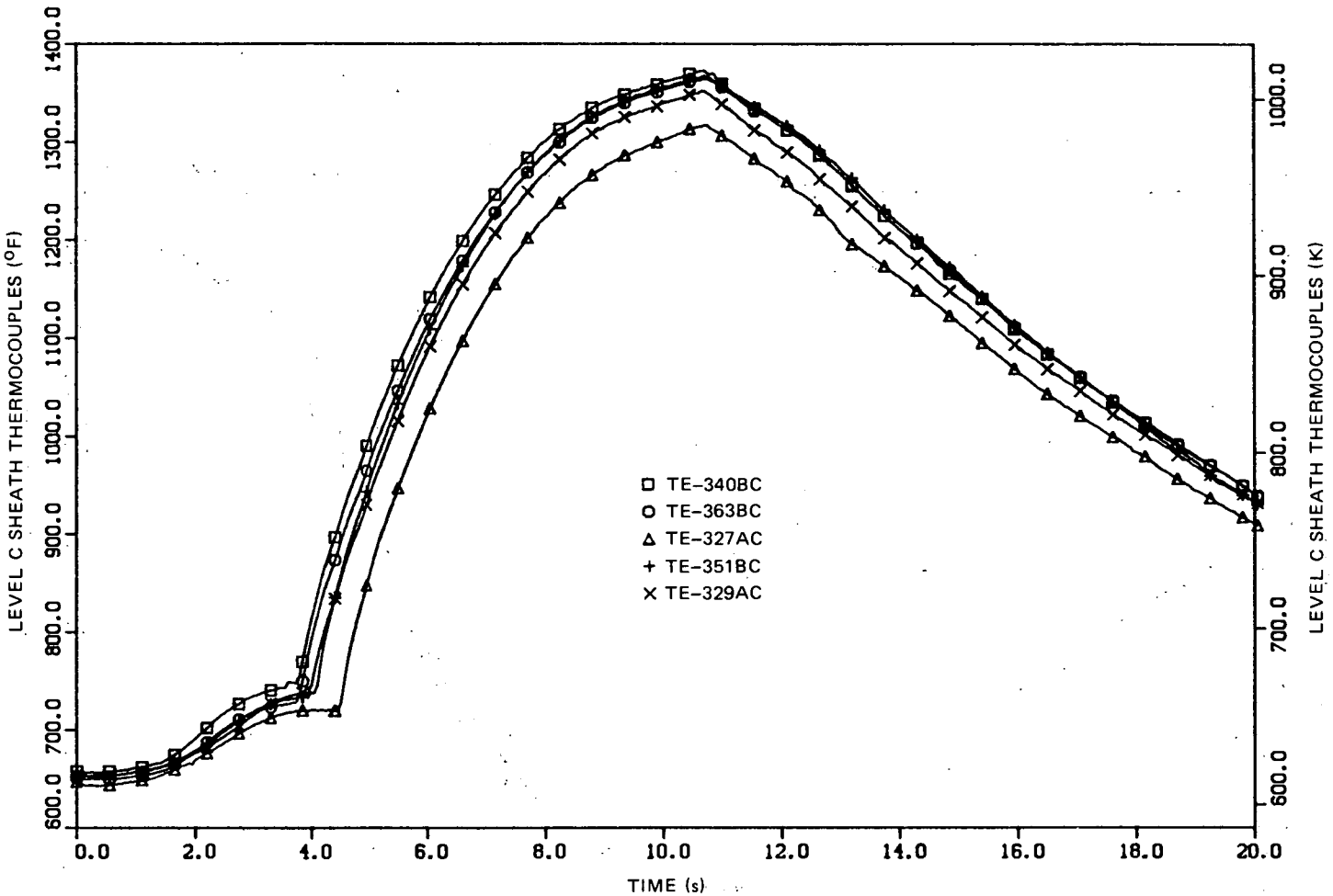

Fig. 4.30. FRS inner-sheath temperatures at level C vs time — test 3.06.6B.

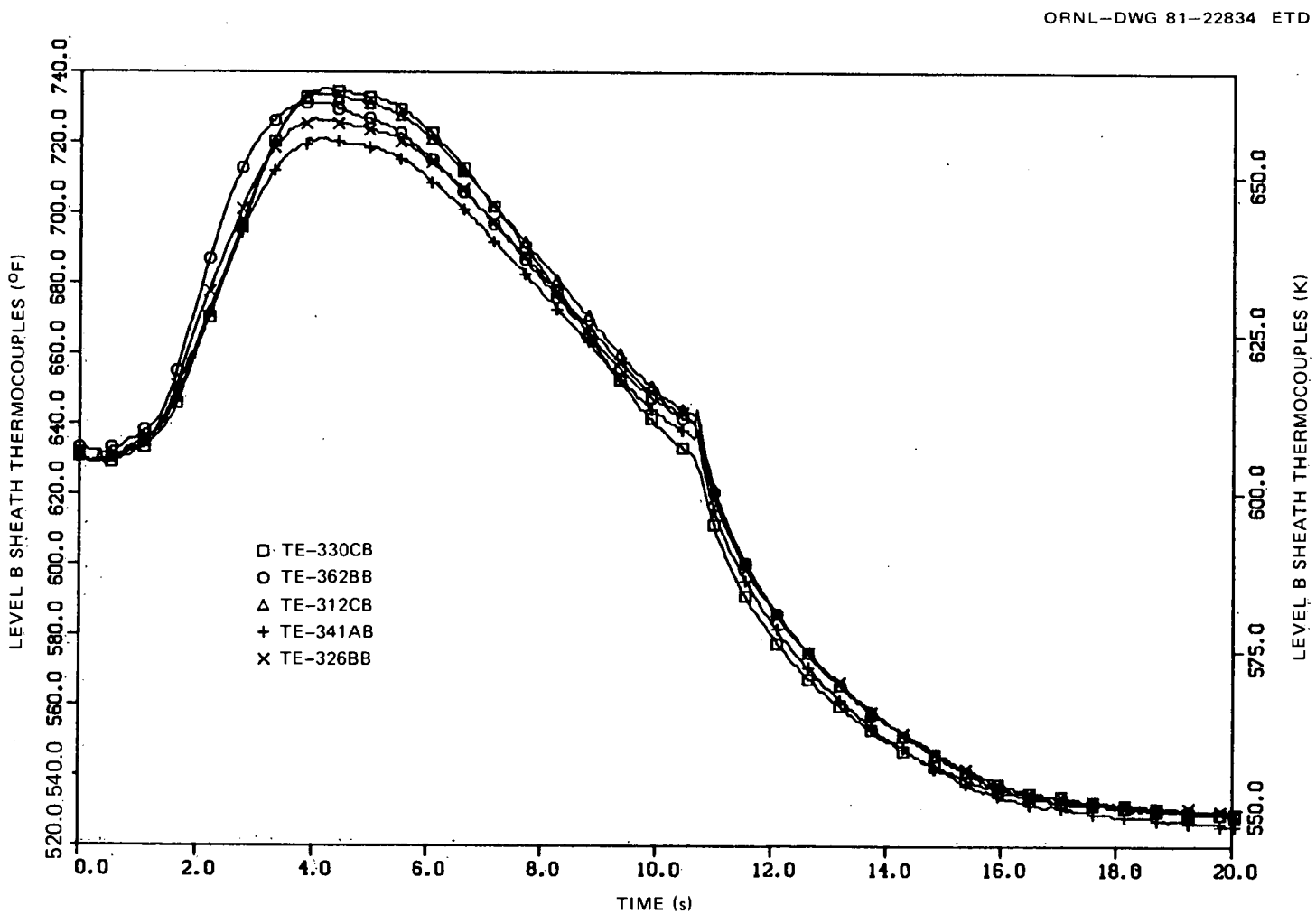

Fig. 4.31. FRS inner-sheath temperatures at level B vs time — test 3.06.6B.

ORNL-DWG 81-22835 ETD

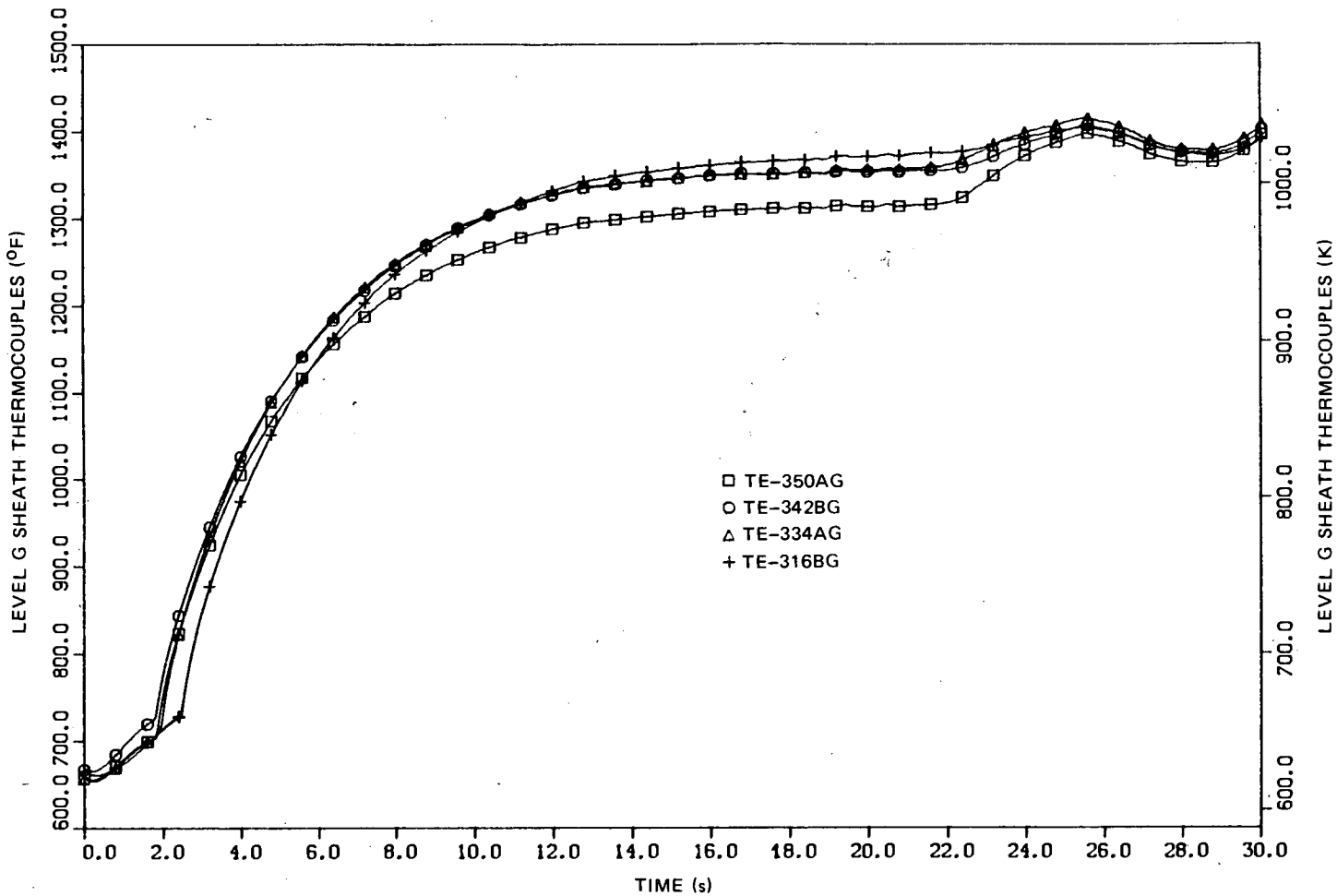

Fig. 4.32. FRS inner-sheath temperatures at level G vs time — test 3.08.6C.

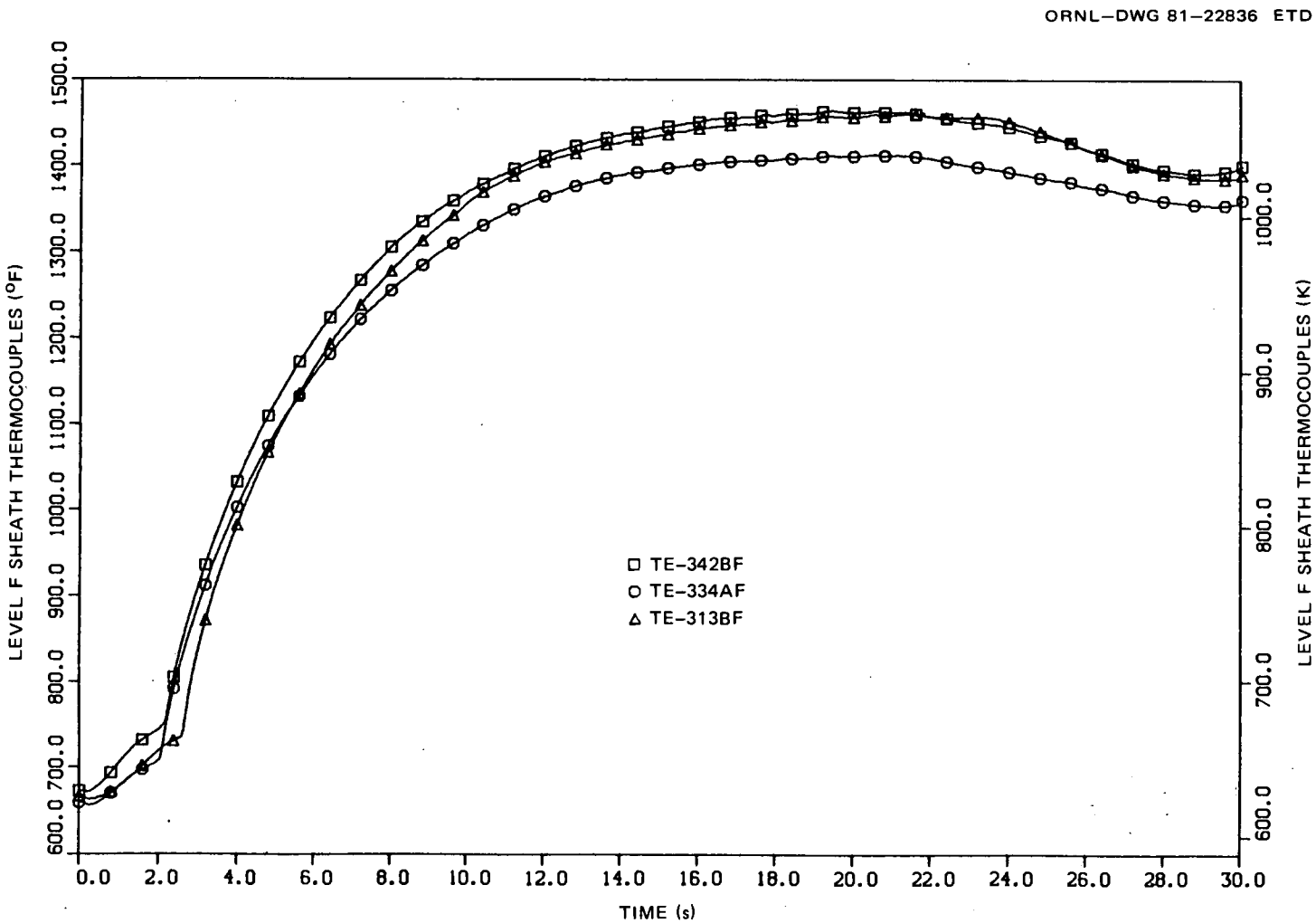

Fig. 4.33. FRS inner-sheath temperatures at level F vs time — test 3.08.6C.

ORNL-DWG 81-22837 ETD

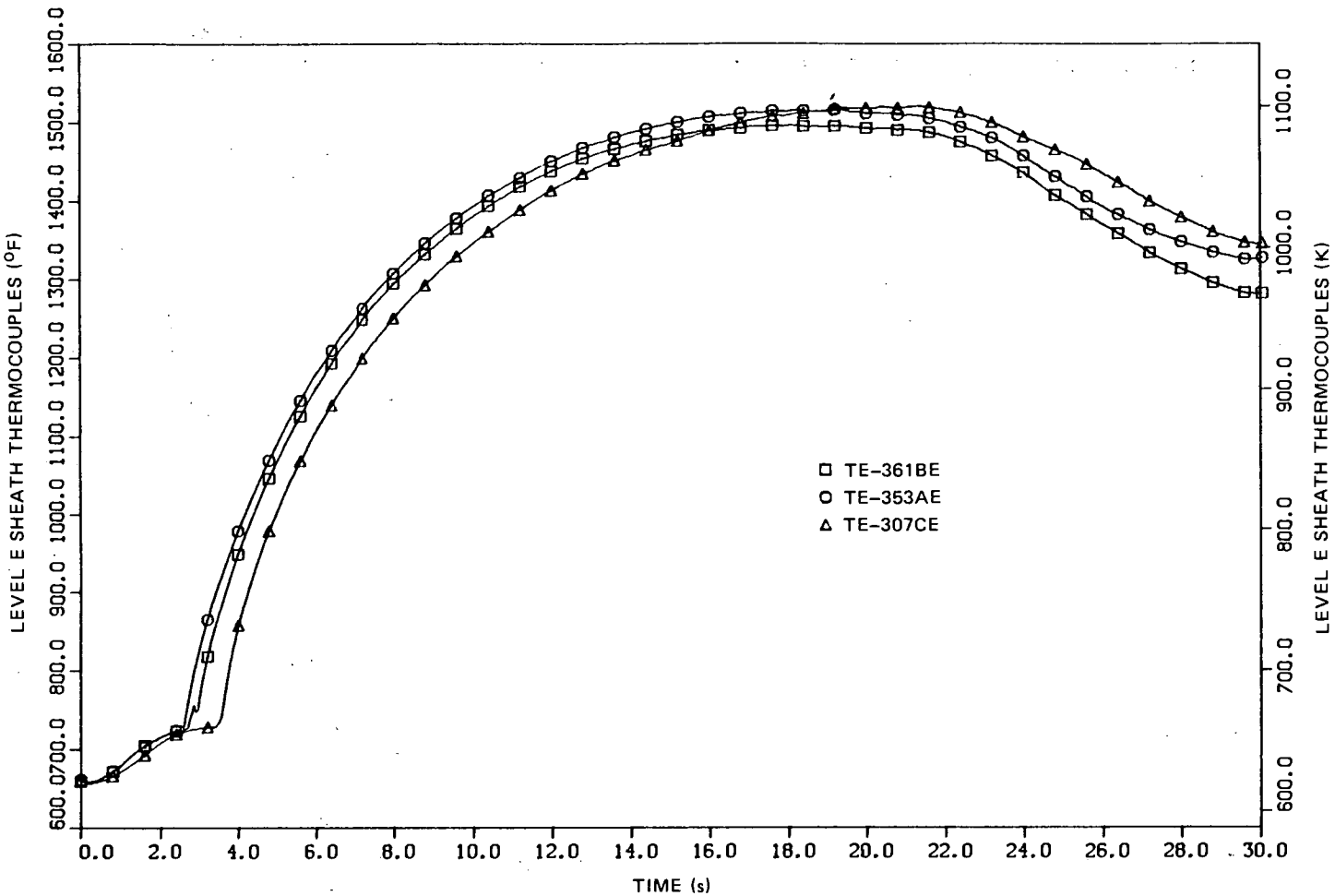

Fig. 4.34. FRS inner-sheath temperatures at level E vs time — test 3.08.6C.

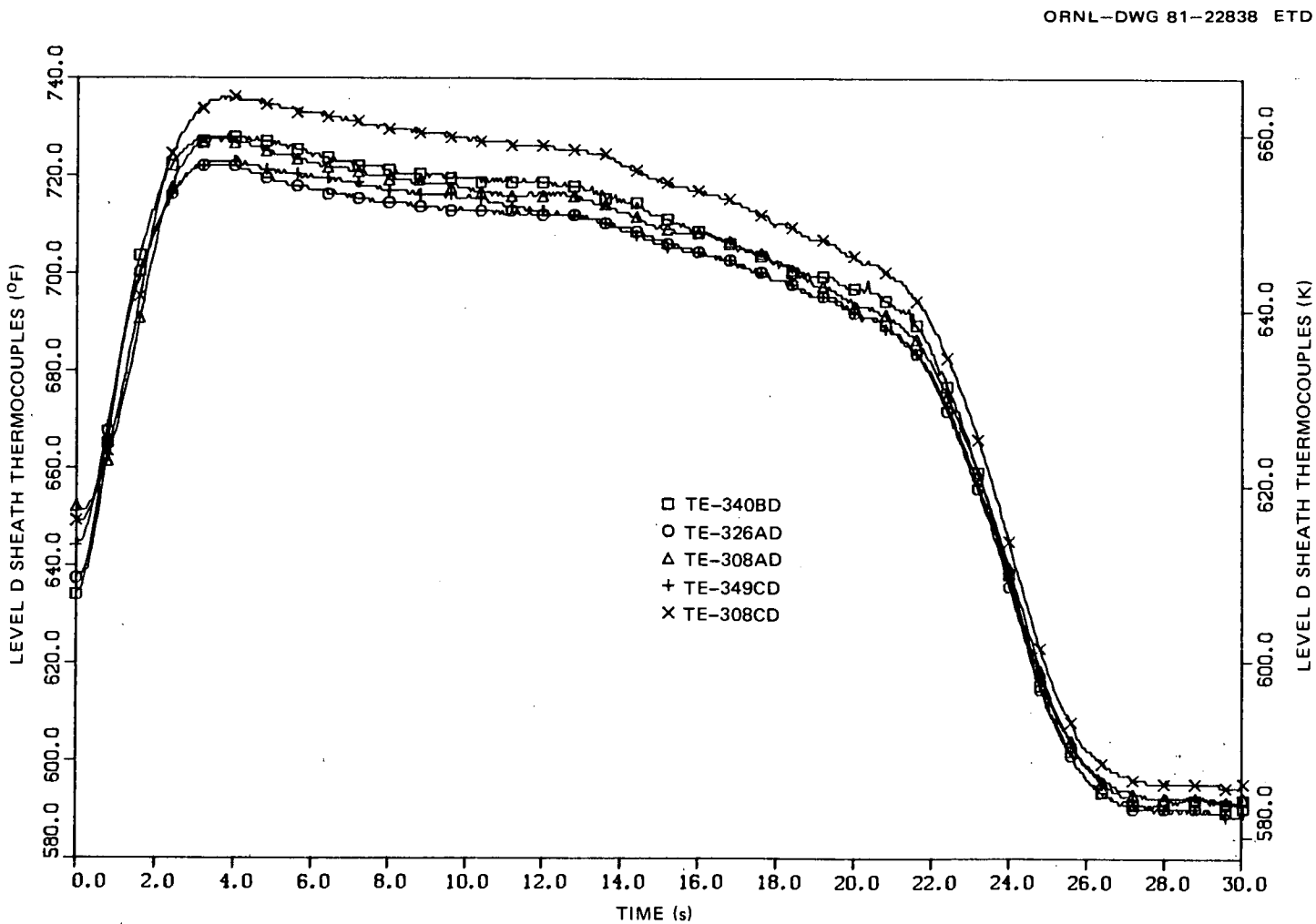

Fig. 4.35. FRS inner-sheath temperatures at level D vs time — test 3.08.6C.

5. ANALYSIS OF EXPERIMENTAL DATA

5.1 Equilibrium Bundle Fluid Conditions and Analysis

The analysis of raw data obtained in the ORNL transient tests is performed to evaluate dispersed-flow film-boiling correlations and compare their results with experimentally determined heat transfer coefficients or heat fluxes. Correlation comparisons permit the recommendation of parameter ranges in which the correlations can be expected to perform well in the dispersed-flow film-boiling regime.

5.1.1 Calculational procedure

The calculational procedure used to analyze the raw data is shown via a flow diagram in Fig. 5.1. The analysis begins with the creation of an engineering units data tape from the raw voltage tape that contains the

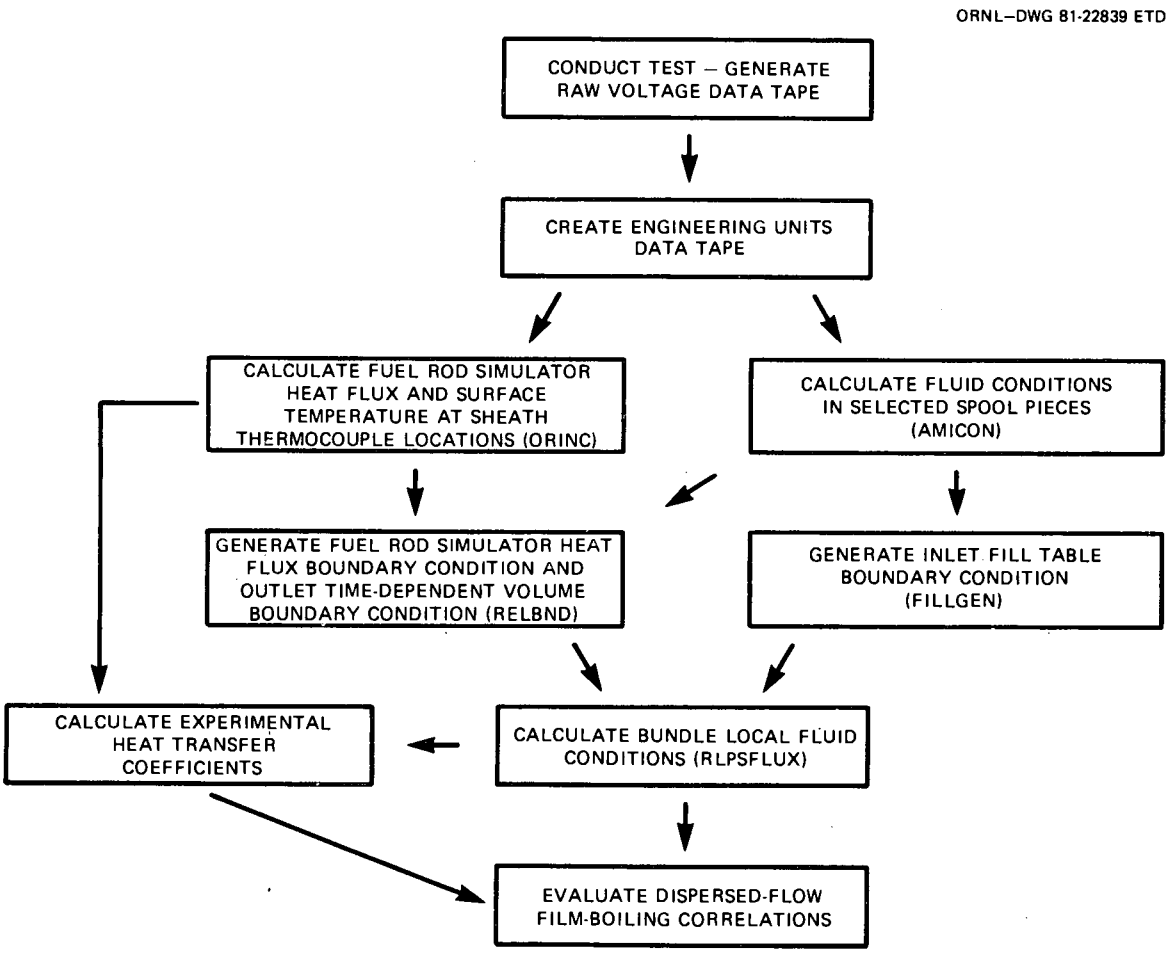

Fig. 5.1. Calculational procedure.

actual instrument responses in millivolts. A computer code has been written to perform this task. Next, the FRS transient surface temperature and heat flux associated with each sheath thermocouple are calculated. This calculation is performed by the computer code ORINC (Ref. 19), which solves a finite-difference inverse formulation of the transient heat conduction equation. The computer code AMICON (Ref. 20) was written to calculate the fluid conditions in selected spool pieces. Two important parameters supplied by the code are the fluid enthalpy and mass flux at the external-downcomer inlet spool pieces. These parameters are used to create (via the computer code FILLGEN)[21] a time-dependent fill table that is one of the boundary calculations used in the bundle fluid conditions calculation. A second boundary condition is created that supplies the time-dependent fluid conditions in the horizontal outlet-nozzle spool piece. The fluid condition specified is pressure. The final boundary condition necessary in the bundle fluid conditions calculation is the FRS surface heat fluxes. The ORINC-calculated surface heat fluxes are used to formulate this boundary condition with the computer code RELBND (Ref. 22).

Three boundary conditions are used in the homogeneous two-phase flow thermodynamic equilibrium computer code RLPSFLUX to calculate the bundle fluid conditions. The RLPSFLUX code[17] is a locally modified version of RELAP4/MOD5/Update 2 (Ref. 23). The modification involved the replacement of the RELAP4/MOD5 heat transfer package with software that supplies the FRS surface heat fluxes calculated with ORINC. Clearly, then, no film-boiling heat transfer correlations (or other heat transfer correlations) are used to calculate FRS heat transfer in the RLPSFLUX bundle fluid conditions calculation. The noding diagram of the THTF test section for the calculation of bundle fluid conditions is depicted in Fig. 5.2. At Junction 27 (J27 in Fig. 5.2), which models the test section inlet, the fill boundary condition was specified. Outlet pressure, the time-dependent volume boundary condition, was specified in Volume 26 (circled 26 in Fig. 5.2).

With the calculated bundle fluid conditions, heater rod surface heat flux, and surface temperature, an experimental heat transfer coefficient can be calculated as described in the following equation:

$$h_{exp} = \frac{q''_{exp}}{T_{surf} - T_{fluid}} ,$$

where

h_{exp} = level-average experimental heat transfer coefficient,
q''_{exp} = level-average rod surface heat flux,
T_{surf} = level-average rod surface temperature,
T_{fluid} = saturated fluid temperature.

The calculated bundle fluid conditions also permit the evaluation of film-boiling heat transfer correlations to obtain correlation-predicted heat transfer coefficients (h_{cor}) or surface heat fluxes (q''_{cor}) for comparison with experimental values.

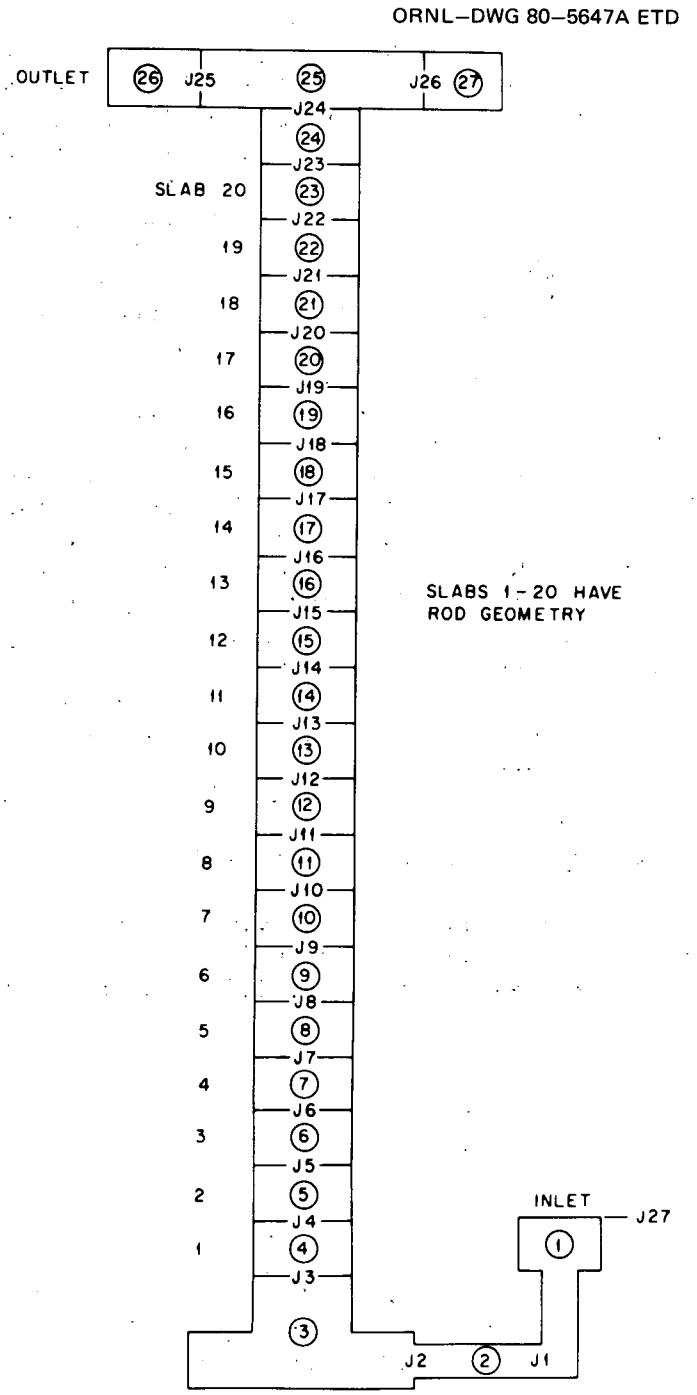

Fig. 5.2. Node diagram of RLPSFLUX THTF test section model.

Calculated bundle fluid conditions, level-average rod surface conditions, experimental heat transfer coefficients, and the dispersion in the experimental heat transfer coefficients are presented in Appendix B for all three ORNL transient tests. The burnout quality is also presented in Appendix B.

5.1.2 Calculation results

Calculated volumetric flow one node downstream of the inlet mass flux boundary condition is compared with the measured volumetric flow in the external-downcomer spool piece (Fig. 2.2) for each of the transient tests in Figs. 5.3–5.5. The fluid entering the test section is subcooled through 17.5, 15, and 30 s for tests 3.03.6AR, 3.06.6B, and 3.08.6C, respectively (Figs. 4.10–4.15). A comparison between the calculated and measured inlet density for the transients is shown in Figs. 5.6–5.8. Since film-boiling data are presented and analyzed only when the inlet fluid is subcooled, the ~1-s delay in the prediction of saturated conditions at the inlet in test 3.06.6B is of no consequence. Calculated pressures at the inlet to the test section (Vol. 1) are compared with those measured in Figs. 5.9–5.11. The comparisons show excellent agreement because outlet pressure is a boundary condition. The calculated upper-bundle fluid temperatures are compared with measured upper-bundle fluid temperatures in Figs. 5.12–5.14. Figures 5.15–5.17 show the calculated volumetric flow at Junction 24 overlaid with the volumetric flows measured by the turbine meter in the outlet-nozzle spool piece. Comparing the calculated outlet volumetric flow with that measured gives some indication of how well the calculated equilibrium bundle fluid conditions approximate the actual bundle fluid conditions since the outlet turbine meter response is not used in the calculations. However, this comparison is not definitive since thermodynamic nonequilibrium in the flow can cause a difference in volumetric flow for a given mass flow. The outlet volumetric flows in test 3.06.6B tend to be higher than those calculated. As will be described in Sect. 5.3, this suggests the existence of significant thermodynamic nonequilibrium in the flow. The flow comparisons in test 3.08.6C show excellent agreement between experimental and calculated outlet volumetric flow. This suggests that thermodynamic nonequilibrium effects are less significant in test 3.08.6C. The actual steam temperature (i.e., that which accounts for the thermodynamic nonequilibrium), and therefore the actual quality, actual steam density, and actual volumetric flow, cannot be calculated with an equilibrium thermal-hydraulic model. However, those parameters not influenced (or influenced little) by thermodynamic nonequilibrium can be calculated accurately. Such parameters include pressure, saturation temperature, total mass flux, and equilibrium quality. Equilibrium quality is defined as the quality that would exist if the fluid were in thermodynamic equilibrium and thus is not equal to the actual quality. The quality calculated by the computer model using equilibrium assumptions is thought to accurately predict the fluid quality had the fluid been in thermodynamic equilibrium. Note that the correlations evaluated in this report were designed for use with equilibrium fluid conditions and are generally used this way in reactor safety analysis.

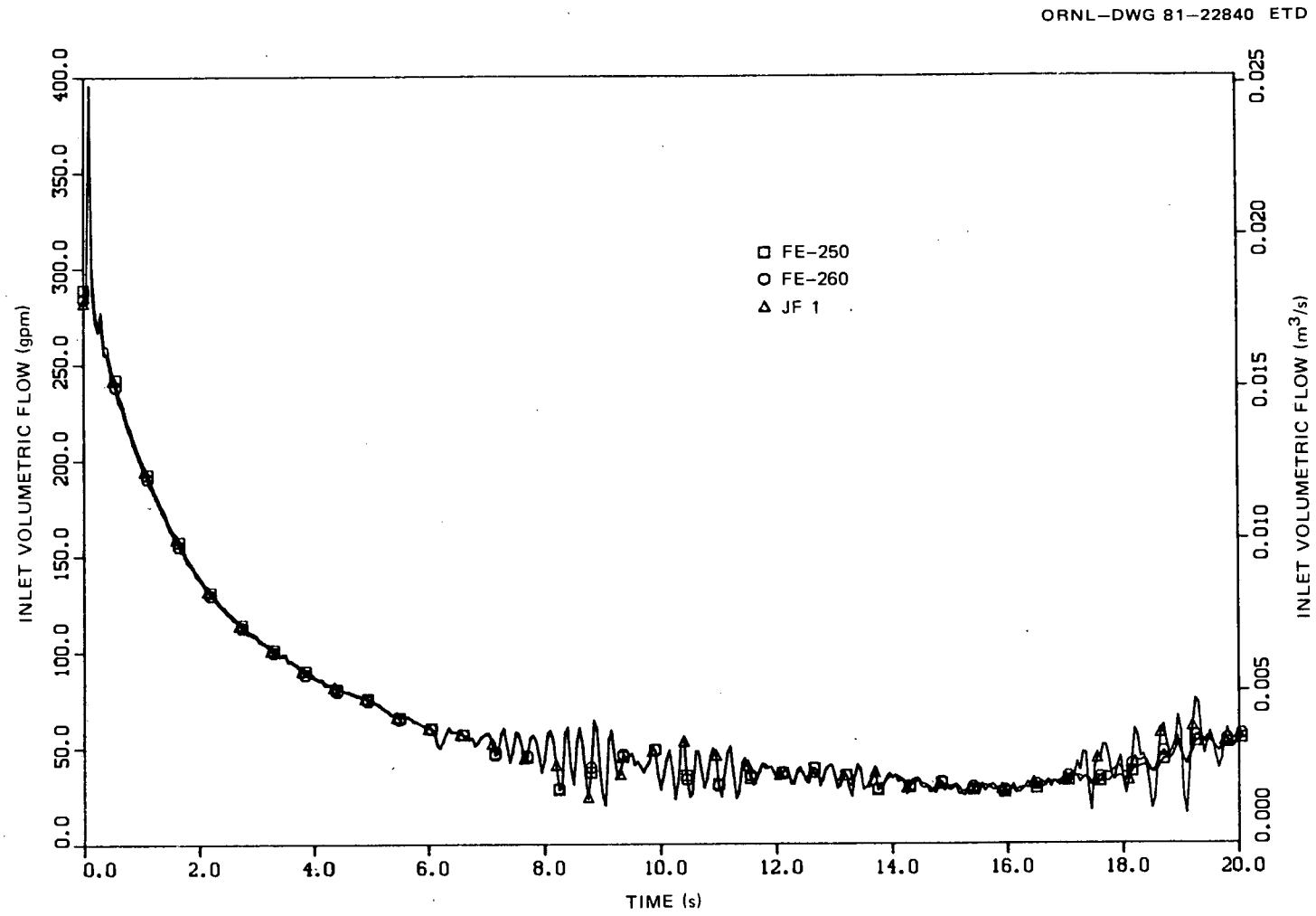

Fig. 5.3. Comparison of measured volumetric flow at test section inlet (□,O) with volumetric flow calculated one node downstream (Junction 1) of mass flux boundary condition (Δ) — test 3.03.6AR.

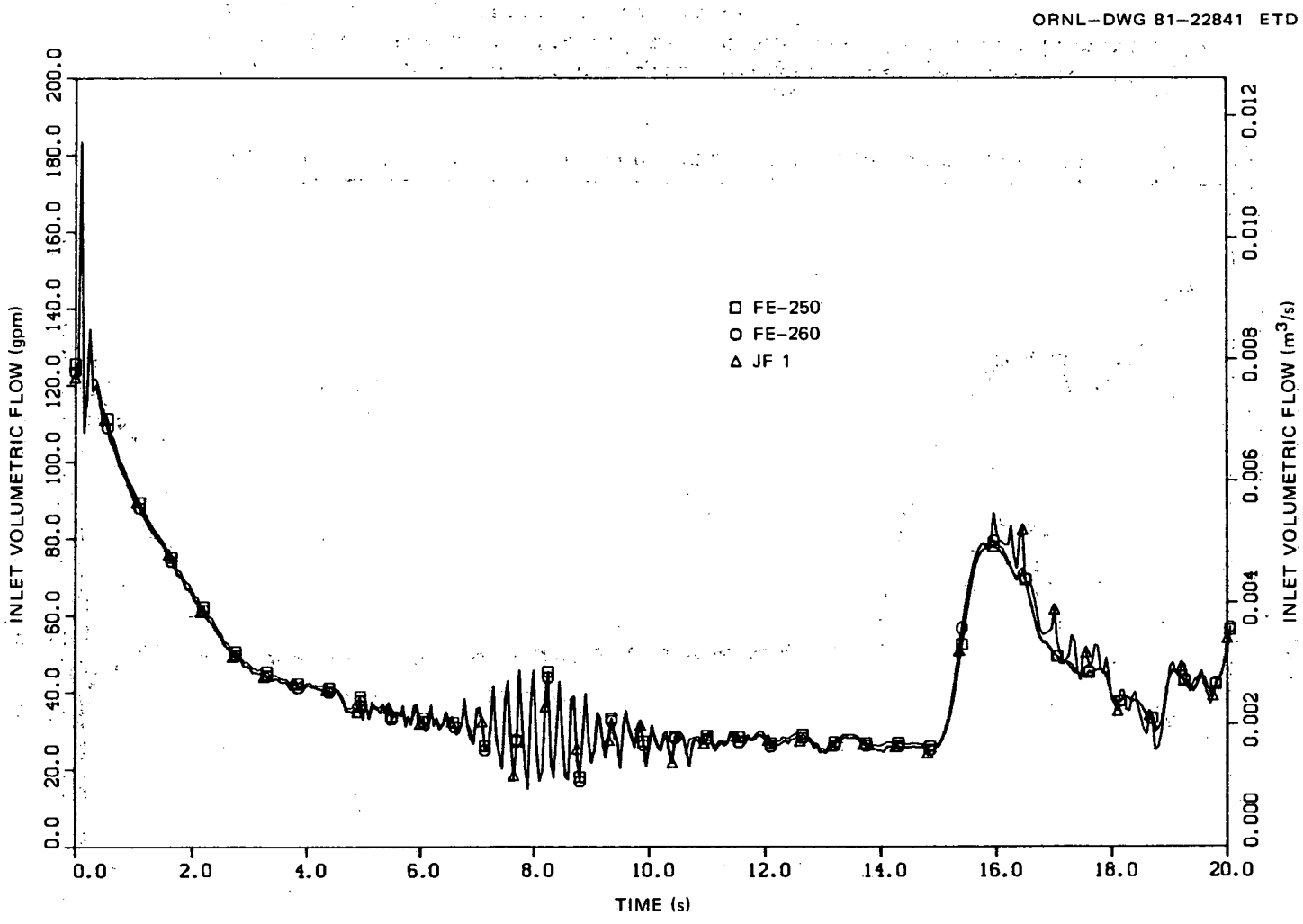

Fig. 5.4. Comparison of measured volumetric flow at test section inlet (□,O) with volumetric flow calculated one node downstream (Junction 1) of mass flux boundary condition (Δ) – test 3.06.6B.

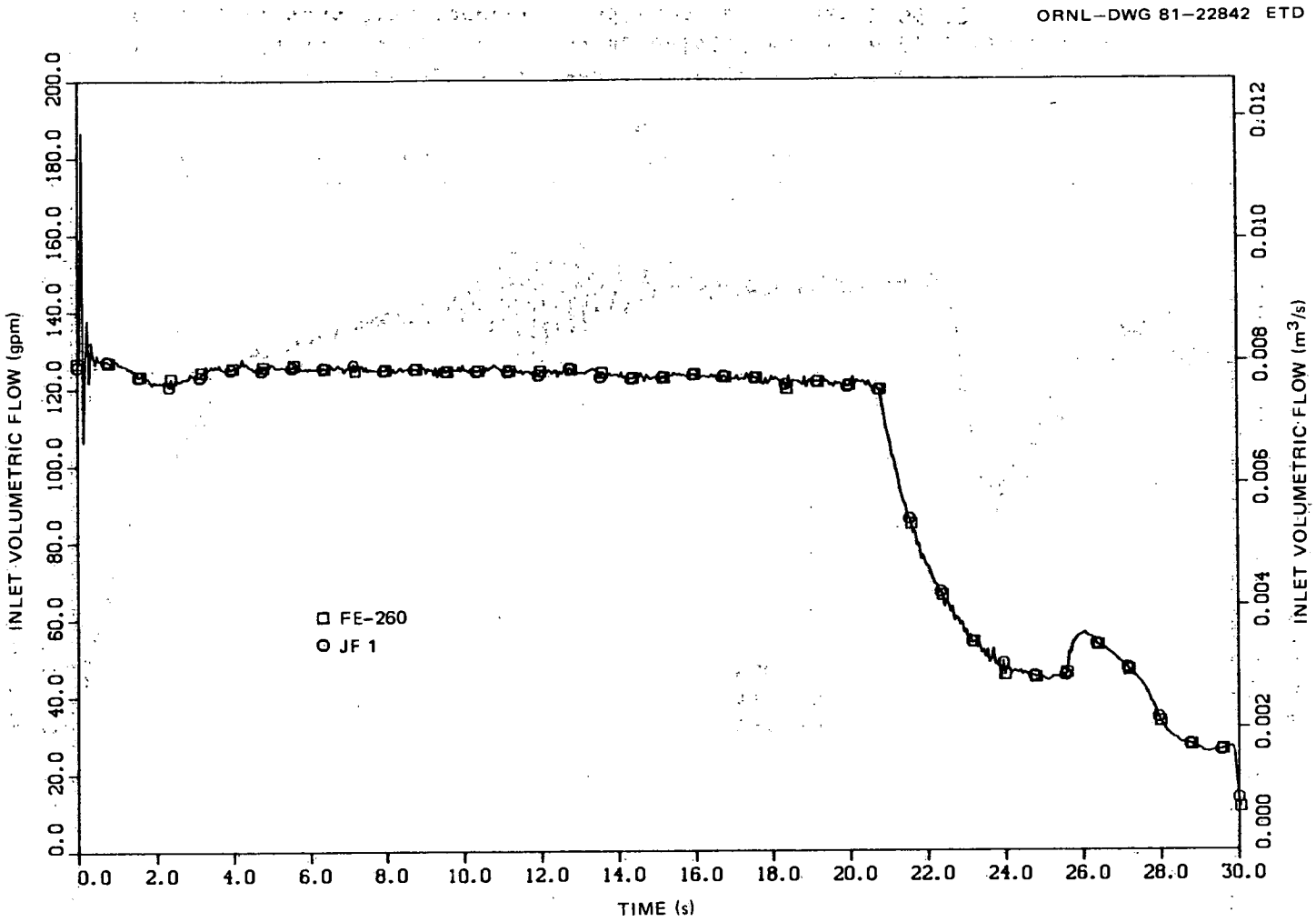

Fig. 5.5. Comparison of measured volumetric flow at test section inlet (□) with volumetric flow calculated one node downstream (Junction 1) of mass flux boundary condition (O) — test 3.08.6C.

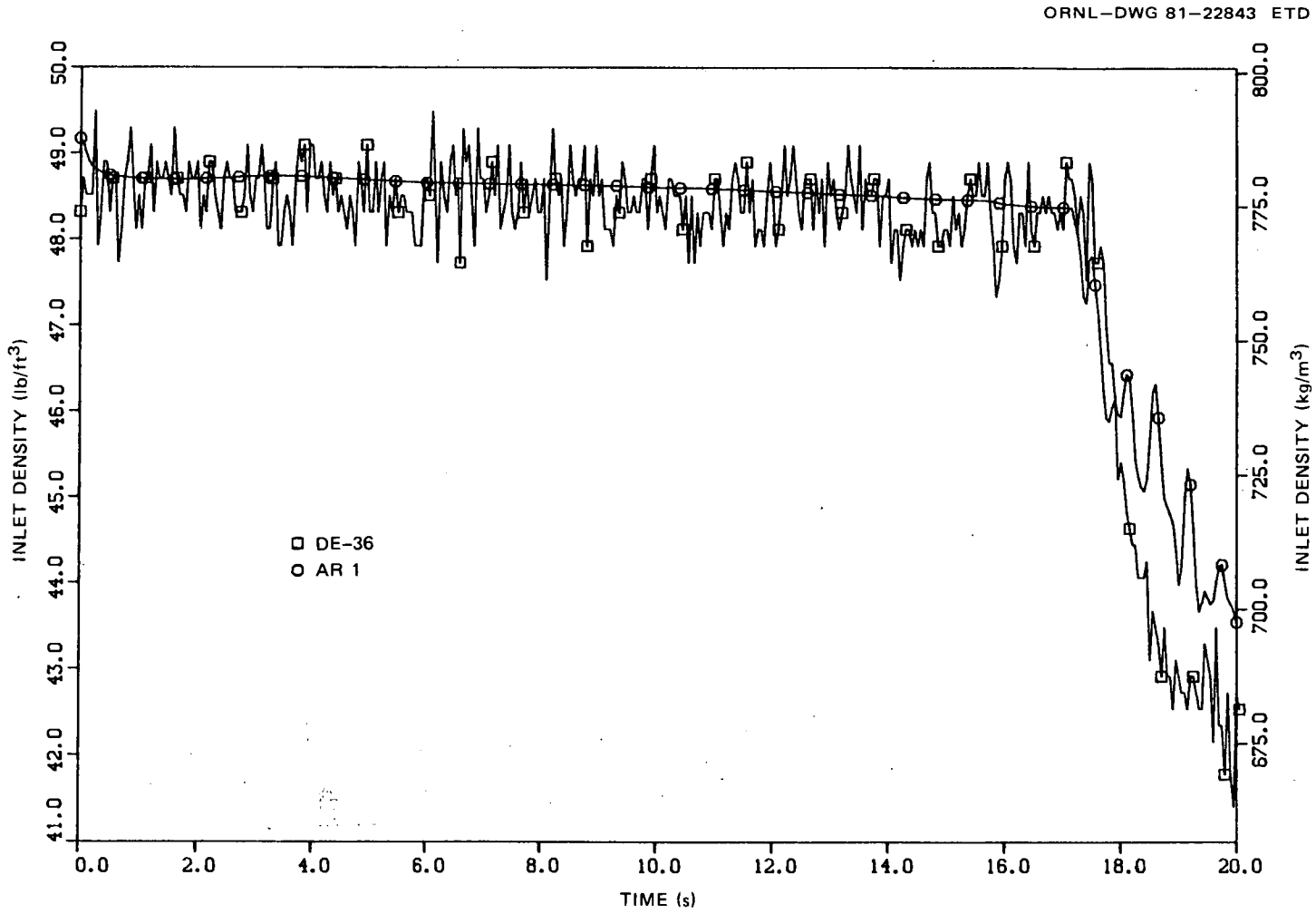

Fig. 5.6. Comparison of measured fluid density at test section inlet (□) with density calculated for node adjacent to mass flux boundary condition (O) — test 3.03.6AR.

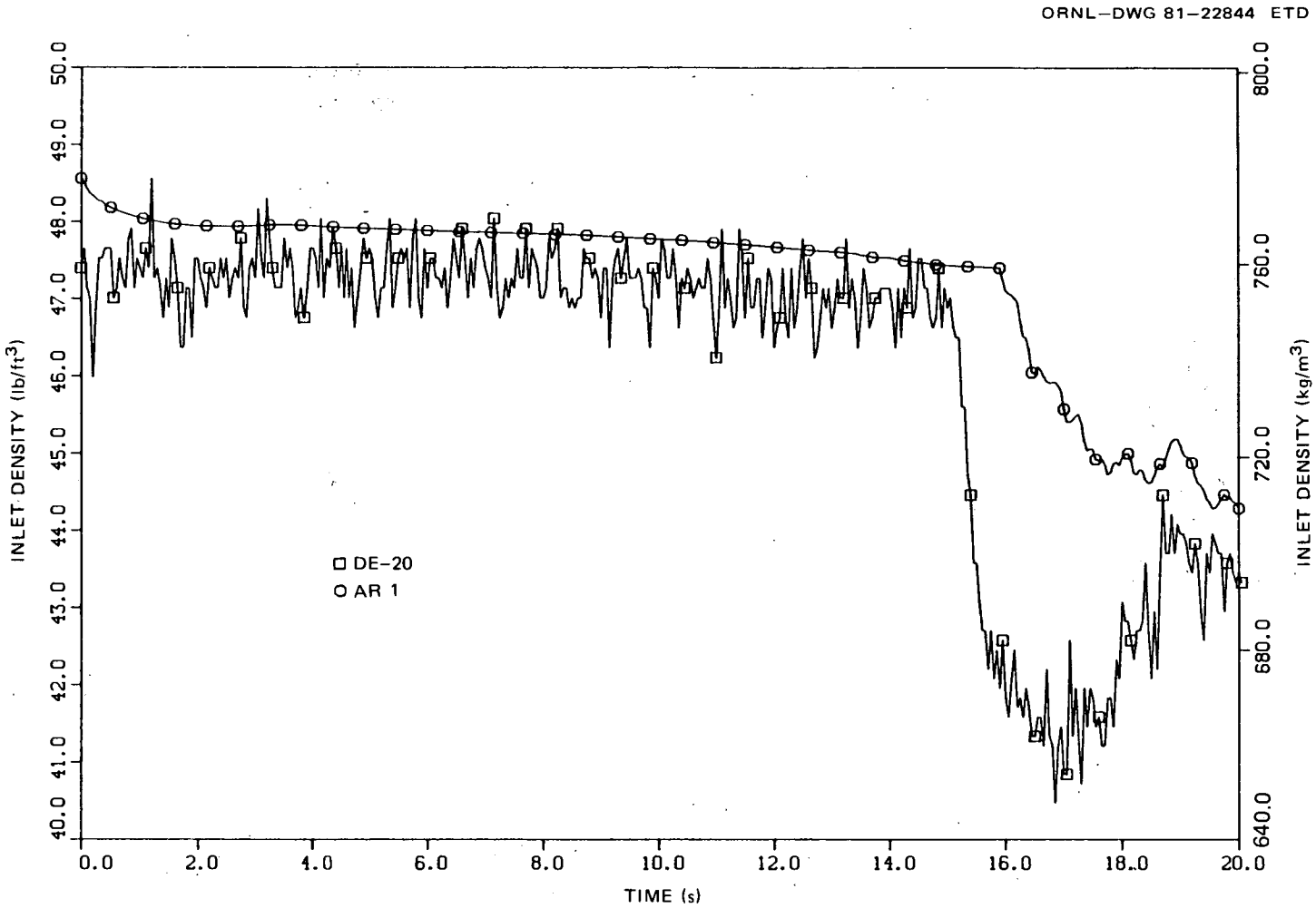

Fig. 5.7. Comparison of measured fluid density at test section inlet (□) with density calculated for node adjacent to mass flux boundary condition (O) – test 3.06.B.

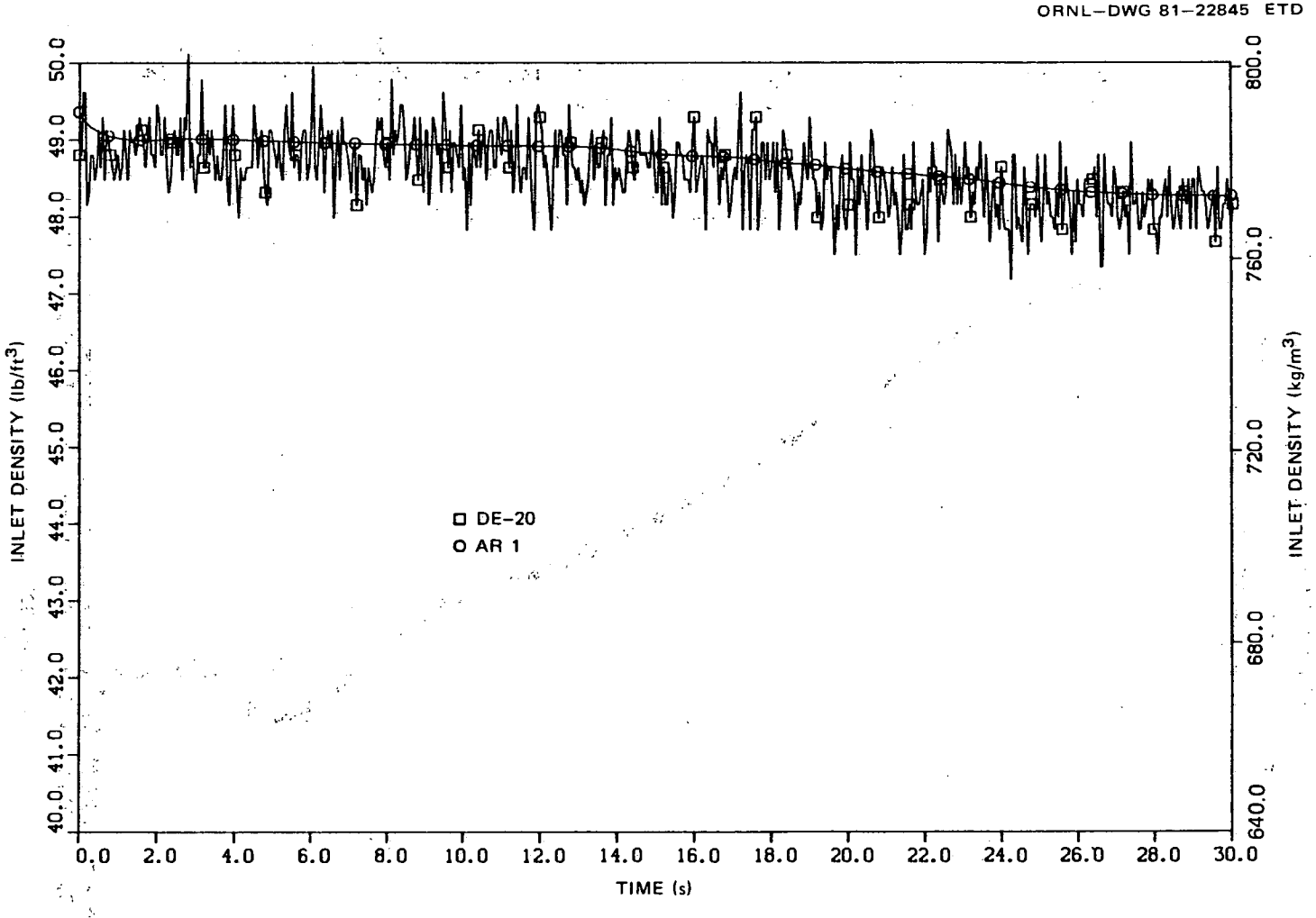

Fig. 5.8. Comparison of measured fluid density at test section inlet (□) with density calculated for node adjacent to mass flux boundary condition (O) – test 3.08.6C.

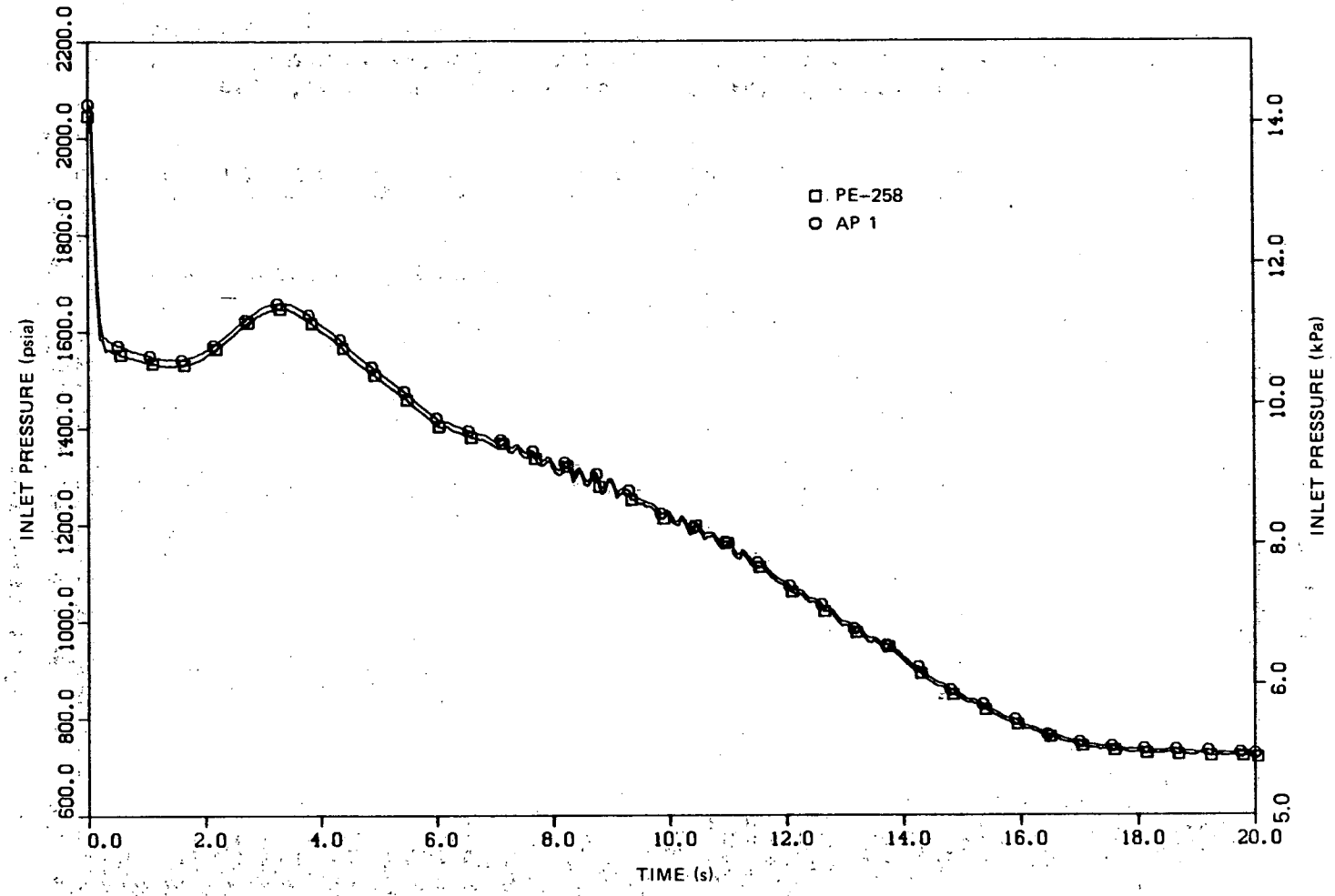

Fig. 5.9. Comparison of measured pressure at test section inlet (□) with pressure calculated for node adjacent to mass flux boundary condition (O) — test 3.06.6AR.

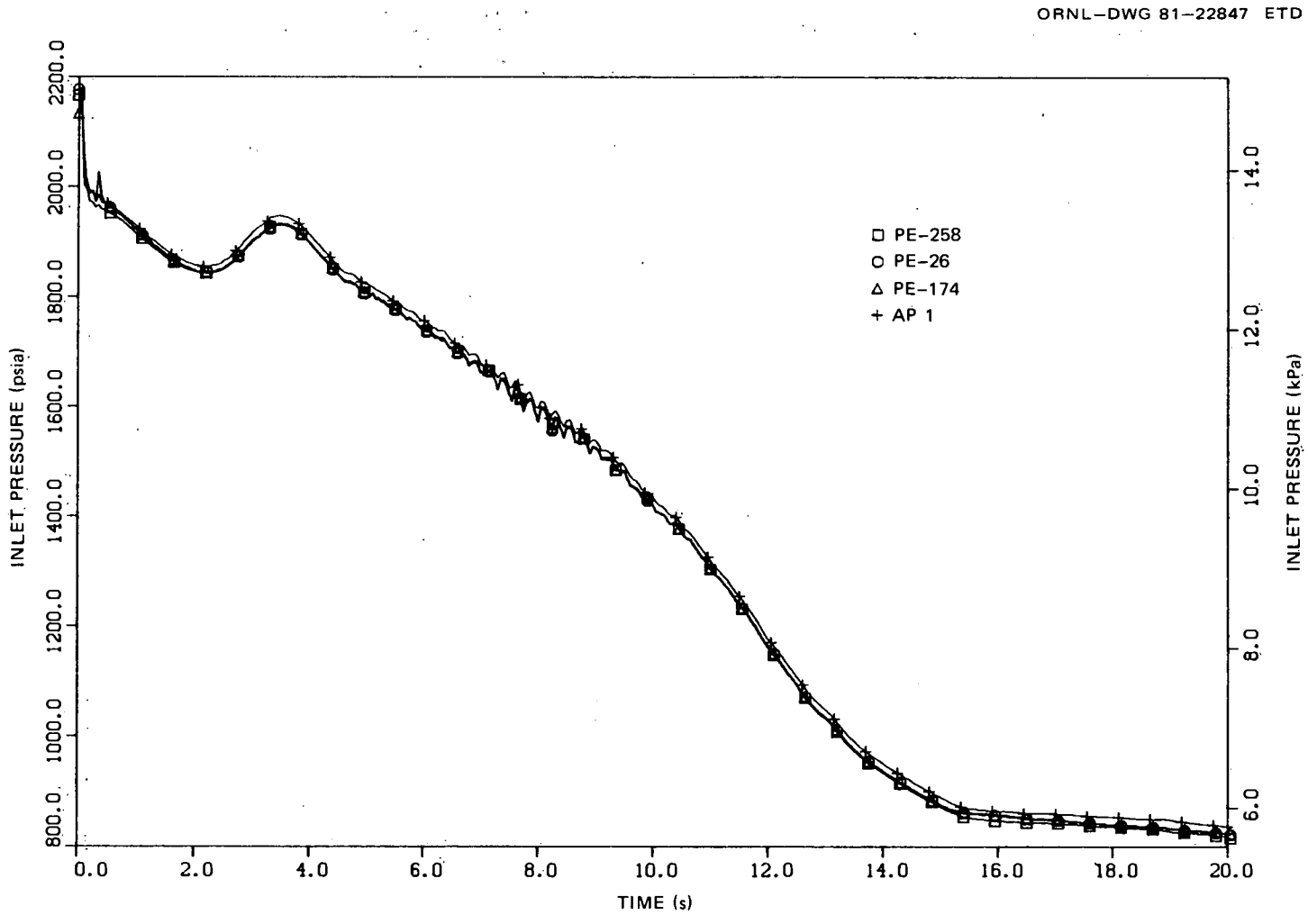

Fig. 5.10. Comparison of measured pressure at test section inlet (□,O,Δ) with pressure calculated for node adjacent to mass flux boundary condition (+) — test 3.06.6B.

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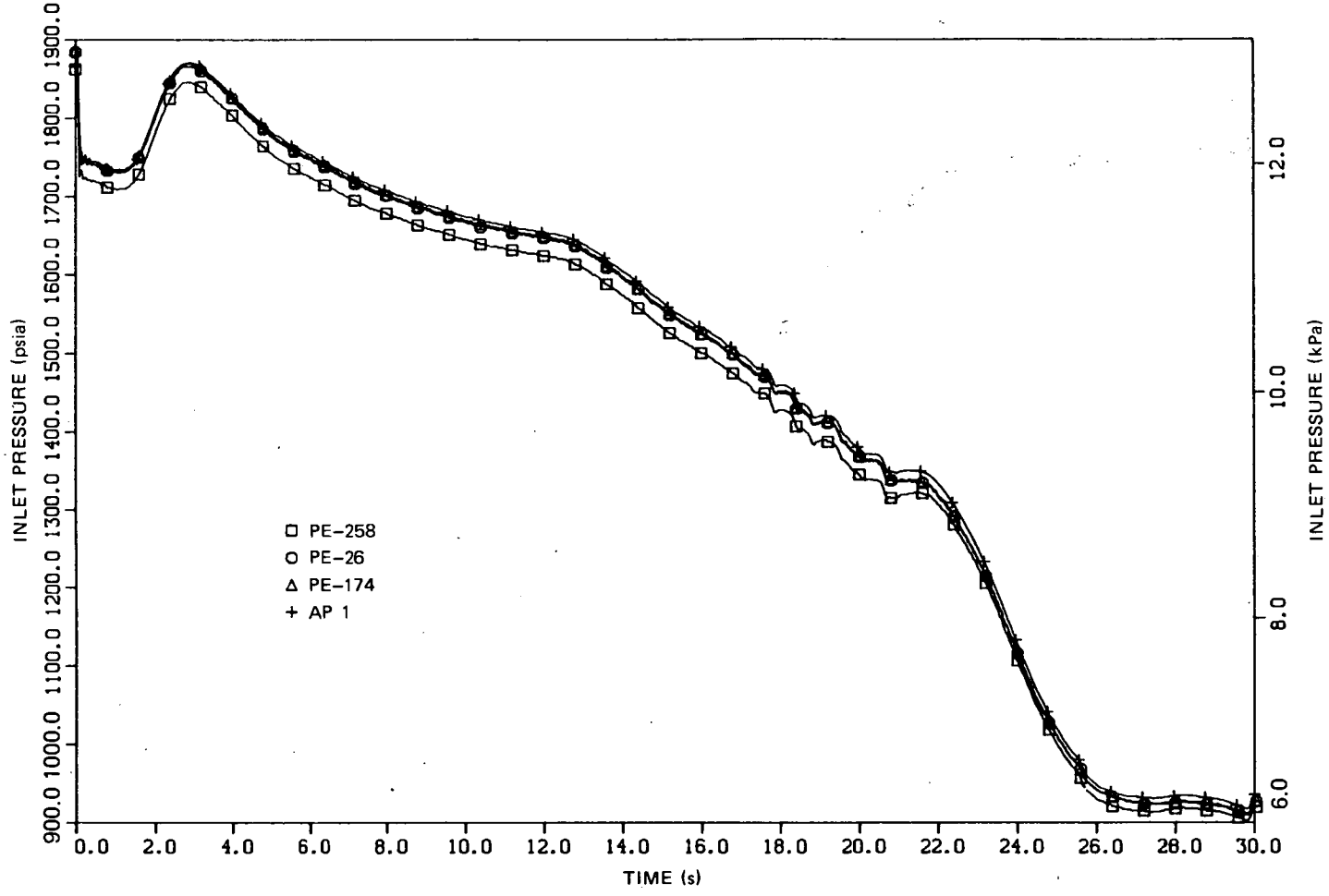

Fig. 5.11. Comparison of measured pressure at test section inlet (□, O,Δ) with pressure calculated for node adjacent to mass flux boundary condition (+) – test 3.08.8C.

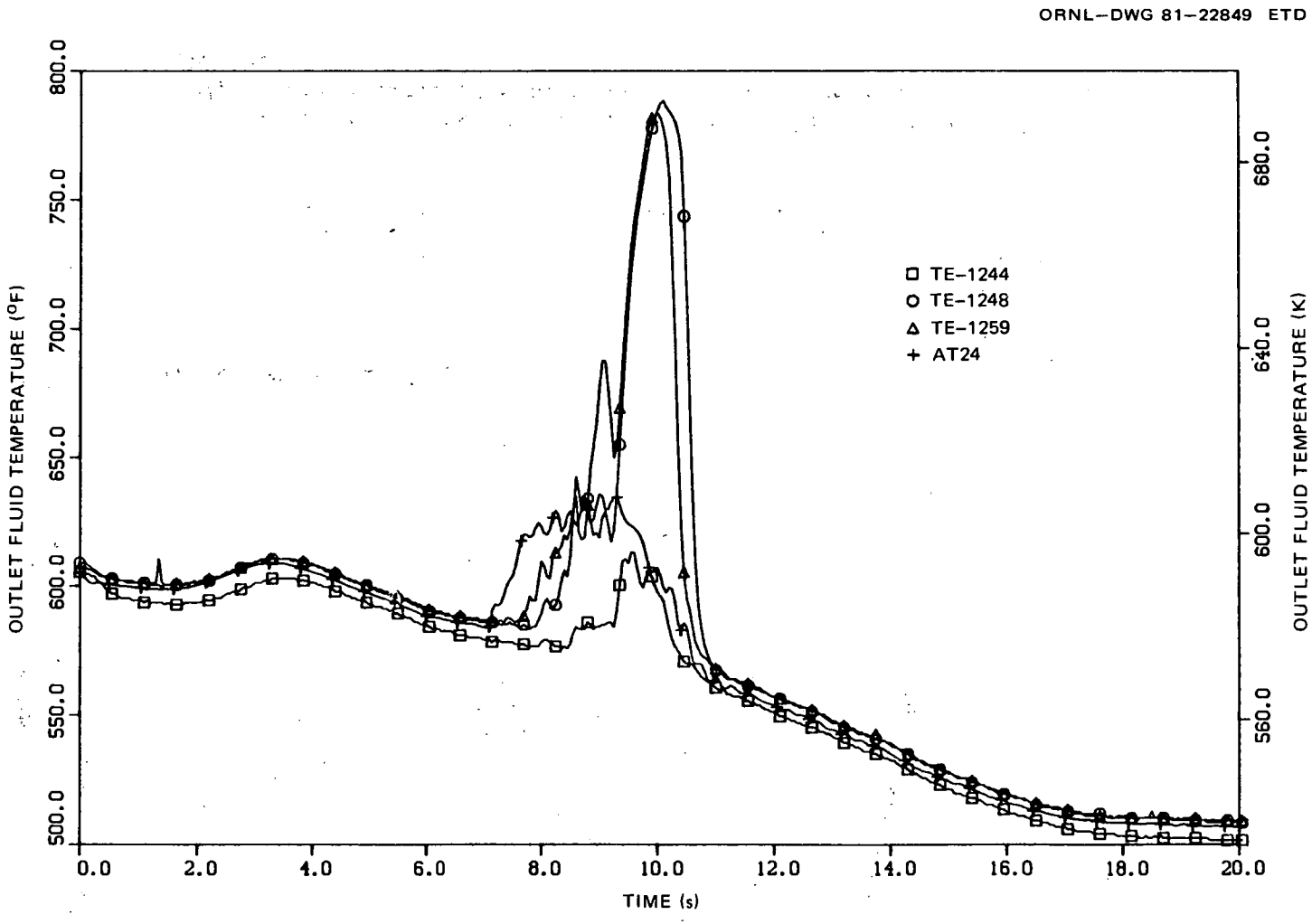

Fig. 5.12. Comparison of upper-bundle fluid thermocouple responses (□,O,Δ) with calculated upper-bundle fluid temperature (+) — test 3.03.6AR.

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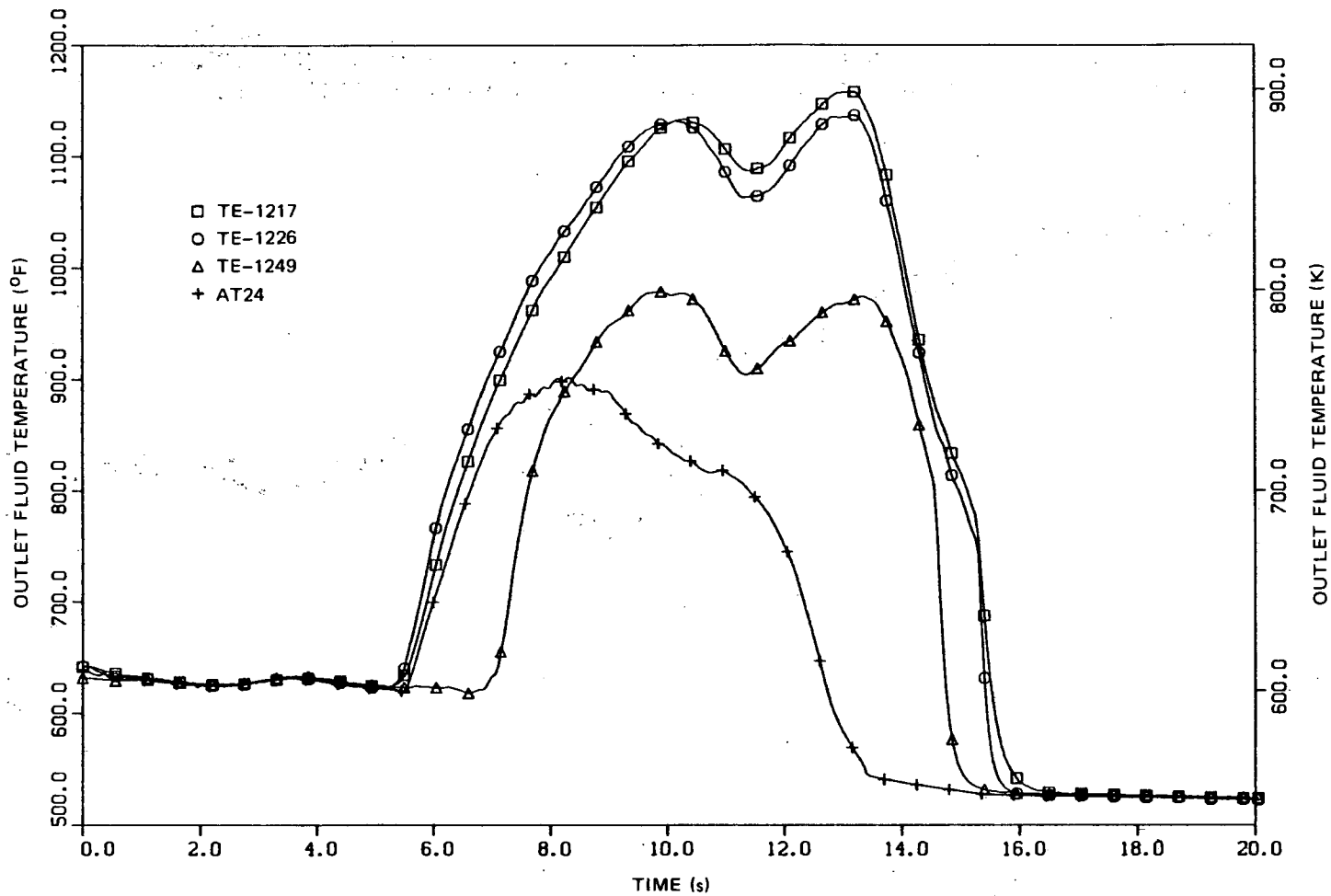

Fig. 5.13. Comparison of upper-bundle fluid thermocouple responses (□,O,Δ) with calculated upper-bundle fluid temperature (+) — test 3.06.6B.

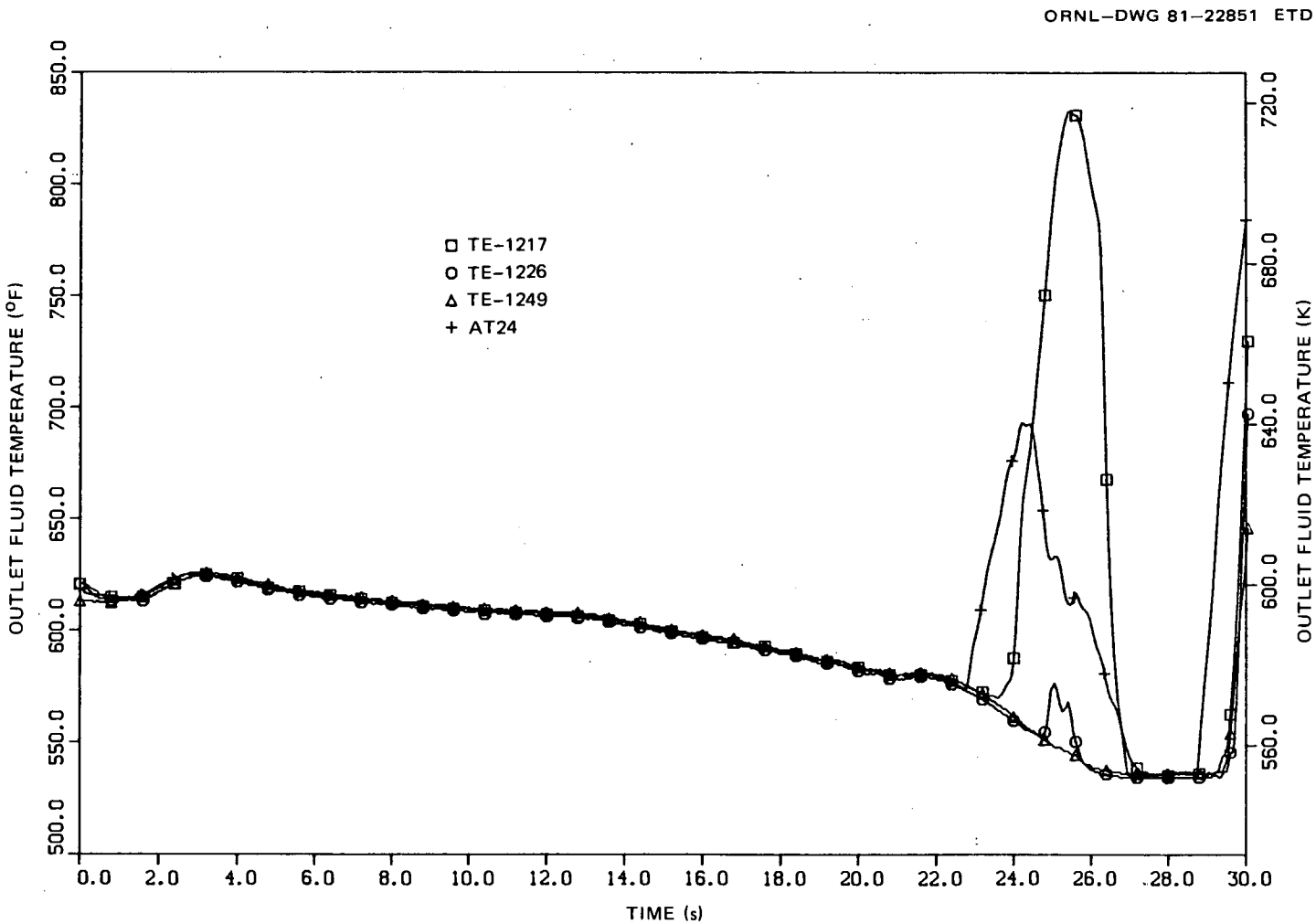

Fig. 5.14. Comparison of upper-bundle fluid thermocouple responses (□,O,Δ) with calculated upper-bundle fluid temperature (+) — test 3.08.6C.

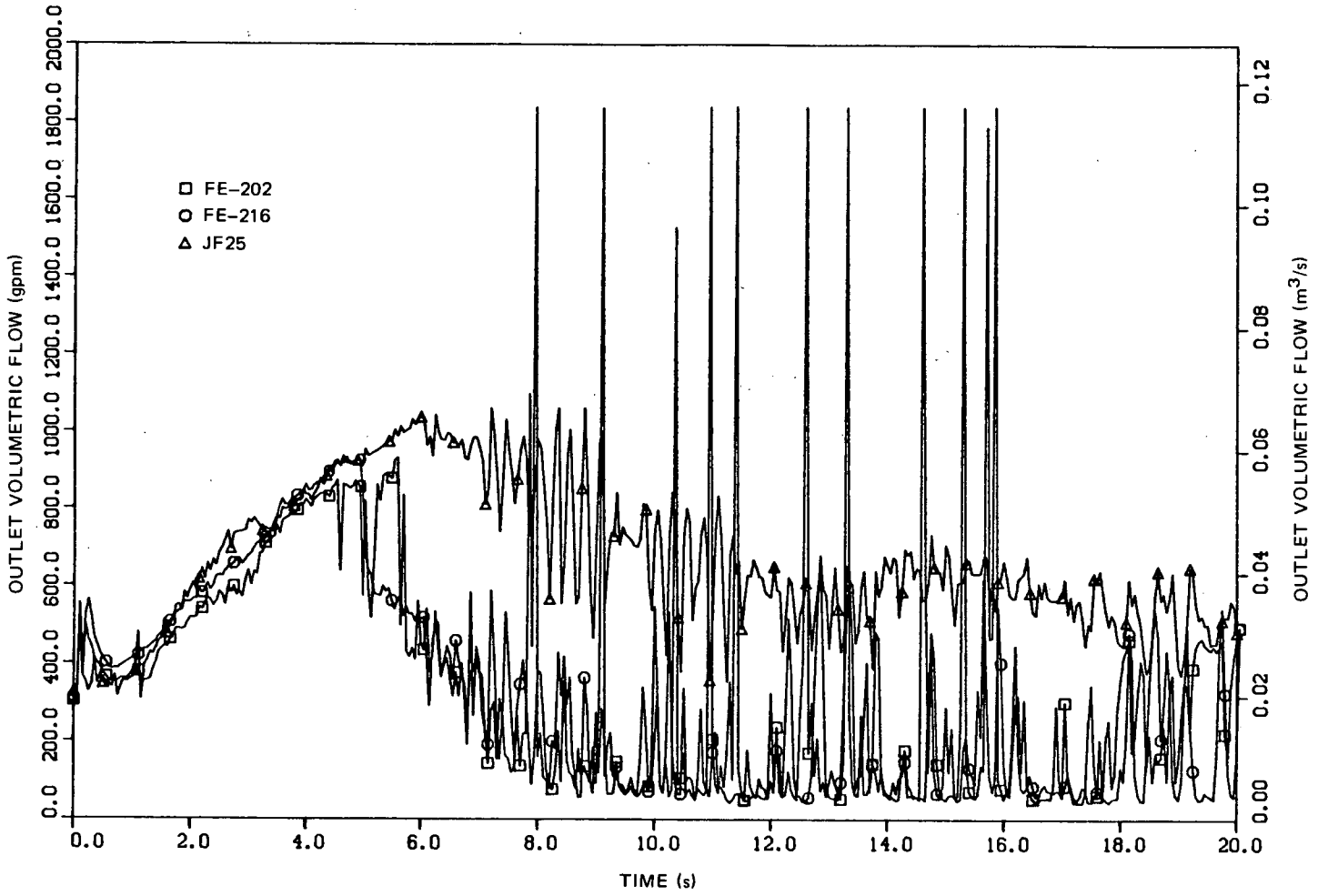

Fig. 5.15. Comparison of measured volumetric flow at test section outlet (□,O) with volumetric flow calculated adjacent to pressure boundary condition (Δ) — test 3.03.6AR (FE-202 and FE-216 failed at ~5 s).

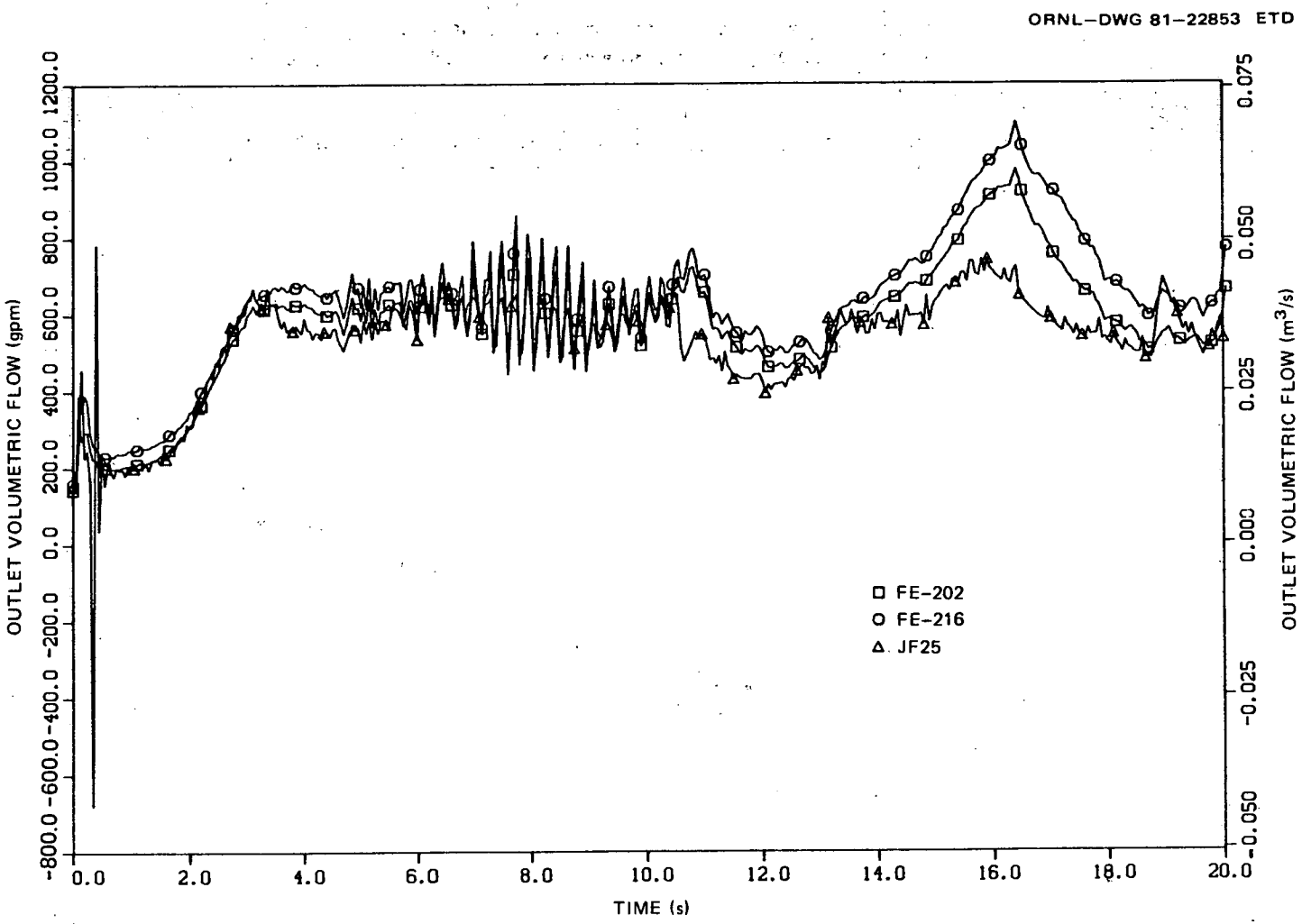

Fig. 5.16. Comparison of measured volumetric flow at test section outlet (□,O) with volumetric flow calculated adjacent to pressure boundary condition (Δ) – test 3.06.6B.

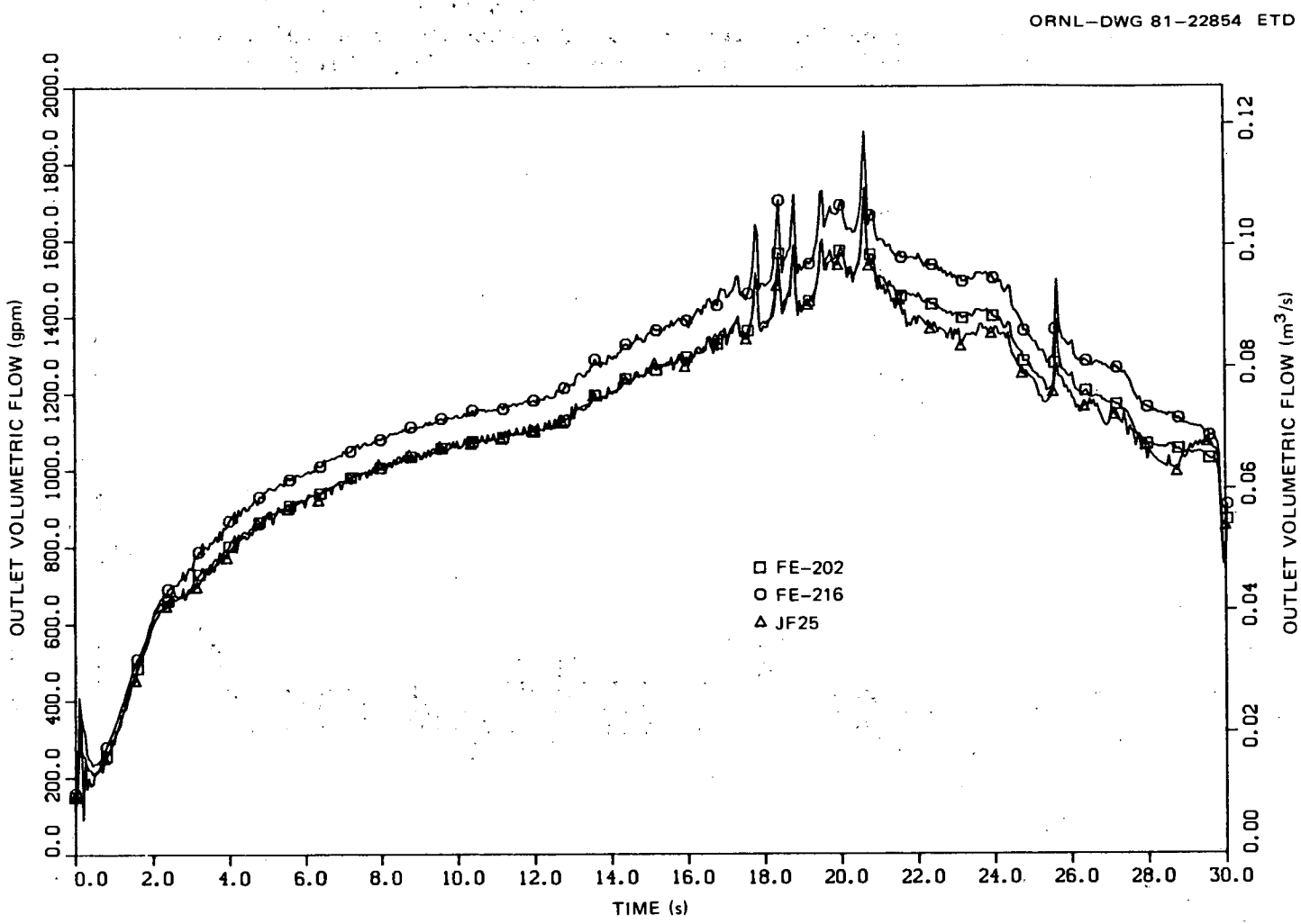

Fig. 5.17. Comparison of measured volumetric flow at test section outlet (□,0) with volumetric flow calculated adjacent to pressure boundary condition (Δ) — test 3.08.6C.

5.1.3 Correlation comparisons

The six dispersed-flow film-boiling correlations evaluated in this report are:

1. Dougall-Rohsenow (Ref. 12) –

$$h = 0.023 \frac{K_g}{D_e} Pr_g^{0.4} \left\{ Re_g \left[X + \frac{\rho_g}{\rho_f} (1 - X) \right] \right\}^{0.8} ,$$

2. Dougall-Rohsenow (with Prandtl number evaluated at the wall temperature, as used in RELAP4-MOD7) (Ref. 13) –

$$h = 0.023 \frac{K_g}{D_e} Pr_w^{0.4} \left\{ Re_g \left[X + \frac{\rho_g}{\rho_f} (1 - X) \right] \right\}^{0.8} ,$$

3. Groeneveld 5.9 (Ref. 14) –

$$h = \frac{0.00327 \frac{K_g}{D_e} Pr_w^{1.32} \left\{ Re_g \left[X + \frac{\rho_g}{\rho_f} (1 - X) \right] \right\}^{0.901}}{\left[1.0 - 0.1 (1 - X)^{0.4} \left(\frac{\rho_f}{\rho_g} - 1 \right)^{0.4} \right]^{1.5}} ,$$

4. Groeneveld 5.7 (Ref. 14) –

$$h = \frac{0.052 \frac{K_g}{D_e} Pr_w^{1.26} \left\{ Re_g \left[X + \frac{\rho_g}{\rho_f} (1 - X) \right] \right\}^{0.688}}{\left[1.0 - 0.1 (1 - X)^{0.4} \left(\frac{\rho_f}{\rho_g} - 1 \right)^{0.4} \right]^{1.06}} ,$$

5. Groeneveld-Delorme* (Ref. 15) –

$$q'' = 0.008348 \frac{K_{fl}}{D_e} Pr_{fl}^{0.6112}$$

$$\times \left\{ Re_{fl} \left[X_a + \frac{\rho_{g,a}}{\rho_f} (1 - X_a) \right] \right\}^{0.8774} (T_w - T_a) ,$$

6. Condie-Bengston IV (Ref. 16) –

$$q'' = 0.00128 \frac{K_g^{0.4593} Pr_w^{2.2598}}{D_e^{0.8095} (1 + X)^{2.0514}}$$

$$\times Re_g^{[0.6249+0.2043 \ln (X+1)]} (T_w - T_s) ,$$

where

h = heat transfer coefficient, kW/m²·K;
K = thermal conductivity, kW/m·K;
G = total mass flux, kg/m²·s;
D_e = equivalent diameter, m;
q'' = heat flux, kW/m²;
Pr = Prandtl number, dimensionless;
Re = Reynolds number, dimensionless ($G\ De/\mu$);
μ = viscosity, kg/m²;
X = quality;
ρ = density, kg/m³;

with subscripts

g = saturated vapor conditions;
f = saturated liquid conditions;
fl = film;
s = saturated conditions;
w = wall.

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*Note that X_a and T_a are the nonequilibrium quality and vapor temperature and are determined from an empirical formula given by Groeneveld and Delorme; $\rho_{g,a}$ is actual vapor density.

The parameter ranges over which these correlations were developed are summarized in Table 4.

Comparisons (in the form of a ratio: h_{cor}/h_{exp} or q''_{cor}/q''_{exp} vs equilibrium quality, pressure, and mass flux) of calculated and measured level-average heat transfer coefficients (or heat fluxes) are shown in Figs. 5.18–5.71. Based on the uncertainty analysis of test 3.06.6B (presented in Sect. 5.2), the uncertainty (defined as one standard deviation) in the ratio of h_{cor}/h_{exp} for the Dougall-Rohsenow, Groeneveld 5.7, and Groeneveld 5.9 correlations is on the order of 20%. The correlations were evaluated during film boiling. Data for film-boiling analysis were selected from the portions of the transients where the flow remained unidirectional and the inlet fluid was subcooled. Under these circumstances, the calculated equilibrium bundle fluid conditions are most accurate. Film boiling was assumed when the superheat on the wall ($T_{surf} - T_{fluid}$) was 220 K (400°F) or greater. The Dougall-Rohsenow, Dougall-Rohsenow (wall Pr), Groeneveld 5.7, and Groeneveld 5.9 correlations were evaluated over their applicable equilibrium quality range of 0 to 1. The Groeneveld-Delorme and Condie-Bengston correlations were evaluated over the equilibrium quality range 0 to 1 and above 1 as they are intended. For the correlation comparisons presented, the dryout point was located ~183, 93, and 212 cm (~6, 3, and 7 ft) from the bottom of the heated length in tests 3.03.6AR, 3.06.6B, and 3.08.6C, respectively. The exact location of the dryout point cannot be determined and is, in fact, rarely clearly defined in a rod bundle. The relationship between equilibrium quality and pressure during film boiling is shown in Figs. 5.72–5.74 for the thermocouple levels used in the correlation evaluations.

Care must be exercised in interpreting the results of the correlation comparisons as they are presented here, since h_{cor}/h_{exp} (q''_{cor}/q''_{exp}) is a function of many independent variables. Thus, when h_{cor}/h_{exp} (q''_{cor}/q''_{exp}) is plotted vs a particular variable, the other variables change simultaneously with the variable represented on the abscissa.

The comparisons of the Dougall-Rohsenow correlations (Figs. 5.18–5.35) show that the correlations often predict high heat transfer coefficients. The Dougall-Rohsenow correlation using the wall Prandtl number predicts heat transfer coefficients that are ~25% lower than those of the Dougall-Rohsenow correlation using the saturated vapor Prandtl number. The high predictions by the Dougall-Rohsenow correlations are probably due, at least in part, to the thermodynamic nonequilibrium in the flow. Since the Dougall-Rohsenow correlations are basically a Dittus-Boelter[24] correlation for the vapor (ignoring the entrained dispersed droplets), using equilibrium quality will result in an error in the vapor Reynolds number and hence the heat transfer coefficient. In addition, Anklam[25] has shown that the Dittus-Boelter correlation overpredicts the convective heat transfer to superheated single-phase steam in a rod bundle for low turbulent flows when the ratio of the wall to vapor temperature is greater than ~1.2.

The Dougall-Rohsenow correlations do not perform significantly better in the analysis of data from test 3.08.6C than in the analysis of data from tests 3.03.6AR and 3.06.6B. Because thermodynamic nonequilibrium effects are much less significant in test 3.08.6C than in tests 3.03.6AR

Table 4. Correlation development parameter ranges

Correlation	Fluid	Geometry	Heat flux [kW/m² (Btu/h·ft²)]	Mass flux [kg/m²·s (lb_m/h·ft²)]	Pressure [MPa (psi)]	Quality (%)
Groeneveld 5.7	Water	Annuli	450–2250 (1.43 x 10^5–7.14 x 10^5)	800–4100 (5.90 x 10^5–3.02 x 10^6)	3.4–10 (493–1450)	10–90
Groeneveld 5.9	Water	Tube and annuli	120–2250 (3.80 x 10^4–7.14 x 10^5)	700–5300 (5.16 x 10^5–3.91 x 10^6)	3.4–21.5 (493–3117)	10–90
Condie-Bengston IV	Water	Tube	34–2074 (1.08 x 10^4–6.58 x 10^5)	16.5–5234 (1.22 x 10^4–3.86 x 10^6)	0.42–21.5 (61–3117)	−12–173
Dittus-Boelter (Dougall-Rohsenow)[a]	Gases and liquids	Tube	Not reported	Gases: 0.976–32.5 (7.20 x 10^2–2.40 x 10^4)	Gases: 0.010–1.31 (1.5–190)	Single phase
Groeneveld-Delorme	Water	Tube	30–2100 (9.52 x 10^3–6.67 x 10^5)	30–5200 (9.58 x 10^4–3.83 x 10^6)	0.70–21.5 (102–3117)	−12–309

[a]Dougall-Rohsenow correlation was theoretically derived from the single-phase Dittus-Boelter[24] correlation.

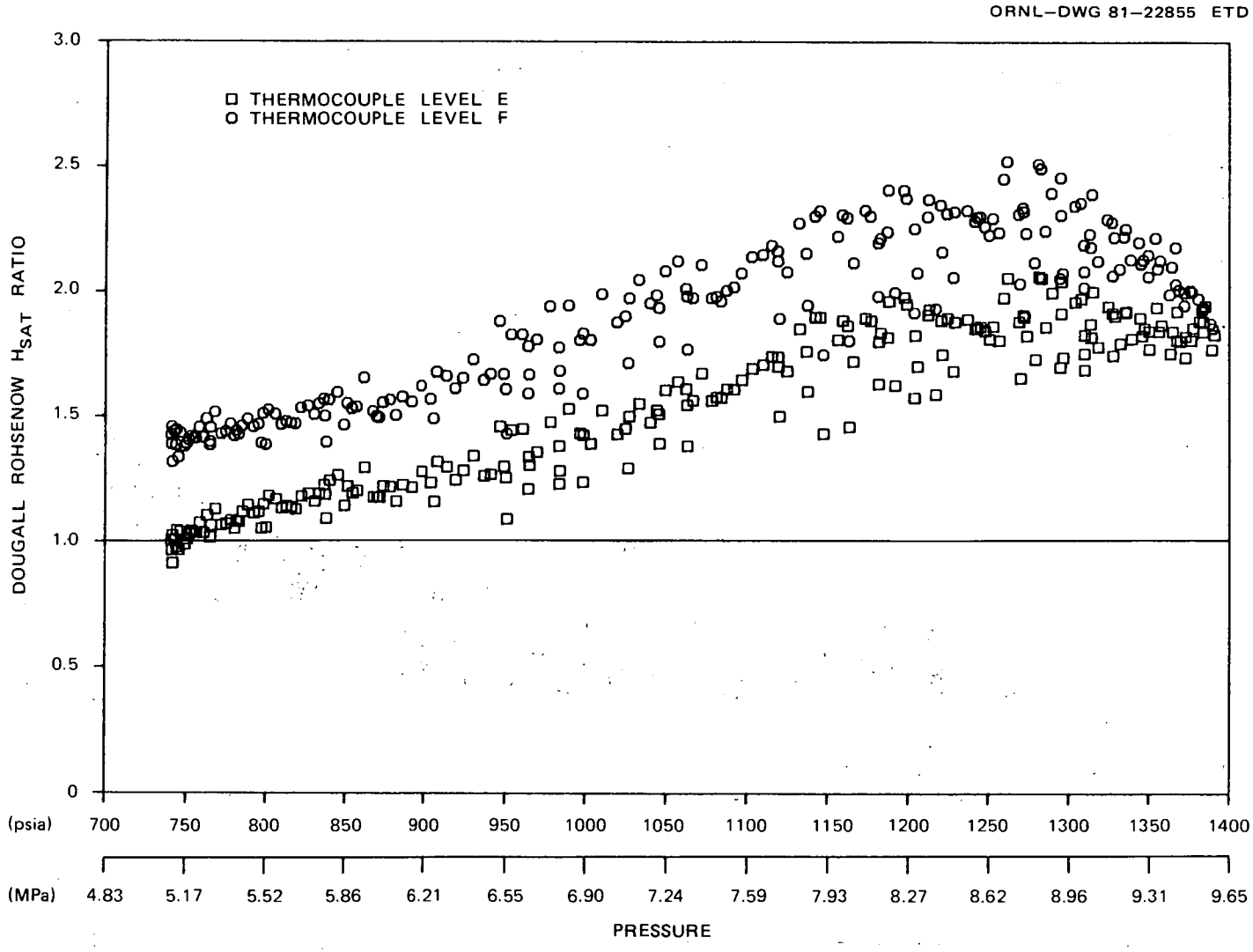

Fig. 5.18. Ratio of h_{cor} to h_{exp} vs pressure for Dougall-Rohsenow correlation — test 3.03.6AR.

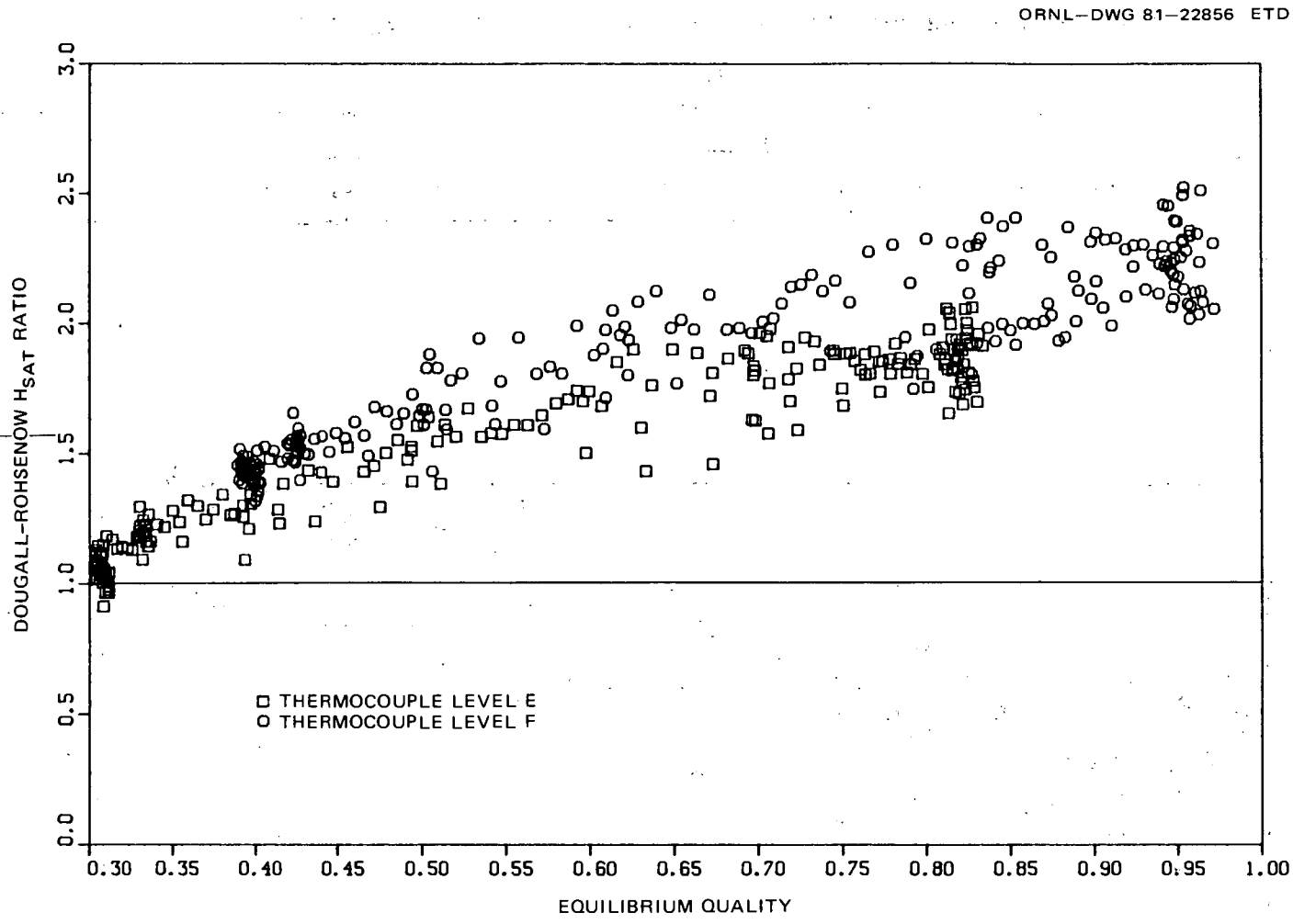

Fig. 5.19. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Dougall-Rohsenow correlation — test 3.03.6AR.

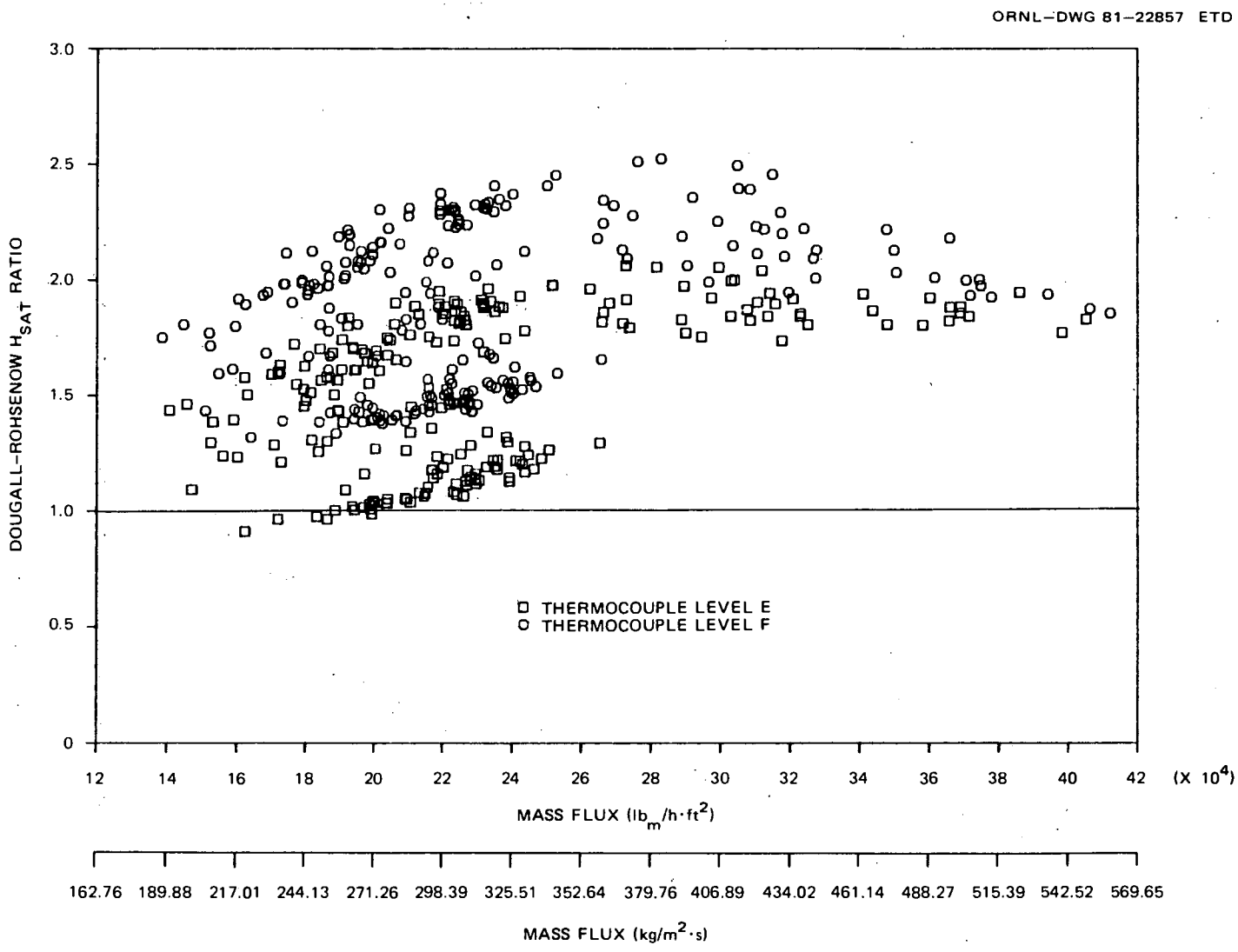

Fig. 5.20. Ratio of h_{cor} to h_{exp} vs mass flux for Dougall-Rohsenow correlation – test 3.03.6AR.

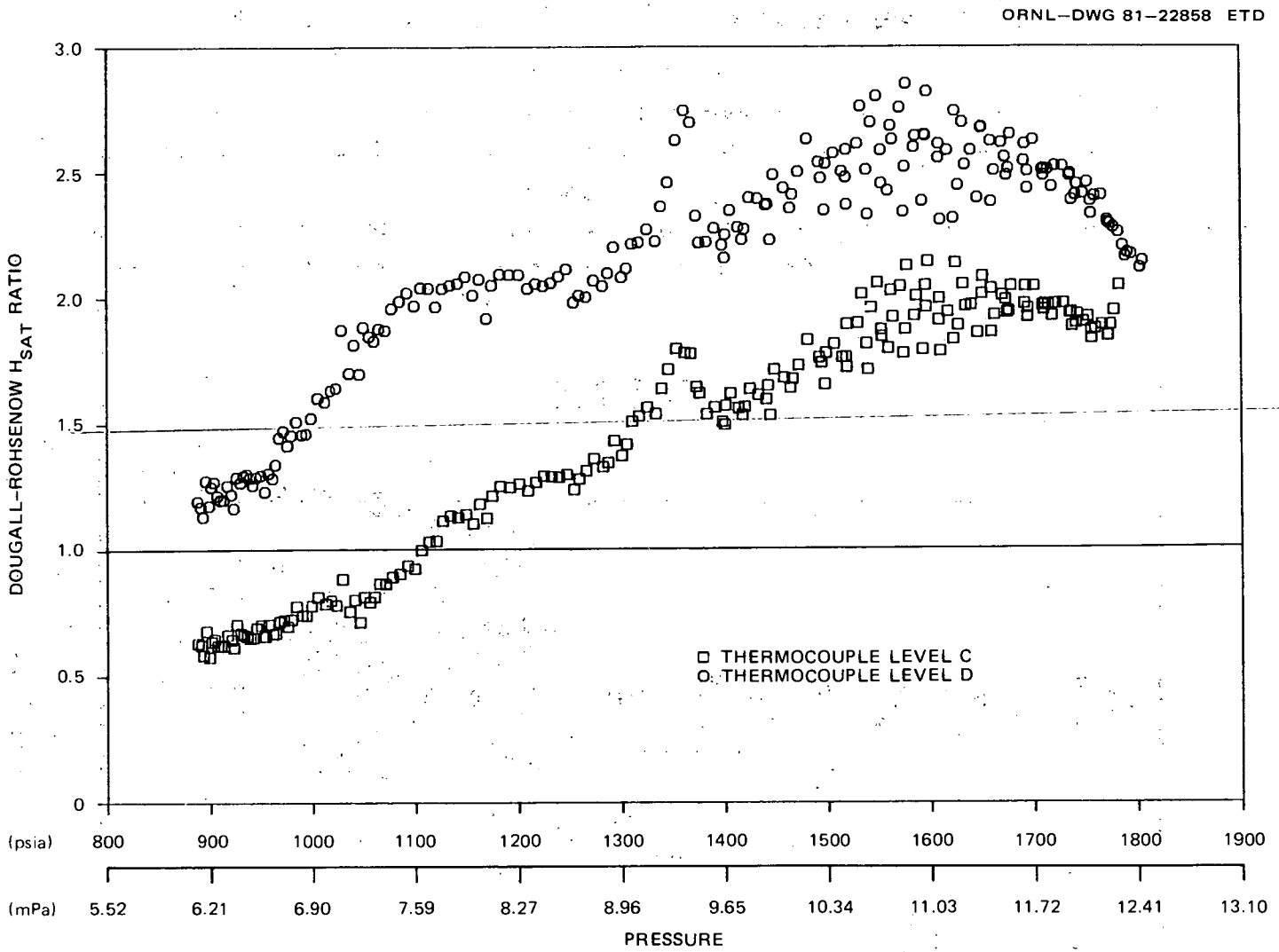

Fig. 5.21. Ratio of h_{cor} to h_{exp} vs pressure for Dougall-Rohsenow correlation — test 3.06.6B.

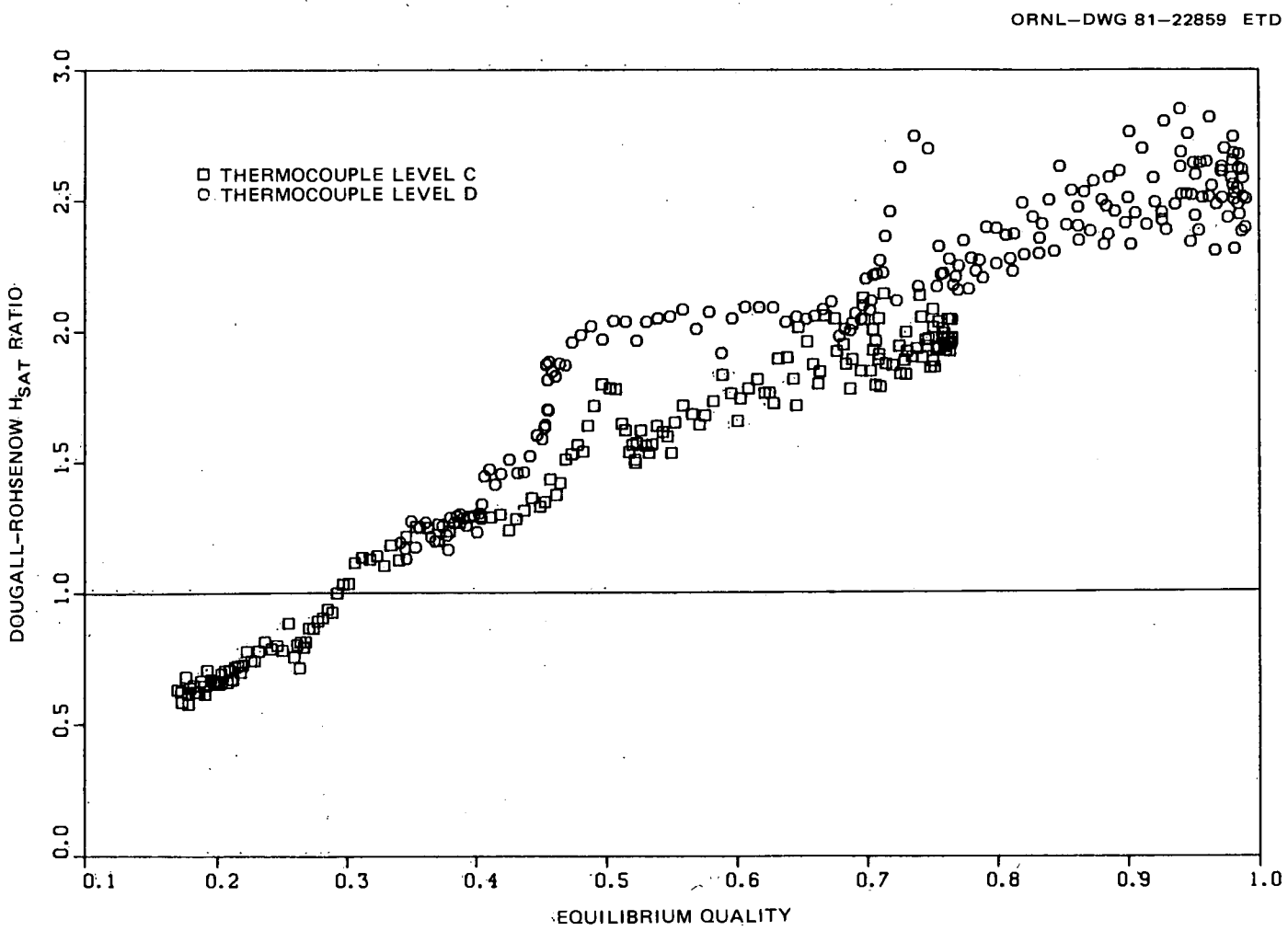

Fig. 5.22. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Dougall-Rohsenow correlation – test 3.06.6B.

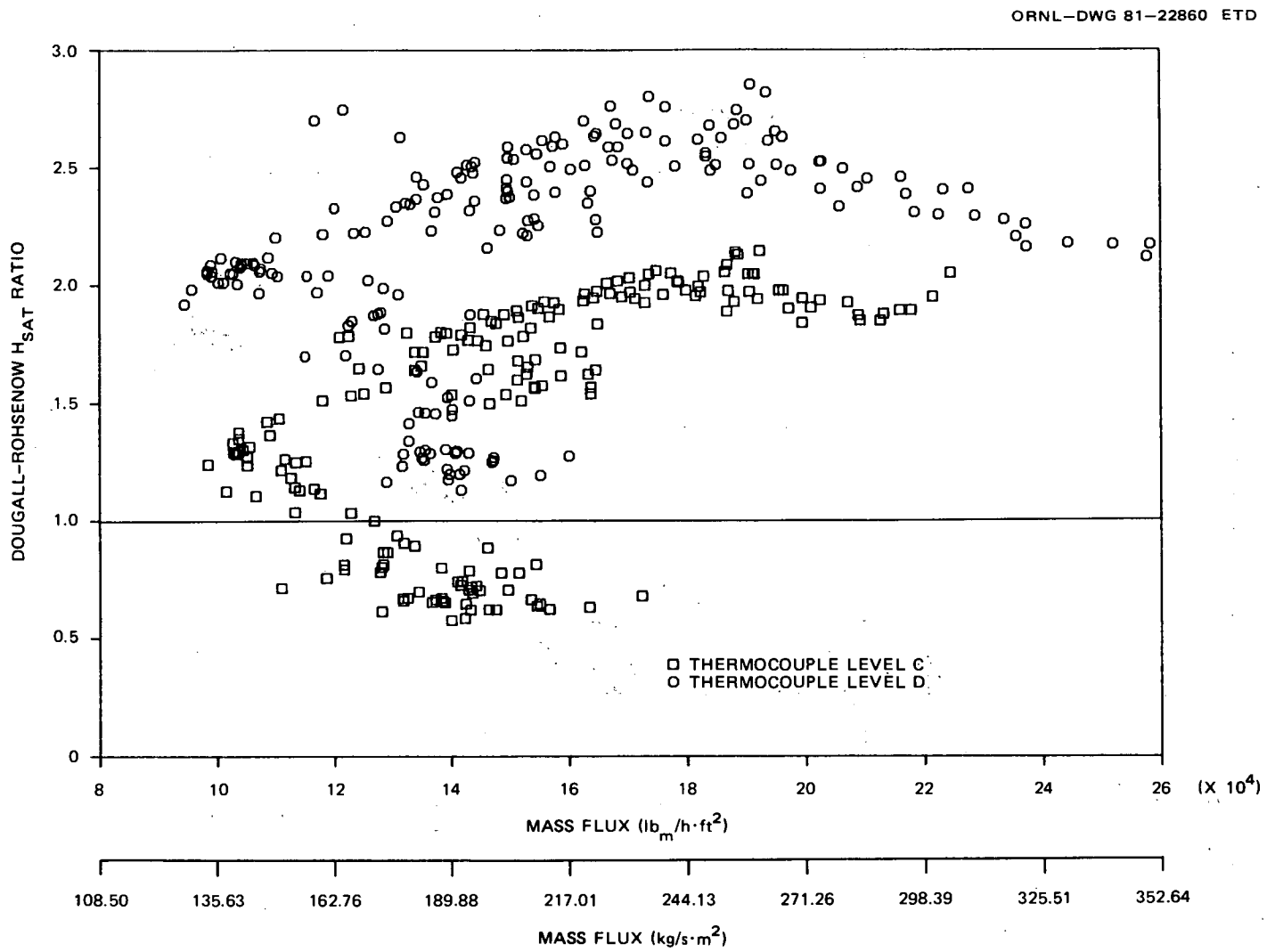

Fig. 5.23. Ratio of h_{cor} to h_{exp} vs mass flux for Dougall-Rohsenow correlation — test 3.06.6B.

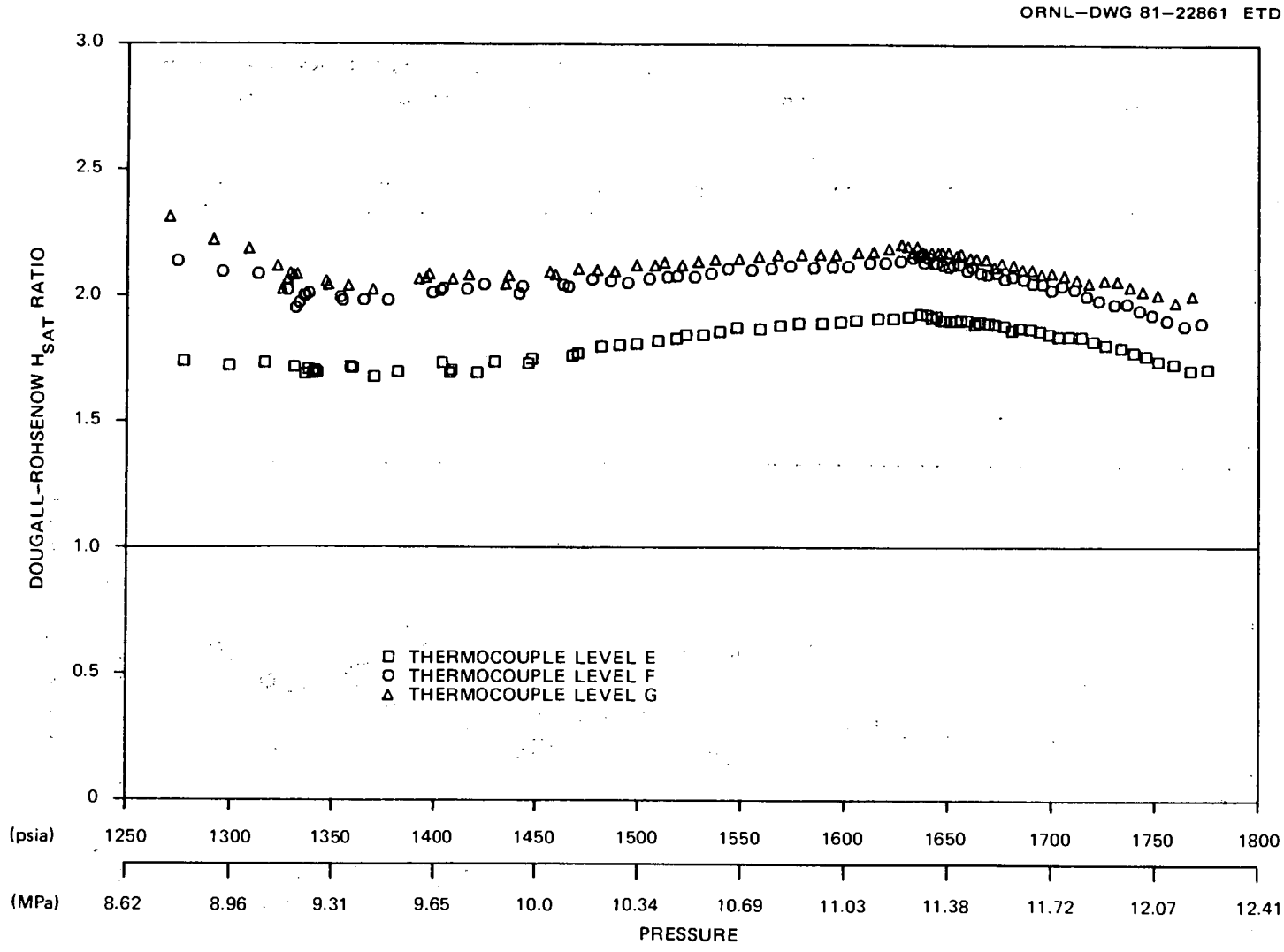

Fig. 5.24. Ratio of h_{cor} to h_{exp} vs pressure for Dougall-Rohsenow correlation — test 3.08.6C.

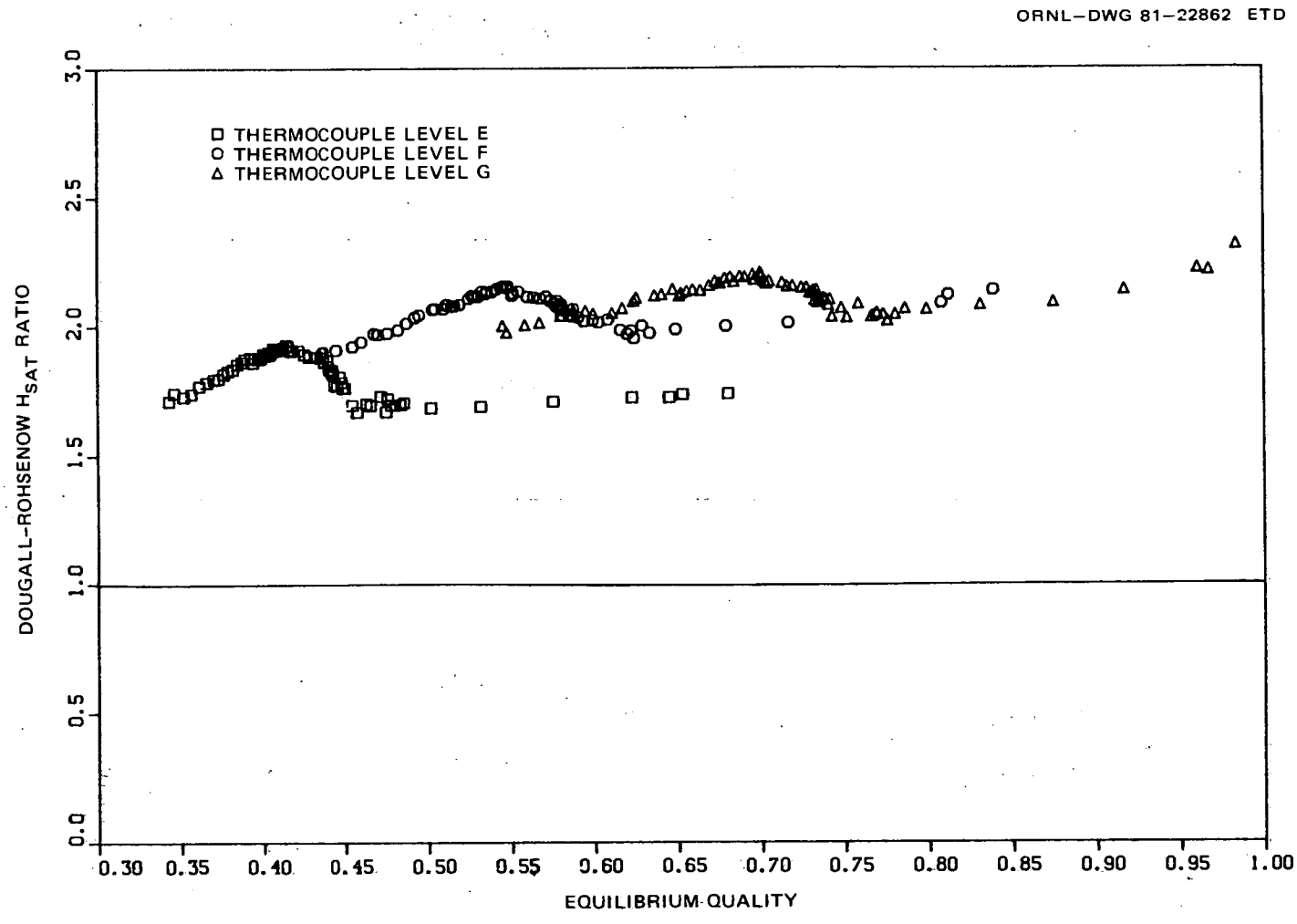

Fig. 5.25. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Dougall-Rohsenow correlation — test 3.08.6C.

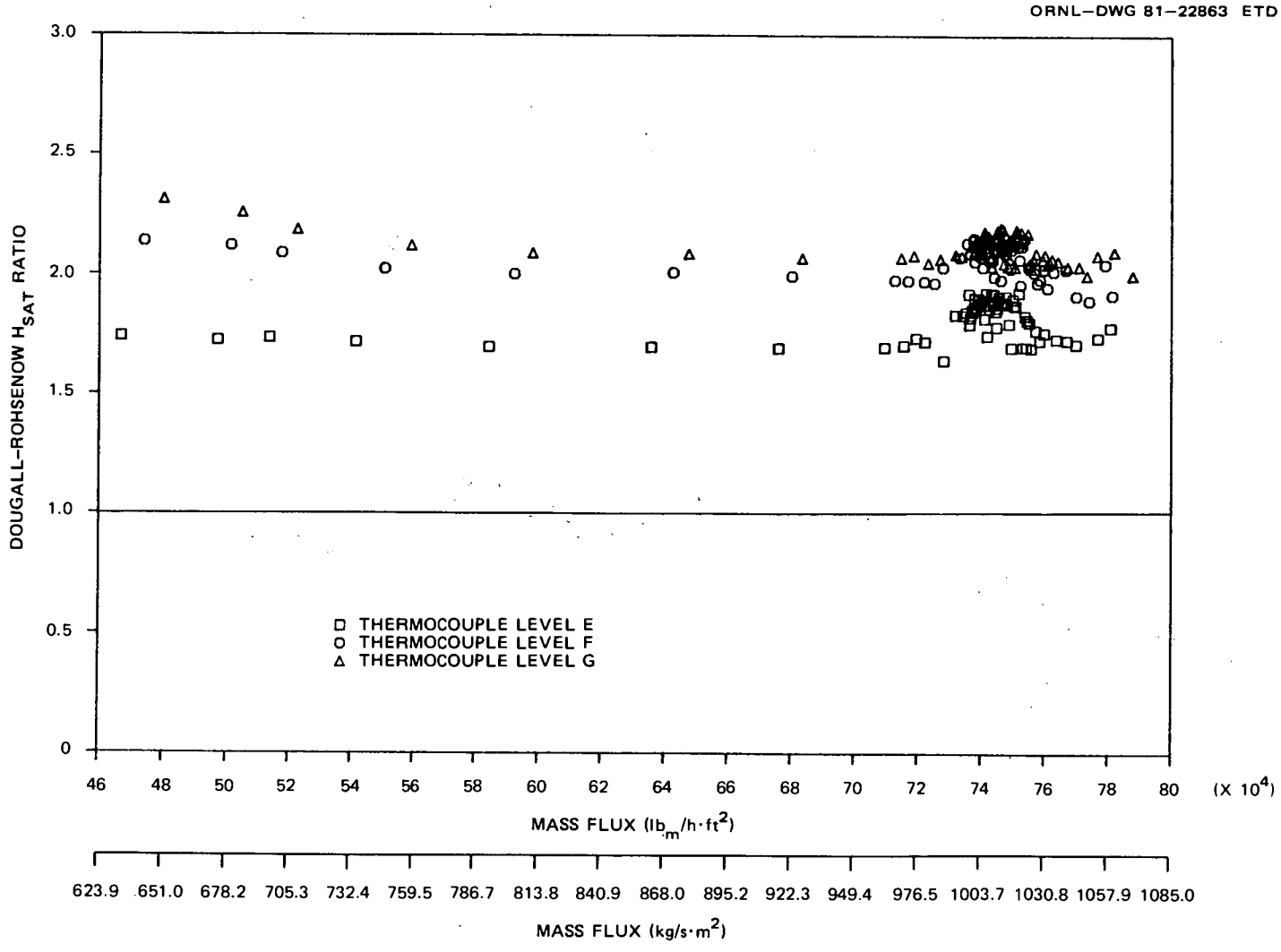

Fig. 5.26. Ratio of h_{cor} to h_{exp} vs mass flux for Dougall-Rohsenow correlation — test 3.08.6C.

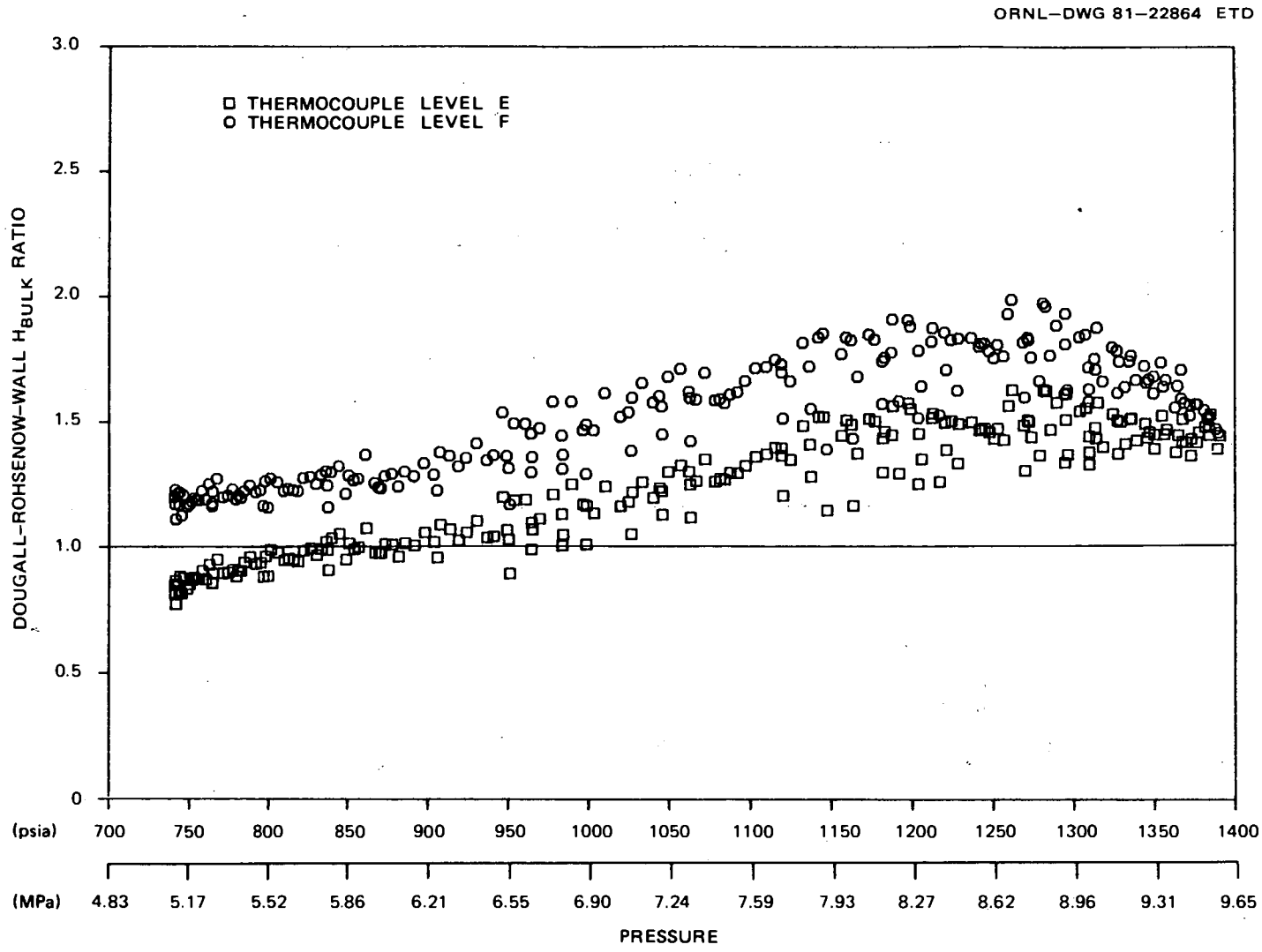

Fig. 5.27. Ratio of h_{cor} to h_{exp} vs pressure for Dougall-Rohsenow correlation (wall Pr) – test 3.03.6AR.

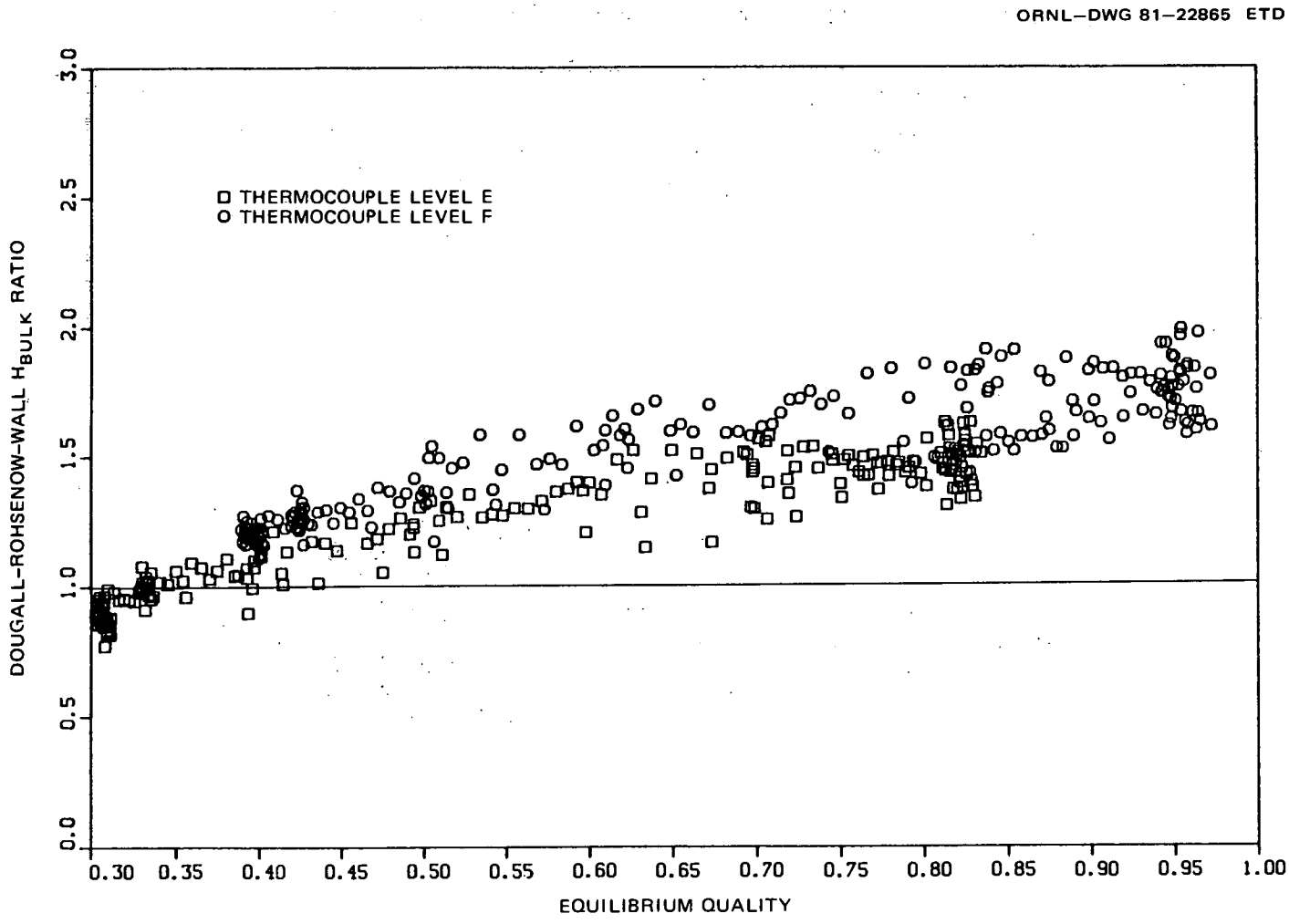

Fig. 5.28. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Dougall-Rohsenow correlation (wall Pr) – test 3.03.6AR.

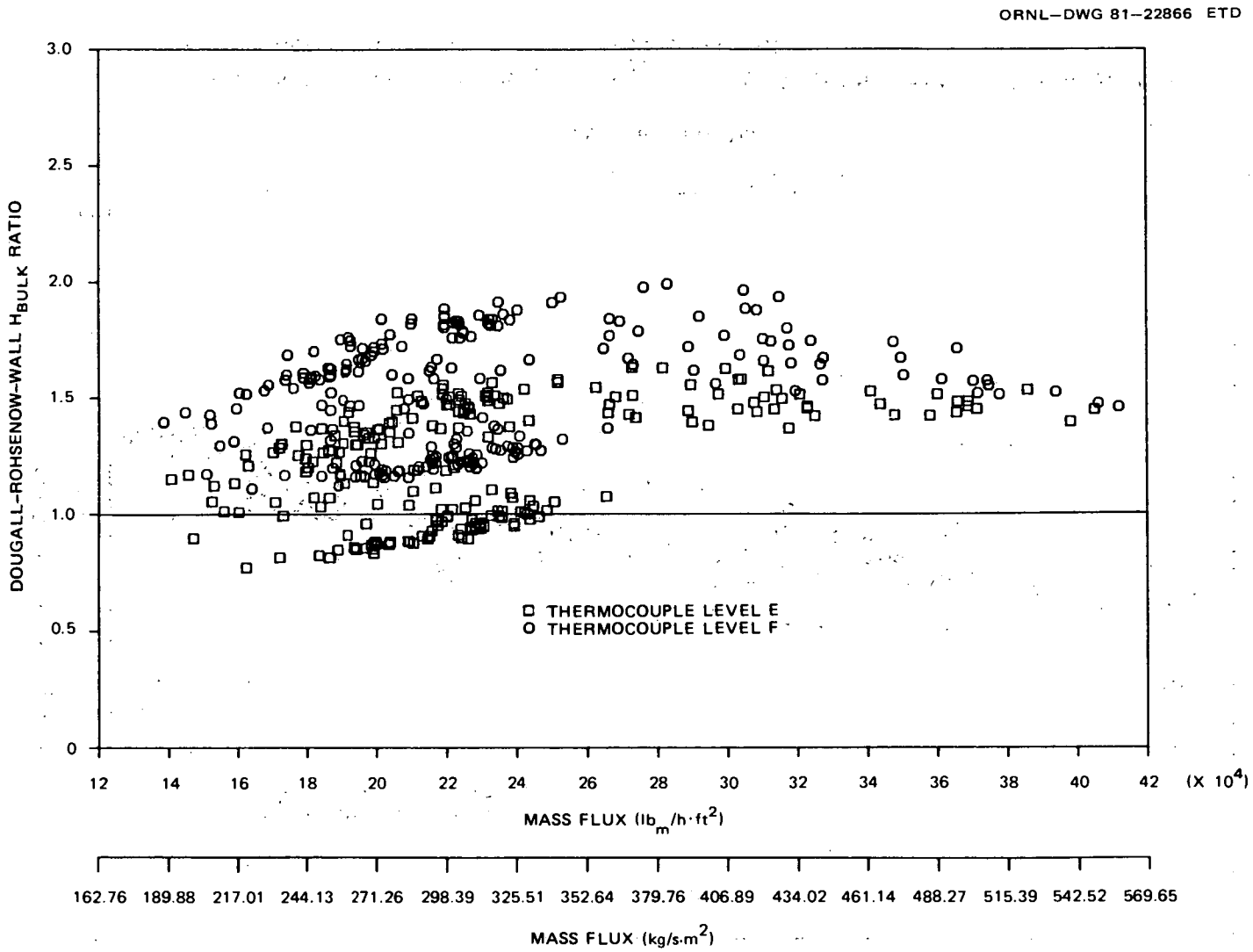

Fig. 5.29. Ratio of h_{cor} to h_{exp} vs mass flux for Dougall-Rohsenow correlation (wall Pr) – test 3.03.6AR.

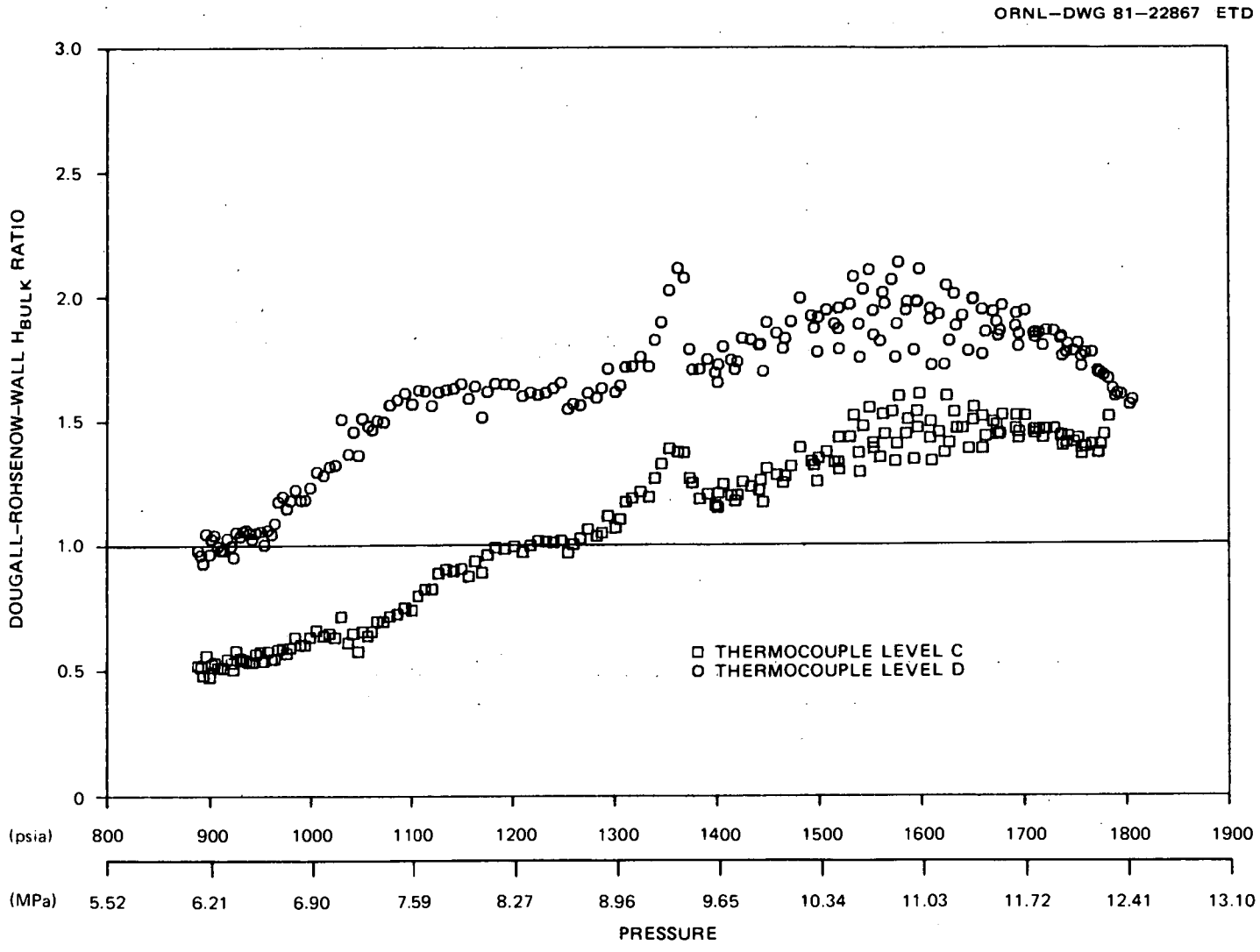

Fig. 5.30. Ratio of h_{cor} to h_{exp} vs pressure for Dougall-Rohsenow correlation (wall Pr) – test 3.06.6B.

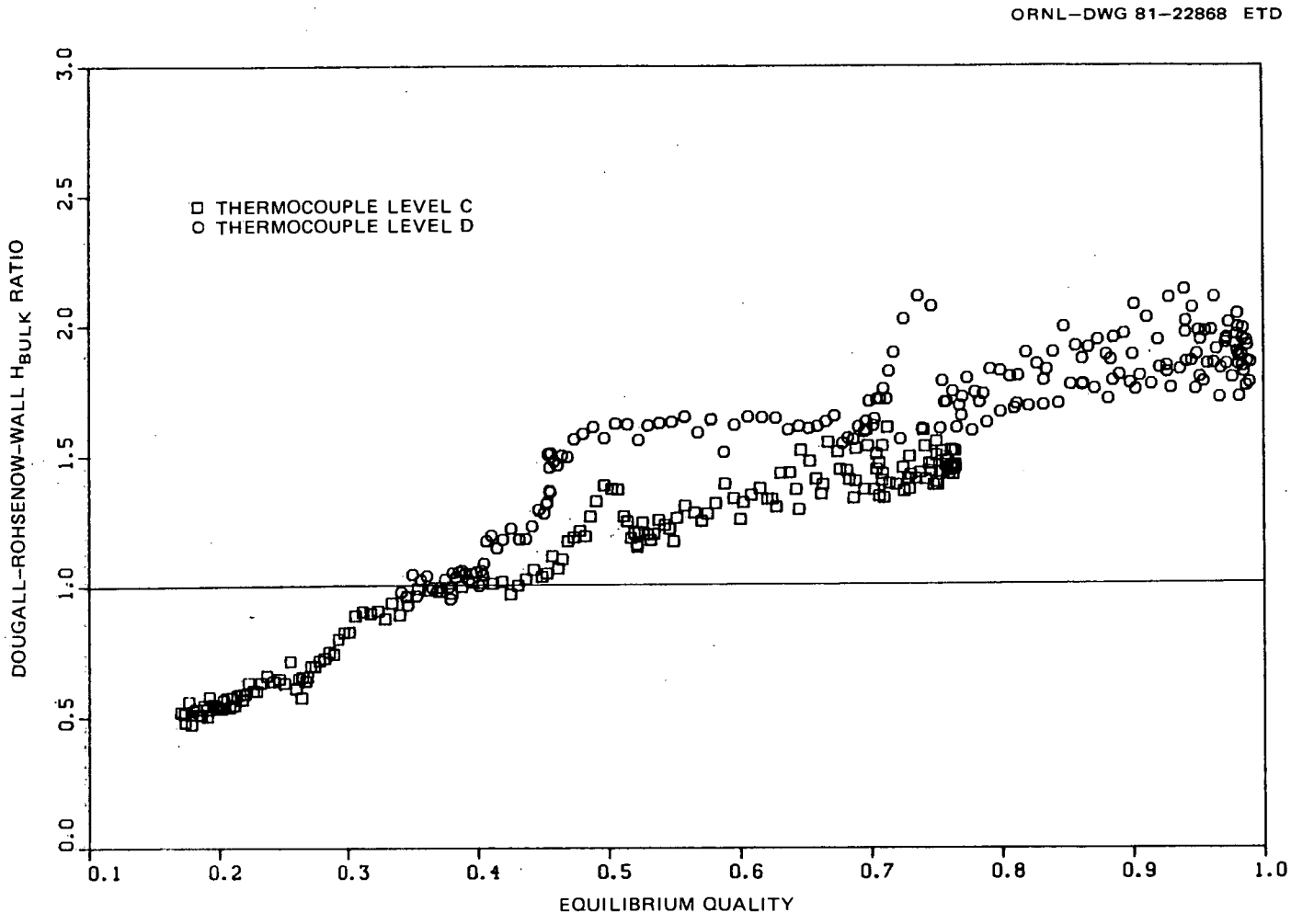

Fig. 5.31. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Dougall-Rohsenow correlation (wall Pr) – test 3.06.6B.

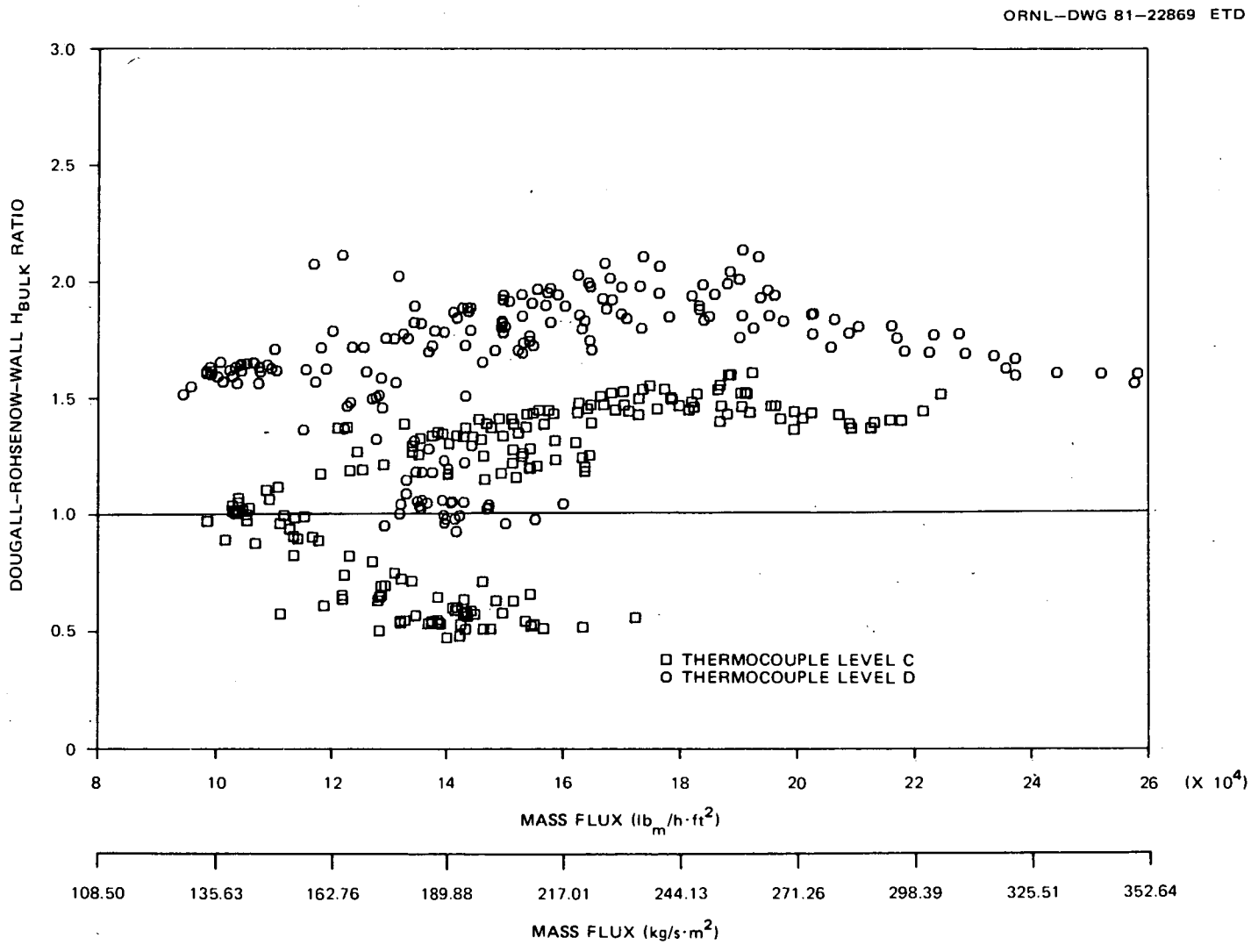

Fig. 5.32. Ratio of h_{cor} to h_{exp} vs mass flux for Dougall-Rohsenow correlation (wall Pr) – test 3.06.6B.

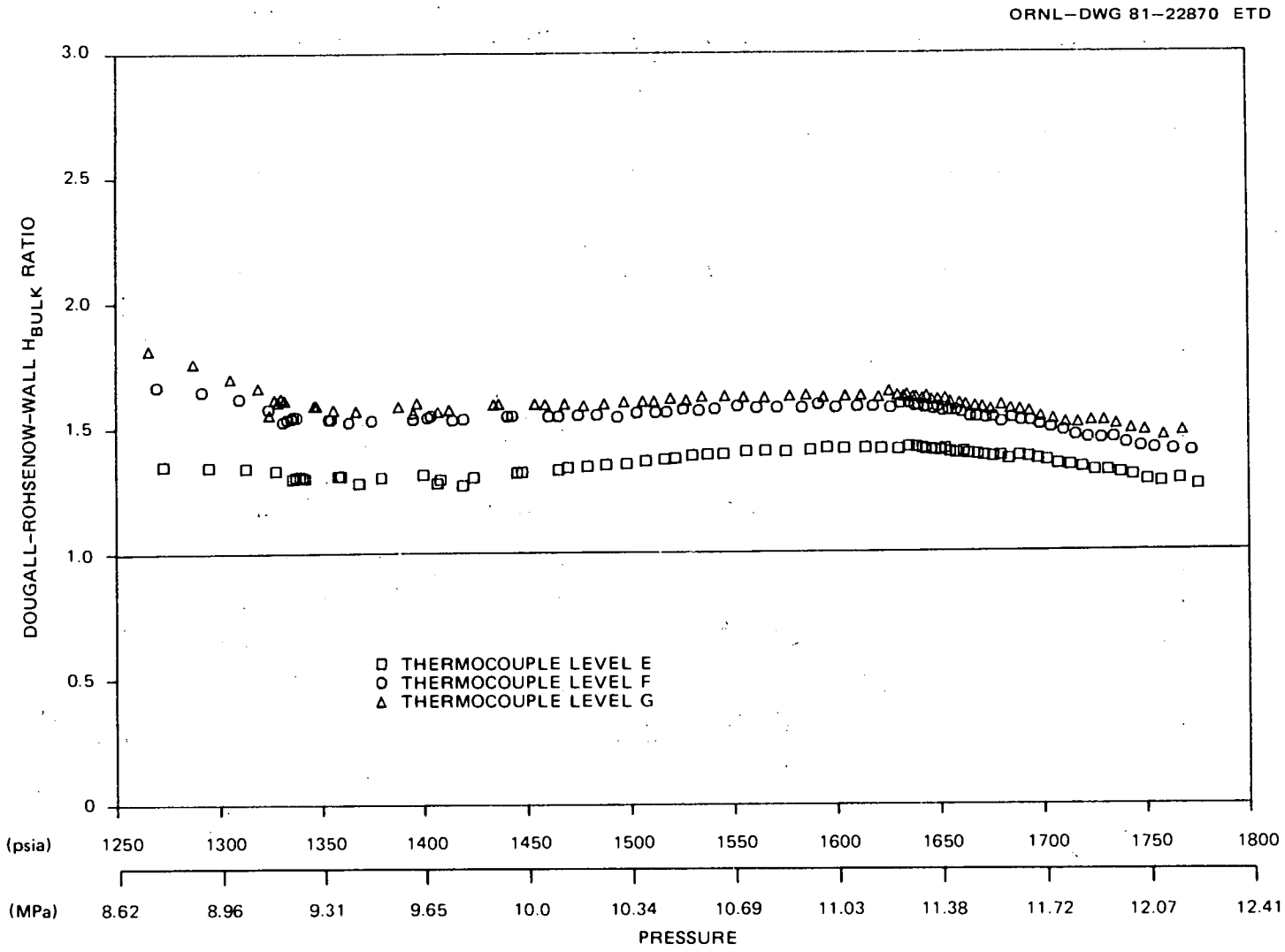

Fig. 5.33. Ratio of h_{cor} to h_{exp} vs pressure for Dougall-Rohsenow correlation (wall Pr) – test 3.08.6C.

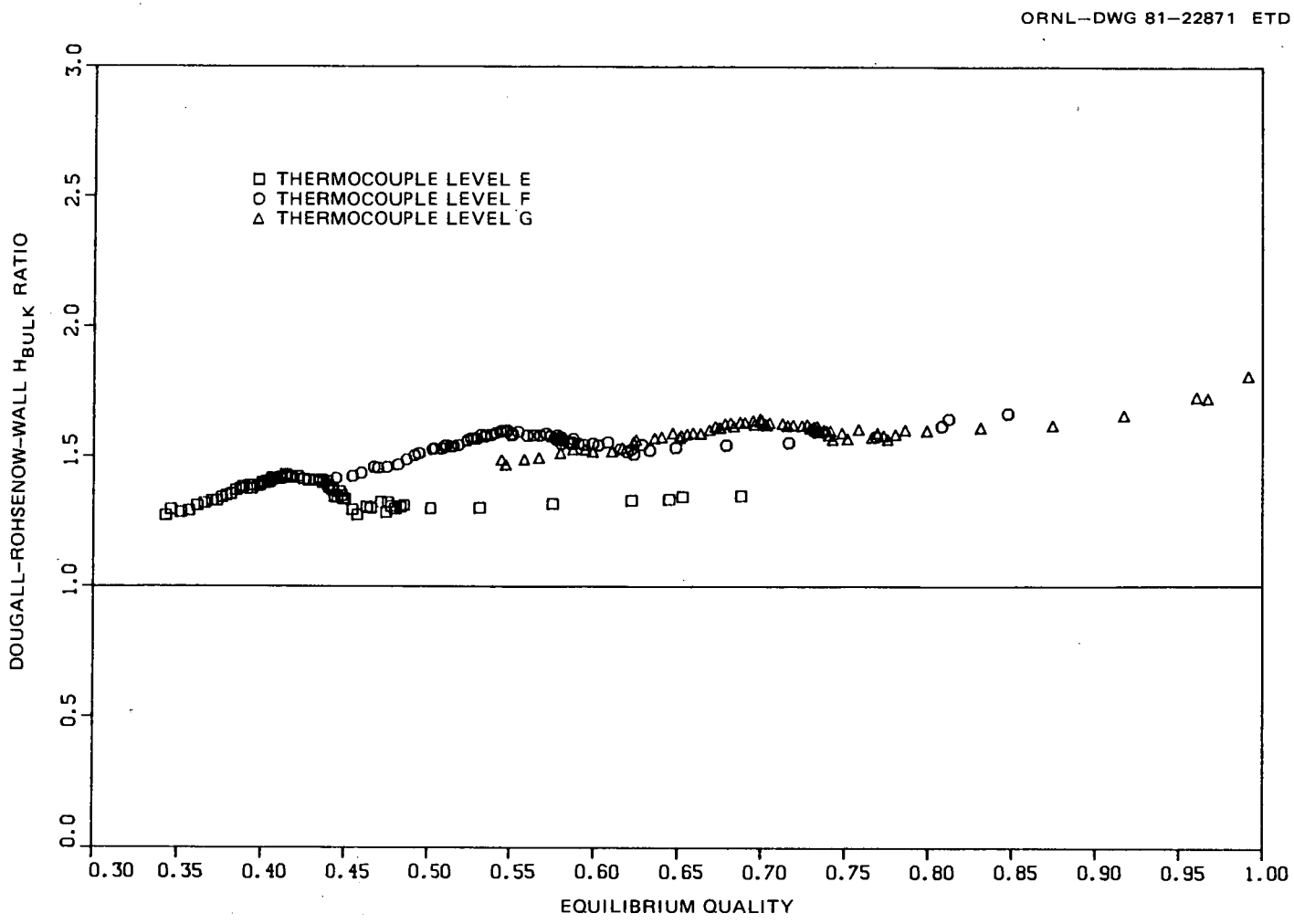

Fig. 5.34. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Dougall-Rohsenow correlation (wall Pr) – test 3.08.6C.

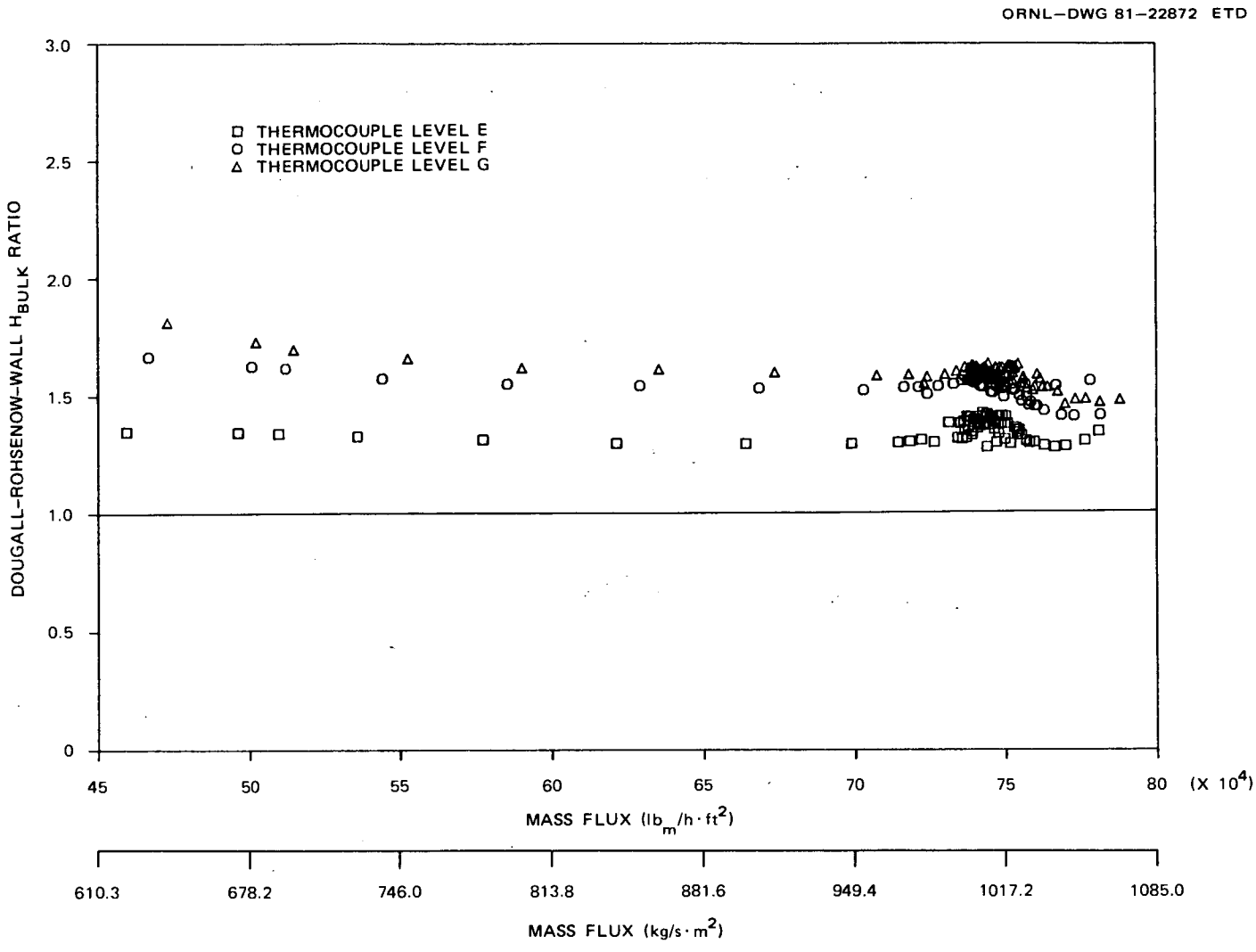

Fig. 5.35. Ratio of h_{cor} to h_{exp} vs mass flux for Dougall-Rohsenow correlation (wall Pr) – test 3.08.6C.

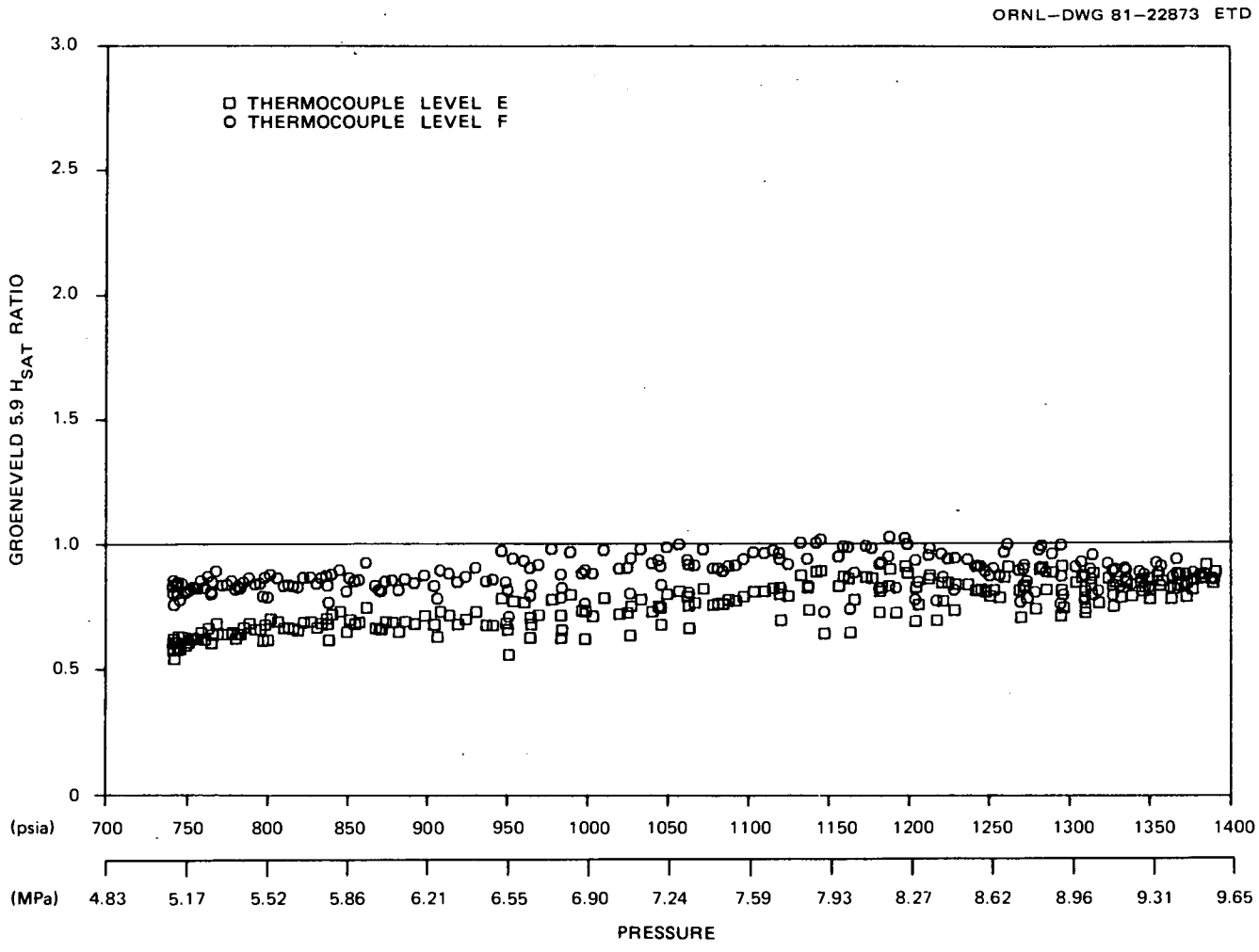

Fig. 5.36. Ratio of h_{cor} to h_{exp} vs pressure for Groeneveld 5.9 correlation – test 3.03.6AR.

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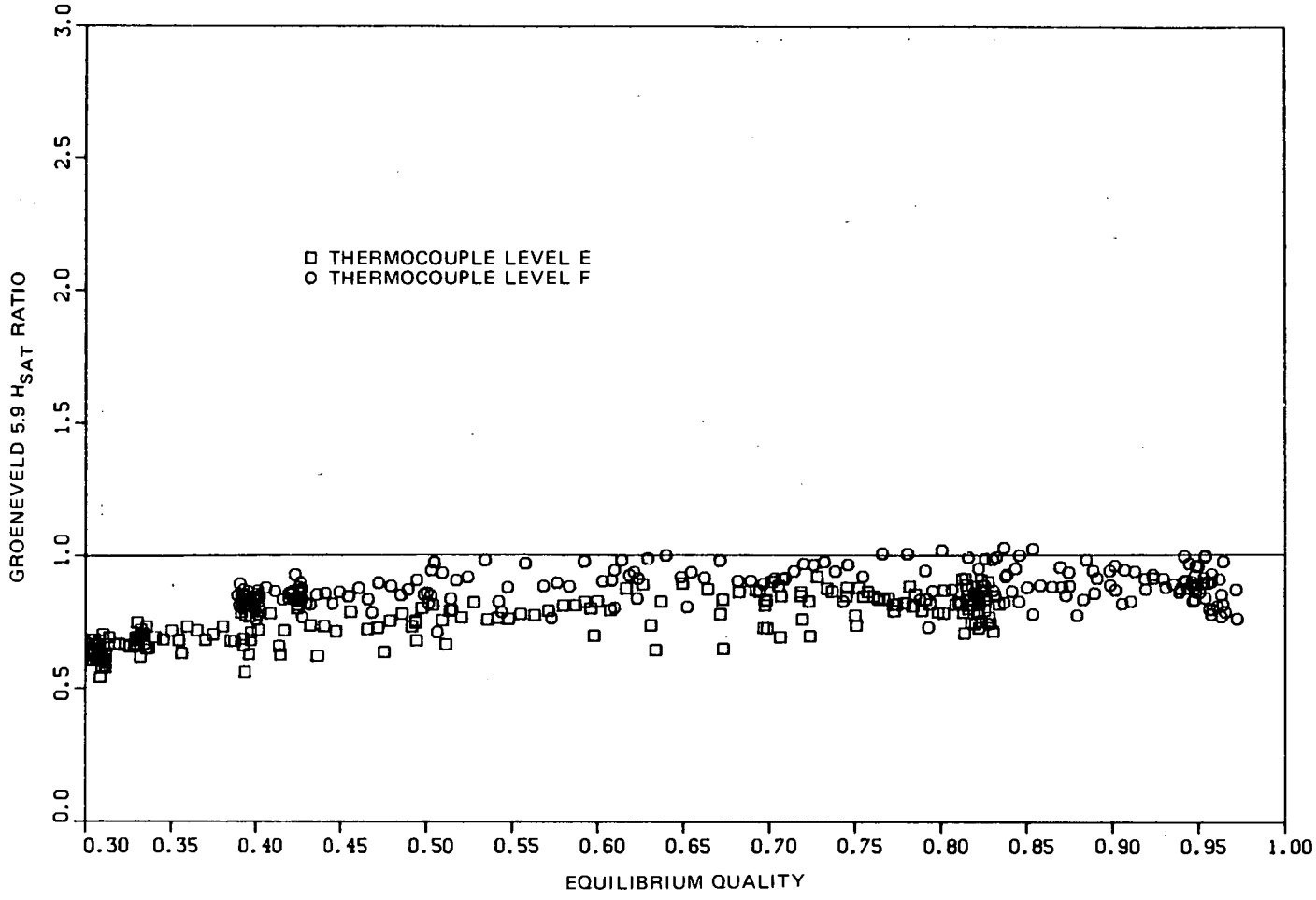

Fig. 5.37. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Groeneveld 5.9 correlation – test 3.03.6AR.

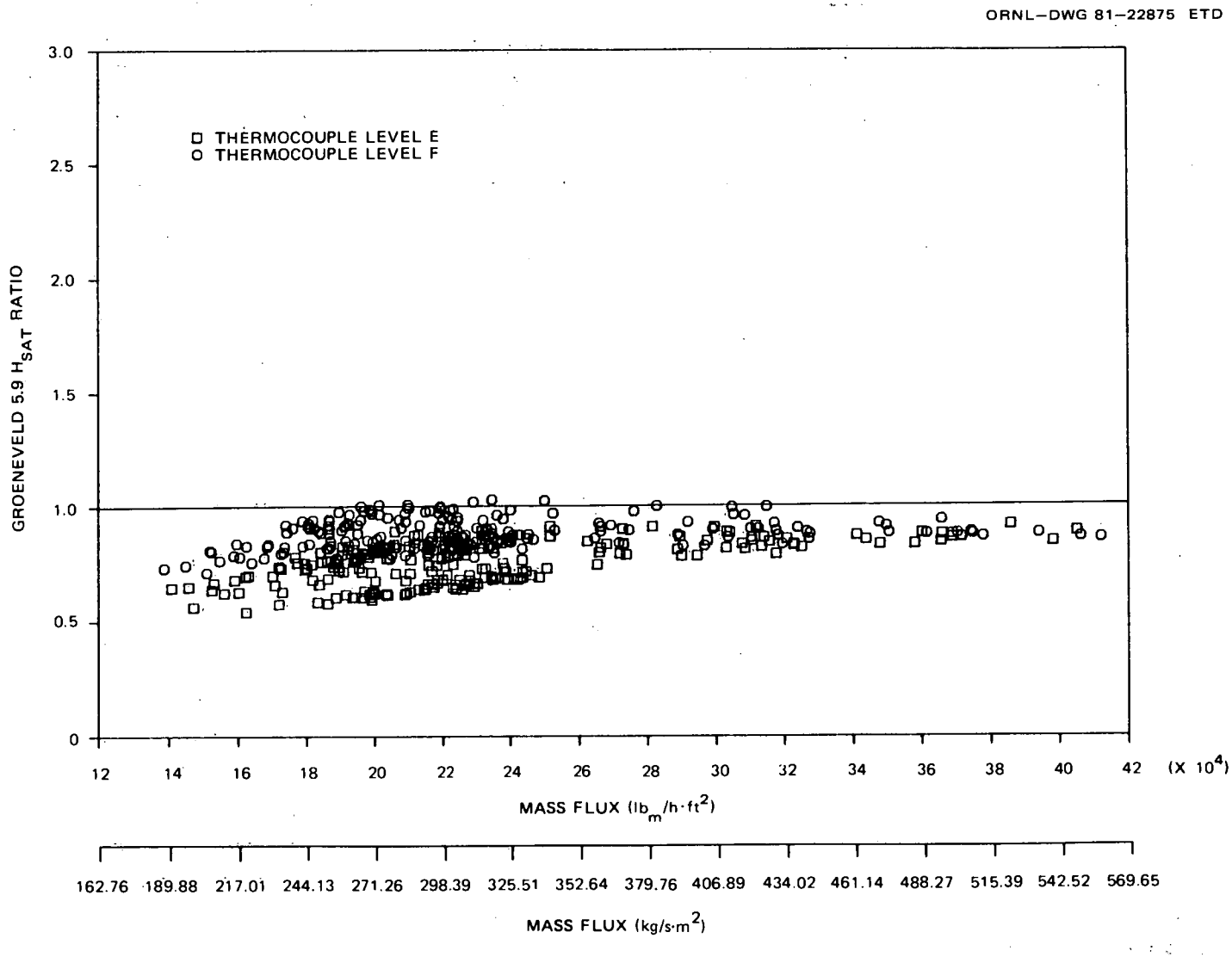

Fig. 5.38. Ratio of h_{cor} to h_{exp} vs mass flux for Groeneveld 5.9 correlation – test 3.03.6AR.

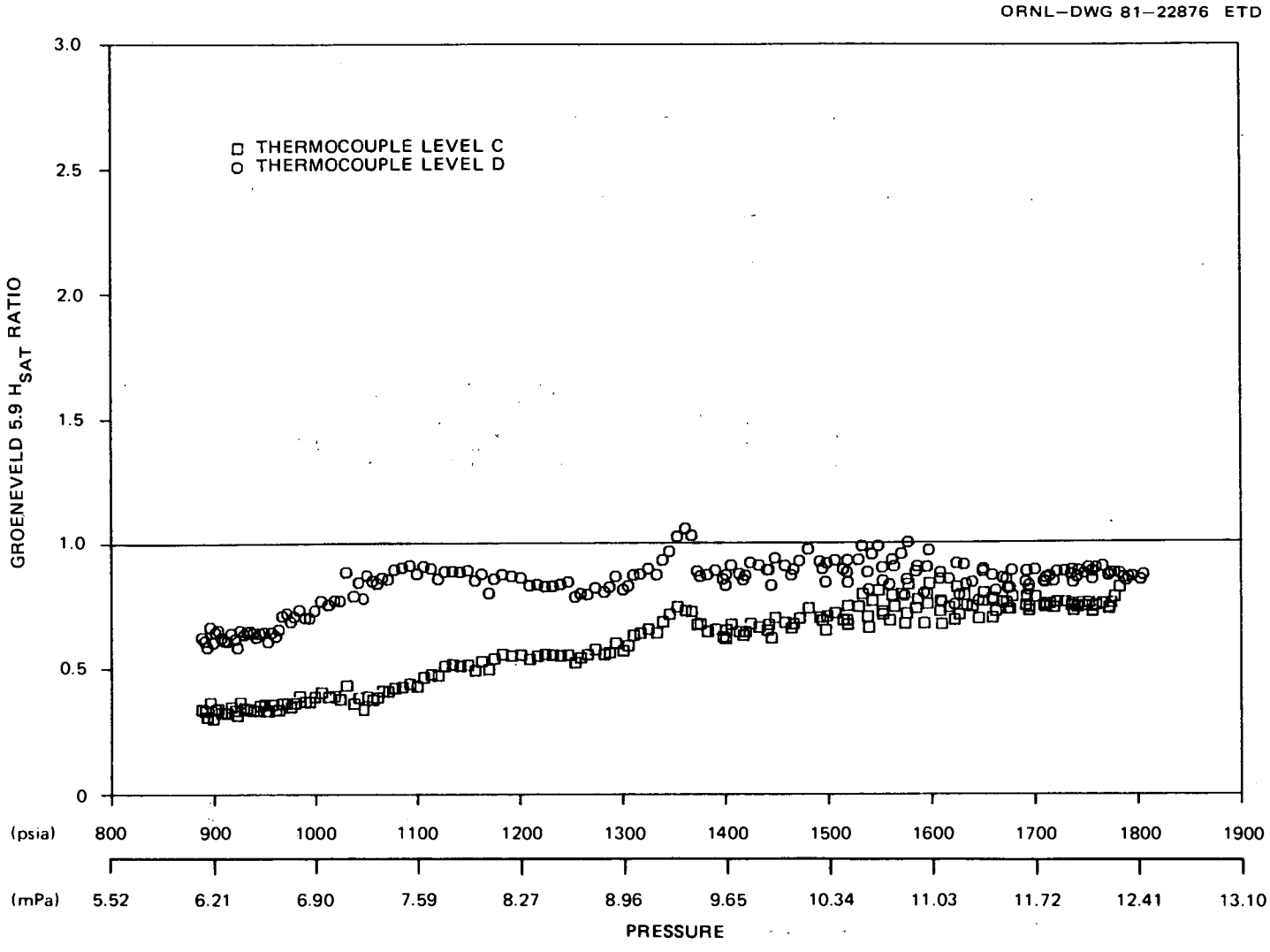

Fig. 5.39. Ratio of h_{cor} to h_{exp} vs pressure for Groeneveld 5.9 correlation – test 3.06.6B.

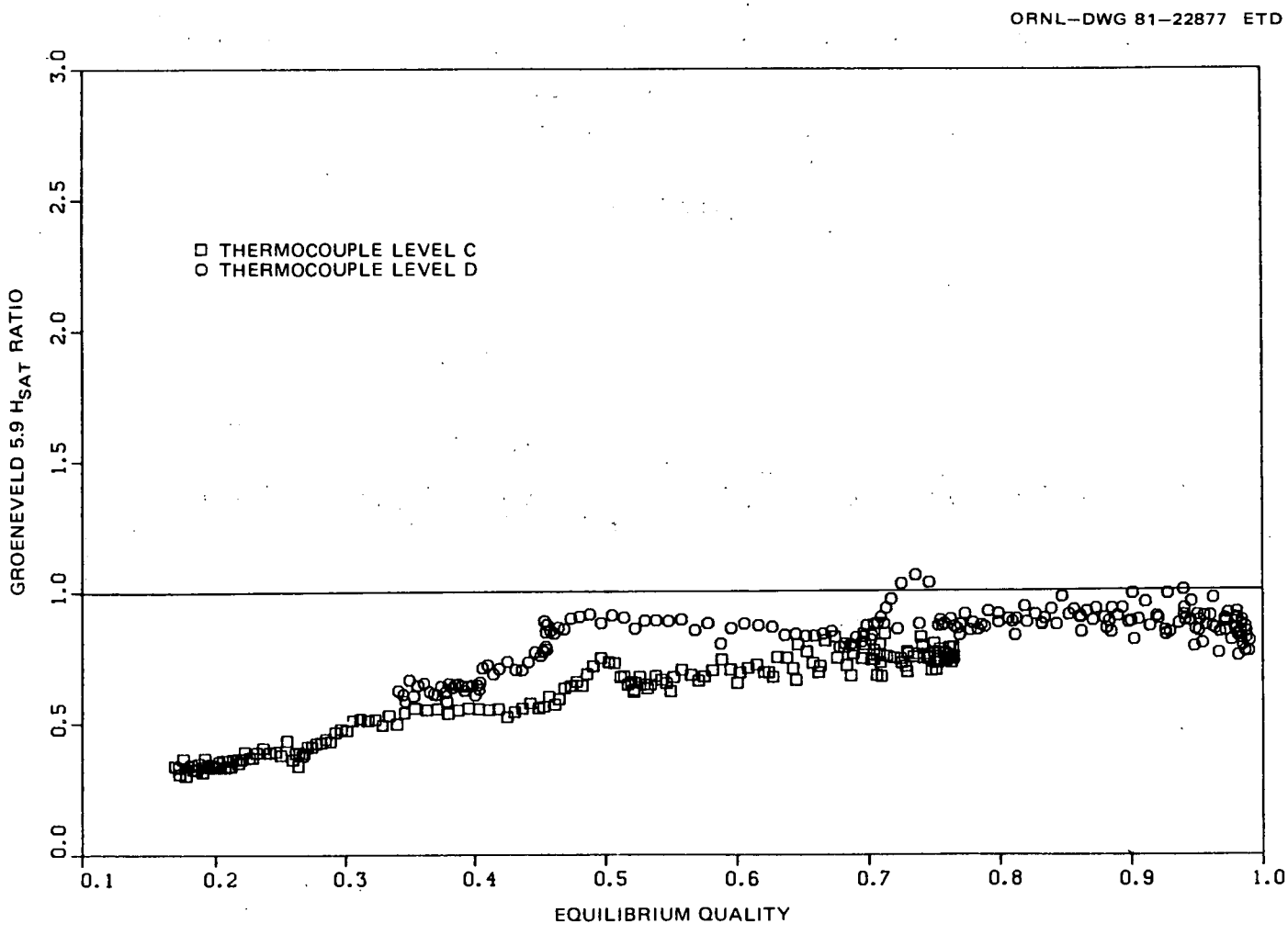

Fig. 5.40. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Groeneveld 5.9 correlation — test 3.06.6B.

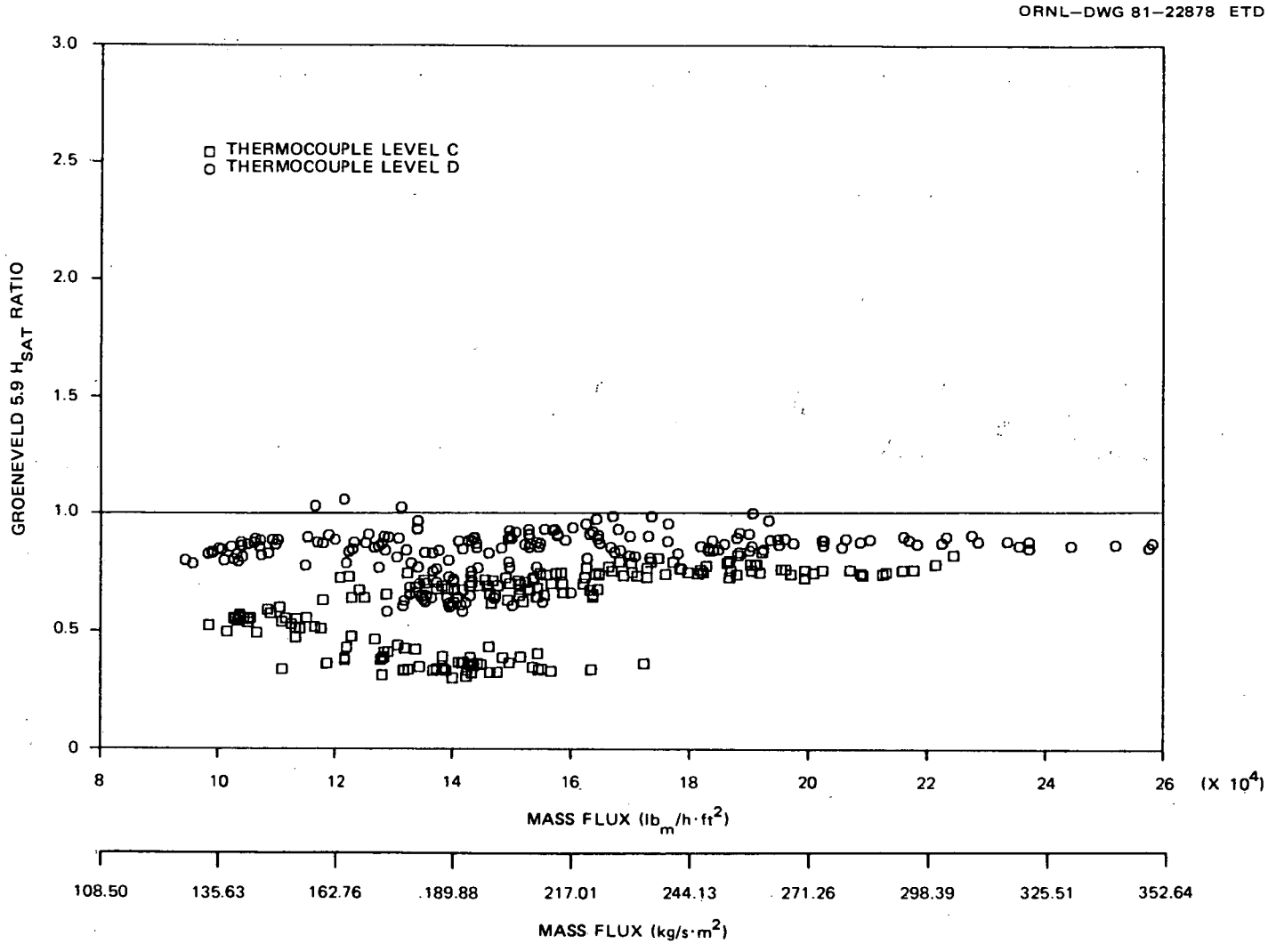

Fig. 5.41. Ratio of h_{cor} to h_{exp} vs mass flux for Groeneveld 5.9 correlation – test 3.06.6B.

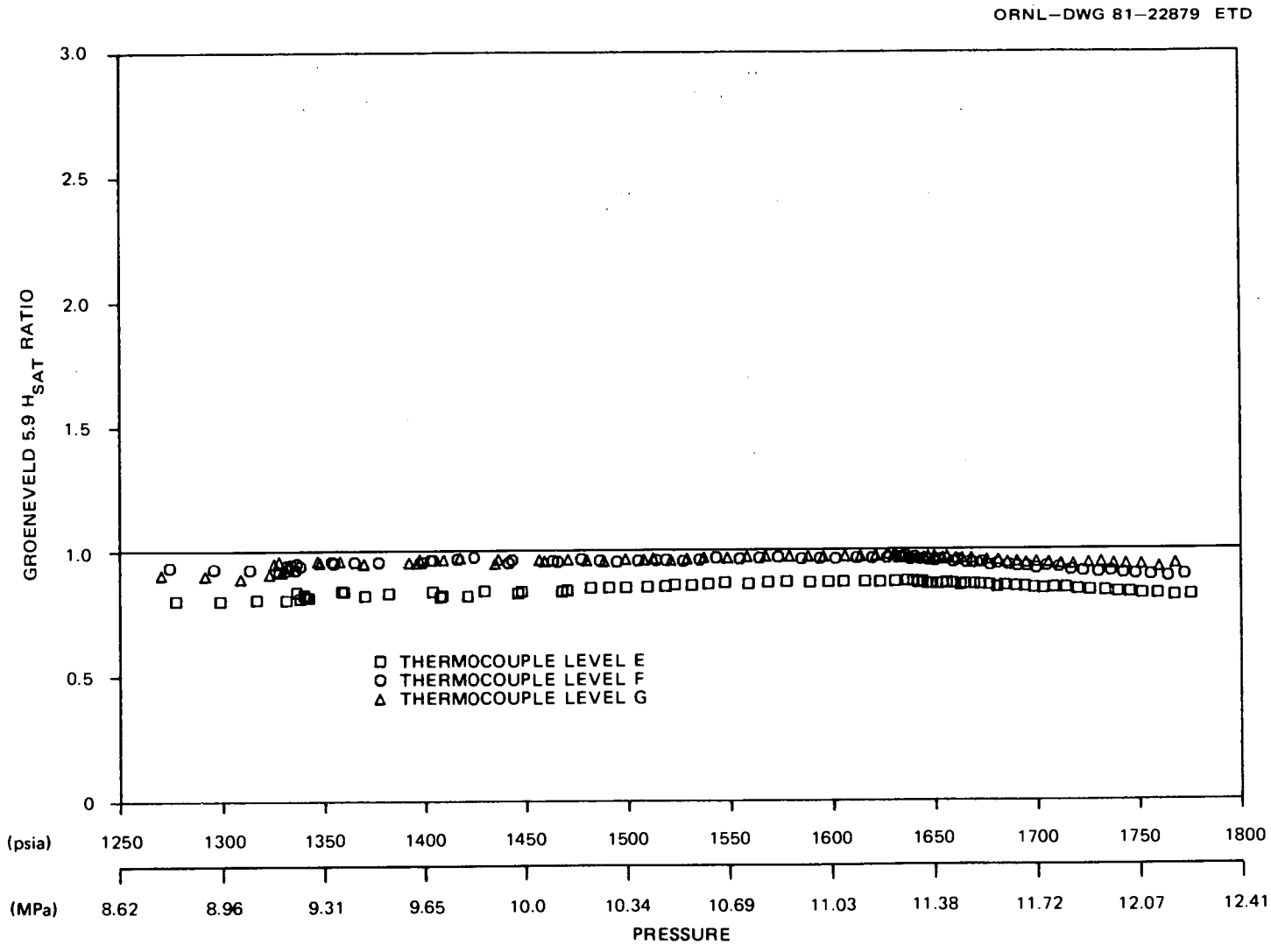

Fig. 5.42. Ratio of h_{cor} to h_{exp} vs pressure for Groeneveld 5.9 correlation – test 3.08.6C.

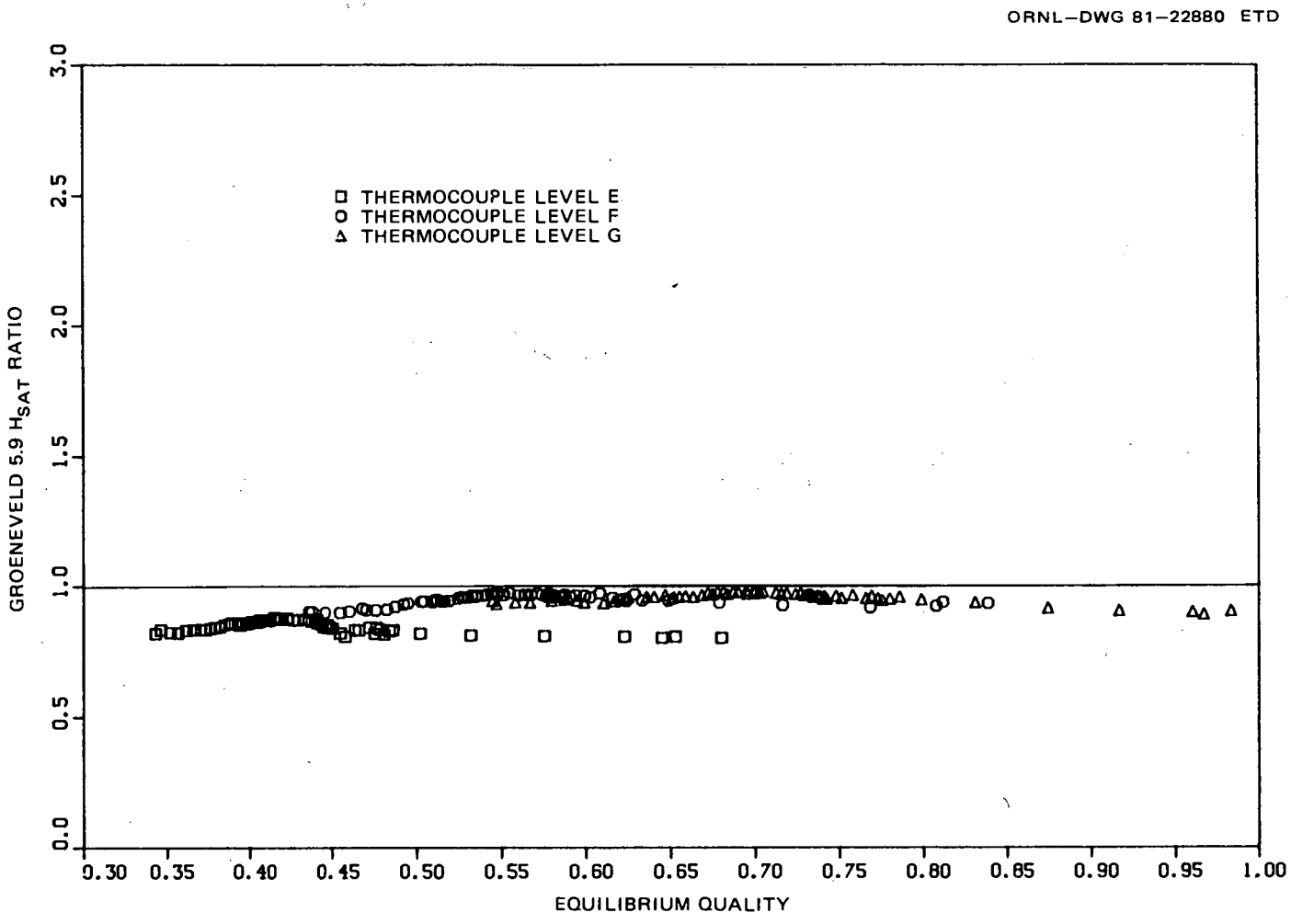

Fig. 5.43. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Groeneveld 5.9 correlation – test 3.08.6C.

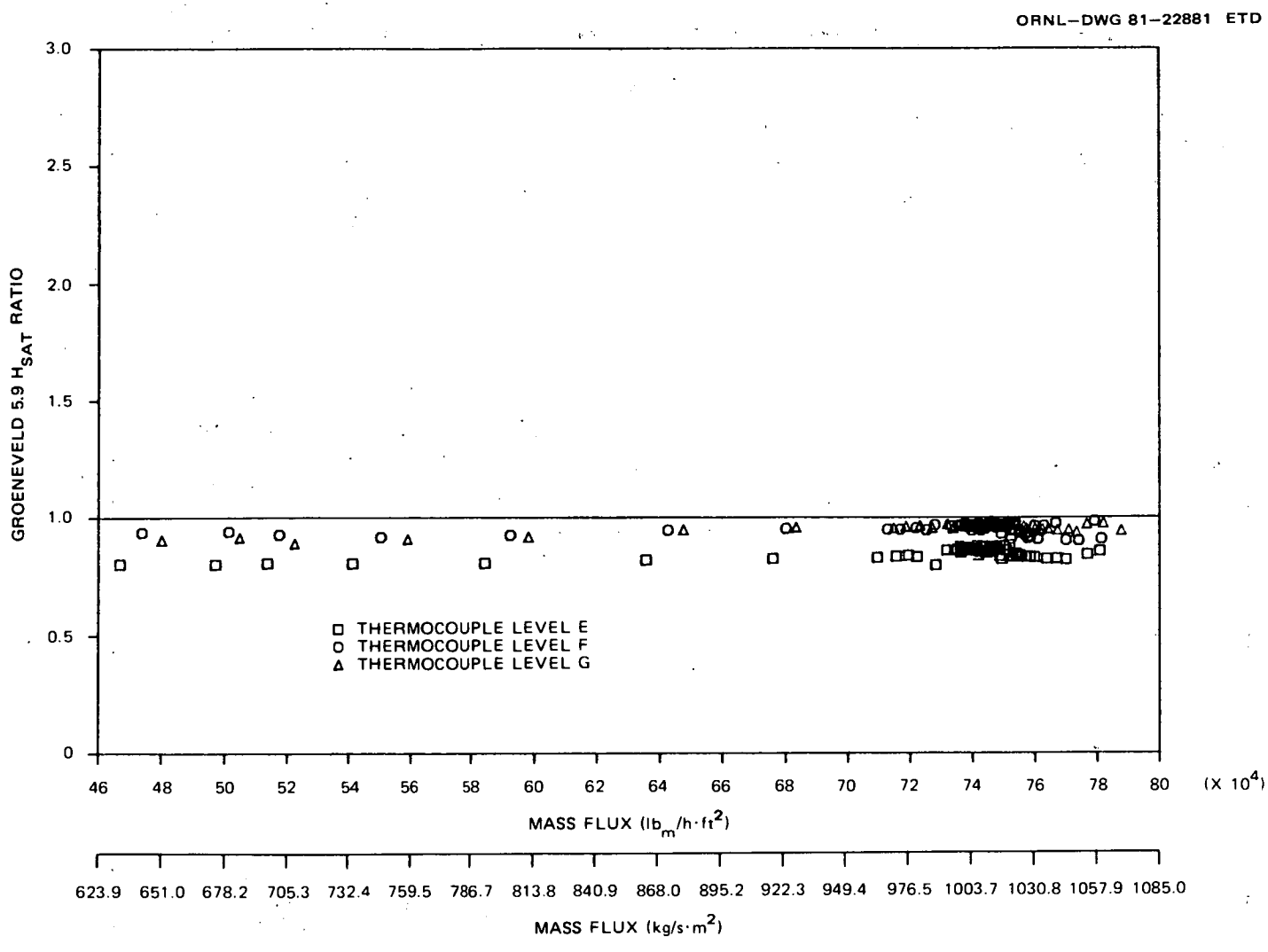

Fig. 5.44. Ratio of h_{cor} to h_{exp} vs mass flux for Groeneveld 5.9 correlation – test 3.08.6C.

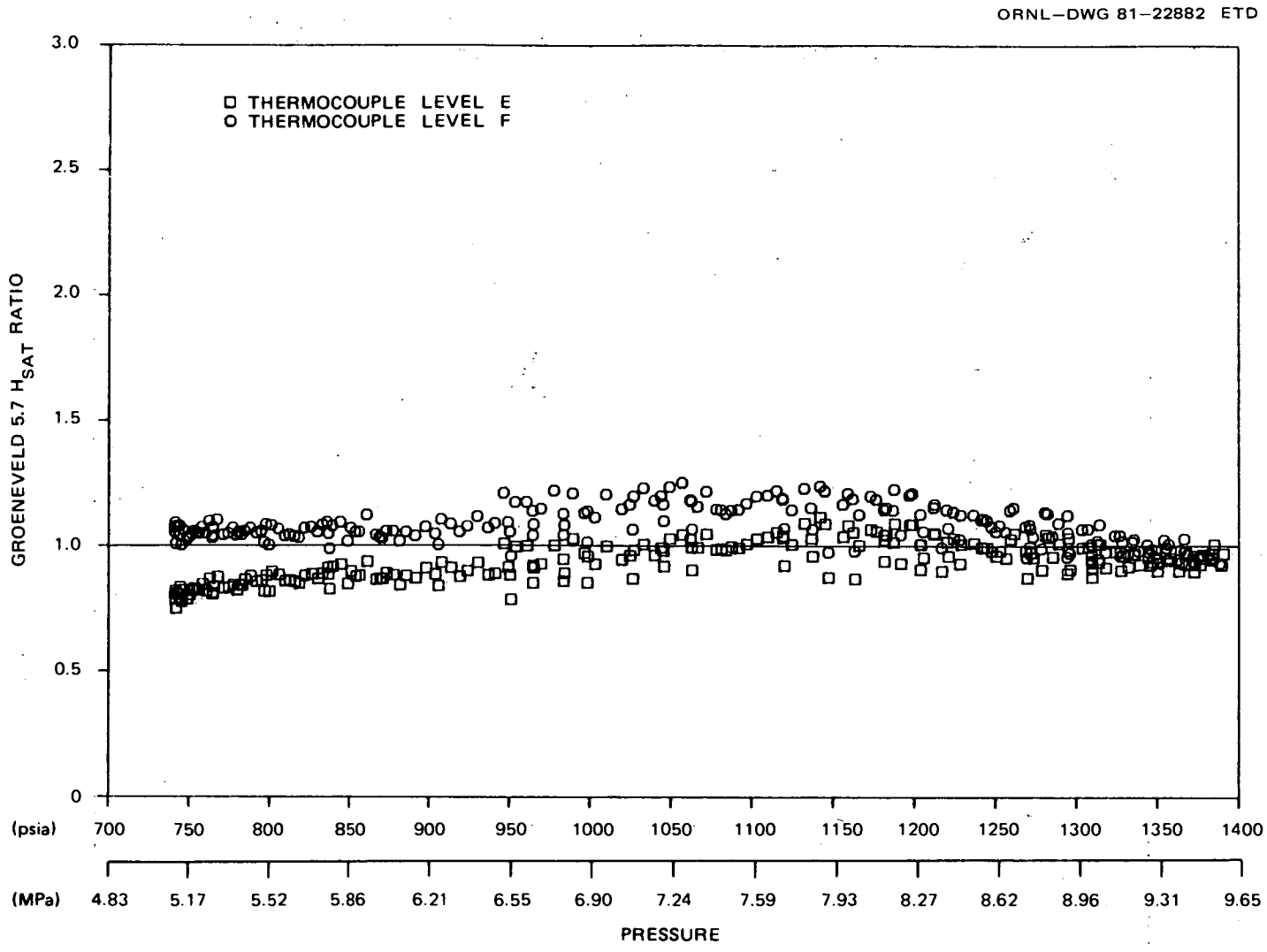

Fig. 5.45. Ratio of h_{cor} to h_{exp} vs pressure for Groeneveld 5.7 correlation — test 3.03.6AR.

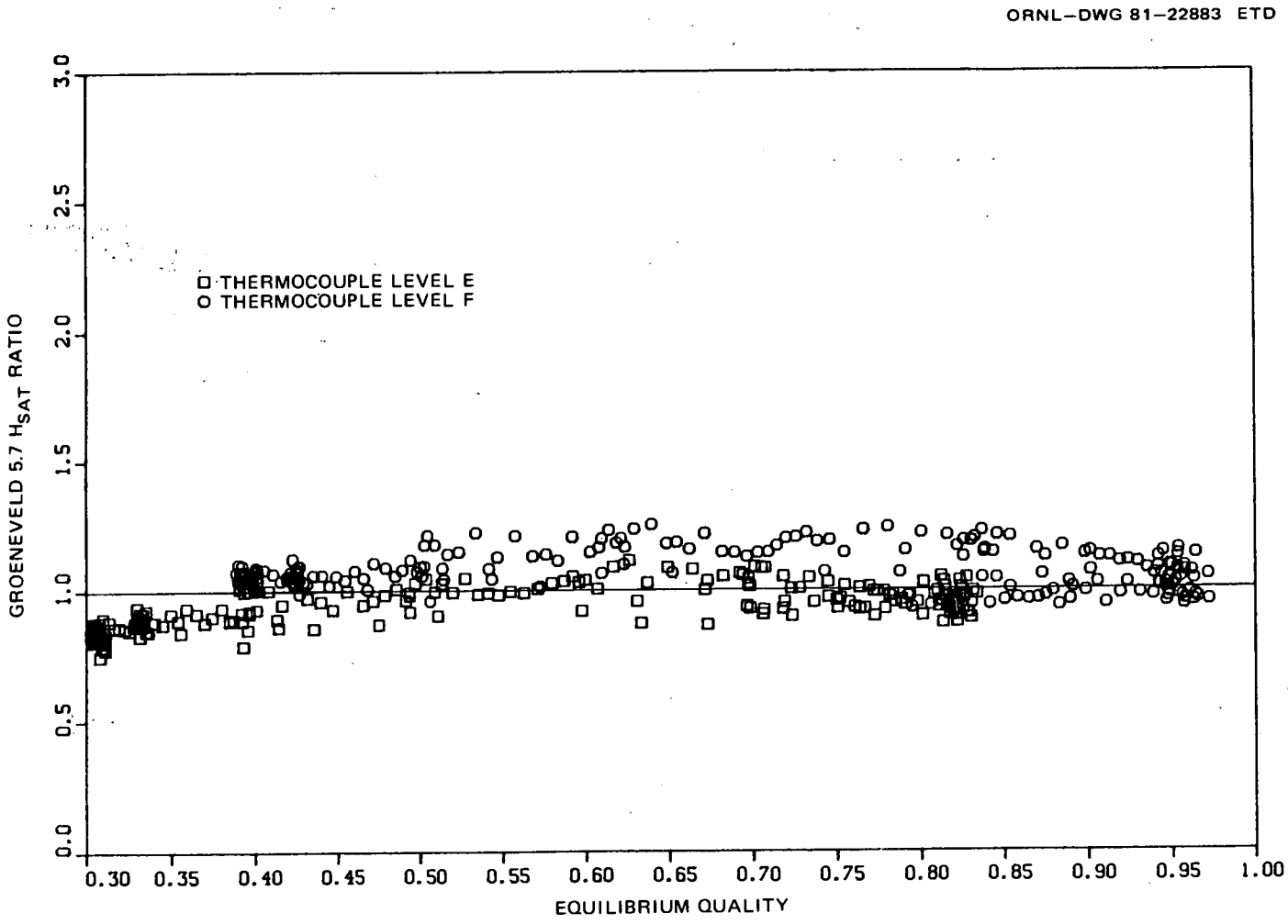

Fig. 5.46. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Groeneveld 5.7 correlation – test 3.03.6AR.

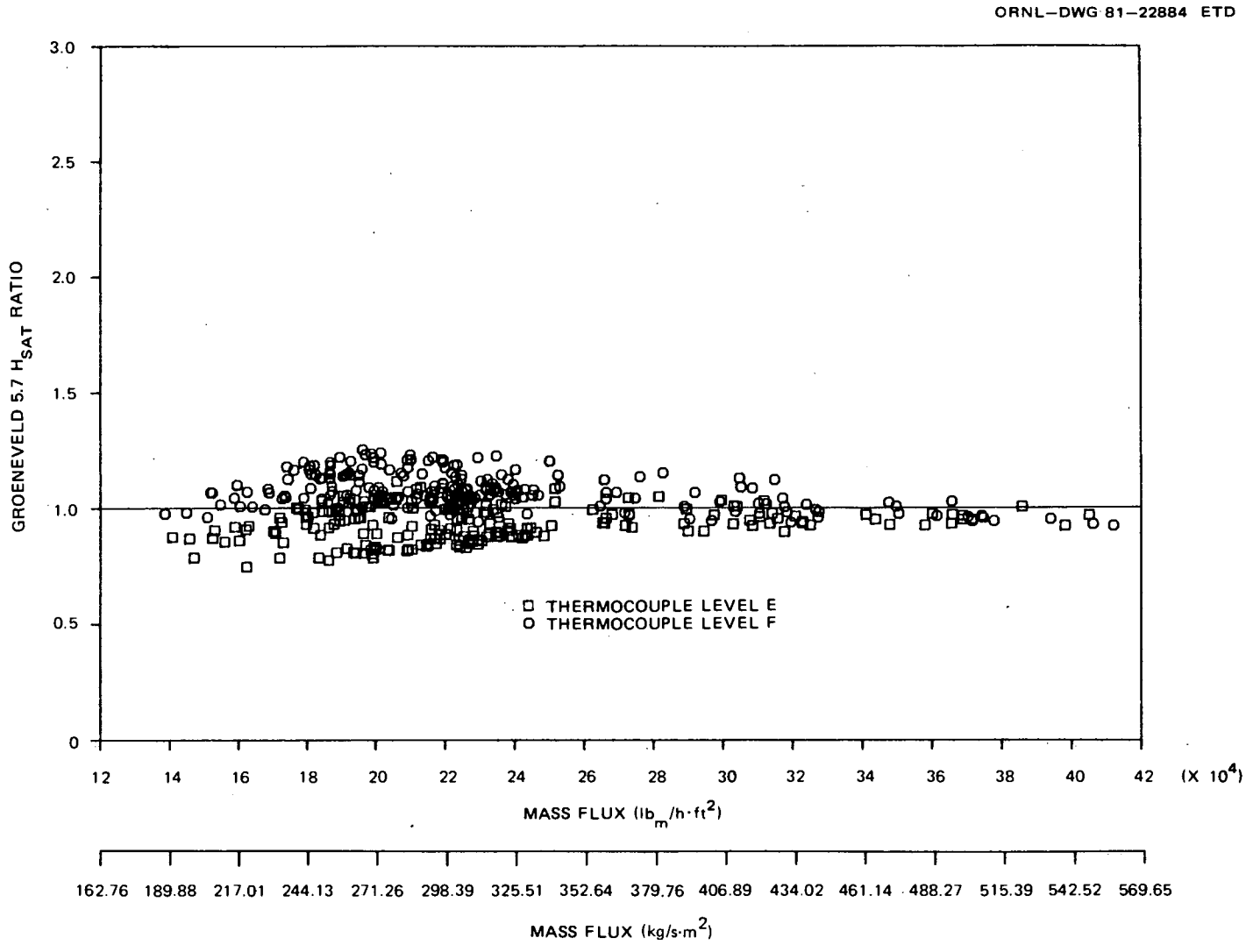

Fig. 5.47. Ratio of h_{cor} to h_{exp} vs mass flux for Groeneveld 5.7 correlation — test 3.03.6AR.

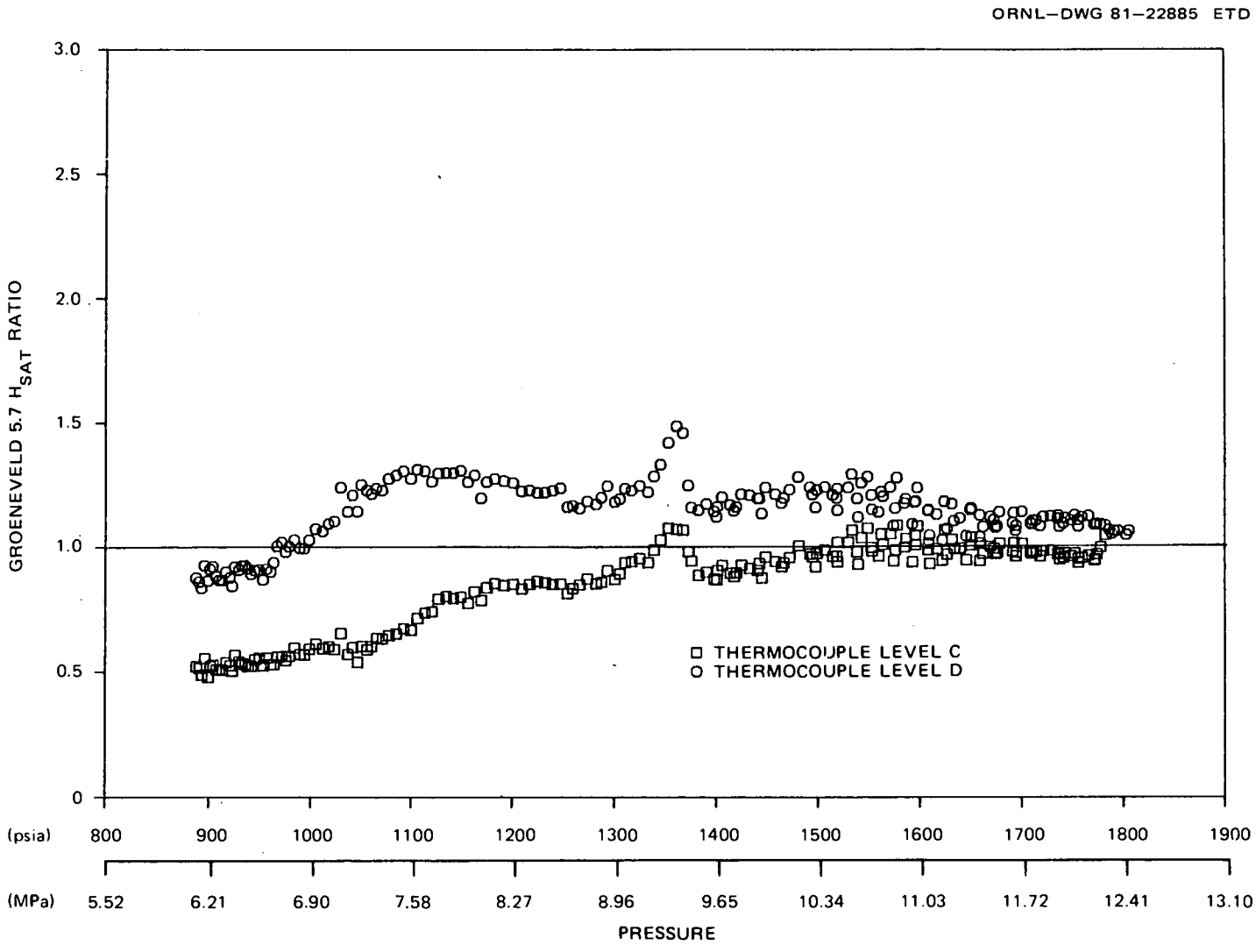

Fig. 5.48. Ratio of h_{cor} to h_{exp} vs pressure for Groeneveld 5.7 correlation — test 3.06.6B.

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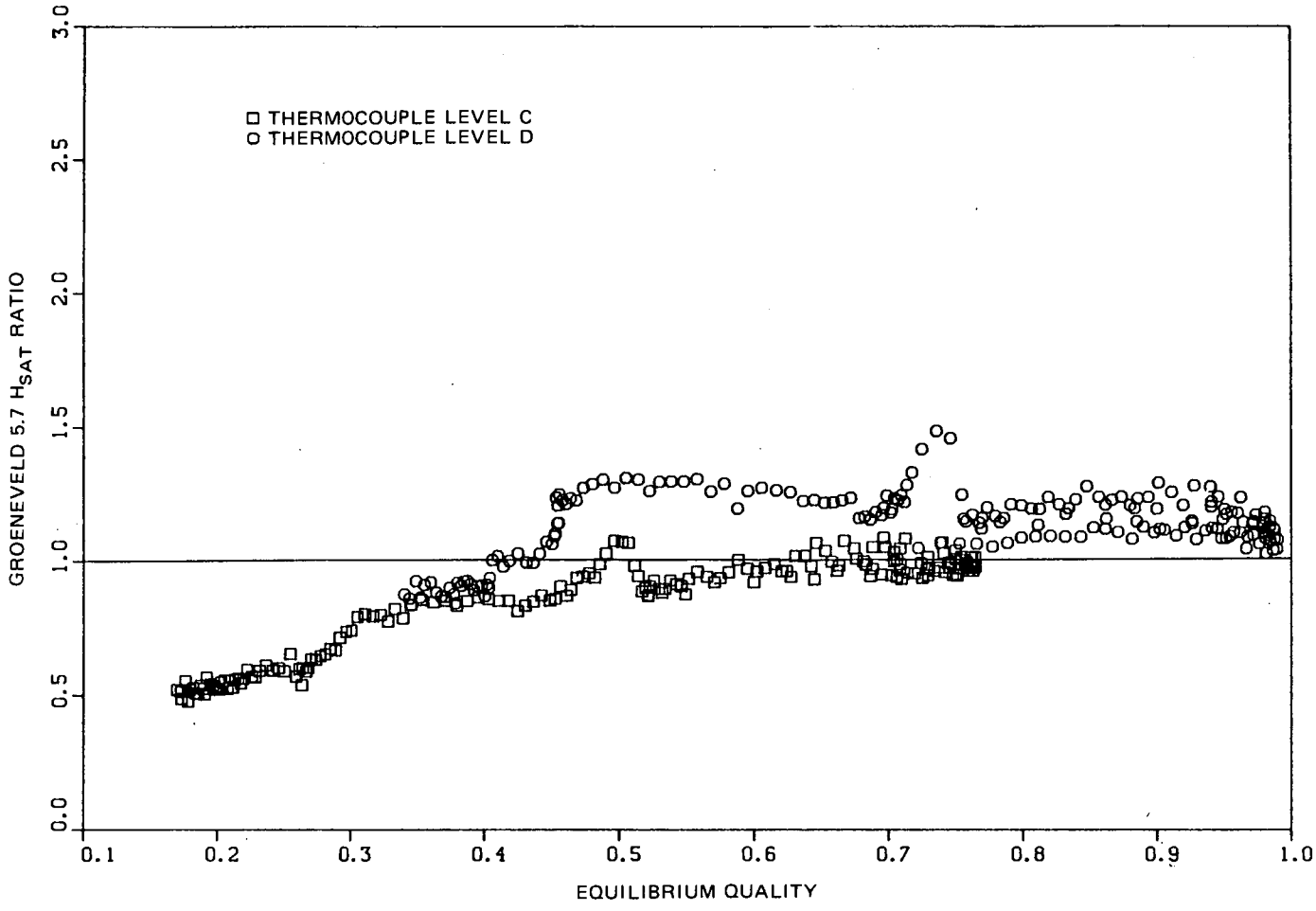

Fig. 5.49. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Groeneveld 5.7 correlation – test 3.06.6B.

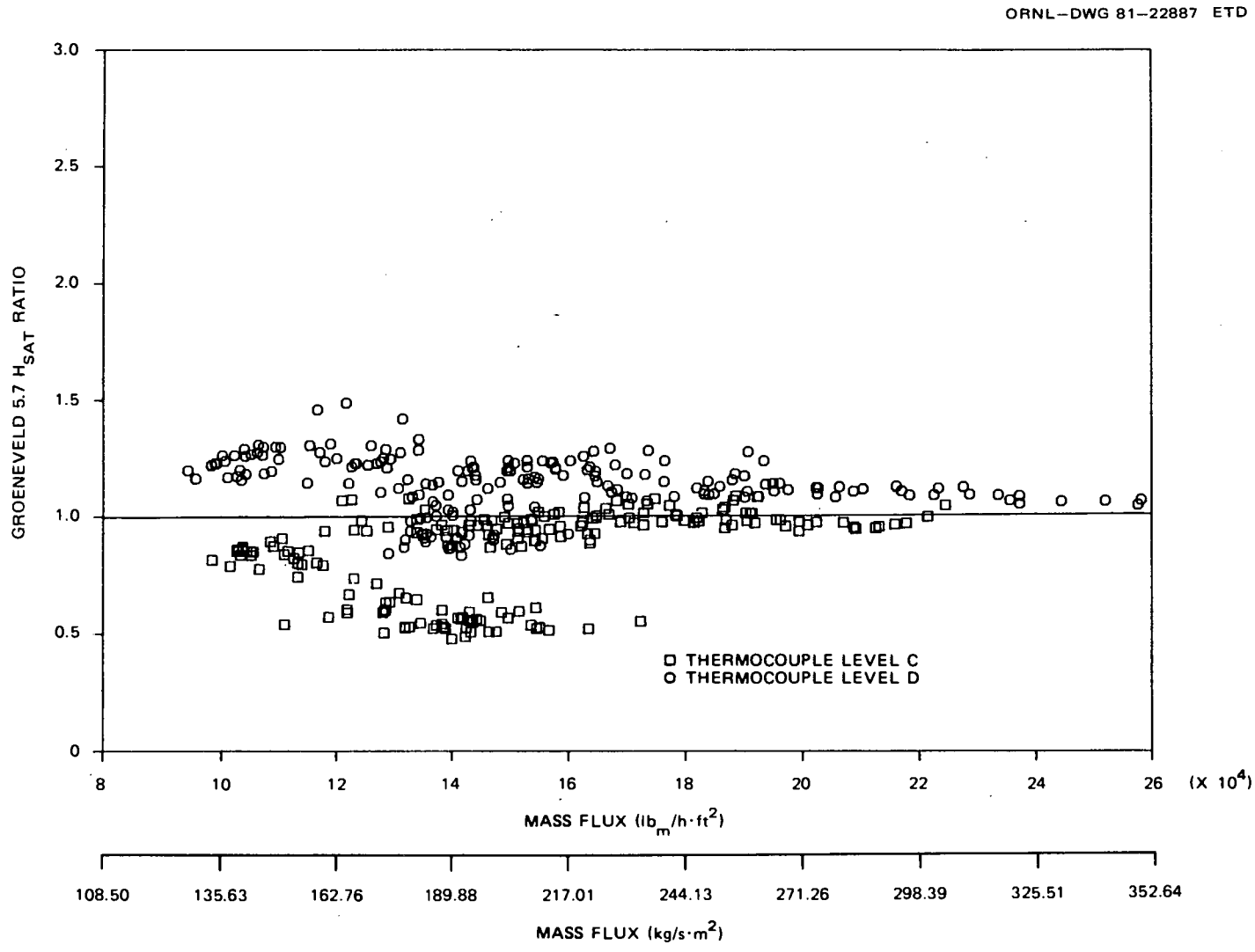

Fig. 5.50. Ratio of h_{cor} to h_{exp} vs mass flux for Groeneveld 5.7 correlation — test 3.06.6B.

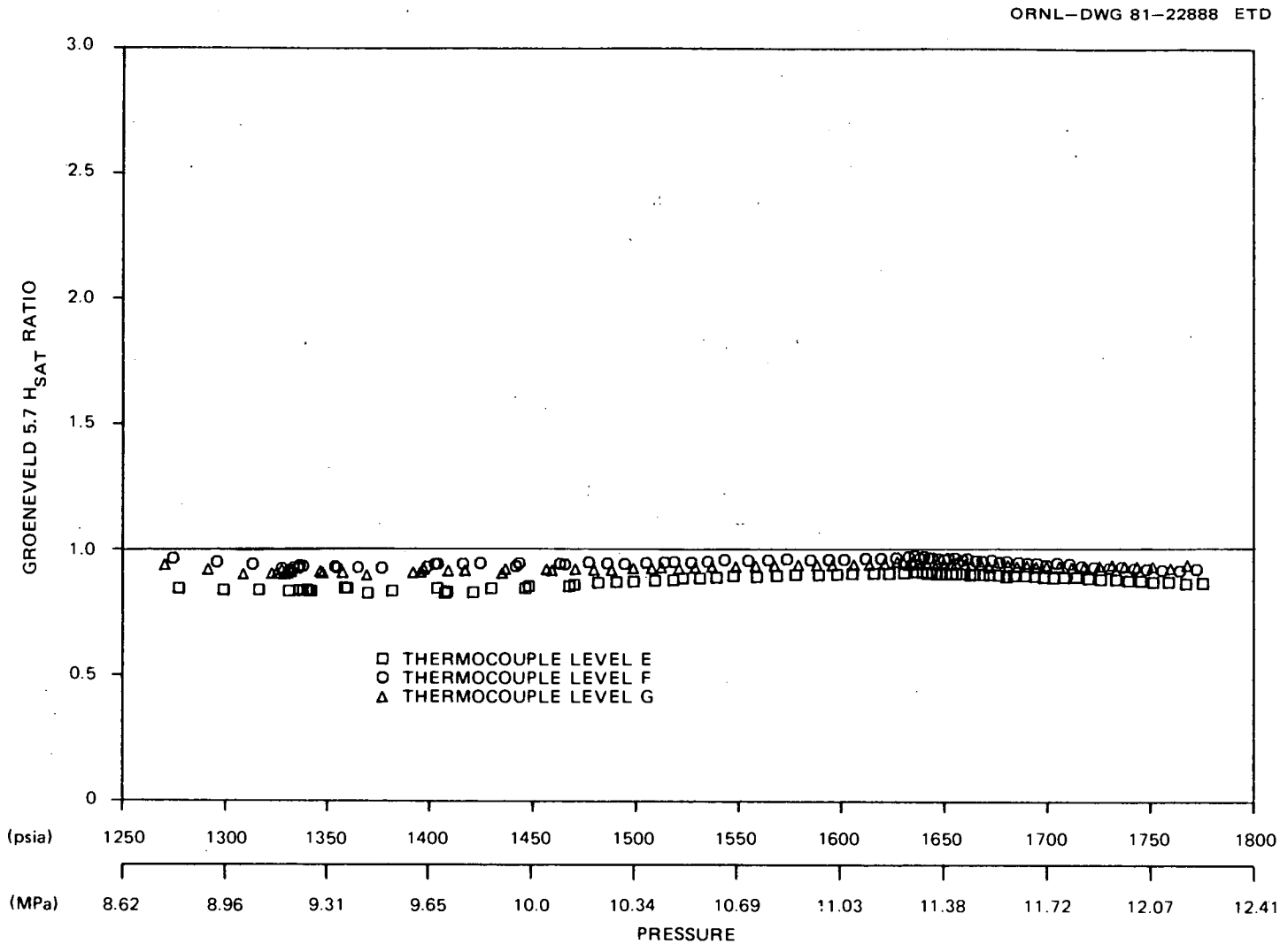

Fig. 5.51. Ratio of h_{cor} to h_{exp} vs pressure for Groeneveld 5.7 correlation – test 3.08.6C.

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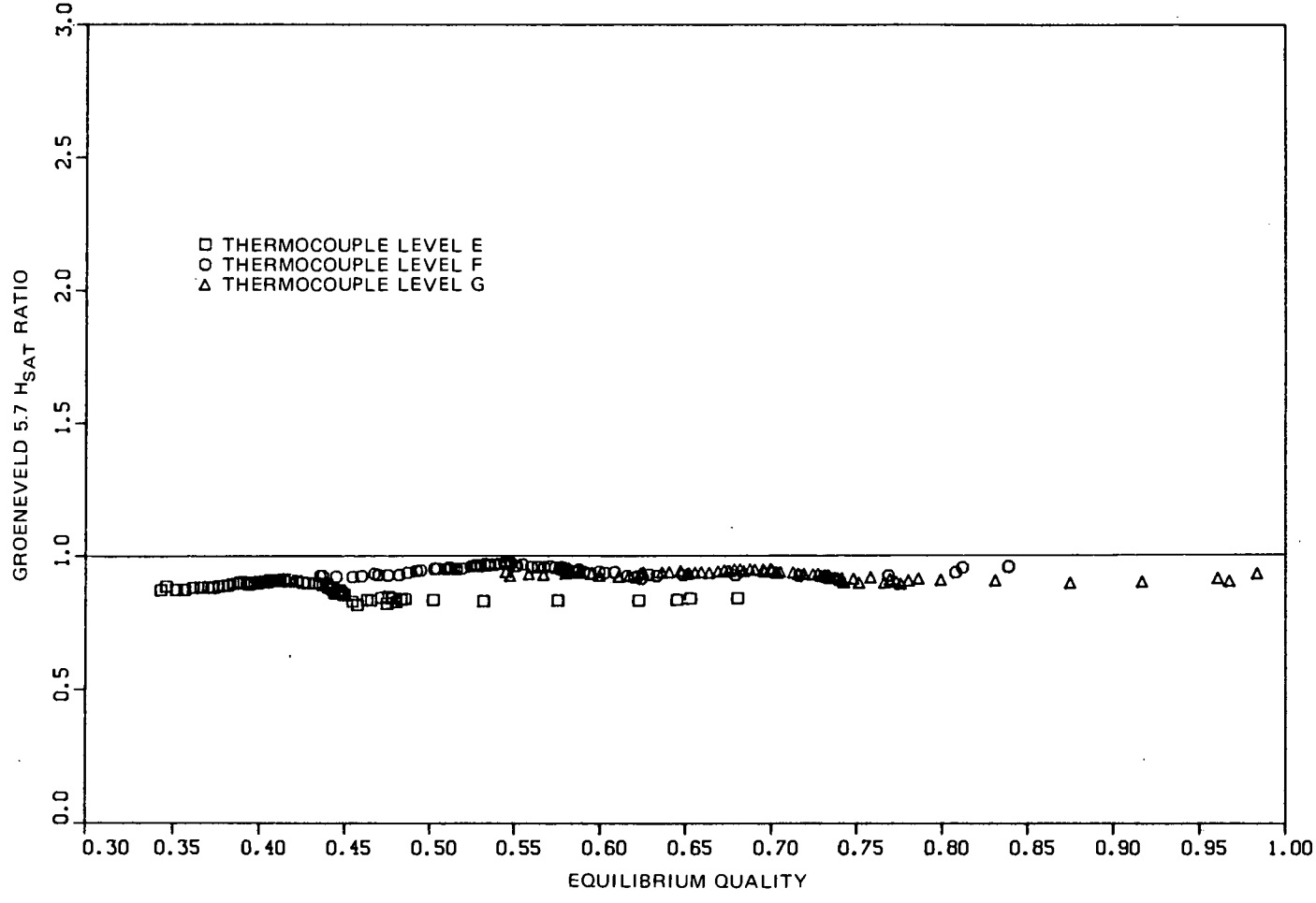

Fig. 5.52. Ratio of h_{cor} to h_{exp} vs equilibrium quality for Groeneveld 5.7 correlation – test 3.08.6C.

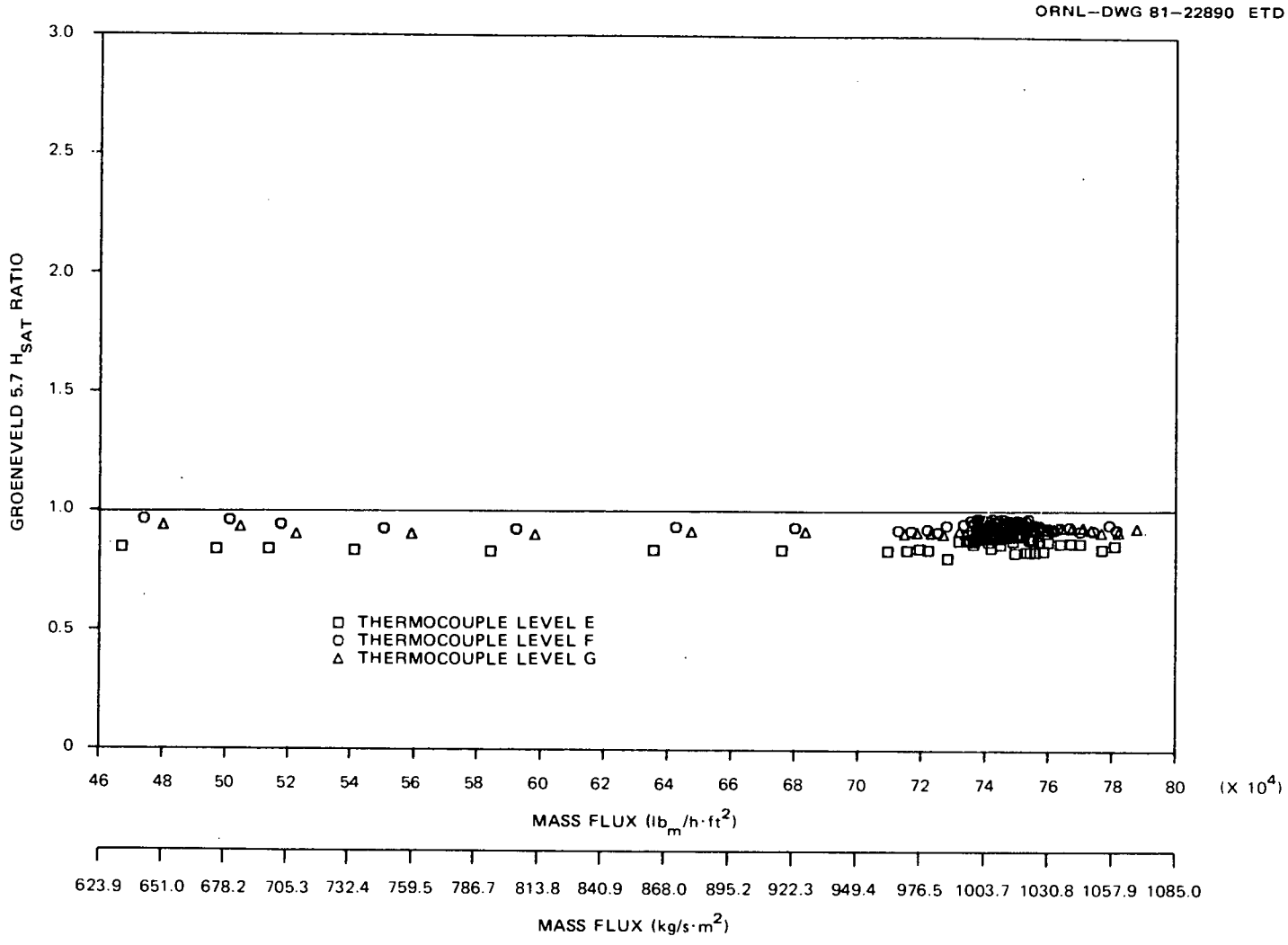

Fig. 5.53. Ratio of h_{cor} to h_{exp} vs mass flux for Groeneveld 5.7 correlation — test 3.08.6C.

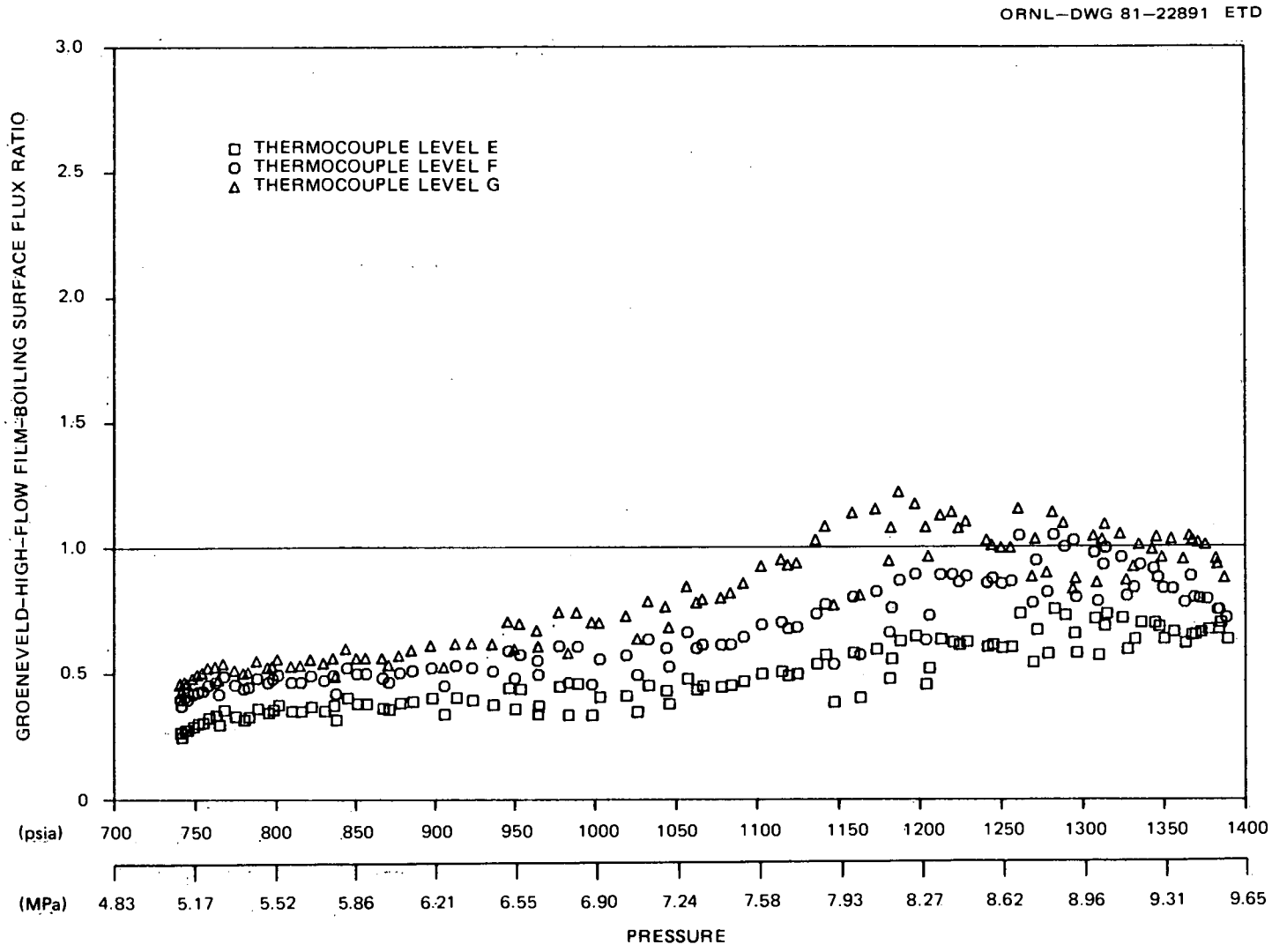

Fig. 5.54. Ratio of q''_{cor} to q''_{exp} vs pressure for Groeneveld-Delorme correlation — test 3.03.6AR.

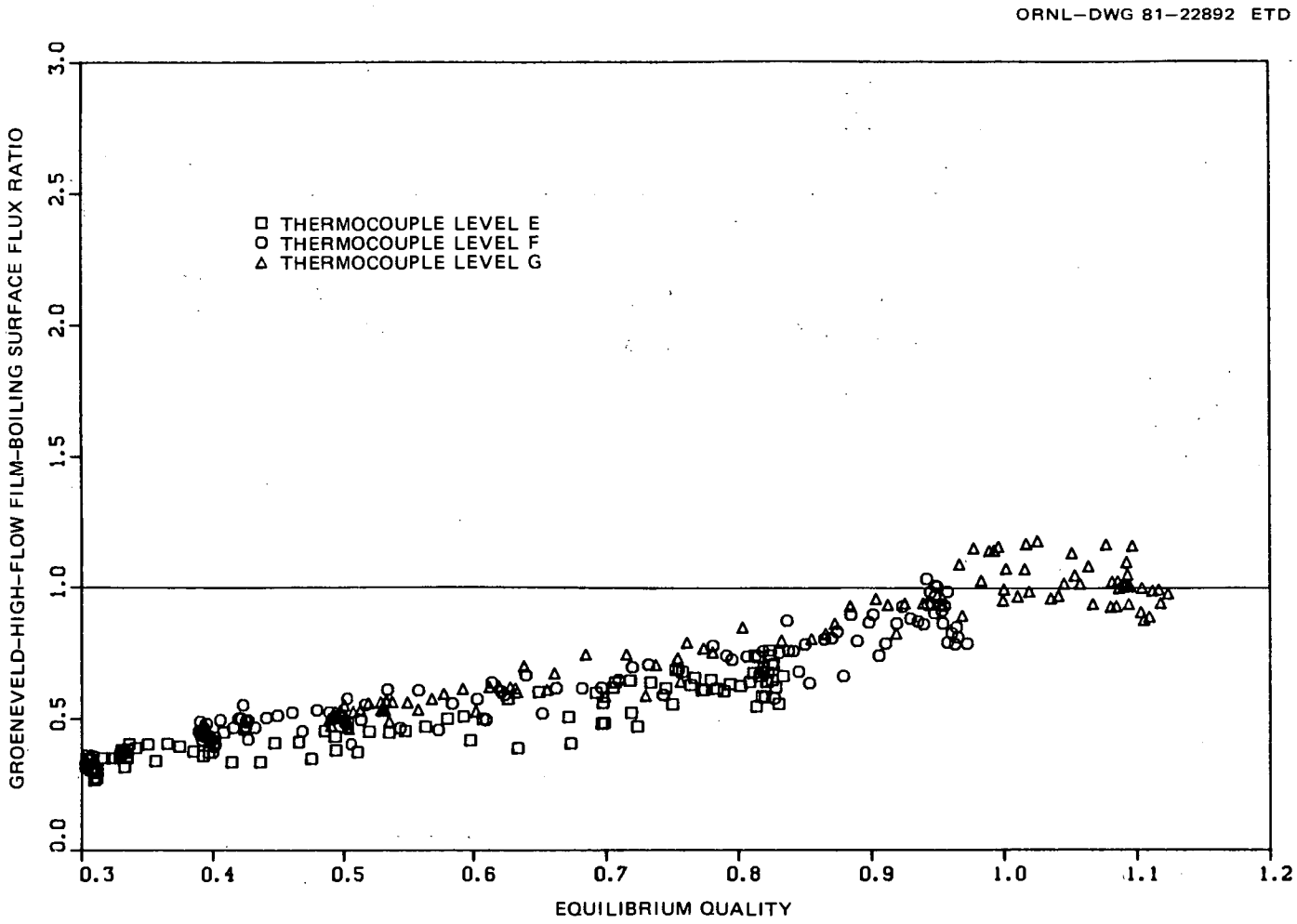

Fig. 5.55. Ratio of q''_{cor} to q''_{exp} vs equilibrium quality for Groeneveld-Delorme correlation – test 3.03.6AR.

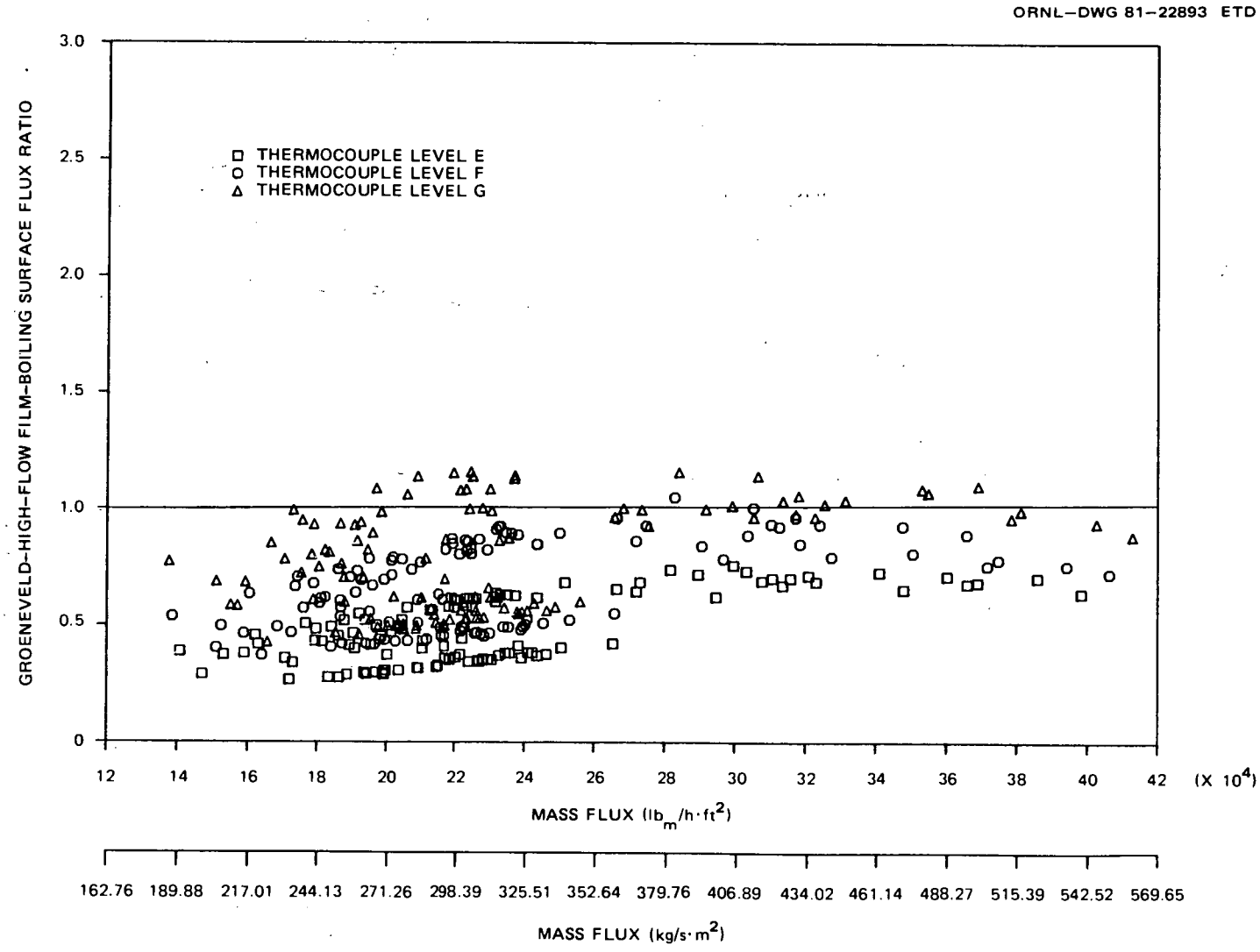

Fig. 5.56. Ratio of q''_{cor} to q''_{exp} vs mass flux for Groeneveld-Delorme correlation — test 3.03.6AR.

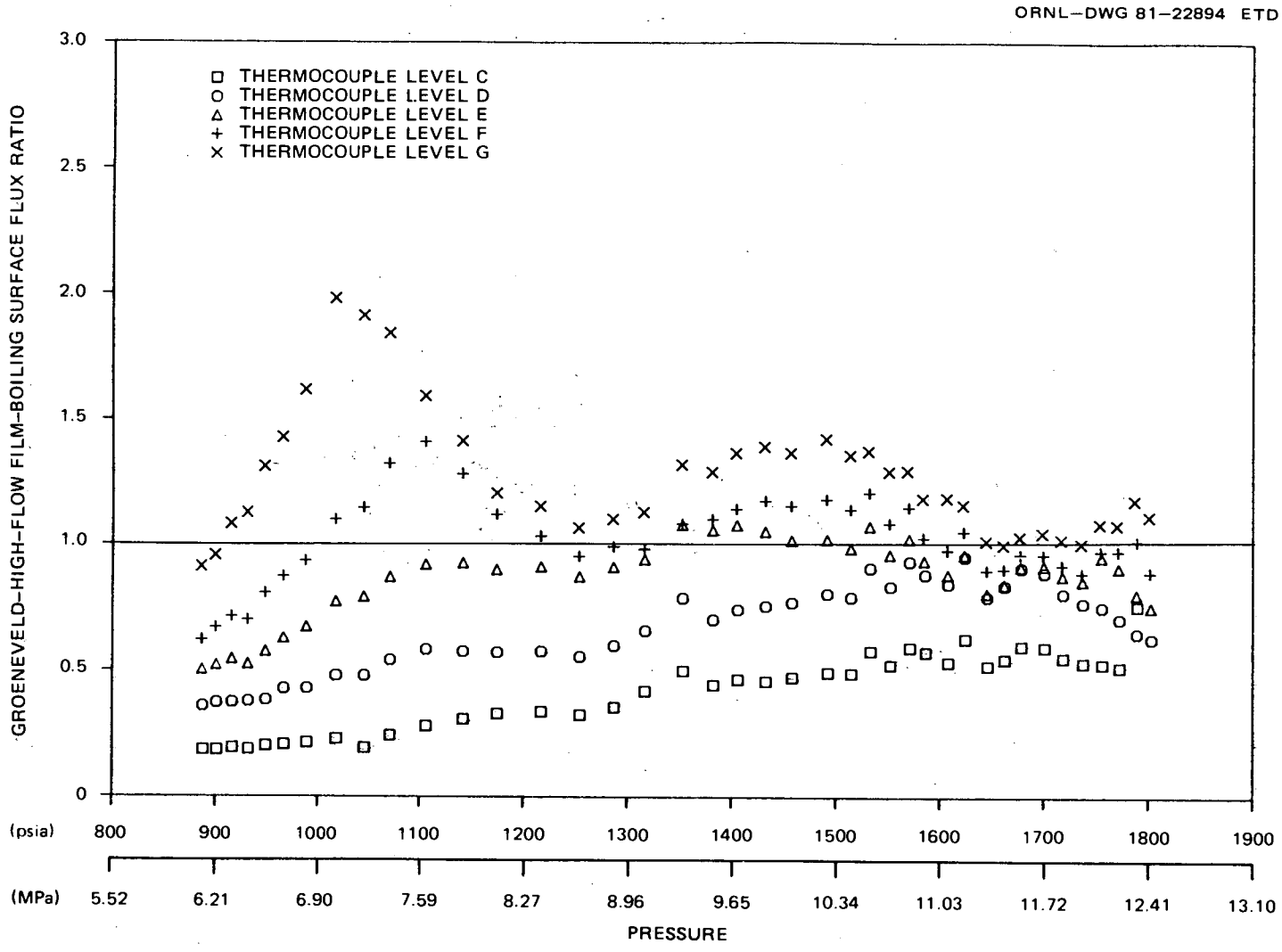

Fig. 5.57. Ratio of q''_{cor} to q''_{exp} vs pressure for Groeneveld-Delorme correlation — test 3.06.6B.

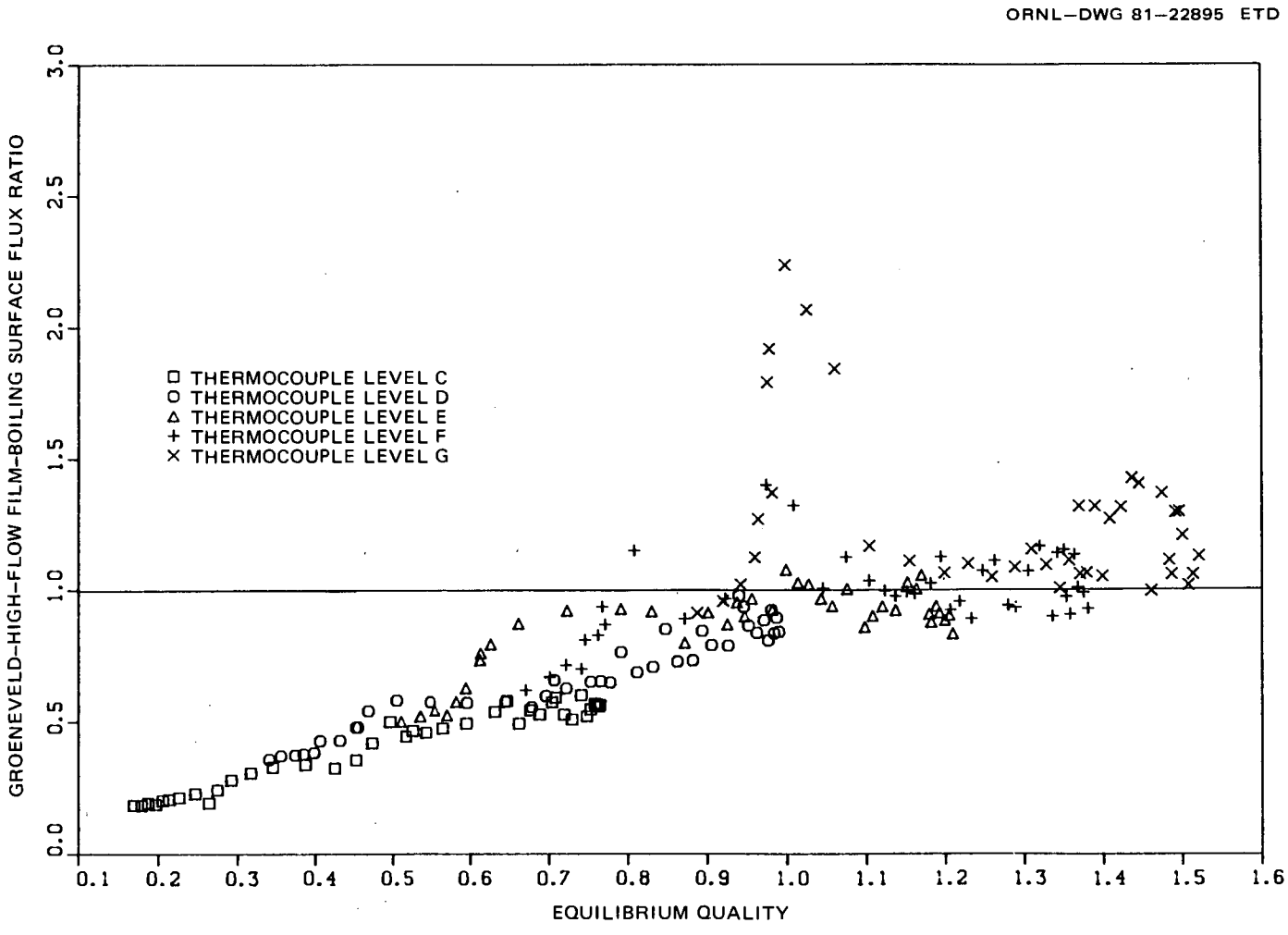

Fig. 5.58. Ratio of q''_{cor} to q''_{exp} vs equilibrium quality for Groeneveld-Delorme correlation — test 3.06.6B.

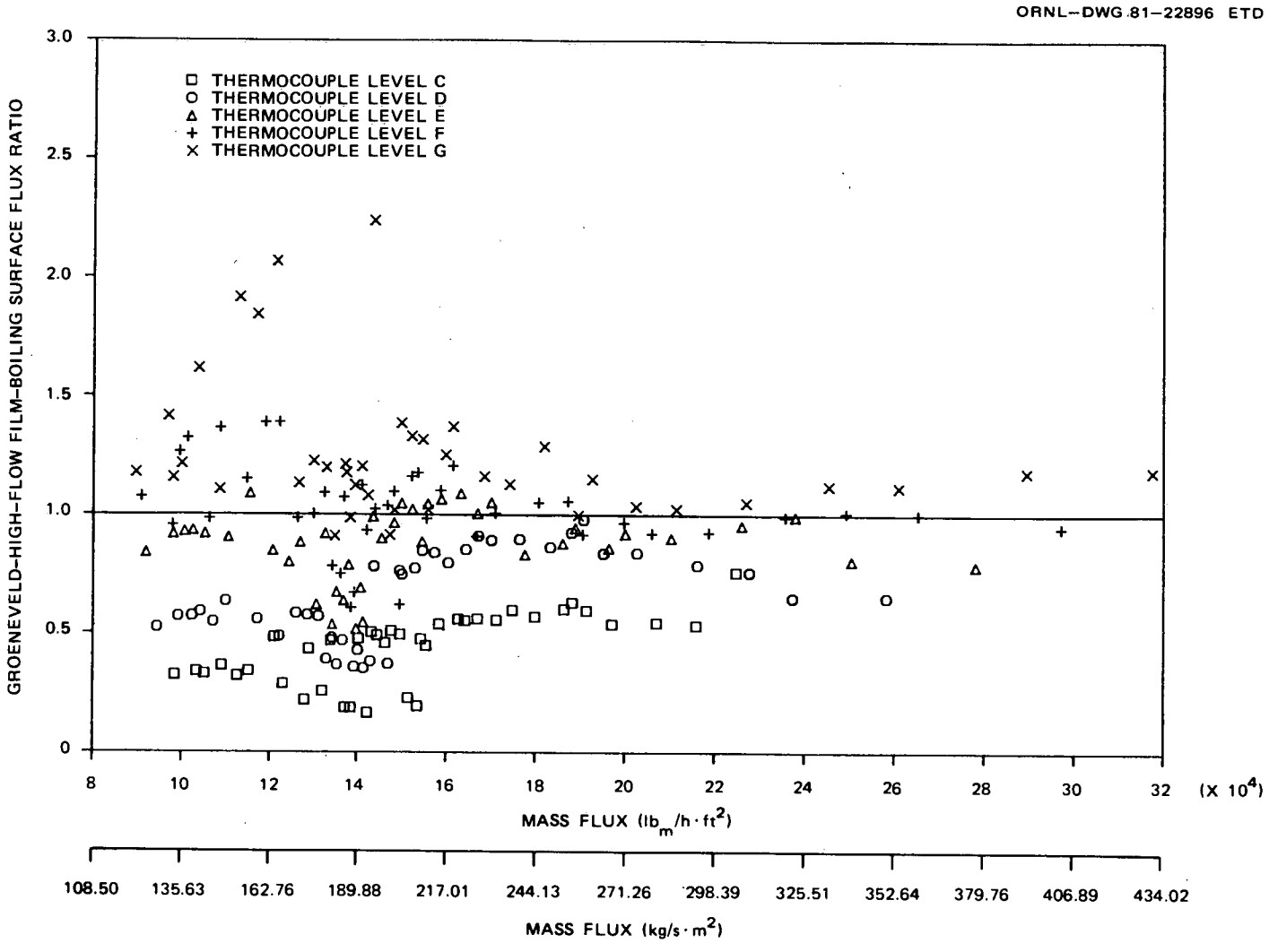

Fig. 5.59. Ratio of q''_{cor} to q''_{exp} vs mass flux for Groeneveld-Delorme correlation — test 3.06.6B.

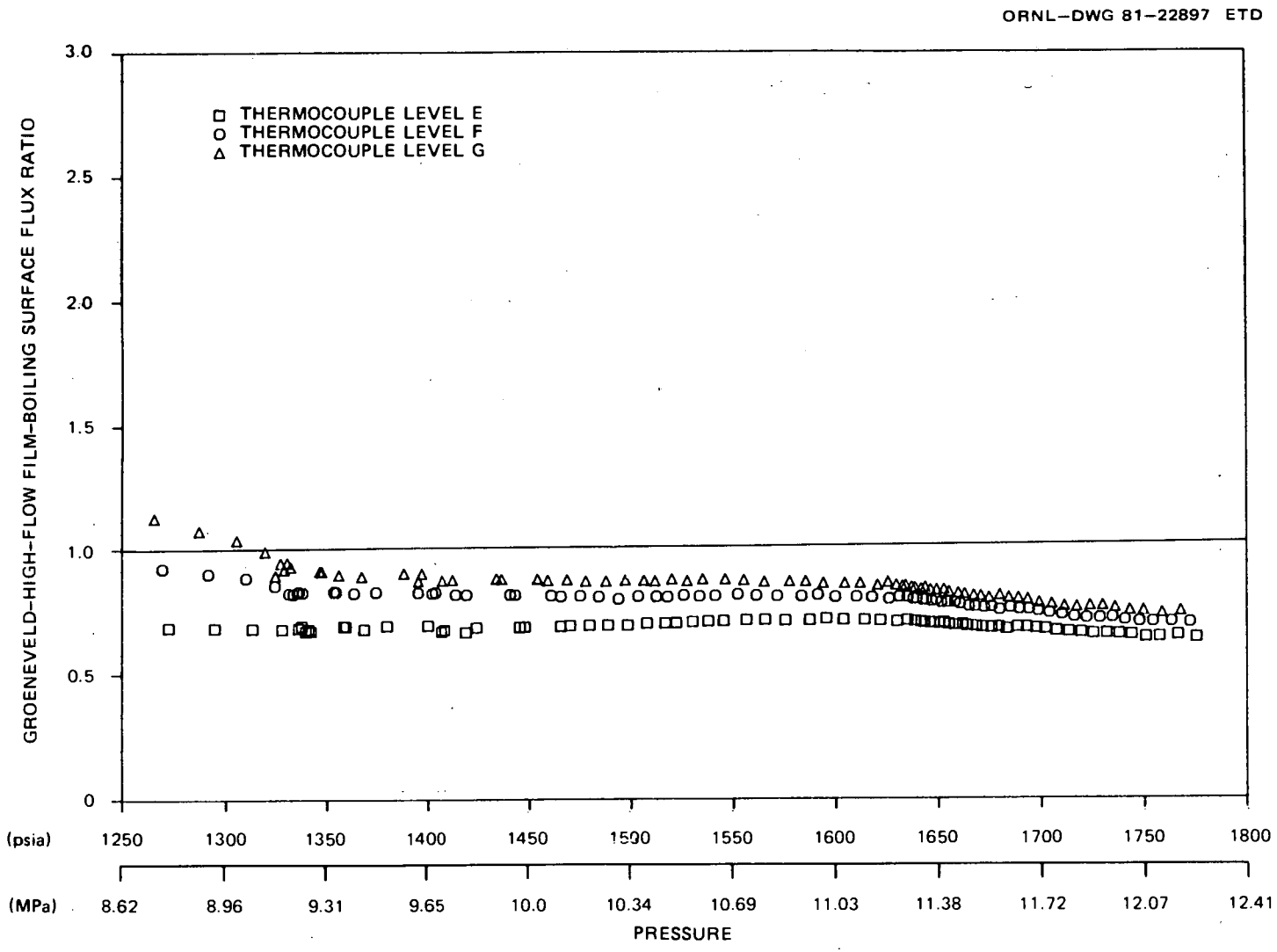

Fig. 5.60. Ratio of q''_{cor} to q''_{exp} vs pressure for Groeneveld-Delorme correlation — test 3.08.6C.

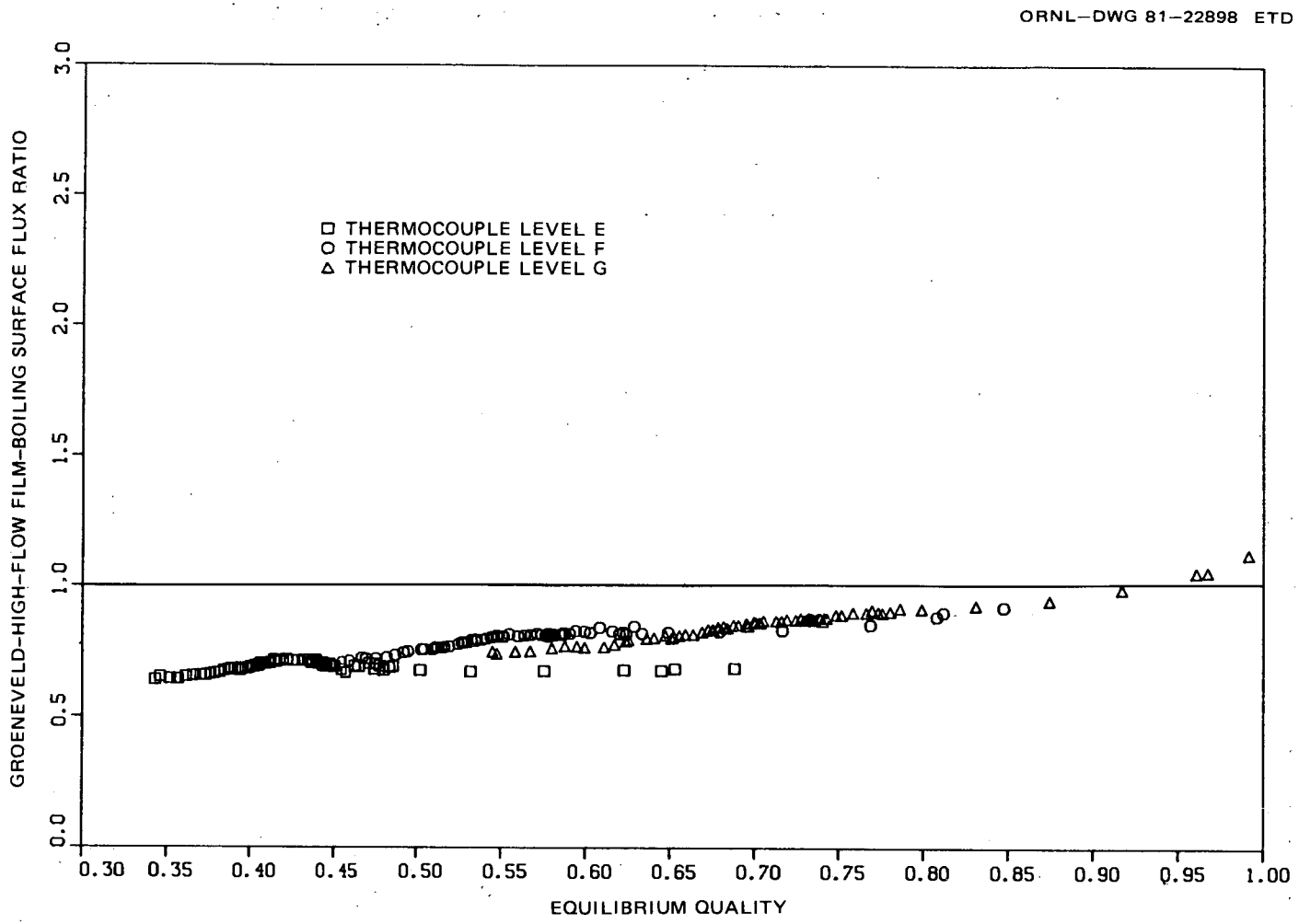

Fig. 5.61. Ratio of q''_{cor} to q''_{exp} vs equilibrium quality for Groeneveld–Delorme correlation – test 3.08.6C.

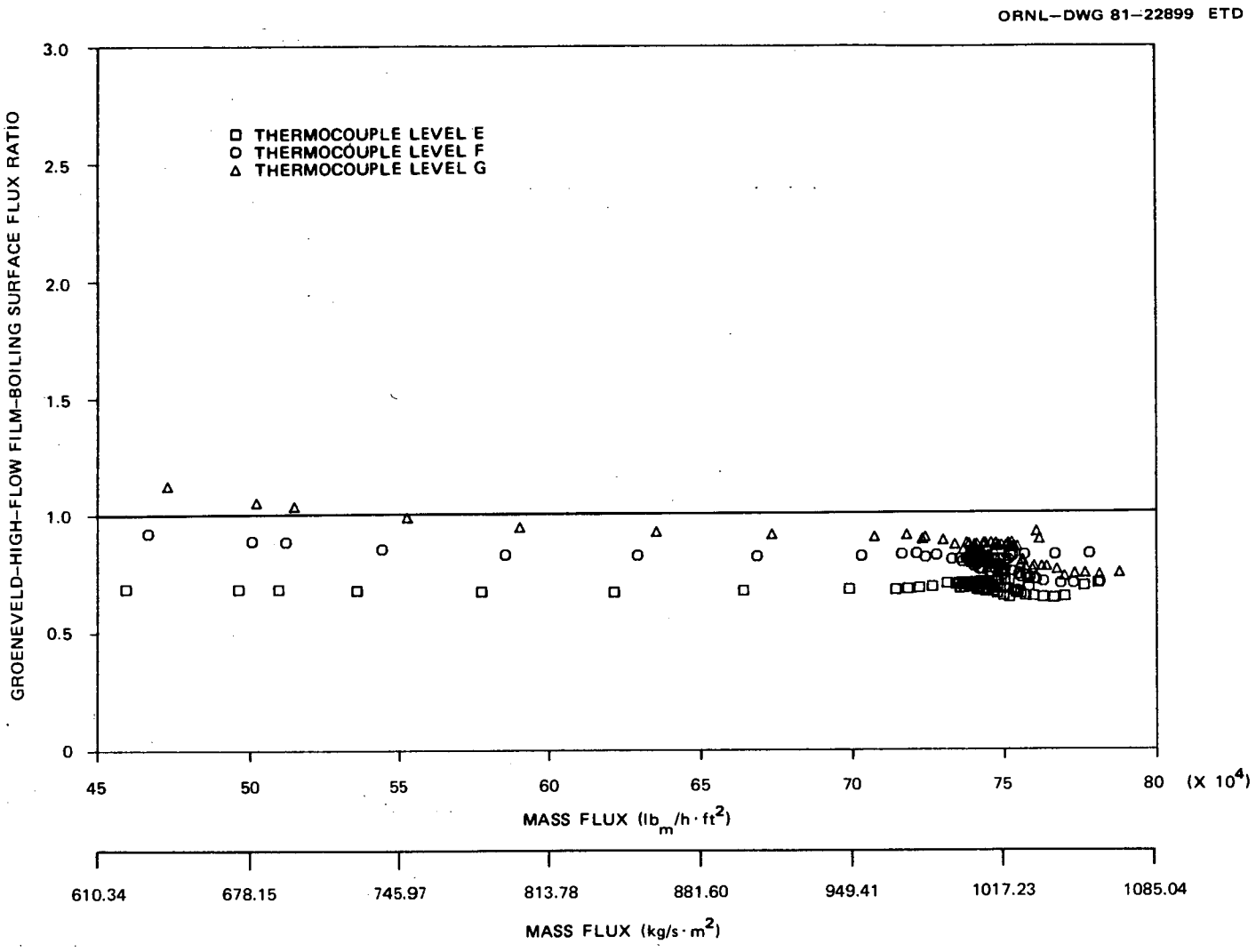

Fig. 5.62. Ratio of q''_{cor} to q''_{exp} vs mass flux for Groeneveld-Delorme correlation — test 3.08.6C.

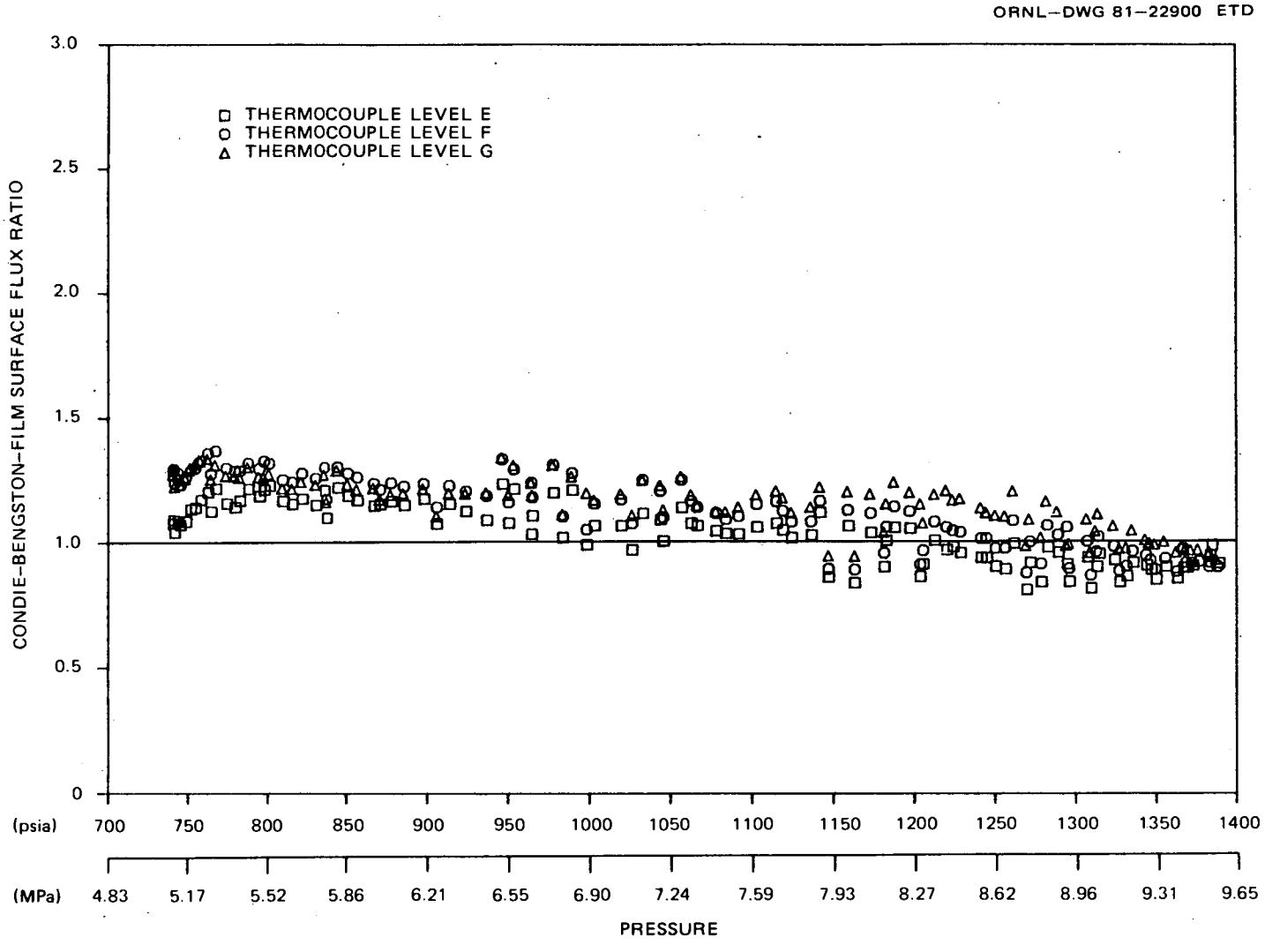

Fig. 5.63. Ratio of q''_{cor} to q''_{exp} vs pressure for Condie-Bengston IV correlation — test 3.03.6AR.

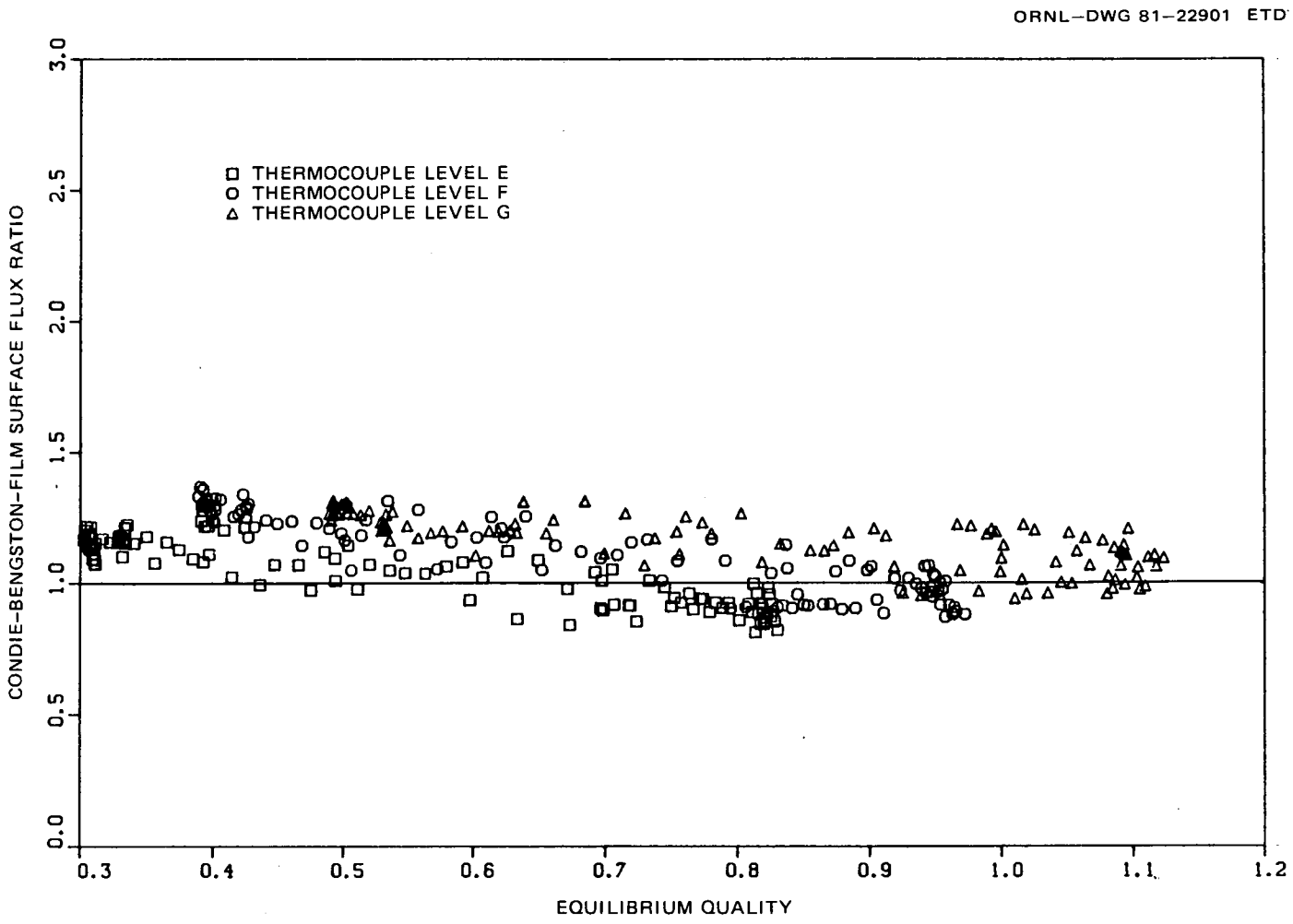

Fig. 5.64. Ratio of q''_{cor} to q''_{exp} vs equilibrium quality for Condie-Bengston IV correlation – test 3.03.6AR.

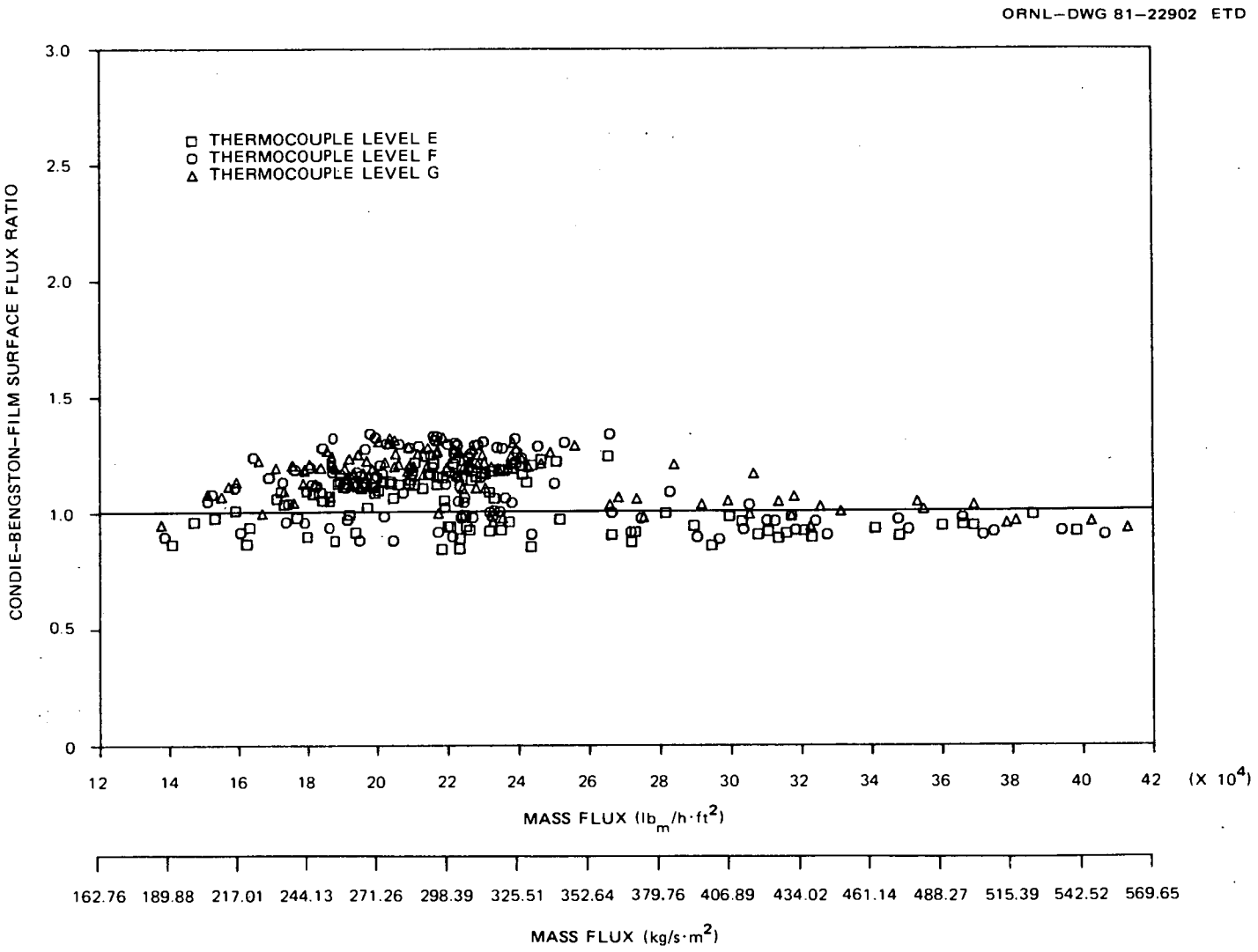

Fig. 5.65. Ratio of q''_{cor} to q''_{exp} vs mass flux for Condie-Bengston IV correlation — test 3.03.6AR.

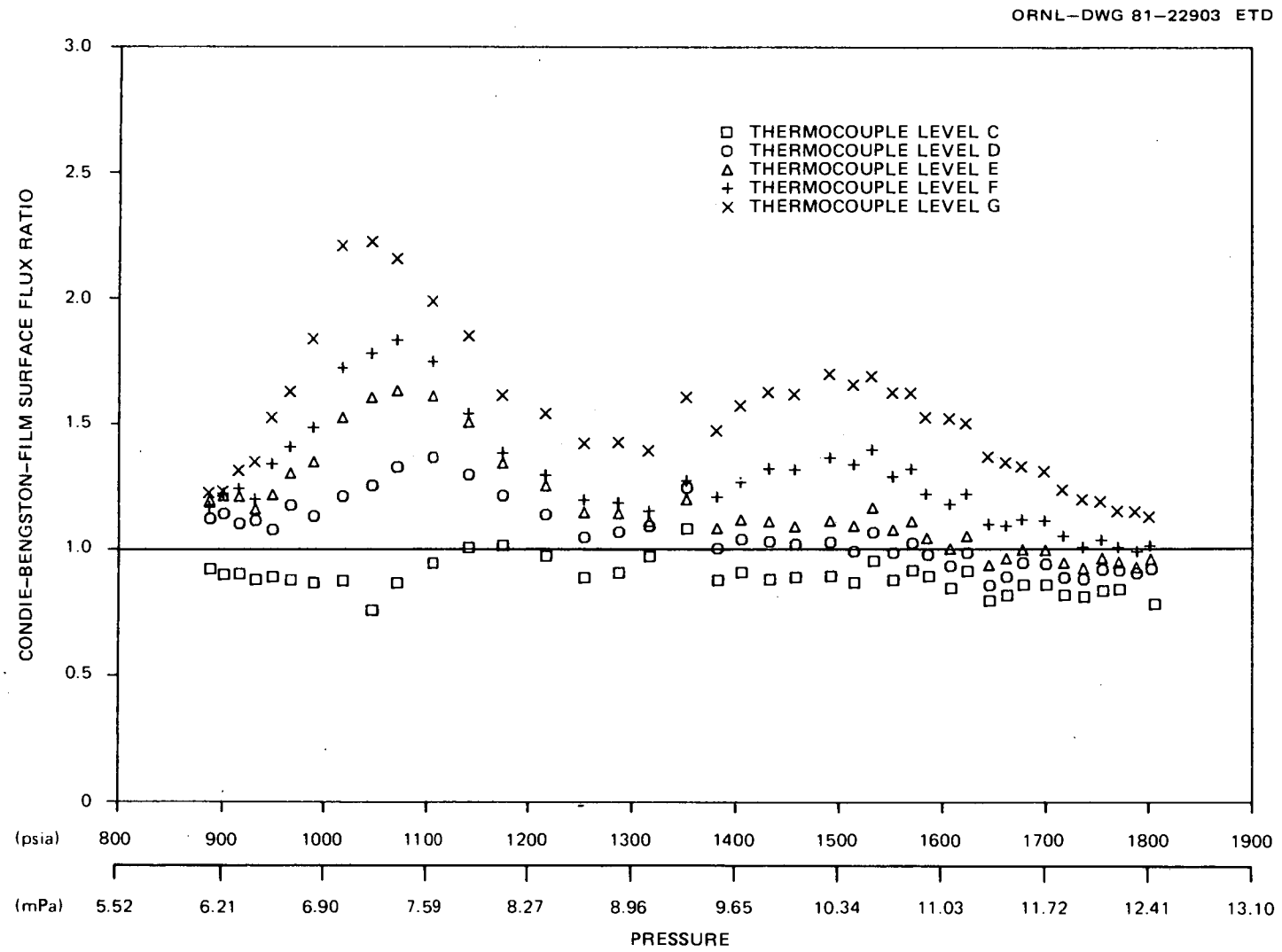

Fig. 5.66. Ratio of q''_{cor} to q''_{exp} vs pressure for Condie-Bengston IV correlation — test 3.06.6B.

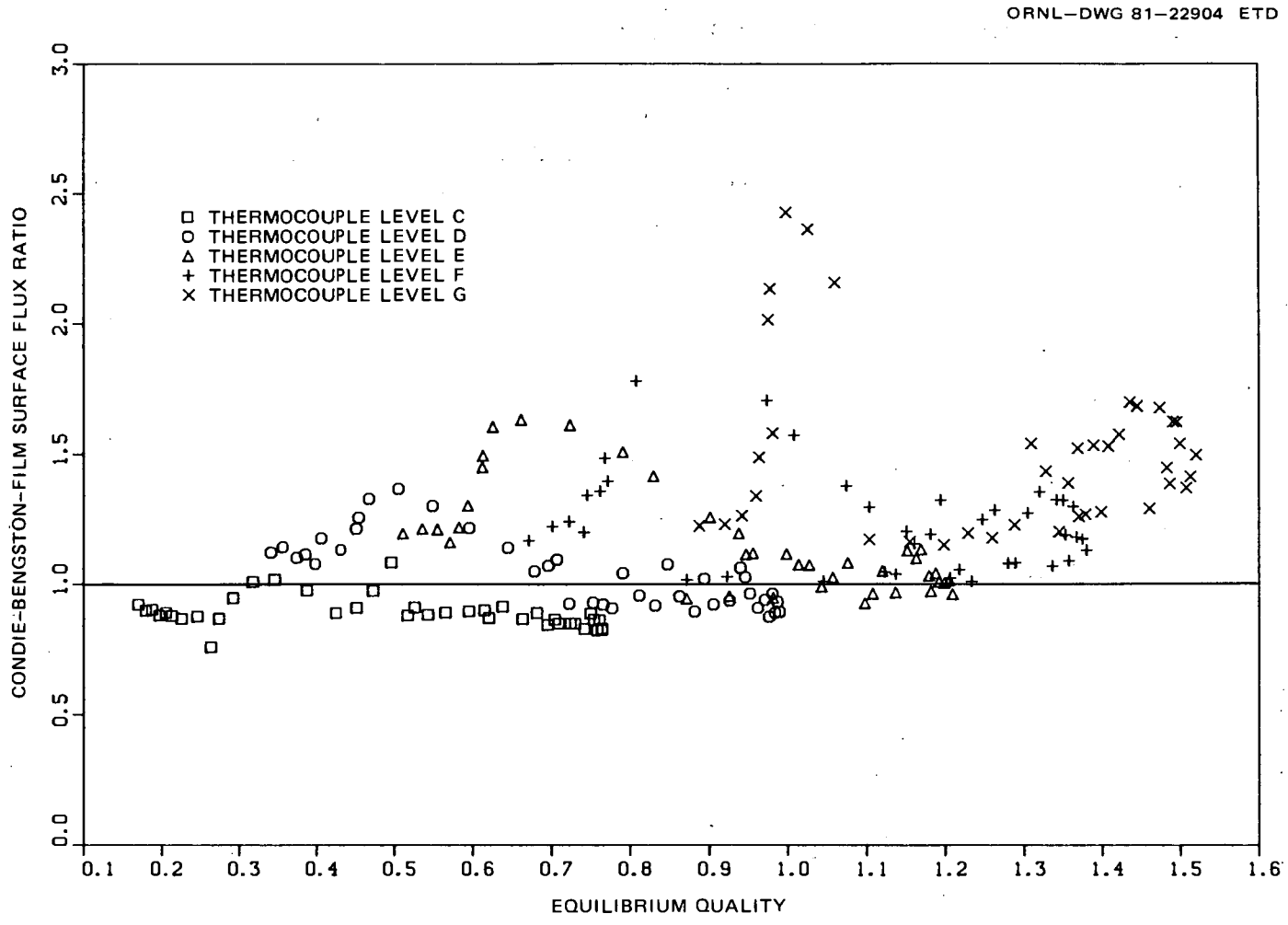

Fig. 5.67. Ratio of q''_{cor} to q''_{exp} vs equilibrium quality for Condie-Bengston IV correlation — test 3.06.6B.

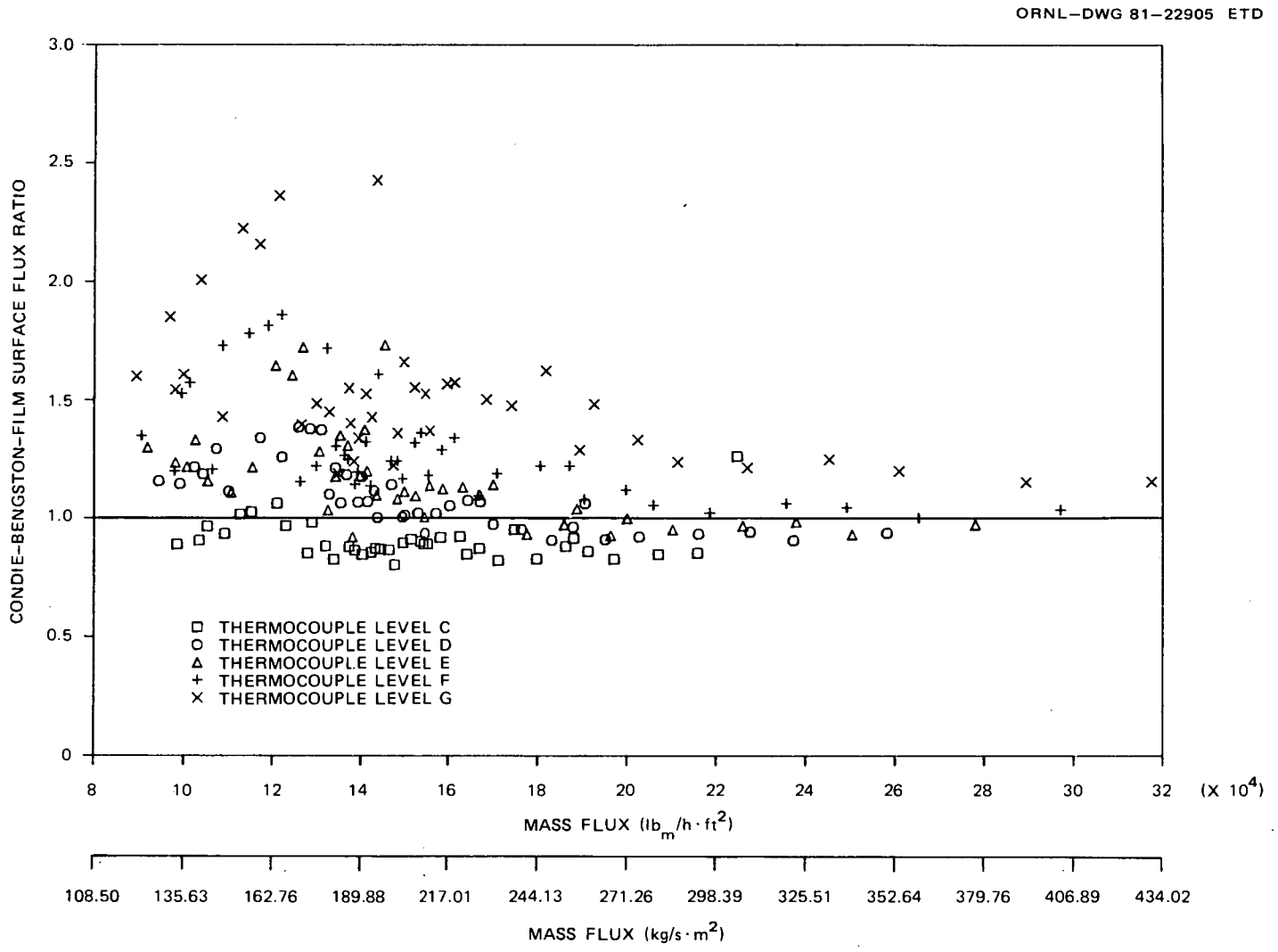

Fig. 5.68. Ratio of q''_{cor} to q''_{exp} vs mass flux for Condie-Bengston IV correlation — test 3.06.6B.

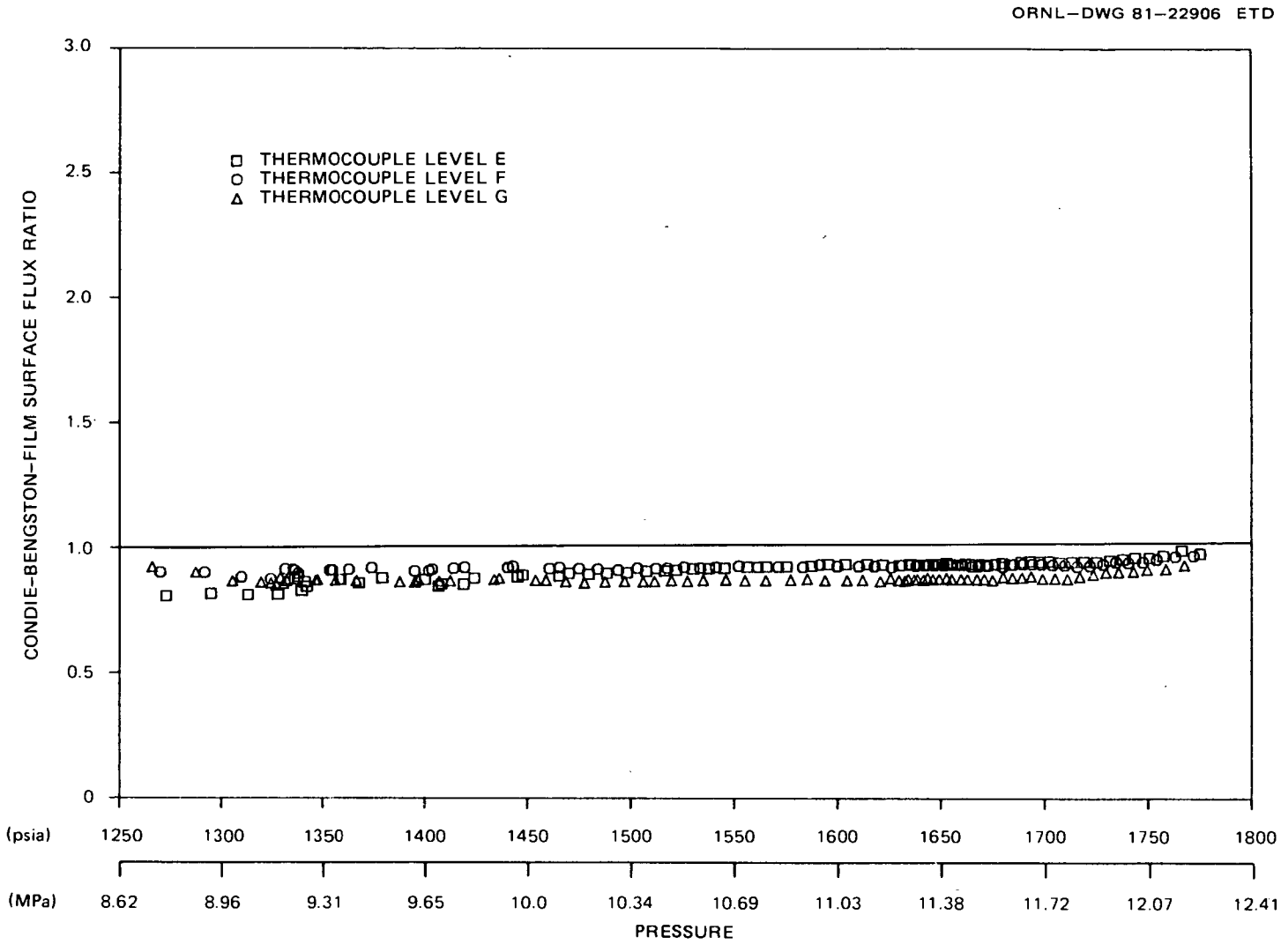

Fig. 5.69. Ratio of q''_{cor} to q''_{exp} vs pressure for Condie-Bengston IV correlation — test 3.08.6C.

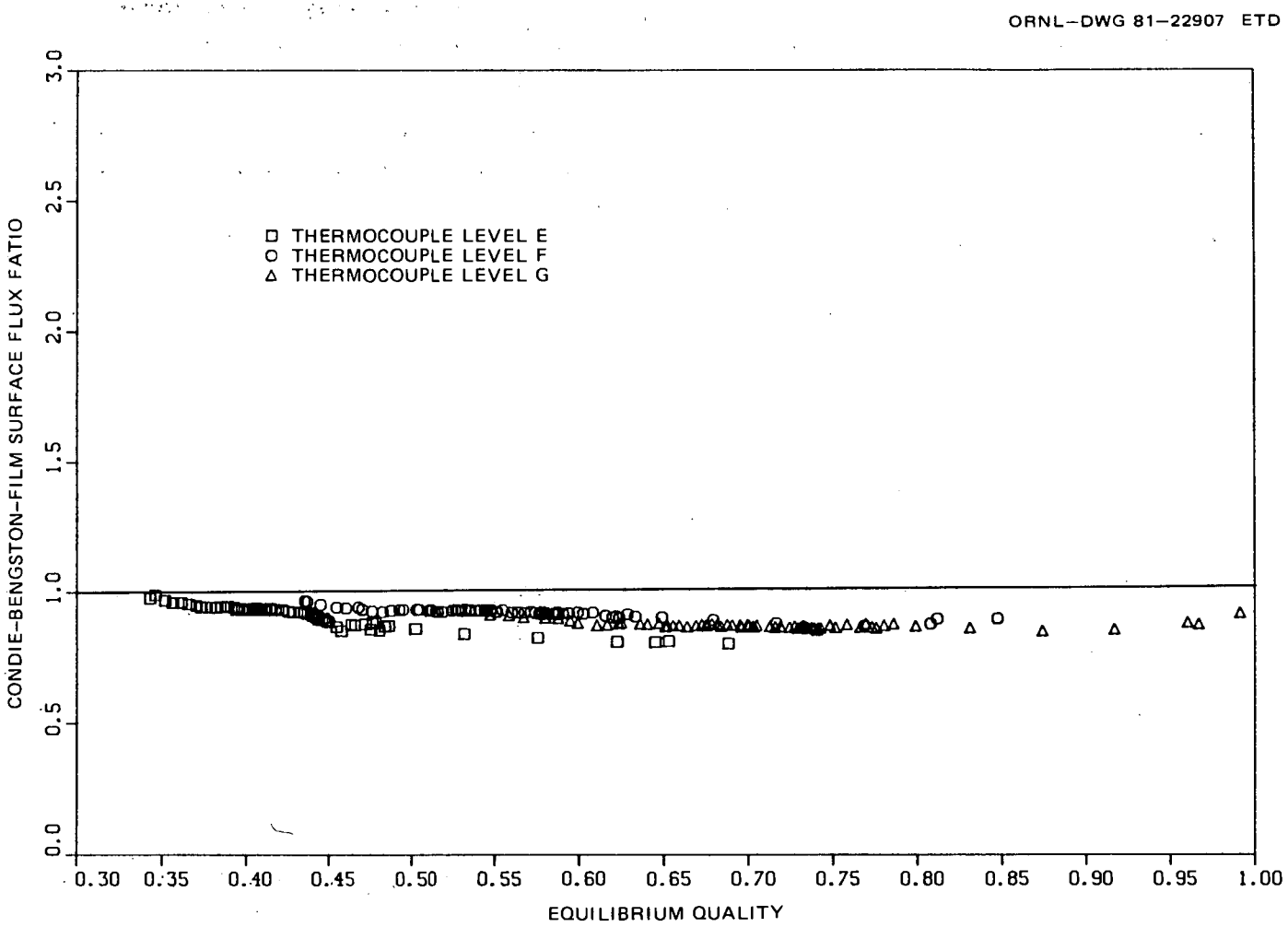

Fig. 5.70. Ratio of q''_{cor} to q''_{exp} vs equilibrium quality for Condie-Bengston IV correlation — test 3.08.6C.

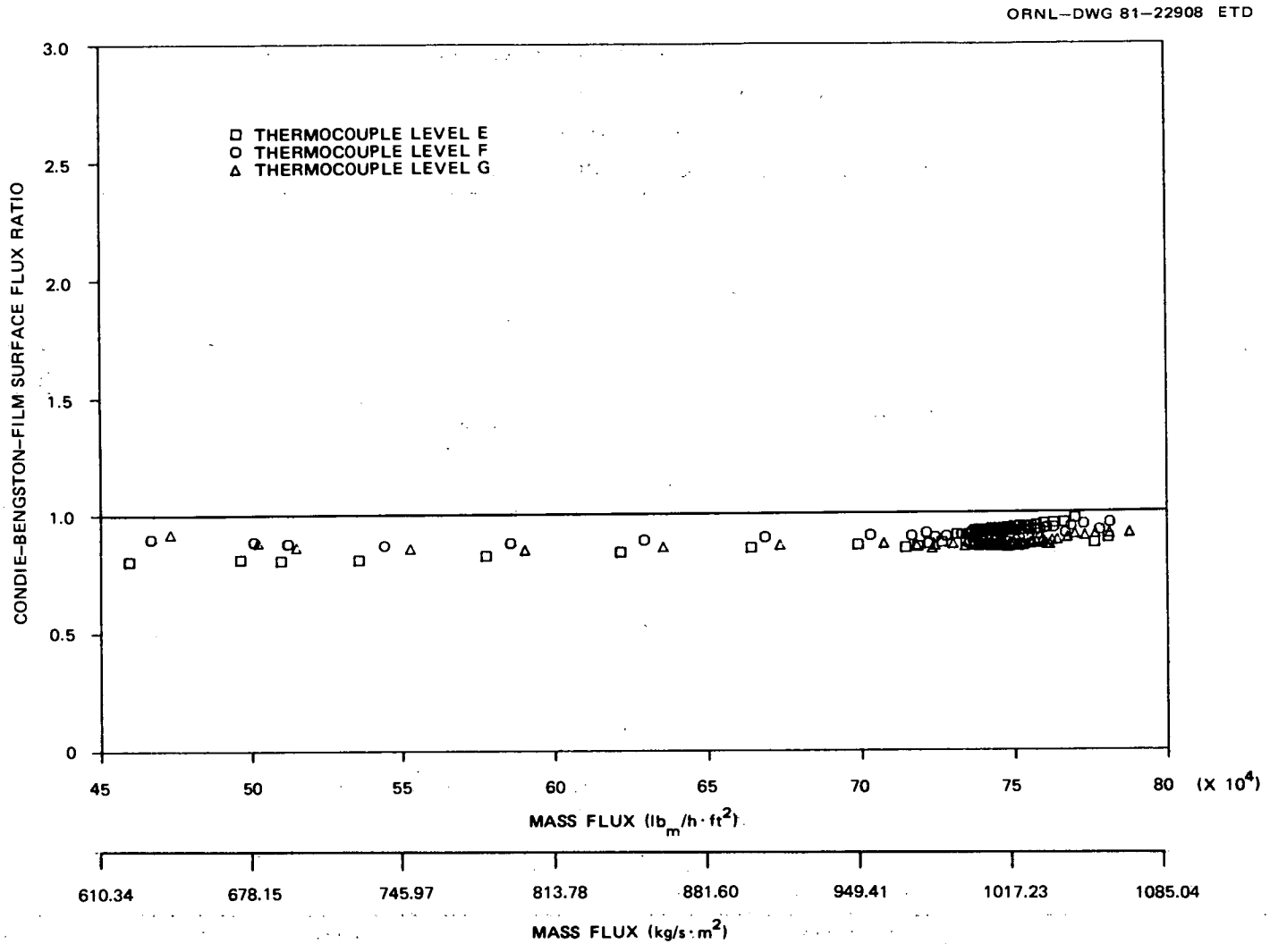

Fig. 5.71. Ratio of q''_{cor} to q''_{exp} vs mass flux for Condie-Bengston IV correlation – test 3.08.6C.

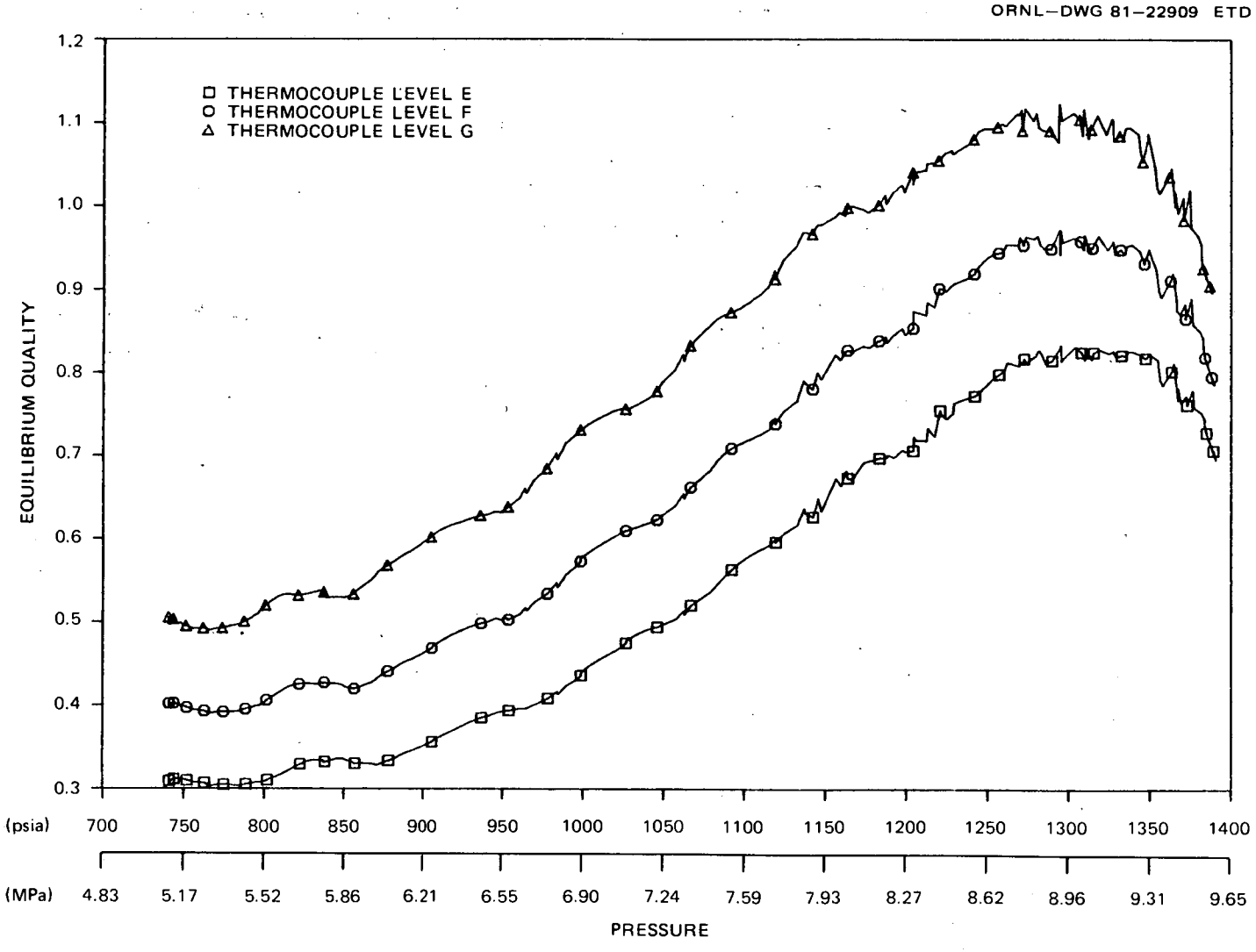

Fig. 5.72. Equilibrium quality vs pressure during film boiling for thermocouple levels used in correlation evaluations — test 3.03.6AR.

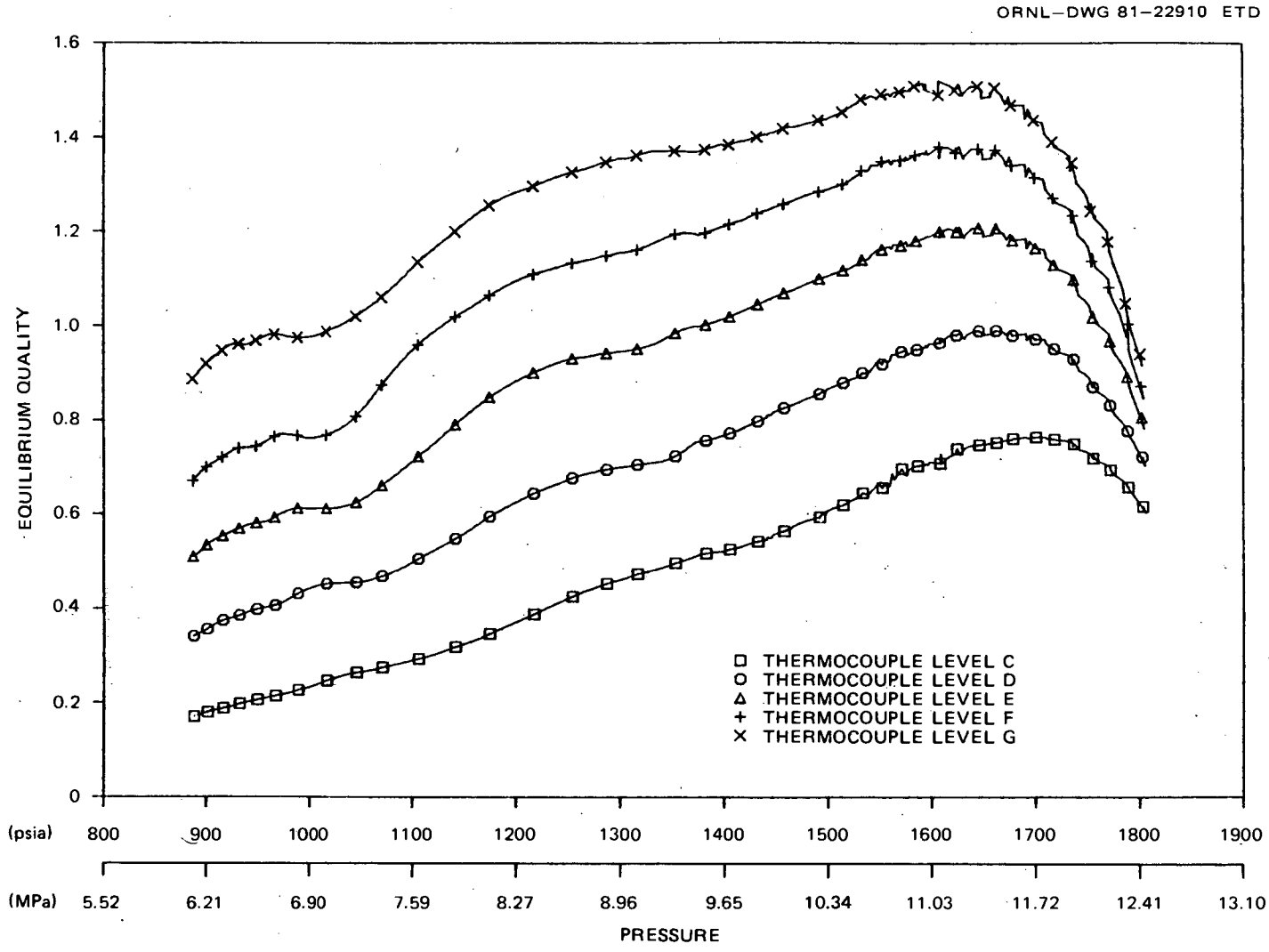

Fig. 5.73. Equilibrium quality vs pressure during film boiling for thermocouple levels used in correlation evaluations — test 3.06.6B.

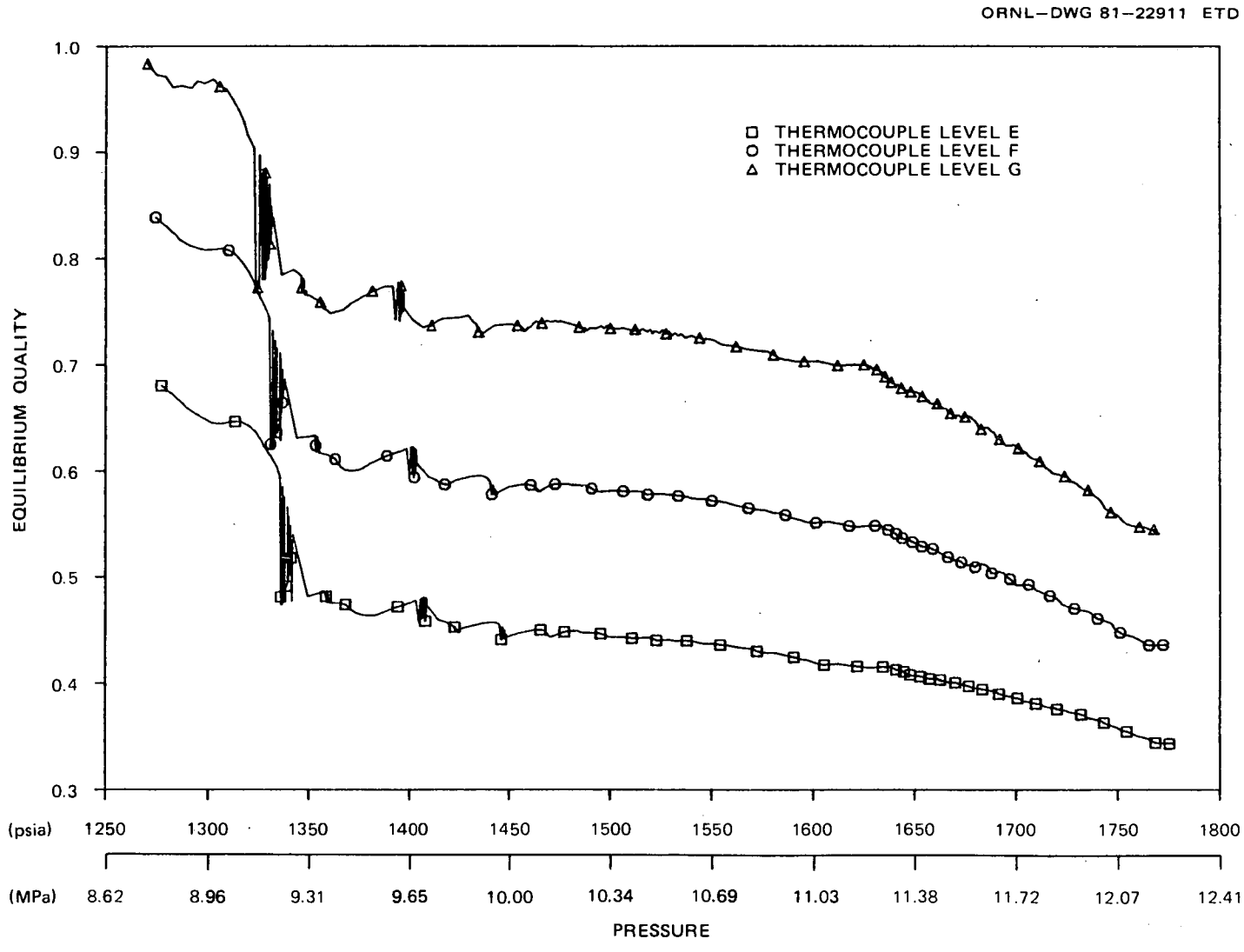

Fig. 5.74. Equilibrium quality vs pressure during film boiling for thermocouple levels used in correlation evaluations — test 3.08.6C.

and 3.06.6B (as shown in Sect. 5.3), the Dougall-Rohsenow correlation comparisons indicate that nonequilibrium effects are only partially responsible for the correlations' poor performances. In general, the Dougall-Rohsenow correlations overpredict the experimental heat transfer more with increasing distance from the dryout point and with increasing quality.

The results of the correlation comparisons with Groeneveld 5.7 and 5.9 are similar (Figs. 5.36–5.53). The predictions of Groeneveld 5.9 tend to be slightly lower than those of Groeneveld 5.7, although both correlations predict the heat transfer better than the Dougall-Rohsenow correlations. Groeneveld 5.7 and 5.9 correlations perform better in the analysis of test 3.08.6C than tests 3.03.6AR and 3.06.6B. This is probably due in part to the higher mass fluxes in test 3.08.6C, which are closer to the data base from which the correlations were regressed.

The comparisons of the Groeneveld-Delorme correlation (Figs. 5.54–5.62) show that the correlation generally underpredicts the heat transfer. However, in test 3.06.6B (Figs. 5.56–5.58) the correlation overpredicts data significantly far from the dryout point when the pressure is low and quality is high.

The Condie-Bengston IV correlation comparisons with the data are shown in Figs. 5.63–5.71. The Condie-Bengston IV correlation predicts the heat transfer better than the Dougall-Rohsenow correlation; also it generally performs better close to the dryout point.

The results of ORNL steady-state experiments conducted in the THTF generally concur with those of the transient tests. Appendix C presents a summary of the steady-state film-boiling results.

5.2 Uncertainty Analysis: Test 3.06.6B

A best-estimate uncertainty analysis was performed on the film-boiling data obtained in test 3.06.6B to determine the accuracy of calculated flow parameters and rod surface conditions. The uncertainties calculated in the flow parameters and rod surface conditions permit the calculation of uncertainties in correlation-predicted and experimentally determined heat transfer.

The uncertainty analysis methodology that was used is similar in many respects to response surface methodology. The method is described in Appendix D. The calculated uncertainties in the bundle fluid conditions and rod surface conditions using this method are reported in Appendix D. Uncertainties are presented for two fluid volumes and for the local rod surface conditions of two rods associated with the fluid volumes. The calculation of uncertainties was limited to locations low in the bundle because locations high in the bundle contained equilibrium qualities greater than one which prohibits the application of the correlations used in the uncertainty analysis. Typical uncertainties in the calculated rod surface conditions (defined as one standard deviation) are: σ (rod surface temperature) of ~5.5 to 8.3 K (10 to 15°F) and σ (heat flux) of ~15%. Typical uncertainties in the calculated fluid conditions (defined as one standard deviation) are: σ (pressure) of ~0.14 MPa (20 psi), σ (saturated fluid temperature) of ~1.1 K (2°F), σ (equilibrium quality) of ~15%, and

σ (mass flux) of 15%. These fluid uncertainties were calculated assuming that slip is one.

The calculated uncertainties in the experimental heat transfer coefficients are generally on the order of 15%. Uncertainties in the heat transfer coefficients calculated using the Dougall-Rohsenow, Groeneveld 5.7, and Groeneveld 5.9 correlations are also on the order of 15%. Figures 5.75–5.86 present correlation comparisons with the data and the calculated uncertainties in the heat transfer coefficients. Figures 5.75–5.78 show Dougall-Rohsenow correlation comparisons with two level-C and -D thermocouples. These comparisons indicate that except when the heat transfer coefficient is low, the Dougall-Rohsenow correlation overpredicts the heat transfer, and the overprediction is statistically significant.

Groeneveld 5.9 correlation comparisons are shown in Figs. 5.79–5.82 for two level-C and -D thermocouples. The level-C comparisons indicate that the correlation underpredicts the heat transfer. The heat transfer is most underpredicted when the heat transfer coefficient is low. The level-D comparisons indicate that the Groeneveld 5.9 correlation underpredicts the heat transfer, but the underprediction is generally within plus or minus one standard deviation.

Correlation comparisons are shown in Figs. 5.83–5.86 for the Groeneveld 5.7 correlation. Comparisons with level-C thermocouples indicate that the correlation predictions are in general agreement with the experimental heat transfer. Many of the predictions lie within plus or minus one standard deviation of the experimental heat transfer. Level-D comparisons show that the correlation generally overpredicts the heat transfer coefficients slightly except when the coefficients are low. However, much of the data lies within plus or minus one standard deviation of the diagonal line.

5.3 Nonequilibrium Bundle Fluid Conditions

Because of the nature of dispersed-flow film boiling, some measure of thermodynamic nonequilibrium is inevitably present. There are several indications that the thermodynamic nonequilibrium in test 3.08.6C is significantly less than that in tests 3.03.6AR and 3.06.6B. Using the nonequilibrium model developed by Yoder,[4] the thermodynamic nonequilibrium in the three ORNL transient tests was calculated. The calculations were performed at similar distances from dryout [~122 cm (4 ft) – test 3.03.6AR; ~91 cm (3 ft) – tests 3.06.6B and 3.08.6C]. In test 3.03.6AR the nonequilibrium quality and steam superheat are estimated to be 0.39 (vs an equilibrium quality of 0.49) and 120 K (217°F), respectively, at 302 cm (119 in.) above the bottom of the rod bundle and 14 s into the transient. The nonequilibrium quality and steam superheat are estimated to be 0.34 (vs an equilibrium quality of 0.40) and 76 K (137°F), respectively, in test 3.06.6B at 14 s and 183 cm (72 in.). For test 3.08.6C at 18 s and 302 cm (119 in.), the nonequilibrium quality and steam superheat are estimated to be 0.49 (vs an equilibrium quality of 0.58) and 49 K (89°F), respectively. Since the steam has significantly less superheat in test 3.08.6C than in the two other transient tests, less thermodynamic nonequilibrium is suggested in test 3.08.6C.

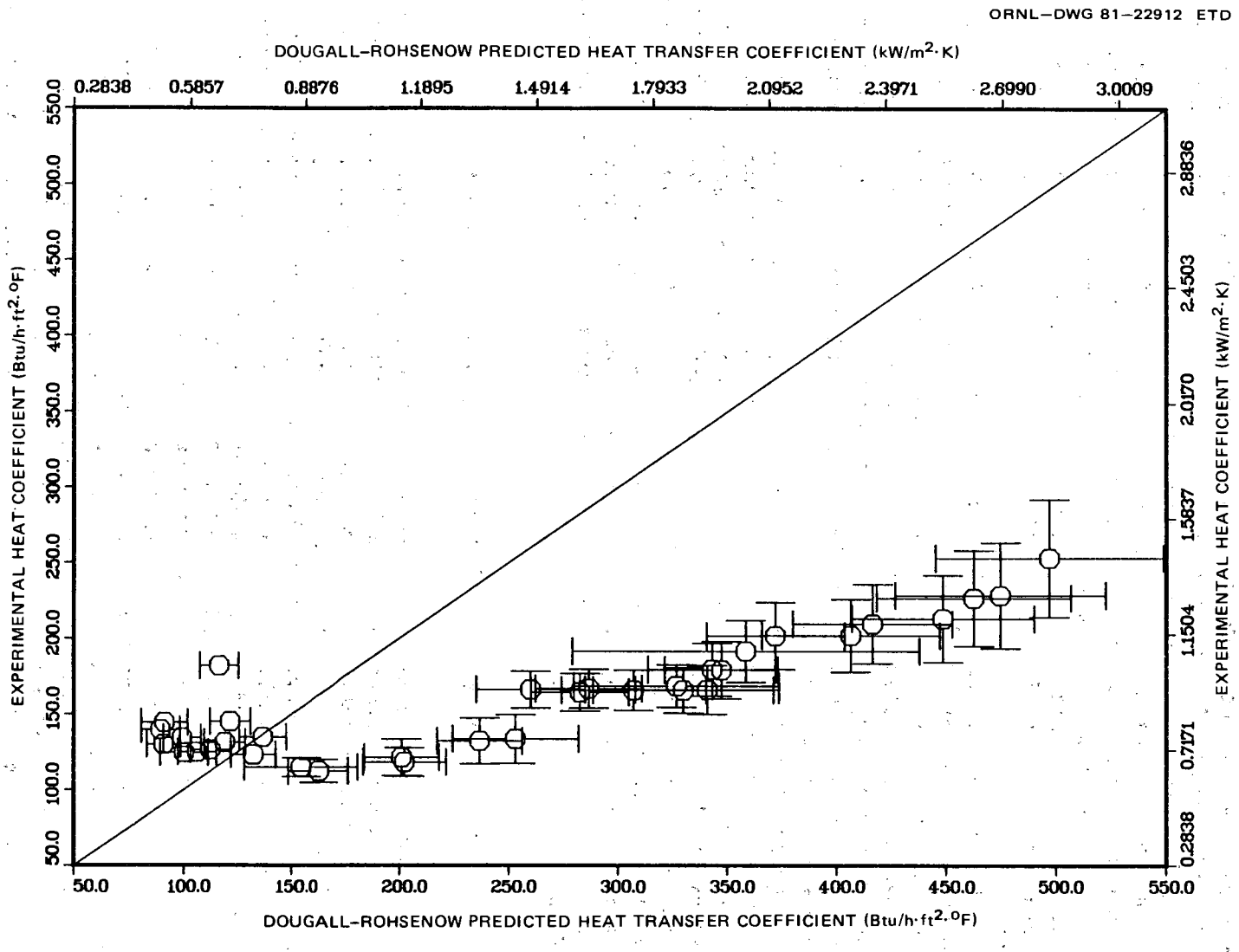

Fig. 5.75. Dougall-Rohsenow correlation comparison with uncertainties, TE-327AC — test 3.06.6B.

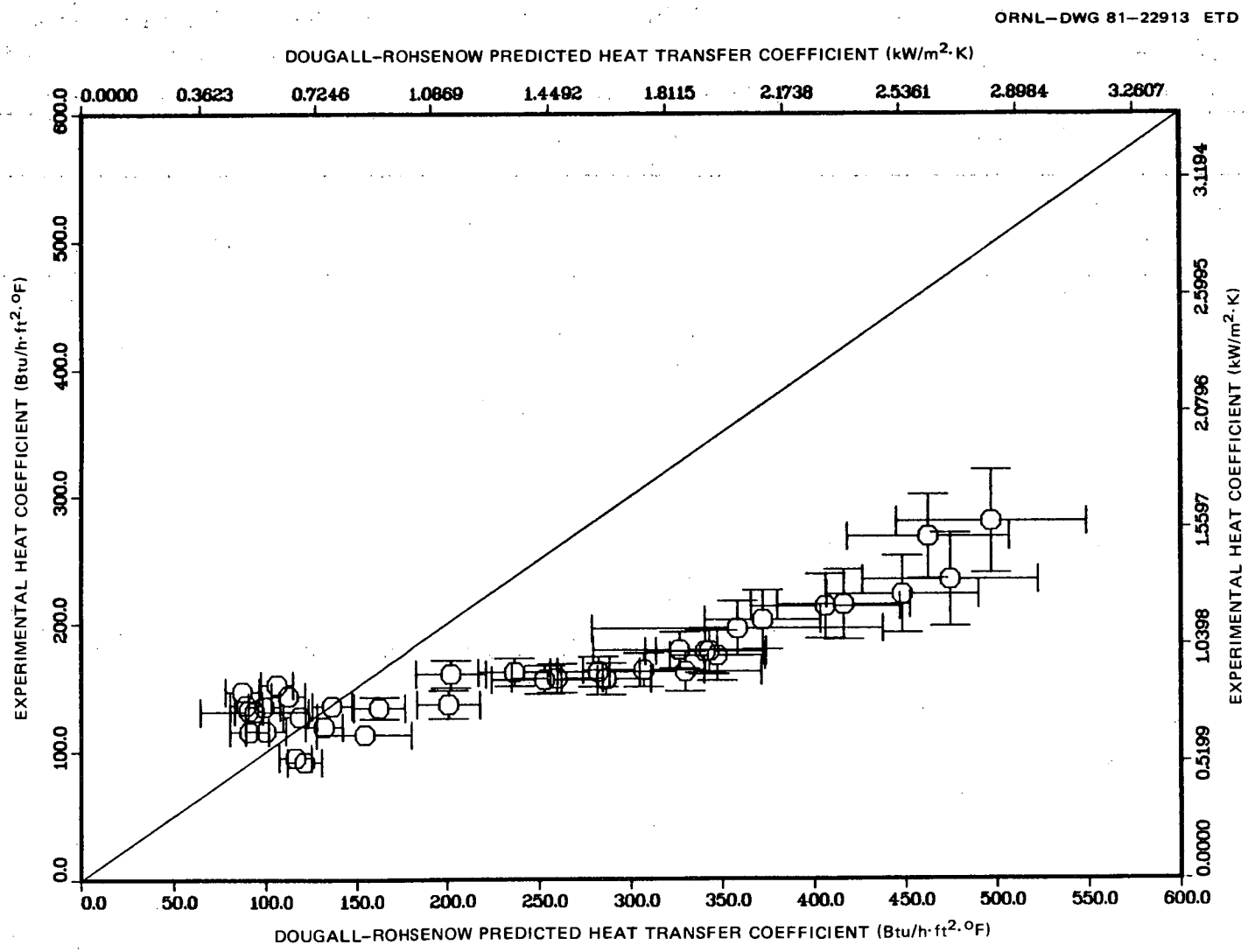

Fig. 5.76. Dougall-Rohsenow correlation comparison with uncertainties, TE-355BC – test 3.06.6B.

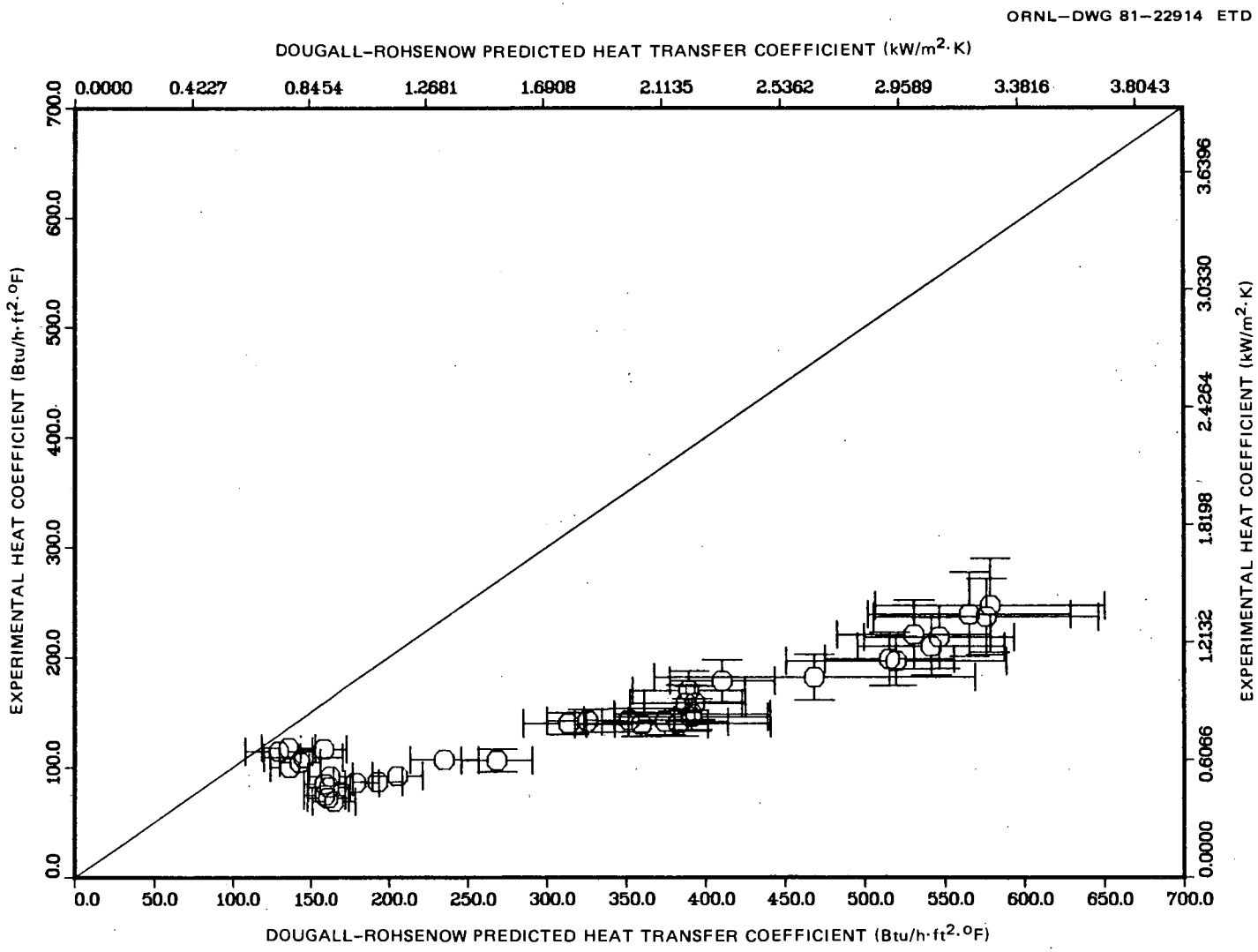

Fig. 5.77. Dougall-Rohsenow correlation comparison with uncertainties, TE-326AD – test 3.06.6B.

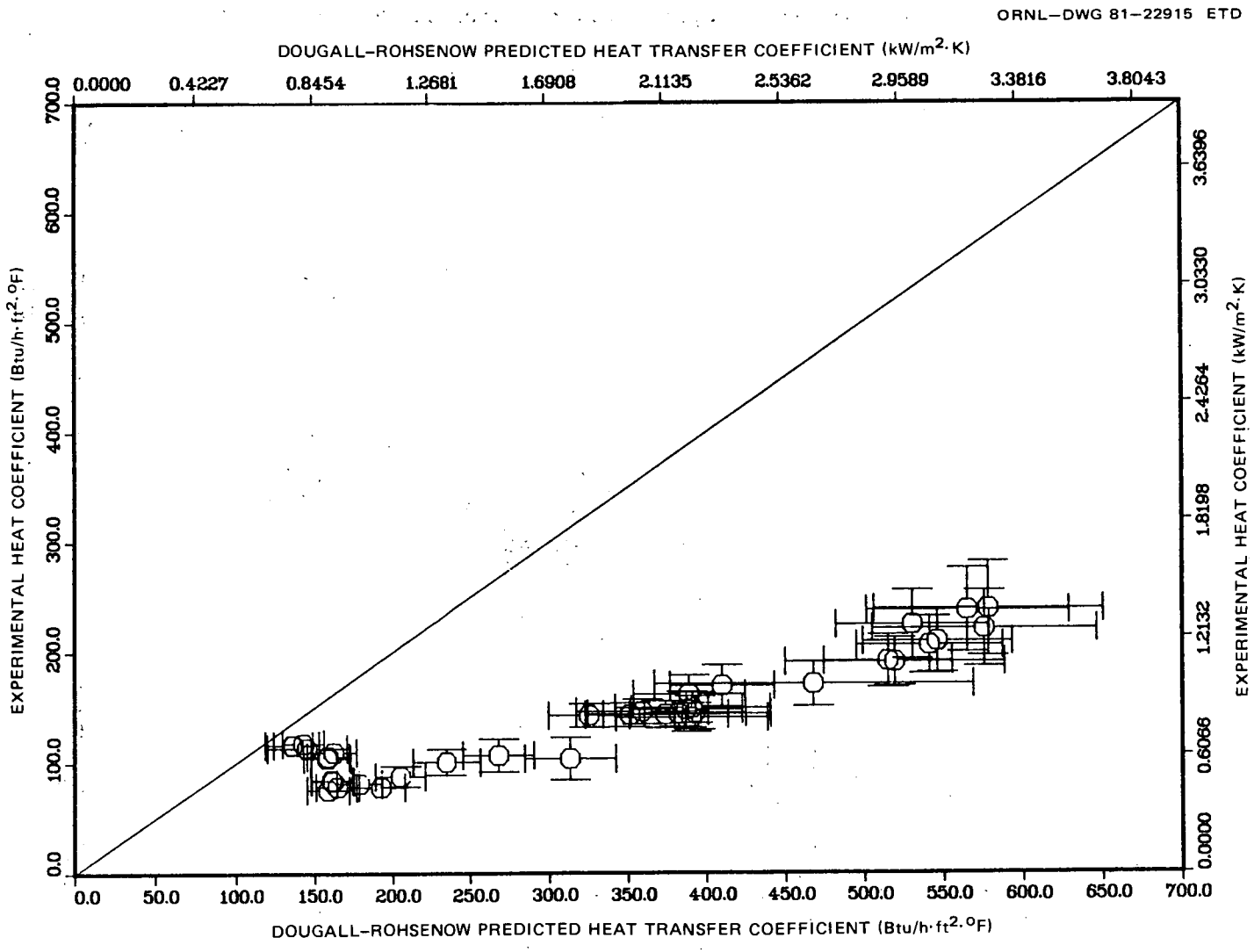

Fig. 5.78. Dougall-Rohsenow correlation comparison with uncertainties, TE-327AD – test 3.06.6B.

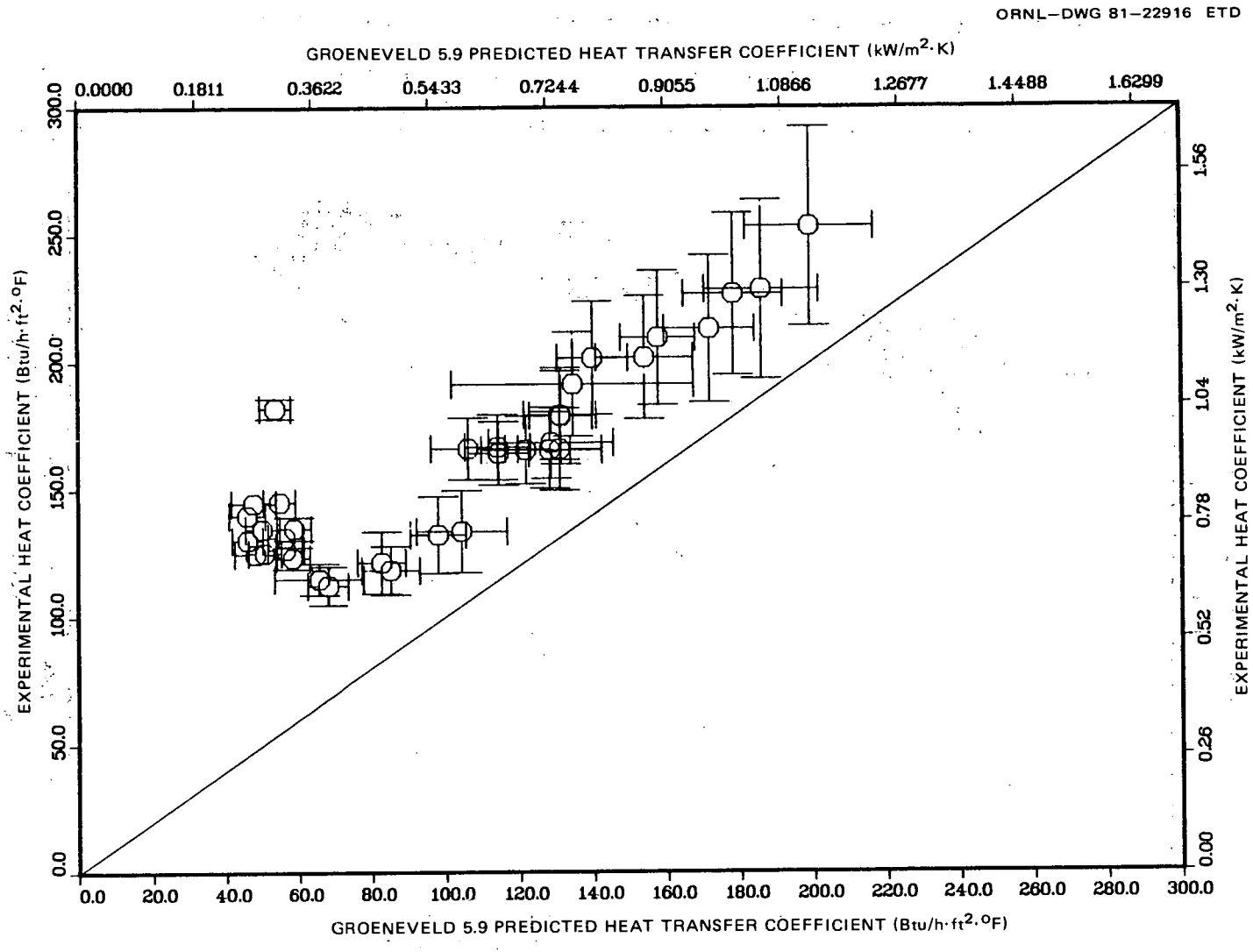

Fig. 5.79. Groeneveld 5.9 correlation comparison with uncertainties, TE-327AC – test 3.06.6B.

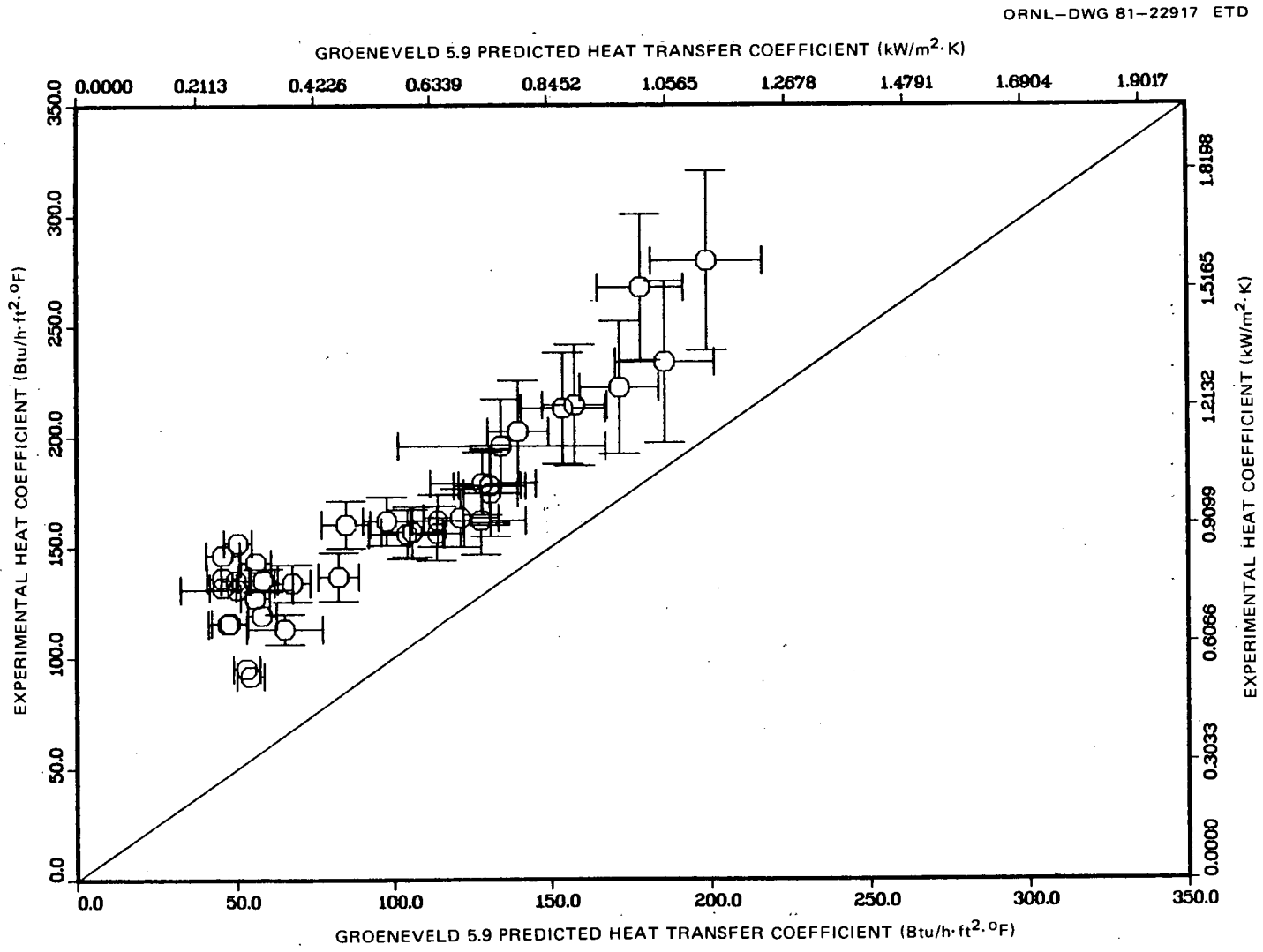

Fig. 5.80. Groeneveld 5.9 correlation comparison with uncertainties, TE-355BC – test 3.06.6B.

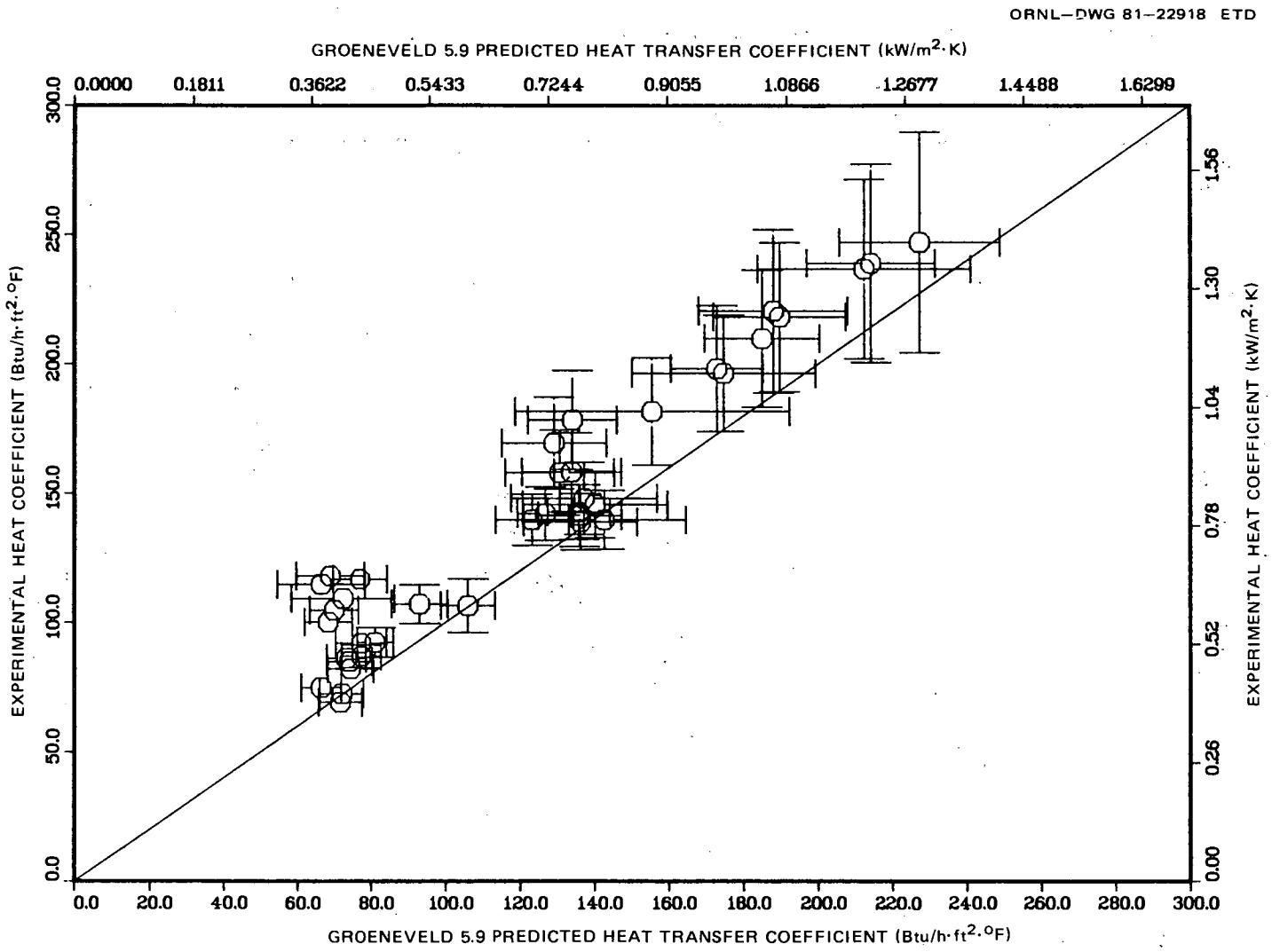

Fig. 5.81. Groeneveld 5.9 correlation comparison with uncertainties, TE-326AD – test 3.06.6B.

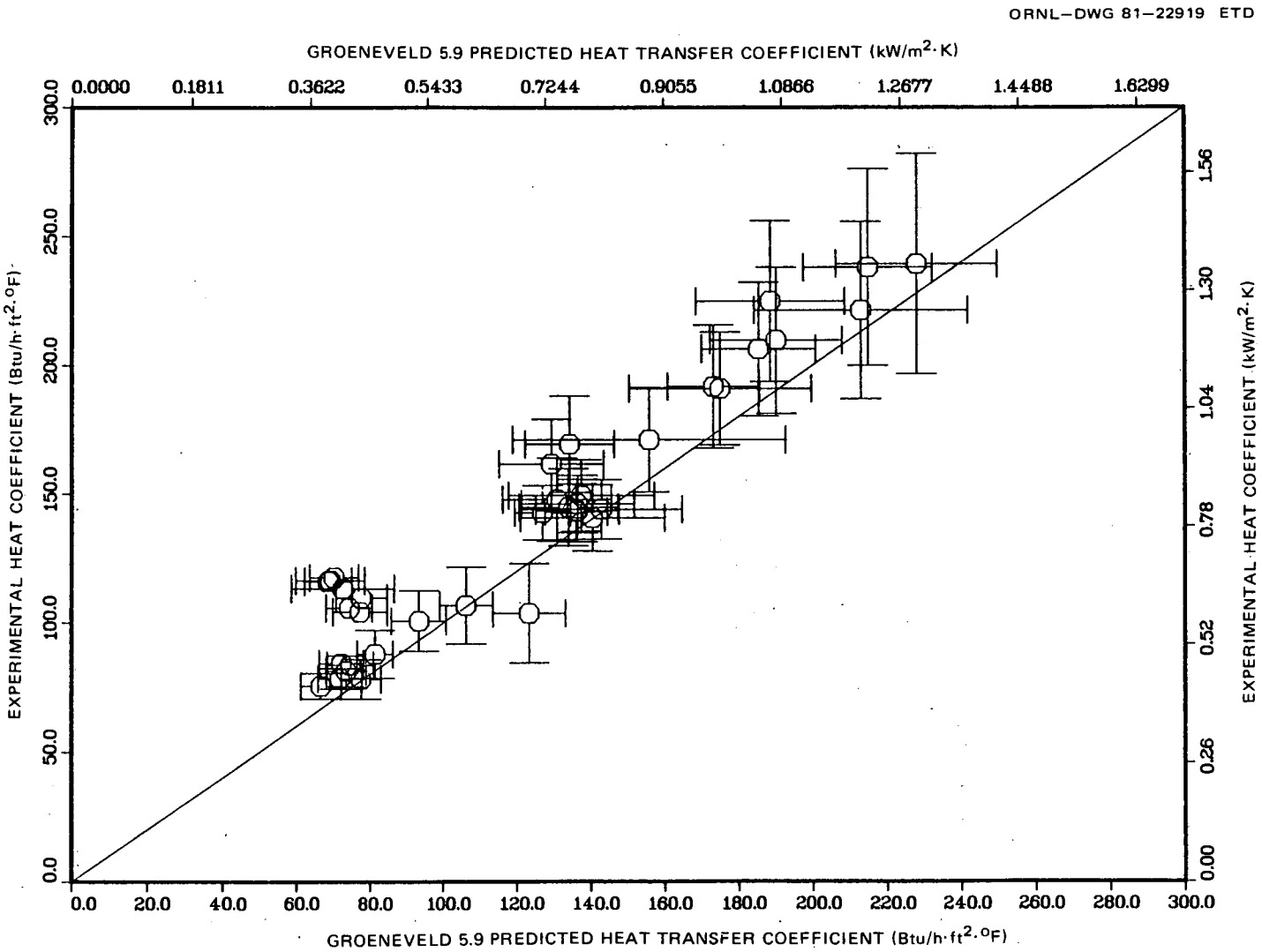

Fig. 5.82. Groeneveld 5.9 correlation comparison with uncertainties, TE-327AD – test 3.06.6B.

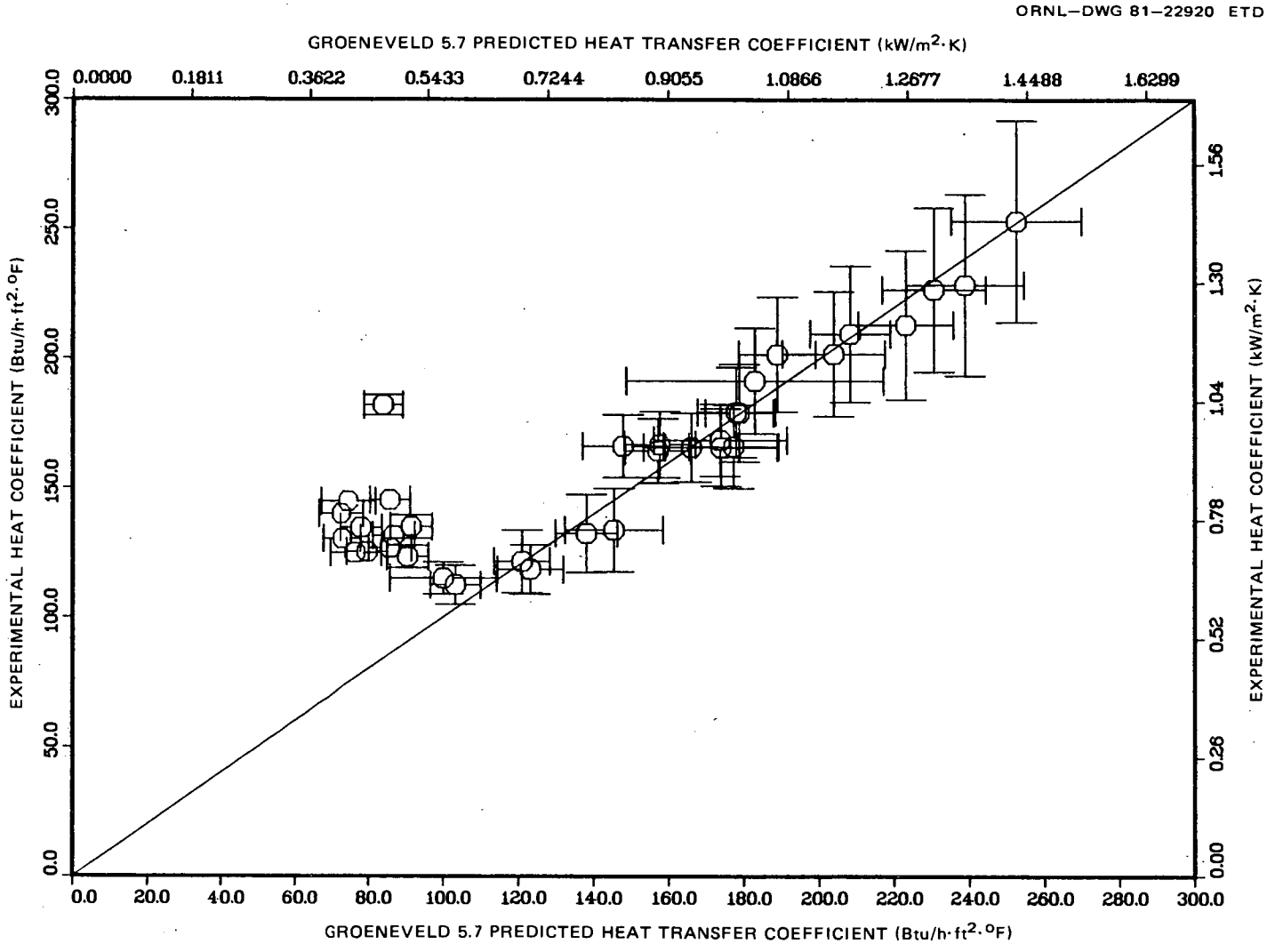

Fig. 5.83. Groeneveld 5.7 correlation comparison with uncertainties, TE-327AC – test 3.06.6B.

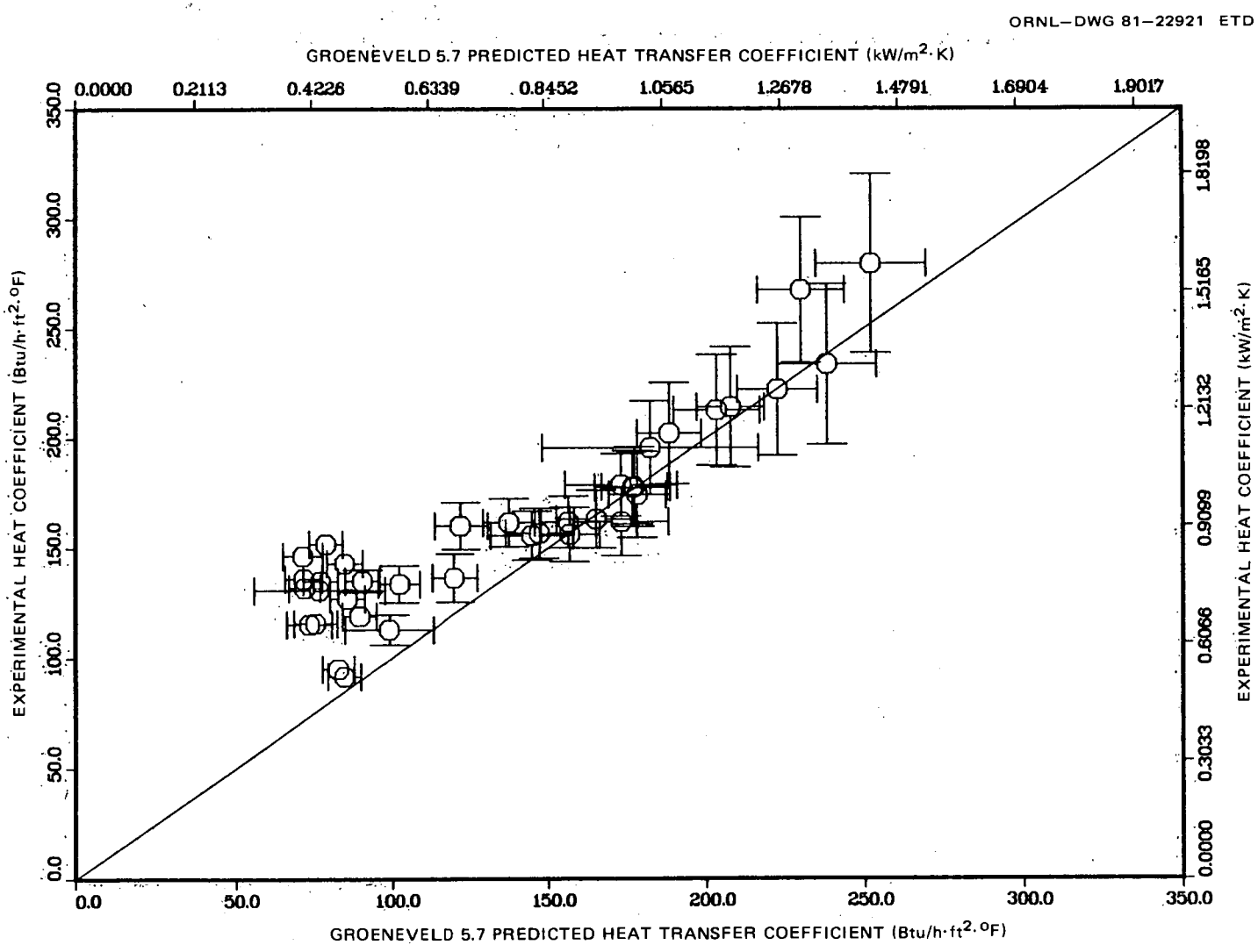

Fig. 5.84. Groeneveld 5.7 correlation comparison with uncertainties, TE-355BC – test 3.06.6B.

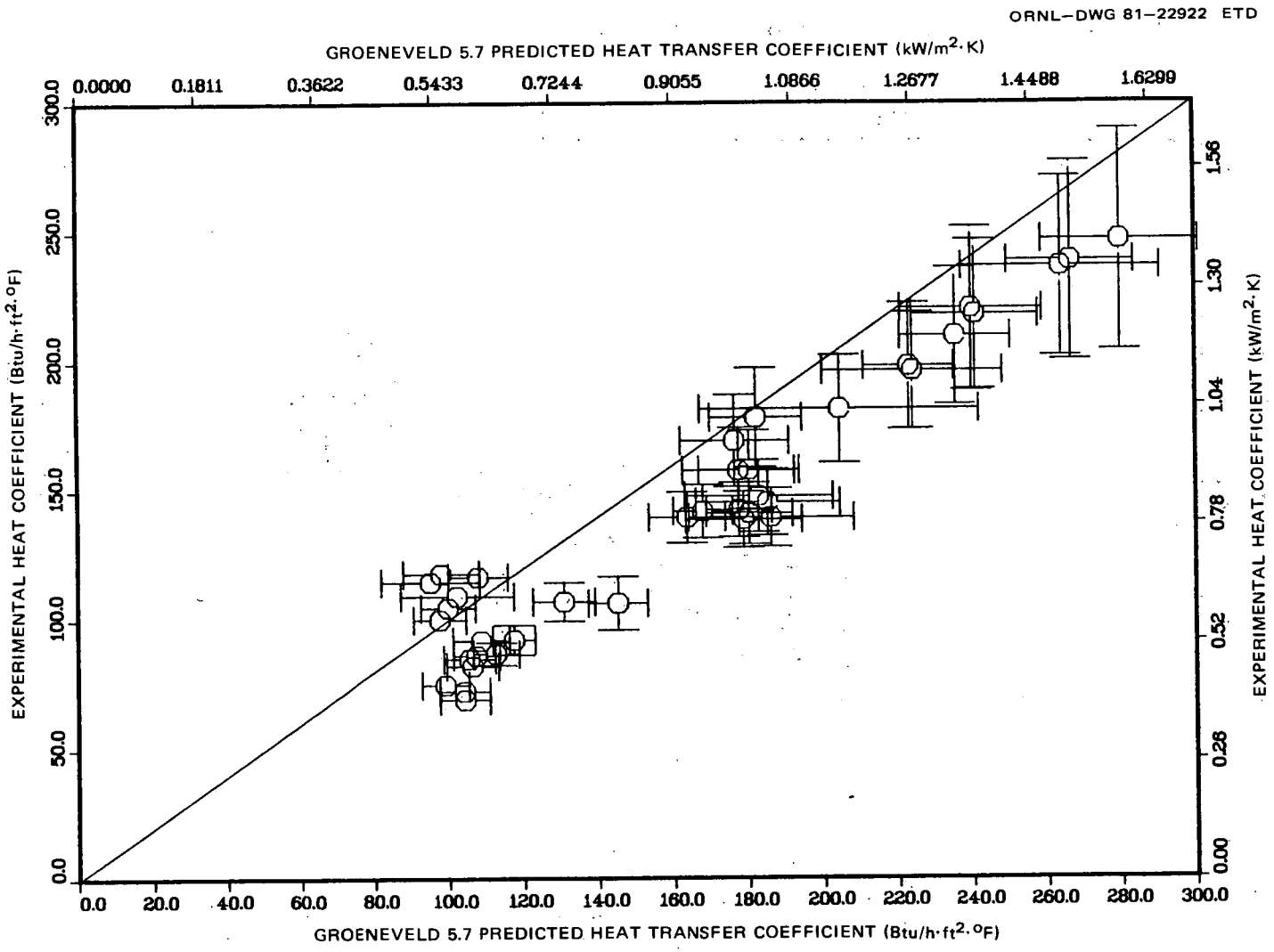

Fig. 5.85. Groeneveld 5.7 correlation comparison with uncertainties, TE-326AD – test 3.06.6B.

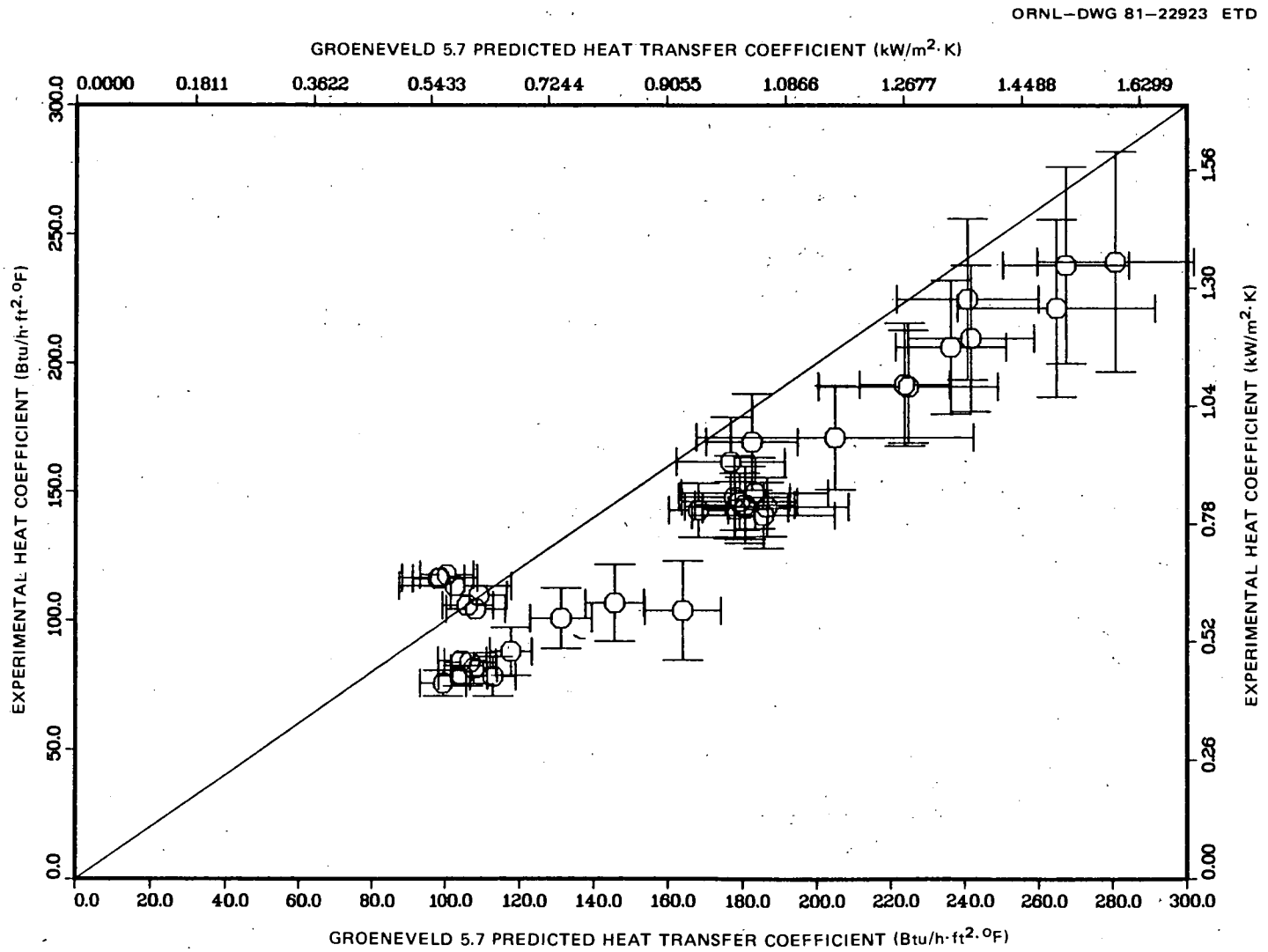

Fig. 5.86. Groeneveld 5.7 correlation comparison with uncertainties, TE-327AD – test 3.06.6B.

Figure 5.87 shows the average axial rod surface temperature profile of the portion of the rod bundle in film boiling for the three transient experiments. Note that the curves for tests 3.03.6AR and 3.06.6B slope upward with increasing distance from the bottom of the heated length, while the curve for test 3.08.6C slopes downward. This effect suggests that the heat transfer coefficient is increasing more with axial distance in test 3.08.6C than in the other two transient tests, and the bulk fluid temperature increases less in test 3.08.6C. Increased steam mass flow is probably causing the heat transfer coefficient to increase, which is consistent with the effects of thermodynamic nonequilibrium. Thus, more liquid is changed to steam in test 3.08.6C, and this steam has less superheat (i.e., less thermodynamic nonequilibrium).

Because of the excellent agreement between the measured and calculated outlet volumetric flow (Fig. 5.17), significant thermodynamic nonequilibrium is not indicated in test 3.08.6C. Had there been significant thermodynamic nonequilibrium, the measured volumetric flow would probably have been higher. This may occur even though steam mass flow decreases with increasing nonequilibrium caused by large increases in the steam's specific volume. Outlet volumetric flow comparisons in test 3.06.6B show that the measured flow is higher than the calculated flow, as expected with significant thermodynamic nonequilibrium (Fig. 5.16). Possible equilibration between the top of the bundle and outlet-nozzle spool piece prevents more definitive statements.

The main reason for the apparent lesser degree of thermodynamic nonequilibrium in test 3.08.6C is the much higher mass flow rate in test 3.08.6C than in the other two experiments. Higher mass fluxes tend to increase droplet-vapor relative velocities and thus increase droplet heat transfer, decreasing nonequilibrium within the flow.

To better quantify the measure of thermodynamic nonequilibrium in the ORNL transient tests, an advanced computer code with nonequilibrium models was used to calculate nonequilibrium bundle fluid conditions.

5.3.1 Calculational procedure

The calculation of nonequilibrium bundle fluid conditions was performed with the computer code COBRA-THTF (Ref. 18). The COBRA-THTF code is a modified version of COBRA-TF (Ref. 26) that involves a heat flux bounding methodology.

The COBRA-TF code solves two energy equations, one for each phase (vapor and liquid), requiring a heat source term for each equation. The distribution of the imposed heat flux between the two phases is inferred from the measured wall temperature and the predicted local fluid conditions. To accomplish this in a consistent manner, the heat transfer selection logic and correlations of COBRA-TF are used with only minor modifications. The total heat added to the fluid is purely experimentally determined; the only effect the code's heat transfer logic and correlations have on the fluid are to determine the distribution of energy between the liquid and vapor phases. A description of the heat transfer selection logic can be found in Ref. 18.

Along with the specified heat flux (heat flux boundary condition), a pressure boundary condition is specified at the outlet of the test

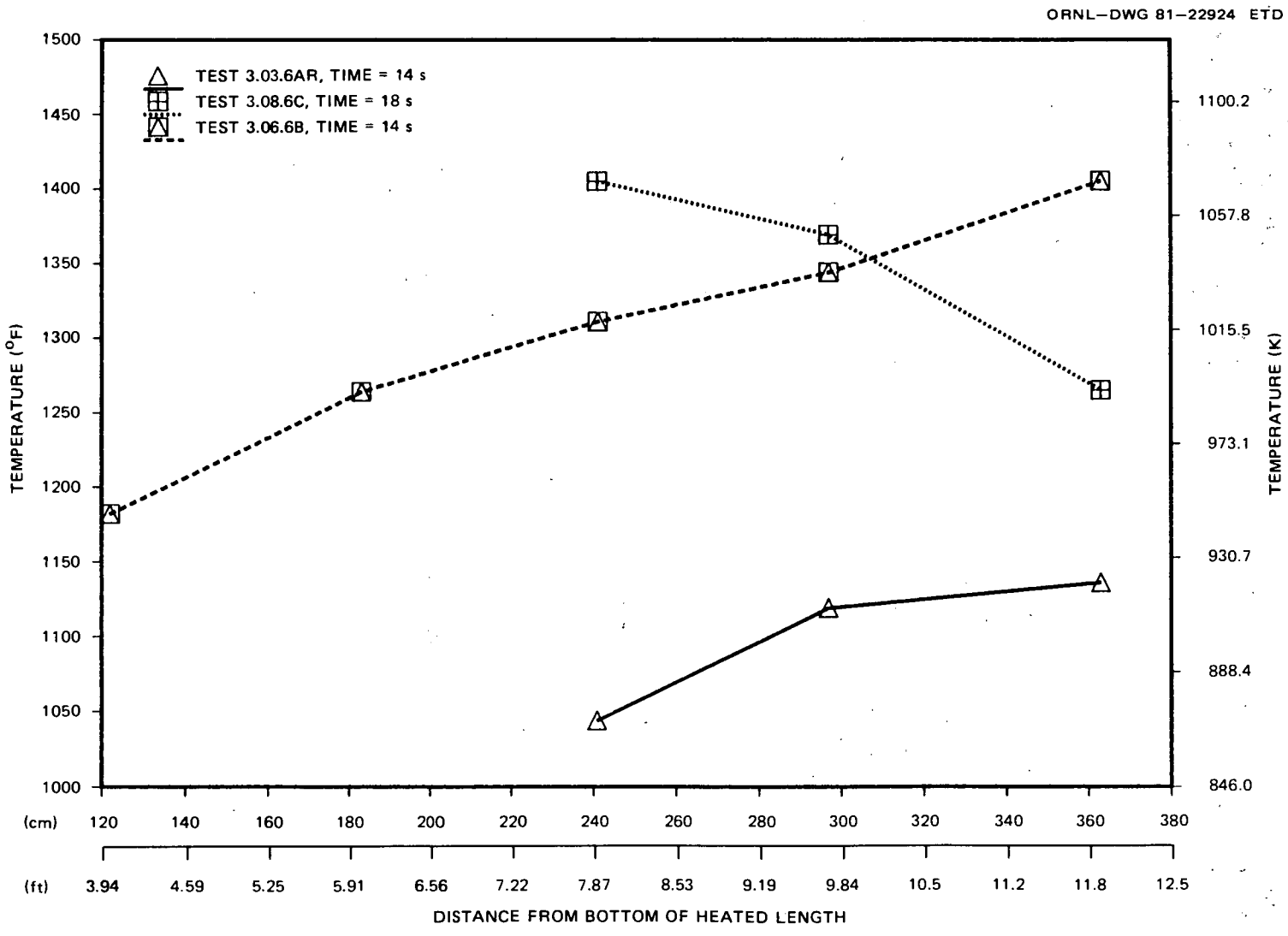

Fig. 5.87. Average axial rod surface temperature profiles for bundle locations in film boiling for tests 3.03.6AR, 3.06.6B, and 3.08.6C.

section, and a mass flux and enthalpy boundary condition are specified at the inlet to the test section. Thus, the same boundary conditions are specified in the execution of COBRA-THTF as are used in RLPSFLUX. A 5-channel 17-node model of the THTF was used in the analysis and is shown in Fig. 5.88. The heated length, for which heat flux bounding is applied, is contained solely within channel one. Structural heat transfer surfaces are modeled using the COBRA-TF heat transfer and conduction models. The surfaces are:

Rod No.	Description
2	Shroud wall
3	Unheated length of fuel rods in upper plenum
4	Vessel wall in upper plenum
5	Box in upper plenum

In addition, an electric heater rod (rod 1) was placed in channel one. This rod has a zero rod multiplication factor, so that no heat is input from the rod to the fluid. However, the transient temperature response of the FRS is calculated normally, so that by comparing its temperature

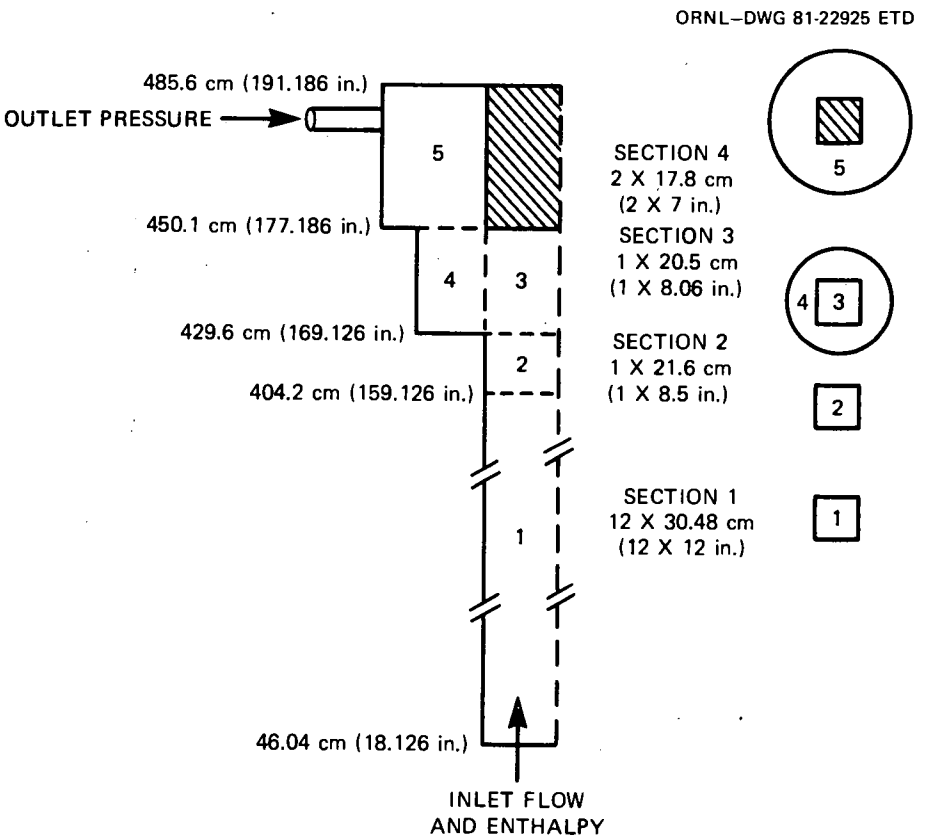

Fig. 5.88. COBRA-THTF model of THTF.

response with that observed experimentally the accuracy of the heat transfer correlations in COBRA-THTF can be assessed using the local fluid conditions resulting from heat flux bounding.

The first step in executing COBRA-THTF was to create the heat flux and rod surface temperature boundary condition. Next, using the pre-blowdown outlet pressure, inlet mass flux, and inlet temperature, a "null transient" calculation was performed to establish steady-state conditions. The third step entailed the creation of the inlet mass flux, enthalpy boundary condition, and the outlet pressure boundary condition. Using the boundary conditions, a transient calculation was performed by restarting from the steady-state conditions. The null transient (or steady-state) and transient input models to COBRA-THTF are listed in Appendix E.

5.3.2 Calculation results

Comparisons of RLPSFLUX equilibrium fluid conditions (consisting of the bulk fluid temperature and equilibrium quality) and COBRA-THTF non-equilibrium fluid conditions [consisting of the vapor temperature and nonequilibrium (actual) quality] are presented in Figs. 5.89–5.100 for the three transient tests. Quality and fluid temperature are plotted vs distance from the bottom of the heated length. Two time points were selected from each test: one early in the transient, and one late in the transient.

The comparisons of equilibrium conditions with nonequilibrium conditions for test 3.03.6AR are shown in Figs. 5.89–5.92. As mentioned previously, the dryout point in test 3.03.6AR was located at ~183 cm (6 ft). The time points for which the data are shown are 10 and 15 s. The actual quality as predicted by COBRA-THTF is a maximum of ~0.2 lower than the equilibrium quality at 10 s in test 3.03.6AR. At 15 s the actual quality is a maximum of ~0.08 lower than the equilibrium quality. The maximum differences between the COBRA-THTF vapor temperature and RLPSFLUX bulk fluid temperature for the 10- and 15-s time points are 91 and 104 K (163 and 187°F), respectively. Thus, the results of COBRA-THTF indicate significant thermodynamic nonequilibrium in test 3.03.6AR.

Comparisons of equilibrium conditions with nonequilibrium conditions for test 3.06.6B are shown in Figs. 5.93–5.96. In test 3.06.6B the dryout point was located at ~93 cm (3 ft). The time points for which the data are shown are 8 and 15 s. The actual quality as predicted by COBRA-THTF is a maximum of ~0.5 lower than the equilibrium quality at 8 s in test 3.06.6B. At 15 s the actual quality is a maximum of ~0.1 lower than the equilibrium quality. The maximum differences between the COBRA-THTF vapor temperature and RLPSFLUX bulk fluid temperature for the 8- and 15-s time points are ~111 and 106 K (200 and 190°F), respectively. Thus, the results of COBRA-THTF indicate significant thermodynamic nonequilibrium in test 3.06.6B, which is greater than that in test 3.03.6AR.

Nonequilibrium conditions are compared with equilibrium conditions for test 3.08.6C in Figs. 5.97–5.100. The dryout point in test 3.08.6C was located at ~212 cm (7 ft). The time points for which the data are shown are 10 and 25 s. Recall that at 10 s the pump is running and the mass flux is high [~1.02×10^3 kg/s·m² (7.5×10^5 lb_m/h·ft²)], and at 25 s the pump has been shut off (tripped at ~21 s) and the mass flux is lower [~3.74×10^3 kg/s·m² (2.8×10^5 lb_m/h·ft²)]. The results from the 10-s

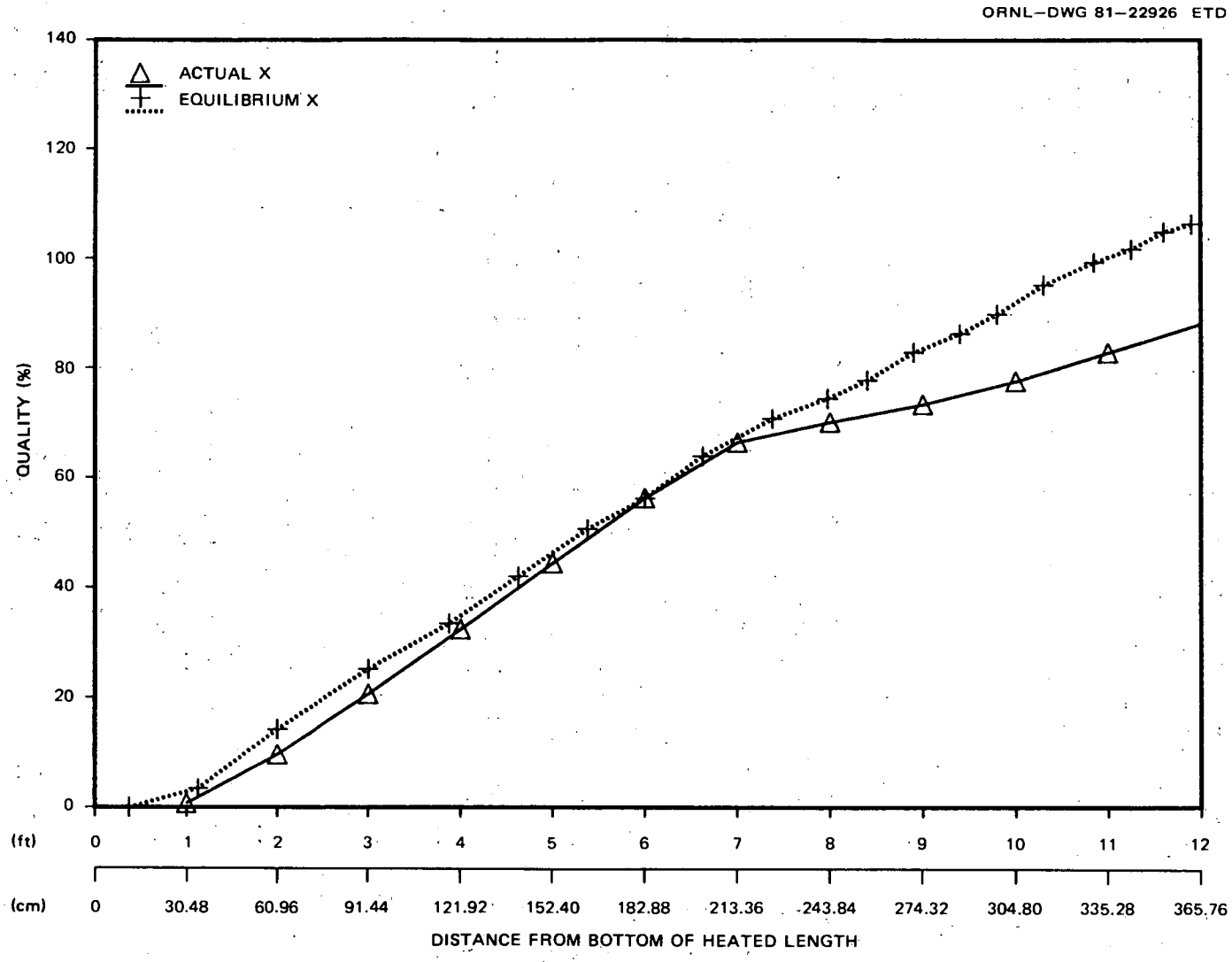

Fig. 5.89. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted quality vs distance from bottom of heated length at 10 s — test 3.03.6AR.

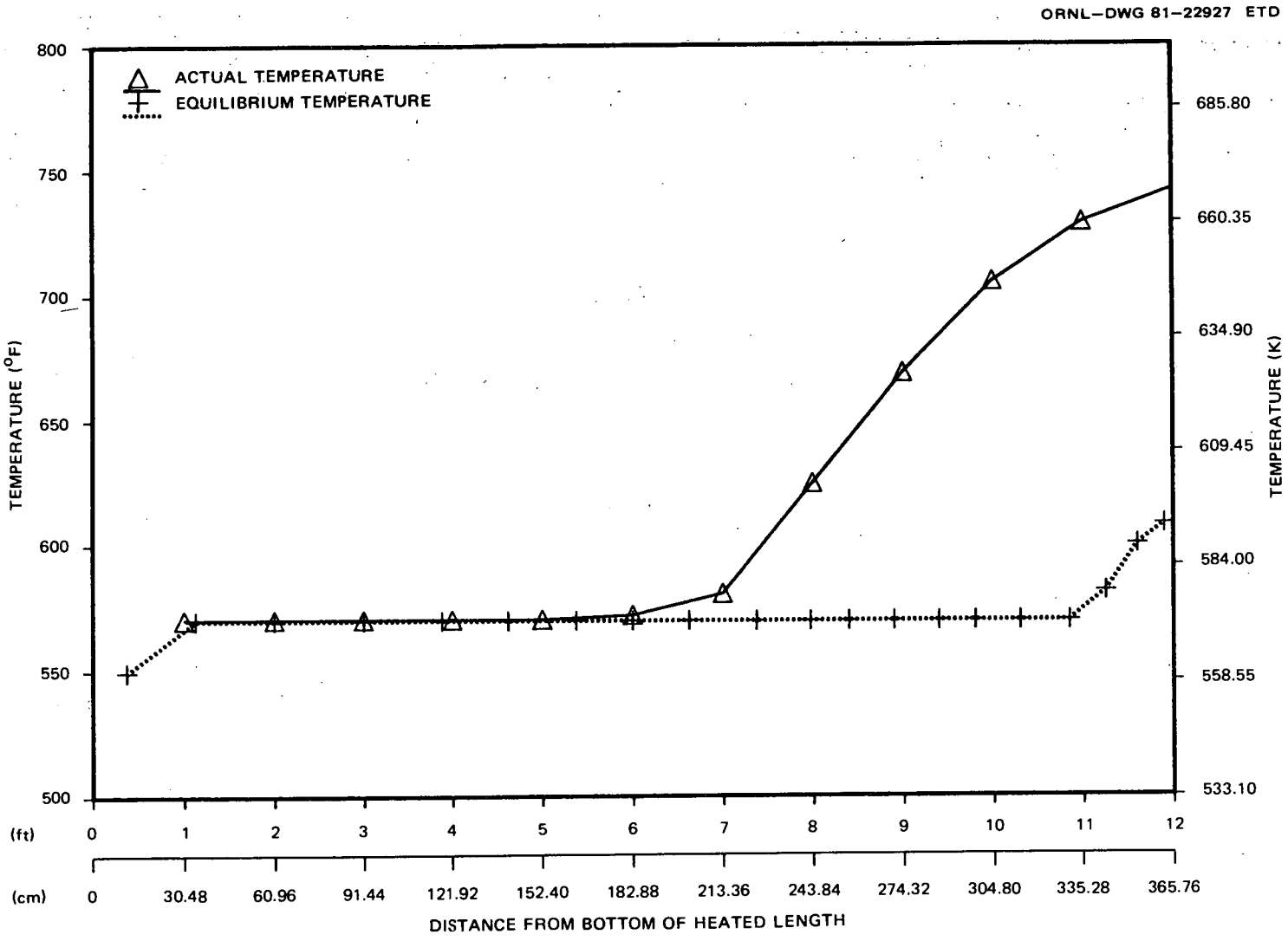

Fig. 5.90. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted vapor temperature vs distance from bottom of heated length at 10 s — test 3.03.6AR.

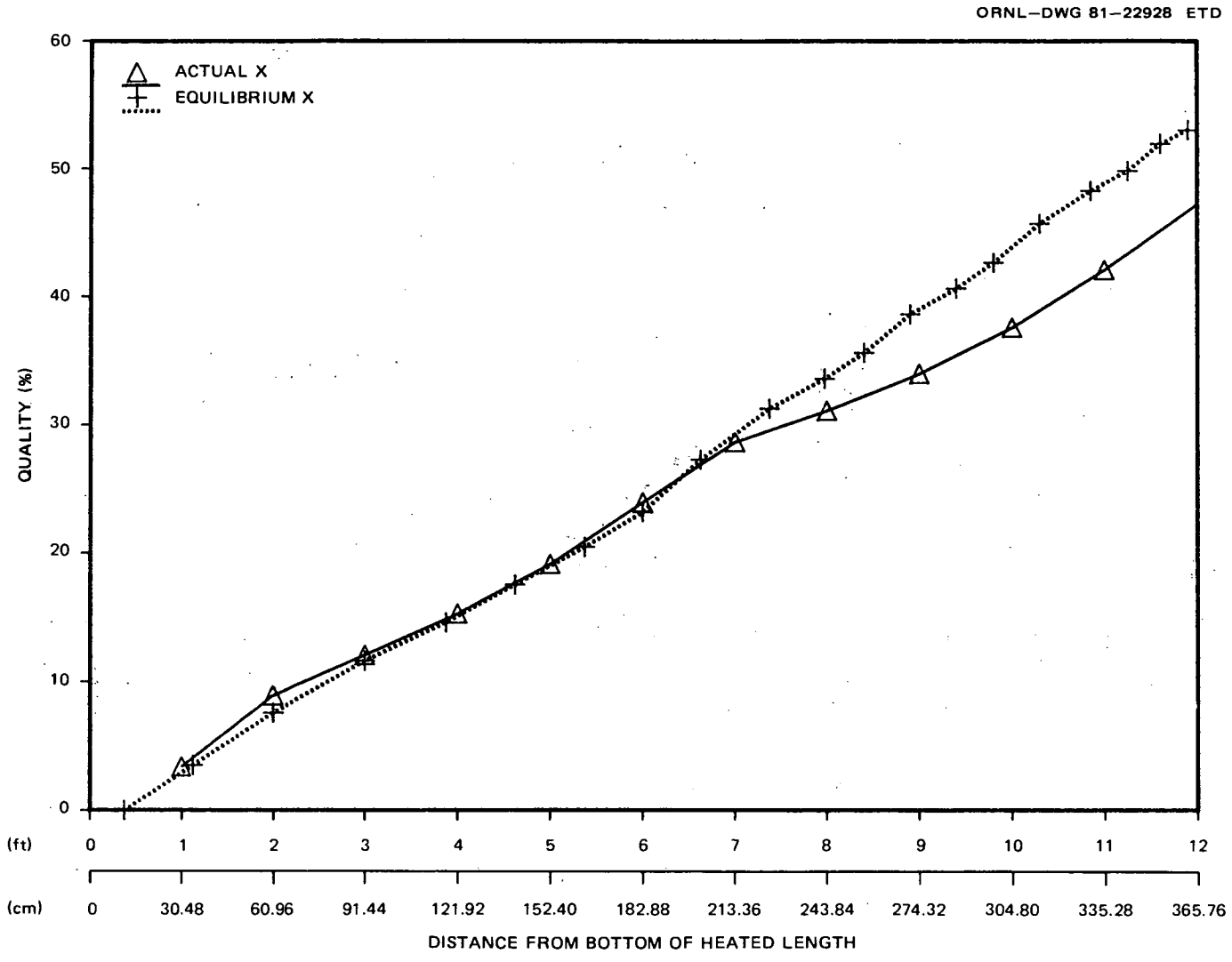

Fig. 5.91. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted quality vs distance from bottom of heated length at 15 s — test 3.03.6AR.

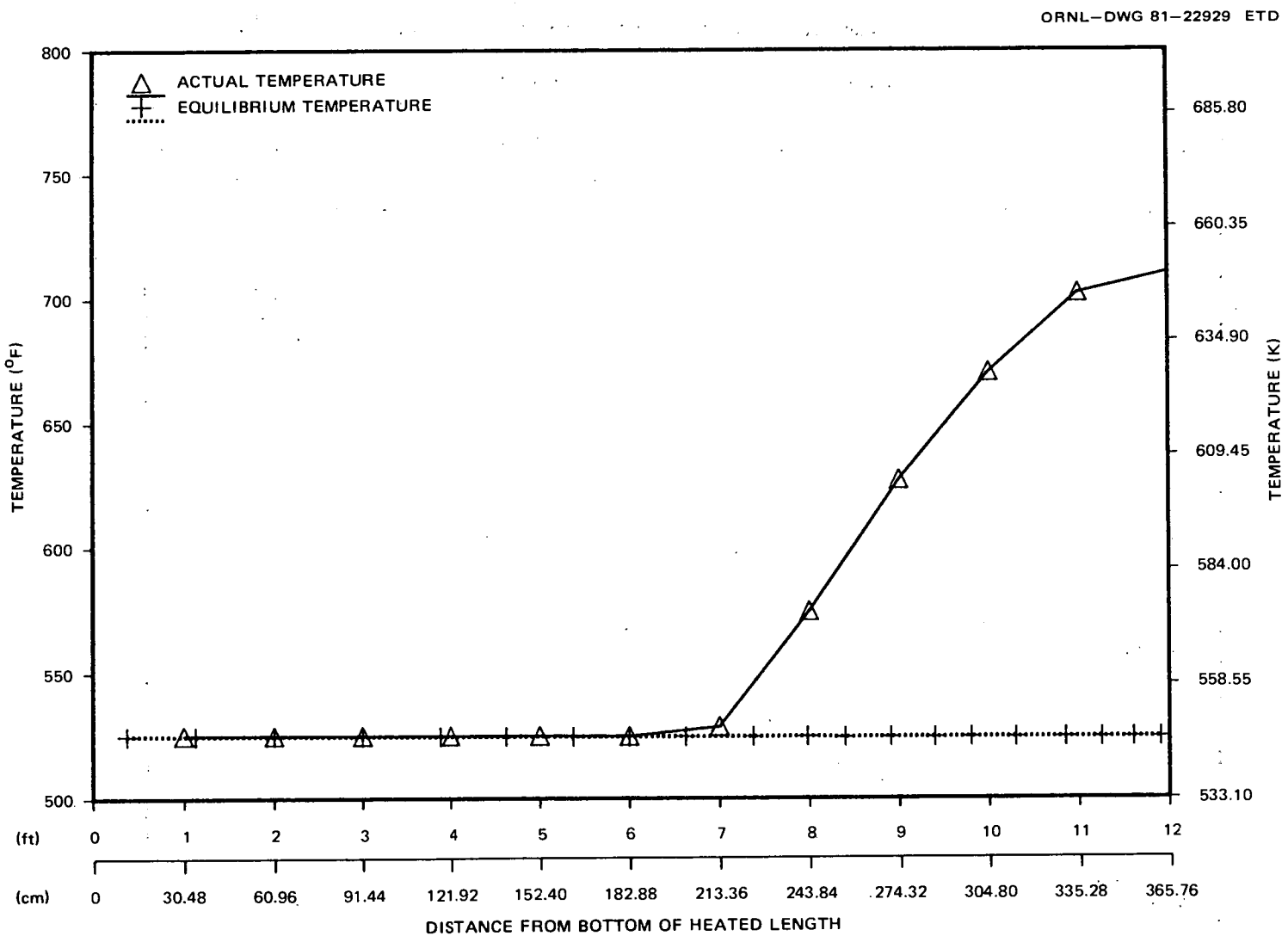

Fig. 5.92. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted vapor temperature vs distance from bottom of heated length at 15 s — test 3.03.6AR.

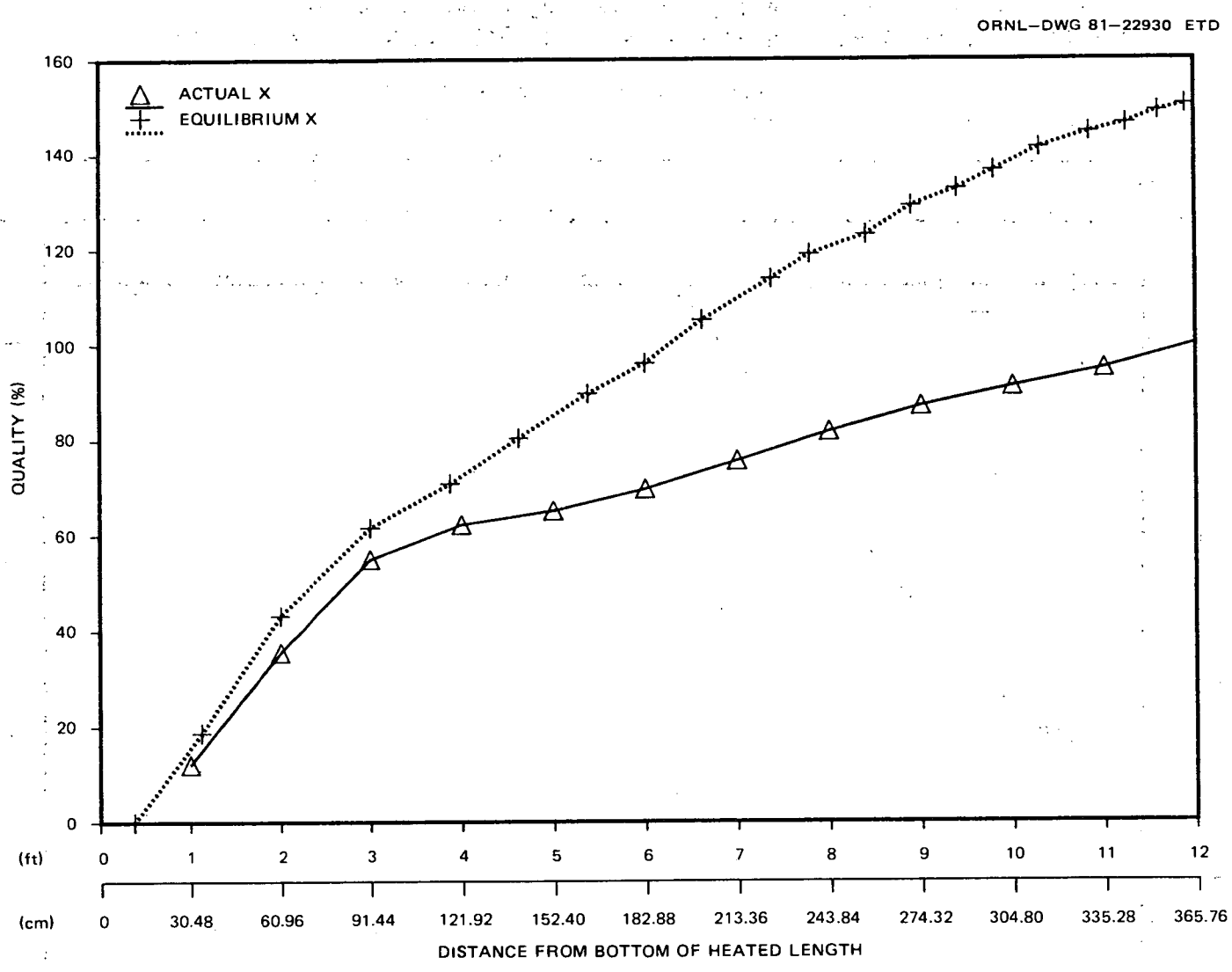

Fig. 5.93. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted quality vs distance from bottom of heated length at 8 s — test 3.06.6B.

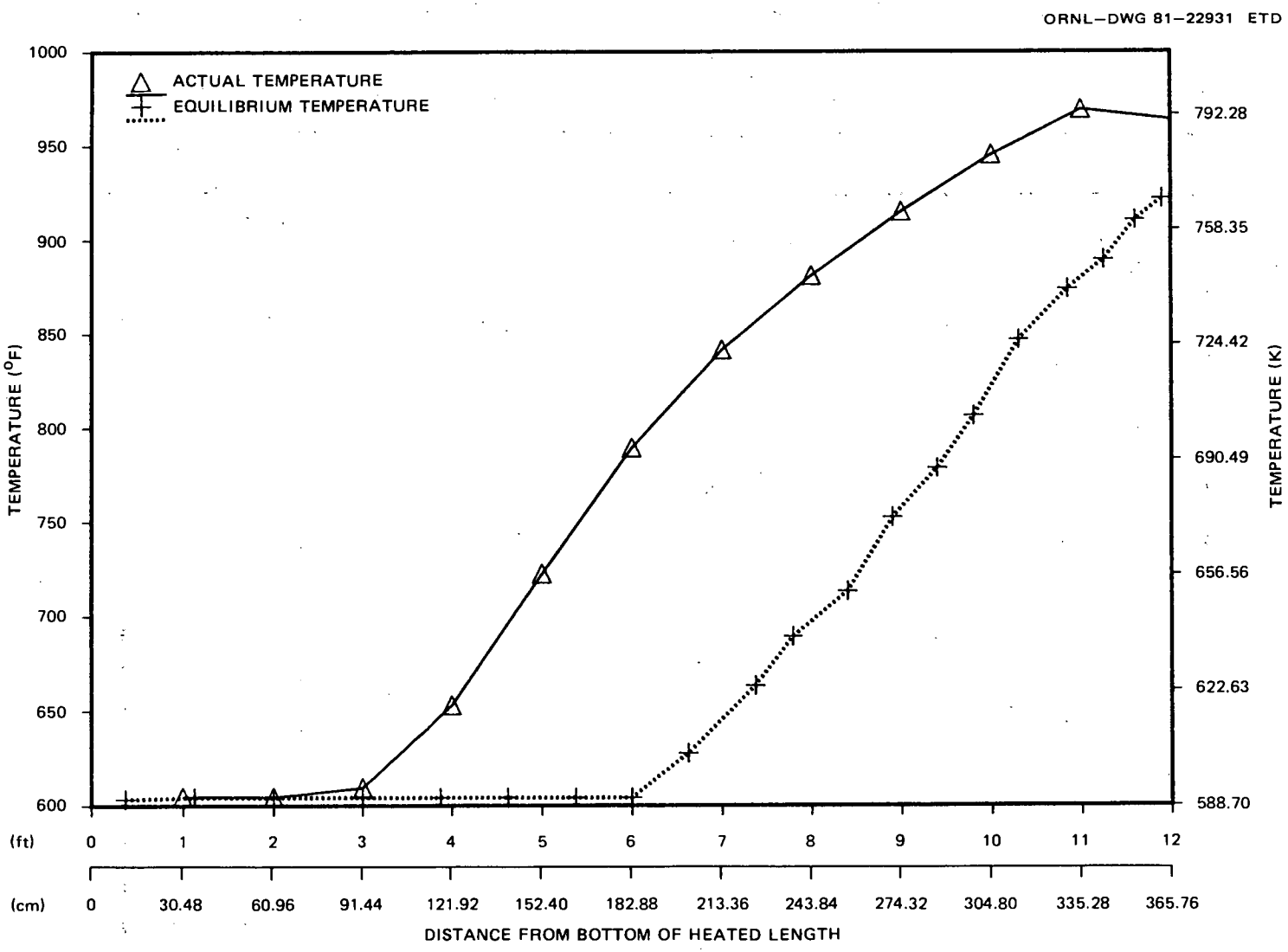

Fig. 5.94. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted vapor temperature vs distance from bottom of heated length at 8 s — test 3.06.6B.

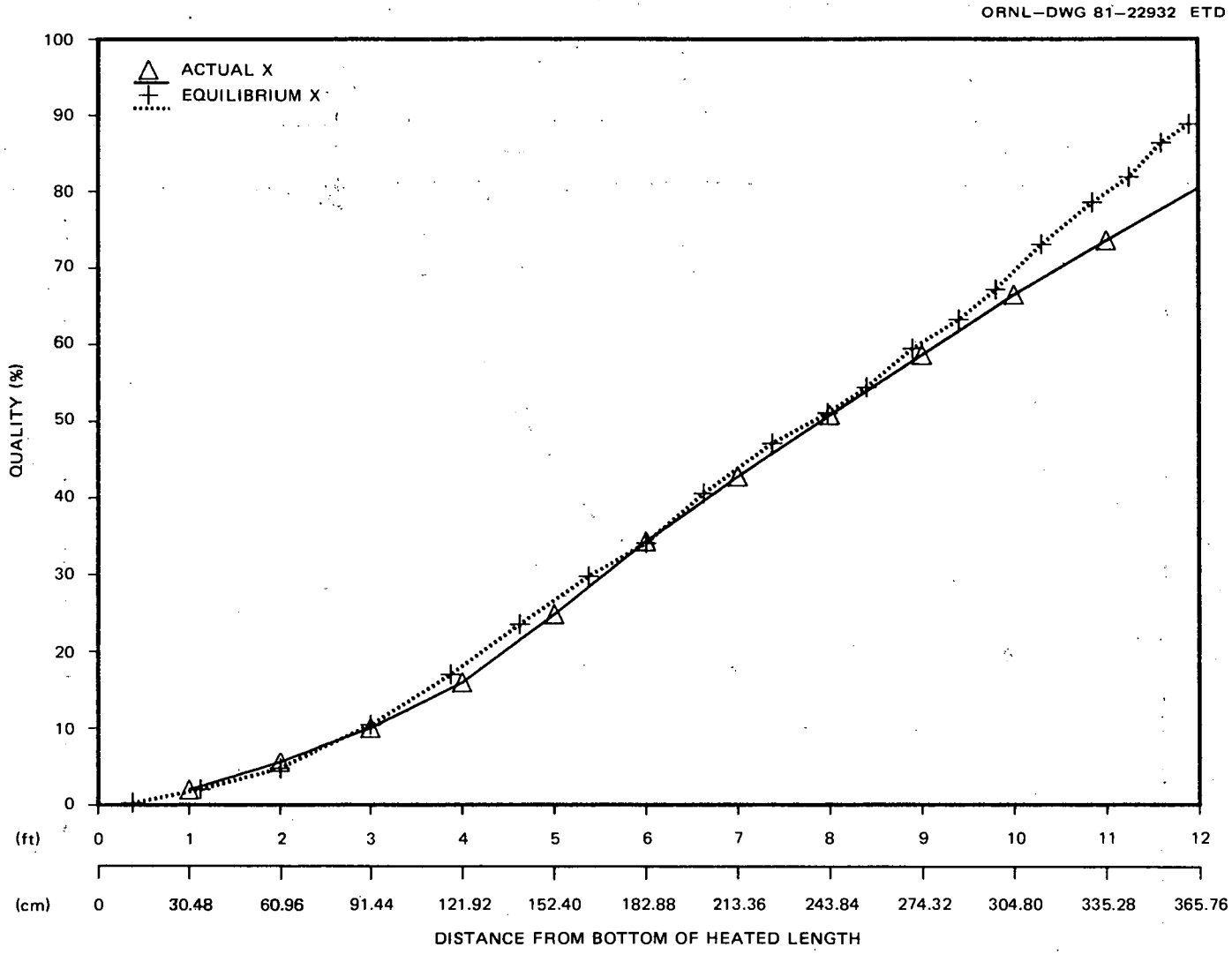

Fig. 5.95. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted quality vs distance from bottom of heated length at 15 s — test 3.06.6B.

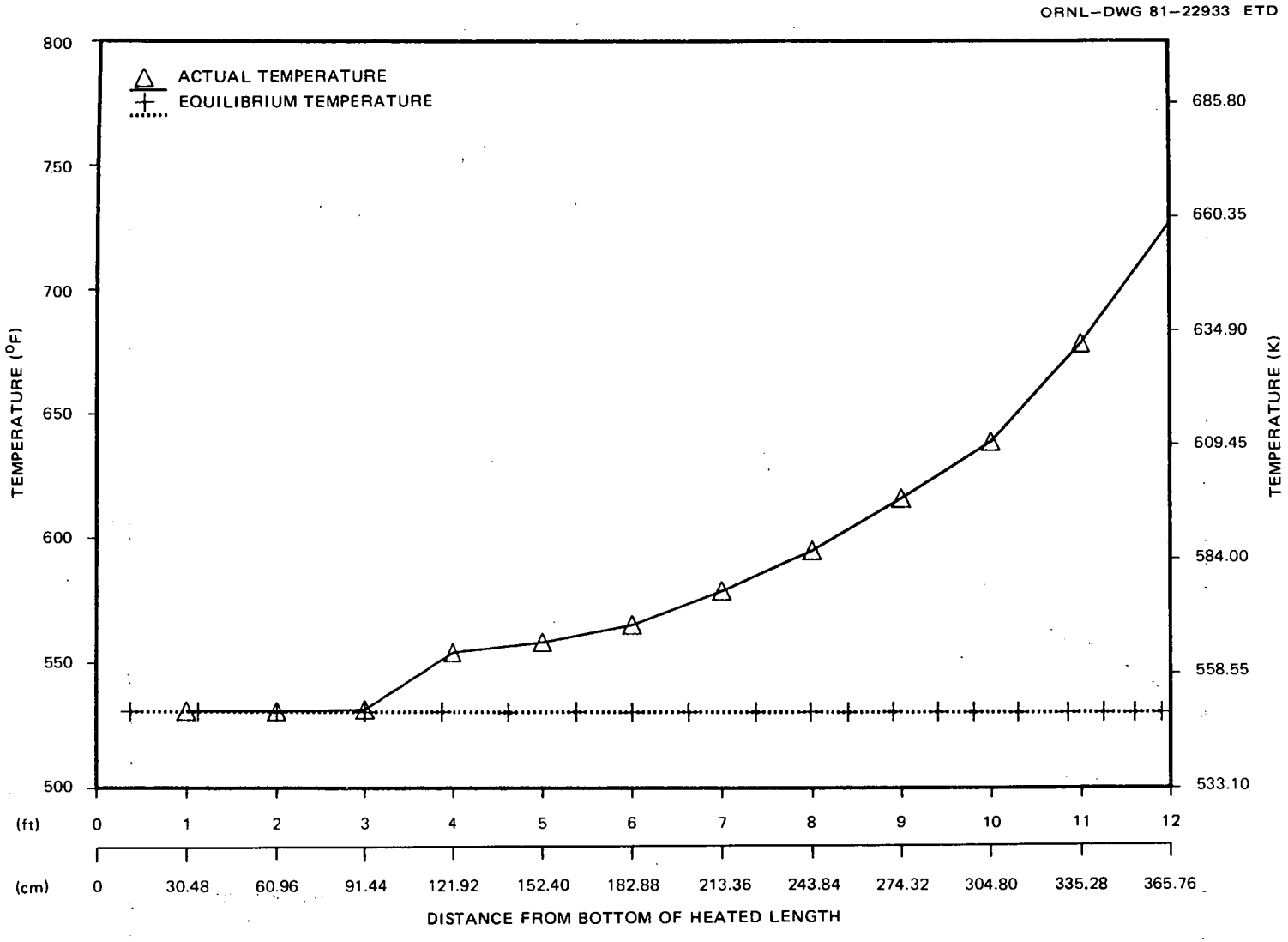

Fig. 5.96. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted vapor temperature vs distance from bottom of heated length at 15 s — test 3.06.6B.

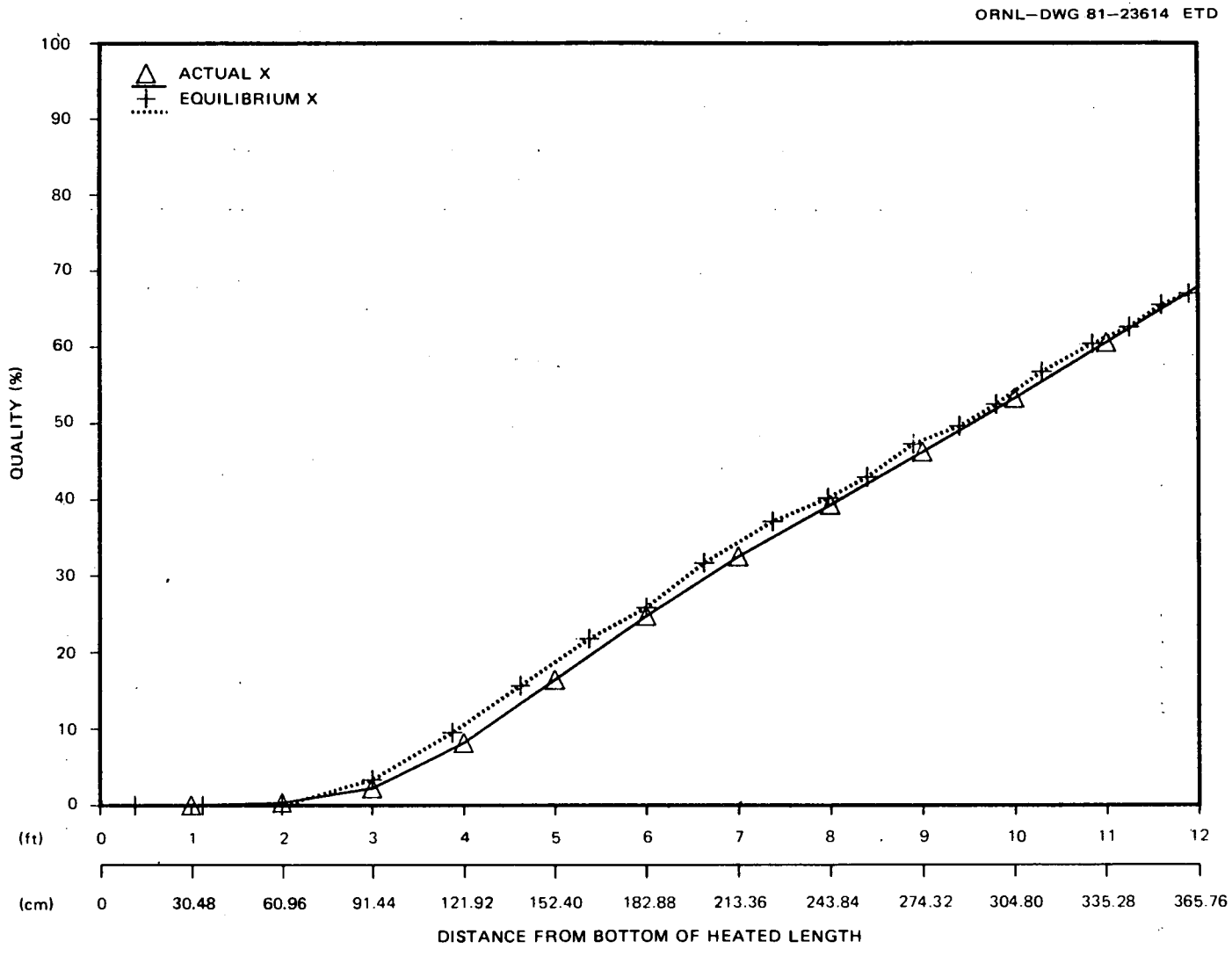

Fig. 5.97. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted quality vs distance from bottom of heated length at 10 s — test 3.08.6C.

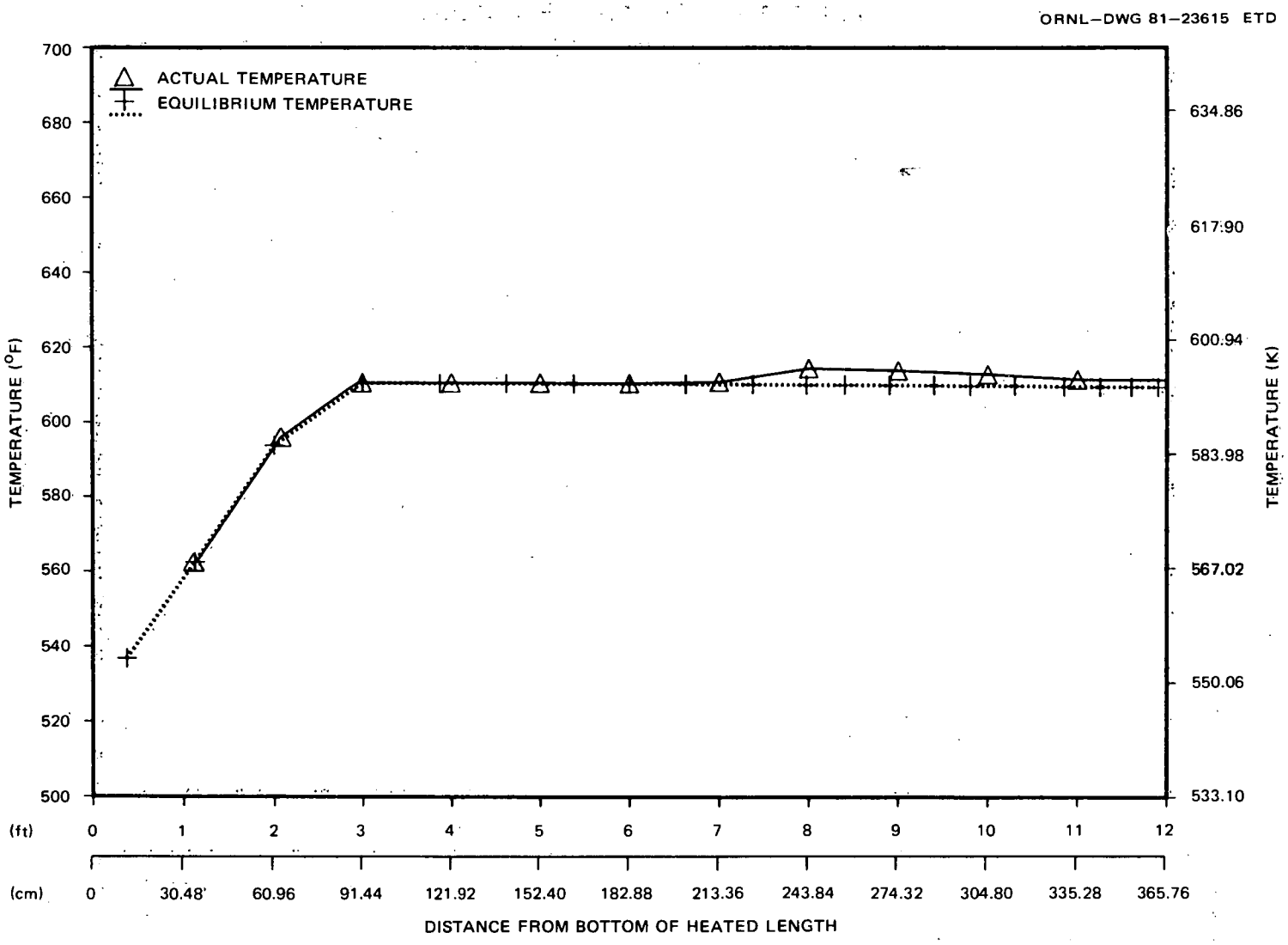

Fig. 5.98. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted vapor temperature vs distance from bottom of heated length at 10 s — test 3.08.6C.

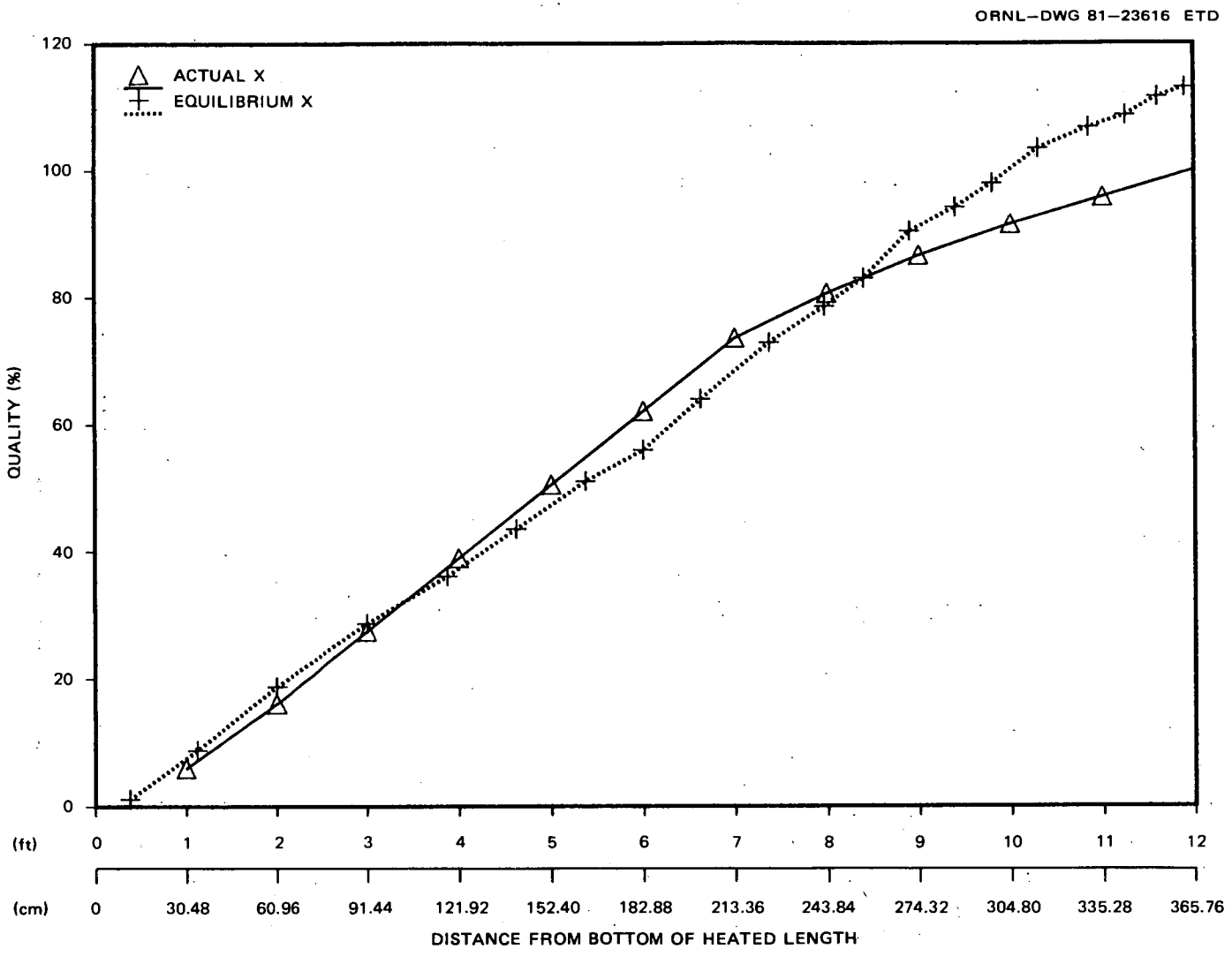

Fig. 5.99. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted quality vs distance from bottom of heated length at 25 s — test 3.08.6C.

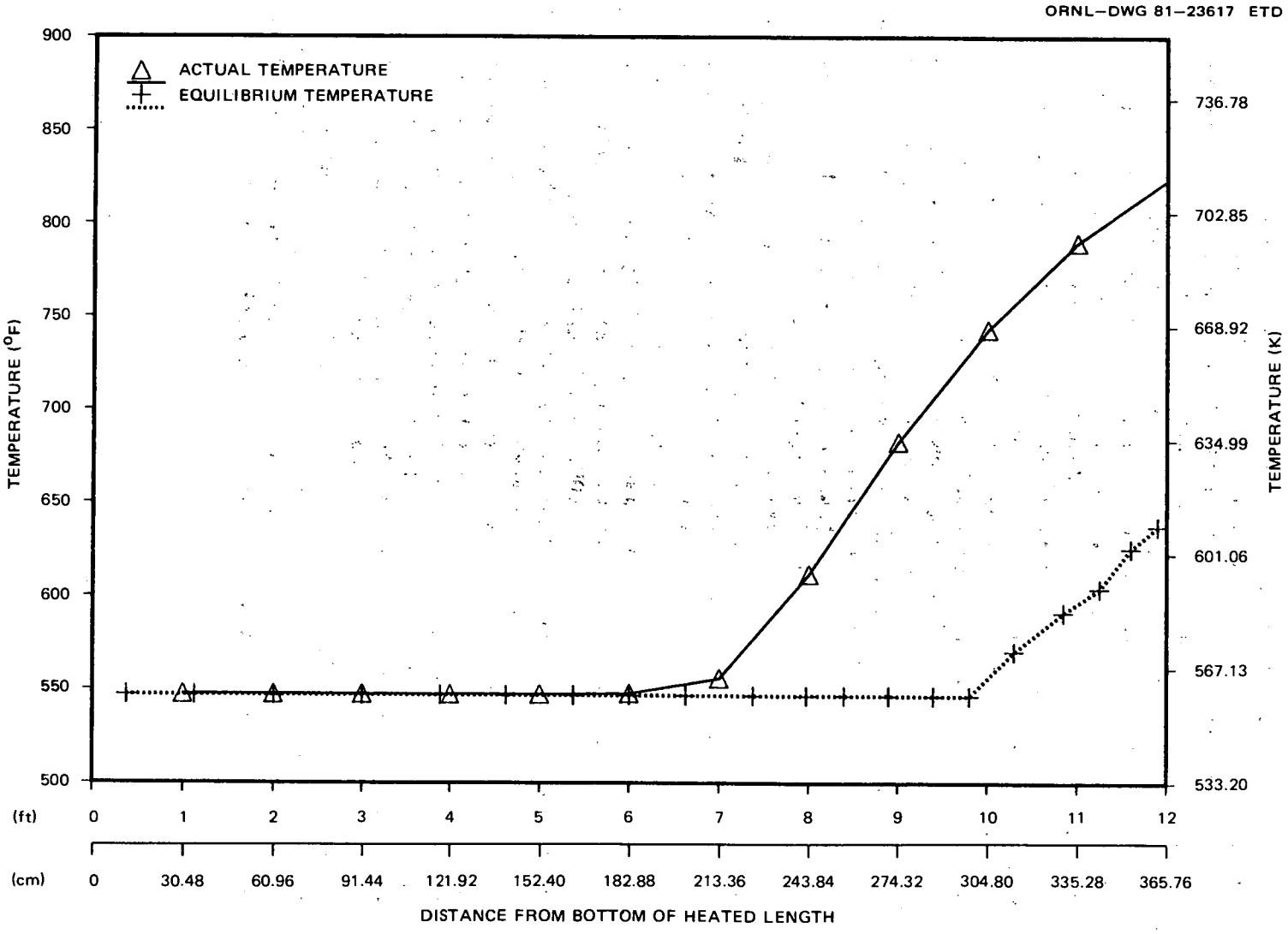

Fig. 5.100. RLPSFLUX (equilibrium) and COBRA-THTF (actual) predicted vapor temperature vs distance from bottom of heated length of 25 s — test 3.08.6C.

time point show little difference between the RLPSFLUX (equilibrium) and COBRA-THTF (nonequilibrium) calculated fluid temperature and quality. The high mass flux tends to minimize the thermodynamic nonequilibrium in test 3.08.6C while the pump is running. The results at 25 s show that some differences exist between the nonequilibrium and equilibrium fluid condition. This difference is probably caused by the reduction in the mass flux that occurred as a result of the pump trip. At 25 s the COBRA-THTF predicted actual quality is a maximum of ~0.15 lower than the equilibrium quality. The maximum difference between the COBRA-THTF vapor temperature and RLPSFLUX bulk fluid temperature at 25 s is ~106 K (190°F). Thus, while the pump was running in test 3.08.6C, the thermodynamic nonequilibrium was not significant; however, after the pump was tripped significant thermodynamic nonequilibrium was observed.

As described previously, a model of an FRS was placed in contact with the COBRA-THTF bundle fluid conditions calculated with a heat flux boundary condition to determine the accuracy of the heat transfer correlations and logic in COBRA-THTF. The accuracy of the correlations and logic was assessed by comparing the surface temperature response of the FRS model in COBRA-THTF with that calculated by ORINC. The ORINC-calculated surface temperatures are calculated using inner-sheath thermocouple responses and are quite accurate [one standard deviation in surface temperature is ~5.6 to 8.3 K (10 to 15°F)]. A surface temperature comparison at 10 s is shown in Fig. 5.101 for test 3.03.6AR, where rod surface temperature is plotted vs distance from the bottom of the heated length. Clearly, the DNB is predicted a little too low in the bundle. The COBRA-THTF predicted surface temperatures in the portion of the bundle in film boiling are high. A similar comparison for test 3.06.6B is shown in Fig. 5.102; the results are shown at 10 s. As in test 3.03.6AR, DNB is predicted too low in the bundle. The COBRA-THTF surface temperature prediction for the portion of the rod in film boiling is in excellent agreement with that calculated by ORINC. The test 3.08.6C surface temperature comparison at 10 s is presented in Fig. 5.103. As in tests 3.03.6AR and 3.06.6B, DNB is predicted too low in the bundle. The COBRA-THTF predicted surface temperatures in the portion of the bundle in film boiling are high. The dips in the ORINC-calculated surface temperatures are caused by spacer grids that enhance the heat transfer downstream of the grid. Individual spacer grids were not modeled in COBRA-THTF.

The too-low predictions of DNB in the bundle for all three ORNL transient tests indicate the need to examine the CHF logic and/or correlations used in COBRA-TF. The CHF is predicted using a combination of the Zuber pool-boiling CHF correlation[27] and the Biasi correlation.[28]

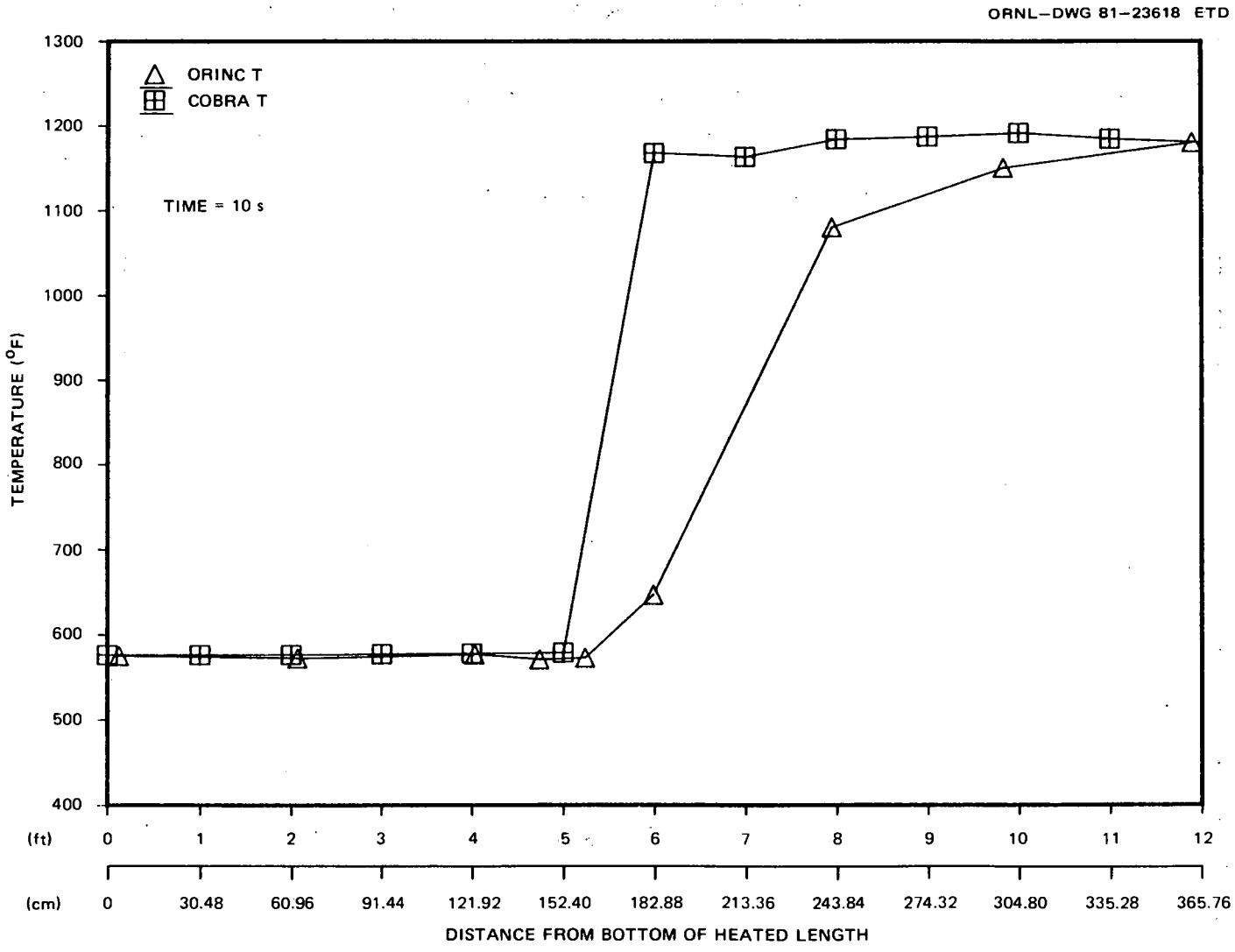

Fig. 5.101. ORINC and COBRA-THTF calculated rod surface temperature vs distance from bottom of heated length at 10 s – test 3.03.6AR.

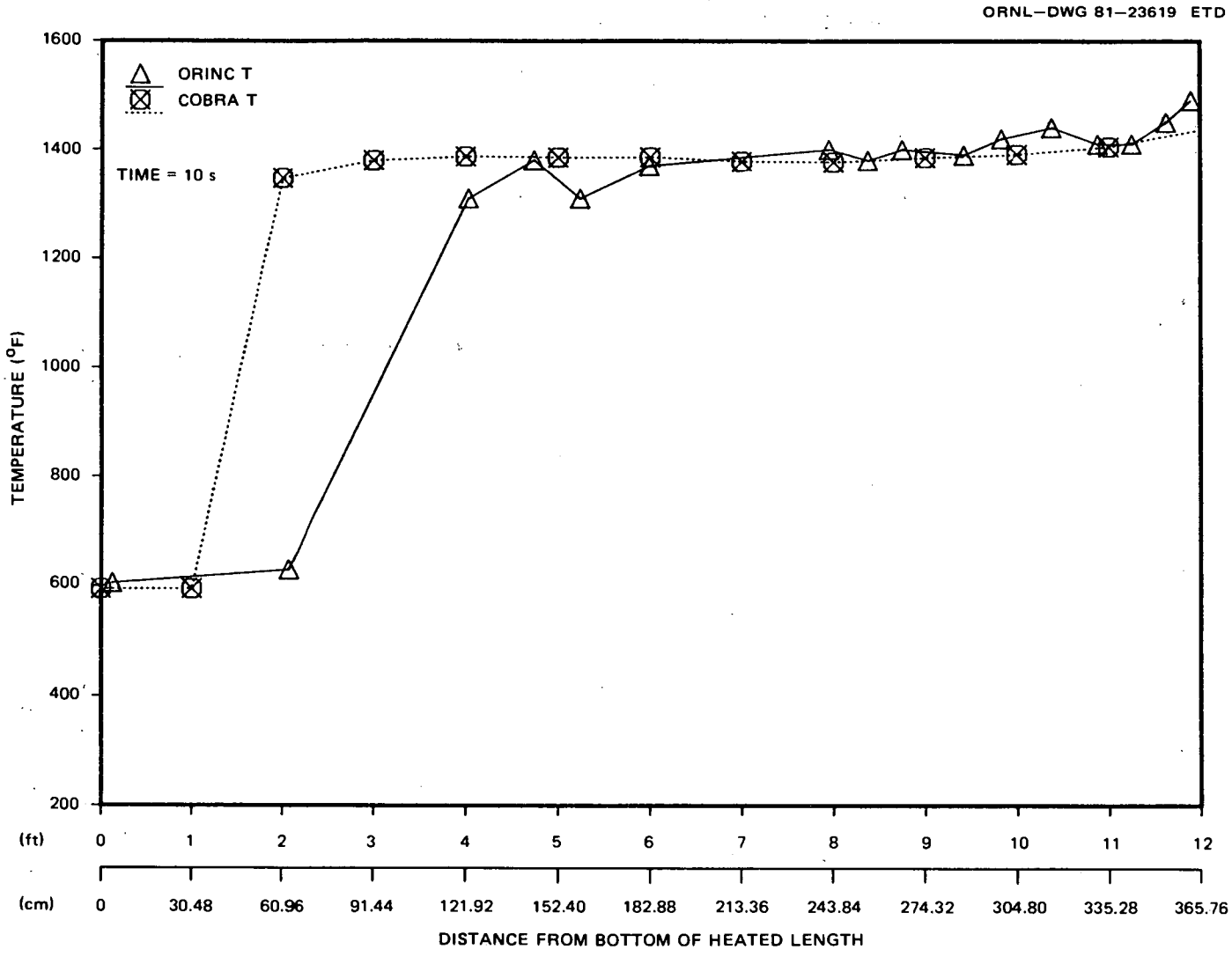

Fig. 5.102. ORINC and COBRA-THTF calculated rod surface temperature vs distance from bottom of heated length at 10 s — test 3.06.6B.

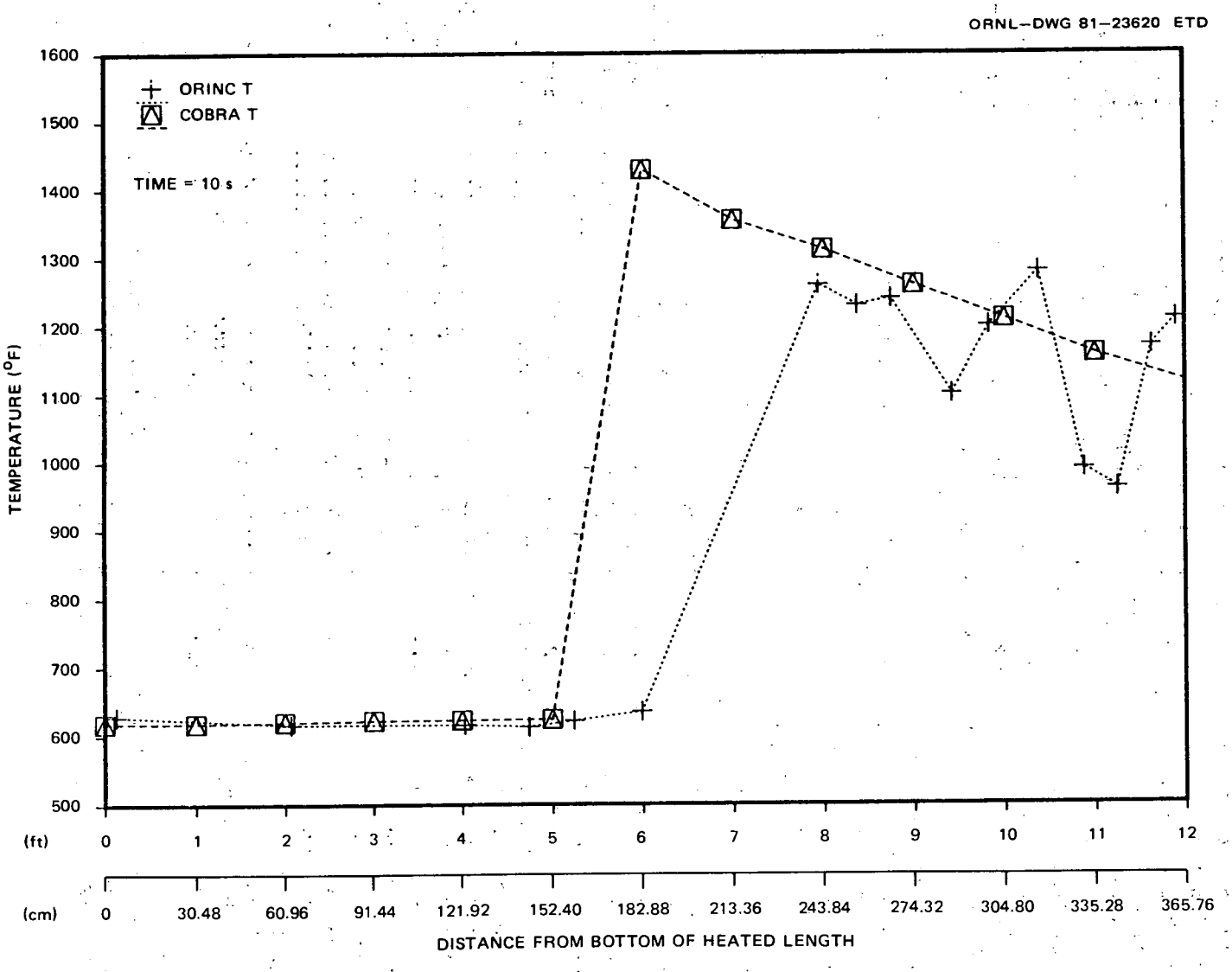

Fig. 5.103. ORINC and COBRA-THTF calculated rod surface temperature vs distance from bottom of heated length at 10 s — test 3.08.6C.

6. CONCLUSIONS

Equilibrium and nonequilibrium bundle fluid conditions were calculated for the three ORNL transient film-boiling experiments. The equilibrium fluid conditions were used in the assessment of film-boiling heat transfer correlations. The equilibrium fluid conditions were calculated using the homogeneous two-phase flow and the thermodynamic equilibrium thermal-hydraulics code RLPSFLUX. The nonequilibrium fluid conditions were calculated with COBRA-THTF, a two-fluid thermal-hydraulics code for local fluid conditions analysis.

Comparisons were made between experimentally determined heat transfer coefficients (or surface heat fluxes) and heat transfer coefficients (or surface heat fluxes) calculated using six film-boiling correlations:

1. Dougall-Rohsenow,
2. Dougall-Rohsenow (with Prandtl number evaluated at the wall temperature, as used in RELAP4-MOD7),
3. Groeneveld 5.9,
4. Groeneveld 5.7,
5. Groeneveld-Delorme, and
6. Condie-Bengston IV.

The Dougall-Rohsenow correlations' heat transfer coefficients are often high by as much as a factor of 2.5 compared with all experimentally determined heat transfer coefficients discussed in this report. The Groeneveld 5.7, Groeneveld 5.9, and Condie-Bengston IV correlation predictions tend to generally agree with the data, while the Groeneveld-Delorme correlation underpredicts the experimentally determined heat transfer. Generally, results of ORNL steady-state tests agree with those of the transient tests.

Uncertainties in experimental and correlation-predicted heat transfer coefficients were calculated for test 3.06.6B. Uncertainties in correlation-predicted heat transfer coefficients were calculated for the Dougall-Rohsenow, Groeneveld 5.7, and Groeneveld 5.9 correlations. Uncertainties in calculated and experimentally determined heat transfer coefficients are on the order of 15%. In light of the calculated uncertainties, the overpredictions of the Dougall-Rohsenow correlations are statistically significant.

Significant thermodynamic nonequilibrium was calculated for tests 3.03.6AR and 3.06.6B using COBRA-THTF. Significant thermodynamic nonequilibrium was not calculated for test 3.08.6C until late in the transient.

Comparisons between the COBRA-TF predicted temperature and the ORINC-calculated rod surface temperature suggest the need to examine the CHF logic and/or correlations used in COBRA-TF.

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Appendix A

RLPSFLUX TEST SECTION MODEL LISTING: TEST 3.03.6AR

```
=T3036AR          1ST ORNL TRANSIENT FILM BOILING TEST:FINAL
*
*  FILL AT INLET, TIME DEPENDENT VOL. AT OUTLET;FLUX BOUNDED
*
*  DATA SET:
*        DSN=X.D.DGM15222.T6AR.FINAL.FTD.LOCAL.FLUIDS
*        VOL=SER=VSTHTF
*
*
* PROBLEM DIMENSIONS AND CONSTANTS CARDS
*
010001 -2  9 6  2 27  0  0 27  0  0  0  1 48 9 3 20  0  0
010002   4.0000  1.0
*
* MINOR EDIT VARIABLES
*
020000  AP 18  AX 01  AP 01  AX 18  JW 18  AP 23  AX 23  JW 23  JW 01
*
*   ENTHALPY TRANSPORT SHUT DOWN
*
030003  0  0.  0.   0.000001
*
* TIME STEP CARDS
*
*       NMIN NMAJ NDMP NCHK DELTMAX DELTMIN TLAST
030010  500 10   1000 0      0.0001   .00001  .001
030020   50 10   1000 0      0.0010   .00001  .050
030030    5  1000   1000 0      0.0100   .00001  .500
030040    5  1000   1000 0      0.0100   .00001  5.00
030050 5  10   1000 0      0.0100   .00001  6.00
030060    5 10   1000 0      0.0100   .00001 210.000
*
* TRIP CARDS
*
040010  1  1  0  0   20.0   0.0 *TRIP END OF PROBLEM
040020  2  1  0  0    0.0   0.0 *TRIP INLET FILL TABLE
*
* VOLUME DATA CARDS
*
050011 0    0 2070.1836 509.5359 -1.000 0.159011  4.2742  4.2742 *DC AND MX TEE
050021 0    0 2055.9158 509.5330 -1.000 0.261200  0.2737  0.2737 *2.3 INCH LINE
050031 0    0 2053.3662 509.5325 -1.000 0.308271  1.3750  1.3750 *LOWER PLENUM
050041 0    0 2051.6028 512.7957 -1.000 0.049875  0.7500  0.7500 *BUNDLE VOL 4
050051 0    0 2050.6550 519.2881 -1.000 0.049874  0.7500  0.7500 *BUNDLE VOL 5
050061 0    0 2049.8474 526.7861 -1.000 0.066499  1.0000  1.0000 *BUNDLE VOL 6
050071 0    0 2048.9688 535.2654 -1.000 0.066499  1.0000  1.0000 *BUNDLE VOL 7
050081 0    0 2048.3806 542.6404 -1.000 0.049874  0.7500  0.7500 *BUNDLE VOL 8
050091 0    0 2047.8630 548.8176 -1.000 0.049874  0.7500  0.7500 *BUNDLE VOL 9
050101 0    0 2046.8994 554.9348 -1.000 0.049874  0.7500  0.7500 *BUNDLE VOL 10
050111 0    0 2046.4524 559.9133 -1.000 0.033250  0.5000  0.5000 *BUNDLE VOL 11
050121 0    0 2046.0061 564.8425 -1.000 0.049874  0.7500  0.7500 *BUNDLE VOL 12
050131 0    0 2045.0330 570.7319 -1.000 0.049874  0.7500  0.7500 *BUNDLE VOL 13
050141 0    0 2044.6016 575.4246 -1.000 0.029925  0.4500  0.4500 *BUNDLE VOL 14
050151 0    0 2044.2668 578.6809 -1.000 0.026600  0.4000  0.4000 *BUNDLE VOL 15
050161 0    0 2043.4238 582.4170 -1.000 0.039899  0.6000  0.6000 *BUNDLE VOL 16
050171 0    0 2043.0481 586.1387 -1.000 0.026600  0.4000  0.4000 *BUNDLE VOL 17
050181 0    0 2042.7278 589.1045 -1.000 0.026600  0.4000  0.4000 *BUNDLE VOL 18
050191 0    0 2042.3528 592.7981 -1.000 0.039899  0.6000  0.6000 *BUNDLE VOL 19
050201 0    0 2041.4700 596.7783 -1.000 0.033250  0.5000  0.5000 *BUNDLE VOL 20
050211 0    0 2041.1501 599.5847 -1.000 0.019950  0.3000  0.3000 *BUNDLE VOL 21
050221 0    0 2040.8577 602.0298 -1.000 0.026600  0.4000  0.4000 *BUNDLE VOL 22
050231 0    0 2040.5930 604.1177 -1.000 0.013300  0.2000  0.2000 *BUNDLE VOL 23
050241 0    0 2040.4368 604.8118 -1.000 0.147108  0.9916  0.9916 *T/C ARRAY
050251 0    0 2037.8916 604.8020 -1.000 0.427210  1.5000  1.5000 *UPPER PLENUM
050261 0   -2 2036.2998 604.7959 -1.000 0.147190  0.2917  0.2917 *OUTLET LINE
050271 0    0 2037.5962 604.8008 -1.000 0.167940  2.4470  2.4470 *DEAD LEG
050012 0   0.0372030  0.0632810  918.8616  0                     *DC AND MX TEE
050022 0   0.0588400  0.1936000  918.8616  0                     *2.3 INCH LINE
050032 0   0.2241970  0.0050190  918.7084  0                     *LOWER PLENUM
050042 0   0.0664999  0.0348000  920.0833  0                     *BUNDLE VOL 4
050052 0   0.0664999  0.0348000  920.8332  0                     *BUNDLE VOL 5
050062 0   0.0664999  0.0348000  921.5831  0                     *BUNDLE VOL 6
050072 0   0.0664999  0.0348000  922.5830  0                     *BUNDLE VOL 7
050082 0   0.0664999  0.0348000  923.5829  0                     *BUNDLE VOL 8
050092 0   0.0664999  0.0348000  924.3328  0                     *BUNDLE VOL 9
050102 0   0.0664999  0.0348000  925.0827  0                     *BUNDLE VOL 10
050112 0   0.0664999  0.0348000  925.8326  0                     *BUNDLE VOL 11
050122 0   0.0664999  0.0348000  926.3325  0                     *BUNDLE VOL 12
050132 0   0.0664999  0.0348000  927.0824  0                     *BUNDLE VOL 13
050142 0   0.0664999  0.0348000  927.8323  0                     *BUNDLE VOL 14
050152 0   0.0664999  0.0348000  928.2822  0                     *BUNDLE VOL 15
050162 0   0.0664999  0.0348000  928.6821  0                     *BUNDLE VOL 16
050172 0   0.0664999  0.0348000  929.2820  0                     *BUNDLE VOL 17
050182 0   0.0664999  0.0348000  929.6819  0                     *BUNDLE VOL 18
050192 0   0.0664999  0.0348000  930.0818  0                     *BUNDLE VOL 19
050202 0   0.0664999  0.0348000  930.6817  0                     *BUNDLE VOL 20
050212 0   0.0664999  0.0348000  931.1816  0                     *BUNDLE VOL 21
050222 0   0.0664999  0.0348000  931.4815  0                     *BUNDLE VOL 22
050232 0   0.0664999  0.0348000  931.8814  0                     *BUNDLE VOL 23
050242 0   0.1483499  0.0098740  932.0813  0                     *T/C ARRAY
050252 0   0.2387000  0.0196000  933.0728  0                     *UPPER PLENUM
050262 0   0.0668100  0.2916999  934.2604  0                     *OUTLET LINE
050272 0   0.0686200  0.0509100  933.4062  0                     *DEAD LEG
```

```
*
* JUNCTION DATA CARDS
*
080011  1  2   0   0 30.909988 0.0205000  918.95840    47.590      3.005      2.976
080021  2  3   0   0 30.909988 0.0294200  918.95840    20.400      1.084      0.959
080031  3  4   0   0 30.909988 0.0664990  920.08335     0.0        1.300      1.385
080041  4  5   0   0 30.909988 0.0664990  920.83325     0.0        0.890      0.890
080051  5  6   0   0 30.909988 0.0664990  921.58315     0.0        0.450      0.450
080061  6  7   0   0 30.909988 0.0664990  922.58305     0.0        0.450      0.450
080071  7  8   0   0 30.909988 0.0664990  923.58295     0.0        0.0        0.0
080081  8  9   0   0 30.909988 0.0664990  924.33285     0.0        0.0        0.0
080091  9 10   0   0 30.909988 0.0664990  925.08275     0.0        0.890      0.890
080101 10 11   0   0 30.909988 0.0664990  925.83265     0.0        0.0        0.0
080111 11 12   0   0 30.909988 0.0664990  926.33255     0.0        0.0        0.0
080121 12 13   0   0 30.909988 0.0664990  927.08245     0.0        0.890      0.890
080131 13 14   0   0 30.909988 0.0664990  927.83235     0.0        0.0        0.0
080141 14 15   0   0 30.909988 0.0664990  928.28225     0.0        0.0        0.0
080151 15 16   0   0 30.909988 0.0664990  928.68215     0.0        0.890      0.890
080161 16 17   0   0 30.909988 0.0664990  929.28205     0.0        0.0        0.0
080171 17 18   0   0 30.909988 0.0664990  929.68195     0.0        0.0        0.0
080181 18 19   0   0 30.909988 0.0664990  930.08185     0.0        0.0        0.0
080191 19 20   0   0 30.909988 0.0664990  930.68175     0.0        0.890      0.890
080201 20 21   0   0 30.909988 0.0664990  931.18165     0.0        0.0        0.0
080211 21 22   0   0 30.909988 0.0664990  931.48155     0.0        0.0        0.0
080221 22 23   0   0 30.909988 0.0664990  931.88145     0.0        0.0        0.0
080231 23 24   0   0 30.909988 0.0664990  932.08135     0.0        0.0        0.0
080241 24 25   0   0 30.909988 0.0664990  933.07285     0.0        3.588      3.425
080251 25 26   0   0 30.909988 0.0668100  934.40623     0.0        1.385      1.535
080261 27 25   0   0  0.0      0.0288100  934.40623     0.0        0.808      0.445
080271  0  1   1   0 13.909988 0.0205000  923.13575     0.0        0.0        0.0
080012 1  5  0  0 0.0      0.0     11 0 0.0     0
080022 1  5  0  0 0.0      0.0     11 0 0.0     0
080032 0  5  2  0 0.0      0.0     11 2 0.0     0
080042 0  5  2  0 0.0      0.0     11 3 0.0     0
080052 0  5  2  0 0.0      0.0     11 3 0.0     0
080062 0  5  2  0 0.0      0.0     11 3 0.0     0
080072 0  5  2  0 0.0      0.0     11 3 0.0     0
080082 0  5  2  0 0.0      0.0     11 3 0.0     0
080092 0  5  2  0 0.0      0.0     11 3 0.0     0
080102 0  5  2  0 0.0      0.0     11 3 0.0     0
080112 0  5  2  0 0.0      0.0     11 3 0.0     0
080122 0  5  2  0 0.0      0.0     11 3 0.0     0
080132 0  5  2  0 0.0      0.0     11 3 0.0     0
080142 0  5  2  0 0.0      0.0     11 3 0.0     0
080152 0  5  2  0 0.0      0.0     11 3 0.0     0
080162 0  5  2  0 0.0      0.0     11 3 0.0     0
080172 0  5  2  0 0.0      0.0     11 3 0.0     0
080182 0  5  2  0 0.0      0.0     11 3 0.0     0
080192 0  5  2  0 0.0      0.0     11 3 0.0     0
080202 0  5  2  0 0.0      0.0     11 3 0.0     0
080212 0  5  2  0 0.0      0.0     11 3 0.0     0
080222 0  5  2  0 0.0      0.0     11 3 0.0     0
080232 0  5  2  0 0.0      0.0     11 1 0.0     0
080242 0  5  2  0 0.0      0.0     11 0 0.0     0
080252 0  5  2  0 0.0      0.0     11 0 0.0     0
080262 1  5  2  0 0.0      0.0     11 0 0.0     0
080272 0  5  2  0 0.0      0.0     11 0 0.0     0
*
* KINETIC CONSTANTS CARD
*
140000  0  0  0.  0.
*
* DUMMY POWER PROGRAM
*
141001   2   2   0.0   1.0   30.0   1.0
*
* SLAB CARDS
*
150011  0  4  1 0 0  2  2  0.0        4.4059887 0.03434300 0.0        0.03480000
150021  0  5  1 1 0  2  2  0.0        4.4059887 0.03434300 0.0        0.03480000
150031  0  6  1 1 0  2  2  0.0        5.8746586 0.04579050 0.0        0.03480000
150041  0  7  1 1 0  2  2  0.0        5.8746586 0.04579050 0.0        0.03480000
150051  0  8  1 1 0  2  2  0.0        4.4059887 0.03434300 0.0        0.03480000
150061  0  9  1 1 0  2  2  0.0        4.4059887 0.03434300 0.0        0.03480000
150071  0 10  1 1 0  2  2  0.0        4.4059887 0.03434300 0.0        0.03480000
150081  0 11  1 1 0  2  2  0.0        2.9373293 0.02289520 0.0        0.03480000
150091  0 12  1 1 0  2  2  0.0        4.4059887 0.03434300 0.0        0.03480000
150101  0 13  1 1 0  2  2  0.0        4.4059887 0.03434300 0.0        0.03480000
150111  0 14  1 1 0  2  2  0.0        2.6435986 0.02060500 0.0        0.03480000
150121  0 15  1 1 0  2  2  0.0        2.3498583 0.01831620 0.0        0.03480000
150131  0 16  1 1 0  2  2  0.0        3.5247984 0.02747400 0.0        0.03480000
150141  0 17  1 1 0  2  2  0.0        2.3498583 0.01831620 0.0        0.03480000
150151  0 18  1 1 0  2  2  0.0        2.3498583 0.01831620 0.0        0.03480000
150161  0 19  1 1 0  2  2  0.0        3.5247984 0.02747400 0.0        0.03480000
150171  0 20  1 1 0  2  2  0.0        2.9373293 0.02289500 0.0        0.03480000
150181  0 21  1 1 0  2  2  0.0        1.7623997 0.01373700 0.0        0.03480000
150191  0 22  1 1 0  2  2  0.0        2.3498583 0.01831600 0.0        0.03480000
150201  0 23  1 1 0  2  2  0.0        1.1749287 0.00915810 0.0        0.03480000
150211  4  0  5 0 0  2  2  1.0209990  0.0       0.09007347 0.02760000 0.0
150221  5  0  5 0 0  2  2  1.0209990  0.0       0.09007347 0.02760000 0.0
150231  6  0  5 0 0  2  2  1.3613291  0.0       0.12009794 0.02760000 0.0
150241  7  0  5 0 0  2  2  1.3613291  0.0       0.12009794 0.02760000 0.0
150251  8  0  5 0 0  2  2  1.0209990  0.0       0.09007347 0.02760000 0.0
```

```
150261  9  0  5 0 0  2  2  1.0209990   0.0          0.09007347 0.02760000 0.0
150271 10  0  5 0 0  2  2  1.0209990   0.0          0.09007347 0.02760000 0.0
150281 11  0  5 0 0  2  2  0.6806700   0.0          0.06004900 0.02760000 0.0
150291 12  0  5 0 0  2  2  1.0209990   0.0          0.09007347 0.02760000 0.0
150301 13  0  5 0 0  2  2  1.0209990   0.0          0.09007347 0.02760000 0.0
150311 14  0  5 0 0  2  2  0.6126000   0.0          0.05404410 0.02760000 0.0
150321 15  0  5 0 0  2  2  0.5445300   0.0          0.04803920 0.02760000 0.0
150331 16  0  5 0 0  2  2  0.8168000   0.0          0.07205880 0.02760000 0.0
150341 17  0  5 0 0  2  2  0.5445300   0.0          0.04803920 0.02760000 0.0
150351 18  0  5 0 0  2  2  0.5445300   0.0          0.04803920 0.02760000 0.0
150361 19  0  5 0 0  2  2  0.8168000   0.0          0.07205880 0.02760000 0.0
150371 20  0  5 0 0  2  2  0.6806700   0.0          0.06004900 0.02760000 0.0
150381 21  0  5 0 0  2  2  0.4084000   0.0          0.03602940 0.02760000 0.0
150391 22  0  5 0 0  2  2  0.5445300   0.0          0.04803920 0.02760000 0.0
150401 23  0  5 0 0  2  2  0.2722700   0.0          0.02401960 0.02760000 0.0
150411 26  0  7 0 0  2  2  2.0186481   0.0          0.09612799 0.29169989 0.0
150421  3  0  4 0 0  2  2  2.3560896   0.0          0.34688497 0.02760000 0.0
150431  1  0  2 0 0  2  2  2.1707993   0.0          0.04376000 0.06328100 0.0
150441 25  0  6 0 0  2  2  3.4360991   0.0          0.31906992 0.01960000 0.0
150451  0 24  9 0 0  2  2  0.0         6.2139988    0.04842000 0.0        0.03480000
150461  0  3  9 0 0  2  2  0.0         8.6162987    0.06713599 0.0        0.03480000
150471  2  0  3 0 0  2  2  5.2989998   0.0          0.13369989 0.19165999 0.0
150481 24  0  8 0 0  2  2  1.6215382   0.0          0.21449089 0.02760000 0.0
150012 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150022 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150032 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150042 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150052 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150062 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150072 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150082 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150092 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150102 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150112 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150122 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150132 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150142 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150152 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150162 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150172 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150182 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150192 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150202 0.0        0.0450000  0.0        0.0          0.0        0.0        .0        0.0
150212 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150222 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150232 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150242 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150252 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150262 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150272 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150282 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150292 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150302 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150312 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150322 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150332 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150342 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150352 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150362 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150372 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150382 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150392 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150402 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150412 0.0        0.0        2.203098   0.0          0.0        0.0        .0        0.0
150422 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150432 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150442 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150452 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150462 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
150472 0.0        0.0        4.400000   0.0          0.0        0.0        .0        0.0
150482 0.0        0.0        0.0        0.0          0.0        0.0        .0        0.0
*
*  CORE CARDS
*
160010  1  5  8  9 0.0      0.0625000 0.0        0.0  -1
160020  2  5  8  9 0.0      0.0625000 0.0        0.0  -2
160030  3  5  8  9 0.0      0.0833330 0.0        0.0  -3
160040  4  5  8  9 0.0      0.0833330 0.0        0.0  -4
160050  5  5  8  9 0.0      0.0625000 0.0        0.0  -5
160060  6  5  8  9 0.0      0.0625000 0.0        0.0  -6
160070  7  5  8  9 0.0      0.0625000 0.0        0.0  -7
160080  8  5  8  9 0.0      0.0416667 0.0        0.0  -8
160090  9  5  8  9 0.0      0.0625000 0.0        0.0  -9
160100 10  5  8  9 0.0      0.0625000 0.0        0.0 -10
160110 11  5  8  9 0.0      0.0375000 0.0        0.0 -11
160120 12  5  8  9 0.0      0.0333300 0.0        0.0 -12
160130 13  5  8  9 0.0      0.0500000 0.0        0.0 -13
160140 14  5  8  9 0.0      0.0333300 0.0        0.0 -14
160150 15  5  8  9 0.0      0.0333300 0.0        0.0 -15
160160 16  5  8  9 0.0      0.0500000 0.0        0.0 -16
160170 17  5  8  9 0.0      0.0416667 0.0        0.0 -17
160180 18  5  8  9 0.0      0.0250000 0.0        0.0 -18
160190 19  5  8  9 0.0      0.0333300 0.0        0.0 -19
160200 20  5  8  9 0.0      0.0166670 0.0        0.0 -20
```

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*
*  SLAB GEOMETRY CARDS
*
170101   2   4   3   3   0.0          0.009075      0.0
170102   0   1   1                    0.0011500     1.0
170103   0   3   3                    0.0037917     0.0
170104   0   2   3                    0.0015750     0.0
170201   2   2   2   3   0.08083      0.0090625     0.0
170202   0   2   1                    0.0090625     0.0
170301   2   2   2   3   0.095833     0.02257       0.0
170302   0   2   1                    0.02257       0.0
170401   1   2   2   3   0.0          0.0736        0.0
170402   0   2   1                    0.0736        0.0
170501   1   1   2   4   0.           0.07310       0.0
170601   2   2   2   3   0.36458      0.04166       0.0
170602   0   2   1                    0.04166       0.0
170701   2   2   2   3   0.1459       0.01666       0.0
170702   0   2   1                    0.025         0.0
170801   1   2   2   3   0.0          0.06615       0.0
170802   0   2   1                    0.06615       0.0
170901   2   4   3   3   0.0          0.009075      0.0
170902   0   1   1                    0.0011500     0.0
170903   0   3   3                    0.0037917     0.0
170904   0   2   3                    0.0015750     0.0
*
*    VOLUMETRIC HEAT CAPACITY  BTU/F-FT**3  MATERIAL 1 - INCONNEL
*
190101 20        0.     51.41      200.     57.434      300.     59.527  * INCONNEL
190102         400.     61.167     500.     62.476      600.     63.572  * INCONNEL
190103         700.     64.578     800.     65.612      900.     66.795  * INCONNEL
190104        1000.     68.247    1100.     70.088     1200.     72.439  * INCONNEL
190105        1300.     75.420    1400.     79.150     1500.     83.750  * INCONNEL
190106        1600.     89.341    1700.     96.042     1800.    103.973  * INCONNEL
190107        1900.    113.255    2000.    124.008                        * INCONNEL
*
*   THERMAL CONDUCTIVITY BTU/FT-HR-F    MATERIAL 1 - INCONNEL
*
180101 20        0.      8.4294    200.      9.098      300.      9.495  * INCONNEL
180102         400.      9.930     500.     10.398      600.     10.896  * INCONNEL
180103         700.     11.420     800.     11.967      900.     12.532  * INCONNEL
180104        1000.     13.113    1100.     13.704     1200.     14.303  * INCONNEL
180105        1300.     14.906    1400.     15.509     1500.     16.109  * INCONNEL
180106        1600.     16.701    1700.     17.282     1800.     17.849  * INCONNEL
180107        1900.     18.397    2000.     18.922                        * INCONNEL
*
*    VOLUMETRIC HEAT CAPACITY  BTU/F-FT**3  MATERIAL 2 - 316 SS
*
190201 20        0.     51.68      200.     56.923      300.     59.020  * 316-STST
190202         400.     60.846     500.     62.447      600.     63.865  * 316-STST
190203         700.     65.141     800.     66.308      900.     67.400  * 316-STST
190204        1000.     68.444    1100.     69.463     1200.     70.480  * 316-STST
190205        1300.     71.508    1400.     72.563     1500.     73.652  * 316-STST
190206        1600.     74.782    1700.     75.952     1800.     77.162  * 316-STST
190207        1900.     78.406    2000.     79.672                        * 316-STST
*
*    THERMAL CONDUCTIVITY BTU/FT-HR-F    MATERIAL 2 - 316 SS
*
180201 20        0.      7.2458    200.      8.225      300.      8.691  * 316-STST
180202         400.      9.144     500.      9.586      600.     10.020  * 316-STST
180203         700.     10.448     800.     10.872      900.     11.294  * 316-STST
180204        1000.     11.718    1100.     12.145     1200.     12.577  * 316-STST
180205        1300.     13.017    1400.     13.467     1500.     13.929  * 316-STST
180206        1600.     14.406    1700.     14.900     1800.     15.414  * 316-STST
180207        1900.     15.948    2000.     16.507                        * 316-STST
*
*    VOLUMETRIC HEAT CAPACITY  BTU/F-FT**3  MATERIAL 3 - BN
*
190301 20        0.     23.044      200.     32.838      300.     36.260  *        BN
190302         400.     39.833      500.     43.033      600.     45.886  *        BN
190303         700.     48.415      800.     50.649      900.     52.613  *        BN
190304        1000.     54.333     1100.     55.836     1200.     57.145  *        BN
190305        1300.     58.289     1400.     59.292     1500.     60.180  *        BN
190306        1600.     60.980     1700.     61.717     1800.     62.418  *        BN
190307        1900.     63.106     2000.     63.810                        *        BN
*
*    THERMAL CONDUCTIVITY BTU/FT-HR-F    MATERIAL 3 - BN
*
180301   2   0.0    13.87445    2000.0    9.08085                         *        BN
*
*   FILL TABLE 1 IS 2 INCH INLET:  SITE B11 ON AMICON TAPE
*
8100000   2   4    401   1   LBS/SEC
8100001        0.0       1507.6853    504.5420      0.0500    1506.4924    504.5420
8100002        0.1000    2097.4143    504.6035      0.1500    1519.9578    502.6372
8100003        0.2000    1439.7153    502.6887      0.2500    1412.3245    502.6895
8100004        0.3000    1432.1521    502.7021      0.3500    1347.5889    503.7231
8100005        0.4000    1347.6978    502.7021      0.4500    1307.1868    502.7046
8100006        0.5000    1277.4731    502.7039      0.5500    1260.7544    502.7063
8100007        0.6000    1215.5151    502.7078      0.6500    1204.8113    502.7078
8100008        0.7000    1175.0364    502.7095      0.7500    1145.3035    502.7095
8100009        0.8000    1127.4241    502.7112      0.8500    1100.0520    502.7119
8100010        0.9000    1081.0051    502.7126      0.9500    1059.5623    502.7144
8100011        1.0000    1042.9136    502.7144      1.0500    1026.2290    502.7161
8100012        1.1000    1007.2026    502.7161      1.1500     984.5916    502.7168
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8100013	1.2000	967.9268	502.7175	1.2500	950.0737	502.7185
8100014	1.3000	933.4268	502.7185	1.3500	913.1963	502.7192
8100015	1.4000	901.3215	502.7185	1.4500	879.9028	502.7192
8100016	1.5000	862.0818	502.7185	1.5500	851.3950	502.7175
8100017	1.6000	838.3005	502.7185	1.6500	819.2896	502.7175
8100018	1.7000	806.2234	502.7168	1.7500	788.4004	502.7161
8100019	1.8000	772.9551	502.7151	1.8500	765.8472	502.7136
8100020	1.9000	753.9683	502.7126	1.9500	737.3447	502.7112
8100021	2.0000	729.0586	502.7087	2.0500	718.3918	502.7063
8100022	2.1000	706.5229	502.7046	2.1500	695.8545	502.7021
8100023	2.2000	685.1851	502.6997	2.2500	682.8416	502.6975
8100024	2.3000	666.7346	503.7190	2.3500	657.2612	503.7168
8100025	2.4000	650.8354	502.6895	2.4500	643.7302	502.6870
8100026	2.5000	631.2244	503.7100	2.5500	627.1482	502.6814
8100027	2.6000	616.4807	502.6782	2.6500	612.9314	502.6768
8100028	2.7000	602.2620	502.6736	2.7500	596.3420	502.6714
8100029	2.8000	592.2026	503.6938	2.8500	578.5378	502.6672
8100030	2.9000	576.8042	503.6892	2.9500	571.4448	502.6633
8100031	3.0000	568.5186	503.6860	3.0500	556.0066	502.6602
8100032	3.1000	552.4541	502.6584	3.1500	548.3376	503.6829
8100033	3.2000	542.9480	502.6567	3.2500	531.7039	503.6814
8100034	3.3000	528.6687	502.6560	3.3500	529.8503	502.6567
8100035	3.4000	515.0508	503.6814	3.4500	516.7529	502.6567
8100036	3.5000	518.5923	503.6836	3.5500	500.0576	502.6592
8100037	3.6000	501.2222	502.6616	3.6500	495.2434	502.6641
8100038	3.7000	491.6465	502.6665	3.7500	484.4954	502.6672
8100039	3.8000	474.9475	502.6697	3.8500	466.1189	503.6973
8100040	3.9000	467.7566	502.6743	3.9500	464.1619	502.6768
8100041	4.0000	455.7991	502.6799	4.0500	452.2048	502.6824
8100042	4.1000	448.6194	502.6838	4.1500	448.5959	502.6863
8100043	4.2000	435.4839	502.6887	4.2499	436.6438	502.6919
8100044	4.2999	433.0439	502.6951	4.3499	431.8318	502.6975
8100045	4.3999	419.9209	502.6990	4.4499	425.8315	502.7031
8100046	4.4999	419.8623	502.7053	4.5499	417.8699	501.6833
8100047	4.5999	416.2356	502.7119	4.6499	412.6392	502.7151
8100048	4.6999	410.6555	501.6912	4.7499	405.4614	502.7200
8100049	4.7999	405.4402	502.7224	4.8499	401.0701	501.6985
8100050	4.8999	400.6421	502.7271	4.9499	393.4951	502.7285
8100051	4.9999	391.0901	502.7314	5.0499	390.2771	501.7083
8100052	5.0999	383.9172	502.7356	5.1499	379.5286	501.7131
8100053	5.1999	373.1804	502.7400	5.2499	366.4031	501.7180
8100054	5.2999	362.4458	502.7441	5.3499	354.4695	501.7229
8100055	5.3999	350.5251	502.7485	5.4499	349.3186	502.7507
8100056	5.4999	343.7097	501.7302	5.5499	349.6318	501.7336
8100057	5.5999	346.8748	502.7588	5.6499	346.0215	501.7395
8100058	5.6999	343.6252	501.7417	5.7499	334.0955	501.7439
8100059	5.7999	333.7366	502.7676	5.8499	330.4880	501.7490
8100060	5.8999	325.7156	501.7512	5.9499	319.7551	501.7534
8100061	5.9999	318.5437	501.7561	6.0499	316.1499	501.7583
8100062	6.0999	307.8247	501.7590	6.1499	269.7971	501.7583
8100063	6.1999	262.6658	501.7583	6.2499	284.0444	501.7605
8100064	6.2999	305.4207	501.7627	6.3499	317.2993	501.7634
8100065	6.3999	305.4099	501.7642	6.4499	307.7759	501.7656
8100066	6.4999	306.5767	501.7671	6.5499	300.6353	501.7671
8100067	6.5999	300.6194	501.7695	6.6499	297.0496	501.7703
8100068	6.6999	291.1084	501.7703	6.7499	291.0981	501.7717
8100069	6.7999	269.9917	500.7476	6.8499	275.6423	501.7732
8100070	6.8999	294.6416	501.7747	6.9499	297.0073	501.7761
8100071	6.9999	301.7434	501.7783	7.0499	299.3569	501.7798
8100072	7.0999	273.2371	501.7776	7.1499	244.9888	500.7527
8100073	7.1999	254.2203	501.7791	7.2499	304.3877	500.7617
8100074	7.2999	314.7607	501.7852	7.3499	268.4565	501.7820
8100075	7.3999	224.5216	501.7791	7.4499	261.5740	500.7632
8100076	7.4999	307.9167	500.7668	7.5499	299.2825	501.7903
8100077	7.5999	273.4443	500.7661	7.6499	228.0370	501.7881
8100078	7.6999	242.2720	501.7910	7.7499	293.6038	500.7734
8100079	7.7999	299.5312	500.7759	7.8499	285.2727	500.7751
8100080	7.8999	241.3146	500.7712	7.9499	195.7432	502.8159
8100081	7.9999	236.2793	501.8008	8.0499	307.7969	500.7832
8100082	8.0999	309.8386	501.8086	8.1499	284.0239	500.7839
8100083	8.1999	213.9509	500.7759	8.2499	151.9841	501.7993
8100084	8.2999	165.0246	501.8047	8.3499	308.9197	500.7922
8100085	8.3999	310.1519	500.7861	8.4499	205.3941	501.8040
8100086	8.4999	165.0099	501.8086	8.5499	280.3840	500.7952
8100087	8.5999	320.7671	500.7969	8.6499	272.0869	500.7922
8100088	8.6999	184.1964	500.7847	8.7499	122.3949	500.7869
8100089	8.7999	210.0605	501.8208	8.8499	340.8967	500.8052
8100090	8.8999	318.3513	500.8020	8.9499	203.1742	500.7922
8100091	8.9999	127.2649	499.7676	9.0499	118.6761	501.8215
8100092	9.0999	290.9836	500.8091	9.1499	304.0698	500.8059
8100093	9.1999	236.3794	500.8037	9.2499	181.7357	500.8044
8100094	9.2999	194.7913	500.8066	9.3499	245.8383	500.8113
8100095	9.3999	235.1497	500.8113	9.4499	241.0706	500.8145
8100096	9.4999	249.1172	501.8396	9.5499	216.1284	500.8152
8100097	9.5999	226.7959	500.8191	9.6499	210.1758	500.8181
8100098	9.6999	195.9197	500.8198	9.7499	216.0899	500.8230
8100099	9.7999	226.7554	500.8267	9.8499	257.5947	500.8315
8100100	9.8999	258.7820	500.8315	9.9499	185.2066	500.8259
8100101	9.9999	156.7049	500.8284	10.0499	192.2887	500.8354
8100102	10.0999	238.5676	500.8376	10.1499	256.6267	499.8147
8100103	10.1999	202.9860	500.8323	10.2499	134.1297	500.8347
8100104	10.2999	176.8328	500.8418	10.3499	281.2256	500.8489
8100105	10.3999	283.9021	499.8223	10.4499	177.0250	499.8147
8100106	10.4999	133.1953	498.7927	10.5499	145.9551	500.8479

8100107	10.5999	255.0881	500.8545	10.6499	250.6193	499.8262
8100108	10.6999	199.5452	499.8262	10.7499	155.4426	500.8496
8100109	10.7998	181.5213	500.8560	10.8498	240.8160	500.8608
8100110	10.8998	261.2297	499.8396	10.9498	243.1842	500.8616
8100111	10.9998	159.1355	499.8333	11.0498	137.6042	500.8623
8100112	11.0998	201.6250	500.8704	11.1498	254.0509	499.8491
8100113	11.1998	262.3516	499.8506	11.2498	191.1523	499.8442
8100114	11.2998	129.2702	500.8728	11.3498	147.0464	500.8770
8100115	11.3998	224.0988	500.8826	11.4498	235.9473	500.8843
8100116	11.4998	212.4548	499.8586	11.5498	187.5265	499.8594
8100117	11.5998	161.2446	500.8860	11.6498	186.3195	499.8643
8100118	11.6998	204.1097	499.8667	11.7498	219.5130	499.8716
8100119	11.7998	218.3185	499.8733	11.8498	207.4087	500.9023
8100120	11.8998	210.9566	500.9041	11.9498	195.7501	499.8789
8100121	11.9998	186.2491	499.8813	12.0498	190.9805	499.8845
8100122	12.0998	195.7148	499.8872	12.1498	205.1928	499.8896
8100123	12.1998	196.8902	499.8896	12.2498	164.8659	499.8896
8100124	12.2998	169.4209	500.9192	12.3498	202.7914	499.8962
8100125	12.3998	209.8915	499.8994	12.4498	193.2935	499.8987
8100126	12.4998	173.1309	499.8994	12.5498	176.6788	499.9019
8100127	12.5998	199.1902	499.9062	12.6498	207.4748	499.9094
8100128	12.6998	199.1758	499.9094	12.7498	169.5365	499.9094
8100129	12.7998	180.0016	500.9404	12.8498	207.4371	499.9180
8100130	12.8998	214.5258	499.9229	12.9498	216.8804	499.9263
8100131	12.9998	184.8851	499.9255	13.0498	156.4383	499.9263
8100132	13.0998	165.9074	499.9297	13.1498	191.9645	499.9331
8100133	13.1998	187.2213	499.9338	13.2498	161.1554	499.9331
8100134	13.2998	158.7739	499.9365	13.3498	188.3787	499.9407
8100135	13.3998	216.7895	499.9460	13.4498	203.7547	499.9468
8100136	13.4998	148.2462	498.9160	13.5498	155.1853	499.9468
8100137	13.5998	169.3914	499.9495	13.6498	184.7805	499.9519
8100138	13.6998	199.1885	498.9285	13.7498	149.2485	499.9512
8100139	13.7998	163.4447	499.9563	13.8498	165.6356	500.9846
8100140	13.8998	182.3781	499.9607	13.9498	193.0225	499.9641
8100141	13.9998	179.9864	499.9668	14.0498	188.2580	499.9712
8100142	14.0998	182.3279	499.9736	14.1498	177.5790	499.9773
8100143	14.1998	174.0211	499.9790	14.2498	149.3179	498.9517
8100144	14.2998	157.4331	499.9834	14.3498	173.9922	499.9868
8100145	14.3998	178.7135	499.9905	14.4498	178.8921	498.9656
8100146	14.4998	163.4848	498.9673	14.5498	162.1201	499.9976
8100147	14.5998	158.5642	499.9993	14.6498	152.8088	498.9717
8100148	14.6998	146.8805	498.9734	14.7498	152.7947	498.9761
8100149	14.7998	165.8116	498.9797	14.8498	169.3585	498.9814
8100150	14.8998	159.8780	498.9832	14.9498	158.6908	498.9841
8100151	14.9998	155.1295	498.9868	15.0498	158.6732	498.9895
8100152	15.0998	162.2197	498.9912	15.1498	152.7498	498.9902
8100153	15.1998	139.5717	500.0200	15.2498	144.4531	498.9929
8100154	15.2998	152.7357	498.9946	15.3498	153.9112	498.9973
8100155	15.3998	155.0866	499.0000	15.4498	161.0000	499.0020
8100156	15.4998	156.2589	499.0037	15.5498	164.5363	499.0063
8100157	15.5998	157.4311	499.0073	15.6498	158.6060	499.0100
8100158	15.6998	159.7838	499.0117	15.7498	162.1449	499.0137
8100159	15.7998	149.9865	508.6282	15.8498	152.3299	508.9495
8100160	15.8998	147.7592	508.0601	15.9498	145.4520	507.5872
8100161	15.9998	159.7542	499.0430	16.0498	149.0983	499.0249
8100162	16.0997	163.2921	499.0227	16.1497	142.1565	506.0251
8100163	16.1997	151.6347	505.6086	16.2497	153.8174	499.0493
8100164	16.2997	156.0149	500.0876	16.3497	168.3553	503.9412
8100165	16.3997	160.8988	499.0615	16.4497	168.5314	502.7969
8100166	16.4996	161.4180	503.1592	16.5496	163.8172	502.7292
8100167	16.5996	169.7986	502.1953	16.6496	162.0668	499.0388
8100168	16.6996	173.4718	501.3945	16.7496	166.7894	499.0425
8100169	16.7996	171.2011	500.8708	16.8496	168.8397	500.8708
8100170	16.8996	170.0658	500.6990	16.9495	178.4283	500.0564
8100171	16.9995	178.4760	499.8838	17.0495	184.5123	499.0742
8100172	17.0995	192.7280	498.9128	17.1495	186.7796	498.9128
8100173	17.1995	186.0293	498.9128	17.2495	183.3557	498.7969
8100174	17.2995	180.1047	498.6350	17.3494	184.6812	498.1550
8100175	17.3994	175.3228	498.8240	17.4494	169.6135	498.3569
8100176	17.4994	171.3138	498.6350	17.5494	170.2118	498.4512
8100177	17.5994	179.5385	498.1790	17.6494	186.1246	497.8076
8100178	17.6994	192.3627	497.6345	17.7493	185.7882	498.3103
8100179	17.7993	188.8042	498.2432	17.8493	195.6284	497.9697
8100180	17.8993	201.8983	498.1785	17.9493	195.4737	498.7136
8100181	17.9993	179.6695	498.8796	18.0493	181.1169	498.9883
8100182	18.0993	185.0517	498.9333	18.1492	199.5236	498.7693
8100183	18.1992	217.1221	498.6055	18.2492	207.3516	498.8811
8100184	18.2992	204.4889	499.1072	18.3492	208.7939	498.8313
8100185	18.3992	205.5651	499.1072	18.4492	191.3246	498.9939
8100186	18.4992	176.8950	499.9656	18.5491	182.4436	499.6133
8100187	18.5991	200.7668	499.4534	18.6491	213.6350	499.2937
8100188	18.6991	223.2873	499.2529	18.7491	219.8875	499.1765
8100189	18.7991	213.8527	499.5303	18.8491	226.4323	499.2529
8100190	18.8991	241.0512	499.2151	18.9491	260.0776	498.8572
8100191	18.9990	228.5289	499.2529	19.0490	200.3820	499.9275
8100192	19.0990	194.1201	499.9275	19.1490	211.9588	499.7708
8100193	19.1990	266.8643	499.2529	19.2490	261.0259	498.6982
8100194	19.2990	261.9575	498.8171	19.3490	255.5974	498.9373
8100195	19.3989	248.3243	499.2151	19.4489	261.2268	498.4629
8100196	19.4989	254.8131	498.5801	19.5489	247.3982	498.6982
8100197	19.5989	226.5446	499.4585	19.6489	227.3233	498.6230
8100198	19.6989	230.6665	499.0583	19.7489	246.1822	499.0583
8100199	19.7988	246.9599	499.4272	19.8488	243.1719	498.8171
8100200	19.8988	232.6730	499.4272	19.9488	233.6022	499.6782
8100201	19.9988	249.4339	498.5396			

Appendix B

CALCULATED FILM-BOILING DATA

This appendix presents the calculated equilibrium bundle fluid conditions, level-average rod surface conditions, experimental heat transfer coefficients, and the dispersion (defined as one standard deviation ≡ SH) in the experimental heat transfer coefficients for the three ORNL transient tests. The burnout quality is also presented. Data are presented from selected thermocouple levels from each test: levels E, F, and G from test 3.03.6AR; levels C, D, E, E3, E7, F, F3, F7, and G from test 3.06.6B; and E, E3, E7, F, F3, F7, and G from test 3.08.6C.

Table B.1(a) presents film boiling data from test 3.03.6AR in metric units from 6.6 to 17.1 s every 0.5 s. Table B.1(b) contains the same information in English units. Film boiling data from test 3.06.6B are presented in Tables B.2(a) (metric units) and B.2(b) (English units) from 5.3 to 14.8 s every 0.5 s. Film-boiling data from test 3.08.6C are presented in Tables B.3(a) (metric units) and B.3(b) (English units) from 5.65 to 29.65 s every 0.5 s. Burnout quality is presented in Table B.4 for each transient test. The burnout point was located at ~183, 93, and 212 cm (6, 3, and 7 ft) from the bottom of the heated length in tests 3.03.6AR, 3.06.6B, and 3.08.6C, respectively.

Microfiche Tables M.1(a), M.1(b), M.2(a), M.2(b) M.3(a), M.3(b), and M.4 contain film-boiling data from the three ORNL transients as in the B tables except that the data is presented every 0.05 s. The notation for these tables is as follows:

Notation for tables

G ≡ mass flux based on bundle flow area of 61.7 cm^2 (9.58 $in.^2$)
X ≡ local thermodynamic quality
P ≡ pressure
TB ≡ bulk fluid temperature
Q ≡ level-average rod surface heat flux
TW ≡ level-average rod surface temperature
H ≡ level-average experimental heat transfer coefficient
SH ≡ dispersion in H
L ≡ distance from bottom of heated length

Table B.1a. Film boiling data — test 3.03.6AR (metric units)

TEST 3.03.6AR, VOLUME 14, L=244. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
6.60	5.398E+02	0.707	9.6	580.9	4.630E+02	803.5	2.075	0.000
7.10	4.313E+02	0.773	9.5	580.0	4.379E+02	813.7	1.867	0.162
7.60	3.933E+02	0.822	9.3	578.7	4.284E+02	821.7	1.760	0.145
8.10	3.920E+02	0.816	9.0	576.6	4.190E+02	829.8	1.657	0.118
8.60	3.608E+02	0.811	8.9	575.2	4.000E+02	842.6	1.500	0.091
9.10	3.825E+02	0.812	8.7	573.9	3.875E+02	850.0	1.403	0.074
9.60	3.052E+02	0.778	8.6	573.0	3.497E+02	852.6	1.245	0.069
10.10	3.079E+02	0.723	8.3	570.6	3.402E+02	858.7	1.180	0.055
10.60	2.997E+02	0.694	8.1	569.0	3.150E+02	863.3	1.073	0.045
11.10	3.147E+02	0.649	7.9	567.1	3.093E+02	865.4	1.037	0.052
11.60	2.591E+02	0.592	7.7	565.2	2.681E+02	866.3	0.891	0.053
12.10	2.563E+02	0.520	7.4	562.2	2.637E+02	864.2	0.873	0.041
12.60	2.699E+02	0.486	7.1	560.0	2.570E+02	861.2	0.853	0.038
13.10	2.930E+02	0.424	6.8	557.1	2.451E+02	856.4	0.819	0.044
13.60	2.984E+02	0.394	6.6	554.6	2.426E+02	851.7	0.817	0.037
14.10	3.242E+02	0.365	6.3	551.8	2.640E+02	845.0	0.900	0.039
14.60	2.943E+02	0.328	6.0	548.6	2.419E+02	839.2	0.832	0.046
15.10	2.984E+02	0.331	5.8	546.1	2.366E+02	833.5	0.823	0.038
15.60	3.133E+02	0.317	5.6	543.9	2.422E+02	827.9	0.852	0.041
16.10	2.916E+02	0.303	5.4	541.7	2.271E+02	823.0	0.808	0.040
16.60	2.930E+02	0.307	5.3	540.1	2.189E+02	818.0	0.788	0.041
17.10	2.523E+02	0.312	5.1	538.6	2.199E+02	812.8	0.802	0.053

TEST 3.03.6AR, VOLUME 18, L=299. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
6.60	5.507E+02	0.795	9.6	580.8	5.009E+02	812.6	2.166	0.087
7.10	4.340E+02	0.883	9.5	579.9	4.599E+02	829.8	1.844	0.090
7.60	3.933E+02	0.947	9.3	578.7	4.536E+02	849.6	1.679	0.090
8.10	3.920E+02	0.948	9.0	576.5	4.473E+02	865.3	1.546	0.081
8.60	3.608E+02	0.948	8.9	575.2	4.221E+02	878.5	1.395	0.073
9.10	3.838E+02	0.954	8.7	573.9	4.064E+02	889.3	1.292	0.052
9.60	3.038E+02	0.930	8.6	572.9	3.717E+02	897.3	1.141	0.057
10.10	3.052E+02	0.874	8.3	570.6	3.623E+02	902.3	1.093	0.044
10.60	3.025E+02	0.830	8.1	569.0	3.402E+02	905.7	1.008	0.037
11.10	3.106E+02	0.800	7.9	567.1	3.339E+02	906.8	0.980	0.027
11.60	2.577E+02	0.732	7.7	565.2	2.822E+02	907.2	0.825	0.036
12.10	2.523E+02	0.662	7.4	562.1	2.788E+02	904.4	0.815	0.031
12.60	2.672E+02	0.614	7.1	560.0	2.605E+02	901.7	0.763	0.036
13.10	2.835E+02	0.558	6.8	557.1	2.599E+02	896.2	0.766	0.038
13.60	2.984E+02	0.503	6.6	554.6	2.596E+02	890.9	0.772	0.032
14.10	3.187E+02	0.479	6.3	551.7	2.800E+02	883.7	0.844	0.035
14.60	2.916E+02	0.432	6.0	548.6	2.599E+02	876.8	0.792	0.040
15.10	2.997E+02	0.425	5.8	546.0	2.529E+02	870.4	0.780	0.031
15.60	3.092E+02	0.416	5.6	543.9	2.542E+02	864.6	0.793	0.038
16.10	2.930E+02	0.392	5.4	541.7	2.340E+02	859.5	0.737	0.033
16.60	2.943E+02	0.393	5.3	540.1	2.205E+02	855.0	0.700	0.032
17.10	2.563E+02	0.401	5.1	538.6	2.189E+02	850.0	0.703	0.031

Table B.1a (continued)

TEST 3.03.6AR, VOLUME 23, L=363. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
6.60	5.602E+02	0.905	9.6	580.7	5.103E+02	814.2	2.187	0.064
7.10	4.381E+02	1.010	9.5	584.4	4.568E+02	836.4	1.815	0.100
7.60	4.001E+02	1.080	9.3	601.3	4.442E+02	857.0	1.736	0.103
8.10	3.960E+02	1.085	9.0	601.8	4.253E+02	873.9	1.568	0.100
8.60	3.635E+02	1.091	8.9	603.1	4.032E+02	888.3	1.412	0.094
9.10	3.852E+02	1.096	8.7	604.2	3.843E+02	900.2	1.294	0.065
9.60	3.011E+02	1.090	8.6	601.8	3.497E+02	909.4	1.137	0.057
10.10	3.025E+02	1.041	8.3	585.5	3.465E+02	915.3	1.047	0.056
10.60	3.052E+02	0.993	8.1	568.9	3.370E+02	918.2	0.963	0.040
11.10	3.092E+02	0.977	7.9	567.0	3.339E+02	918.6	0.954	0.044
11.60	2.550E+02	0.903	7.7	565.2	2.873E+02	918.4	0.814	0.044
12.10	2.496E+02	0.832	7.4	562.1	2.911E+02	914.5	0.826	0.037
12.60	2.658E+02	0.761	7.1	560.0	2.744E+02	911.1	0.782	0.029
13.10	2.753E+02	0.716	6.8	557.0	2.731E+02	905.0	0.784	0.026
13.60	2.943E+02	0.638	6.6	554.6	2.684E+02	899.2	0.779	0.024
14.10	3.147E+02	0.612	6.3	551.7	3.008E+02	890.8	0.888	0.024
14.60	2.889E+02	0.558	6.0	548.6	2.807E+02	882.5	0.841	0.032
15.10	3.038E+02	0.531	5.8	546.0	2.703E+02	875.1	0.822	0.037
15.60	3.065E+02	0.531	5.6	543.9	2.712E+02	868.4	0.836	0.023
16.10	2.943E+02	0.496	5.4	541.7	2.489E+02	862.6	0.776	0.033
16.60	2.957E+02	0.492	5.3	540.0	2.325E+02	857.2	0.733	0.033
17.10	2.604E+02	0.500	5.1	538.6	2.287E+02	852.1	0.729	0.028

Table B.1b. Film boiling data — test 3.03.6AR (English units)

TEST 3.03.6AR, VOLUME 14, L= 8.0 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
6.60	3.980E+05	0.707	1389.3	586.1	1.470E+05	986.8	366.0	0.0
7.10	3.180E+05	0.773	1372.7	584.5	1.390E+05	1005.2	329.2	28.6
7.60	2.900E+05	0.822	1350.2	582.3	1.360E+05	1019.5	310.4	25.6
8.10	2.890E+05	0.816	1309.8	578.4	1.330E+05	1034.2	292.2	20.8
8.60	2.660E+05	0.811	1285.7	576.0	1.270E+05	1057.2	264.6	16.1
9.10	2.820E+05	0.812	1261.9	573.6	1.230E+05	1070.5	247.4	13.1
9.60	2.250E+05	0.778	1245.1	571.9	1.110E+05	1075.2	219.5	12.1
10.10	2.270E+05	0.723	1204.2	567.6	1.080E+05	1086.2	208.1	9.7
10.60	2.210E+05	0.694	1177.0	564.7	1.000E+05	1094.5	189.2	7.9
11.10	2.320E+05	0.649	1145.3	561.3	9.820E+04	1098.2	182.9	9.1
11.60	1.910E+05	0.592	1115.4	558.0	8.510E+04	1099.9	157.1	9.4
12.10	1.890E+05	0.520	1066.8	552.5	8.370E+04	1096.0	154.0	7.2
12.60	1.990E+05	0.486	1033.3	548.6	8.160E+04	1090.6	150.5	6.7
13.10	2.160E+05	0.424	989.7	543.3	7.780E+04	1082.1	144.4	7.8
13.60	2.200E+05	0.394	953.9	538.9	7.700E+04	1073.5	144.1	6.6
14.10	2.390E+05	0.365	914.0	533.8	8.380E+04	1061.6	158.8	6.8
14.60	2.170E+05	0.328	871.2	528.1	7.680E+04	1051.0	146.8	8.1
15.10	2.200E+05	0.331	837.4	523.5	7.510E+04	1040.9	145.1	6.7
15.60	2.310E+05	0.317	810.0	519.6	7.690E+04	1030.8	150.3	7.3
16.10	2.150E+05	0.303	782.9	515.7	7.210E+04	1021.9	142.5	7.0
16.60	2.160E+05	0.307	762.8	512.8	6.950E+04	1013.0	139.0	7.2
17.10	1.860E+05	0.312	745.4	510.1	6.980E+04	1003.5	141.5	9.3

TEST 3.03.6AR, VOLUME 18, L= 9.8 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
6.60	4.060E+05	0.795	1388.2	586.0	1.590E+05	1003.2	382.0	15.3
7.10	3.200E+05	0.883	1372.0	584.4	1.460E+05	1034.1	325.2	15.9
7.60	2.900E+05	0.947	1349.5	582.3	1.440E+05	1069.8	296.2	15.9
8.10	2.890E+05	0.948	1309.2	578.3	1.420E+05	1098.0	272.6	14.2
8.60	2.660E+05	0.948	1285.1	575.9	1.340E+05	1121.9	246.1	12.8
9.10	2.830E+05	0.954	1261.3	573.5	1.290E+05	1141.2	227.9	9.2
9.60	2.240E+05	0.930	1244.6	571.8	1.180E+05	1155.6	201.3	10.1
10.10	2.250E+05	0.874	1203.8	567.6	1.150E+05	1164.7	192.8	7.7
10.60	2.230E+05	0.830	1176.5	564.7	1.080E+05	1170.8	177.8	6.6
11.10	2.290E+05	0.800	1144.8	561.3	1.060E+05	1172.8	172.9	4.8
11.60	1.900E+05	0.732	1115.1	558.0	8.960E+04	1173.5	145.5	6.4
12.10	1.860E+05	0.662	1066.4	552.4	8.850E+04	1168.5	143.7	5.5
12.60	1.970E+05	0.614	1032.9	548.5	8.270E+04	1163.5	134.5	6.3
13.10	2.090E+05	0.558	989.2	543.3	8.250E+04	1153.7	135.1	6.7
13.60	2.200E+05	0.503	953.5	538.8	8.240E+04	1144.2	136.1	5.7
14.10	2.350E+05	0.479	913.5	533.7	8.890E+04	1131.2	148.8	6.1
14.60	2.150E+05	0.432	870.8	528.1	8.250E+04	1118.7	139.7	7.0
15.10	2.210E+05	0.425	837.0	523.4	8.030E+04	1107.3	137.6	5.5
15.60	2.280E+05	0.416	809.6	519.6	8.070E+04	1096.8	139.8	6.7
16.10	2.160E+05	0.392	782.5	515.7	7.430E+04	1087.6	129.9	5.9
16.60	2.170E+05	0.393	762.4	512.7	7.000E+04	1079.5	123.5	5.6
17.10	1.890E+05	0.401	745.2	510.1	6.950E+04	1070.6	124.0	5.4

Table B.1b (continued)

TEST 3.03.6AR, VOLUME 23, L=11.9 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
6.60	4.130E+05	0.905	1387.0	585.8	1.620E+05	1006.0	385.7	11.2
7.10	3.230E+05	1.010	1371.0	592.5	1.450E+05	1046.1	320.1	17.7
7.60	2.950E+05	1.080	1348.7	622.9	1.410E+05	1083.2	306.1	18.1
8.10	2.920E+05	1.085	1308.4	623.8	1.350E+05	1113.5	276.5	17.6
8.60	2.680E+05	1.091	1284.4	626.1	1.280E+05	1139.4	249.1	16.5
9.10	2.840E+05	1.096	1260.6	628.2	1.220E+05	1160.9	228.2	11.4
9.60	2.220E+05	1.090	1244.2	623.8	1.110E+05	1177.4	200.5	10.0
10.10	2.230E+05	1.041	1203.4	594.4	1.100E+05	1188.0	184.7	9.8
10.60	2.250E+05	0.993	1175.9	564.6	1.070E+05	1193.2	169.9	7.0
11.10	2.280E+05	0.977	1144.2	561.2	1.060E+05	1194.0	168.2	7.8
11.60	1.880E+05	0.903	1114.6	557.9	9.120E+04	1193.7	143.5	7.7
12.10	1.840E+05	0.832	1066.1	552.4	9.240E+04	1186.6	145.7	6.6
12.60	1.960E+05	0.761	1032.5	548.5	8.710E+04	1180.5	137.9	5.2
13.10	2.030E+05	0.716	988.7	543.2	8.670E+04	1169.5	138.3	4.6
13.60	2.170E+05	0.638	953.0	538.8	8.520E+04	1159.1	137.4	4.2
14.10	2.320E+05	0.612	912.9	533.6	9.550E+04	1143.9	156.6	4.3
14.60	2.130E+05	0.558	870.4	528.0	8.910E+04	1129.0	148.3	5.7
15.10	2.240E+05	0.531	836.6	523.4	8.580E+04	1115.7	144.9	6.5
15.60	2.260E+05	0.531	809.0	519.5	8.610E+04	1103.6	147.4	4.0
16.10	2.170E+05	0.496	782.1	515.6	7.900E+04	1093.2	136.8	5.9
16.60	2.180E+05	0.492	761.8	512.6	7.380E+04	1083.5	129.3	5.8
17.10	1.920E+05	0.500	744.8	510.0	7.260E+04	1074.3	128.6	5.0

Table B.2a. Film boiling data — test 3.06.6B (metric units)

TEST 3.06.6B, VOLUME 8, L=118. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.80	2.835E+02	0.702	12.2	599.0	3.465E+02	834.1	1.469	0.274
6.30	2.536E+02	0.750	12.0	597.5	3.528E+02	858.1	1.348	0.148
6.80	2.577E+02	0.763	11.7	595.5	3.654E+02	888.5	1.244	0.112
7.30	2.536E+02	0.750	11.4	593.6	3.717E+02	913.9	1.160	0.084
7.80	2.007E+02	0.729	11.2	592.4	3.623E+02	935.3	1.052	0.064
8.30	1.885E+02	0.706	11.0	591.0	3.560E+02	952.6	0.987	0.060
8.80	2.021E+02	0.658	10.7	589.0	3.497E+02	966.3	0.929	0.055
9.30	2.089E+02	0.615	10.4	586.8	3.560E+02	975.5	0.914	0.053
9.80	2.197E+02	0.558	10.0	583.9	3.623E+02	981.8	0.913	0.041
10.30	2.116E+02	0.523	9.7	581.5	3.623E+02	987.3	0.895	0.041
10.80	1.831E+02	0.491	9.3	578.5	2.841E+02	995.1	0.682	0.104
11.30	1.397E+02	0.449	8.8	575.1	2.624E+02	984.6	0.641	0.055
11.80	1.424E+02	0.380	8.3	570.9	2.413E+02	973.4	0.600	0.086
12.30	1.587E+02	0.312	7.8	566.5	2.350E+02	962.0	0.594	0.077
12.80	1.750E+02	0.271	7.3	562.1	2.829E+02	945.9	0.737	0.071
13.30	1.940E+02	0.242	7.0	558.6	2.933E+02	930.3	0.789	0.080
13.80	1.804E+02	0.212	6.6	555.3	2.791E+02	915.6	0.775	0.073
14.30	1.872E+02	0.195	6.4	552.9	2.592E+02	902.2	0.743	0.065
14.80	1.899E+02	0.178	6.2	550.7	2.718E+02	888.0	0.806	0.070

TEST 3.06.6B, VOLUME 11, L=183. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.30	3.499E+02	0.722	12.4	600.4	3.623E+02	830.3	1.573	0.138
5.80	2.957E+02	0.843	12.2	599.0	3.591E+02	859.8	1.382	0.094
6.30	2.577E+02	0.929	12.0	597.5	3.717E+02	894.0	1.256	0.075
6.80	2.631E+02	0.971	11.7	595.5	3.843E+02	922.9	1.173	0.066
7.30	2.550E+02	0.981	11.4	593.6	3.875E+02	947.3	1.098	0.067
7.80	1.940E+02	0.981	11.2	592.3	3.780E+02	967.8	1.005	0.064
8.30	1.885E+02	0.954	11.0	590.9	3.623E+02	984.9	0.921	0.051
8.80	2.034E+02	0.919	10.7	589.0	3.528E+02	998.6	0.858	0.052
9.30	2.075E+02	0.874	10.4	586.8	3.465E+02	1008.4	0.824	0.052
9.80	2.170E+02	0.819	10.0	583.9	3.528E+02	1015.5	0.819	0.041
10.30	2.102E+02	0.770	9.7	581.5	3.623E+02	1021.4	0.820	0.040
10.80	1.817E+02	0.717	9.3	578.5	2.794E+02	1029.7	0.619	0.073
11.30	1.397E+02	0.695	8.8	575.1	2.526E+02	1020.1	0.568	0.057
11.80	1.344E+02	0.637	8.3	570.9	2.196E+02	1010.5	0.500	0.065
12.30	1.492E+02	0.539	7.8	566.4	1.994E+02	1001.7	0.458	0.049
12.80	1.736E+02	0.464	7.3	562.1	2.101E+02	991.3	0.489	0.052
13.30	1.858E+02	0.451	7.0	558.6	2.438E+02	979.2	0.579	0.043
13.80	1.804E+02	0.404	6.6	555.3	2.479E+02	965.5	0.604	0.050
14.30	1.831E+02	0.383	6.4	552.9	2.438E+02	952.2	0.611	0.048
14.80	1.899E+02	0.353	6.2	550.7	2.432E+02	939.3	0.626	0.053

Table B.2a (continued)

TEST 3.06.6B, VOLUME 14, L=244. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.30	3.771E+02	0.806	12.4	600.4	3.812E+02	836.2	1.614	0.092
5.80	3.079E+02	0.982	12.2	599.0	3.812E+02	872.4	1.391	0.079
6.30	2.658E+02	1.098	12.0	616.5	3.812E+02	906.4	1.310	0.069
6.80	2.672E+02	1.165	11.7	631.7	3.812E+02	935.8	1.253	0.072
7.30	2.563E+02	1.189	11.4	638.5	3.749E+02	961.1	1.158	0.069
7.80	1.967E+02	1.202	11.2	642.4	3.623E+02	982.6	1.061	0.057
8.30	1.912E+02	1.185	11.0	637.4	3.497E+02	1000.3	0.965	0.051
8.80	2.007E+02	1.162	10.7	629.8	3.339E+02	1014.9	0.868	0.043
9.30	2.062E+02	1.112	10.4	614.3	3.339E+02	1025.6	0.809	0.036
9.80	2.157E+02	1.061	10.0	597.7	3.497E+02	1032.4	0.806	0.031
10.30	2.102E+02	1.015	9.7	586.2	3.591E+02	1038.2	0.791	0.030
10.80	1.777E+02	0.976	9.3	578.5	3.021E+02	1045.1	0.647	0.064
11.30	1.424E+02	0.942	8.8	575.0	2.485E+02	1035.7	0.539	0.039
11.80	1.328E+02	0.894	8.3	570.9	2.104E+02	1027.3	0.461	0.033
12.30	1.411E+02	0.777	7.8	566.4	1.761E+02	1020.1	0.388	0.028
12.80	1.695E+02	0.652	7.3	562.1	1.792E+02	1011.6	0.399	0.027
13.30	1.899E+02	0.614	7.0	558.6	2.120E+02	1001.4	0.479	0.027
13.80	1.804E+02	0.590	6.6	555.3	2.366E+02	987.9	0.547	0.032
14.30	1.817E+02	0.568	6.4	552.9	2.507E+02	973.9	0.595	0.036
14.80	1.858E+02	0.531	6.2	550.7	2.426E+02	961.3	0.591	0.029

TEST 3.06.6B, VOLUME 16, L=271. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.30	3.906E+02	0.842	12.4	600.4	3.591E+02	835.7	1.529	0.053
5.80	3.160E+02	1.048	12.2	607.6	3.654E+02	869.5	1.394	0.084
6.30	2.713E+02	1.175	12.0	634.3	3.654E+02	902.3	1.363	0.091
6.80	2.699E+02	1.252	11.7	657.3	3.623E+02	931.5	1.315	0.099
7.30	2.563E+02	1.283	11.4	669.2	3.560E+02	956.5	1.242	0.097
7.80	1.994E+02	1.300	11.2	676.3	3.370E+02	978.6	1.115	0.066
8.30	1.926E+02	1.290	11.0	673.4	3.276E+02	996.5	1.010	0.057
8.80	2.007E+02	1.271	10.7	667.2	3.182E+02	1011.3	0.920	0.059
9.30	2.062E+02	1.219	10.4	647.8	3.112E+02	1022.4	0.831	0.050
9.80	2.143E+02	1.171	10.0	630.2	3.308E+02	1030.0	0.826	0.048
10.30	2.102E+02	1.127	9.7	615.9	3.370E+02	1036.5	0.802	0.042
10.80	1.763E+02	1.094	9.3	605.4	2.920E+02	1042.1	0.668	0.044
11.30	1.438E+02	1.057	8.8	593.4	2.463E+02	1032.2	0.561	0.053
11.80	1.326E+02	1.016	8.3	577.0	2.070E+02	1023.7	0.463	0.053
12.30	1.397E+02	0.916	7.8	566.4	1.670E+02	1017.2	0.370	0.043
12.80	1.668E+02	0.757	7.3	562.1	1.566E+02	1010.2	0.349	0.040
13.30	1.912E+02	0.693	7.0	558.6	1.855E+02	1001.1	0.419	0.019
13.80	1.790E+02	0.683	6.6	555.2	2.092E+02	989.1	0.482	0.039
14.30	1.817E+02	0.661	6.4	552.9	2.277E+02	976.2	0.538	0.028
14.80	1.845E+02	0.621	6.2	550.7	2.252E+02	964.3	0.545	0.031

Table B.2a (continued)

TEST 3.06.6B, VOLUME 17, L=287. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.30	3.974E+02	0.856	12.4	600.3	3.685E+02	824.3	1.648	0.053
5.80	3.201E+02	1.072	12.2	611.8	3.528E+02	855.2	1.450	0.152
6.30	2.740E+02	1.203	12.0	641.8	3.434E+02	890.3	1.385	0.159
6.80	2.713E+02	1.284	11.7	668.1	3.434E+02	921.1	1.355	0.150
7.30	2.577E+02	1.318	11.4	682.0	3.308E+02	948.6	1.242	0.143
7.80	1.994E+02	1.335	11.2	689.9	3.141E+02	972.2	1.112	0.109
8.30	1.926E+02	1.328	11.0	688.6	3.103E+02	991.7	1.024	0.117
8.80	2.007E+02	1.310	10.7	682.7	2.989E+02	1007.6	0.920	0.087
9.30	2.062E+02	1.257	10.4	662.3	2.996E+02	1019.9	0.838	0.062
9.80	2.143E+02	1.211	10.0	644.6	3.144E+02	1028.4	0.819	0.053
10.30	2.089E+02	1.169	9.7	630.0	3.308E+02	1035.6	0.811	0.028
10.80	1.763E+02	1.141	9.3	620.2	3.043E+02	1041.1	0.723	0.049
11.30	1.451E+02	1.102	8.8	606.4	2.555E+02	1029.9	0.604	0.046
11.80	1.322E+02	1.060	8.3	591.1	2.104E+02	1021.3	0.489	0.056
12.30	1.383E+02	0.967	7.8	566.4	1.739E+02	1014.3	0.388	0.052
12.80	1.655E+02	0.805	7.3	562.1	1.600E+02	1007.2	0.359	0.045
13.30	1.926E+02	0.728	7.0	558.6	1.947E+02	998.1	0.443	0.024
13.80	1.790E+02	0.722	6.6	555.2	2.180E+02	985.1	0.507	0.010
14.30	1.817E+02	0.699	6.4	552.9	2.359E+02	971.8	0.563	0.016
14.80	1.845E+02	0.658	6.2	550.7	2.334E+02	959.2	0.571	0.012

TEST 3.06.6B, VOLUME 18, L=299. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.30	4.028E+02	0.872	12.4	600.3	3.906E+02	841.2	1.619	0.113
5.80	3.242E+02	1.098	12.2	616.9	3.780E+02	877.3	1.453	0.110
6.30	2.767E+02	1.233	12.0	650.5	3.654E+02	912.5	1.390	0.111
6.80	2.713E+02	1.317	11.7	679.8	3.497E+02	943.6	1.330	0.101
7.30	2.577E+02	1.353	11.4	695.5	3.402E+02	970.5	1.232	0.107
7.80	1.994E+02	1.371	11.2	705.0	3.150E+02	994.3	1.093	0.066
8.30	1.926E+02	1.367	11.0	705.0	3.068E+02	1014.2	0.993	0.063
8.80	2.021E+02	1.348	10.7	698.5	2.892E+02	1031.2	0.869	0.059
9.30	2.062E+02	1.294	10.4	677.3	2.835E+02	1044.2	0.772	0.048
9.80	2.143E+02	1.250	10.0	660.0	3.027E+02	1053.3	0.769	0.048
10.30	2.089E+02	1.211	9.7	645.5	3.276E+02	1060.4	0.790	0.042
10.80	1.750E+02	1.188	9.3	637.4	2.970E+02	1067.1	0.691	0.089
11.30	1.451E+02	1.147	8.8	622.0	2.539E+02	1056.3	0.585	0.062
11.80	1.321E+02	1.104	8.3	605.1	2.151E+02	1047.6	0.486	0.056
12.30	1.370E+02	1.008	7.8	569.0	1.805E+02	1040.1	0.383	0.046
12.80	1.641E+02	0.858	7.3	562.1	1.707E+02	1032.7	0.362	0.038
13.30	1.926E+02	0.766	7.0	558.6	2.016E+02	1023.1	0.434	0.039
13.80	1.790E+02	0.763	6.6	555.2	2.334E+02	1009.5	0.514	0.043
14.30	1.817E+02	0.739	6.4	552.9	2.611E+02	995.0	0.591	0.048
14.80	1.831E+02	0.698	6.2	550.7	2.589E+02	981.3	0.601	0.046

Table B.2a (continued)

TEST 3.06.6B, VOLUME 20, L=332. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.30	4.164E+02	0.909	12.4	600.3	3.591E+02	839.4	1.503	0.180
5.80	3.323E+02	1.156	12.2	629.5	3.497E+02	876.7	1.418	0.184
6.30	2.821E+02	1.298	12.0	671.5	3.370E+02	911.3	1.403	0.153
6.80	2.740E+02	1.388	11.7	707.9	3.182E+02	942.7	1.353	0.159
7.30	2.591E+02	1.429	11.4	729.0	2.980E+02	970.8	1.232	0.145
7.80	2.007E+02	1.449	11.2	740.5	2.813E+02	995.3	1.103	0.108
8.30	1.926E+02	1.454	11.0	745.1	2.734E+02	1016.0	1.009	0.087
8.80	2.021E+02	1.433	10.7	738.6	2.589E+02	1033.4	0.878	0.069
9.30	2.062E+02	1.382	10.4	716.7	2.526E+02	1046.8	0.765	0.063
9.80	2.143E+02	1.343	10.0	700.3	2.687E+02	1057.1	0.753	0.066
10.30	2.089E+02	1.310	9.7	688.3	2.901E+02	1065.8	0.769	0.044
10.80	1.763E+02	1.294	9.3	683.1	2.718E+02	1071.7	0.700	0.071
11.30	1.451E+02	1.262	8.8	670.3	2.344E+02	1061.2	0.599	0.059
11.80	1.321E+02	1.212	8.3	648.3	1.953E+02	1052.9	0.483	0.041
12.30	1.350E+02	1.110	7.8	604.2	1.622E+02	1046.0	0.367	0.041
12.80	1.628E+02	0.986	7.3	562.1	1.534E+02	1039.3	0.321	0.016
13.30	1.940E+02	0.885	7.0	558.5	1.830E+02	1030.8	0.387	0.033
13.80	1.790E+02	0.884	6.6	555.2	2.189E+02	1018.2	0.473	0.035
14.30	1.817E+02	0.859	6.4	552.9	2.466E+02	1004.3	0.545	0.057
14.80	1.831E+02	0.812	6.2	550.6	2.457E+02	991.9	0.557	0.030

TEST 3.06.6B, VOLUME 22, L=354. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.30	4.259E+02	0.932	12.4	600.2	3.339E+02	831.2	1.444	0.228
5.80	3.391E+02	1.188	12.2	637.5	3.213E+02	861.9	1.429	0.177
6.30	2.848E+02	1.334	12.0	684.3	2.986E+02	898.8	1.393	0.136
6.80	2.767E+02	1.427	11.7	725.2	2.829E+02	931.9	1.368	0.132
7.30	2.591E+02	1.471	11.4	747.9	2.646E+02	961.3	1.239	0.100
7.80	2.007E+02	1.491	11.2	759.9	2.482E+02	987.4	1.091	0.087
8.30	1.926E+02	1.500	11.0	766.8	2.385E+02	1009.2	0.984	0.062
8.80	2.034E+02	1.478	10.7	759.9	2.284E+02	1027.6	0.853	0.053
9.30	2.062E+02	1.430	10.4	740.5	2.296E+02	1041.8	0.762	0.052
9.80	2.143E+02	1.394	10.0	726.4	2.492E+02	1052.7	0.764	0.052
10.30	2.102E+02	1.366	9.6	715.4	2.800E+02	1061.6	0.809	0.053
10.80	1.763E+02	1.354	9.3	712.7	2.551E+02	1067.9	0.718	0.063
11.30	1.451E+02	1.326	8.8	701.4	2.224E+02	1057.7	0.624	0.046
11.80	1.322E+02	1.272	8.3	676.8	1.818E+02	1050.1	0.487	0.042
12.30	1.335E+02	1.168	7.8	628.0	1.487E+02	1043.7	0.358	0.028
12.80	1.614E+02	1.035	7.3	573.6	1.449E+02	1037.2	0.312	0.028
13.30	1.926E+02	0.965	7.0	558.5	1.726E+02	1029.1	0.366	0.023
13.80	1.790E+02	0.962	6.6	555.2	2.218E+02	1016.1	0.481	0.033
14.30	1.831E+02	0.938	6.4	552.8	2.548E+02	1001.8	0.568	0.034
14.80	1.831E+02	0.891	6.2	550.6	2.747E+02	986.6	0.630	0.026

Table B.2a (continued)

TEST 3.06.6B, VOLUME 23, L=363. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.30	4.286E+02	0.940	12.4	600.2	3.780E+02	846.8	1.538	0.132
5.80	3.418E+02	1.199	12.2	640.3	3.528E+02	885.3	1.433	0.151
6.30	2.862E+02	1.345	12.0	688.4	3.213E+02	922.3	1.380	0.156
6.80	2.767E+02	1.440	11.7	730.8	3.103E+02	955.1	1.382	0.158
7.30	2.604E+02	1.484	11.4	753.8	2.854E+02	984.6	1.237	0.115
7.80	2.007E+02	1.505	11.2	766.0	2.633E+02	1010.9	1.075	0.094
8.30	1.926E+02	1.515	11.0	773.4	2.539E+02	1032.9	0.979	0.083
8.80	2.034E+02	1.491	10.7	766.2	2.410E+02	1051.7	0.844	0.071
9.30	2.062E+02	1.445	10.4	747.6	2.407E+02	1066.5	0.755	0.067
9.80	2.143E+02	1.410	10.0	734.0	2.580E+02	1077.6	0.751	0.061
10.30	2.102E+02	1.382	9.6	723.5	2.788E+02	1086.8	0.768	0.052
10.80	1.763E+02	1.370	9.3	721.5	2.548E+02	1095.0	0.682	0.078
11.30	1.451E+02	1.345	8.8	711.4	2.221E+02	1085.3	0.594	0.042
11.80	1.324E+02	1.289	8.3	685.9	1.909E+02	1077.5	0.487	0.037
12.30	1.329E+02	1.186	7.8	635.9	1.572E+02	1071.1	0.361	0.039
12.80	1.614E+02	1.049	7.3	578.4	1.525E+02	1064.4	0.314	0.028
13.30	1.940E+02	0.983	7.0	558.5	1.761E+02	1056.3	0.354	0.037
13.80	1.790E+02	0.982	6.6	555.2	2.221E+02	1043.1	0.455	0.034
14.30	1.831E+02	0.962	6.4	552.8	2.611E+02	1028.3	0.549	0.041
14.80	1.831E+02	0.916	6.2	550.6	2.813E+02	1012.7	0.608	0.044

Table B.2b. Film boiling data — test 3.06.6B (English units)

TEST 3.06.6B, VOLUME 8, L=3.9 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.80	2.090E+05	0.702	1772.0	618.8	1.100E+05	1041.9	259.1	48.4
6.30	1.870E+05	0.750	1737.5	616.1	1.120E+05	1085.1	237.8	26.1
6.80	1.900E+05	0.763	1692.5	612.5	1.160E+05	1139.8	219.4	19.7
7.30	1.870E+05	0.750	1650.8	609.1	1.180E+05	1185.6	204.6	14.8
7.80	1.480E+05	0.729	1622.4	606.8	1.150E+05	1224.1	185.5	11.3
8.30	1.390E+05	0.706	1592.8	604.3	1.130E+05	1255.2	174.0	10.6
8.80	1.490E+05	0.658	1552.5	600.8	1.110E+05	1279.8	163.9	9.7
9.30	1.540E+05	0.615	1506.8	596.8	1.130E+05	1296.4	161.2	9.4
9.80	1.620E+05	0.558	1448.4	591.5	1.150E+05	1307.8	161.1	7.2
10.30	1.560E+05	0.523	1401.3	587.2	1.150E+05	1317.7	157.9	7.3
10.80	1.350E+05	0.491	1345.7	581.9	9.020E+04	1331.6	120.3	18.4
11.30	1.030E+05	0.449	1282.6	575.7	8.330E+04	1312.7	113.0	9.7
11.80	1.050E+05	0.380	1209.8	568.2	7.660E+04	1292.7	105.8	15.1
12.30	1.170E+05	0.312	1134.8	560.2	7.460E+04	1272.1	104.7	13.5
12.80	1.290E+05	0.271	1065.9	552.4	8.980E+04	1243.1	130.0	12.5
13.30	1.430E+05	0.242	1012.6	546.1	9.310E+04	1215.1	139.1	14.1
13.80	1.330E+05	0.212	963.9	540.1	8.860E+04	1188.6	136.6	12.8
14.30	1.380E+05	0.195	929.7	535.8	8.230E+04	1164.5	131.0	11.4
14.80	1.400E+05	0.178	899.5	531.9	8.630E+04	1138.9	142.2	12.3

TEST 3.06.6B, VOLUME 11, L= 6.0 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.30	2.580E+05	0.722	1802.9	621.2	1.150E+05	1035.0	277.4	24.3
5.80	2.180E+05	0.843	1771.5	618.8	1.140E+05	1088.2	243.7	16.6
6.30	1.900E+05	0.929	1737.1	616.1	1.180E+05	1149.7	221.5	13.3
6.80	1.940E+05	0.971	1692.1	612.5	1.220E+05	1201.7	206.8	11.7
7.30	1.880E+05	0.981	1650.2	609.1	1.230E+05	1245.6	193.6	11.9
7.80	1.430E+05	0.981	1622.1	606.7	1.200E+05	1282.6	177.3	11.2
8.30	1.390E+05	0.954	1592.5	604.2	1.150E+05	1313.3	162.4	9.0
8.80	1.500E+05	0.919	1552.3	600.8	1.120E+05	1338.0	151.3	9.1
9.30	1.530E+05	0.874	1506.5	596.8	1.100E+05	1355.7	145.4	9.2
9.80	1.600E+05	0.819	1448.0	591.5	1.120E+05	1368.4	144.4	7.2
10.30	1.550E+05	0.770	1400.9	587.2	1.150E+05	1379.0	144.7	7.0
10.80	1.340E+05	0.717	1345.5	581.9	8.870E+04	1394.0	109.2	12.9
11.30	1.030E+05	0.695	1282.3	575.7	8.020E+04	1376.7	100.1	10.1
11.80	9.910E+04	0.637	1209.6	568.2	6.970E+04	1359.4	88.1	11.5
12.30	1.100E+05	0.539	1134.6	560.1	6.330E+04	1343.5	80.8	8.7
12.80	1.280E+05	0.464	1065.6	552.4	6.670E+04	1324.8	86.3	9.1
13.30	1.370E+05	0.451	1012.3	546.1	7.740E+04	1303.0	102.2	7.6
13.80	1.330E+05	0.404	963.7	540.1	7.870E+04	1278.4	106.6	8.8
14.30	1.350E+05	0.383	929.4	535.8	7.740E+04	1254.5	107.7	8.4
14.80	1.400E+05	0.353	899.2	531.9	7.720E+04	1231.3	110.4	9.4

Table B.2b (continued)

TEST 3.06.6B, VOLUME 14, L= 8.0 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.30	2.780E+05	0.806	1802.3	621.2	1.210E+05	1045.7	284.6	16.3
5.80	2.270E+05	0.982	1770.9	618.8	1.210E+05	1110.8	245.3	13.9
6.30	1.960E+05	1.098	1736.7	650.2	1.210E+05	1172.1	231.1	12.1
6.80	1.970E+05	1.165	1691.6	677.6	1.210E+05	1224.9	221.0	12.7
7.30	1.890E+05	1.189	1649.7	689.8	1.190E+05	1270.4	204.3	12.2
7.80	1.450E+05	1.202	1621.8	696.8	1.150E+05	1309.2	187.1	10.1
8.30	1.410E+05	1.185	1592.2	687.8	1.110E+05	1341.1	170.2	9.0
8.80	1.480E+05	1.162	1552.0	674.2	1.060E+05	1367.4	153.0	7.5
9.30	1.520E+05	1.112	1506.2	646.3	1.060E+05	1386.6	142.6	6.3
9.80	1.590E+05	1.061	1447.7	616.4	1.110E+05	1398.9	142.1	5.5
10.30	1.550E+05	1.015	1400.5	595.8	1.140E+05	1409.2	139.5	5.3
10.80	1.310E+05	0.976	1345.2	581.9	9.590E+04	1421.6	114.1	11.3
11.30	1.050E+05	0.942	1282.0	575.6	7.890E+04	1404.8	95.1	6.9
11.80	9.790E+04	0.894	1209.4	568.2	6.680E+04	1389.6	81.3	5.8
12.30	1.040E+05	0.777	1134.4	560.1	5.590E+04	1376.6	68.4	5.0
12.80	1.250E+05	0.652	1065.4	552.3	5.690E+04	1361.4	70.3	4.7
13.30	1.400E+05	0.614	1012.0	546.0	6.730E+04	1343.0	84.5	4.7
13.80	1.330E+05	0.590	963.4	540.1	7.510E+04	1318.7	96.4	5.6
14.30	1.340E+05	0.568	929.1	535.7	7.960E+04	1293.6	105.0	6.4
14.80	1.370E+05	0.531	898.9	531.8	7.700E+04	1270.8	104.2	5.1

TEST 3.06.6B, VOLUME 16, L= 8.9 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.30	2.880E+05	0.842	1801.8	621.2	1.140E+05	1044.7	269.7	9.3
5.80	2.330E+05	1.048	1770.4	634.2	1.160E+05	1105.7	245.8	14.9
6.30	2.000E+05	1.175	1736.4	682.3	1.160E+05	1164.7	240.4	16.0
6.80	1.990E+05	1.252	1691.2	723.7	1.150E+05	1217.2	232.0	17.4
7.30	1.890E+05	1.283	1649.3	745.1	1.130E+05	1262.2	219.0	17.1
7.80	1.470E+05	1.300	1621.6	757.8	1.070E+05	1301.9	196.6	11.6
8.30	1.420E+05	1.290	1592.0	752.7	1.040E+05	1334.2	178.1	10.1
8.80	1.480E+05	1.271	1551.7	741.5	1.010E+05	1360.8	162.3	10.4
9.30	1.520E+05	1.219	1505.9	706.6	9.880E+04	1380.9	146.6	8.9
9.80	1.580E+05	1.171	1447.4	674.9	1.050E+05	1394.5	145.7	8.5
10.30	1.550E+05	1.127	1400.2	649.2	1.070E+05	1406.2	141.5	7.4
10.80	1.300E+05	1.094	1345.1	630.2	9.270E+04	1416.3	117.9	7.7
11.30	1.060E+05	1.057	1281.9	608.6	7.820E+04	1398.5	99.0	9.3
11.80	9.780E+04	1.016	1209.4	579.1	6.570E+04	1383.2	81.6	9.4
12.30	1.030E+05	0.916	1134.2	560.1	5.300E+04	1371.4	65.3	7.5
12.80	1.230E+05	0.757	1065.2	552.3	4.970E+04	1358.8	61.6	7.0
13.30	1.410E+05	0.693	1011.8	546.0	5.890E+04	1342.5	73.9	3.4
13.80	1.320E+05	0.683	963.2	540.0	6.640E+04	1320.8	85.0	6.9
14.30	1.340E+05	0.661	928.9	535.7	7.230E+04	1297.6	94.9	4.9
14.80	1.360E+05	0.621	898.7	531.8	7.150E+04	1276.2	96.1	5.4

Table B.2b (continued)

TEST 3.06.6B, VOLUME 17, L= 9.4 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.30	2.930E+05	0.856	1801.6	621.1	1.170E+05	1024.2	290.6	9.3
5.80	2.360E+05	1.072	1770.4	641.8	1.120E+05	1079.9	255.8	26.8
6.30	2.020E+05	1.203	1736.2	695.8	1.090E+05	1143.0	244.3	28.0
6.80	2.000E+05	1.284	1691.1	743.2	1.090E+05	1198.5	239.0	26.4
7.30	1.900E+05	1.318	1649.2	768.1	1.050E+05	1247.9	219.0	25.3
7.80	1.470E+05	1.335	1621.5	782.4	9.970E+04	1290.5	196.2	19.2
8.30	1.420E+05	1.328	1591.9	780.1	9.850E+04	1325.6	180.6	20.6
8.80	1.480E+05	1.310	1551.6	769.4	9.490E+04	1354.2	162.2	15.4
9.30	1.520E+05	1.257	1505.8	732.6	9.510E+04	1376.3	147.8	10.9
9.80	1.580E+05	1.211	1447.3	700.8	9.980E+04	1391.6	144.4	9.4
10.30	1.540E+05	1.169	1400.1	674.5	1.050E+05	1404.5	143.1	5.0
10.80	1.300E+05	1.141	1345.0	657.0	9.660E+04	1414.5	127.5	8.6
11.30	1.070E+05	1.102	1281.8	632.1	8.110E+04	1394.3	106.5	8.1
11.80	9.750E+04	1.060	1209.4	604.6	6.680E+04	1378.8	86.3	9.8
12.30	1.020E+05	0.967	1134.2	560.1	5.520E+04	1366.2	68.4	9.1
12.80	1.220E+05	0.805	1065.2	552.3	5.080E+04	1353.4	63.4	7.9
13.30	1.420E+05	0.728	1011.7	546.0	6.180E+04	1337.0	78.1	4.2
13.80	1.320E+05	0.722	963.1	540.0	6.920E+04	1313.7	89.4	1.7
14.30	1.340E+05	0.699	928.8	535.7	7.490E+04	1289.8	99.3	2.9
14.80	1.360E+05	0.658	898.6	531.8	7.410E+04	1267.1	100.7	2.2

TEST 3.06.6B, VOLUME 18, L= 9.8 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.30	2.970E+05	0.872	1801.4	621.1	1.240E+05	1054.6	285.6	20.0
5.80	2.390E+05	1.098	1770.2	650.9	1.200E+05	1120.6	256.3	19.4
6.30	2.040E+05	1.233	1736.1	711.4	1.160E+05	1183.0	245.1	19.6
6.80	2.000E+05	1.317	1690.9	764.1	1.110E+05	1238.9	234.6	17.9
7.30	1.900E+05	1.353	1649.0	792.5	1.080E+05	1287.4	217.2	18.9
7.80	1.470E+05	1.371	1621.4	809.5	1.000E+05	1330.3	192.8	11.6
8.30	1.420E+05	1.367	1591.8	809.6	9.740E+04	1366.0	175.1	11.1
8.80	1.490E+05	1.348	1551.5	797.9	9.180E+04	1396.6	153.3	10.4
9.30	1.520E+05	1.294	1505.7	759.7	9.000E+04	1420.0	136.2	8.4
9.80	1.580E+05	1.250	1447.2	728.5	9.610E+04	1436.5	135.7	8.4
10.30	1.540E+05	1.211	1400.0	702.5	1.040E+05	1449.2	139.3	7.4
10.80	1.290E+05	1.188	1344.9	687.9	9.430E+04	1461.2	121.9	15.7
11.30	1.070E+05	1.147	1281.7	660.1	8.060E+04	1441.8	103.2	11.0
11.80	9.740E+04	1.104	1209.3	629.8	6.830E+04	1426.1	85.7	9.9
12.30	1.010E+05	1.008	1134.2	564.7	5.730E+04	1412.7	67.5	8.2
12.80	1.210E+05	0.858	1065.1	552.3	5.420E+04	1399.4	63.9	6.7
13.30	1.420E+05	0.766	1011.6	546.0	6.400E+04	1382.0	76.5	6.8
13.80	1.320E+05	0.763	963.0	540.0	7.410E+04	1357.6	90.6	7.6
14.30	1.340E+05	0.739	928.7	535.7	8.290E+04	1331.5	104.2	8.4
14.80	1.350E+05	0.698	898.6	531.8	8.220E+04	1306.8	106.0	8.1

Table B.2b (continued)

TEST 3.06.6B, VOLUME 20, L=10.9 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.30	3.070E+05	0.909	1800.8	621.1	1.140E+05	1051.5	265.0	31.8
5.80	2.450E+05	1.156	1769.7	673.6	1.110E+05	1118.6	250.1	32.5
6.30	2.080E+05	1.298	1735.7	749.3	1.070E+05	1180.8	247.5	27.0
6.80	2.020E+05	1.388	1690.5	814.7	1.010E+05	1237.4	238.7	28.1
7.30	1.910E+05	1.429	1648.6	852.7	9.460E+04	1288.0	217.3	25.5
7.80	1.480E+05	1.449	1621.1	873.5	8.930E+04	1332.1	194.6	19.0
8.30	1.420E+05	1.454	1591.6	881.7	8.680E+04	1369.3	177.9	15.4
8.80	1.490E+05	1.433	1551.3	870.0	8.220E+04	1400.6	154.9	12.2
9.30	1.520E+05	1.382	1505.4	830.6	8.020E+04	1424.8	135.0	11.1
9.80	1.580E+05	1.343	1446.9	801.1	8.530E+04	1443.3	132.8	11.6
10.30	1.540E+05	1.310	1399.7	779.4	9.210E+04	1458.9	135.6	7.8
10.80	1.300E+05	1.294	1344.7	770.2	8.630E+04	1469.5	123.4	12.6
11.30	1.070E+05	1.262	1281.5	747.1	7.440E+04	1450.6	105.7	10.4
11.80	9.740E+04	1.212	1209.1	707.5	6.200E+04	1435.7	85.1	7.3
12.30	9.950E+04	1.110	1134.1	628.2	5.150E+04	1423.3	64.8	7.3
12.80	1.200E+05	0.986	1064.9	552.3	4.870E+04	1411.3	56.7	2.9
13.30	1.430E+05	0.885	1011.3	545.9	5.810E+04	1395.9	68.3	5.8
13.80	1.320E+05	0.884	962.8	540.0	6.950E+04	1373.2	83.4	6.2
14.30	1.340E+05	0.859	928.5	535.7	7.830E+04	1349.2	96.2	10.1
14.80	1.350E+05	0.812	898.3	531.7	7.800E+04	1325.9	98.2	5.3

TEST 3.06.6B, VOLUME 22, L=11.6 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.30	3.140E+05	0.932	1800.4	621.0	1.060E+05	1036.7	254.6	40.2
5.80	2.500E+05	1.188	1769.4	688.1	1.020E+05	1091.9	252.0	31.3
6.30	2.100E+05	1.334	1735.4	772.2	9.480E+04	1158.3	245.6	23.9
6.80	2.040E+05	1.427	1690.2	845.9	8.980E+04	1217.9	241.3	23.2
7.30	1.910E+05	1.471	1648.3	886.8	8.400E+04	1270.8	218.6	17.7
7.80	1.480E+05	1.491	1621.0	908.4	7.880E+04	1317.8	192.5	15.4
8.30	1.420E+05	1.500	1591.4	920.8	7.570E+04	1357.1	173.5	10.9
8.80	1.500E+05	1.478	1551.1	908.4	7.250E+04	1390.1	150.5	9.4
9.30	1.520E+05	1.430	1505.2	873.4	7.290E+04	1415.8	134.4	9.1
9.80	1.580E+05	1.394	1446.6	848.0	7.910E+04	1435.3	134.7	9.2
10.30	1.550E+05	1.366	1399.5	828.3	8.890E+04	1451.3	142.6	9.4
10.80	1.300E+05	1.354	1344.6	823.4	8.100E+04	1462.7	126.7	11.1
11.30	1.070E+05	1.326	1281.4	803.1	7.060E+04	1444.3	110.0	8.1
11.80	9.750E+04	1.272	1209.0	758.8	5.770E+04	1430.6	85.9	7.4
12.30	9.840E+04	1.168	1133.9	670.9	4.720E+04	1419.1	63.1	5.0
12.80	1.190E+05	1.035	1064.8	573.0	4.600E+04	1407.5	55.1	5.0
13.30	1.420E+05	0.965	1011.1	545.9	5.480E+04	1392.9	64.6	4.0
13.80	1.320E+05	0.962	962.6	540.0	7.040E+04	1369.5	84.9	5.9
14.30	1.350E+05	0.938	928.3	535.6	8.090E+04	1343.8	100.1	6.0
14.80	1.350E+05	0.891	898.1	531.7	8.720E+04	1316.3	111.1	4.6

Table B.2b (continued)

TEST 3.06.6B, VOLUME 23, L=11.9 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.30	3.160E+05	0.940	1800.2	621.0	1.200E+05	1064.8	271.2	23.2
5.80	2.520E+05	1.199	1769.2	693.0	1.120E+05	1134.1	252.8	26.7
6.30	2.110E+05	1.345	1735.3	779.7	1.020E+05	1200.6	243.3	27.6
6.80	2.040E+05	1.440	1690.0	855.9	9.850E+04	1259.7	243.8	27.8
7.30	1.920E+05	1.484	1648.1	897.3	9.060E+04	1312.8	218.2	20.2
7.80	1.480E+05	1.505	1620.9	919.4	8.360E+04	1360.1	189.6	16.6
8.30	1.420E+05	1.515	1591.3	932.7	8.060E+04	1399.8	172.6	14.6
8.80	1.500E+05	1.491	1551.0	919.7	7.650E+04	1433.5	148.9	12.6
9.30	1.520E+05	1.445	1505.1	886.2	7.640E+04	1460.1	133.1	11.9
9.80	1.580E+05	1.410	1446.5	861.7	8.190E+04	1480.1	132.4	10.7
10.30	1.550E+05	1.382	1399.4	842.9	8.850E+04	1496.8	135.4	9.2
10.80	1.300E+05	1.370	1344.5	839.2	8.090E+04	1511.4	120.3	13.8
11.30	1.070E+05	1.345	1281.4	821.1	7.050E+04	1494.1	104.7	7.4
11.80	9.760E+04	1.289	1208.9	775.1	6.060E+04	1479.9	85.9	6.6
12.30	9.800E+04	1.186	1133.9	685.1	4.990E+04	1468.5	63.7	6.9
12.80	1.190E+05	1.049	1064.7	581.7	4.840E+04	1456.4	55.4	4.9
13.30	1.430E+05	0.983	1011.1	545.9	5.590E+04	1441.8	62.4	6.6
13.80	1.320E+05	0.982	962.5	540.0	7.050E+04	1418.0	80.3	6.0
14.30	1.350E+05	0.962	928.2	535.6	8.290E+04	1391.5	96.8	7.2
14.80	1.350E+05	0.916	898.1	531.7	8.930E+04	1363.4	107.3	7.8

Table B.3a. Film boiling data — test 3.08.6C (metric units)

TEST 3.08.6C, VOLUME 14, L=244. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.65	1.035E+03	0.356	12.1	598.1	6.836E+02	842.2	2.807	0.132
6.15	1.028E+03	0.365	12.0	597.6	7.308E+02	862.2	2.758	0.145
6.65	1.025E+03	0.373	11.9	597.0	7.718E+02	882.0	2.713	0.134
7.15	1.024E+03	0.378	11.8	596.5	8.096E+02	899.9	2.665	0.134
7.65	1.012E+03	0.384	11.7	596.0	8.411E+02	914.2	2.645	0.133
8.15	1.010E+03	0.388	11.7	595.6	8.694E+02	928.9	2.612	0.164
8.65	1.016E+03	0.394	11.6	595.1	9.009E+02	939.7	2.613	0.187
9.15	1.013E+03	0.397	11.6	594.8	9.261E+02	951.7	2.595	0.183
9.65	1.010E+03	0.401	11.5	594.5	9.482E+02	962.6	2.576	0.181
10.15	1.002E+03	0.403	11.5	594.2	9.702E+02	972.6	2.563	0.181
10.65	1.012E+03	0.405	11.4	593.9	9.891E+02	981.5	2.551	0.179
11.15	1.001E+03	0.407	11.4	593.6	1.005E+03	989.9	2.536	0.176
11.65	1.001E+03	0.409	11.4	593.4	1.021E+03	997.3	2.529	0.180
12.15	9.982E+02	0.412	11.3	593.2	1.036E+03	1003.9	2.527	0.187
12.65	1.008E+03	0.415	11.3	593.0	1.052E+03	1010.2	2.524	0.185
13.15	1.015E+03	0.415	11.2	592.4	1.074E+03	1015.2	2.539	0.197
13.65	1.019E+03	0.417	11.1	591.5	1.084E+03	1019.7	2.533	0.203
14.15	1.010E+03	0.425	11.0	590.7	1.099E+03	1023.6	2.537	0.214
14.65	1.015E+03	0.432	10.8	589.8	1.118E+03	1026.7	2.557	0.223
15.15	1.009E+03	0.437	10.7	588.8	1.121E+03	1029.6	2.544	0.235
15.65	9.915E+02	0.440	10.6	588.0	1.128E+03	1032.4	2.534	0.242
16.15	9.955E+02	0.443	10.5	587.4	1.143E+03	1034.6	2.555	0.248
16.65	1.001E+03	0.444	10.3	586.4	1.153E+03	1035.7	2.569	0.256
17.15	1.008E+03	0.449	10.2	585.6	1.169E+03	1036.3	2.594	0.299
17.65	1.002E+03	0.449	10.1	584.9	1.181E+03	1036.7	2.614	0.359
18.15	1.001E+03	0.453	10.0	583.8	1.184E+03	1036.2	2.620	0.404
18.65	1.020E+03	0.455	9.8	582.5	1.219E+03	1033.7	2.702	0.599
19.15	9.698E+02	0.479	9.7	581.9	1.213E+03	1039.4	2.649	0.614
19.65	1.021E+03	0.464	9.5	580.5	1.229E+03	1040.3	2.672	0.448
20.15	9.955E+02	0.476	9.4	579.2	1.206E+03	1042.7	2.601	0.232
20.65	1.031E+03	0.477	9.3	578.3	1.235E+03	1041.2	2.667	0.232
21.15	9.169E+02	0.498	9.2	578.2	1.172E+03	1042.2	2.525	0.234
21.65	7.921E+02	0.567	9.2	578.2	1.134E+03	1041.4	2.451	0.244
22.15	6.971E+02	0.646	9.1	576.9	1.084E+03	1039.4	2.346	0.244
22.65	6.334E+02	0.680	8.8	574.8	1.017E+03	1036.9	2.203	0.243
23.15	5.330E+02	0.766	8.5	572.0	9.545E+02	1033.6	2.071	0.238
23.65	4.706E+02	0.824	8.0	568.4	9.009E+02	1028.9	1.954	0.231
24.15	4.110E+02	0.861	7.6	564.5	8.411E+02	1022.7	1.833	0.266
24.65	3.920E+02	0.812	7.2	561.0	7.970E+02	1014.3	1.759	0.710
25.15	3.743E+02	0.770	6.9	558.0	7.119E+02	1011.7	1.569	0.238
25.65	3.879E+02	0.746	6.6	555.3	7.812E+02	999.6	1.759	0.956
26.15	3.540E+02	0.700	6.5	553.6	6.930E+02	994.8	1.570	0.325
26.65	3.784E+02	0.664	6.4	553.0	7.403E+02	991.2	1.687	1.230
27.15	3.947E+02	0.601	6.4	552.9	6.489E+02	991.1	1.482	0.170
27.65	3.852E+02	0.580	6.4	552.8	6.300E+02	984.9	1.458	0.255
28.15	3.567E+02	0.617	6.4	553.1	5.985E+02	982.9	1.394	0.156
28.65	3.269E+02	0.685	6.4	553.0	5.922E+02	977.8	1.393	0.193
29.15	2.713E+02	0.823	6.4	552.7	5.607E+02	977.2	1.323	0.124
29.65	2.428E+02	0.920	6.3	552.1	5.418E+02	974.9	1.280	0.133

Table B.3a (continued)

TEST 3.08.6C, VOLUME 16, L=271. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.65	1.038E+03	0.404	12.1	598.1	6.678E+02	862.0	2.533	0.059
6.15	1.029E+03	0.418	12.0	597.5	7.213E+02	884.5	2.510	0.056
6.65	1.027E+03	0.428	11.9	597.0	7.592E+02	904.5	2.472	0.047
7.15	1.025E+03	0.437	11.8	596.4	7.970E+02	922.8	2.444	0.045
7.65	1.015E+03	0.445	11.7	595.9	8.379E+02	938.9	2.446	0.058
8.15	1.012E+03	0.456	11.7	595.5	8.568E+02	954.2	2.392	0.075
8.65	1.017E+03	0.460	11.6	595.1	8.883E+02	967.6	2.387	0.058
9.15	1.013E+03	0.465	11.5	594.7	9.167E+02	980.0	2.379	0.058
9.65	1.010E+03	0.467	11.5	594.4	9.387E+02	990.9	2.366	0.060
10.15	1.002E+03	0.474	11.4	594.1	9.608E+02	1001.4	2.357	0.089
10.65	1.012E+03	0.476	11.4	593.8	9.733E+02	1010.9	2.333	0.091
11.15	1.001E+03	0.479	11.4	593.5	9.860E+02	1019.7	2.316	0.094
11.65	1.001E+03	0.481	11.3	593.4	1.014E+03	1027.2	2.334	0.084
12.15	9.982E+02	0.486	11.3	593.1	1.021E+03	1034.7	2.314	0.071
12.65	1.008E+03	0.490	11.3	592.9	1.043E+03	1041.4	2.321	0.082
13.15	1.016E+03	0.489	11.2	592.2	1.049E+03	1047.7	2.301	0.084
13.65	1.019E+03	0.491	11.1	591.4	1.068E+03	1052.3	2.320	0.078
14.15	1.012E+03	0.499	10.9	590.6	1.084E+03	1057.1	2.322	0.090
14.65	1.016E+03	0.507	10.8	589.7	1.096E+03	1060.9	2.327	0.075
15.15	1.010E+03	0.513	10.7	588.7	1.109E+03	1064.0	2.335	0.077
15.65	9.928E+02	0.517	10.5	587.9	1.115E+03	1067.1	2.328	0.079
16.15	9.969E+02	0.519	10.5	587.2	1.118E+03	1070.5	2.311	0.078
16.65	1.002E+03	0.519	10.3	586.3	1.134E+03	1072.6	2.333	0.075
17.15	1.009E+03	0.526	10.2	585.4	1.147E+03	1074.1	2.345	0.079
17.65	1.005E+03	0.525	10.1	584.7	1.147E+03	1076.3	2.332	0.078
18.15	1.005E+03	0.527	10.0	583.7	1.143E+03	1077.7	2.316	0.096
18.65	1.024E+03	0.529	9.8	582.4	1.162E+03	1078.0	2.343	0.089
19.15	9.711E+02	0.556	9.7	581.7	1.162E+03	1079.0	2.338	0.109
19.65	1.021E+03	0.540	9.5	580.3	1.194E+03	1077.8	2.401	0.095
20.15	9.969E+02	0.553	9.4	579.1	1.184E+03	1077.6	2.376	0.101
20.65	1.029E+03	0.555	9.2	578.1	1.210E+03	1077.4	2.422	0.085
21.15	9.196E+02	0.576	9.2	578.1	1.156E+03	1078.7	2.308	0.092
21.65	7.989E+02	0.650	9.2	578.1	1.125E+03	1077.6	2.253	0.087
22.15	6.999E+02	0.740	9.1	576.9	1.071E+03	1075.7	2.144	0.111
22.65	6.388E+02	0.774	8.8	574.7	1.011E+03	1072.4	2.029	0.114
23.15	5.371E+02	0.870	8.5	571.9	9.482E+02	1068.2	1.912	0.116
23.65	4.747E+02	0.937	8.0	568.4	8.883E+02	1063.2	1.793	0.126
24.15	4.123E+02	0.978	7.6	564.5	8.158E+02	1057.5	1.656	0.110
24.65	3.906E+02	0.929	7.2	560.9	7.340E+02	1052.1	1.495	0.111
25.15	3.743E+02	0.882	6.9	557.9	6.741E+02	1046.7	1.376	0.084
25.65	3.879E+02	0.859	6.6	555.2	6.741E+02	1039.9	1.391	0.072
26.15	3.540E+02	0.806	6.5	553.6	6.300E+02	1034.1	1.308	0.073
26.65	3.757E+02	0.763	6.4	553.0	6.143E+02	1028.7	1.293	0.056
27.15	3.933E+02	0.691	6.4	552.8	6.080E+02	1022.7	1.293	0.054
27.65	3.852E+02	0.665	6.4	552.7	5.859E+02	1018.3	1.257	0.066
28.15	3.581E+02	0.705	6.4	553.0	5.607E+02	1015.3	1.212	0.075
28.65	3.309E+02	0.771	6.4	552.9	5.544E+02	1012.1	1.204	0.075
29.15	2.753E+02	0.924	6.4	552.6	5.387E+02	1009.9	1.176	0.093
29.65	2.455E+02	1.028	6.3	566.6	5.323E+02	1007.7	1.207	0.100

Table B.3a (continued)

TEST 3.08.6C, VOLUME 17, L=287. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.65	1.043E+03	0.431	12.1	598.0	8.064E+02	825.9	3.543	0.115
6.15	1.036E+03	0.444	12.0	597.5	8.158E+02	840.0	3.366	0.156
6.65	1.031E+03	0.450	11.9	596.9	8.537E+02	855.3	3.309	0.155
7.15	1.028E+03	0.462	11.8	596.4	9.009E+02	868.6	3.310	0.150
7.65	1.017E+03	0.468	11.7	595.9	9.167E+02	880.9	3.215	0.182
8.15	1.010E+03	0.476	11.7	595.5	8.852E+02	877.7	3.132	0.209
8.65	1.016E+03	0.483	11.6	595.0	9.167E+02	889.9	3.109	0.207
9.15	1.016E+03	0.486	11.5	594.7	9.513E+02	900.4	3.116	0.209
9.65	1.012E+03	0.490	11.5	594.4	9.733E+02	910.1	3.084	0.260
10.15	1.004E+03	0.498	11.4	594.1	9.923E+02	919.2	3.050	0.262
10.65	1.013E+03	0.501	11.4	593.7	1.008E+03	927.1	3.023	0.253
11.15	1.002E+03	0.505	11.4	593.5	1.030E+03	933.9	3.026	0.247
11.65	1.002E+03	0.509	11.3	593.3	1.043E+03	940.3	3.005	0.262
12.15	9.982E+02	0.514	11.3	593.1	1.055E+03	946.1	2.991	0.264
12.65	1.008E+03	0.518	11.3	592.9	1.071E+03	951.1	2.986	0.258
13.15	1.019E+03	0.517	11.2	592.2	1.084E+03	955.2	2.988	0.274
13.65	1.020E+03	0.520	11.0	591.4	1.099E+03	958.4	2.993	0.296
14.15	1.015E+03	0.529	10.9	590.6	1.121E+03	961.1	3.026	0.302
14.65	1.020E+03	0.536	10.8	589.6	1.121E+03	963.6	3.002	0.292
15.15	1.012E+03	0.543	10.6	588.6	1.137E+03	965.4	3.021	0.288
15.65	9.942E+02	0.547	10.5	587.9	1.131E+03	967.6	2.978	0.299
16.15	9.982E+02	0.549	10.4	587.2	1.143E+03	969.3	2.989	0.297
16.65	1.004E+03	0.549	10.3	586.2	1.150E+03	970.8	2.991	0.303
17.15	1.010E+03	0.556	10.2	585.4	1.153E+03	971.9	2.979	0.311
17.65	1.008E+03	0.555	10.1	584.7	1.153E+03	972.8	2.971	0.296
18.15	1.010E+03	0.557	10.0	583.6	1.156E+03	973.3	2.969	0.314
18.65	1.027E+03	0.558	9.8	582.3	1.169E+03	973.2	2.991	0.322
19.15	9.765E+02	0.587	9.7	581.6	1.156E+03	974.5	2.946	0.298
19.65	1.020E+03	0.571	9.5	580.2	1.184E+03	973.8	3.012	0.335
20.15	9.982E+02	0.587	9.3	579.0	1.175E+03	973.7	2.976	0.331
20.65	1.029E+03	0.598	9.2	578.1	1.200E+03	973.4	3.037	0.324
21.15	9.236E+02	0.612	9.2	578.0	1.131E+03	975.2	2.847	0.294
21.65	8.056E+02	0.678	9.2	578.0	1.090E+03	975.7	2.737	0.300
22.15	7.039E+02	0.768	9.1	576.8	1.011E+03	976.6	2.526	0.280
22.65	6.456E+02	0.804	8.8	574.6	9.293E+02	978.3	2.300	0.260
23.15	5.452E+02	0.903	8.5	571.9	8.473E+02	979.7	2.075	0.231
23.65	4.815E+02	0.973	8.0	568.3	7.875E+02	980.0	1.911	0.218
24.15	4.150E+02	1.016	7.6	569.1	7.151E+02	979.2	1.745	0.180
24.65	3.879E+02	0.969	7.2	560.9	6.426E+02	977.8	1.543	0.166
25.15	3.716E+02	0.922	6.9	557.9	5.859E+02	976.4	1.397	0.128
25.65	3.852E+02	0.897	6.6	555.2	5.985E+02	972.9	1.431	0.108
26.15	3.526E+02	0.843	6.5	553.6	5.607E+02	969.7	1.348	0.091
26.65	3.730E+02	0.798	6.4	553.0	5.544E+02	966.9	1.337	0.077
27.15	3.920E+02	0.723	6.4	552.7	5.481E+02	963.7	1.336	0.077
27.65	3.852E+02	0.696	6.4	552.7	5.292E+02	961.8	1.292	0.089
28.15	3.581E+02	0.736	6.4	553.0	5.103E+02	961.2	1.247	0.085
28.65	3.350E+02	0.800	6.4	552.9	4.977E+02	960.8	1.219	0.090
29.15	2.821E+02	0.957	6.4	552.6	4.851E+02	961.1	1.184	0.092
29.65	2.482E+02	1.064	6.3	579.9	4.630E+02	962.8	1.206	0.101

Table B.3a (continued)

TEST 3.08.6C, VOLUME 18, L=299. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.65	1.042E+03	0.452	12.1	598.0	7.497E+02	852.7	2.948	0.213
6.15	1.034E+03	0.467	12.0	597.5	7.907E+02	870.2	2.901	0.223
6.65	1.029E+03	0.474	11.9	596.9	8.348E+02	886.5	2.876	0.224
7.15	1.027E+03	0.487	11.8	596.4	8.631E+02	901.2	2.835	0.219
7.65	1.017E+03	0.493	11.7	595.9	8.978E+02	914.3	2.820	0.225
8.15	1.010E+03	0.503	11.7	595.5	9.230E+02	926.2	2.792	0.216
8.65	1.016E+03	0.510	11.6	595.0	9.482E+02	936.8	2.776	0.221
9.15	1.015E+03	0.514	11.5	594.6	9.671E+02	946.6	2.751	0.216
9.65	1.012E+03	0.518	11.5	594.3	9.923E+02	955.0	2.748	0.227
10.15	1.004E+03	0.526	11.4	594.0	1.008E+03	963.0	2.731	0.218
10.65	1.013E+03	0.530	11.4	593.7	1.024E+03	970.2	2.723	0.215
11.15	1.001E+03	0.535	11.4	593.5	1.040E+03	976.6	2.710	0.210
11.65	1.002E+03	0.538	11.3	593.2	1.052E+03	982.3	2.707	0.213
12.15	9.982E+02	0.544	11.3	593.0	1.068E+03	987.7	2.702	0.202
12.65	1.008E+03	0.548	11.3	592.8	1.080E+03	992.2	2.705	0.218
13.15	1.017E+03	0.547	11.2	592.2	1.099E+03	995.6	2.726	0.226
13.65	1.020E+03	0.551	11.0	591.4	1.112E+03	998.4	2.730	0.227
14.15	1.013E+03	0.559	10.9	590.6	1.118E+03	1001.2	2.726	0.222
14.65	1.019E+03	0.567	10.8	589.6	1.131E+03	1003.3	2.735	0.229
15.15	1.012E+03	0.574	10.6	588.6	1.131E+03	1005.7	2.713	0.230
15.65	9.942E+02	0.578	10.5	587.8	1.137E+03	1007.8	2.705	0.231
16.15	9.982E+02	0.581	10.4	587.1	1.143E+03	1009.9	2.704	0.218
16.65	1.002E+03	0.580	10.3	586.2	1.153E+03	1011.1	2.714	0.204
17.15	1.010E+03	0.588	10.2	585.3	1.156E+03	1012.2	2.708	0.214
17.65	1.006E+03	0.585	10.1	584.6	1.159E+03	1013.6	2.699	0.221
18.15	1.009E+03	0.587	9.9	583.6	1.156E+03	1014.4	2.681	0.221
18.65	1.027E+03	0.588	9.8	582.2	1.166E+03	1014.4	2.699	0.212
19.15	9.738E+02	0.617	9.7	581.6	1.156E+03	1016.0	2.660	0.212
19.65	1.021E+03	0.602	9.5	580.2	1.188E+03	1015.1	2.734	0.216
20.15	9.982E+02	0.618	9.3	579.0	1.178E+03	1015.1	2.700	0.196
20.65	1.029E+03	0.629	9.2	578.0	1.203E+03	1014.9	2.754	0.198
21.15	9.223E+02	0.643	9.2	578.0	1.131E+03	1017.7	2.571	0.168
21.65	8.029E+02	0.712	9.2	578.0	1.090E+03	1019.2	2.467	0.158
22.15	7.026E+02	0.804	9.1	576.7	1.017E+03	1020.3	2.294	0.151
22.65	6.429E+02	0.839	8.8	574.6	9.450E+02	1021.8	2.110	0.143
23.15	5.412E+02	0.938	8.5	571.9	8.631E+02	1023.3	1.915	0.129
23.65	4.788E+02	1.009	8.0	571.1	8.001E+02	1023.6	1.771	0.119
24.15	4.137E+02	1.054	7.6	581.7	7.340E+02	1022.8	1.663	0.107
24.65	3.893E+02	1.008	7.2	565.0	6.552E+02	1021.9	1.433	0.100
25.15	3.730E+02	0.963	6.9	557.9	6.048E+02	1020.1	1.310	0.090
25.65	3.865E+02	0.936	6.6	555.2	6.174E+02	1016.1	1.338	0.075
26.15	3.526E+02	0.881	6.5	553.5	5.796E+02	1012.2	1.267	0.076
26.65	3.743E+02	0.835	6.4	552.9	5.764E+02	1008.6	1.267	0.067
27.15	3.920E+02	0.756	6.4	552.7	5.702E+02	1004.6	1.263	0.066
27.65	3.852E+02	0.728	6.4	552.7	5.513E+02	1001.9	1.224	0.064
28.15	3.581E+02	0.769	6.4	553.0	5.323E+02	1000.4	1.190	0.062
28.65	3.336E+02	0.832	6.4	552.9	5.229E+02	998.9	1.171	0.061
29.15	2.780E+02	0.992	6.4	552.6	4.977E+02	999.0	1.115	0.070
29.65	2.468E+02	1.103	6.3	596.2	4.725E+02	1000.4	1.166	0.075

Table B.3a (continued)

TEST 3.08.6C, VOLUME 20, L=332. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.65	1.046E+03	0.514	12.0	597.9	7.560E+02	864.4	2.840	0.098
6.15	1.038E+03	0.532	12.0	597.4	7.938E+02	882.6	2.783	0.091
6.65	1.031E+03	0.542	11.9	596.8	8.348E+02	898.3	2.766	0.104
7.15	1.029E+03	0.557	11.8	596.2	8.726E+02	912.3	2.759	0.083
7.65	1.019E+03	0.564	11.7	595.7	9.041E+02	924.7	2.750	0.092
8.15	1.010E+03	0.578	11.6	595.4	9.324E+02	935.6	2.737	0.068
8.65	1.016E+03	0.587	11.6	594.9	9.545E+02	945.5	2.718	0.084
9.15	1.016E+03	0.590	11.5	594.5	9.860E+02	953.7	2.745	0.091
9.65	1.012E+03	0.598	11.5	594.2	1.005E+03	961.1	2.743	0.109
10.15	1.005E+03	0.606	11.4	593.9	1.017E+03	968.3	2.720	0.122
10.65	1.013E+03	0.609	11.4	593.6	1.036E+03	974.1	2.722	0.120
11.15	1.002E+03	0.614	11.3	593.4	1.043E+03	979.9	2.696	0.139
11.65	1.002E+03	0.619	11.3	593.1	1.055E+03	985.2	2.695	0.136
12.15	9.996E+02	0.626	11.3	592.9	1.068E+03	989.9	2.691	0.126
12.65	1.009E+03	0.631	11.2	592.7	1.080E+03	994.3	2.686	0.132
13.15	1.019E+03	0.631	11.1	592.1	1.103E+03	996.9	2.723	0.146
13.65	1.020E+03	0.634	11.0	591.2	1.109E+03	999.2	2.720	0.143
14.15	1.015E+03	0.643	10.9	590.4	1.121E+03	1001.2	2.727	0.138
14.65	1.020E+03	0.649	10.8	589.5	1.128E+03	1003.2	2.722	0.104
15.15	1.013E+03	0.658	10.6	588.4	1.125E+03	1005.1	2.698	0.122
15.65	9.942E+02	0.663	10.5	587.6	1.134E+03	1006.7	2.705	0.130
16.15	9.982E+02	0.664	10.4	587.0	1.131E+03	1008.7	2.684	0.124
16.65	1.004E+03	0.665	10.3	586.0	1.143E+03	1009.8	2.699	0.104
17.15	1.010E+03	0.672	10.2	585.2	1.153E+03	1010.7	2.710	0.116
17.65	1.008E+03	0.668	10.1	584.5	1.140E+03	1011.8	2.671	0.086
18.15	1.012E+03	0.667	9.9	583.4	1.143E+03	1012.8	2.665	0.094
18.65	1.028E+03	0.669	9.7	582.1	1.150E+03	1012.8	2.669	0.077
19.15	9.779E+02	0.698	9.7	581.4	1.143E+03	1014.3	2.638	0.102
19.65	1.020E+03	0.686	9.5	580.0	1.175E+03	1013.3	2.710	0.090
20.15	9.996E+02	0.701	9.3	578.8	1.153E+03	1014.3	2.644	0.089
20.65	1.031E+03	0.711	9.2	577.8	1.181E+03	1014.6	2.706	0.094
21.15	9.250E+02	0.725	9.2	577.8	1.106E+03	1017.8	2.514	0.096
21.65	8.070E+02	0.797	9.2	577.9	1.065E+03	1019.3	2.414	0.124
22.15	7.053E+02	0.888	9.0	576.6	9.986E+02	1020.3	2.253	0.139
22.65	6.470E+02	0.917	8.8	574.5	9.198E+02	1021.7	2.058	0.141
23.15	5.466E+02	1.019	8.4	579.0	8.316E+02	1023.9	1.868	0.148
23.65	4.828E+02	1.093	8.0	599.4	7.528E+02	1025.8	1.763	0.166
24.15	4.150E+02	1.145	7.6	616.6	6.804E+02	1026.9	1.657	0.170
24.65	3.879E+02	1.101	7.2	597.5	6.048E+02	1027.3	1.405	0.150
25.15	3.716E+02	1.056	6.9	579.3	5.544E+02	1027.0	1.239	0.123
25.65	3.852E+02	1.032	6.6	569.7	5.764E+02	1024.2	1.269	0.088
26.15	3.513E+02	0.992	6.5	553.5	5.544E+02	1020.7	1.186	0.069
26.65	3.716E+02	0.943	6.4	552.9	5.607E+02	1017.2	1.204	0.064
27.15	3.920E+02	0.851	6.4	552.6	5.607E+02	1013.1	1.219	0.057
27.65	3.852E+02	0.818	6.4	552.6	5.449E+02	1009.8	1.192	0.040
28.15	3.594E+02	0.859	6.4	552.9	5.292E+02	1008.3	1.161	0.062
28.65	3.364E+02	0.918	6.4	552.8	5.166E+02	1006.8	1.140	0.060
29.15	2.835E+02	1.078	6.4	585.6	4.851E+02	1007.4	1.148	0.086
29.65	2.496E+02	1.196	6.3	642.2	4.473E+02	1009.8	1.218	0.108

Table B.3a (continued)

TEST 3.08.6C, VOLUME 22, L=354. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.65	1.047E+03	0.554	12.0	597.9	7.938E+02	821.2	3.556	0.046
6.15	1.040E+03	0.573	11.9	597.3	8.537E+02	831.1	3.644	0.171
6.65	1.032E+03	0.586	11.8	596.7	8.978E+02	844.3	3.624	0.151
7.15	1.031E+03	0.602	11.8	596.2	9.293E+02	855.8	3.580	0.154
7.65	1.019E+03	0.611	11.7	595.7	9.482E+02	860.3	3.583	0.183
8.15	1.010E+03	0.627	11.6	595.2	9.765E+02	869.4	3.566	0.180
8.65	1.016E+03	0.637	11.6	594.8	9.986E+02	877.2	3.539	0.192
9.15	1.017E+03	0.640	11.5	594.5	1.017E+03	884.3	3.510	0.172
9.65	1.012E+03	0.649	11.5	594.1	1.036E+03	890.3	3.497	0.157
10.15	1.005E+03	0.657	11.4	593.8	1.049E+03	895.9	3.471	0.155
10.65	1.013E+03	0.660	11.4	593.5	1.058E+03	900.8	3.445	0.165
11.15	1.002E+03	0.666	11.3	593.2	1.071E+03	905.0	3.437	0.163
11.65	1.004E+03	0.672	11.3	593.1	1.084E+03	908.7	3.434	0.156
12.15	9.996E+02	0.679	11.3	592.9	1.099E+03	911.7	3.443	0.142
12.65	1.009E+03	0.684	11.2	592.6	1.103E+03	914.6	3.421	0.153
13.15	1.019E+03	0.684	11.1	592.0	1.121E+03	916.6	3.451	0.139
13.65	1.020E+03	0.688	11.0	591.1	1.131E+03	918.0	3.455	0.167
14.15	1.016E+03	0.696	10.9	590.4	1.134E+03	919.2	3.452	0.158
14.65	1.021E+03	0.703	10.8	589.4	1.140E+03	920.2	3.449	0.163
15.15	1.013E+03	0.711	10.6	588.3	1.143E+03	921.1	3.438	0.146
15.65	9.955E+02	0.716	10.5	587.5	1.140E+03	922.4	3.406	0.149
16.15	9.996E+02	0.718	10.4	586.9	1.140E+03	923.6	3.386	0.162
16.65	1.004E+03	0.719	10.3	585.9	1.153E+03	923.6	3.415	0.163
17.15	1.012E+03	0.725	10.1	585.1	1.156E+03	923.8	3.413	0.143
17.65	1.009E+03	0.720	10.1	584.4	1.153E+03	924.6	3.385	0.153
18.15	1.013E+03	0.719	9.9	583.3	1.147E+03	924.8	3.361	0.155
18.65	1.029E+03	0.721	9.7	581.9	1.162E+03	924.1	3.393	0.146
19.15	9.806E+02	0.750	9.6	581.3	1.140E+03	925.5	3.310	0.147
19.65	1.020E+03	0.740	9.5	579.9	1.175E+03	924.1	3.416	0.163
20.15	9.996E+02	0.753	9.3	578.6	1.159E+03	924.2	3.352	0.170
20.65	1.031E+03	0.764	9.2	577.6	1.184E+03	924.3	3.415	0.151
21.15	9.264E+02	0.777	9.2	577.7	1.103E+03	927.1	3.156	0.161
21.65	8.097E+02	0.853	9.2	577.7	1.049E+03	929.1	2.982	0.170
22.15	7.080E+02	0.942	9.0	576.5	9.513E+02	932.9	2.667	0.193
22.65	6.497E+02	0.967	8.8	574.4	8.411E+02	938.7	2.312	0.230
23.15	5.520E+02	1.067	8.4	593.9	7.403E+02	945.6	2.105	0.255
23.65	4.869E+02	1.141	8.0	617.5	6.741E+02	951.1	2.021	0.248
24.15	4.164E+02	1.197	7.6	640.1	5.953E+02	955.9	1.888	0.222
24.65	3.865E+02	1.153	7.2	620.0	5.292E+02	959.6	1.558	0.185
25.15	3.703E+02	1.108	6.9	599.6	4.914E+02	962.0	1.353	0.164
25.65	3.852E+02	1.086	6.6	589.7	5.229E+02	961.6	1.404	0.113
26.15	3.513E+02	1.051	6.5	575.7	5.292E+02	958.1	1.386	0.082
26.65	3.716E+02	1.007	6.4	557.0	5.418E+02	954.4	1.364	0.070
27.15	3.920E+02	0.918	6.4	552.6	5.544E+02	949.8	1.396	0.051
27.65	3.852E+02	0.877	6.4	552.6	5.323E+02	947.1	1.347	0.062
28.15	3.594E+02	0.915	6.4	552.9	5.103E+02	946.4	1.294	0.072
28.65	3.377E+02	0.972	6.4	552.7	4.851E+02	946.7	1.234	0.078
29.15	2.875E+02	1.125	6.4	606.5	4.379E+02	949.8	1.274	0.097
29.65	2.509E+02	1.245	6.3	670.4	3.812E+02	956.3	1.335	0.115

Table B.3a (continued)

TEST 3.08.6C, VOLUME 23, L=363. CM

TIME (S)	G (KG/S-M**2)	X	P (MPA)	TB (K)	Q (KW/M**2)	TW (K)	H (KW/K-M**2)	SH (KW/K-M**2)
5.65	1.048E+03	0.565	12.0	597.8	8.096E+02	846.9	3.255	0.204
6.15	1.040E+03	0.585	11.9	597.2	8.537E+02	862.2	3.222	0.197
6.65	1.034E+03	0.598	11.8	596.7	8.946E+02	873.3	3.235	0.263
7.15	1.031E+03	0.615	11.8	596.1	9.293E+02	884.8	3.223	0.253
7.65	1.020E+03	0.625	11.7	595.6	9.576E+02	894.9	3.195	0.255
8.15	1.010E+03	0.641	11.6	595.2	9.828E+02	903.9	3.183	0.239
8.65	1.016E+03	0.652	11.6	594.7	1.005E+03	911.7	3.175	0.237
9.15	1.017E+03	0.654	11.5	594.4	1.024E+03	918.7	3.153	0.225
9.65	1.012E+03	0.664	11.4	594.1	1.040E+03	924.9	3.145	0.221
10.15	1.005E+03	0.672	11.4	593.8	1.055E+03	930.7	3.129	0.226
10.65	1.013E+03	0.675	11.4	593.5	1.071E+03	935.4	3.129	0.205
11.15	1.002E+03	0.681	11.3	593.2	1.080E+03	939.8	3.121	0.215
11.65	1.004E+03	0.687	11.3	593.0	1.093E+03	943.7	3.118	0.216
12.15	9.996E+02	0.695	11.3	592.8	1.106E+03	947.0	3.120	0.200
12.65	1.009E+03	0.699	11.2	592.5	1.112E+03	949.8	3.112	0.194
13.15	1.020E+03	0.699	11.1	591.9	1.134E+03	951.4	3.153	0.201
13.65	1.020E+03	0.703	11.0	591.1	1.140E+03	952.9	3.152	0.192
14.15	1.016E+03	0.711	10.9	590.3	1.143E+03	954.4	3.138	0.183
14.65	1.023E+03	0.718	10.7	589.3	1.153E+03	955.3	3.151	0.187
15.15	1.013E+03	0.725	10.6	588.3	1.153E+03	956.5	3.134	0.196
15.65	9.942E+02	0.730	10.5	587.5	1.150E+03	957.9	3.107	0.174
16.15	9.996E+02	0.734	10.4	586.9	1.159E+03	959.1	3.110	0.176
16.65	1.004E+03	0.732	10.3	585.9	1.166E+03	959.3	3.117	0.174
17.15	1.012E+03	0.741	10.1	585.0	1.169E+03	959.7	3.117	0.171
17.65	1.010E+03	0.735	10.0	584.3	1.162E+03	960.7	3.092	0.181
18.15	1.015E+03	0.734	9.9	583.2	1.159E+03	961.1	3.065	0.164
18.65	1.029E+03	0.737	9.7	581.9	1.175E+03	960.3	3.103	0.162
19.15	9.820E+02	0.767	9.6	581.2	1.153E+03	962.1	3.024	0.164
19.65	1.020E+03	0.755	9.4	579.8	1.194E+03	960.6	3.134	0.163
20.15	1.001E+03	0.769	9.3	578.6	1.175E+03	960.7	3.072	0.153
20.65	1.032E+03	0.781	9.2	577.6	1.200E+03	961.1	3.129	0.170
21.15	9.264E+02	0.792	9.2	577.6	1.115E+03	964.3	2.882	0.141
21.65	8.111E+02	0.870	9.2	577.7	1.068E+03	966.3	2.751	0.129
22.15	7.093E+02	0.960	9.0	576.5	9.860E+02	969.4	2.508	0.142
22.65	6.510E+02	0.983	8.8	574.4	8.852E+02	974.1	2.214	0.188
23.15	5.534E+02	1.084	8.4	599.0	7.875E+02	979.8	2.069	0.194
23.65	4.883E+02	1.156	8.0	623.6	7.088E+02	985.1	1.964	0.191
24.15	4.164E+02	1.213	7.6	648.3	6.332E+02	989.2	1.857	0.180
24.65	3.865E+02	1.172	7.2	628.8	5.513E+02	993.6	1.509	0.134
25.15	3.703E+02	1.124	6.9	606.7	5.198E+02	995.9	1.331	0.151
25.65	3.838E+02	1.102	6.6	596.9	5.513E+02	995.1	1.382	0.112
26.15	3.513E+02	1.069	6.5	582.6	5.449E+02	991.6	1.330	0.087
26.65	3.703E+02	1.025	6.4	566.2	5.607E+02	987.4	1.333	0.081
27.15	3.920E+02	0.940	6.4	552.6	5.733E+02	982.1	1.334	0.088
27.65	3.852E+02	0.895	6.4	552.6	5.513E+02	978.6	1.296	0.074
28.15	3.594E+02	0.933	6.4	552.9	5.261E+02	977.3	1.243	0.060
28.65	3.391E+02	0.989	6.4	552.7	5.103E+02	976.8	1.203	0.065
29.15	2.889E+02	1.140	6.4	613.5	4.599E+02	979.2	1.254	0.070
29.65	2.509E+02	1.261	6.3	679.6	4.032E+02	985.1	1.323	0.102

Table B.3b. Film boiling data — test 3.08.6C (English units)

TEST 3.08.6C, VOLUME 14, L= 8.0 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.65	7.630E+05	0.356	1751.4	617.2	2.170E+05	1056.5	495.0	23.2
6.15	7.580E+05	0.365	1739.5	616.3	2.320E+05	1092.5	486.4	25.6
6.65	7.560E+05	0.373	1725.9	615.2	2.450E+05	1128.1	478.4	23.7
7.15	7.550E+05	0.378	1714.1	614.3	2.570E+05	1160.3	470.1	23.7
7.65	7.460E+05	0.384	1703.0	613.4	2.670E+05	1186.1	466.5	23.5
8.15	7.450E+05	0.388	1693.9	612.6	2.760E+05	1212.6	460.6	29.0
8.65	7.490E+05	0.394	1684.1	611.8	2.860E+05	1231.9	460.8	33.0
9.15	7.470E+05	0.397	1676.6	611.2	2.940E+05	1253.5	457.6	32.2
9.65	7.450E+05	0.401	1669.1	610.6	3.010E+05	1273.1	454.4	31.9
10.15	7.390E+05	0.403	1662.6	610.1	3.080E+05	1291.1	452.0	32.0
10.65	7.460E+05	0.405	1655.7	609.5	3.140E+05	1307.2	450.0	31.5
11.15	7.380E+05	0.407	1650.6	609.1	3.190E+05	1322.3	447.2	31.1
11.65	7.380E+05	0.409	1646.2	608.7	3.240E+05	1335.6	446.0	31.8
12.15	7.360E+05	0.412	1641.7	608.4	3.290E+05	1347.5	445.7	32.9
12.65	7.430E+05	0.415	1636.5	607.9	3.340E+05	1358.8	445.1	32.6
13.15	7.480E+05	0.415	1623.2	606.8	3.410E+05	1367.8	447.8	34.8
13.65	7.510E+05	0.417	1605.3	605.3	3.440E+05	1375.9	446.8	35.8
14.15	7.450E+05	0.425	1588.8	603.9	3.490E+05	1383.0	447.5	37.7
14.65	7.480E+05	0.432	1568.5	602.2	3.550E+05	1388.5	451.0	39.4
15.15	7.440E+05	0.437	1547.4	600.4	3.560E+05	1393.8	448.6	41.5
15.65	7.310E+05	0.440	1531.0	598.9	3.580E+05	1398.9	447.0	42.6
16.15	7.340E+05	0.443	1518.1	597.8	3.630E+05	1402.7	450.6	43.8
16.65	7.380E+05	0.444	1498.8	596.1	3.660E+05	1404.8	453.1	45.2
17.15	7.430E+05	0.449	1481.7	594.6	3.710E+05	1405.9	457.5	52.7
17.65	7.390E+05	0.449	1467.6	593.3	3.750E+05	1406.5	461.0	63.4
18.15	7.380E+05	0.453	1446.8	591.4	3.760E+05	1405.7	462.0	71.3
18.65	7.520E+05	0.455	1421.0	589.0	3.870E+05	1401.2	476.6	105.7
19.15	7.150E+05	0.479	1408.7	587.9	3.850E+05	1411.4	467.2	108.3
19.65	7.530E+05	0.464	1382.0	585.4	3.900E+05	1413.1	471.3	79.0
20.15	7.340E+05	0.476	1359.1	583.2	3.830E+05	1417.3	458.7	40.9
20.65	7.600E+05	0.477	1341.6	581.5	3.920E+05	1414.7	470.3	40.9
21.15	6.760E+05	0.498	1339.9	581.3	3.720E+05	1416.4	445.4	41.3
21.65	5.840E+05	0.567	1339.5	581.3	3.600E+05	1415.1	432.2	43.1
22.15	5.140E+05	0.646	1316.4	579.0	3.440E+05	1411.4	413.8	43.1
22.65	4.670E+05	0.680	1277.3	575.2	3.230E+05	1407.0	388.6	42.9
23.15	3.930E+05	0.766	1228.3	570.1	3.030E+05	1401.0	365.2	41.9
23.65	3.470E+05	0.824	1167.3	563.7	2.860E+05	1392.5	344.7	40.8
24.15	3.030E+05	0.861	1103.6	556.7	2.670E+05	1381.4	323.3	46.9
24.65	2.890E+05	0.812	1048.2	550.3	2.530E+05	1366.2	310.2	125.2
25.15	2.760E+05	0.770	1002.6	544.9	2.260E+05	1361.6	276.7	42.0
25.65	2.860E+05	0.746	963.2	540.1	2.480E+05	1339.8	310.3	168.6
26.15	2.610E+05	0.700	939.7	537.1	2.200E+05	1331.1	276.9	57.4
26.65	2.790E+05	0.664	931.2	536.0	2.350E+05	1324.6	297.5	216.9
27.15	2.910E+05	0.601	928.6	535.7	2.060E+05	1324.5	261.3	29.9
27.65	2.840E+05	0.580	928.2	535.6	2.000E+05	1313.4	257.1	45.0
28.15	2.630E+05	0.617	932.0	536.1	1.900E+05	1309.7	245.8	27.6
28.65	2.410E+05	0.685	930.1	535.9	1.880E+05	1300.6	245.7	34.1
29.15	2.000E+05	0.823	926.4	535.4	1.780E+05	1299.4	233.3	21.9
29.65	1.790E+05	0.920	918.6	534.4	1.720E+05	1295.3	225.7	23.4

Table B.3b (continued)

TEST 3.08.6C, VOLUME 16, L= 8.9 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.65	7.650E+05	0.404	1749.6	617.1	2.120E+05	1092.2	446.8	10.4
6.15	7.590E+05	0.418	1737.6	616.1	2.290E+05	1132.6	442.6	9.8
6.65	7.570E+05	0.428	1724.0	615.1	2.410E+05	1168.7	435.9	8.3
7.15	7.560E+05	0.437	1712.2	614.1	2.530E+05	1201.5	431.1	7.9
7.65	7.480E+05	0.445	1701.1	613.2	2.660E+05	1230.5	431.4	10.2
8.15	7.460E+05	0.456	1692.0	612.5	2.720E+05	1258.0	421.9	13.2
8.65	7.500E+05	0.460	1682.1	611.7	2.820E+05	1282.1	421.0	10.3
9.15	7.470E+05	0.465	1674.6	611.1	2.910E+05	1304.5	419.5	10.3
9.65	7.450E+05	0.467	1667.1	610.5	2.980E+05	1324.2	417.2	10.6
10.15	7.390E+05	0.474	1660.6	609.9	3.050E+05	1343.0	415.7	15.7
10.65	7.460E+05	0.476	1653.7	609.4	3.090E+05	1360.1	411.4	16.0
11.15	7.380E+05	0.479	1648.6	608.9	3.130E+05	1375.9	408.4	16.6
11.65	7.380E+05	0.481	1644.1	608.6	3.220E+05	1389.4	411.7	14.9
12.15	7.360E+05	0.486	1639.6	608.2	3.240E+05	1402.9	408.2	12.5
12.65	7.430E+05	0.490	1634.3	607.8	3.310E+05	1415.1	409.3	14.4
13.15	7.490E+05	0.489	1621.1	606.6	3.330E+05	1426.4	405.9	14.8
13.65	7.510E+05	0.491	1603.1	605.1	3.390E+05	1434.7	409.1	13.8
14.15	7.460E+05	0.499	1586.6	603.7	3.440E+05	1443.3	409.5	15.9
14.65	7.490E+05	0.507	1566.1	602.0	3.480E+05	1450.1	410.4	13.3
15.15	7.450E+05	0.513	1545.0	600.2	3.520E+05	1455.7	411.8	13.6
15.65	7.320E+05	0.517	1528.7	598.7	3.540E+05	1461.2	410.5	13.9
16.15	7.350E+05	0.519	1515.7	597.6	3.550E+05	1467.4	407.5	13.7
16.65	7.390E+05	0.519	1496.4	595.9	3.600E+05	1471.1	411.4	13.3
17.15	7.440E+05	0.526	1479.1	594.3	3.640E+05	1473.9	413.5	14.0
17.65	7.410E+05	0.525	1465.1	593.1	3.640E+05	1477.8	411.3	13.8
18.15	7.410E+05	0.527	1444.3	591.2	3.630E+05	1480.4	408.5	17.0
18.65	7.550E+05	0.529	1418.3	588.8	3.690E+05	1480.8	413.2	15.7
19.15	7.160E+05	0.556	1406.1	587.6	3.690E+05	1482.7	412.3	19.3
19.65	7.530E+05	0.540	1379.1	585.1	3.790E+05	1480.6	423.5	16.7
20.15	7.350E+05	0.553	1356.3	582.9	3.760E+05	1480.2	419.1	17.9
20.65	7.590E+05	0.555	1338.6	581.2	3.840E+05	1479.8	427.1	15.0
21.15	6.780E+05	0.576	1337.4	581.1	3.670E+05	1482.2	407.1	16.3
21.65	5.890E+05	0.650	1337.4	581.1	3.570E+05	1480.2	397.3	15.4
22.15	5.160E+05	0.740	1314.6	578.9	3.400E+05	1476.7	378.1	19.5
22.65	4.710E+05	0.774	1275.7	575.0	3.210E+05	1470.8	357.9	20.1
23.15	3.960E+05	0.870	1226.9	570.0	3.010E+05	1463.2	337.2	20.5
23.65	3.500E+05	0.937	1166.1	563.6	2.820E+05	1454.3	316.3	22.3
24.15	3.040E+05	0.978	1102.6	556.6	2.590E+05	1444.0	292.1	19.4
24.65	2.880E+05	0.929	1047.3	550.2	2.330E+05	1434.3	263.7	19.6
25.15	2.760E+05	0.882	1001.7	544.8	2.140E+05	1424.6	242.7	14.8
25.65	2.860E+05	0.859	962.3	539.9	2.140E+05	1412.4	245.4	12.7
26.15	2.610E+05	0.806	939.0	537.0	2.000E+05	1401.9	230.6	12.8
26.65	2.770E+05	0.763	930.4	535.9	1.950E+05	1392.1	228.1	9.8
27.15	2.900E+05	0.691	927.7	535.6	1.930E+05	1381.4	228.0	9.6
27.65	2.840E+05	0.665	927.4	535.5	1.860E+05	1373.4	221.7	11.7
28.15	2.640E+05	0.705	931.3	536.0	1.780E+05	1368.1	213.7	13.2
28.65	2.440E+05	0.771	929.5	535.8	1.760E+05	1362.2	212.3	13.3
29.15	2.030E+05	0.924	925.9	535.3	1.710E+05	1358.3	207.4	16.4
29.65	1.810E+05	1.028	918.1	560.5	1.690E+05	1354.3	212.9	17.7

Table B.3b (continued)

TEST 3.08.6C, VOLUME 17, L= 9.4 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.65	7.690E+05	0.431	1748.9	617.0	2.560E+05	1027.1	624.8	20.3
6.15	7.640E+05	0.444	1736.9	616.1	2.590E+05	1052.5	593.6	27.6
6.65	7.600E+05	0.450	1723.3	615.0	2.710E+05	1080.0	583.6	27.3
7.15	7.580E+05	0.462	1711.4	614.0	2.860E+05	1104.0	583.7	26.4
7.65	7.500E+05	0.468	1700.3	613.2	2.910E+05	1126.2	567.0	32.1
8.15	7.450E+05	0.476	1691.2	612.4	2.810E+05	1120.3	552.3	36.8
8.65	7.490E+05	0.483	1681.3	611.6	2.910E+05	1142.3	548.3	36.5
9.15	7.490E+05	0.486	1673.8	611.0	3.020E+05	1161.3	549.5	36.8
9.65	7.460E+05	0.490	1666.2	610.4	3.090E+05	1178.7	544.0	45.9
10.15	7.400E+05	0.498	1659.8	609.9	3.150E+05	1195.0	538.0	46.2
10.65	7.470E+05	0.501	1652.8	609.3	3.200E+05	1209.2	533.2	44.7
11.15	7.390E+05	0.505	1647.7	608.9	3.270E+05	1221.6	533.6	43.5
11.65	7.390E+05	0.509	1643.3	608.5	3.310E+05	1233.1	529.9	46.2
12.15	7.360E+05	0.514	1638.8	608.1	3.350E+05	1243.4	527.5	46.5
12.65	7.430E+05	0.518	1633.5	607.7	3.400E+05	1252.4	526.7	45.5
13.15	7.510E+05	0.517	1620.2	606.6	3.440E+05	1259.8	526.9	48.4
13.65	7.520E+05	0.520	1602.2	605.1	3.490E+05	1265.6	527.8	52.2
14.15	7.480E+05	0.529	1585.6	603.7	3.560E+05	1270.5	533.6	53.2
14.65	7.520E+05	0.536	1565.2	601.9	3.560E+05	1274.9	529.5	51.5
15.15	7.460E+05	0.543	1544.0	600.1	3.610E+05	1278.2	532.8	50.8
15.65	7.330E+05	0.547	1527.8	598.7	3.590E+05	1282.2	525.3	52.7
16.15	7.360E+05	0.549	1514.7	597.5	3.630E+05	1285.2	527.2	52.4
16.65	7.400E+05	0.549	1495.4	595.8	3.650E+05	1287.9	527.6	53.4
17.15	7.450E+05	0.556	1478.1	594.2	3.660E+05	1289.9	525.4	54.9
17.65	7.430E+05	0.555	1464.1	593.0	3.660E+05	1291.6	524.0	52.2
18.15	7.450E+05	0.557	1443.2	591.1	3.670E+05	1292.4	523.7	55.4
18.65	7.570E+05	0.558	1417.2	588.7	3.710E+05	1292.2	527.6	56.8
19.15	7.200E+05	0.587	1405.0	587.5	3.670E+05	1294.6	519.6	52.6
19.65	7.520E+05	0.571	1377.9	585.0	3.760E+05	1293.3	531.3	59.0
20.15	7.360E+05	0.587	1355.2	582.8	3.730E+05	1293.1	524.8	58.3
20.65	7.590E+05	0.598	1337.3	581.1	3.810E+05	1292.7	535.6	57.2
21.15	6.810E+05	0.612	1336.3	581.0	3.590E+05	1295.9	502.2	51.9
21.65	5.940E+05	0.678	1336.5	581.0	3.460E+05	1296.8	482.7	52.9
22.15	5.190E+05	0.768	1313.8	578.8	3.210E+05	1298.4	445.5	49.3
22.65	4.760E+05	0.804	1275.0	574.9	2.950E+05	1301.5	405.6	45.8
23.15	4.020E+05	0.903	1226.4	569.9	2.690E+05	1304.0	366.0	40.7
23.65	3.550E+05	0.973	1165.7	563.5	2.500E+05	1304.5	337.0	38.5
24.15	3.060E+05	1.016	1102.2	564.9	2.270E+05	1303.0	307.7	31.8
24.65	2.860E+05	0.969	1046.9	550.2	2.040E+05	1300.6	272.1	29.3
25.15	2.740E+05	0.922	1001.4	544.7	1.860E+05	1298.0	246.3	22.5
25.65	2.840E+05	0.897	961.9	539.9	1.900E+05	1291.8	252.3	19.1
26.15	2.600E+05	0.843	938.7	537.0	1.780E+05	1285.9	237.8	16.1
26.65	2.750E+05	0.798	930.1	535.9	1.760E+05	1281.0	235.8	13.5
27.15	2.890E+05	0.723	927.4	535.5	1.740E+05	1275.2	235.7	13.5
27.65	2.840E+05	0.696	927.0	535.5	1.680E+05	1271.7	227.8	15.7
28.15	2.640E+05	0.736	931.0	536.0	1.620E+05	1270.7	220.0	15.0
28.65	2.470E+05	0.800	929.2	535.7	1.580E+05	1270.0	215.0	15.9
29.15	2.080E+05	0.957	925.7	535.3	1.540E+05	1270.5	208.9	16.3
29.65	1.830E+05	1.064	917.9	584.3	1.470E+05	1273.6	212.7	17.8

Table B.3b (continued)

TEST 3.08.6C, VOLUME 18, L= 9.8 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.65	7.680E+05	0.452	1748.2	617.0	2.380E+05	1075.4	519.9	37.5
6.15	7.620E+05	0.467	1736.2	616.0	2.510E+05	1106.8	511.6	39.3
6.65	7.590E+05	0.474	1722.5	614.9	2.650E+05	1136.3	507.3	39.5
7.15	7.570E+05	0.487	1710.7	614.0	2.740E+05	1162.7	500.0	38.6
7.65	7.500E+05	0.493	1699.5	613.1	2.850E+05	1186.3	497.3	39.6
8.15	7.450E+05	0.503	1690.4	612.4	2.930E+05	1207.7	492.4	38.1
8.65	7.490E+05	0.510	1680.5	611.5	3.010E+05	1226.8	489.6	39.0
9.15	7.480E+05	0.514	1673.0	610.9	3.070E+05	1244.4	485.1	38.1
9.65	7.460E+05	0.518	1665.4	610.3	3.150E+05	1259.5	484.7	40.0
10.15	7.400E+05	0.526	1658.9	609.8	3.200E+05	1273.9	481.6	38.4
10.65	7.470E+05	0.530	1652.0	609.2	3.250E+05	1286.8	480.2	38.0
11.15	7.380E+05	0.535	1646.9	608.8	3.300E+05	1298.3	478.0	37.0
11.65	7.390E+05	0.538	1642.5	608.4	3.340E+05	1308.7	477.5	37.5
12.15	7.360E+05	0.544	1637.9	608.0	3.390E+05	1318.3	476.6	35.7
12.65	7.430E+05	0.548	1632.6	607.6	3.430E+05	1326.5	477.1	38.4
13.15	7.500E+05	0.547	1619.3	606.5	3.490E+05	1332.5	480.8	39.8
13.65	7.520E+05	0.551	1601.3	605.0	3.530E+05	1337.6	481.4	40.1
14.15	7.470E+05	0.559	1584.7	603.6	3.550E+05	1342.7	480.7	39.1
14.65	7.510E+05	0.567	1564.2	601.8	3.590E+05	1346.4	482.3	40.3
15.15	7.460E+05	0.574	1543.1	600.0	3.590E+05	1350.7	478.5	40.5
15.65	7.330E+05	0.578	1526.8	598.6	3.610E+05	1354.5	477.1	40.7
16.15	7.360E+05	0.581	1513.8	597.4	3.630E+05	1358.3	476.9	38.4
16.65	7.390E+05	0.580	1494.4	595.7	3.660E+05	1360.4	478.6	36.0
17.15	7.450E+05	0.588	1477.1	594.1	3.670E+05	1362.4	477.6	37.7
17.65	7.420E+05	0.585	1463.0	592.9	3.680E+05	1364.9	476.0	38.9
18.15	7.440E+05	0.587	1442.1	591.0	3.670E+05	1366.5	472.8	38.9
18.65	7.570E+05	0.588	1416.1	588.6	3.700E+05	1366.5	476.1	37.4
19.15	7.180E+05	0.617	1403.9	587.4	3.670E+05	1369.3	469.1	37.4
19.65	7.530E+05	0.602	1376.8	584.9	3.770E+05	1367.6	482.2	38.1
20.15	7.360E+05	0.618	1354.0	582.7	3.740E+05	1367.6	476.2	34.5
20.65	7.590E+05	0.629	1336.0	581.0	3.820E+05	1367.4	485.8	34.9
21.15	6.800E+05	0.643	1335.3	580.9	3.590E+05	1372.3	453.5	29.7
21.65	5.920E+05	0.712	1335.7	580.9	3.460E+05	1375.0	435.1	27.9
22.15	5.180E+05	0.804	1313.1	578.7	3.230E+05	1377.1	404.5	26.6
22.65	4.740E+05	0.839	1274.4	574.9	3.000E+05	1379.7	372.2	25.2
23.15	3.990E+05	0.938	1225.9	569.9	2.740E+05	1382.4	337.8	22.7
23.65	3.530E+05	1.009	1165.2	568.6	2.540E+05	1383.0	312.3	20.9
24.15	3.050E+05	1.054	1101.8	587.6	2.330E+05	1381.5	293.3	18.8
24.65	2.870E+05	1.008	1046.6	557.6	2.080E+05	1380.0	252.7	17.6
25.15	2.750E+05	0.963	1001.1	544.7	1.920E+05	1376.7	231.1	15.9
25.65	2.850E+05	0.936	961.6	539.9	1.960E+05	1369.5	236.0	13.3
26.15	2.600E+05	0.881	938.4	536.9	1.840E+05	1362.4	223.4	13.4
26.65	2.760E+05	0.835	929.7	535.8	1.830E+05	1355.9	223.4	11.9
27.15	2.890E+05	0.756	927.1	535.5	1.810E+05	1348.8	222.7	11.7
27.65	2.840E+05	0.728	926.7	535.4	1.750E+05	1343.9	215.9	11.3
28.15	2.640E+05	0.769	930.8	535.9	1.690E+05	1341.2	209.8	10.9
28.65	2.460E+05	0.832	928.9	535.7	1.660E+05	1338.6	206.6	10.8
29.15	2.050E+05	0.992	925.5	535.3	1.580E+05	1338.7	196.6	12.3
29.65	1.820E+05	1.103	917.7	613.7	1.500E+05	1341.3	205.7	13.3

Table B.3b (continued)

TEST 3.08.6C, VOLUME 20, L=10.9 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.65	7.710E+05	0.514	1745.9	616.8	2.400E+05	1096.5	500.9	17.3
6.15	7.650E+05	0.532	1733.9	615.8	2.520E+05	1129.2	490.9	16.0
6.65	7.600E+05	0.542	1720.2	614.8	2.650E+05	1157.5	487.9	18.4
7.15	7.590E+05	0.557	1708.3	613.8	2.770E+05	1182.7	486.6	14.6
7.65	7.510E+05	0.564	1697.1	612.9	2.870E+05	1204.9	485.0	16.3
8.15	7.450E+05	0.578	1688.0	612.2	2.960E+05	1224.5	482.7	12.0
8.65	7.490E+05	0.587	1678.0	611.3	3.030E+05	1242.4	479.3	14.8
9.15	7.490E+05	0.590	1670.5	610.7	3.130E+05	1257.1	484.1	16.0
9.65	7.460E+05	0.598	1662.9	610.1	3.190E+05	1270.5	483.7	19.2
10.15	7.410E+05	0.606	1656.4	609.6	3.230E+05	1283.5	479.7	21.6
10.65	7.470E+05	0.609	1649.4	609.0	3.290E+05	1293.8	480.1	21.2
11.15	7.390E+05	0.614	1644.3	608.6	3.310E+05	1304.3	475.4	24.6
11.65	7.390E+05	0.619	1639.9	608.2	3.350E+05	1313.8	475.3	23.9
12.15	7.370E+05	0.626	1635.3	607.8	3.390E+05	1322.4	474.6	22.3
12.65	7.440E+05	0.631	1629.9	607.4	3.430E+05	1330.2	473.8	23.2
13.15	7.510E+05	0.631	1616.5	606.3	3.500E+05	1335.0	480.2	25.7
13.65	7.520E+05	0.634	1598.4	604.7	3.520E+05	1339.0	479.7	25.3
14.15	7.480E+05	0.643	1581.9	603.3	3.560E+05	1342.7	480.9	24.3
14.65	7.520E+05	0.649	1561.3	601.6	3.580E+05	1346.3	480.1	18.4
15.15	7.470E+05	0.658	1540.1	599.7	3.570E+05	1349.7	475.8	21.6
15.65	7.330E+05	0.663	1523.9	598.3	3.600E+05	1352.6	477.1	23.0
16.15	7.360E+05	0.664	1510.8	597.2	3.590E+05	1356.2	473.4	21.9
16.65	7.400E+05	0.665	1491.4	595.4	3.630E+05	1358.1	476.0	18.3
17.15	7.450E+05	0.672	1473.9	593.9	3.660E+05	1359.7	478.0	20.4
17.65	7.430E+05	0.668	1459.9	592.6	3.620E+05	1361.8	471.1	15.1
18.15	7.460E+05	0.667	1438.9	590.7	3.630E+05	1363.6	470.0	16.5
18.65	7.580E+05	0.669	1412.7	588.3	3.650E+05	1363.6	470.8	13.6
19.15	7.210E+05	0.698	1400.7	587.1	3.630E+05	1366.3	465.2	18.0
19.65	7.520E+05	0.686	1373.3	584.5	3.730E+05	1364.4	478.0	15.8
20.15	7.370E+05	0.701	1350.5	582.4	3.660E+05	1366.2	466.4	15.7
20.65	7.600E+05	0.711	1332.2	580.6	3.750E+05	1366.7	477.2	16.5
21.15	6.820E+05	0.725	1332.1	580.6	3.510E+05	1372.6	443.3	17.0
21.65	5.950E+05	0.797	1333.1	580.7	3.380E+05	1375.2	425.7	21.9
22.15	5.200E+05	0.888	1310.9	578.5	3.170E+05	1377.1	397.3	24.6
22.65	4.770E+05	0.917	1272.4	574.7	2.920E+05	1379.5	362.9	24.8
23.15	4.030E+05	1.019	1224.2	582.7	2.640E+05	1383.5	329.5	26.1
23.65	3.560E+05	1.093	1163.8	619.5	2.390E+05	1386.9	311.0	29.2
24.15	3.060E+05	1.145	1100.6	650.4	2.160E+05	1389.0	292.2	30.0
24.65	2.860E+05	1.101	1045.5	616.0	1.920E+05	1389.7	247.8	26.4
25.15	2.740E+05	1.056	1000.1	583.3	1.760E+05	1389.1	218.5	21.7
25.65	2.840E+05	1.032	960.6	566.0	1.830E+05	1384.0	223.8	15.6
26.15	2.590E+05	0.992	937.5	536.8	1.760E+05	1377.8	209.1	12.2
26.65	2.740E+05	0.943	928.8	535.7	1.780E+05	1371.5	212.4	11.2
27.15	2.890E+05	0.851	926.0	535.3	1.780E+05	1364.1	215.0	10.0
27.65	2.840E+05	0.818	925.8	535.3	1.730E+05	1358.2	210.2	7.0
28.15	2.650E+05	0.859	929.9	535.8	1.680E+05	1355.4	204.8	11.0
28.65	2.480E+05	0.918	928.2	535.6	1.640E+05	1352.7	201.1	10.6
29.15	2.090E+05	1.078	924.8	594.7	1.540E+05	1353.9	202.5	15.1
29.65	1.840E+05	1.196	917.2	696.5	1.420E+05	1358.1	214.9	19.1

Table B.3b (continued)

TEST 3.08.6C, VOLUME 22, L=11.6 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.65	7.720E+05	0.554	1744.3	616.7	2.520E+05	1018.6	627.1	8.1
6.15	7.670E+05	0.573	1732.2	615.7	2.710E+05	1036.5	642.7	30.1
6.65	7.610E+05	0.586	1718.5	614.6	2.850E+05	1060.3	639.1	26.7
7.15	7.600E+05	0.602	1706.6	613.7	2.950E+05	1081.0	631.4	27.1
7.65	7.510E+05	0.611	1695.4	612.8	3.010E+05	1089.1	632.0	32.2
8.15	7.450E+05	0.627	1686.3	612.0	3.100E+05	1105.4	628.9	31.7
8.65	7.490E+05	0.637	1676.2	611.2	3.170E+05	1119.5	624.1	33.9
9.15	7.500E+05	0.640	1668.7	610.6	3.230E+05	1132.3	619.1	30.4
9.65	7.460E+05	0.649	1661.1	610.0	3.290E+05	1143.1	616.8	27.7
10.15	7.410E+05	0.657	1654.6	609.4	3.330E+05	1153.1	612.1	27.4
10.65	7.470E+05	0.660	1647.5	608.8	3.360E+05	1161.9	607.6	29.1
11.15	7.390E+05	0.666	1642.5	608.4	3.400E+05	1169.6	606.1	28.7
11.65	7.400E+05	0.672	1638.0	608.1	3.440E+05	1176.1	605.7	27.5
12.15	7.370E+05	0.679	1633.5	607.7	3.490E+05	1181.5	607.2	25.1
12.65	7.440E+05	0.684	1628.0	607.2	3.500E+05	1186.8	603.4	27.0
13.15	7.510E+05	0.684	1614.5	606.1	3.560E+05	1190.3	608.6	24.5
13.65	7.520E+05	0.688	1596.4	604.6	3.590E+05	1192.9	609.4	29.4
14.15	7.490E+05	0.696	1579.8	603.2	3.600E+05	1195.0	608.8	27.8
14.65	7.530E+05	0.703	1559.2	601.4	3.620E+05	1196.9	608.3	28.7
15.15	7.470E+05	0.711	1537.9	599.5	3.630E+05	1198.5	606.4	25.8
15.65	7.340E+05	0.716	1521.8	598.1	3.620E+05	1200.9	600.7	26.2
16.15	7.370E+05	0.718	1508.7	597.0	3.620E+05	1202.9	597.1	28.6
16.65	7.400E+05	0.719	1489.2	595.2	3.660E+05	1203.0	602.3	28.8
17.15	7.460E+05	0.725	1471.6	593.7	3.670E+05	1203.4	601.9	25.2
17.65	7.440E+05	0.720	1457.6	592.4	3.660E+05	1204.8	597.0	27.0
18.15	7.470E+05	0.719	1436.6	590.5	3.640E+05	1205.2	592.8	27.4
18.65	7.590E+05	0.721	1410.2	588.0	3.690E+05	1203.8	598.5	25.7
19.15	7.230E+05	0.750	1398.4	586.9	3.620E+05	1206.4	583.8	25.9
19.65	7.520E+05	0.740	1370.8	584.3	3.730E+05	1203.8	602.4	28.7
20.15	7.370E+05	0.753	1348.0	582.1	3.680E+05	1204.0	591.1	30.0
20.65	7.600E+05	0.764	1329.5	580.3	3.760E+05	1204.2	602.3	26.6
21.15	6.830E+05	0.777	1329.9	580.4	3.500E+05	1209.2	556.7	28.4
21.65	5.970E+05	0.853	1331.3	580.5	3.330E+05	1212.9	525.9	30.0
22.15	5.220E+05	0.942	1309.4	578.3	3.020E+05	1219.8	470.4	34.0
22.65	4.790E+05	0.967	1271.0	574.5	2.670E+05	1230.2	407.8	40.5
23.15	4.070E+05	1.067	1223.1	609.6	2.350E+05	1242.6	371.3	45.0
23.65	3.590E+05	1.141	1162.7	652.1	2.140E+05	1252.5	356.5	43.8
24.15	3.070E+05	1.197	1099.8	692.7	1.890E+05	1261.1	332.9	39.2
24.65	2.850E+05	1.153	1044.8	656.6	1.680E+05	1267.7	274.7	32.6
25.15	2.730E+05	1.108	999.4	619.8	1.560E+05	1272.1	238.7	29.0
25.65	2.840E+05	1.086	959.8	602.1	1.660E+05	1271.4	247.7	20.0
26.15	2.590E+05	1.051	936.9	576.8	1.680E+05	1265.0	244.4	14.4
26.65	2.740E+05	1.007	928.1	543.2	1.720E+05	1258.5	240.6	12.3
27.15	2.890E+05	0.918	925.3	535.3	1.760E+05	1250.2	246.2	9.0
27.65	2.840E+05	0.877	925.1	535.2	1.690E+05	1245.2	237.5	10.9
28.15	2.650E+05	0.915	929.3	535.8	1.620E+05	1244.0	228.2	12.7
28.65	2.490E+05	0.972	927.6	535.5	1.540E+05	1244.6	217.6	13.8
29.15	2.120E+05	1.125	924.4	632.3	1.390E+05	1250.2	224.7	17.1
29.65	1.850E+05	1.245	916.7	747.3	1.210E+05	1261.9	235.5	20.3

Table B.3b (continued)

TEST 3.08.6C, VOLUME 23, L=11.9 FT

TIME (S)	G (LBM/HR-FT**2)	X	P (PSIA)	TB (F)	Q (BTU/HR-FT**2)	TW (F)	H (BTU/HR-F-FT**2)	SH (BTU/HR-F-FT**2)
5.65	7.730E+05	0.565	1743.5	616.6	2.570E+05	1065.0	574.1	36.0
6.15	7.670E+05	0.585	1731.4	615.6	2.710E+05	1092.4	568.3	34.7
6.65	7.620E+05	0.598	1717.7	614.6	2.840E+05	1112.5	570.6	46.3
7.15	7.600E+05	0.615	1705.7	613.6	2.950E+05	1133.2	568.5	44.7
7.65	7.520E+05	0.625	1694.6	612.7	3.040E+05	1151.4	563.5	45.0
8.15	7.450E+05	0.641	1685.4	612.0	3.120E+05	1167.5	561.3	42.1
8.65	7.490E+05	0.652	1675.4	611.1	3.190E+05	1181.5	559.9	41.8
9.15	7.500E+05	0.654	1667.8	610.5	3.250E+05	1194.2	556.0	39.7
9.65	7.460E+05	0.664	1660.2	609.9	3.300E+05	1205.3	554.6	38.9
10.15	7.410E+05	0.672	1653.7	609.4	3.350E+05	1215.7	551.9	39.9
10.65	7.470E+05	0.675	1646.6	608.8	3.400E+05	1224.3	551.8	36.1
11.15	7.390E+05	0.681	1641.6	608.4	3.430E+05	1232.2	550.4	38.0
11.65	7.400E+05	0.687	1637.1	608.0	3.470E+05	1239.1	550.0	38.1
12.15	7.370E+05	0.695	1632.6	607.6	3.510E+05	1245.1	550.3	35.2
12.65	7.440E+05	0.699	1627.0	607.1	3.530E+05	1250.1	548.8	34.3
13.15	7.520E+05	0.699	1613.6	606.0	3.600E+05	1253.0	556.1	35.4
13.65	7.520E+05	0.703	1595.5	604.5	3.620E+05	1255.7	555.9	33.8
14.15	7.490E+05	0.711	1578.8	603.1	3.630E+05	1258.4	553.4	32.2
14.65	7.540E+05	0.718	1558.1	601.3	3.660E+05	1260.1	555.8	33.0
15.15	7.470E+05	0.725	1536.9	599.5	3.660E+05	1262.2	552.8	34.6
15.65	7.330E+05	0.730	1520.8	598.0	3.650E+05	1264.7	547.9	30.6
16.15	7.370E+05	0.734	1507.6	596.9	3.680E+05	1266.8	548.5	31.1
16.65	7.400E+05	0.732	1488.1	595.1	3.700E+05	1267.3	549.8	30.6
17.15	7.460E+05	0.741	1470.5	593.6	3.710E+05	1267.9	549.8	30.1
17.65	7.450E+05	0.735	1456.5	592.3	3.690E+05	1269.7	545.3	31.9
18.15	7.480E+05	0.734	1435.5	590.4	3.680E+05	1270.4	540.6	28.9
18.65	7.590E+05	0.737	1409.1	587.9	3.730E+05	1269.1	547.3	28.6
19.15	7.240E+05	0.767	1397.3	586.8	3.660E+05	1272.2	533.3	28.9
19.65	7.520E+05	0.755	1369.5	584.2	3.790E+05	1269.6	552.8	28.8
20.15	7.380E+05	0.769	1346.8	582.0	3.730E+05	1269.8	541.8	26.9
20.65	7.610E+05	0.781	1328.2	580.2	3.810E+05	1270.5	551.9	30.0
21.15	6.830E+05	0.792	1328.8	580.3	3.540E+05	1276.2	508.3	24.8
21.65	5.980E+05	0.870	1330.4	580.4	3.390E+05	1279.9	485.1	22.8
22.15	5.230E+05	0.960	1308.6	578.3	3.130E+05	1285.4	442.3	25.0
22.65	4.800E+05	0.983	1270.4	574.5	2.810E+05	1293.8	390.5	33.2
23.15	4.080E+05	1.084	1222.5	618.8	2.500E+05	1304.2	364.9	34.2
23.65	3.600E+05	1.156	1162.3	663.0	2.250E+05	1313.6	346.3	33.7
24.15	3.070E+05	1.213	1099.4	707.5	2.010E+05	1321.1	327.6	31.7
24.65	2.850E+05	1.172	1044.4	672.4	1.750E+05	1329.0	266.2	23.6
25.15	2.730E+05	1.124	999.1	632.6	1.650E+05	1333.2	234.8	26.6
25.65	2.830E+05	1.102	959.5	614.9	1.750E+05	1331.6	243.7	19.7
26.15	2.590E+05	1.069	936.6	589.2	1.730E+05	1325.4	234.5	15.4
26.65	2.730E+05	1.025	927.8	559.7	1.780E+05	1317.9	235.1	14.2
27.15	2.890E+05	0.940	925.0	535.2	1.820E+05	1308.3	235.3	15.6
27.65	2.840E+05	0.895	924.8	535.2	1.750E+05	1302.0	228.5	13.1
28.15	2.650E+05	0.933	929.0	535.7	1.670E+05	1299.7	219.2	10.6
28.65	2.500E+05	0.989	927.3	535.5	1.620E+05	1298.8	212.2	11.5
29.15	2.130E+05	1.140	924.1	644.9	1.460E+05	1303.1	221.2	12.4
29.65	1.850E+05	1.261	916.5	763.8	1.280E+05	1313.7	233.3	18.0

Table B.4. Burnout quality for ORNL transient tests

TEST 3.08.6C TIME(S)	BURNOUT X
5.65	0.3124
6.15	0.3194
6.65	0.3244
7.15	0.3282
7.65	0.3320
8.15	0.3351
8.65	0.3388
9.15	0.3411
9.65	0.3434
10.15	0.3451
10.65	0.3459
11.15	0.3469
11.65	0.3483
12.15	0.3510
12.65	0.3531
13.15	0.3531
13.65	0.3551
14.15	0.3619
14.65	0.3687
15.15	0.3732
15.65	0.3760
16.15	0.3782
16.65	0.3797
17.15	0.3848
17.65	0.3853
18.15	0.3897
18.65	0.3912
19.15	0.4090
19.65	0.3961
20.15	0.4093
20.65	0.4090
21.15	0.4306
21.65	0.4948
22.15	0.5649
22.65	0.6010
23.15	0.6781
23.65	0.7301
24.15	0.7611
24.65	0.7099
25.15	0.6742
25.65	0.6475
26.15	0.6041
26.65	0.5517
27.15	0.5068
27.65	0.5002
28.15	0.5354
28.65	0.6083
29.15	0.7235
29.65	0.8185

TEST 3.03.6AR TIME(S)	BURNOUT X
6.60	0.5826
7.10	0.6362
7.60	0.6620
8.10	0.6458
8.60	0.6380
9.10	0.6244
9.60	0.5954
10.10	0.5423
10.60	0.5141
11.10	0.4675
11.60	0.4264
12.10	0.3687
12.60	0.3362
13.10	0.2922
13.60	0.2704
14.10	0.2452
14.60	0.2292
15.10	0.2299
15.60	0.2201
16.10	0.2171
16.60	0.2221
17.10	0.2232

TEST 3.06.6B TIME(S)	BURNOUT X
5.30	0.5809
5.80	0.6488
6.30	0.6837
6.80	0.6838
7.30	0.6645
7.80	0.6362
8.30	0.6147
8.80	0.5622
9.30	0.5159
9.80	0.4605
10.30	0.4307
10.80	0.3989
11.30	0.3414
11.80	0.2713
12.30	0.2127
12.80	0.1758
13.30	0.1523
13.80	0.1324
14.30	0.1206
14.80	0.1096

Appendix C

ORNL STEADY-STATE EXPERIMENTS

A series of 22 steady-state film-boiling tests (3.07.9) were completed October 1, 1981. A discussion of those tests is presented in Ref. 1, and a summary of the results is presented here.

The steady-state test series covered the following data range:

1. mass flux – 225.3–800 $kg/m^2 \cdot s$ (1.6×10^5–5.9×10^5 $lb_m/ft^2 \cdot h$),
2. heat flux – 315–940 kW/m^2 (1×10^5–3×10^5 $Btu/ft^2 \cdot h$),
3. quality – 0.4–1.3, and
4. pressure – 13.4–4.4 MPa (1940–650 psi).

Bundle fluid conditions were calculated using a simple mass and energy balance on the bundle. Experimental heat transfer coefficients (heat fluxes) were compared with the same correlations as those in the transient tests.

Figure C.1 shows all experimental steady-state film-boiling heat transfer coefficients compared with the Dougall-Rohsenow predicted heat transfer coefficient. The Groeneveld 5.7 predicted heat transfer coefficient is compared with steady-state data in Fig. C.2, while the Condie-Bengston IV comparison is shown in Fig. C.3. Experimental heat fluxes are compared with Groeneveld-Delorme predicted heat fluxes in Fig. C.4.

In general, results of the steady-state tests agree with those of the transient tests. The Dougall-Rohsenow correlation overpredicts heat transfer coefficients for much of the data range. The Groeneveld 5.7 and Condie-Bengston IV correlations predict the data better than the Dougall-Rohsenow correlation. The Groeneveld-Delorme correlation tends to predict low heat fluxes near the dryout point but improves as distance from dryout increases.

Reference

1. G. L. Yoder et al., *Dispersed-Flow Film Boiling in Rod Bundle Geometry – Steady-State Heat Transfer Data and Correlation Comparisons*, ORNL-5822 (to be published).

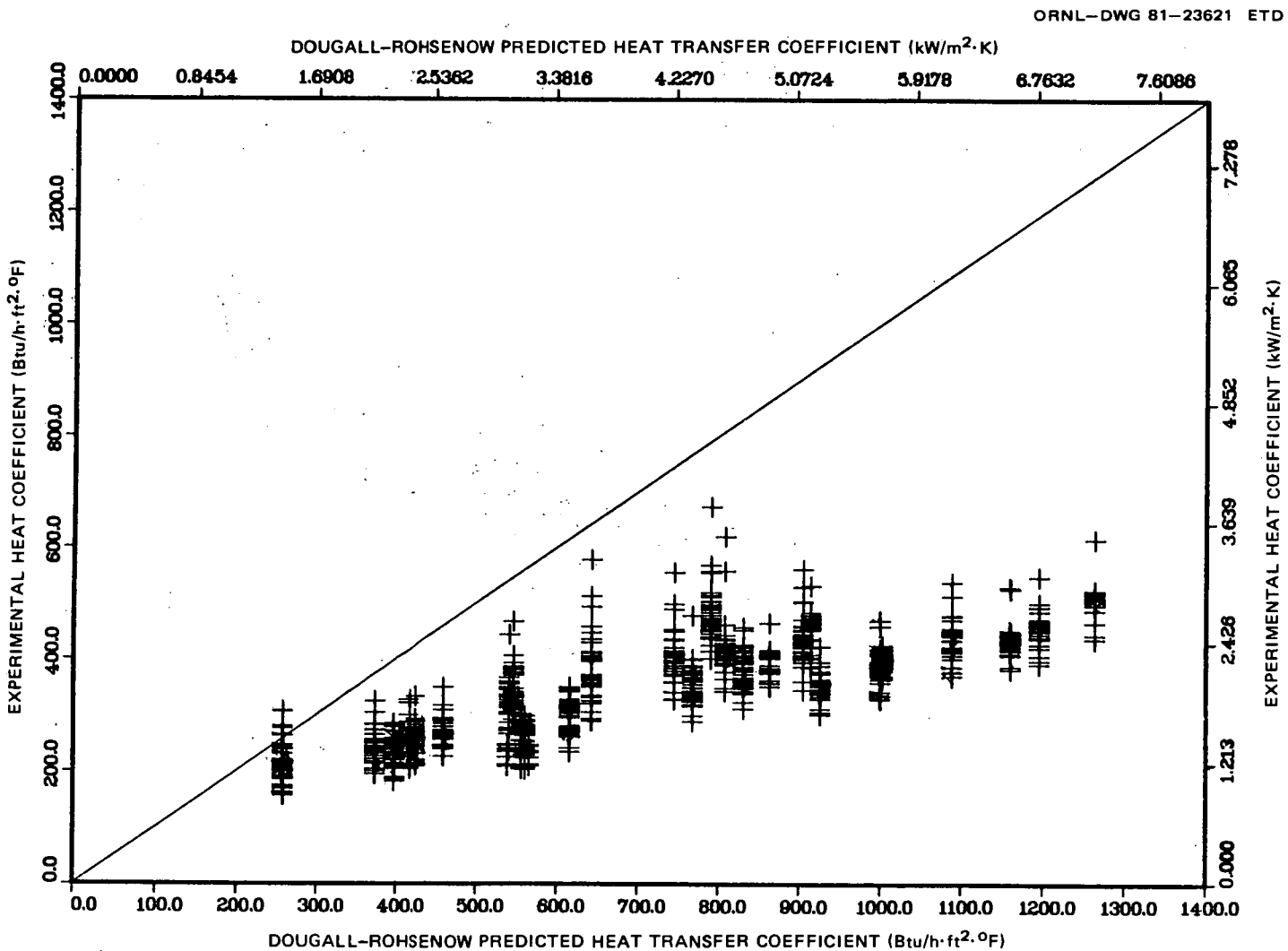

Fig. C.1. Plot of h_{exp} vs h_{cor} for Dougall-Rohsenow correlation.

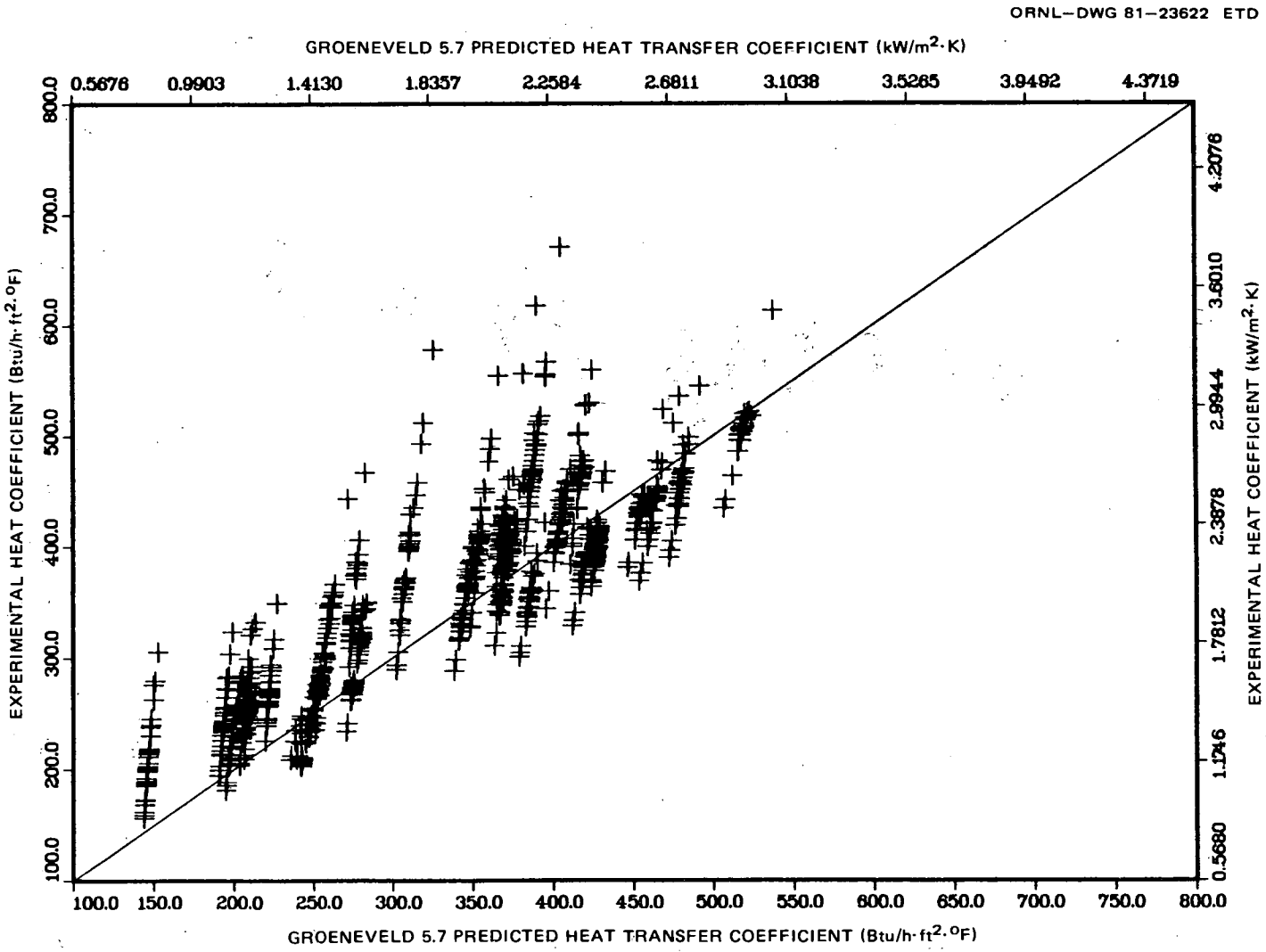

Fig. C.2. Plot of h_{exp} vs h_{cor} for Groeneveld 5.7 correlation.

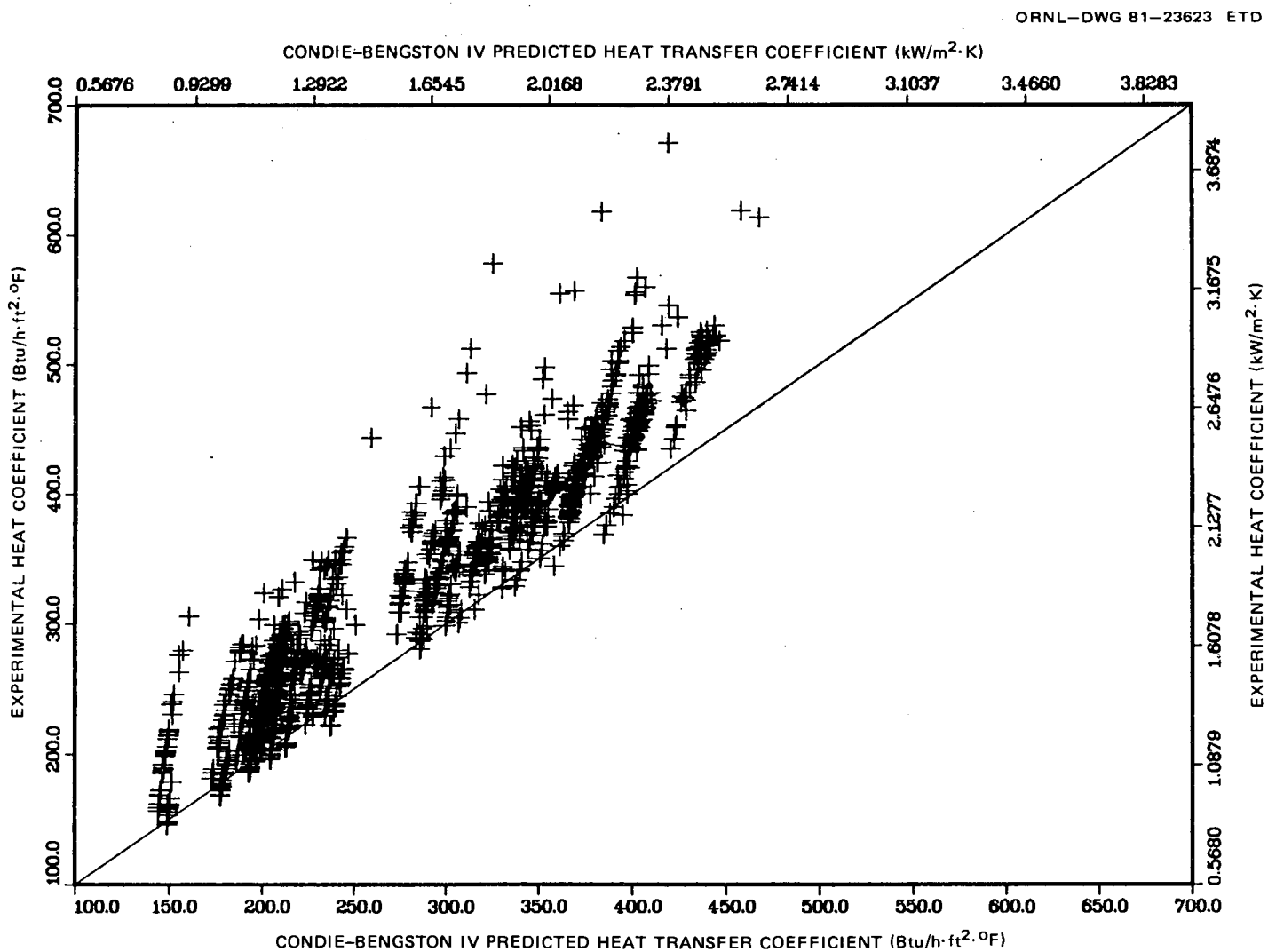

Fig. C.3. Plot of h_{exp} vs h_{cor} for Condie-Bengston IV correlation.

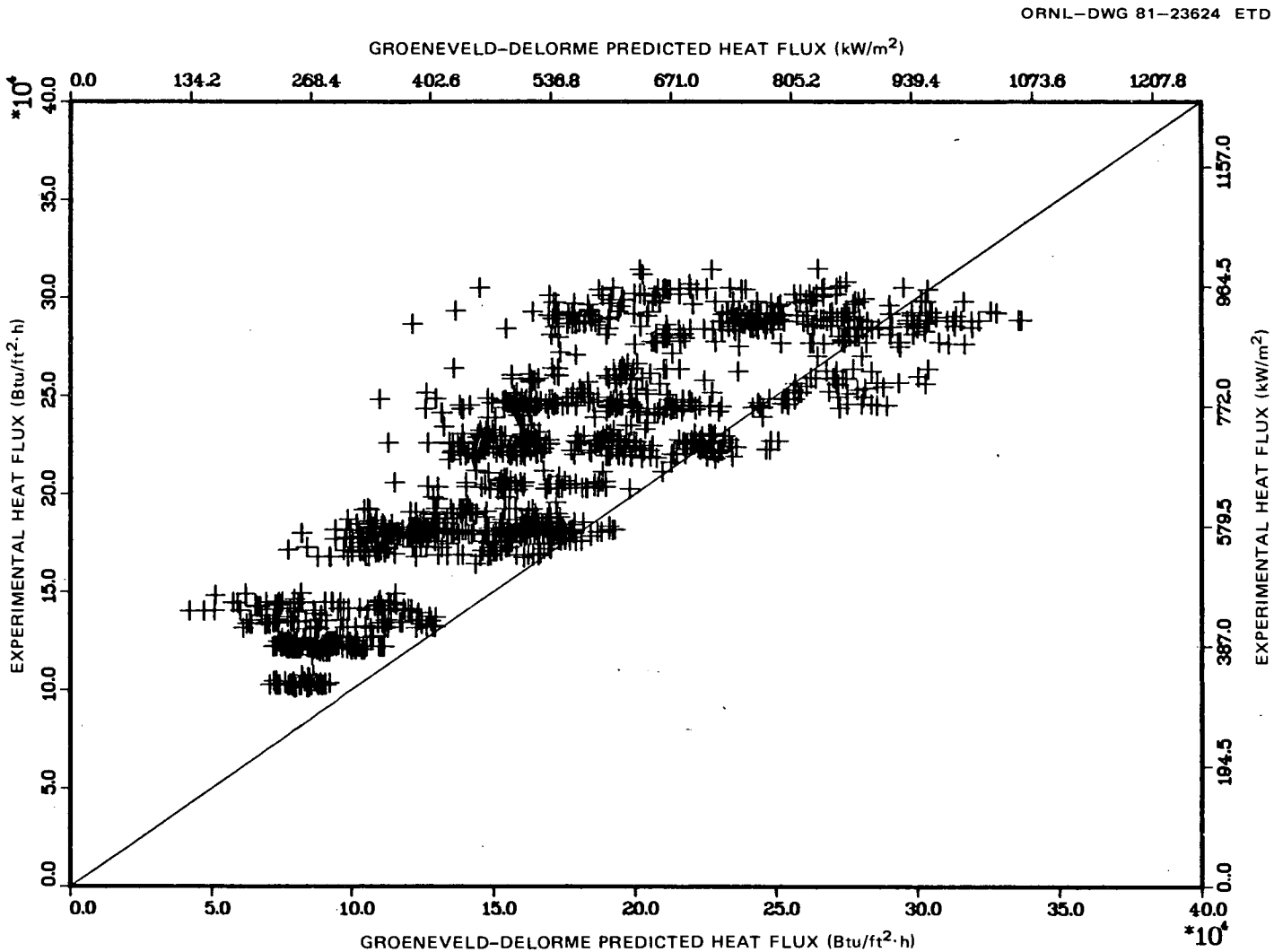

Fig. C.4. Plot of h_{exp} vs h_{cor} for Groeneveld-Delorme correlation.

Appendix D

TEST 3.06.6B UNCERTAINTY ANALYSIS: METHOD AND UNCERTAINTIES

The best-estimate uncertainty analysis procedure used to calculate uncertainties in heat transfer parameters for test 3.06.6B is shown via a flow diagram in Fig. D.1. The first step in the analysis is the assignment of FRS instrument and property uncertainties. Next, using an uncertainty analysis technique, uncertainties in rod surface conditions (T_w and q_w'') are calculated. Using the calculated uncertainties in rod surface conditions, and fluid instrument uncertainties, the uncertainty analysis technique is applied to determine the uncertainties in bundle fluid conditions. Next, the calculated uncertainties in bundle fluid conditions are increased using engineering judgement to include additional model uncertainties neglected in the formal fluid uncertainty analysis. Finally, calculated rod surface uncertainties and the bundle fluid uncertainties

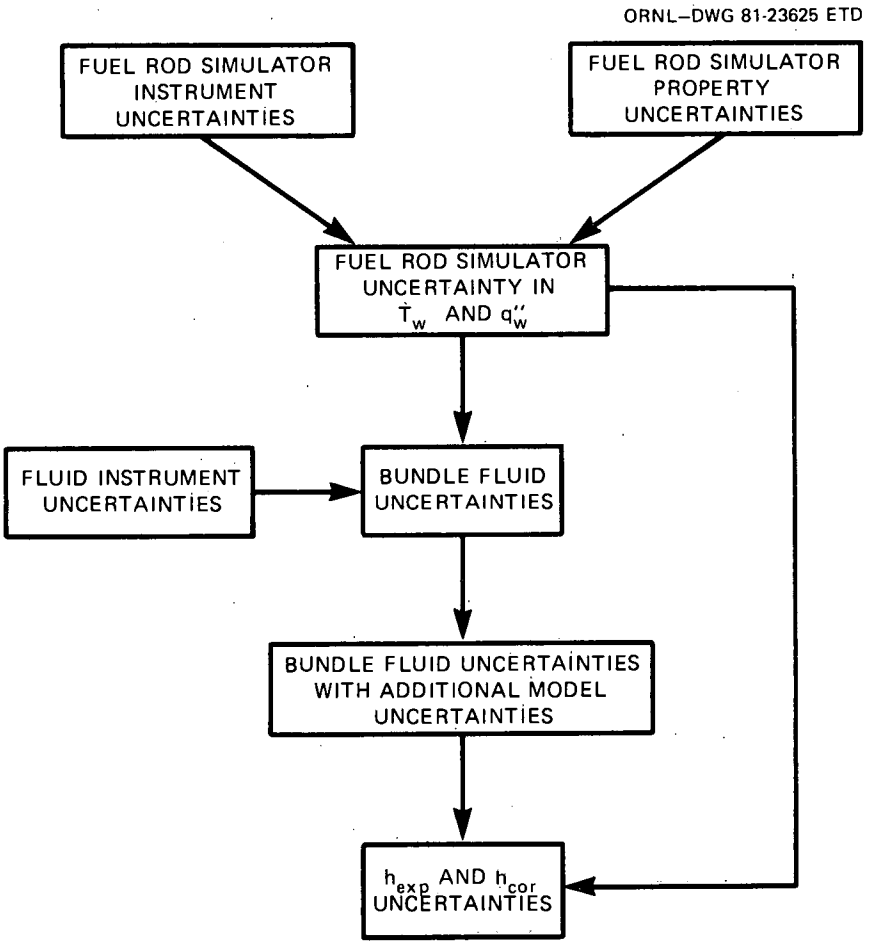

Fig. D.1. Uncertainty analysis procedure.

are used to determine the uncertainties in experimental and correlation-predicted heat transfer coefficients using the uncertainty analysis technique.

Bundle fluid conditions and uncertainties are presented in Tables D.1(a and b) and D.2(a and b) for two fluid volumes; one is 118 cm (3.9 ft) from the bottom of the heated length (L), and the other is 183 cm (6 ft) from the bottom of the heated length. The bundle fluid conditions and uncertainties correspond to level-C and -D thermocouples. Local rod surface conditions and uncertainties are presented in Tables D.3–D.6 for two level-C and two level-D thermocouples. The calculation of uncertainties was limited to the locations shown because locations above these contained equilibrium qualities greater than one, which prohibits the application of the correlations used in the uncertainty analysis.

The methodology used to calculate output uncertainties due to input uncertainties has been documented.[1] The technique employed to calculate uncertainties is a sensitivity analysis method. The formula to calculate an output uncertainty caused by an input uncertainty can be derived from a Taylor series. With inputs $(X_1, \ldots, X_i, \ldots, X_N) = X$, the output, $R(X)$, is given by:

$$R(X) = R(X_o) + \sum \partial R/\partial X \; \Delta X_i + 1/2 \sum\sum \partial^2 R/\partial X_i \partial X_j \; \Delta X_i \Delta X_j + \ldots ,$$

where X_o = nominal X value. The variance of $R(X)$ about $R(X_o)$ is given by:

$$\mathrm{Var}\; R(X_o) = \sum (\partial R/\partial X_i)^2 \; \overline{\Delta X^2} + \sum_{i \neq j}\sum (\partial R/\partial X_i)\; (\partial R/\partial X_j)\; \overline{\Delta X_i \Delta X_j}$$

$$+ 1/4 \sum\sum (\partial^2 R/\partial X_i \partial X_j)^2 \; \overline{\Delta X_i^2 \Delta X_j^2} + \ldots .$$

Thus, the uncertainty in $R(X_o)$ can be defined as:

$$\sigma_{R(X_o)} = [\mathrm{Var}\; R(X_o)]^{1/2} .$$

Two types of data are needed to propagate the input uncertainties. The first type is a knowledge of the input uncertainties, which includes the variance $\overline{\Delta X_i^2}$, the covariance $\overline{\Delta X_i \Delta X_j}$, and higher moments. The other type of data needed is a knowledge of sensitivity derivatives:

$$\frac{\partial R(X)}{\partial X_i}, \; \frac{\partial^2 R}{\partial X_i \partial X_j} .$$

Table D.1a. Test 3.06.6B, fluid uncertainties (one standard deviation), L = 118 cm

TIME (S)	JUN 08 G(KG/S-M**2) NOM. RESP.	JUN 08 G(KG/S-M**2) ST. DEV.	JUN 08 X NOM. RESP.	JUN 08 X ST. DEV.	VOL 08 P(MPA) NOM. RESP.	VOL 08 P(MPA) ST. DEV.	VOL 08 T(K) NOM. RESP.	VOL 08 T(K) ST. DEV.
5.65	3.0309E+02	1.5606E+01	6.8163E-01	1.0156E-01	1.2259E+01	1.2756E-01	5.9928E+02	9.0478E-01
5.70	2.9772E+02	1.3905E+01	6.8830E-01	1.0065E-01	1.2234E+01	1.2756E-01	5.9912E+02	9.0611E-01
5.75	2.9045E+02	1.4092E+01	6.9495E-01	9.9991E-02	1.2221E+01	1.2756E-01	5.9903E+02	9.0744E-01
5.80	2.8580E+02	1.3208E+01	7.0224E-01	9.9632E-02	1.2218E+01	1.2772E-01	5.9902E+02	9.0744E-01
5.85	2.9554E+02	1.4865E+01	7.0840E-01	9.9119E-02	1.2179E+01	1.2756E-01	5.9877E+02	9.0744E-01
5.90	2.9148E+02	1.4489E+01	7.1404E-01	9.8648E-02	1.2134E+01	1.2790E-01	5.9849E+02	9.1150E-01
5.95	2.8511E+02	1.1989E+01	7.1942E-01	9.8272E-02	1.2107E+01	1.2756E-01	5.9832E+02	9.1150E-01
6.00	2.7179E+02	2.1336E+01	7.2532E-01	9.8299E-02	1.2109E+01	1.2783E-01	5.9833E+02	9.1350E-01
6.05	2.8286E+02	2.4586E+01	7.3023E-01	9.7703E-02	1.2085E+01	1.3157E-01	5.9818E+02	9.3706E-01
6.10	2.7409E+02	1.4417E+01	7.3426E-01	9.7249E-02	1.2056E+01	1.2823E-01	5.9799E+02	9.1689E-01
6.15	2.7624E+02	1.3214E+01	7.3766E-01	9.6393E-02	1.2017E+01	1.2727E-01	5.9774E+02	9.1178E-01
6.20	2.6848E+02	1.2243E+01	7.4204E-01	9.6471E-02	1.2006E+01	1.2756E-01	5.9768E+02	9.1422E-01
6.25	2.7214E+02	1.2278E+01	7.4543E-01	9.6168E-02	1.1974E+01	1.2740E-01	5.9747E+02	9.1556E-01
6.30	2.5395E+02	1.2508E+01	7.5018E-01	9.6240E-02	1.1980E+01	1.2623E-01	5.9751E+02	9.0750E-01
6.35	2.6168E+02	1.1746E+01	7.5442E-01	9.6060E-02	1.1968E+01	1.2773E-01	5.9743E+02	9.1822E-01
6.40	2.6676E+02	1.1845E+01	7.5703E-01	9.5664E-02	1.1923E+01	1.2739E-01	5.9714E+02	9.1689E-01
6.45	2.6745E+02	1.1776E+01	7.5831E-01	9.5115E-02	1.1871E+01	1.2739E-01	5.9681E+02	9.2089E-01
6.50	2.5565E+02	1.0381E+01	7.6001E-01	9.4716E-02	1.1850E+01	1.2723E-01	5.9667E+02	9.2089E-01
6.55	2.5923E+02	1.1055E+01	7.6121E-01	9.4229E-02	1.1824E+01	1.2739E-01	5.9650E+02	9.2222E-01
6.60	2.5418E+02	1.0692E+01	7.6171E-01	9.3684E-02	1.1799E+01	1.2739E-01	5.9634E+02	9.2361E-01
6.65	2.4658E+02	1.0234E+01	7.6315E-01	9.3391E-02	1.1793E+01	1.2773E-01	5.9631E+02	9.2361E-01
6.70	2.4792E+02	1.0508E+01	7.6503E-01	9.3224E-02	1.1786E+01	1.2739E-01	5.9626E+02	9.2556E-01
6.75	2.6078E+02	1.1457E+01	7.6445E-01	9.2832E-02	1.1727E+01	1.2756E-01	5.9588E+02	9.2628E-01
6.80	2.5871E+02	1.0993E+01	7.6254E-01	9.2604E-02	1.1670E+01	1.2745E-01	5.9551E+02	9.2933E-01
6.85	2.3412E+02	6.2082E+00	7.6305E-01	9.1900E-02	1.1684E+01	1.2759E-01	5.9560E+02	9.2917E-01
6.90	2.3902E+02	9.6547E+00	7.6414E-01	9.1808E-02	1.1687E+01	1.2739E-01	5.9562E+02	9.2761E-01
6.95	2.4462E+02	1.1007E+01	7.6467E-01	9.1396E-02	1.1664E+01	1.2740E-01	5.9547E+02	9.2900E-01
7.00	2.6008E+02	2.1680E+01	7.6135E-01	8.9776E-02	1.1573E+01	1.2777E-01	5.9487E+02	9.3544E-01
7.05	2.4674E+02	1.0064E+01	7.5886E-01	9.0011E-02	1.1536E+01	1.2740E-01	5.9463E+02	9.3567E-01
7.10	2.3176E+02	1.5951E+01	7.5848E-01	8.9703E-02	1.1546E+01	1.2723E-01	5.9470E+02	9.3500E-01
7.15	2.2915E+02	9.5189E+00	7.5885E-01	8.9356E-02	1.1558E+01	1.2690E-01	5.9477E+02	9.3167E-01
7.20	2.4305E+02	3.1916E+01	7.5740E-01	8.8681E-02	1.1513E+01	1.2754E-01	5.9448E+02	9.3528E-01
7.25	2.4872E+02	2.8447E+01	7.5430E-01	8.3044E-02	1.1441E+01	1.2802E-01	5.9400E+02	9.4383E-01
7.30	2.5345E+02	3.7659E+01	7.5011E-01	8.2103E-02	1.1382E+01	1.2744E-01	5.9361E+02	9.4133E-01
7.35	2.1161E+02	9.8773E+00	7.5142E-01	8.0888E-02	1.1440E+01	1.2758E-01	5.9400E+02	9.5983E-01
7.40	2.2030E+02	1.1421E+01	7.5302E-01	8.0683E-02	1.1463E+01	1.2606E-01	5.9414E+02	9.3028E-01
7.45	2.4347E+02	9.0716E+01	7.5028E-01	7.4116E-02	1.1378E+01	1.2850E-01	5.9358E+02	9.4978E-01
7.50	2.5330E+02	6.0008E+01	7.4107E-01	5.9531E-02	1.1251E+01	1.2774E-01	5.9274E+02	9.4917E-01
7.55	2.3031E+02	5.8212E+01	7.4441E-01	5.9771E-02	1.1268E+01	1.2208E-01	5.9286E+02	9.1111E-01
7.60	2.0481E+02	5.4484E+01	7.4814E-01	5.8408E-02	1.1348E+01	1.3266E-01	5.9339E+02	9.7772E-01
7.65	2.2426E+02	2.6551E+01	7.4660E-01	5.9879E-02	1.1306E+01	1.2847E-01	5.9311E+02	9.5206E-01
7.70	2.5486E+02	1.8607E+01	7.3996E-01	5.3676E-02	1.1201E+01	1.0021E-01	5.9240E+02	7.6594E-01
7.75	2.3480E+02	4.6316E+01	7.2939E-01	5.3643E-02	1.1092E+01	1.1268E-01	5.9167E+02	8.5450E-01
7.80	1.9839E+02	1.1768E+01	7.2943E-01	5.9185E-02	1.1186E+01	1.2459E-01	5.9230E+02	9.3272E-01
7.85	2.0439E+02	1.0443E+01	7.2845E-01	6.3816E-02	1.1219E+01	1.2739E-01	5.9252E+02	9.4911E-01
7.90	2.2361E+02	4.9521E+01	7.2436E-01	6.9059E-02	1.1149E+01	1.2830E-01	5.9205E+02	9.5917E-01
7.95	2.6084E+02	2.7084E+01	7.1235E-01	5.6920E-02	1.1016E+01	1.2796E-01	5.9115E+02	9.6294E-01
8.00	2.3917E+02	6.9135E+01	7.0860E-01	6.4312E-02	1.1000E+01	1.1920E-01	5.9104E+02	9.0172E-01
8.05	1.9086E+02	1.4169E+01	7.0986E-01	6.6903E-02	1.1099E+01	1.2531E-01	5.9171E+02	9.3894E-01
8.10	2.0905E+02	1.2155E+01	7.0903E-01	7.1276E-02	1.1089E+01	1.2690E-01	5.9164E+02	9.5311E-01
8.15	2.2776E+02	6.3532E+01	7.0617E-01	7.2771E-02	1.1004E+01	1.1897E-01	5.9107E+02	9.0183E-01
8.20	2.5635E+02	2.3620E+01	6.9636E-01	6.3025E-02	1.0877E+01	1.2265E-01	5.9019E+02	9.3089E-01
8.25	2.2570E+02	4.3886E+01	7.0405E-01	7.5221E-02	1.0940E+01	1.3232E-01	5.9063E+02	9.9689E-01
8.30	1.8869E+02	1.3837E+01	7.0623E-01	7.4375E-02	1.0982E+01	1.2696E-01	5.9092E+02	9.5761E-01
8.35	2.1196E+02	1.4881E+01	7.0411E-01	7.7952E-02	1.0928E+01	1.2810E-01	5.9054E+02	9.6817E-01
8.40	2.3570E+02	1.3155E+01	6.9747E-01	8.2008E-02	1.0854E+01	1.2577E-01	5.8989E+02	9.5744E-01
8.45	2.2951E+02	2.8952E+01	6.8830E-01	9.0796E-02	1.0771E+01	1.2767E-01	5.8946E+02	9.7267E-01
8.50	1.8439E+02	1.8710E+01	6.8667E-01	9.6724E-02	1.0855E+01	1.2028E-01	5.9004E+02	9.1717E-01
8.55	1.9673E+02	1.5132E+01	6.8340E-01	1.0118E-01	1.0866E+01	1.2723E-01	5.9012E+02	9.6517E-01
8.60	2.1381E+02	1.6407E+01	6.7630E-01	1.0490E-01	1.0783E+01	1.2724E-01	5.8954E+02	9.5933E-01
8.65	2.3676E+02	3.4253E+01	6.6733E-01	1.0376E-01	1.0679E+01	1.2751E-01	5.8882E+02	9.7806E-01
8.70	1.9745E+02	4.8476E+01	6.6345E-01	1.1687E-01	1.0709E+01	1.3107E-01	5.8903E+02	9.9967E-01
8.75	1.8669E+02	1.5003E+01	6.6205E-01	1.1800E-01	1.0752E+01	1.3056E-01	5.8933E+02	9.9472E-01
8.80	2.0244E+02	2.3526E+01	6.5809E-01	1.1648E-01	1.0704E+01	1.2807E-01	5.8900E+02	9.7872E-01
8.85	2.2082E+02	2.1723E+01	6.5343E-01	1.1206E-01	1.0638E+01	1.3043E-01	5.8853E+02	9.9906E-01
8.90	2.2774E+02	3.4150E+01	6.4659E-01	1.0501E-01	1.0573E+01	1.2245E-01	5.8808E+02	9.4544E-01
8.95	1.8044E+02	1.5478E+01	6.4517E-01	9.9097E-02	1.0615E+01	1.2374E-01	5.8837E+02	9.5328E-01
9.00	1.9405E+02	1.5258E+01	6.4294E-01	9.3428E-02	1.0607E+01	1.2806E-01	5.8832E+02	9.8267E-01

Table D.1a (continued)

TIME (S)	JUN 08 G(KG/S-M**2) NOM. RESP.	JUN 08 G(KG/S-M**2) ST. DEV.	JUN 08 X NOM. RESP.	JUN 08 X ST. DEV.	VOL 08 P(MPA) NOM. RESP.	VOL 08 P(MPA) ST. DEV.	VOL 08 T(K) NOM. RESP.	VOL 08 T(K) ST. DEV.
9.05	2.1002E+02	1.4682E+01	6.3810E-01	8.7260E-02	1.0548E+01	1.2756E-01	5.8790E+02	9.8267E-01
9.10	2.1419E+02	1.5462E+01	6.3111E-01	8.1391E-02	1.0473E+01	1.2756E-01	5.8737E+02	9.8806E-01
9.15	1.8930E+02	1.2767E+01	6.2772E-01	7.6704E-02	1.0475E+01	1.2625E-01	5.8738E+02	9.7878E-01
9.20	1.9316E+02	1.1432E+01	6.2454E-01	7.3259E-02	1.0469E+01	1.2756E-01	5.8734E+02	9.8667E-01
9.25	1.9565E+02	1.1168E+01	6.2084E-01	7.0261E-02	1.0444E+01	1.2772E-01	5.8716E+02	9.8939E-01
9.30	2.0785E+02	1.3533E+01	6.1530E-01	6.7556E-02	1.0389E+01	1.2758E-01	5.8677E+02	9.9222E-01
9.35	2.0567E+02	1.0662E+01	6.0846E-01	6.4191E-02	1.0335E+01	1.2345E-01	5.8638E+02	9.6550E-01
9.40	1.9684E+02	1.4375E+01	6.0251E-01	6.3328E-02	1.0305E+01	1.3041E-01	5.8617E+02	1.0163E+00
9.45	1.8199E+02	1.6234E+01	6.0028E-01	6.1992E-02	1.0327E+01	1.2806E-01	5.8632E+02	9.9878E-01
9.50	2.0283E+02	1.9327E+01	5.9533E-01	6.1187E-02	1.0286E+01	1.2756E-01	5.8605E+02	9.9611E-01
9.55	2.2318E+02	3.2654E+01	5.8860E-01	6.0588E-02	1.0212E+01	1.2748E-01	5.8550E+02	1.0007E+00
9.60	2.1424E+02	9.1600E+00	5.8147E-01	5.9023E-02	1.0150E+01	1.2746E-01	5.8505E+02	1.0046E+00
9.65	2.0430E+02	1.3323E+01	5.7533E-01	5.8644E-02	1.0111E+01	1.2741E-01	5.8476E+02	1.0056E+00
9.70	1.9740E+02	1.2532E+01	5.7100E-01	5.8312E-02	1.0096E+01	1.2740E-01	5.8465E+02	1.0068E+00
9.75	2.0861E+02	1.2502E+01	5.6539E-01	5.7701E-02	1.0054E+01	1.2757E-01	5.8435E+02	1.0109E+00
9.80	2.1916E+02	2.2357E+01	5.5835E-01	5.7584E-02	9.9867E+00	1.2803E-01	5.8386E+02	1.0172E+00
9.85	2.0636E+02	1.6208E+01	5.5212E-01	5.6800E-02	9.9453E+00	1.2508E-01	5.8355E+02	9.9756E-01
9.90	1.8910E+02	9.0210E+00	5.4974E-01	5.6384E-02	9.9612E+00	1.2739E-01	5.8367E+02	1.0136E+00
9.95	2.0506E+02	8.1680E+00	5.4657E-01	5.6444E-02	9.9343E+00	1.2757E-01	5.8347E+02	1.0163E+00
10.00	2.1527E+02	1.0632E+01	5.4287E-01	5.6455E-02	9.8605E+00	1.3439E-01	5.8307E+02	1.0699E+00
10.05	2.2296E+02	1.3069E+01	5.3838E-01	5.7133E-02	9.8240E+00	1.2744E-01	5.8265E+02	1.0219E+00
10.10	2.0867E+02	2.2548E+01	5.3463E-01	5.6299E-02	9.7902E+00	1.3640E-01	5.8239E+02	1.0915E+00
10.15	2.0216E+02	8.1535E+00	5.3232E-01	5.6171E-02	9.7744E+00	1.2741E-01	5.8228E+02	1.0257E+00
10.20	2.0921E+02	1.1074E+01	5.2994E-01	5.6249E-02	9.7482E+00	1.2739E-01	5.8208E+02	1.0269E+00
10.25	2.2142E+02	1.0076E+01	5.2605E-01	5.6212E-02	9.6937E+00	1.2756E-01	5.8168E+02	1.0297E+00
10.30	2.1055E+02	8.5602E+00	5.2296E-01	5.6168E-02	9.6620E+00	1.2723E-01	5.8143E+02	1.0310E+00
10.35	1.9875E+02	8.4028E+00	5.2198E-01	5.6307E-02	9.6578E+00	1.2739E-01	5.8140E+02	1.0323E+00
10.40	2.0669E+02	1.0131E+01	5.2172E-01	5.6439E-02	9.6406E+00	1.2557E-01	5.8127E+02	1.0190E+00
10.45	2.2253E+02	9.4274E+00	5.1976E-01	5.6853E-02	9.5882E+00	1.2723E-01	5.8088E+02	1.0351E+00
10.50	2.2243E+02	1.1644E+01	5.1722E-01	5.6876E-02	9.5344E+00	1.2723E-01	5.8047E+02	1.0377E+00
10.55	2.0739E+02	1.3583E+01	5.1439E-01	5.6696E-02	9.4868E+00	1.2707E-01	5.8010E+02	1.0392E+00
10.60	1.6799E+02	7.2226E+00	5.1168E-01	5.6665E-02	9.4668E+00	1.2756E-01	5.7994E+02	1.0458E+00
10.65	1.6334E+02	1.1656E+01	5.0711E-01	5.5812E-02	9.4289E+00	1.2774E-01	5.7966E+02	1.0485E+00
10.70	1.6592E+02	1.2300E+01	5.0257E-01	5.5384E-02	9.3882E+00	1.2739E-01	5.7934E+02	1.0484E+00
10.75	1.7868E+02	1.1253E+01	4.9672E-01	5.4623E-02	9.3524E+00	1.2740E-01	5.7891E+02	1.0512E+00
10.80	1.8249E+02	9.6665E+00	4.9059E-01	5.3489E-02	9.2786E+00	1.2740E-01	5.7849E+02	1.0552E+00
10.85	1.8117E+02	1.2369E+01	4.8590E-01	5.2904E-02	9.2345E+00	1.2706E-01	5.7815E+02	1.0565E+00
10.90	1.6966E+02	1.1959E+01	4.8227E-01	5.2271E-02	9.1938E+00	1.2723E-01	5.7783E+02	1.0606E+00
10.95	1.7473E+02	1.0670E+01	4.7800E-01	5.1447E-02	9.1373E+00	1.2740E-01	5.7738E+02	1.0633E+00
11.00	1.6647E+02	8.9344E+00	4.7344E-01	5.0568E-02	9.0821E+00	1.2740E-01	5.7695E+02	1.0673E+00
11.05	1.5928E+02	1.0974E+01	4.6876E-01	4.9964E-02	9.0373E+00	1.2745E-01	5.7660E+02	1.0718E+00
11.10	1.4671E+02	8.3376E+00	4.6463E-01	4.9015E-02	9.0014E+00	1.2744E-01	5.7631E+02	1.0743E+00
11.15	1.4042E+02	4.9361E+00	4.6146E-01	4.8084E-02	8.9683E+00	1.2742E-01	5.7605E+02	1.0768E+00
11.20	1.4933E+02	6.5111E+00	4.5695E-01	4.6605E-02	8.9187E+00	1.2794E-01	5.7564E+02	1.0837E+00
11.25	1.4004E+02	1.7317E+01	4.5276E-01	4.5513E-02	8.8773E+00	1.2458E-01	5.7532E+02	1.0580E+00
11.30	1.3874E+02	6.0812E+00	4.4909E-01	4.4544E-02	8.8435E+00	1.2790E-01	5.7504E+02	1.0887E+00
11.35	1.4679E+02	2.8463E+01	4.4279E-01	4.3356E-02	8.7829E+00	1.2990E-01	5.7455E+02	1.1089E+00
11.40	1.4184E+02	3.1724E+01	4.3682E-01	4.1119E-02	8.7311E+00	1.3173E-01	5.7413E+02	1.1264E+00
11.45	1.3880E+02	1.7016E+01	4.3076E-01	3.9528E-02	8.6843E+00	1.2068E-01	5.7375E+02	1.0401E+00
11.50	1.3210E+02	8.3193E+00	4.2520E-01	3.9344E-02	8.6484E+00	1.2508E-01	5.7345E+02	1.0808E+00
11.55	1.3974E+02	7.5690E+00	4.1847E-01	3.8217E-02	8.6008E+00	1.2756E-01	5.7306E+02	1.1035E+00
11.60	1.3764E+02	8.2246E+00	4.1120E-01	3.7100E-02	8.5491E+00	1.2739E-01	5.7263E+02	1.1048E+00
11.65	1.3709E+02	8.3376E+00	4.0355E-01	3.6024E-02	8.4974E+00	1.2739E-01	5.7220E+02	1.1102E+00
11.70	1.3806E+02	8.6866E+00	3.9562E-01	3.4980E-02	8.4457E+00	1.2739E-01	5.7177E+02	1.1129E+00
11.75	1.4007E+02	8.9763E+00	3.8755E-01	3.3991E-02	8.3940E+00	1.2739E-01	5.7133E+02	1.1169E+00
11.80	1.4024E+02	9.1916E+00	3.7991E-01	3.3120E-02	8.3416E+00	1.2739E-01	5.7089E+02	1.1209E+00
11.85	1.4841E+02	9.1815E+00	3.7163E-01	3.2264E-02	8.2823E+00	1.2739E-01	5.7039E+02	1.1249E+00
11.90	1.5078E+02	8.7393E+00	3.6282E-01	3.1405E-02	8.2202E+00	1.2706E-01	5.6986E+02	1.1303E+00
11.95	1.5279E+02	1.0507E+01	3.5383E-01	3.0368E-02	8.1582E+00	1.2723E-01	5.6933E+02	1.1343E+00
12.00	1.4747E+02	1.0811E+01	3.4571E-01	2.8836E-02	8.1037E+00	1.2723E-01	5.6886E+02	1.1397E+00
12.05	1.3568E+02	1.0289E+01	3.3994E-01	2.7148E-02	8.0671E+00	1.2739E-01	5.6854E+02	1.1424E+00
12.10	1.5025E+02	1.0494E+01	3.3387E-01	2.5923E-02	8.0203E+00	1.2739E-01	5.6814E+02	1.1464E+00
12.15	1.4299E+02	1.0877E+01	3.2877E-01	2.5169E-02	7.9768E+00	1.2739E-01	5.6776E+02	1.1504E+00
12.20	1.5146E+02	1.0770E+01	3.2335E-01	2.4659E-02	7.9279E+00	1.2723E-01	5.6733E+02	1.1545E+00
12.25	1.5250E+02	1.0537E+01	3.1770E-01	2.4340E-02	7.8762E+00	1.2723E-01	5.6687E+02	1.1585E+00
12.30	1.5561E+02	1.0929E+01	3.1182E-01	2.4076E-02	7.8244E+00	1.2739E-01	5.6642E+02	1.1626E+00
12.35	1.5722E+02	1.0777E+01	3.0596E-01	2.3859E-02	7.7727E+00	1.2706E-01	5.6596E+02	1.1652E+00
12.40	1.5227E+02	1.1062E+01	3.0141E-01	2.3879E-02	7.7293E+00	1.2723E-01	5.6556E+02	1.1719E+00
12.45	1.6506E+02	1.1541E+01	2.9700E-01	2.3929E-02	7.6803E+00	1.2723E-01	5.6513E+02	1.1760E+00
12.50	1.7039E+02	1.1981E+01	2.9233E-01	2.4012E-02	7.6293E+00	1.2739E-01	5.6467E+02	1.1800E+00
12.55	1.6491E+02	1.1987E+01	2.8877E-01	2.4084E-02	7.5852E+00	1.2723E-01	5.6427E+02	1.1841E+00
12.60	1.7601E+02	1.2118E+01	2.8510E-01	2.4140E-02	7.5369E+00	1.2723E-01	5.6383E+02	1.1881E+00
12.65	1.7785E+02	1.1592E+01	2.8134E-01	2.4211E-02	7.4859E+00	1.2756E-01	5.6336E+02	1.1948E+00
12.70	1.8017E+02	1.2187E+01	2.7752E-01	2.4104E-02	7.4342E+00	1.2706E-01	5.6288E+02	1.1961E+00
12.75	1.7317E+02	1.3170E+01	2.7413E-01	2.4056E-02	7.3908E+00	1.2706E-01	5.6248E+02	1.2002E+00

Table D.1a (continued)

TIME (S)	JUN 08 G(KG/S-M**2) NOM. RESP.	JUN 08 G(KG/S-M**2) ST. DEV.	JUN 08 X NOM. RESP.	JUN 08 X ST. DEV.	VOL 08 P(MPA) NOM. RESP.	VOL 08 P(MPA) ST. DEV.	VOL 08 T(K) NOM. RESP.	VOL 08 T(K) ST. DEV.
12.80	1.7380E+02	1.2751E+01	2.7075E-01	2.3959E-02	7.3494E+00	1.2723E-01	5.6209E+02	1.2055E+00
12.85	1.6479E+02	1.1967E+01	2.6833E-01	2.3820E-02	7.3156E+00	1.2706E-01	5.6178E+02	1.2069E+00
12.90	1.6509E+02	1.2425E+01	2.6668E-01	2.3728E-02	7.2853E+00	1.2723E-01	5.6149E+02	1.2109E+00
12.95	1.7328E+02	1.2826E+01	2.6425E-01	2.3635E-02	7.2466E+00	1.2706E-01	5.6113E+02	1.2149E+00
13.00	1.5201E+02	1.2068E+01	2.6359E-01	2.3852E-02	7.2198E+00	1.2723E-01	5.6088E+02	1.2190E+00
13.05	1.7239E+02	1.2227E+01	2.6171E-01	2.3511E-02	7.1853E+00	1.2706E-01	5.6056E+02	1.2203E+00
13.10	1.6044E+02	1.8370E+01	2.5932E-01	2.3668E-02	7.1515E+00	1.2723E-01	5.6023E+02	1.2243E+00
13.15	1.9418E+02	1.5795E+01	2.5498E-01	2.2961E-02	7.1046E+00	1.2756E-01	5.5979E+02	1.2337E+00
13.20	1.7180E+02	1.4579E+01	2.5039E-01	2.2284E-02	7.0619E+00	1.2790E-01	5.5938E+02	1.1935E+00
13.25	1.8480E+02	1.4967E+01	2.4632E-01	2.2507E-02	7.0226E+00	1.2739E-01	5.5900E+02	1.2391E+00
13.30	1.9112E+02	1.4506E+01	2.4181E-01	2.2124E-02	6.9819E+00	1.2690E-01	5.5861E+02	1.2404E+00
13.35	2.0553E+02	1.4089E+01	2.3665E-01	2.1577E-02	6.9336E+00	1.2690E-01	5.5814E+02	1.2445E+00
13.40	1.9871E+02	1.5364E+01	2.3188E-01	2.1236E-02	6.8893E+00	1.2696E-01	5.5771E+02	1.2498E+00
13.45	1.8991E+02	1.4449E+01	2.2873E-01	2.0860E-02	6.8555E+00	1.2645E-01	5.5737E+02	1.2485E+00
13.50	1.9078E+02	1.5242E+01	2.2616E-01	2.0684E-02	6.8248E+00	1.2694E-01	5.5707E+02	1.2579E+00
13.55	2.0245E+02	1.5051E+01	2.2263E-01	2.0340E-02	6.7870E+00	1.2688E-01	5.5670E+02	1.2606E+00
13.60	1.9086E+02	1.5006E+01	2.1961E-01	2.0135E-02	6.7523E+00	1.2694E-01	5.5636E+02	1.2659E+00
13.65	1.8184E+02	1.4222E+01	2.1795E-01	1.9996E-02	6.7287E+00	1.2699E-01	5.5612E+02	1.2687E+00
13.70	1.9394E+02	1.4450E+01	2.1594E-01	1.9783E-02	6.7013E+00	1.2696E-01	5.5585E+02	1.2713E+00
13.75	1.9293E+02	1.3841E+01	2.1347E-01	1.9579E-02	6.6702E+00	1.2670E-01	5.5553E+02	1.2713E+00
13.80	1.7990E+02	1.3962E+01	2.1198E-01	1.9485E-02	6.6462E+00	1.2676E-01	5.5529E+02	1.2753E+00
13.85	1.7868E+02	1.3358E+01	2.1119E-01	1.9412E-02	6.6258E+00	1.2674E-01	5.5509E+02	1.2767E+00
13.90	1.9197E+02	1.3371E+01	2.0937E-01	1.9228E-02	6.5987E+00	1.2661E-01	5.5482E+02	1.2794E+00
13.95	1.7869E+02	1.4321E+01	2.0767E-01	1.9137E-02	6.5744E+00	1.2681E-01	5.5457E+02	1.2848E+00
14.00	1.9424E+02	1.3257E+01	2.0570E-01	1.8916E-02	6.5477E+00	1.2699E-01	5.5430E+02	1.2901E+00
14.05	1.9312E+02	4.4971E+01	2.0311E-01	1.8933E-02	6.5164E+00	1.0958E-01	5.5398E+02	1.1156E+00
14.10	1.8503E+02	1.8215E+01	2.0151E-01	1.8637E-02	6.4927E+00	1.1971E-01	5.5374E+02	1.2217E+00
14.15	1.8773E+02	1.6364E+01	2.0024E-01	1.8597E-02	6.4723E+00	1.1785E-01	5.5353E+02	1.2042E+00
14.20	1.8682E+02	1.6086E+01	1.9874E-01	1.8499E-02	6.4514E+00	1.1811E-01	5.5331E+02	1.2096E+00
14.25	1.8485E+02	1.6962E+01	1.9700E-01	1.8400E-02	6.4307E+00	1.1821E-01	5.5310E+02	1.2123E+00
14.30	1.8572E+02	1.7381E+01	1.9503E-01	1.8276E-02	6.4102E+00	1.1826E-01	5.5289E+02	1.2149E+00
14.35	1.9970E+02	2.4823E+01	1.9221E-01	1.8325E-02	6.3829E+00	1.1222E-01	5.5261E+02	1.1559E+00
14.40	1.7416E+02	3.4089E+01	1.9062E-01	1.8316E-02	6.3650E+00	1.2796E-01	5.5242E+02	1.3210E+00
14.45	1.9186E+02	1.7545E+01	1.8977E-01	1.8208E-02	6.3495E+00	1.1458E-01	5.5226E+02	1.1827E+00
14.50	2.0604E+02	3.3547E+01	1.8763E-01	1.8255E-02	6.3219E+00	1.1365E-01	5.5197E+02	1.1774E+00
14.55	1.9391E+02	2.9881E+01	1.8591E-01	1.8168E-02	6.2973E+00	1.2021E-01	5.5172E+02	1.2472E+00
14.60	1.9768E+02	2.0986E+01	1.8480E-01	1.8188E-02	6.2775E+00	1.1715E-01	5.5151E+02	1.2190E+00
14.65	1.9912E+02	5.0282E+01	1.8346E-01	1.8361E-02	6.2567E+00	1.1919E-01	5.5129E+02	1.2418E+00
14.70	2.0770E+02	5.0414E+01	1.8183E-01	1.6885E-02	6.2348E+00	1.1705E-01	5.5106E+02	1.2232E+00
14.75	2.0707E+02	5.6027E+01	1.7928E-01	1.9853E-02	6.2159E+00	1.1707E-01	5.5086E+02	1.2244E+00
14.80	1.9053E+02	4.7552E+01	1.7810E-01	2.0947E-02	6.2018E+00	1.2161E-01	5.5071E+02	1.2741E+00
14.85	2.2820E+02	8.7350E+01	1.7613E-01	1.7896E-02	6.1802E+00	1.1595E-01	5.5048E+02	1.2163E+00
14.90	1.9322E+02	1.5153E+02	1.7318E-01	2.0288E-02	6.1598E+00	1.2045E-01	5.5026E+02	1.2673E+00
14.95	2.0994E+02	9.8378E+01	1.7267E-01	1.8889E-02	6.1457E+00	1.2085E-01	5.5011E+02	1.2727E+00
15.00	2.1838E+02	8.3261E+01	1.6988E-01	1.8981E-02	6.1248E+00	1.1667E-01	5.4989E+02	1.2313E+00

Table D.1b. Test 3.06.6B, fluid uncertainties (one standard deviation), L = 3.9 ft

TIME (S)	JUN 08 G(LBM/HR-FT**2) NOM. RESP.	JUN 08 G(LBM/HR-FT**2) ST. DEV.	JUN 08 X NOM. RESP.	JUN 08 X ST. DEV.	VOL 08 P(PSIA) NOM. RESP.	VOL 08 P(PSIA) ST. DEV.	VOL 08 T(F) NOM. RESP.	VOL 08 T(F) ST. DEV.
5.65	2.2347E+05	1.1506E+04	6.8163E-01	1.0156E-01	1.7780E+03	1.8500E+01	6.1931E+02	1.6286E+00
5.70	2.1951E+05	1.0252E+04	6.8830E-01	1.0065E-01	1.7744E+03	1.8501E+01	6.1903E+02	1.6310E+00
5.75	2.1415E+05	1.0390E+04	6.9495E-01	9.9991E-02	1.7724E+03	1.8500E+01	6.1887E+02	1.6334E+00
5.80	2.1072E+05	9.7382E+03	7.0224E-01	9.9632E-02	1.7720E+03	1.8524E+01	6.1884E+02	1.6334E+00
5.85	2.1790E+05	1.0960E+04	7.0840E-01	9.9119E-02	1.7663E+03	1.8500E+01	6.1840E+02	1.6334E+00
5.90	2.1491E+05	1.0683E+04	7.1404E-01	9.8648E-02	1.7598E+03	1.8549E+01	6.1789E+02	1.6407E+00
5.95	2.1021E+05	8.8394E+03	7.1942E-01	9.8272E-02	1.7559E+03	1.8501E+01	6.1758E+02	1.6407E+00
6.00	2.0039E+05	1.5731E+04	7.2532E-01	9.8299E-02	1.7562E+03	1.8559E+01	6.1760E+02	1.6443E+00
6.05	2.0855E+05	1.8127E+04	7.3023E-01	9.7703E-02	1.7527E+03	1.9082E+01	6.1733E+02	1.6867E+00
6.10	2.0209E+05	1.0630E+04	7.3426E-01	9.7249E-02	1.7485E+03	1.8597E+01	6.1700E+02	1.6504E+00
6.15	2.0367E+05	9.7430E+03	7.3766E-01	9.6393E-02	1.7428E+03	1.8459E+01	6.1655E+02	1.6412E+00
6.20	1.9795E+05	9.0265E+03	7.4204E-01	9.6471E-02	1.7413E+03	1.8501E+01	6.1643E+02	1.6456E+00
6.25	2.0065E+05	9.0529E+03	7.4543E-01	9.6168E-02	1.7366E+03	1.8477E+01	6.1606E+02	1.6480E+00
6.30	1.8724E+05	9.2221E+03	7.5018E-01	9.6240E-02	1.7375E+03	1.8307E+01	6.1613E+02	1.6335E+00
6.35	1.9294E+05	8.6601E+03	7.5442E-01	9.6060E-02	1.7357E+03	1.8525E+01	6.1599E+02	1.6528E+00
6.40	1.9668E+05	8.7331E+03	7.5703E-01	9.5664E-02	1.7292E+03	1.8476E+01	6.1547E+02	1.6504E+00
6.45	1.9719E+05	8.6822E+03	7.5831E-01	9.5115E-02	1.7217E+03	1.8476E+01	6.1487E+02	1.6576E+00
6.50	1.8849E+05	7.6537E+03	7.6001E-01	9.4716E-02	1.7186E+03	1.8452E+01	6.1462E+02	1.6576E+00
6.55	1.9113E+05	8.1508E+03	7.6121E-01	9.4229E-02	1.7148E+03	1.8476E+01	6.1431E+02	1.6600E+00
6.60	1.8741E+05	7.8835E+03	7.6171E-01	9.3684E-02	1.7112E+03	1.8476E+01	6.1403E+02	1.6625E+00
6.65	1.8180E+05	7.5453E+03	7.6315E-01	9.3391E-02	1.7104E+03	1.8525E+01	6.1397E+02	1.6625E+00
6.70	1.8279E+05	7.7472E+03	7.6503E-01	9.3224E-02	1.7093E+03	1.8476E+01	6.1387E+02	1.6624E+00
6.75	1.9227E+05	8.4471E+03	7.6445E-01	9.2832E-02	1.7008E+03	1.8500E+01	6.1319E+02	1.6673E+00
6.80	1.9075E+05	8.1054E+03	7.6254E-01	9.2604E-02	1.6925E+03	1.8484E+01	6.1253E+02	1.6728E+00
6.85	1.7262E+05	4.5773E+03	7.6305E-01	9.1900E-02	1.6946E+03	1.8505E+01	6.1269E+02	1.6725E+00
6.90	1.7623E+05	7.1184E+03	7.6414E-01	9.1808E-02	1.6950E+03	1.8476E+01	6.1273E+02	1.6697E+00
6.95	1.8036E+05	8.1154E+03	7.6467E-01	9.1396E-02	1.6916E+03	1.8477E+01	6.1245E+02	1.6722E+00
7.00	1.9176E+05	1.5985E+04	7.6135E-01	8.9776E-02	1.6785E+03	1.8531E+01	6.1138E+02	1.6838E+00
7.05	1.8192E+05	7.4202E+03	7.5886E-01	9.0011E-02	1.6731E+03	1.8477E+01	6.1094E+02	1.6842E+00
7.10	1.7088E+05	1.1761E+04	7.5848E-01	8.9703E-02	1.6746E+03	1.8453E+01	6.1107E+02	1.6794E+00
7.15	1.6895E+05	7.0183E+03	7.5885E-01	8.9356E-02	1.6763E+03	1.8404E+01	6.1120E+02	1.6770E+00
7.20	1.7920E+05	2.3532E+04	7.5740E-01	8.8681E-02	1.6697E+03	1.8497E+01	6.1067E+02	1.6835E+00
7.25	1.8338E+05	2.0974E+04	7.5430E-01	8.3044E-02	1.6593E+03	1.8567E+01	6.0981E+02	1.6989E+00
7.30	1.8687E+05	2.7766E+04	7.5011E-01	8.2103E-02	1.6508E+03	1.8483E+01	6.0911E+02	1.6944E+00
7.35	1.5602E+05	7.2825E+03	7.5142E-01	8.0888E-02	1.6592E+03	1.8503E+01	6.0981E+02	1.6917E+00
7.40	1.6243E+05	8.4205E+03	7.5302E-01	8.0683E-02	1.6625E+03	1.8283E+01	6.1007E+02	1.6745E+00
7.45	1.7951E+05	6.6885E+04	7.5028E-01	7.4116E-02	1.6502E+03	1.8637E+01	6.0906E+02	1.7096E+00
7.50	1.8676E+05	4.4244E+04	7.4107E-01	5.9531E-02	1.6318E+03	1.8526E+01	6.0754E+02	1.7085E+00
7.55	1.6981E+05	4.2920E+04	7.4441E-01	5.9771E-02	1.6343E+03	1.7705E+01	6.0775E+02	1.6400E+00
7.60	1.5101E+05	4.0171E+04	7.4814E-01	5.8408E-02	1.6459E+03	1.9240E+01	6.0871E+02	1.7599E+00
7.65	1.6535E+05	1.9576E+04	7.4660E-01	5.9879E-02	1.6397E+03	1.8632E+01	6.0820E+02	1.7137E+00
7.70	1.8791E+05	1.3719E+04	7.3996E-01	5.3676E-02	1.6245E+03	1.4534E+01	6.0693E+02	1.3787E+00
7.75	1.7312E+05	3.4149E+04	7.2939E-01	5.3643E-02	1.6087E+03	1.6342E+01	6.0561E+02	1.5381E+00
7.80	1.4627E+05	8.6762E+03	7.2943E-01	5.9185E-02	1.6224E+03	1.8069E+01	6.0675E+02	1.6789E+00
7.85	1.5070E+05	7.6995E+03	7.2845E-01	6.3816E-02	1.6271E+03	1.8476E+01	6.0715E+02	1.7084E+00
7.90	1.6487E+05	3.6512E+04	7.2436E-01	6.9059E-02	1.6169E+03	1.8607E+01	6.0630E+02	1.7265E+00
7.95	1.9232E+05	1.9969E+04	7.1235E-01	5.6920E-02	1.5977E+03	1.8558E+01	6.0468E+02	1.7333E+00
8.00	1.7634E+05	5.0973E+04	7.0860E-01	6.4312E-02	1.5954E+03	1.7288E+01	6.0448E+02	1.6231E+00
8.05	1.4072E+05	1.0447E+04	7.0986E-01	6.6903E-02	1.6097E+03	1.8174E+01	6.0569E+02	1.6901E+00
8.10	1.5413E+05	8.9616E+03	7.0903E-01	7.1276E-02	1.6082E+03	1.8404E+01	6.0556E+02	1.7156E+00
8.15	1.6793E+05	4.6842E+04	7.0617E-01	7.2771E-02	1.5960E+03	1.7254E+01	6.0453E+02	1.6233E+00
8.20	1.8901E+05	1.7415E+04	6.9636E-01	6.3025E-02	1.5775E+03	1.7788E+01	6.0296E+02	1.6756E+00
8.25	1.6641E+05	3.2357E+04	7.0405E-01	7.5221E-02	1.5867E+03	1.9191E+01	6.0374E+02	1.7944E+00
8.30	1.3912E+05	1.0202E+04	7.0623E-01	7.4373E-02	1.5928E+03	1.8414E+01	6.0426E+02	1.7237E+00
8.35	1.5628E+05	1.0972E+04	7.0411E-01	7.7952E-02	1.5849E+03	1.8579E+01	6.0358E+02	1.7427E+00
8.40	1.7378E+05	9.6989E+03	6.9747E-01	8.2008E-02	1.5713E+03	1.8241E+01	6.0242E+02	1.7234E+00
8.45	1.6922E+05	2.1346E+04	6.8830E-01	9.0796E-02	1.5621E+03	1.8516E+01	6.0164E+02	1.7508E+00
8.50	1.3595E+05	1.3795E+04	6.8667E-01	9.6724E-02	1.5743E+03	1.7444E+01	6.0268E+02	1.6509E+00
8.55	1.4505E+05	1.1157E+04	6.8340E-01	1.0118E-01	1.5759E+03	1.8452E+01	6.0282E+02	1.7373E+00
8.60	1.5764E+05	1.2097E+04	6.7630E-01	1.0490E-01	1.5639E+03	1.8454E+01	6.0179E+02	1.7448E+00
8.65	1.7456E+05	2.5255E+04	6.6733E-01	1.0376E-01	1.5488E+03	1.8493E+01	6.0049E+02	1.7605E+00
8.70	1.4558E+05	3.5741E+04	6.6345E-01	1.1687E-01	1.5531E+03	1.9009E+01	6.0086E+02	1.7994E+00
8.75	1.3765E+05	1.1062E+04	6.6205E-01	1.1800E-01	1.5594E+03	1.8935E+01	6.0141E+02	1.7905E+00
8.80	1.4926E+05	1.7346E+04	6.5809E-01	1.1648E-01	1.5525E+03	1.8574E+01	6.0081E+02	1.7617E+00
8.85	1.6281E+05	1.6016E+04	6.5343E-01	1.1206E-01	1.5428E+03	1.8917E+01	5.9996E+02	1.7983E+00
8.90	1.6791E+05	2.5179E+04	6.4659E-01	1.0501E-01	1.5334E+03	1.7759E+01	5.9915E+02	1.7018E+00
8.95	1.3304E+05	1.1412E+04	6.4517E-01	9.9097E-02	1.5395E+03	1.7947E+01	5.9967E+02	1.7159E+00
9.00	1.4307E+05	1.1250E+04	6.4294E-01	9.3428E-02	1.5384E+03	1.8573E+01	5.9958E+02	1.7688E+00

Table D.1b (continued)

TIME (S)	JUN 08 G(LBM/HR-FT**2) NOM. RESP.	JUN 08 G(LBM/HR-FT**2) ST. DEV.	JUN 08 X NOM. RESP.	JUN 08 X ST. DEV.	VOL 08 P(PSIA) NOM. RESP.	VOL 08 P(PSIA) ST. DEV.	VOL 08 T(F) NOM. RESP.	VOL 08 T(F) ST. DEV.
9.05	1.5485E+05	1.0825E+04	6.3810E-01	8.7260E-02	1.5298E+03	1.8500E+01	5.9883E+02	1.7688E+00
9.10	1.5792E+05	1.1400E+04	6.3111E-01	8.1391E-02	1.5189E+03	1.8501E+01	5.9787E+02	1.7785E+00
9.15	1.3957E+05	9.4132E+03	6.2772E-01	7.6704E-02	1.5192E+03	1.8310E+01	5.9790E+02	1.7618E+00
9.20	1.4242E+05	8.4290E+03	6.2454E-01	7.3259E-02	1.5184E+03	1.8500E+01	5.9783E+02	1.7760E+00
9.25	1.4425E+05	8.2341E+03	6.2084E-01	7.0261E-02	1.5147E+03	1.8524E+01	5.9750E+02	1.7809E+00
9.30	1.5325E+05	9.9776E+03	6.1530E-01	6.7556E-02	1.5068E+03	1.8503E+01	5.9680E+02	1.7860E+00
9.35	1.5164E+05	7.8611E+03	6.0846E-01	6.4191E-02	1.4989E+03	1.7905E+01	5.9610E+02	1.7379E+00
9.40	1.4513E+05	1.0599E+04	6.0251E-01	6.3328E-02	1.4946E+03	1.8913E+01	5.9571E+02	1.8294E+00
9.45	1.3418E+05	1.1969E+04	6.0028E-01	6.1992E-02	1.4977E+03	1.8573E+01	5.9599E+02	1.7978E+00
9.50	1.4955E+05	1.4250E+04	5.9533E-01	6.1187E-02	1.4921E+03	1.8501E+01	5.9550E+02	1.7930E+00
9.55	1.6455E+05	2.4076E+04	5.8860E-01	6.0588E-02	1.4811E+03	1.8489E+01	5.9451E+02	1.8013E+00
9.60	1.5796E+05	6.7537E+03	5.8147E-01	5.9023E-02	1.4721E+03	1.8486E+01	5.9370E+02	1.8083E+00
9.65	1.5063E+05	9.8227E+03	5.7533E-01	5.8644E-02	1.4664E+03	1.8478E+01	5.9318E+02	1.8100E+00
9.70	1.4554E+05	9.2396E+03	5.7100E-01	5.8312E-02	1.4642E+03	1.8477E+01	5.9298E+02	1.8123E+00
9.75	1.5381E+05	9.2178E+03	5.6539E-01	5.7701E-02	1.4582E+03	1.8502E+01	5.9244E+02	1.8197E+00
9.80	1.6159E+05	1.6484E+04	5.5835E-01	5.7584E-02	1.4484E+03	1.8569E+01	5.9155E+02	1.8310E+00
9.85	1.5215E+05	1.1950E+04	5.5212E-01	5.6800E-02	1.4424E+03	1.8140E+01	5.9100E+02	1.7956E+00
9.90	1.3942E+05	6.6512E+03	5.4974E-01	5.6384E-02	1.4447E+03	1.8476E+01	5.9121E+02	1.8244E+00
9.95	1.5119E+05	6.0223E+03	5.4657E-01	5.6444E-02	1.4408E+03	1.8502E+01	5.9086E+02	1.8293E+00
10.00	1.5872E+05	7.8390E+03	5.4287E-01	5.6455E-02	1.4330E+03	1.9491E+01	5.9013E+02	1.9259E+00
10.05	1.6439E+05	9.6360E+03	5.3838E-01	5.7133E-02	1.4248E+03	1.8483E+01	5.8933E+02	1.8394E+00
10.10	1.5385E+05	1.6625E+04	5.3463E-01	5.6299E-02	1.4199E+03	1.9783E+01	5.8892E+02	1.9647E+00
10.15	1.4905E+05	6.0116E+03	5.3232E-01	5.6171E-02	1.4176E+03	1.8478E+01	5.8871E+02	1.8462E+00
10.20	1.5425E+05	8.1647E+03	5.2994E-01	5.6249E-02	1.4138E+03	1.8476E+01	5.8836E+02	1.8485E+00
10.25	1.6325E+05	7.4287E+03	5.2605E-01	5.6212E-02	1.4059E+03	1.8500E+01	5.8763E+02	1.8534E+00
10.30	1.5524E+05	6.3114E+03	5.2296E-01	5.6168E-02	1.4013E+03	1.8453E+01	5.8719E+02	1.8558E+00
10.35	1.4654E+05	6.1954E+03	5.2198E-01	5.6307E-02	1.4007E+03	1.8476E+01	5.8713E+02	1.8582E+00
10.40	1.5239E+05	7.4698E+03	5.2172E-01	5.6439E-02	1.3982E+03	1.8212E+01	5.8690E+02	1.8342E+00
10.45	1.6407E+05	6.9508E+03	5.1976E-01	5.6853E-02	1.3906E+03	1.8452E+01	5.8619E+02	1.8631E+00
10.50	1.6400E+05	8.5853E+03	5.1722E-01	5.6876E-02	1.3828E+03	1.8452E+01	5.8545E+02	1.8679E+00
10.55	1.5291E+05	1.0015E+04	5.1439E-01	5.6696E-02	1.3759E+03	1.8430E+01	5.8479E+02	1.8705E+00
10.60	1.2386E+05	5.3252E+03	5.1168E-01	5.6665E-02	1.3730E+03	1.8501E+01	5.8451E+02	1.8824E+00
10.65	1.2043E+05	8.5937E+03	5.0711E-01	5.5812E-02	1.3675E+03	1.8526E+01	5.8399E+02	1.8873E+00
10.70	1.2233E+05	9.0686E+03	5.0257E-01	5.5384E-02	1.3616E+03	1.8476E+01	5.8342E+02	1.8872E+00
10.75	1.3174E+05	8.2969E+03	4.9672E-01	5.4623E-02	1.3535E+03	1.8477E+01	5.8265E+02	1.8921E+00
10.80	1.3455E+05	7.1271E+03	4.9059E-01	5.3489E-02	1.3457E+03	1.8477E+01	5.8190E+02	1.8994E+00
10.85	1.3358E+05	9.1199E+03	4.8590E-01	5.2904E-02	1.3393E+03	1.8428E+01	5.8128E+02	1.9017E+00
10.90	1.2509E+05	8.8175E+03	4.8227E-01	5.2271E-02	1.3334E+03	1.8453E+01	5.8071E+02	1.9090E+00
10.95	1.2883E+05	7.8668E+03	4.7800E-01	5.1447E-02	1.3252E+03	1.8477E+01	5.7990E+02	1.9139E+00
11.00	1.2274E+05	6.5873E+03	4.7344E-01	5.0568E-02	1.3172E+03	1.8477E+01	5.7912E+02	1.9211E+00
11.05	1.1744E+05	8.0914E+03	4.6876E-01	4.9964E-02	1.3107E+03	1.8485E+01	5.7849E+02	1.9292E+00
11.10	1.0817E+05	6.1473E+03	4.6463E-01	4.9015E-02	1.3055E+03	1.8483E+01	5.7797E+02	1.9338E+00
11.15	1.0353E+05	3.6394E+03	4.6146E-01	4.8084E-02	1.3007E+03	1.8480E+01	5.7750E+02	1.9383E+00
11.20	1.1010E+05	4.8006E+03	4.5695E-01	4.6605E-02	1.2935E+03	1.8555E+01	5.7677E+02	1.9507E+00
11.25	1.0325E+05	1.2768E+04	4.5276E-01	4.5513E-02	1.2875E+03	1.8068E+01	5.7618E+02	1.9044E+00
11.30	1.0229E+05	4.4837E+03	4.4909E-01	4.4544E-02	1.2826E+03	1.8549E+01	5.7568E+02	1.9597E+00
11.35	1.0823E+05	2.0986E+04	4.4279E-01	4.3356E-02	1.2738E+03	1.8840E+01	5.7480E+02	1.9961E+00
11.40	1.0458E+05	2.3390E+04	4.3682E-01	4.1119E-02	1.2663E+03	1.9105E+01	5.7404E+02	2.0275E+00
11.45	1.0234E+05	1.2546E+04	4.3076E-01	3.9528E-02	1.2595E+03	1.7503E+01	5.7336E+02	1.8721E+00
11.50	9.7400E+04	6.1338E+03	4.2520E-01	3.9344E-02	1.2543E+03	1.8140E+01	5.7282E+02	1.9454E+00
11.55	1.0303E+05	5.5806E+03	4.1847E-01	3.8217E-02	1.2474E+03	1.8500E+01	5.7212E+02	1.9863E+00
11.60	1.0148E+05	6.0640E+03	4.1120E-01	3.7100E-02	1.2399E+03	1.8476E+01	5.7135E+02	1.9887E+00
11.65	1.0108E+05	6.1473E+03	4.0355E-01	3.6024E-02	1.2324E+03	1.8476E+01	5.7057E+02	1.9983E+00
11.70	1.0179E+05	6.4046E+03	3.9562E-01	3.4980E-02	1.2249E+03	1.8476E+01	5.6979E+02	2.0032E+00
11.75	1.0327E+05	6.6182E+03	3.8755E-01	3.3991E-02	1.2174E+03	1.8476E+01	5.6901E+02	2.0104E+00
11.80	1.0340E+05	6.7770E+03	3.7991E-01	3.3120E-02	1.2098E+03	1.8476E+01	5.6822E+02	2.0177E+00
11.85	1.0942E+05	6.7695E+03	3.7163E-01	3.2264E-02	1.2012E+03	1.8476E+01	5.6731E+02	2.0249E+00
11.90	1.1117E+05	6.4435E+03	3.6282E-01	3.1405E-02	1.1922E+03	1.8428E+01	5.6636E+02	2.0346E+00
11.95	1.1265E+05	7.7470E+03	3.5383E-01	3.0368E-02	1.1832E+03	1.8452E+01	5.6540E+02	2.0418E+00
12.00	1.0873E+05	7.9711E+03	3.4571E-01	2.8836E-02	1.1753E+03	1.8452E+01	5.6455E+02	2.0515E+00
12.05	1.0004E+05	7.5862E+03	3.3994E-01	2.7148E-02	1.1700E+03	1.8476E+01	5.6399E+02	2.0563E+00
12.10	1.1078E+05	7.7375E+03	3.3387E-01	2.5923E-02	1.1632E+03	1.8476E+01	5.6326E+02	2.0636E+00
12.15	1.0543E+05	8.0195E+03	3.2877E-01	2.5169E-02	1.1569E+03	1.8476E+01	5.6257E+02	2.0708E+00
12.20	1.1167E+05	7.9410E+03	3.2335E-01	2.4659E-02	1.1498E+03	1.8452E+01	5.6180E+02	2.0781E+00
12.25	1.1244E+05	7.7686E+03	3.1770E-01	2.4340E-02	1.1423E+03	1.8452E+01	5.6098E+02	2.0855E+00
12.30	1.1473E+05	8.0582E+03	3.1182E-01	2.4076E-02	1.1348E+03	1.8476E+01	5.6016E+02	2.0926E+00
12.35	1.1592E+05	7.9461E+03	3.0596E-01	2.3859E-02	1.1273E+03	1.8428E+01	5.5933E+02	2.0974E+00
12.40	1.1227E+05	8.1560E+03	3.0141E-01	2.3879E-02	1.1210E+03	1.8452E+01	5.5862E+02	2.1095E+00
12.45	1.2170E+05	8.5091E+03	2.9700E-01	2.3929E-02	1.1139E+03	1.8452E+01	5.5784E+02	2.1168E+00
12.50	1.2563E+05	8.8333E+03	2.9233E-01	2.4012E-02	1.1065E+03	1.8476E+01	5.5701E+02	2.1240E+00
12.55	1.2159E+05	8.8382E+03	2.8877E-01	2.4084E-02	1.1001E+03	1.8452E+01	5.5629E+02	2.1313E+00
12.60	1.2977E+05	8.9344E+03	2.8510E-01	2.4140E-02	1.0931E+03	1.8452E+01	5.5550E+02	2.1385E+00
12.65	1.3113E+05	8.5469E+03	2.8134E-01	2.4211E-02	1.0857E+03	1.8500E+01	5.5465E+02	2.1506E+00
12.70	1.3284E+05	8.9856E+03	2.7752E-01	2.4104E-02	1.0782E+03	1.8428E+01	5.5380E+02	2.1530E+00
12.75	1.2768E+05	9.7104E+03	2.7413E-01	2.4056E-02	1.0719E+03	1.8428E+01	5.5307E+02	2.1603E+00

Table D.1b (continued)

TIME (S)	JUN 08 G(LBM/HR-FT**2) NOM. RESP.	JUN 08 G(LBM/HR-FT**2) ST. DEV.	JUN 08 X NOM. RESP.	JUN 08 X ST. DEV.	VOL 08 P(PSIA) NOM. RESP.	VOL 08 P(PSIA) ST. DEV.	VOL 08 T(F) NOM. RESP.	VOL 08 T(F) ST. DEV.
12.80	1.2814E+05	9.4016E+03	2.7075E-01	2.3959E-02	1.0659E+03	1.8452E+01	5.5238E+02	2.1699E+00
12.85	1.2150E+05	8.8233E+03	2.6833E-01	2.3820E-02	1.0610E+03	1.8428E+01	5.5182E+02	2.1724E+00
12.90	1.2172E+05	9.1606E+03	2.6668E-01	2.3728E-02	1.0566E+03	1.8452E+01	5.5130E+02	2.1796E+00
12.95	1.2776E+05	9.4568E+03	2.6425E-01	2.3635E-02	1.0510E+03	1.8428E+01	5.5065E+02	2.1868E+00
13.00	1.1208E+05	8.8974E+03	2.6359E-01	2.3852E-02	1.0471E+03	1.8452E+01	5.5020E+02	2.1942E+00
13.05	1.2710E+05	9.0146E+03	2.6171E-01	2.3511E-02	1.0421E+03	1.8428E+01	5.4961E+02	2.1965E+00
13.10	1.1829E+05	1.3544E+04	2.5932E-01	2.3668E-02	1.0372E+03	1.8452E+01	5.4903E+02	2.2038E+00
13.15	1.4317E+05	1.1646E+04	2.5498E-01	2.2961E-02	1.0304E+03	1.8501E+01	5.4823E+02	2.2207E+00
13.20	1.2667E+05	1.0749E+04	2.5039E-01	2.2284E-02	1.0242E+03	1.7825E+01	5.4749E+02	2.1483E+00
13.25	1.3625E+05	1.1035E+04	2.4632E-01	2.2507E-02	1.0185E+03	1.8476E+01	5.4681E+02	2.2304E+00
13.30	1.4091E+05	1.0695E+04	2.4181E-01	2.2124E-02	1.0126E+03	1.8404E+01	5.4610E+02	2.2328E+00
13.35	1.5154E+05	1.0388E+04	2.3665E-01	2.1577E-02	1.0056E+03	1.8404E+01	5.4526E+02	2.2401E+00
13.40	1.4651E+05	1.1328E+04	2.3188E-01	2.1236E-02	9.9917E+02	1.8413E+01	5.4448E+02	2.2497E+00
13.45	1.4002E+05	1.0653E+04	2.2873E-01	2.0860E-02	9.9427E+02	1.8339E+01	5.4388E+02	2.2473E+00
13.50	1.4066E+05	1.1238E+04	2.2616E-01	2.0684E-02	9.8982E+02	1.8411E+01	5.4334E+02	2.2642E+00
13.55	1.4927E+05	1.1097E+04	2.2263E-01	2.0340E-02	9.8434E+02	1.8402E+01	5.4267E+02	2.2691E+00
13.60	1.4072E+05	1.1064E+04	2.1961E-01	2.0135E-02	9.7931E+02	1.8411E+01	5.4205E+02	2.2787E+00
13.65	1.3407E+05	1.0486E+04	2.1795E-01	1.9996E-02	9.7588E+02	1.8418E+01	5.4163E+02	2.2836E+00
13.70	1.4299E+05	1.0654E+04	2.1594E-01	1.9783E-02	9.7191E+02	1.8413E+01	5.4114E+02	2.2884E+00
13.75	1.4225E+05	1.0205E+04	2.1347E-01	1.9579E-02	9.6739E+02	1.8375E+01	5.4057E+02	2.2884E+00
13.80	1.3264E+05	1.0294E+04	2.1198E-01	1.9485E-02	9.6391E+02	1.8384E+01	5.4014E+02	2.2956E+00
13.85	1.3174E+05	9.8492E+03	2.1119E-01	1.9412E-02	9.6096E+02	1.8382E+01	5.3977E+02	2.2980E+00
13.90	1.4154E+05	9.8582E+03	2.0937E-01	1.9228E-02	9.5702E+02	1.8363E+01	5.3928E+02	2.3029E+00
13.95	1.3175E+05	1.0559E+04	2.0767E-01	1.9137E-02	9.5350E+02	1.8392E+01	5.3883E+02	2.3126E+00
14.00	1.4321E+05	9.7744E+03	2.0570E-01	1.8916E-02	9.4963E+02	1.8418E+01	5.3835E+02	2.3222E+00
14.05	1.4239E+05	3.3157E+04	2.0311E-01	1.8935E-02	9.4509E+02	1.5893E+01	5.3777E+02	2.0081E+00
14.10	1.3642E+05	1.3430E+04	2.0151E-01	1.8637E-02	9.4165E+02	1.7362E+01	5.3734E+02	2.1990E+00
14.15	1.3841E+05	1.2065E+04	2.0024E-01	1.8597E-02	9.3869E+02	1.7092E+01	5.3696E+02	2.1676E+00
14.20	1.3774E+05	1.1860E+04	1.9874E-01	1.8499E-02	9.3567E+02	1.7130E+01	5.3657E+02	2.1772E+00
14.25	1.3629E+05	1.2506E+04	1.9700E-01	1.8400E-02	9.3266E+02	1.7145E+01	5.3619E+02	2.1821E+00
14.30	1.3693E+05	1.2815E+04	1.9503E-01	1.8276E-02	9.2969E+02	1.7152E+01	5.3581E+02	2.1869E+00
14.35	1.4724E+05	1.8302E+04	1.9221E-01	1.8325E-02	9.2573E+02	1.6275E+01	5.3530E+02	2.0806E+00
14.40	1.2841E+05	2.5134E+04	1.9062E-01	1.8316E-02	9.2313E+02	1.8558E+01	5.3497E+02	2.3778E+00
14.45	1.4146E+05	1.2936E+04	1.8977E-01	1.8208E-02	9.2088E+02	1.6618E+01	5.3468E+02	2.1289E+00
14.50	1.5191E+05	2.4734E+04	1.8763E-01	1.8255E-02	9.1688E+02	1.6483E+01	5.3416E+02	2.1193E+00
14.55	1.4297E+05	2.2031E+04	1.8591E-01	1.8168E-02	9.1332E+02	1.7435E+01	5.3370E+02	2.2449E+00
14.60	1.4575E+05	1.5473E+04	1.8480E-01	1.8188E-02	9.1042E+02	1.6990E+01	5.3332E+02	2.1942E+00
14.65	1.4681E+05	3.7073E+04	1.8346E-01	1.8361E-02	9.0743E+02	1.7287E+01	5.3293E+02	2.2353E+00
14.70	1.5314E+05	3.7170E+04	1.8183E-01	1.6885E-02	9.0425E+02	1.6976E+01	5.3251E+02	2.2017E+00
14.75	1.5267E+05	4.1309E+04	1.7928E-01	1.9853E-02	9.0151E+02	1.6979E+01	5.3215E+02	2.2039E+00
14.80	1.4048E+05	3.5060E+04	1.7810E-01	2.0947E-02	8.9947E+02	1.7638E+01	5.3189E+02	2.2933E+00
14.85	1.6825E+05	6.4403E+04	1.7613E-01	1.7896E-02	8.9633E+02	1.6817E+01	5.3147E+02	2.1894E+00
14.90	1.4246E+05	1.1172E+05	1.7318E-01	2.0288E-02	8.9337E+02	1.7469E+01	5.3108E+02	2.2811E+00
14.95	1.5479E+05	7.2534E+04	1.7267E-01	1.8889E-02	8.9132E+02	1.7527E+01	5.3081E+02	2.2908E+00
15.00	1.6101E+05	6.1388E+04	1.6988E-01	1.8981E-02	8.8830E+02	1.6921E+01	5.3041E+02	2.2163E+00

Table D.2a. Test 3.06.6B, fluid uncertainties (one standard deviation), L = 183 cm

TIME (S)	JUN 11 G(KG/S-M**2) NOM. RESP.	JUN 11 G(KG/S-M**2) ST. DEV.	JUN 11 X NOM. RESP.	JUN 11 X ST. DEV.	VOL 11 P(MPA) NOM. RESP.	VOL 11 P(MPA) ST. DEV.	VOL 11 T(K) NOM. RESP.	VOL 11 T(K) ST. DEV.
5.35	3.5334E+02	2.5360E+01	7.3883E-01	1.3588E-01	1.2405E+01	1.2757E-01	6.0019E+02	9.0078E-01
5.40	3.4439E+02	2.6240E+01	7.5306E-01	1.3539E-01	1.2373E+01	1.2756E-01	5.9999E+02	9.0211E-01
5.45	3.3365E+02	2.2365E+01	7.6568E-01	1.3443E-01	1.2349E+01	1.2790E-01	5.9984E+02	9.0344E-01
5.50	3.2374E+02	2.1596E+01	7.7746E-01	1.3320E-01	1.2334E+01	1.2690E-01	5.9974E+02	8.9811E-01
5.55	3.2138E+02	1.8235E+01	7.8849E-01	1.3179E-01	1.2317E+01	1.2941E-01	5.9964E+02	9.1561E-01
5.60	3.2374E+02	1.9786E+01	7.9889E-01	1.3010E-01	1.2288E+01	1.2673E-01	5.9946E+02	8.9944E-01
5.65	3.1877E+02	1.9957E+01	8.0948E-01	1.2849E-01	1.2255E+01	1.2756E-01	5.9926E+02	9.0611E-01
5.70	3.1194E+02	1.7357E+01	8.2046E-01	1.2713E-01	1.2231E+01	1.2756E-01	5.9910E+02	9.0611E-01
5.75	3.0349E+02	1.7283E+01	8.3172E-01	1.2600E-01	1.2217E+01	1.2756E-01	5.9901E+02	9.0611E-01
5.80	2.9768E+02	1.5781E+01	8.4331E-01	1.2506E-01	1.2214E+01	1.2772E-01	5.9899E+02	9.0878E-01
5.85	3.1051E+02	1.7903E+01	8.5266E-01	1.2380E-01	1.2175E+01	1.2756E-01	5.9874E+02	9.0878E-01
5.90	3.0450E+02	1.7315E+01	8.6161E-01	1.2272E-01	1.2130E+01	1.2806E-01	5.9847E+02	9.1283E-01
5.95	2.9577E+02	1.3749E+01	8.7103E-01	1.2180E-01	1.2103E+01	1.2756E-01	5.9829E+02	9.1150E-01
6.00	2.8012E+02	2.2600E+01	8.8162E-01	1.2176E-01	1.2106E+01	1.2800E-01	5.9831E+02	9.1344E-01
6.05	2.9453E+02	2.9453E+01	8.9004E-01	1.2086E-01	1.2081E+01	1.3290E-01	5.9816E+02	9.4650E-01
6.10	2.8450E+02	1.6399E+01	8.9808E-01	1.2044E-01	1.2052E+01	1.2790E-01	5.9797E+02	9.1556E-01
6.15	2.8674E+02	1.4499E+01	9.0557E-01	1.1945E-01	1.2013E+01	1.2727E-01	5.9772E+02	9.1450E-01
6.20	2.7571E+02	1.3304E+01	9.1433E-01	1.1956E-01	1.2004E+01	1.2740E-01	5.9766E+02	9.1422E-01
6.25	2.8101E+02	1.3441E+01	9.2073E-01	1.1887E-01	1.1970E+01	1.2739E-01	5.9745E+02	9.1556E-01
6.30	2.5862E+02	1.3543E+01	9.2934E-01	1.1886E-01	1.1977E+01	1.2623E-01	5.9749E+02	9.0750E-01
6.35	2.6889E+02	1.2678E+01	9.3617E-01	1.1854E-01	1.1965E+01	1.2773E-01	5.9741E+02	9.1822E-01
6.40	2.7559E+02	1.2912E+01	9.4091E-01	1.1804E-01	1.1920E+01	1.2756E-01	5.9712E+02	9.1822E-01
6.45	2.7597E+02	1.2814E+01	9.4504E-01	1.1754E-01	1.1868E+01	1.2739E-01	5.9679E+02	9.2089E-01
6.50	2.6194E+02	1.0934E+01	9.5140E-01	1.1747E-01	1.1846E+01	1.2723E-01	5.9666E+02	9.2089E-01
6.55	2.6559E+02	1.1790E+01	9.5704E-01	1.1724E-01	1.1820E+01	1.2739E-01	5.9648E+02	9.2222E-01
6.60	2.5919E+02	1.1260E+01	9.6197E-01	1.1686E-01	1.1796E+01	1.2739E-01	5.9633E+02	9.2356E-01
6.65	2.5013E+02	1.0746E+01	9.6745E-01	1.1655E-01	1.1790E+01	1.2756E-01	5.9629E+02	9.2494E-01
6.70	2.5131E+02	1.0686E+01	9.7192E-01	1.1603E-01	1.1782E+01	1.2739E-01	5.9624E+02	9.2356E-01
6.75	2.6668E+02	1.2061E+01	9.7151E-01	1.1510E-01	1.1724E+01	1.2739E-01	5.9586E+02	9.2761E-01
6.80	2.6328E+02	1.1256E+01	9.7096E-01	1.1461E-01	1.1667E+01	1.2743E-01	5.9549E+02	9.2922E-01
6.85	2.3545E+02	5.5983E+00	9.7626E-01	1.1119E-01	1.1682E+01	1.2760E-01	5.9558E+02	1.1064E+00
6.90	2.4196E+02	9.7389E+00	9.8098E-01	1.0280E-01	1.1685E+01	1.2739E-01	5.9561E+02	2.4161E+00
6.95	2.4908E+02	1.1516E+01	9.8351E-01	9.8323E-02	1.1661E+01	1.2740E-01	5.9545E+02	3.0736E+00
7.00	2.6502E+02	2.0890E+01	9.7985E-01	1.0468E-01	1.1570E+01	1.2768E-01	5.9486E+02	1.5334E+00
7.05	2.4888E+02	1.0167E+01	9.8001E-01	1.0347E-01	1.1533E+01	1.2756E-01	5.9451E+02	1.9407E+00
7.10	2.3191E+02	1.7235E+01	9.8391E-01	9.6891E-02	1.1544E+01	1.2740E-01	5.9468E+02	3.0432E+00
7.15	2.3077E+02	9.8625E+00	9.8764E-01	9.0484E-02	1.1555E+01	1.2706E-01	5.9476E+02	4.1232E+00
7.20	2.4731E+02	3.4211E+01	9.8702E-01	9.1816E-02	1.1510E+01	1.2760E-01	5.9446E+02	3.6609E+00
7.25	2.5261E+02	2.4622E+01	9.8410E-01	9.4772E-02	1.1437E+01	1.2806E-01	5.9398E+02	2.3312E+00
7.30	2.5531E+02	3.5870E+01	9.8055E-01	1.0163E-01	1.1378E+01	1.2746E-01	5.9359E+02	1.7023E+00
7.35	2.0894E+02	1.0303E+01	9.8666E-01	9.1080E-02	1.1438E+01	1.2759E-01	5.9399E+02	3.3321E+00
7.40	2.2086E+02	1.1530E+01	9.8989E-01	8.3800E-02	1.1460E+01	1.2590E-01	5.9413E+02	4.1380E+00
7.45	2.5003E+02	7.2704E+01	9.8432E-01	9.3124E-02	1.1375E+01	1.2887E-01	5.9357E+02	1.1313E+00
7.50	2.5844E+02	6.7339E+01	9.7356E-01	8.9627E-02	1.1249E+01	1.3173E-01	5.9272E+02	9.7733E-01
7.55	2.2685E+02	5.7472E+01	9.8106E-01	9.7428E-02	1.1262E+01	1.2380E-01	5.9282E+02	9.2378E-01
7.60	2.0290E+02	6.2003E+01	9.8942E-01	8.7747E-02	1.1346E+01	1.3523E-01	5.9337E+02	1.8777E+00
7.65	2.2892E+02	3.3894E+01	9.8765E-01	8.8476E-02	1.1304E+01	1.2873E-01	5.9309E+02	1.0272E+00
7.70	2.5578E+02	1.6105E+01	9.8026E-01	7.4580E-02	1.1197E+01	9.9502E-02	5.9238E+02	7.6250E-01
7.75	2.3993E+02	2.5220E+01	9.7189E-01	7.2507E-02	1.1089E+01	1.1182E-01	5.9164E+02	8.4894E-01
7.80	1.9392E+02	1.4809E+01	9.8136E-01	7.5903E-02	1.1184E+01	1.2494E-01	5.9229E+02	9.3444E-01
7.85	2.0274E+02	1.0446E+01	9.8493E-01	7.6907E-02	1.1217E+01	1.2756E-01	5.9251E+02	9.4911E-01
7.90	2.2654E+02	3.7636E+01	9.7894E-01	7.6775E-02	1.1146E+01	1.2837E-01	5.9203E+02	9.6000E-01
7.95	2.6247E+02	2.5561E+01	9.6234E-01	6.6956E-02	1.1013E+01	1.2734E-01	5.9113E+02	9.5794E-01
8.00	2.3431E+02	6.0887E+01	9.6010E-01	7.6959E-02	1.0997E+01	1.2192E-01	5.9101E+02	9.2244E-01
8.05	1.8579E+02	1.6963E+01	9.6650E-01	8.0476E-02	1.1098E+01	1.2494E-01	5.9170E+02	9.3728E-01
8.10	2.0974E+02	1.3376E+01	9.6400E-01	8.1979E-02	1.1086E+01	1.2706E-01	5.9162E+02	9.5444E-01
8.15	2.3080E+02	4.8994E+01	9.5553E-01	7.9232E-02	1.1002E+01	1.2099E-01	5.9105E+02	9.1689E-01
8.20	2.5877E+02	1.9782E+01	9.3974E-01	7.2355E-02	1.0874E+01	1.2235E-01	5.9017E+02	9.3117E-01
8.25	2.2298E+02	4.2275E+01	9.5022E-01	8.8904E-02	1.0933E+01	1.3243E-01	5.9058E+02	9.9767E-01
8.30	1.8911E+02	1.6333E+01	9.5416E-01	8.8288E-02	1.0980E+01	1.2692E-01	5.9091E+02	9.5872E-01
8.35	2.1622E+02	1.7506E+01	9.5171E-01	8.9187E-02	1.0925E+01	1.2807E-01	5.9053E+02	9.6800E-01
8.40	2.3983E+02	1.3845E+01	9.4563E-01	8.8804E-02	1.0830E+01	1.2645E-01	5.8987E+02	9.6161E-01
8.45	2.2791E+02	2.4776E+01	9.4046E-01	9.4136E-02	1.0768E+01	1.2752E-01	5.8944E+02	9.7144E-01
8.50	1.8036E+02	1.9493E+01	9.4804E-01	9.8105E-02	1.0852E+01	1.1942E-01	5.9002E+02	9.1167E-01
8.55	1.9550E+02	1.0539E+01	9.4889E-01	1.0244E-01	1.0864E+01	1.2739E-01	5.9011E+02	9.6517E-01
8.60	2.1408E+02	1.3281E+01	9.4022E-01	1.0793E-01	1.0781E+01	1.2724E-01	5.8953E+02	9.6933E-01
8.65	2.3541E+02	3.0612E+01	9.2768E-01	1.1190E-01	1.0676E+01	1.2772E-01	5.8880E+02	9.7711E-01
8.70	1.9171E+02	5.2059E+01	9.2596E-01	1.2800E-01	1.0706E+01	1.3008E-01	5.8901E+02	9.9322E-01
8.75	1.8336E+02	1.2715E+01	9.2635E-01	1.3278E-01	1.0751E+01	1.3089E-01	5.8932E+02	9.9472E-01
8.80	2.0307E+02	2.0263E+01	9.1936E-01	1.3805E-01	1.0703E+01	1.2790E-01	5.8898E+02	9.7733E-01

Table D.2a (continued)

TIME (S)	JUN 11 G(KG/S-M**2) NOM. RESP.	JUN 11 G(KG/S-M**2) ST. DEV.	JUN 11 X NOM. RESP.	JUN 11 X ST. DEV.	VOL 11 P(MPA) NOM. RESP.	VOL 11 P(MPA) ST. DEV.	VOL 11 T(K) NOM. RESP.	VOL 11 T(K) ST. DEV.
8.85	2.2044E+02	2.1130E+01	9.1089E-01	1.4184E-01	1.0635E+01	1.2944E-01	5.8851E+02	9.9106E-01
8.90	2.2649E+02	3.9341E+01	9.0118E-01	1.4288E-01	1.0569E+01	1.2017E-01	5.8805E+02	9.2972E-01
8.95	1.7696E+02	1.5465E+01	9.0225E-01	1.4383E-01	1.0613E+01	1.2424E-01	5.8836E+02	9.5722E-01
9.00	1.9353E+02	1.7081E+01	8.9996E-01	1.4267E-01	1.0605E+01	1.2772E-01	5.8830E+02	9.8267E-01
9.05	2.1105E+02	1.7662E+01	8.9346E-01	1.3836E-01	1.0546E+01	1.2756E-01	5.8788E+02	9.8400E-01
9.10	2.1335E+02	1.8592E+01	8.8559E-01	1.3214E-01	1.0471E+01	1.2741E-01	5.8736E+02	9.8678E-01
9.15	1.8674E+02	1.6482E+01	8.8496E-01	1.2603E-01	1.0473E+01	1.2624E-01	5.8737E+02	9.7739E-01
9.20	1.9127E+02	1.3413E+01	8.8337E-01	1.2019E-01	1.0467E+01	1.2723E-01	5.8733E+02	9.8400E-01
9.25	1.9466E+02	1.2890E+01	8.7998E-01	1.1393E-01	1.0442E+01	1.2772E-01	5.8714E+02	9.8933E-01
9.30	2.0731E+02	1.4552E+01	8.7352E-01	1.0738E-01	1.0387E+01	1.2759E-01	5.8676E+02	9.9222E-01
9.35	2.0429E+02	1.1125E+01	8.6636E-01	1.0006E-01	1.0333E+01	1.2381E-01	5.8637E+02	9.6694E-01
9.40	1.9482E+02	1.5486E+01	8.6156E-01	9.6728E-02	1.0303E+01	1.3107E-01	5.8616E+02	1.0217E+00
9.45	1.7929E+02	1.7742E+01	8.6216E-01	9.2863E-02	1.0325E+01	1.2823E-01	5.8631E+02	1.0001E+00
9.50	2.0300E+02	2.3147E+01	8.5660E-01	8.9531E-02	1.0285E+01	1.2759E-01	5.8603E+02	9.9628E-01
9.55	2.2283E+02	3.6564E+01	8.4751E-01	8.6657E-02	1.0209E+01	1.2773E-01	5.8547E+02	1.0027E+00
9.60	2.1274E+02	9.3955E+00	8.3932E-01	8.2415E-02	1.0148E+01	1.2761E-01	5.8503E+02	1.0032E+00
9.65	2.0266E+02	1.4371E+01	8.3406E-01	8.0849E-02	1.0109E+01	1.2759E-01	5.8474E+02	1.0056E+00
9.70	1.9533E+02	1.3315E+01	8.3196E-01	8.0045E-02	1.0094E+01	1.2740E-01	5.8464E+02	1.0068E+00
9.75	2.0738E+02	1.2992E+01	8.2692E-01	7.8687E-02	1.0052E+01	1.2757E-01	5.8433E+02	1.0109E+00
9.80	2.1735E+02	2.5216E+01	8.1876E-01	7.8272E-02	9.9840E+00	1.2792E-01	5.8383E+02	1.0163E+00
9.85	2.0321E+02	1.8199E+01	8.1237E-01	7.6817E-02	9.9433E+00	1.2409E-01	5.8353E+02	9.8961E-01
9.90	1.8516E+02	8.4927E+00	8.1140E-01	7.6027E-02	9.9591E+00	1.2740E-01	5.8366E+02	1.0136E+00
9.95	2.0239E+02	7.5641E+00	8.0633E-01	7.5744E-02	9.9329E+00	1.2740E-01	5.8346E+02	1.0176E+00
10.00	2.1379E+02	1.0079E+01	7.9885E-01	7.5067E-02	9.8778E+00	1.3356E-01	5.8305E+02	1.0659E+00
10.05	2.2189E+02	1.1070E+01	7.9108E-01	7.5832E-02	9.8205E+00	1.2759E-01	5.8262E+02	1.0243E+00
10.10	2.0755E+02	2.1526E+01	7.8589E-01	7.4527E-02	9.7875E+00	1.3607E-01	5.8238E+02	1.0888E+00
10.15	2.0100E+02	8.4927E+00	7.8311E-01	7.4344E-02	9.7723E+00	1.2741E-01	5.8226E+02	1.0243E+00
10.20	2.0910E+02	1.1129E+01	7.7952E-01	7.4452E-02	9.7461E+00	1.2739E-01	5.8207E+02	1.0256E+00
10.25	2.2138E+02	1.0180E+01	7.7351E-01	7.4413E-02	9.6916E+00	1.2739E-01	5.8166E+02	1.0297E+00
10.30	2.1004E+02	9.0304E+00	7.6991E-01	7.4520E-02	9.6592E+00	1.2723E-01	5.8141E+02	1.0310E+00
10.35	1.9824E+02	8.8575E+00	7.6928E-01	7.4848E-02	9.6551E+00	1.2739E-01	5.8138E+02	1.0323E+00
10.40	2.0755E+02	1.1419E+01	7.6773E-01	7.4800E-02	9.6378E+00	1.2623E-01	5.8126E+02	1.0243E+00
10.45	2.2317E+02	9.3734E+00	7.6258E-01	7.5200E-02	9.5861E+00	1.2723E-01	5.8086E+02	1.0350E+00
10.50	2.2379E+02	1.1899E+01	7.5787E-01	7.5283E-02	9.5323E+00	1.2723E-01	5.8045E+02	1.0391E+00
10.55	2.0696E+02	1.4664E+01	7.5619E-01	7.5237E-02	9.4841E+00	1.2709E-01	5.8008E+02	1.0393E+00
10.60	1.6278E+02	7.0837E+00	7.5466E-01	7.5900E-02	9.4655E+00	1.2756E-01	5.7994E+02	1.0444E+00
10.65	1.5756E+02	1.3852E+01	7.4629E-01	7.4643E-02	9.4275E+00	1.2774E-01	5.7965E+02	1.0472E+00
10.70	1.6448E+02	1.3606E+01	7.3591E-01	7.3724E-02	9.3855E+00	1.2740E-01	5.7932E+02	1.0485E+00
10.75	1.7766E+02	1.3150E+01	7.2515E-01	7.2923E-02	9.3303E+00	1.2741E-01	5.7889E+02	1.0513E+00
10.80	1.8183E+02	9.1621E+00	7.1742E-01	7.2187E-02	9.2772E+00	1.2740E-01	5.7848E+02	1.0552E+00
10.85	1.8223E+02	1.3971E+01	7.1346E-01	7.2288E-02	9.2317E+00	1.2724E-01	5.7813E+02	1.0552E+00
10.90	1.7058E+02	1.3009E+01	7.1179E-01	7.2527E-02	9.1924E+00	1.2741E-01	5.7782E+02	1.0620E+00
10.95	1.7583E+02	1.1095E+01	7.0942E-01	7.2256E-02	9.1352E+00	1.2741E-01	5.7737E+02	1.0647E+00
11.00	1.6786E+02	9.4069E+00	7.0683E-01	7.1895E-02	9.0807E+00	1.2723E-01	5.7694E+02	1.0673E+00
11.05	1.6036E+02	1.0763E+01	7.0431E-01	7.2000E-02	9.0359E+00	1.2746E-01	5.7658E+02	1.0718E+00
11.10	1.4777E+02	8.0732E+00	7.0256E-01	7.1591E-02	9.0007E+00	1.2745E-01	5.7630E+02	1.0744E+00
11.15	1.4183E+02	4.5987E+00	7.0159E-01	7.1092E-02	8.9676E+00	1.2741E-01	5.7604E+02	1.0754E+00
11.20	1.4937E+02	6.0854E+00	6.9858E-01	6.9995E-02	8.9173E+00	1.2778E-01	5.7563E+02	1.0824E+00
11.25	1.4032E+02	1.2925E+01	6.9618E-01	6.9485E-02	8.8759E+00	1.2524E-01	5.7531E+02	1.0647E+00
11.30	1.3978E+02	4.7072E+00	6.9486E-01	6.9071E-02	8.8415E+00	1.2790E-01	5.7502E+02	1.0887E+00
11.35	1.4602E+02	3.1751E+01	6.9051E-01	6.8315E-02	8.7822E+00	1.3158E-01	5.7454E+02	1.1238E+00
11.40	1.4053E+02	3.0751E+01	6.8665E-01	6.6163E-02	8.7298E+00	1.3289E-01	5.7412E+02	1.1371E+00
11.45	1.3718E+02	1.2039E+01	6.8229E-01	6.4579E-02	8.6836E+00	1.2166E-01	5.7374E+02	1.0479E+00
11.50	1.2979E+02	1.0347E+01	6.7816E-01	6.4589E-02	8.6470E+00	1.2407E-01	5.7344E+02	1.0713E+00
11.55	1.3634E+02	7.1290E+00	6.7206E-01	6.3273E-02	8.5994E+00	1.2756E-01	5.7305E+02	1.1034E+00
11.60	1.3405E+02	7.4691E+00	6.6557E-01	6.1887E-02	8.5477E+00	1.2739E-01	5.7262E+02	1.1062E+00
11.65	1.3321E+02	7.5135E+00	6.5916E-01	6.0577E-02	8.4960E+00	1.2739E-01	5.7219E+02	1.1088E+00
11.70	1.3315E+02	7.6899E+00	6.5258E-01	5.9289E-02	8.4443E+00	1.2739E-01	5.7176E+02	1.1142E+00
11.75	1.3414E+02	7.8838E+00	6.4500E-01	5.7916E-02	8.3919E+00	1.2739E-01	5.7132E+02	1.1182E+00
11.80	1.3398E+02	8.0435E+00	6.3679E-01	5.6535E-02	8.3402E+00	1.2739E-01	5.7088E+02	1.1223E+00
11.85	1.4069E+02	7.9830E+00	6.2718E-01	5.5104E-02	8.2809E+00	1.2739E-01	5.7038E+02	1.1263E+00
11.90	1.4194E+02	7.7202E+00	6.1668E-01	5.3664E-02	8.2188E+00	1.2706E-01	5.6985E+02	1.1276E+00
11.95	1.4333E+02	9.2883E+00	6.0590E-01	5.2251E-02	8.1561E+00	1.2723E-01	5.6932E+02	1.1357E+00
12.00	1.3794E+02	9.4314E+00	5.9582E-01	5.1369E-02	8.1023E+00	1.2739E-01	5.6884E+02	1.1411E+00
12.05	1.2739E+02	9.0670E+00	5.8795E-01	5.0796E-02	8.0658E+00	1.2739E-01	5.6853E+02	1.1437E+00
12.10	1.3998E+02	9.7812E+00	5.7809E-01	4.9944E-02	8.0189E+00	1.2739E-01	5.6813E+02	1.1464E+00
12.15	1.3497E+02	1.0145E+01	5.6834E-01	4.9035E-02	7.9754E+00	1.2739E-01	5.6774E+02	1.1518E+00
12.20	1.4335E+02	1.0326E+01	5.5809E-01	4.7915E-02	7.9265E+00	1.2723E-01	5.6731E+02	1.1545E+00
12.25	1.4468E+02	1.0221E+01	5.4826E-01	4.6781E-02	7.8748E+00	1.2739E-01	5.6686E+02	1.1585E+00
12.30	1.4758E+02	1.0543E+01	5.3904E-01	4.5613E-02	7.8231E+00	1.2739E-01	5.6640E+02	1.1639E+00
12.35	1.4885E+02	1.0428E+01	5.3029E-01	4.4457E-02	7.7714E+00	1.2706E-01	5.6594E+02	1.1652E+00
12.40	1.4470E+02	1.0465E+01	5.2277E-01	4.3587E-02	7.7279E+00	1.2739E-01	5.6555E+02	1.1719E+00
12.45	1.5565E+02	1.1021E+01	5.1454E-01	4.2651E-02	7.6790E+00	1.2723E-01	5.6511E+02	1.1760E+00
12.50	1.6036E+02	1.1396E+01	5.0532E-01	4.1707E-02	7.6272E+00	1.2739E-01	5.6465E+02	1.1800E+00
12.55	1.5795E+02	1.1472E+01	4.9677E-01	4.0872E-02	7.5838E+00	1.2739E-01	5.6425E+02	1.1841E+00

Table D.2a (continued)

TIME (S)	JUN 11 G(KG/S-M**2) NOM. RESP.	JUN 11 G(KG/S-M**2) ST. DEV.	JUN 11 X NOM. RESP.	JUN 11 X ST. DEV.	VOL 11 P(MPA) NOM. RESP.	VOL 11 P(MPA) ST. DEV.	VOL 11 T(K) NOM. RESP.	VOL 11 T(K) ST. DEV.
12.60	1.6984E+02	1.1765E+01	4.8826E-01	4.0183E-02	7.5355E+00	1.2723E-01	5.6381E+02	1.1881E+00
12.65	1.7361E+02	1.1426E+01	4.8043E-01	3.9712E-02	7.4838E+00	1.2756E-01	5.6334E+02	1.1961E+00
12.70	1.7721E+02	1.2019E+01	4.7368E-01	3.9360E-02	7.4328E+00	1.2723E-01	5.6287E+02	1.1974E+00
12.75	1.7191E+02	1.2783E+01	4.6865E-01	3.9356E-02	7.3887E+00	1.2723E-01	5.6246E+02	1.2002E+00
12.80	1.7289E+02	1.2443E+01	4.6434E-01	3.9455E-02	7.3480E+00	1.2723E-01	5.6208E+02	1.2055E+00
12.85	1.6621E+02	1.1755E+01	4.6091E-01	3.9544E-02	7.3142E+00	1.2723E-01	5.6177E+02	1.2082E+00
12.90	1.6714E+02	1.2156E+01	4.5828E-01	3.9672E-02	7.2832E+00	1.2723E-01	5.6148E+02	1.2122E+00
12.95	1.7396E+02	1.2599E+01	4.5582E-01	3.9868E-02	7.2446E+00	1.2706E-01	5.6112E+02	1.2149E+00
13.00	1.5660E+02	1.1659E+01	4.5549E-01	4.0351E-02	7.2184E+00	1.2723E-01	5.6087E+02	1.2177E+00
13.05	1.7504E+02	1.2150E+01	4.5494E-01	4.0464E-02	7.1839E+00	1.2706E-01	5.6054E+02	1.2203E+00
13.10	1.6635E+02	1.7175E+01	4.5477E-01	4.1065E-02	7.1494E+00	1.2723E-01	5.6022E+02	1.2243E+00
13.15	1.9476E+02	1.5622E+01	4.5367E-01	4.1060E-02	7.1018E+00	1.2790E-01	5.5976E+02	1.2364E+00
13.20	1.7386E+02	1.5368E+01	4.5298E-01	4.0821E-02	7.0605E+00	1.2323E-01	5.5936E+02	1.1976E+00
13.25	1.8257E+02	1.4070E+01	4.5252E-01	4.1576E-02	7.0205E+00	1.2723E-01	5.5898E+02	1.2391E+00
13.30	1.8566E+02	1.3803E+01	4.5073E-01	4.1667E-02	6.9798E+00	1.2690E-01	5.5859E+02	1.2404E+00
13.35	1.9539E+02	1.3654E+01	4.4662E-01	4.1396E-02	6.9315E+00	1.2690E-01	5.5812E+02	1.2444E+00
13.40	1.8866E+02	1.4660E+01	4.4140E-01	4.1141E-02	6.8873E+00	1.2694E-01	5.5763E+02	1.2498E+00
13.45	1.8192E+02	1.4038E+01	4.3666E-01	4.0599E-02	6.8536E+00	1.2651E-01	5.5736E+02	1.2498E+00
13.50	1.8329E+02	1.5063E+01	4.3172E-01	4.0467E-02	6.8229E+00	1.2698E-01	5.5706E+02	1.2566E+00
13.55	1.9310E+02	1.5825E+01	4.2536E-01	4.0056E-02	6.7848E+00	1.2694E-01	5.5668E+02	1.2619E+00
13.60	1.8550E+02	1.6159E+01	4.1911E-01	3.9611E-02	6.7504E+00	1.2701E-01	5.5634E+02	1.2659E+00
13.65	1.7964E+02	1.5511E+01	4.1457E-01	3.8952E-02	6.7269E+00	1.2705E-01	5.5610E+02	1.2686E+00
13.70	1.8956E+02	1.5875E+01	4.1029E-01	3.8143E-02	6.6993E+00	1.2701E-01	5.5583E+02	1.2713E+00
13.75	1.8977E+02	1.5199E+01	4.0641E-01	3.7144E-02	6.6682E+00	1.2674E-01	5.5552E+02	1.2727E+00
13.80	1.8033E+02	1.4788E+01	4.0443E-01	3.6392E-02	6.6444E+00	1.2681E-01	5.5528E+02	1.2753E+00
13.85	1.7922E+02	1.4122E+01	4.0386E-01	3.5859E-02	6.6240E+00	1.2681E-01	5.5507E+02	1.2781E+00
13.90	1.8861E+02	1.4054E+01	4.0240E-01	3.5261E-02	6.5966E+00	1.2665E-01	5.5479E+02	1.2794E+00
13.95	1.7883E+02	1.4579E+01	4.0080E-01	3.4859E-02	6.5726E+00	1.2693E-01	5.5455E+02	1.2847E+00
14.00	1.9089E+02	1.3734E+01	3.9848E-01	3.4420E-02	6.5456E+00	1.2705E-01	5.5428E+02	1.2901E+00
14.05	1.9063E+02	3.9006E+01	3.9522E-01	3.2783E-02	6.5144E+00	1.1011E-01	5.5396E+02	1.1209E+00
14.10	1.8352E+02	1.4641E+01	3.9272E-01	3.3280E-02	6.4908E+00	1.1936E-01	5.5372E+02	1.2176E+00
14.15	1.8481E+02	1.4732E+01	3.9023E-01	3.3156E-02	6.4703E+00	1.1793E-01	5.5351E+02	1.2050E+00
14.20	1.8364E+02	1.4157E+01	3.8770E-01	3.3192E-02	6.4495E+00	1.1816E-01	5.5329E+02	1.2109E+00
14.25	1.8256E+02	1.4800E+01	3.8532E-01	3.3411E-02	6.4288E+00	1.1823E-01	5.5308E+02	1.2136E+00
14.30	1.8313E+02	1.5005E+01	3.8324E-01	3.3631E-02	6.4083E+00	1.1828E-01	5.5287E+02	1.2163E+00
14.35	1.9356E+02	1.9597E+01	3.8048E-01	3.3839E-02	6.3807E+00	1.1283E-01	5.5258E+02	1.1626E+00
14.40	1.7522E+02	2.8545E+01	3.7888E-01	3.5012E-02	6.3634E+00	1.2641E-01	5.5241E+02	1.3049E+00
14.45	1.8880E+02	1.5565E+01	3.7770E-01	3.4739E-02	6.3473E+00	1.1583E-01	5.5224E+02	1.1975E+00
14.50	1.9905E+02	2.5355E+01	3.7457E-01	3.5260E-02	6.3196E+00	1.1391E-01	5.5194E+02	1.1801E+00
14.55	1.8931E+02	2.4967E+01	3.7135E-01	3.5972E-02	6.2955E+00	1.1946E-01	5.5169E+02	1.2418E+00
14.60	1.9133E+02	1.8018E+01	3.6845E-01	3.6099E-02	6.2753E+00	1.1751E-01	5.5148E+02	1.2217E+00
14.65	1.9219E+02	3.2180E+01	3.6483E-01	3.7055E-02	6.2547E+00	1.1925E-01	5.5127E+02	1.2432E+00
14.70	1.9862E+02	3.0830E+01	3.6057E-01	3.6284E-02	6.2324E+00	1.1737E-01	5.5103E+02	1.2259E+00
14.75	1.9837E+02	3.6579E+01	3.5600E-01	3.8467E-02	6.2138E+00	1.1735E-01	5.5083E+02	1.2271E+00
14.80	1.8891E+02	3.4247E+01	3.5293E-01	4.0008E-02	6.2001E+00	1.2164E-01	5.5069E+02	1.2753E+00
14.85	2.1596E+02	5.3255E+01	3.4965E-01	3.8967E-02	6.1773E+00	1.1595E-01	5.5045E+02	1.2177E+00
14.90	1.9209E+02	9.9129E+01	3.4619E-01	4.1024E-02	6.1583E+00	1.2068E-01	5.5024E+02	1.2700E+00
14.95	2.0308E+02	5.8608E+01	3.4487E-01	4.1287E-02	6.1431E+00	1.2064E-01	5.5008E+02	1.2713E+00
15.00	2.0956E+02	5.8861E+01	3.4105E-01	4.1772E-02	6.1226E+00	1.1693E-01	5.4986E+02	1.2338E+00

Table D.2b. Test 3.06.6B, fluid uncertainties (one standard deviation), L = 6 ft

TIME (S)	JUN 11 G(LBM/HR-FT**2) NOM. RESP.	JUN 11 G(LBM/HR-FT**2) ST. DEV.	JUN 11 X NOM. RESP.	JUN 11 X ST. DEV.	VOL 11 P(PSIA) NOM. RESP.	VOL 11 P(PSIA) ST. DEV.	VOL 11 T(F) NOM. RESP.	VOL 11 T(F) ST. DEV.
5.35	2.6052E+05	1.8698E+04	7.3883E-01	1.3588E-01	1.7992E+03	1.8502E+01	6.2095E+02	1.6214E+00
5.40	2.5392E+05	1.9347E+04	7.5306E-01	1.3539E-01	1.7945E+03	1.8501E+01	6.2059E+02	1.6238E+00
5.45	2.4600E+05	1.6490E+04	7.6568E-01	1.3443E-01	1.7910E+03	1.8549E+01	6.2032E+02	1.6262E+00
5.50	2.3869E+05	1.5923E+04	7.7746E-01	1.3320E-01	1.7888E+03	1.8405E+01	6.2015E+02	1.6166E+00
5.55	2.3695E+05	1.3445E+04	7.8849E-01	1.3179E-01	1.7864E+03	1.8769E+01	6.1996E+02	1.6481E+00
5.60	2.3869E+05	1.4588E+04	7.9889E-01	1.3010E-01	1.7821E+03	1.8380E+01	6.1963E+02	1.6190E+00
5.65	2.3503E+05	1.4714E+04	8.0948E-01	1.2849E-01	1.7774E+03	1.8500E+01	6.1927E+02	1.6310E+00
5.70	2.2999E+05	1.2797E+04	8.2046E-01	1.2713E-01	1.7739E+03	1.8501E+01	6.1899E+02	1.6310E+00
5.75	2.2376E+05	1.2743E+04	8.3172E-01	1.2600E-01	1.7719E+03	1.8500E+01	6.1883E+02	1.6310E+00
5.80	2.1948E+05	1.1635E+04	8.4331E-01	1.2506E-01	1.7715E+03	1.8524E+01	6.1880E+02	1.6358E+00
5.85	2.2894E+05	1.3200E+04	8.5266E-01	1.2380E-01	1.7658E+03	1.8500E+01	6.1835E+02	1.6358E+00
5.90	2.2451E+05	1.2766E+04	8.6161E-01	1.2272E-01	1.7593E+03	1.8573E+01	6.1785E+02	1.6431E+00
5.95	2.1807E+05	1.0137E+04	8.7103E-01	1.2180E-01	1.7554E+03	1.8501E+01	6.1754E+02	1.6407E+00
6.00	2.0653E+05	1.6663E+04	8.8162E-01	1.2176E-01	1.7558E+03	1.8564E+01	6.1757E+02	1.6442E+00
6.05	2.1716E+05	2.1716E+04	8.9004E-01	1.2086E-01	1.7522E+03	1.9275E+01	6.1729E+02	1.7037E+00
6.10	2.0976E+05	1.2091E+04	8.9808E-01	1.2044E-01	1.7480E+03	1.8549E+01	6.1696E+02	1.6480E+00
6.15	2.1141E+05	1.0690E+04	9.0557E-01	1.1945E-01	1.7423E+03	1.8459E+01	6.1651E+02	1.6461E+00
6.20	2.0328E+05	9.8093E+03	9.1433E-01	1.1956E-01	1.7409E+03	1.8477E+01	6.1639E+02	1.6456E+00
6.25	2.0719E+05	9.9102E+03	9.2073E-01	1.1887E-01	1.7361E+03	1.8476E+01	6.1602E+02	1.6480E+00
6.30	1.9068E+05	9.9850E+03	9.2934E-01	1.1886E-01	1.7371E+03	1.8307E+01	6.1610E+02	1.6335E+00
6.35	1.9825E+05	9.3478E+03	9.3617E-01	1.1854E-01	1.7353E+03	1.8525E+01	6.1595E+02	1.6528E+00
6.40	2.0319E+05	9.5203E+03	9.4091E-01	1.1804E-01	1.7288E+03	1.8500E+01	6.1543E+02	1.6528E+00
6.45	2.0347E+05	9.4477E+03	9.4504E-01	1.1754E-01	1.7212E+03	1.8476E+01	6.1483E+02	1.6576E+00
6.50	1.9313E+05	8.0616E+03	9.5140E-01	1.1747E-01	1.7181E+03	1.3452E+01	6.1459E+02	1.6576E+00
6.55	1.9582E+05	8.6929E+03	9.5704E-01	1.1724E-01	1.7143E+03	1.8476E+01	6.1428E+02	1.6600E+00
6.60	1.9110E+05	8.3021E+03	9.6197E-01	1.1686E-01	1.7108E+03	1.8476E+01	6.1400E+02	1.6624E+00
6.65	1.8442E+05	7.9228E+03	9.6745E-01	1.1655E-01	1.7100E+03	1.8500E+01	6.1394E+02	1.6649E+00
6.70	1.8529E+05	7.8789E+03	9.7192E-01	1.1603E-01	1.7088E+03	1.8476E+01	6.1384E+02	1.6624E+00
6.75	1.9662E+05	8.8928E+03	9.7151E-01	1.1510E-01	1.7003E+03	1.8476E+01	6.1315E+02	1.6697E+00
6.80	1.9412E+05	8.2987E+03	9.7096E-01	1.1461E-01	1.6921E+03	1.8482E+01	6.1249E+02	1.6726E+00
6.85	1.7360E+05	4.1276E+03	9.7626E-01	1.1119E-01	1.6942E+03	1.8506E+01	6.1266E+02	1.9916E+00
6.90	1.7840E+05	7.1805E+03	9.8098E-01	1.0280E-01	1.6947E+03	1.8476E+01	6.1270E+02	4.3490E+00
6.95	1.8365E+05	8.4907E+03	9.8351E-01	9.8323E-02	1.6912E+03	1.8477E+01	6.1242E+02	5.5324E+00
7.00	1.9540E+05	1.5402E+04	9.7985E-01	1.0468E-01	1.6781E+03	1.8518E+01	6.1135E+02	2.7601E+00
7.05	1.8350E+05	7.4964E+03	9.8001E-01	1.0347E-01	1.6726E+03	1.8501E+01	6.1091E+02	3.4932E+00
7.10	1.7099E+05	1.2707E+04	9.8391E-01	9.6891E-02	1.6743E+03	1.8477E+01	6.1104E+02	5.4777E+00
7.15	1.7015E+05	7.2716E+03	9.8764E-01	9.0484E-02	1.6759E+03	1.8428E+01	6.1118E+02	7.4218E+00
7.20	1.8234E+05	2.5224E+04	9.8702E-01	9.1816E-02	1.6693E+03	1.8506E+01	6.1063E+02	6.5896E+00
7.25	1.8625E+05	1.8154E+04	9.8410E-01	9.4772E-02	1.6588E+03	1.8573E+01	6.0978E+02	4.1962E+00
7.30	1.8824E+05	2.6447E+04	9.8055E-01	1.0163E-01	1.6502E+03	1.8486E+01	6.0907E+02	3.0642E+00
7.35	1.5405E+05	7.5965E+03	9.8666E-01	9.1080E-02	1.6589E+03	1.8505E+01	6.0979E+02	5.9977E+00
7.40	1.6284E+05	8.5008E+03	9.8989E-01	8.3800E-02	1.6621E+03	1.8259E+01	6.1005E+02	7.4484E+00
7.45	1.8435E+05	5.3605E+04	9.8432E-01	9.3124E-02	1.6497E+03	1.8691E+01	6.0903E+02	2.0364E+00
7.50	1.9055E+05	4.9649E+04	9.7356E-01	8.9627E-02	1.6314E+03	1.9105E+01	6.0751E+02	1.7592E+00
7.55	1.6726E+05	4.2374E+04	9.8106E-01	9.7428E-02	1.6334E+03	1.7955E+01	6.0768E+02	1.6628E+00
7.60	1.4960E+05	4.5715E+04	9.8942E-01	8.7747E-02	1.6455E+03	1.9613E+01	6.0863E+02	3.3798E+00
7.65	1.6878E+05	2.4990E+04	9.8765E-01	8.8476E-02	1.6394E+03	1.8670E+01	6.0817E+02	1.8490E+00
7.70	1.8859E+05	1.1874E+04	9.8026E-01	7.4580E-02	1.6240E+03	1.4431E+01	6.0689E+02	1.3725E+00
7.75	1.7690E+05	1.8595E+04	9.7189E-01	7.2507E-02	1.6083E+03	1.6217E+01	6.0557E+02	1.5281E+00
7.80	1.4298E+05	1.0919E+04	9.8136E-01	7.5903E-02	1.6221E+03	1.8121E+01	6.0673E+02	1.6820E+00
7.85	1.4948E+05	7.7019E+03	9.8493E-01	7.6907E-02	1.6269E+03	1.8500E+01	6.0713E+02	1.7084E+00
7.90	1.6703E+05	2.7749E+04	9.7894E-01	7.6775E-02	1.6166E+03	1.8618E+01	6.0627E+02	1.7280E+00
7.95	1.9352E+05	1.8846E+04	9.6234E-01	6.6956E-02	1.5973E+03	1.8468E+01	6.0464E+02	1.7243E+00
8.00	1.7276E+05	4.4892E+04	9.6010E-01	7.6959E-02	1.5949E+03	1.7683E+01	6.0443E+02	1.6604E+00
8.05	1.3698E+05	1.2507E+04	9.6650E-01	8.0476E-02	1.6095E+03	1.8120E+01	6.0567E+02	1.6871E+00
8.10	1.5464E+05	9.8622E+03	9.6400E-01	8.1979E-02	1.6079E+03	1.8428E+01	6.0553E+02	1.7180E+00
8.15	1.7017E+05	3.6123E+04	9.5553E-01	7.9232E-02	1.5956E+03	1.7548E+01	6.0450E+02	1.6504E+00
8.20	1.9079E+05	1.4585E+04	9.3974E-01	7.2355E-02	1.5771E+03	1.7745E+01	6.0292E+02	1.6761E+00
8.25	1.6440E+05	3.1169E+04	9.5022E-01	8.8904E-02	1.5857E+03	1.9206E+01	6.0366E+02	1.7958E+00
8.30	1.3943E+05	1.2042E+04	9.5416E-01	8.8288E-02	1.5925E+03	1.8408E+01	6.0424E+02	1.7257E+00
8.35	1.5942E+05	1.2907E+04	9.5171E-01	8.9187E-02	1.5845E+03	1.8575E+01	6.0356E+02	1.7424E+00
8.40	1.7683E+05	1.0208E+04	9.4563E-01	8.8804E-02	1.5707E+03	1.8340E+01	6.0233E+02	1.7309E+00
8.45	1.6804E+05	1.8267E+04	9.4046E-01	9.4136E-02	1.5617E+03	1.8494E+01	6.0160E+02	1.7486E+00
8.50	1.3298E+05	1.4372E+04	9.4804E-01	9.8105E-02	1.5739E+03	1.7320E+01	6.0265E+02	1.6410E+00
8.55	1.4414E+05	7.7707E+03	9.4889E-01	1.0244E-01	1.5757E+03	1.8476E+01	6.0280E+02	1.7373E+00
8.60	1.5784E+05	9.7923E+03	9.4022E-01	1.0793E-01	1.5636E+03	1.8454E+01	6.0176E+02	1.7448E+00
8.65	1.7357E+05	2.2570E+04	9.2768E-01	1.1190E-01	1.5484E+03	1.8524E+01	6.0045E+02	1.7588E+00
8.70	1.4135E+05	3.8383E+04	9.2596E-01	1.2800E-01	1.5527E+03	1.8866E+01	6.0082E+02	1.7878E+00
8.75	1.3519E+05	9.3750E+03	9.2635E-01	1.3278E-01	1.5592E+03	1.8983E+01	6.0138E+02	1.7905E+00
8.80	1.4972E+05	1.4940E+04	9.1936E-01	1.3805E-01	1.5523E+03	1.8550E+01	6.0078E+02	1.7592E+00

Table D.2b (continued)

TIME (S)	JUN 11 G(LBM/HR-FT**2) NOM. RESP.	JUN 11 G(LBM/HR-FT**2) ST. DEV.	JUN 11 X NOM. RESP.	JUN 11 X ST. DEV.	VOL 11 P(PSIA) NOM. RESP.	VOL 11 P(PSIA) ST. DEV.	VOL 11 T(F) NOM. RESP.	VOL 11 T(F) ST. DEV.
8.85	1.6253E+05	1.5579E+04	9.1089E-01	1.4184E-01	1.5424E+03	1.8773E+01	5.9993E+02	1.7839E+00
8.90	1.6699E+05	2.9006E+04	9.0118E-01	1.4288E-01	1.5329E+03	1.7429E+01	5.9910E+02	1.6735E+00
8.95	1.3047E+05	1.1402E+04	9.0225E-01	1.4383E-01	1.5392E+03	1.8019E+01	5.9965E+02	1.7230E+00
9.00	1.4269E+05	1.2594E+04	8.9996E-01	1.4267E-01	1.5381E+03	1.8524E+01	5.9955E+02	1.7688E+00
9.05	1.5561E+05	1.3022E+04	8.9346E-01	1.3836E-01	1.5295E+03	1.8500E+01	5.9880E+02	1.7712E+00
9.10	1.5730E+05	1.3708E+04	8.8559E-01	1.3214E-01	1.5186E+03	1.8478E+01	5.9785E+02	1.7762E+00
9.15	1.3768E+05	1.2152E+04	8.8496E-01	1.2603E-01	1.5189E+03	1.8309E+01	5.9787E+02	1.7593E+00
9.20	1.4102E+05	9.8896E+03	8.8337E-01	1.2019E-01	1.5181E+03	1.8452E+01	5.9781E+02	1.7712E+00
9.25	1.4352E+05	9.5035E+03	8.7998E-01	1.1393E-01	1.5144E+03	1.8524E+01	5.9747E+02	1.7808E+00
9.30	1.5285E+05	1.0729E+04	8.7352E-01	1.0738E-01	1.5064E+03	1.8504E+01	5.9677E+02	1.7860E+00
9.35	1.5062E+05	8.2023E+03	8.6636E-01	1.0006E-01	1.4986E+03	1.7956E+01	5.9607E+02	1.7405E+00
9.40	1.4364E+05	1.1418E+04	8.6156E-01	9.6728E-02	1.4943E+03	1.9009E+01	5.9569E+02	1.8390E+00
9.45	1.3219E+05	1.3081E+04	8.6216E-01	9.2863E-02	1.4974E+03	1.8597E+01	5.9596E+02	1.8002E+00
9.50	1.4967E+05	1.7066E+04	8.5660E-01	8.9531E-02	1.4917E+03	1.8504E+01	5.9546E+02	1.7933E+00
9.55	1.6429E+05	2.6959E+04	8.4751E-01	8.6657E-02	1.4806E+03	1.8525E+01	5.9446E+02	1.8049E+00
9.60	1.5685E+05	6.9273E+03	8.3932E-01	8.2415E-02	1.4718E+03	1.8508E+01	5.9367E+02	1.8057E+00
9.65	1.4942E+05	1.0596E+04	8.3406E-01	8.0849E-02	1.4661E+03	1.8504E+01	5.9315E+02	1.8101E+00
9.70	1.4402E+05	9.8174E+03	8.3196E-01	8.0045E-02	1.4639E+03	1.8477E+01	5.9296E+02	1.8123E+00
9.75	1.5290E+05	9.5791E+03	8.2692E-01	7.8687E-02	1.4578E+03	1.8502E+01	5.9241E+02	1.8197E+00
9.80	1.6025E+05	1.8592E+04	8.1876E-01	7.8272E-02	1.4480E+03	1.8552E+01	5.9151E+02	1.8293E+00
9.85	1.4983E+05	1.3418E+04	8.1237E-01	7.6817E-02	1.4421E+03	1.7997E+01	5.9097E+02	1.7813E+00
9.90	1.3652E+05	6.2617E+03	8.1140E-01	7.6027E-02	1.4444E+03	1.8477E+01	5.9119E+02	1.8244E+00
9.95	1.4922E+05	5.5770E+03	8.0633E-01	7.5744E-02	1.4406E+03	1.8477E+01	5.9083E+02	1.8317E+00
10.00	1.5763E+05	7.4313E+03	7.9885E-01	7.5067E-02	1.4326E+03	1.9370E+01	5.9010E+02	1.9186E+00
10.05	1.6360E+05	8.1619E+03	7.9108E-01	7.5832E-02	1.4243E+03	1.8504E+01	5.8933E+02	1.8438E+00
10.10	1.5303E+05	1.5871E+04	7.8589E-01	7.4527E-02	1.4195E+03	1.9735E+01	5.8889E+02	1.9598E+00
10.15	1.4820E+05	6.2617E+03	7.8311E-01	7.4344E-02	1.4173E+03	1.8478E+01	5.8868E+02	1.8438E+00
10.20	1.5417E+05	8.2057E+03	7.7952E-01	7.4452E-02	1.4135E+03	1.8476E+01	5.8833E+02	1.8461E+00
10.25	1.6322E+05	7.5060E+03	7.7351E-01	7.4413E-02	1.4056E+03	1.8476E+01	5.8759E+02	1.8534E+00
10.30	1.5486E+05	6.6581E+03	7.6991E-01	7.4520E-02	1.4009E+03	1.8453E+01	5.8715E+02	1.8558E+00
10.35	1.4616E+05	6.5306E+03	7.6928E-01	7.4848E-02	1.4003E+03	1.8476E+01	5.8710E+02	1.8582E+00
10.40	1.5303E+05	8.4190E+03	7.6773E-01	7.4800E-02	1.3978E+03	1.8308E+01	5.8687E+02	1.8438E+00
10.45	1.6454E+05	6.9110E+03	7.6258E-01	7.5200E-02	1.3903E+03	1.8452E+01	5.8616E+02	1.8630E+00
10.50	1.6500E+05	8.7730E+03	7.5787E-01	7.5283E-02	1.3825E+03	1.8452E+01	5.8542E+02	1.8703E+00
10.55	1.5259E+05	1.0812E+04	7.5619E-01	7.5237E-02	1.3755E+03	1.8432E+01	5.8475E+02	1.8707E+00
10.60	1.2002E+05	5.2228E+03	7.5466E-01	7.5900E-02	1.3728E+03	1.8501E+01	5.8450E+02	1.8800E+00
10.65	1.1617E+05	1.0213E+04	7.4629E-01	7.4643E-02	1.3673E+03	1.8526E+01	5.8398E+02	1.8649E+00
10.70	1.2127E+05	1.0032E+04	7.3591E-01	7.3724E-02	1.3612E+03	1.8477E+01	5.8339E+02	1.8873E+00
10.75	1.3099E+05	9.6952E+03	7.2515E-01	7.2923E-02	1.3532E+03	1.8479E+01	5.8262E+02	1.8923E+00
10.80	1.3406E+05	6.7552E+03	7.1742E-01	7.2187E-02	1.3455E+03	1.8477E+01	5.8188E+02	1.8994E+00
10.85	1.3436E+05	1.0301E+04	7.1346E-01	7.2288E-02	1.3389E+03	1.8454E+01	5.8125E+02	1.8994E+00
10.90	1.2577E+05	9.5912E+03	7.1179E-01	7.2527E-02	1.3332E+03	1.8479E+01	5.8069E+02	1.9116E+00
10.95	1.2964E+05	8.1805E+03	7.0942E-01	7.2236E-02	1.3249E+03	1.8478E+01	5.7988E+02	1.9164E+00
11.00	1.2376E+05	6.9357E+03	7.0683E-01	7.1895E-02	1.3170E+03	1.8453E+01	5.7910E+02	1.9211E+00
11.05	1.1823E+05	7.9356E+03	7.0431E-01	7.2000E-02	1.3105E+03	1.8486E+01	5.7846E+02	1.9292E+00
11.10	1.0895E+05	5.9524E+03	7.0256E-01	7.1591E-02	1.3054E+03	1.8484E+01	5.7795E+02	1.9339E+00
11.15	1.0457E+05	3.3906E+03	7.0159E-01	7.1092E-02	1.3006E+03	1.8479E+01	5.7748E+02	1.9358E+00
11.20	1.1013E+05	4.4868E+03	6.9858E-01	6.9995E-02	1.2933E+03	1.8532E+01	5.7675E+02	1.9483E+00
11.25	1.0346E+05	9.5294E+03	6.9618E-01	6.9485E-02	1.2873E+03	1.8164E+01	5.7616E+02	1.9164E+00
11.30	1.0306E+05	3.4706E+03	6.9486E-01	6.9071E-02	1.2823E+03	1.8549E+01	5.7565E+02	1.9597E+00
11.35	1.0766E+05	2.3410E+04	6.9051E-01	6.8315E-02	1.2737E+03	1.9083E+01	5.7479E+02	2.0228E+00
11.40	1.0361E+05	2.2673E+04	6.8665E-01	6.6163E-02	1.2661E+03	1.9274E+01	5.7403E+02	2.0468E+00
11.45	1.0114E+05	8.8765E+03	6.8229E-01	6.4579E-02	1.2594E+03	1.7644E+01	5.7334E+02	1.8862E+00
11.50	9.5695E+04	7.6291E+03	6.7816E-01	6.4589E-02	1.2541E+03	1.7994E+01	5.7280E+02	1.9284E+00
11.55	1.0052E+05	5.2562E+03	6.7206E-01	6.3273E-02	1.2472E+03	1.8500E+01	5.7210E+02	1.9862E+00
11.60	9.8835E+04	5.5070E+03	6.6557E-01	6.1887E-02	1.2397E+03	1.8476E+01	5.7133E+02	1.9911E+00
11.65	9.8218E+04	5.5397E+03	6.5916E-01	6.0577E-02	1.2322E+03	1.8476E+01	5.7055E+02	1.9959E+00
11.70	9.8174E+04	5.6698E+03	6.5258E-01	5.9289E-02	1.2247E+03	1.8476E+01	5.6977E+02	2.0056E+00
11.75	9.8900E+04	5.8127E+03	6.4500E-01	5.7916E-02	1.2171E+03	1.8476E+01	5.6899E+02	2.0128E+00
11.80	9.8781E+04	5.9305E+03	6.3679E-01	5.6535E-02	1.2096E+03	1.8476E+01	5.6820E+02	2.0201E+00
11.85	1.0373E+05	5.8859E+03	6.2718E-01	5.5104E-02	1.2010E+03	1.8476E+01	5.6729E+02	2.0274E+00
11.90	1.0465E+05	5.6921E+03	6.1668E-01	5.3664E-02	1.1920E+03	1.8428E+01	5.6634E+02	2.0297E+00
11.95	1.0568E+05	6.8483E+03	6.0590E-01	5.2251E-02	1.1829E+03	1.8452E+01	5.6538E+02	2.0443E+00
12.00	1.0170E+05	6.9538E+03	5.9582E-01	5.1369E-02	1.1751E+03	1.8476E+01	5.6453E+02	2.0539E+00
12.05	9.3925E+04	6.6851E+03	5.8795E-01	5.0796E-02	1.1696E+03	1.8476E+01	5.6397E+02	2.0597E+00
12.10	1.0321E+05	7.2117E+03	5.7809E-01	4.9944E-02	1.1630E+03	1.8476E+01	5.6324E+02	2.0636E+00
12.15	9.9517E+04	7.4797E+03	5.6834E-01	4.9035E-02	1.1567E+03	1.8476E+01	5.6255E+02	2.0733E+00
12.20	1.0569E+05	7.6131E+03	5.5809E-01	4.7915E-02	1.1496E+03	1.8452E+01	5.6177E+02	2.0781E+00
12.25	1.0667E+05	7.5360E+03	5.4826E-01	4.6781E-02	1.1421E+03	1.8476E+01	5.6096E+02	2.0853E+00
12.30	1.0881E+05	7.7735E+03	5.3904E-01	4.5613E-02	1.1346E+03	1.8476E+01	5.6013E+02	2.0950E+00
12.35	1.0975E+05	7.6882E+03	5.3029E-01	4.4457E-02	1.1271E+03	1.8428E+01	5.5931E+02	2.0974E+00
12.40	1.0669E+05	7.7161E+03	5.2277E-01	4.3587E-02	1.1208E+03	1.8476E+01	5.5860E+02	2.1095E+00
12.45	1.1476E+05	8.1259E+03	5.1454E-01	4.2651E-02	1.1137E+03	1.8452E+01	5.5781E+02	2.1168E+00
12.50	1.1823E+05	8.4021E+03	5.0532E-01	4.1707E-02	1.1062E+03	1.8476E+01	5.5698E+02	2.1240E+00
12.55	1.1646E+05	8.4580E+03	4.9677E-01	4.0872E-02	1.0999E+03	1.8476E+01	5.5626E+02	2.1313E+00

Table D.2b (continued)

TIME (S)	JUN 11 G(LBM/HR-FT**2) NOM. RESP.	ST. DEV.	JUN 11 X NOM. RESP.	ST. DEV.	VOL 11 P(PSIA) NOM. RESP.	ST. DEV.	VOL 11 T(F) NOM. RESP.	ST. DEV.
12.60	1.2522E+05	8.6741E+03	4.8826E-01	4.0183E-02	1.0929E+03	1.8452E+01	5.5547E+02	2.1385E+00
12.65	1.2800E+05	8.4246E+03	4.8043E-01	3.9712E-02	1.0854E+03	1.8500E+01	5.5462E+02	2.1530E+00
12.70	1.3066E+05	8.8618E+03	4.7368E-01	3.9360E-02	1.0780E+03	1.8452E+01	5.5377E+02	2.1554E+00
12.75	1.2675E+05	9.4249E+03	4.6865E-01	3.9356E-02	1.0716E+03	1.8452E+01	5.5304E+02	2.1603E+00
12.80	1.2747E+05	9.1744E+03	4.6434E-01	3.9455E-02	1.0657E+03	1.8452E+01	5.5235E+02	2.1699E+00
12.85	1.2255E+05	8.6673E+03	4.6091E-01	3.9544E-02	1.0608E+03	1.8452E+01	5.5179E+02	2.1748E+00
12.90	1.2323E+05	8.9623E+03	4.5828E-01	3.9672E-02	1.0563E+03	1.8452E+01	5.5127E+02	2.1820E+00
12.95	1.2826E+05	9.2889E+03	4.5582E-01	3.9868E-02	1.0507E+03	1.8428E+01	5.5062E+02	2.1868E+00
13.00	1.1546E+05	8.5960E+03	4.5549E-01	4.0351E-02	1.0469E+03	1.8452E+01	5.5017E+02	2.1918E+00
13.05	1.2906E+05	8.9582E+03	4.5494E-01	4.0464E-02	1.0419E+03	1.8428E+01	5.4958E+02	2.1965E+00
13.10	1.2265E+05	1.2663E+04	4.5477E-01	4.1065E-02	1.0369E+03	1.8452E+01	5.4900E+02	2.2038E+00
13.15	1.4360E+05	1.1518E+04	4.5367E-01	4.1060E-02	1.0300E+03	1.8549E+01	5.4818E+02	2.2256E+00
13.20	1.2819E+05	1.1331E+04	4.5298E-01	4.0821E-02	1.0240E+03	1.7873E+01	5.4746E+02	2.1556E+00
13.25	1.3461E+05	1.0374E+04	4.5252E-01	4.1576E-02	1.0182E+03	1.8452E+01	5.4677E+02	2.2304E+00
13.30	1.3689E+05	1.0177E+04	4.5073E-01	4.1667E-02	1.0123E+03	1.8404E+01	5.4607E+02	2.2328E+00
13.35	1.4406E+05	1.0067E+04	4.4662E-01	4.1396E-02	1.0053E+03	1.8404E+01	5.4522E+02	2.2400E+00
13.40	1.3910E+05	1.0809E+04	4.4140E-01	4.1141E-02	9.9888E+02	1.8411E+01	5.4444E+02	2.2497E+00
13.45	1.3413E+05	1.0350E+04	4.3666E-01	4.0599E-02	9.9400E+02	1.8348E+01	5.4385E+02	2.2497E+00
13.50	1.3514E+05	1.1106E+04	4.3172E-01	4.0467E-02	9.8954E+02	1.8416E+01	5.4331E+02	2.2618E+00
13.55	1.4237E+05	1.1668E+04	4.2536E-01	4.0056E-02	9.8402E+02	1.8411E+01	5.4263E+02	2.2715E+00
13.60	1.3677E+05	1.1914E+04	4.1911E-01	3.9611E-02	9.7903E+02	1.8421E+01	5.4202E+02	2.2787E+00
13.65	1.3245E+05	1.1436E+04	4.1457E-01	3.8952E-02	9.7562E+02	1.8423E+01	5.4159E+02	2.2835E+00
13.70	1.3976E+05	1.1705E+04	4.1029E-01	3.8143E-02	9.7161E+02	1.8421E+01	5.4110E+02	2.2884E+00
13.75	1.3992E+05	1.1206E+04	4.0641E-01	3.7144E-02	9.6710E+02	1.8382E+01	5.4054E+02	2.2908E+00
13.80	1.3296E+05	1.0903E+04	4.0443E-01	3.6392E-02	9.6365E+02	1.8392E+01	5.4011E+02	2.2956E+00
13.85	1.3214E+05	1.0412E+04	4.0386E-01	3.5859E-02	9.6070E+02	1.8392E+01	5.3974E+02	2.3005E+00
13.90	1.3906E+05	1.0362E+04	4.0240E-01	3.5261E-02	9.5672E+02	1.8368E+01	5.3924E+02	2.3029E+00
13.95	1.3185E+05	1.0749E+04	4.0080E-01	3.4859E-02	9.5324E+02	1.8409E+01	5.3880E+02	2.3125E+00
14.00	1.4074E+05	1.0126E+04	3.9848E-01	3.4420E-02	9.4932E+02	1.8426E+01	5.3831E+02	2.3222E+00
14.05	1.4055E+05	2.8759E+04	3.9522E-01	3.2783E-02	9.4480E+02	1.5970E+01	5.3774E+02	2.0177E+00
14.10	1.3531E+05	1.0795E+04	3.9272E-01	3.3280E-02	9.4138E+02	1.7311E+01	5.3730E+02	2.1917E+00
14.15	1.3626E+05	1.0862E+04	3.9023E-01	3.3156E-02	9.3841E+02	1.7104E+01	5.3693E+02	2.1700E+00
14.20	1.3540E+05	1.0438E+04	3.8770E-01	3.3192E-02	9.3539E+02	1.7137E+01	5.3654E+02	2.1796E+00
14.25	1.3460E+05	1.0912E+04	3.8532E-01	3.3411E-02	9.3239E+02	1.7147E+01	5.3616E+02	2.1845E+00
14.30	1.3502E+05	1.1063E+04	3.8324E-01	3.3631E-02	9.2941E+02	1.7154E+01	5.3578E+02	2.1893E+00
14.35	1.4271E+05	1.4449E+04	3.8048E-01	3.3839E-02	9.2541E+02	1.6364E+01	5.3526E+02	2.0927E+00
14.40	1.2919E+05	2.1046E+04	3.7888E-01	3.5012E-02	9.2290E+02	1.8333E+01	5.3494E+02	2.3438E+00
14.45	1.3920E+05	1.1476E+04	3.7770E-01	3.4739E-02	9.2057E+02	1.6799E+01	5.3464E+02	2.1555E+00
14.50	1.4676E+05	1.8694E+04	3.7457E-01	3.5260E-02	9.1655E+02	1.6521E+01	5.3411E+02	2.1241E+00
14.55	1.3958E+05	1.8408E+04	3.7135E-01	3.5972E-02	9.1305E+02	1.7326E+01	5.3366E+02	2.2352E+00
14.60	1.4107E+05	1.3285E+04	3.6845E-01	3.6099E-02	9.1012E+02	1.7043E+01	5.3328E+02	2.1990E+00
14.65	1.4170E+05	2.3726E+04	3.6483E-01	3.7055E-02	9.0713E+02	1.7295E+01	5.3289E+02	2.2377E+00
14.70	1.4644E+05	2.2731E+04	3.6057E-01	3.6284E-02	9.0390E+02	1.7022E+01	5.3247E+02	2.2066E+00
14.75	1.4626E+05	2.6970E+04	3.5600E-01	3.8467E-02	9.0120E+02	1.7020E+01	5.3211E+02	2.2088E+00
14.80	1.3928E+05	2.5250E+04	3.5293E-01	4.0008E-02	8.9922E+02	1.7642E+01	5.3185E+02	2.2956E+00
14.85	1.5923E+05	3.9265E+04	3.4965E-01	3.8967E-02	8.9591E+02	1.6816E+01	5.3142E+02	2.1918E+00
14.90	1.4163E+05	7.3088E+04	3.4619E-01	4.1024E-02	8.9316E+02	1.7502E+01	5.3105E+02	2.2860E+00
14.95	1.4973E+05	4.3212E+04	3.4487E-01	4.1287E-02	8.9095E+02	1.7497E+01	5.3076E+02	2.2884E+00
15.00	1.5451E+05	4.3398E+04	3.4105E-01	4.1772E-02	8.8797E+02	1.6958E+01	5.3036E+02	2.2209E+00

Table D.3. Test 3.06.6B, rod uncertainties (one standard deviation), TE-327AC

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
6.25	1023.40	9.76	102846.	17161.	823.82	5.42	323.95	54.06
6.30	1029.91	9.74	104176.	17021.	827.44	5.41	328.15	53.62
6.35	1036.45	9.71	103857.	16894.	831.07	5.39	327.15	53.22
6.40	1042.77	9.69	104572.	16761.	834.58	5.38	329.40	52.80
6.45	1048.43	9.72	108829.	16614.	837.73	5.40	342.81	52.33
6.50	1053.91	9.75	111388.	16481.	840.77	5.42	350.87	51.92
6.55	1059.58	9.74	111127.	16358.	843.92	5.41	350.05	51.53
6.60	1065.94	9.68	106159.	16262.	847.46	5.38	334.40	51.23
6.65	1072.04	9.63	105455.	16136.	850.85	5.35	332.18	50.83
6.70	1077.98	9.59	105281.	16007.	854.15	5.33	331.64	50.42
6.75	1083.51	9.58	107301.	15868.	857.22	5.32	338.00	49.98
6.80	1088.72	9.60	109739.	15732.	860.11	5.33	345.68	49.56
6.85	1094.19	9.57	108566.	15613.	863.15	5.32	341.98	49.18
6.90	1099.67	9.55	107663.	15492.	866.20	5.31	339.14	48.80
6.95	1104.58	9.56	110697.	15348.	868.92	5.31	348.70	48.35
7.00	1109.34	9.57	112524.	15214.	871.57	5.32	354.45	47.92
7.05	1114.26	9.56	111877.	15090.	874.30	5.31	352.41	47.53
7.10	1119.42	9.52	109711.	14973.	877.17	5.29	345.59	47.16
7.15	1124.28	9.50	110394.	14838.	879.87	5.28	347.74	46.74
7.20	1129.18	9.47	109730.	14712.	882.59	5.26	345.65	46.34
7.25	1133.87	9.45	110349.	14577.	885.20	5.25	347.60	45.92
7.30	1138.77	9.41	108582.	14457.	887.92	5.23	342.03	45.54
7.35	1143.96	9.34	105147.	14349.	890.80	5.19	331.21	45.20
7.40	1148.53	9.32	107289.	14195.	893.34	5.18	337.96	44.71
7.45	1152.27	9.37	112992.	14036.	895.42	5.21	355.92	44.21
7.50	1155.95	9.40	115385.	13897.	897.47	5.22	363.46	43.78
7.55	1159.97	9.38	113951.	13770.	899.70	5.21	358.95	43.38
7.60	1164.32	9.34	110930.	13656.	902.12	5.19	349.43	43.02
7.65	1168.41	9.31	111068.	13522.	904.39	5.17	349.86	42.59
7.70	1172.10	9.30	113165.	13378.	906.44	5.17	356.47	42.14
7.75	1175.97	9.28	112122.	13253.	908.59	5.16	353.18	41.75
7.80	1180.25	9.21	108406.	13150.	910.97	5.12	341.48	41.42
7.85	1184.40	9.16	107141.	13027.	913.27	5.09	337.49	41.04
7.90	1187.77	9.17	111158.	12869.	915.15	5.09	350.15	40.54
7.95	1190.44	9.22	117009.	12720.	916.63	5.12	368.58	40.07
8.00	1193.65	9.22	115410.	12593.	918.41	5.12	363.54	39.67
8.05	1197.32	9.16	111621.	12488.	920.45	5.09	351.61	39.34
8.10	1201.14	9.10	108516.	12384.	922.57	5.06	341.83	39.01
8.15	1204.05	9.10	112872.	12223.	924.19	5.06	355.55	38.50
8.20	1206.86	9.11	114450.	12087.	925.75	5.06	360.52	38.07
8.25	1210.06	9.07	112082.	11973.	927.53	5.04	353.06	37.71
8.30	1213.25	9.03	110809.	11855.	929.30	5.02	349.05	37.34
8.35	1216.61	8.98	108361.	11748.	931.17	4.99	341.34	37.01
8.40	1219.35	8.97	110935.	11600.	932.69	4.98	349.45	36.54
8.45	1222.26	8.94	110042.	11479.	934.31	4.97	346.63	36.16
8.50	1225.19	8.90	108900.	11363.	935.94	4.94	343.03	35.79
8.55	1227.66	8.90	111090.	11220.	937.31	4.94	349.93	35.34
8.60	1229.58	8.92	115247.	11071.	938.37	4.96	363.03	34.87
8.65	1231.65	8.93	115575.	10936.	939.52	4.96	364.06	34.45
8.70	1234.14	8.89	112611.	10826.	940.91	4.94	354.72	34.10
8.75	1236.97	8.82	108668.	10738.	942.48	4.90	342.30	33.82
8.80	1239.50	8.77	108335.	10617.	943.89	4.87	341.26	33.44
8.85	1241.61	8.75	110190.	10476.	945.06	4.86	347.10	33.00
8.90	1243.45	8.75	112053.	10338.	946.08	4.86	352.97	32.56
8.95	1246.10	8.68	106584.	10265.	947.55	4.82	335.74	32.33
9.00	1248.39	8.63	106389.	10145.	948.83	4.79	335.13	31.96
9.05	1250.29	8.61	107999.	10009.	949.88	4.78	340.20	31.53
9.10	1252.00	8.60	109284.	9878.	950.83	4.78	344.24	31.12
9.15	1253.75	8.58	109078.	9760.	951.80	4.77	343.60	30.74
9.20	1255.56	8.55	108284.	9653.	952.81	4.75	341.09	30.41
9.25	1257.40	8.52	107351.	9552.	953.83	4.73	338.16	30.09
9.30	1258.81	8.52	109587.	9453.	954.61	4.73	345.20	29.71
9.35	1259.76	8.54	113468.	9316.	955.14	4.74	357.42	29.35
9.40	1260.86	8.55	113914.	9212.	955.75	4.75	358.83	29.02
9.45	1262.36	8.53	111543.	9133.	956.59	4.74	351.36	28.77
9.50	1263.72	8.51	111672.	9055.	957.34	4.73	351.77	28.52
9.55	1264.72	8.53	114097.	8974.	957.90	4.74	359.41	28.27
9.60	1265.90	8.52	113792.	8905.	958.55	4.73	358.44	28.05
9.65	1267.45	8.49	111122.	8856.	959.42	4.72	350.03	27.90
9.70	1268.84	8.48	111177.	8799.	960.19	4.71	350.21	27.72
9.75	1269.85	8.49	113612.	8738.	960.75	4.72	357.88	27.52
9.80	1271.03	8.49	113339.	8688.	961.40	4.72	357.02	27.37
9.85	1272.59	8.46	110693.	8654.	962.27	4.70	348.68	27.26

Table D.3 (continued)

TIME (S)	TW (F)	STW (F)	Q (BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
9.90	1273.97	8.45	110767.	8610.	963.04	4.69	348.92	27.12
9.95	1274.99	8.47	113213.	8562.	963.60	4.71	356.62	25.97
10.00	1275.74	8.50	116065.	8521.	964.02	4.72	365.60	26.84
10.05	1276.83	8.50	114971.	8483.	964.63	4.72	362.16	26.72
10.10	1277.95	8.50	114637.	8452.	965.25	4.72	361.11	26.62
10.15	1279.34	8.48	112624.	8429.	966.02	4.71	354.77	26.55
10.20	1280.58	8.47	112861.	8400.	966.71	4.71	355.51	26.46
10.25	1281.99	8.45	111570.	8379.	967.49	4.69	351.45	26.39
10.30	1283.65	8.42	109173.	8367.	968.42	4.68	343.89	26.36
10.35	1285.06	8.41	109723.	8339.	969.20	4.67	345.63	26.27
10.40	1286.06	8.43	112545.	8311.	969.75	4.68	354.52	26.18
10.45	1286.79	8.47	115627.	8293.	970.16	4.71	364.23	26.12
10.50	1287.43	8.52	117782.	8277.	970.52	4.73	371.01	26.07
10.55	1288.29	8.56	117513.	8110.	970.99	4.76	370.17	25.55
10.60	1290.86	8.51	105469.	8656.	972.42	4.73	332.23	27.27
10.65	1293.69	8.39	94915.	10198.	973.99	4.66	298.98	32.12
10.70	1295.01	8.28	94318.	11342.	974.73	4.60	297.10	35.73
10.75	1295.04	8.15	95980.	11824.	974.74	4.53	302.34	37.25
10.80	1294.48	7.99	95291.	11833.	974.43	4.44	300.17	37.27
10.85	1293.74	7.81	92263.	11591.	974.02	4.34	290.63	36.51
10.90	1292.48	7.66	91787.	11132.	973.32	4.26	289.13	35.07
10.95	1290.66	7.53	93107.	10577.	972.31	4.18	293.29	33.32
11.00	1288.92	7.40	91377.	10075.	971.34	4.11	287.84	31.74
11.05	1287.49	7.26	87229.	9665.	970.55	4.03	274.77	30.44
11.10	1286.27	7.12	82802.	9317.	969.87	3.96	260.83	29.35
11.15	1284.67	7.02	82498.	8907.	968.98	3.90	259.87	28.06
11.20	1282.57	6.94	84729.	8448.	967.82	3.86	266.90	26.61
11.25	1280.14	6.89	87202.	7975.	966.47	3.83	274.69	25.12
11.30	1278.02	6.83	85588.	7556.	965.29	3.79	269.60	23.80
11.35	1275.92	6.76	84666.	7172.	964.12	3.76	266.70	22.59
11.40	1274.09	6.69	82075.	6850.	963.10	3.72	258.54	21.58
11.45	1272.09	6.63	81756.	6525.	961.99	3.68	257.53	20.55
11.50	1269.39	6.61	86176.	6150.	960.49	3.67	271.45	19.37
11.55	1266.44	6.61	89500.	5761.	958.85	3.67	281.92	18.15
11.60	1264.03	6.57	87181.	5412.	957.52	3.65	274.62	17.05
11.65	1262.29	6.50	81794.	5209.	956.55	3.61	257.65	16.41
11.70	1260.93	6.42	76705.	5103.	955.79	3.57	241.62	16.07
11.75	1259.66	6.34	73222.	5011.	955.09	3.52	230.65	15.78
11.80	1257.92	6.29	74182.	4829.	954.12	3.49	233.67	15.21
11.85	1255.23	6.30	80576.	4572.	952.63	3.50	253.81	14.40
11.90	1253.06	6.28	79170.	4326.	951.42	3.49	249.39	13.63
11.95	1251.04	6.24	77763.	4133.	950.30	3.47	244.95	13.02
12.00	1249.29	6.20	75231.	3995.	949.33	3.44	236.98	12.58
12.05	1246.84	6.19	78873.	3790.	947.96	3.44	248.45	11.94
12.10	1242.74	6.27	91826.	3692.	945.69	3.48	289.25	11.63
12.15	1238.96	6.32	95294.	3324.	943.59	3.51	300.18	10.47
12.20	1236.37	6.30	89692.	2875.	942.15	3.50	282.53	9.06
12.25	1234.76	6.22	81278.	2816.	941.25	3.46	256.03	8.87
12.30	1233.53	6.14	74979.	2914.	940.57	3.41	236.18	9.18
12.35	1231.91	6.08	74282.	2867.	939.67	3.38	233.99	9.03
12.40	1230.19	6.05	73714.	2832.	938.71	3.36	232.20	8.92
12.45	1227.28	6.07	81336.	2739.	937.10	3.37	256.21	8.63
12.50	1224.00	6.12	86827.	2663.	935.27	3.40	273.51	8.39
12.55	1220.46	6.16	91489.	2524.	933.31	3.42	288.19	7.95
12.60	1217.25	6.19	91909.	2261.	931.52	3.44	289.51	7.12
12.65	1214.43	6.18	90173.	2019.	929.96	3.43	284.04	6.36
12.70	1211.03	6.21	94117.	1999.	928.07	3.45	296.47	6.30
12.75	1207.68	6.22	95647.	1894.	926.21	3.46	301.29	5.97
12.80	1204.30	6.24	97077.	1808.	924.33	3.47	305.79	5.70
12.85	1200.01	6.31	104770.	2063.	921.95	3.51	330.03	6.50
12.90	1195.13	6.42	112736.	2332.	919.23	3.57	355.12	7.35
12.95	1190.59	6.48	114908.	2161.	916.71	3.60	361.96	6.81
13.00	1187.11	6.47	109837.	1681.	914.78	3.59	345.99	5.30
13.05	1184.51	6.40	102559.	1457.	913.33	3.56	323.06	4.59
13.10	1182.33	6.32	96666.	1447.	912.12	3.51	304.50	4.56
13.15	1181.09	6.19	86971.	1702.	911.43	3.44	273.96	5.36
13.20	1179.85	6.10	82047.	1742.	910.74	3.39	258.45	5.49
13.25	1178.55	6.02	78843.	1754.	910.02	3.34	248.36	5.53
13.30	1176.80	5.98	79415.	1687.	909.05	3.32	250.16	5.31
13.35	1174.62	5.97	81551.	1679.	907.84	3.32	256.89	5.29
13.40	1172.60	5.95	80718.	1698.	906.72	3.31	254.26	5.35
13.45	1170.95	5.91	77502.	1749.	905.80	3.28	244.13	5.51
13.50	1169.12	5.88	76982.	1765.	904.78	3.27	242.49	5.56
13.55	1166.91	5.87	78849.	1753.	903.56	3.26	248.37	5.52
13.60	1164.86	5.86	78123.	1733.	902.42	3.26	246.09	5.46

Table D.3 (continued)

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
13.65	1162.73	5.84	78176.	1715.	901.23	3.24	246.25	5.40
13.70	1160.84	5.81	76343.	1707.	900.18	3.23	240.48	5.38
13.75	1158.35	5.82	79520.	1701.	898.80	3.23	250.49	5.36
13.80	1156.02	5.82	79546.	1657.	897.50	3.23	250.57	5.22
13.85	1153.69	5.81	79572.	1613.	896.21	3.23	250.65	5.08
13.90	1151.74	5.78	76968.	1586.	895.13	3.21	242.45	5.00
13.95	1149.70	5.76	76451.	1579.	893.99	3.20	240.82	4.97
14.00	1147.41	5.75	77639.	1575.	892.72	3.19	244.56	4.96
14.05	1145.34	5.73	76384.	1553.	891.57	3.18	240.61	4.89
14.10	1142.79	5.74	79215.	1565.	890.15	3.19	249.53	4.93
14.15	1140.01	5.76	81867.	1578.	888.61	3.20	257.88	4.97
14.20	1137.67	5.75	80108.	1457.	887.31	3.19	252.34	4.59
14.25	1135.92	5.70	75494.	1433.	886.34	3.17	237.81	4.51
14.30	1134.53	5.65	71025.	1522.	885.56	3.14	223.73	4.79
14.35	1132.79	5.62	70988.	1513.	884.60	3.12	223.61	4.77
14.40	1130.56	5.62	73648.	1507.	883.36	3.12	231.99	4.75
14.45	1128.02	5.63	76617.	1533.	881.95	3.13	241.34	4.83
14.50	1125.38	5.65	78627.	1527.	880.48	3.14	247.68	4.81
14.55	1123.17	5.64	76707.	1411.	879.25	3.13	241.63	4.44
14.60	1121.02	5.62	75753.	1373.	878.06	3.12	238.62	4.32
14.65	1118.70	5.62	76429.	1367.	876.77	3.12	240.75	4.31
14.70	1115.77	5.64	80915.	1458.	875.14	3.13	254.88	4.59
14.75	1112.74	5.67	83587.	1479.	873.46	3.15	263.30	4.66
14.80	1109.90	5.68	83910.	1389.	871.88	3.16	264.32	4.38
14.85	1107.71	5.65	79993.	1222.	870.66	3.14	251.98	3.85
14.90	1105.23	5.65	80687.	1225.	869.29	3.14	254.16	3.86
14.95	1102.55	5.65	82109.	1252.	867.80	3.14	258.64	3.94
15.00	1100.31	5.63	79799.	1181.	866.55	3.13	251.37	3.72

Table D.4. Test 3.06.6B, rod uncertainties (one standard deviation), TE-355BC

TIME (S)	TW (F)	STW (F)	Q (BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
5.65	1026.92	10.12	114819.	17909.	825.78	5.62	361.68	56.41
5.70	1033.16	10.14	120041.	17764.	829.24	5.63	378.13	55.96
5.75	1039.60	10.13	120048.	17651.	832.82	5.63	378.15	55.60
5.80	1046.84	10.05	114336.	17571.	836.84	5.58	360.16	55.35
5.85	1052.61	10.08	121385.	17406.	840.05	5.60	382.36	54.83
5.90	1057.23	10.20	131297.	17272.	842.62	5.67	413.59	54.41
5.95	1062.88	10.21	128532.	17150.	845.76	5.67	404.88	54.02
6.00	1069.74	10.10	119596.	17075.	849.57	5.61	376.73	53.79
6.05	1076.28	10.02	117612.	16954.	853.20	5.57	370.48	53.41
6.10	1083.75	9.86	109104.	16896.	857.35	5.48	343.68	53.22
6.15	1089.79	9.84	113997.	16699.	860.71	5.47	359.09	52.60
6.20	1096.59	9.75	109163.	16604.	864.49	5.42	343.86	52.30
6.25	1101.72	9.80	117881.	16413.	867.34	5.44	371.33	51.70
6.30	1107.01	9.82	119309.	16280.	870.27	5.46	375.82	51.28
6.35	1110.51	9.97	132324.	16143.	872.22	5.54	416.92	50.85
6.40	1115.29	9.98	128969.	16002.	874.88	5.54	406.25	50.41
6.45	1119.94	9.99	129391.	15873.	877.46	5.55	407.58	50.00
6.50	1125.66	9.90	122012.	15783.	880.64	5.50	384.34	49.72
6.55	1131.14	9.82	120197.	15662.	883.68	5.46	378.62	49.34
6.60	1136.92	9.73	116241.	15553.	886.89	5.41	366.16	48.99
6.65	1142.64	9.65	113951.	15429.	890.07	5.36	358.95	48.60
6.70	1147.32	9.65	118943.	15252.	892.67	5.36	374.67	48.04
6.75	1152.71	9.59	115066.	15146.	895.67	5.33	362.46	47.71
6.80	1157.15	9.61	119547.	14986.	898.13	5.34	376.57	47.21
6.85	1161.99	9.58	117716.	14864.	900.82	5.32	370.81	46.82
6.90	1165.92	9.61	123086.	14710.	903.01	5.34	387.72	46.34
6.95	1170.09	9.61	122994.	14579.	905.32	5.34	387.43	45.92
7.00	1173.12	9.70	130995.	14435.	907.01	5.39	412.63	45.47
7.05	1177.12	9.68	127319.	14308.	909.23	5.38	401.05	45.07
7.10	1181.79	9.59	121506.	14213.	911.82	5.33	382.74	44.77
7.15	1186.23	9.53	120077.	14085.	914.29	5.29	378.24	44.37
7.20	1190.52	9.49	119582.	13953.	916.67	5.27	376.68	43.95
7.25	1194.90	9.43	117735.	13831.	919.11	5.24	370.87	43.57
7.30	1199.91	9.32	111687.	13747.	921.89	5.18	351.81	43.30
7.35	1203.23	9.35	120048.	13540.	923.73	5.19	378.15	42.65
7.40	1206.28	9.40	124233.	13394.	925.43	5.22	391.33	42.19
7.45	1209.04	9.44	127909.	13252.	926.96	5.24	402.91	41.74
7.50	1212.54	9.42	124360.	13128.	928.91	5.23	391.73	41.35
7.55	1215.91	9.39	123813.	12999.	930.78	5.22	390.01	40.95
7.60	1219.77	9.32	119608.	12895.	932.92	5.18	376.77	40.62
7.65	1222.86	9.30	122630.	12739.	934.64	5.17	386.28	40.13
7.70	1225.86	9.30	123621.	12601.	936.31	5.17	389.41	39.69
7.75	1230.04	9.18	115194.	12538.	938.63	5.10	362.86	39.49
7.80	1234.18	9.08	111277.	12434.	940.93	5.04	350.52	39.17
7.85	1238.07	9.00	110019.	12299.	943.09	5.00	346.56	38.74
7.90	1240.44	9.05	118934.	12098.	944.41	5.03	374.64	38.11
7.95	1243.22	9.05	118739.	11965.	945.95	5.03	374.03	37.69
8.00	1245.33	9.09	123334.	11817.	947.13	5.05	388.50	37.22
8.05	1248.30	9.04	118879.	11702.	948.78	5.02	374.47	36.86
8.10	1251.54	8.97	114959.	11604.	950.58	4.98	362.12	36.55
8.15	1253.38	9.01	122590.	11427.	951.60	5.01	386.16	36.00
8.20	1256.24	8.95	117549.	11324.	953.19	4.97	370.28	35.67
8.25	1258.79	8.92	117640.	11194.	954.60	4.96	370.57	35.26
8.30	1261.76	8.85	113895.	11095.	956.25	4.92	358.77	34.95
8.35	1263.91	8.84	117376.	10936.	957.45	4.91	369.73	34.45
8.40	1265.61	8.87	121203.	10788.	958.39	4.93	381.79	33.98
8.45	1267.16	8.89	123511.	10647.	959.25	4.94	389.06	33.54
8.50	1269.72	8.81	117098.	10555.	960.68	4.89	368.86	33.25
8.55	1273.36	8.66	106457.	10558.	962.70	4.81	335.34	33.26
8.60	1275.83	8.61	109243.	10362.	964.07	4.78	344.12	32.64
8.65	1277.92	8.58	111384.	10207.	965.23	4.77	350.86	32.15
8.70	1279.85	8.57	112407.	10069.	966.30	4.76	354.08	31.72
8.75	1282.27	8.51	108792.	9971.	967.65	4.73	342.69	31.41
8.80	1282.87	8.58	119635.	9785.	967.98	4.77	376.85	30.82
8.85	1283.64	8.63	122288.	9633.	968.41	4.79	385.21	30.34
8.90	1284.61	8.63	122257.	9485.	968.95	4.79	385.11	29.88
8.95	1286.16	8.59	118306.	9373.	969.81	4.77	372.66	29.52
9.00	1288.06	8.51	113860.	9290.	970.87	4.73	358.66	29.26
9.05	1290.18	8.42	109742.	9214.	972.04	4.68	345.69	29.02
9.10	1291.44	8.40	113192.	9056.	972.74	4.67	356.55	28.53
9.15	1292.61	8.39	114258.	8940.	973.39	4.66	359.91	28.16
9.20	1294.13	8.35	111810.	8857.	974.24	4.64	352.20	27.90
9.25	1295.58	8.32	110996.	8768.	975.04	4.62	349.64	27.62

Table D.4 (continued)

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
9.30	1297.16	8.28	109266.	8694.	975.92	4.60	344.19	27.39
9.35	1298.50	8.26	109778.	8608.	976.67	4.59	345.80	27.12
9.40	1299.98	8.23	108442.	8542.	977.49	4.57	341.59	26.91
9.45	1300.82	8.25	112283.	8453.	977.96	4.58	353.69	26.63
9.50	1301.79	8.25	112575.	8387.	978.49	4.58	354.61	26.42
9.55	1302.33	8.29	116013.	8325.	978.79	4.61	365.44	26.22
9.60	1303.24	8.29	114936.	8268.	979.30	4.61	362.05	26.04
9.65	1304.71	8.25	110773.	8240.	980.12	4.58	348.93	25.96
9.70	1305.72	8.25	112364.	8188.	980.68	4.58	353.95	25.79
9.75	1306.37	8.27	115278.	8144.	981.04	4.59	363.13	25.65
9.80	1306.49	8.33	120331.	8115.	981.11	4.63	379.04	25.56
9.85	1308.05	8.28	112476.	8089.	981.97	4.60	354.30	25.48
9.90	1308.61	8.31	116887.	8048.	982.28	4.62	368.19	25.35
9.95	1309.19	8.33	118291.	8024.	982.61	4.63	372.62	25.28
10.00	1310.32	8.31	115185.	8005.	983.23	4.62	362.83	25.22
10.05	1311.66	8.28	112575.	7995.	983.98	4.60	354.61	25.18
10.10	1312.80	8.27	112783.	7971.	984.61	4.59	355.27	25.11
10.15	1314.15	8.24	111019.	7960.	985.36	4.58	349.71	25.07
10.20	1315.41	8.22	110712.	7942.	986.06	4.57	348.74	25.02
10.25	1315.99	8.26	115256.	7919.	986.38	4.59	363.06	24.94
10.30	1316.78	8.28	115485.	7902.	986.82	4.60	363.78	24.89
10.35	1317.28	8.32	118089.	7891.	987.10	4.62	371.98	24.86
10.40	1318.20	8.32	116294.	7876.	987.61	4.62	366.33	24.81
10.45	1317.91	8.41	124742.	7896.	987.45	4.67	392.94	24.87
10.50	1318.85	8.40	119529.	7853.	987.97	4.67	376.52	24.74
10.55	1321.08	8.28	108794.	7769.	989.21	4.60	342.70	24.47
10.60	1323.76	8.14	100887.	8025.	990.70	4.52	317.79	25.28
10.65	1326.40	7.93	92485.	8844.	992.17	4.41	291.33	27.86
10.70	1326.69	7.79	98457.	8995.	992.33	4.33	310.14	28.33
10.75	1326.68	7.60	95733.	9124.	992.32	4.22	301.56	28.74
10.80	1323.85	7.55	110296.	8433.	990.75	4.19	347.43	25.56
10.85	1320.23	7.53	118407.	7838.	988.74	4.18	372.98	24.69
10.90	1317.46	7.44	114564.	7311.	987.20	4.13	360.88	23.03
10.95	1316.40	7.25	100244.	7147.	986.51	4.03	315.77	22.51
11.00	1315.55	7.06	91723.	6971.	986.14	3.92	288.93	21.96
11.05	1314.14	6.94	90077.	6613.	985.36	3.86	283.74	20.83
11.10	1311.24	6.91	98092.	6097.	983.74	3.84	308.99	19.21
11.15	1308.88	6.85	96214.	5767.	982.43	3.81	303.07	18.17
11.20	1307.76	6.73	86241.	5649.	981.81	3.74	271.66	17.79
11.25	1306.70	6.63	81095.	5495.	981.22	3.68	255.45	17.31
11.30	1305.88	6.52	75706.	5370.	980.77	3.62	238.47	16.92
11.35	1303.64	6.50	82293.	4952.	979.52	3.61	259.22	15.60
11.40	1301.58	6.46	82386.	4685.	978.38	3.59	259.52	14.76
11.45	1299.05	6.46	85631.	4387.	976.97	3.59	269.74	13.82
11.50	1295.90	6.48	91237.	4112.	975.22	3.60	287.40	12.95
11.55	1292.67	6.50	94264.	3800.	973.43	3.61	296.93	11.97
11.60	1289.32	6.52	97056.	3514.	971.57	3.62	305.73	11.07
11.65	1287.14	6.47	90398.	3237.	970.35	3.59	284.75	10.20
11.70	1284.46	6.45	91718.	3056.	968.87	3.58	288.91	9.63
11.75	1282.01	6.42	90211.	2907.	967.50	3.57	284.16	9.16
11.80	1278.76	6.44	95330.	2768.	965.70	3.58	300.29	8.72
11.85	1277.30	6.35	84539.	2715.	964.89	3.53	266.30	8.55
11.90	1274.02	6.38	93351.	2553.	963.07	3.54	294.06	8.04
11.95	1272.40	6.31	84300.	2484.	962.17	3.51	265.55	7.82
12.00	1271.23	6.22	77566.	2588.	961.52	3.46	244.33	8.15
12.05	1271.11	6.10	66280.	2957.	961.45	3.39	208.78	9.31
12.10	1270.36	6.03	64796.	2827.	961.03	3.35	204.11	8.91
12.15	1268.63	6.01	69344.	2566.	960.07	3.34	218.43	8.08
12.20	1267.47	5.97	65900.	2565.	959.43	3.32	207.59	8.08
12.25	1266.56	5.92	62283.	2584.	958.92	3.29	196.19	8.14
12.30	1265.93	5.87	57964.	2639.	958.57	3.26	182.59	8.31
12.35	1263.66	5.88	66949.	2402.	957.31	3.27	210.89	7.57
12.40	1261.40	5.90	69803.	2282.	956.05	3.28	219.83	7.19
12.45	1257.71	5.97	81485.	2431.	954.00	3.32	256.68	7.66
12.50	1254.28	6.03	85124.	2228.	952.10	3.35	268.14	7.02
12.55	1251.72	6.03	81745.	1764.	950.68	3.35	257.50	5.56
12.60	1248.23	6.07	88060.	1871.	948.74	3.37	277.39	5.89
12.65	1245.88	6.05	82909.	1494.	947.43	3.36	261.16	4.71
12.70	1243.57	6.03	81315.	1419.	946.15	3.35	256.14	4.47
12.75	1240.71	6.04	84496.	1454.	944.56	3.36	266.16	4.58
12.80	1236.75	6.11	93715.	1816.	942.36	3.39	295.20	5.72
12.85	1232.05	6.22	103336.	2244.	939.75	3.46	325.51	7.07
12.90	1227.95	6.28	104410.	1955.	937.47	3.49	328.89	6.16
12.95	1225.26	6.24	96525.	1338.	935.97	3.47	304.05	4.21
13.00	1223.69	6.14	86148.	1337.	935.10	3.41	271.37	4.21

Table D.4 (continued)

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
13.05	1221.28	6.11	87573.	1187.	933.76	3.39	275.85	3.74
13.10	1220.19	6.01	77746.	1453.	933.16	3.34	244.90	4.58
13.15	1217.90	5.99	81695.	1171.	931.89	3.33	257.34	3.69
13.20	1215.41	5.99	83566.	1184.	930.50	3.33	263.23	3.73
13.25	1211.50	6.07	94311.	1671.	928.33	3.37	297.08	5.26
13.30	1208.51	6.08	92408.	1383.	926.67	3.38	291.09	4.36
13.35	1205.27	6.11	94402.	1402.	924.87	3.39	297.37	4.42
13.40	1203.11	6.06	88024.	1148.	923.67	3.37	277.23	3.62
13.45	1201.70	5.98	80326.	1264.	922.88	3.32	253.03	3.98
13.50	1199.31	5.96	83484.	1115.	921.56	3.31	262.97	3.51
13.55	1196.80	5.96	84729.	1131.	920.16	3.31	266.90	3.56
13.60	1193.89	5.97	87926.	1230.	918.55	3.32	276.97	3.87
13.65	1192.37	5.91	79470.	1160.	917.70	3.28	250.33	3.65
13.70	1190.18	5.89	80810.	1118.	916.48	3.27	254.55	3.52
13.75	1187.50	5.90	84068.	1184.	915.00	3.28	264.81	3.73
13.80	1185.11	5.89	83176.	1138.	913.67	3.27	262.00	3.58
13.85	1182.47	5.90	84729.	1178.	912.20	3.28	266.90	3.71
13.90	1181.06	5.83	76633.	1168.	911.42	3.24	241.39	3.68
13.95	1177.98	5.86	85000.	1250.	909.71	3.26	267.75	3.94
14.00	1175.67	5.85	82452.	1132.	908.42	3.25	259.72	3.57
14.05	1172.34	5.89	88990.	1379.	906.57	3.27	280.32	4.34
14.10	1169.82	5.88	86038.	1172.	905.17	3.27	271.02	3.69
14.15	1165.85	5.95	95636.	1664.	902.97	3.31	301.25	5.24
14.20	1163.63	5.92	87534.	1130.	901.73	3.29	275.73	3.56
14.25	1161.67	5.86	83169.	1105.	900.64	3.26	261.98	3.48
14.30	1160.95	5.75	72298.	1446.	900.24	3.19	227.74	4.55
14.35	1159.52	5.70	71978.	1247.	899.45	3.17	226.73	3.93
14.40	1157.35	5.69	75559.	1096.	898.24	3.16	238.01	3.45
14.45	1154.72	5.71	79554.	1180.	896.78	3.17	250.60	3.72
14.50	1151.13	5.78	87856.	1576.	894.79	3.21	276.75	4.96
14.55	1148.89	5.76	82340.	1136.	893.54	3.20	259.37	3.58
14.60	1145.40	5.81	89635.	1465.	891.60	3.23	282.35	4.61
14.65	1142.56	5.82	88150.	1264.	890.03	3.23	277.67	3.98
14.70	1139.71	5.82	88347.	1207.	888.44	3.23	278.29	3.80
14.75	1138.41	5.73	77878.	1166.	887.72	3.18	245.32	3.67
14.80	1137.25	5.65	72441.	1280.	887.08	3.14	228.19	4.03
14.85	1134.68	5.66	78929.	1064.	885.65	3.14	248.63	3.35
14.90	1131.90	5.68	82199.	1165.	884.10	3.16	258.93	3.67
14.95	1129.28	5.69	82627.	1152.	882.65	3.16	260.28	3.63
15.00	1127.71	5.63	75763.	1073.	881.78	3.13	238.65	3.38

Table D.5. Test 3.06.6B, rod uncertainties (one standard deviation). TR-326AD

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
5.35	1026.82	10.11	113460.	18869.	825.72	5.62	357.40	59.44
5.40	1034.47	10.09	112460.	18786.	829.97	5.61	354.25	59.18
5.45	1042.16	10.05	111164.	18701.	834.24	5.58	350.17	58.91
5.50	1049.89	10.00	109675.	18613.	838.54	5.56	345.48	58.63
5.55	1057.65	9.95	108065.	18523.	842.85	5.53	340.40	58.35
5.60	1064.58	9.98	112296.	18400.	846.70	5.54	353.73	57.96
5.65	1071.07	10.03	116557.	18290.	850.31	5.57	367.15	57.61
5.70	1077.93	10.03	115600.	18195.	854.12	5.57	364.14	57.31
5.75	1084.99	10.00	113813.	18102.	858.04	5.56	358.51	57.02
5.80	1091.99	9.97	113004.	18003.	861.93	5.54	355.96	56.71
5.85	1098.88	9.95	112824.	17899.	865.76	5.53	355.40	56.38
5.90	1105.74	9.92	112308.	17792.	869.57	5.51	353.77	56.04
5.95	1112.20	9.92	114271.	17669.	873.16	5.51	359.95	55.66
6.00	1118.26	9.96	117386.	17543.	876.53	5.53	369.77	55.26
6.05	1124.10	9.99	119927.	17420.	879.77	5.55	377.77	54.87
6.10	1130.34	9.97	118032.	17308.	883.24	5.54	371.80	54.52
6.15	1136.25	9.97	119409.	17182.	886.52	5.54	376.14	54.12
6.20	1142.02	9.98	120475.	17055.	889.73	5.54	379.50	53.72
6.25	1147.85	9.97	120186.	16933.	892.97	5.54	378.59	53.34
6.30	1153.84	9.93	118510.	16816.	896.29	5.52	373.31	52.97
6.35	1159.94	9.87	116491.	16700.	899.68	5.48	366.95	52.61
6.40	1165.67	9.85	117508.	16565.	902.87	5.47	370.15	52.18
6.45	1170.98	9.87	120160.	16428.	905.82	5.48	378.50	51.75
6.50	1176.05	9.89	122520.	16297.	908.63	5.49	385.94	51.34
6.55	1181.08	9.91	123596.	16172.	911.43	5.51	389.33	50.94
6.60	1186.57	9.87	120546.	16064.	914.48	5.48	379.72	50.60
6.65	1191.73	9.85	121274.	15935.	917.35	5.47	382.01	50.20
6.70	1196.74	9.84	122033.	15808.	920.13	5.47	384.40	49.80
6.75	1201.37	9.86	124671.	15675.	922.70	5.48	392.71	49.38
6.80	1206.11	9.86	124533.	15552.	925.33	5.48	392.28	48.99
6.85	1211.15	9.81	122164.	15439.	928.13	5.45	384.82	48.63
6.90	1216.02	9.78	121856.	15310.	930.84	5.43	383.85	48.23
6.95	1220.57	9.78	123382.	15171.	933.37	5.43	388.65	47.79
7.00	1224.90	9.78	125015.	15035.	935.77	5.43	393.80	47.36
7.05	1229.59	9.74	122591.	14917.	938.38	5.41	386.16	46.99
7.10	1234.35	9.69	120699.	14796.	941.02	5.38	380.20	46.61
7.15	1238.98	9.65	120078.	14665.	943.60	5.36	378.25	46.19
7.20	1243.03	9.66	123112.	14517.	945.85	5.37	387.80	45.73
7.25	1247.02	9.66	124234.	14383.	948.06	5.37	391.34	45.31
7.30	1250.78	9.67	125958.	14247.	950.15	5.37	396.77	44.88
7.35	1254.75	9.65	124841.	14121.	952.36	5.36	393.25	44.48
7.40	1259.02	9.59	121767.	14008.	954.73	5.33	383.57	44.13
7.45	1262.72	9.59	124136.	13859.	956.79	5.33	391.03	43.66
7.50	1266.46	9.57	123956.	13728.	958.87	5.32	390.46	43.24
7.55	1270.61	9.50	120435.	13618.	961.17	5.28	379.37	42.90
7.60	1274.74	9.43	118374.	13494.	963.47	5.24	372.88	42.51
7.65	1278.18	9.43	121579.	13332.	965.38	5.24	382.97	42.00
7.70	1281.38	9.45	123855.	13188.	967.15	5.25	390.14	41.54
7.75	1284.69	9.43	123530.	13055.	968.99	5.24	389.12	41.12
7.80	1288.20	9.39	121506.	12934.	970.94	5.22	382.74	40.74
7.85	1291.85	9.33	119187.	12816.	972.97	5.18	375.44	40.37
7.90	1295.13	9.31	120086.	12675.	974.79	5.17	378.27	39.93
7.95	1297.98	9.31	122735.	12530.	976.38	5.17	386.62	39.47
8.00	1301.01	9.29	122027.	12403.	978.06	5.16	384.39	39.07
8.05	1304.44	9.23	118403.	12297.	979.97	5.13	372.97	38.74
8.10	1307.75	9.17	117077.	12171.	981.81	5.09	368.79	38.34
8.15	1310.31	9.19	121049.	12010.	983.23	5.11	381.30	37.83
8.20	1313.03	9.17	120772.	11878.	984.74	5.09	380.43	37.42
8.25	1316.32	9.09	116088.	11782.	986.57	5.05	365.68	37.11
8.30	1319.67	9.01	113003.	11672.	988.43	5.01	355.96	36.77
8.35	1322.34	8.99	115576.	11507.	989.91	4.99	364.05	36.25
8.40	1324.34	9.03	120604.	11349.	991.02	5.02	379.90	35.75
8.45	1326.41	9.04	121669.	11211.	992.17	5.02	383.26	35.31
8.50	1328.87	9.01	119135.	11090.	993.54	5.01	375.28	34.93
8.55	1331.66	8.94	115325.	10987.	995.09	4.97	363.27	34.61
8.60	1334.17	8.89	114961.	10851.	996.48	4.94	362.13	34.18
8.65	1336.70	8.83	113668.	10725.	997.89	4.91	358.05	33.78
8.70	1339.42	8.76	110818.	10616.	999.40	4.87	349.08	33.44
8.75	1342.33	8.67	107175.	10515.	1001.02	4.82	337.60	33.12
8.80	1344.49	8.66	110057.	10336.	1002.22	4.81	346.68	32.56
8.85	1346.20	8.67	113482.	10177.	1003.17	4.82	357.47	32.06
8.90	1347.83	8.68	114916.	10032.	1004.07	4.82	361.99	31.60
8.95	1350.00	8.62	111119.	9923.	1005.28	4.79	350.02	31.26

Table D.5 (continued)

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
9.00	1352.31	8.55	108082.	9820.	1006.56	4.75	340.46	30.93
9.05	1354.07	8.53	109997.	9668.	1007.54	4.74	346.49	30.45
9.10	1356.03	8.49	108359.	9559.	1008.63	4.72	341.33	30.11
9.15	1358.11	8.44	106186.	9461.	1009.79	4.69	334.49	29.80
9.20	1359.76	8.43	107830.	9333.	1010.70	4.68	339.66	29.40
9.25	1361.25	8.42	108971.	9223.	1011.53	4.68	343.26	29.05
9.30	1362.86	8.41	108292.	9132.	1012.43	4.67	341.12	28.77
9.35	1364.22	8.41	109663.	9038.	1013.18	4.67	345.44	28.47
9.40	1366.04	8.37	106523.	8977.	1014.19	4.65	335.55	28.28
9.45	1367.67	8.35	106456.	8902.	1015.10	4.64	335.34	28.04
9.50	1369.28	8.34	106173.	8836.	1015.99	4.63	334.44	27.83
9.55	1370.53	8.35	108468.	8762.	1016.69	4.64	341.67	27.60
9.60	1371.87	8.36	108581.	8703.	1017.43	4.64	342.03	27.41
9.65	1373.44	8.34	106926.	8657.	1018.30	4.63	336.82	27.27
9.70	1374.80	8.34	107761.	8605.	1019.06	4.63	339.45	27.11
9.75	1376.21	8.34	107571.	8561.	1019.84	4.63	338.85	26.97
9.80	1377.39	8.35	109151.	8516.	1020.50	4.64	343.83	26.83
9.85	1378.73	8.35	108634.	8479.	1021.24	4.64	342.20	26.71
9.90	1380.32	8.33	106598.	8453.	1022.13	4.63	335.78	26.63
9.95	1381.70	8.33	107244.	8416.	1022.89	4.63	337.82	26.51
10.00	1382.71	8.36	110129.	8381.	1023.45	4.64	346.91	26.40
10.05	1383.45	8.41	113328.	8354.	1023.86	4.67	356.98	26.32
10.10	1384.53	8.42	112483.	8322.	1024.46	4.68	354.32	26.21
10.15	1385.64	8.43	112285.	8298.	1025.08	4.68	353.70	26.14
10.20	1386.60	8.45	113500.	8277.	1025.61	4.69	357.53	26.07
10.25	1387.38	8.48	115431.	8259.	1026.05	4.71	363.61	26.02
10.30	1388.52	8.48	113854.	8242.	1026.68	4.71	358.64	25.96
10.35	1389.69	8.48	113292.	8228.	1027.33	4.71	356.87	25.92
10.40	1390.68	8.49	114334.	8213.	1027.88	4.72	360.15	25.87
10.45	1391.50	8.52	116157.	8200.	1028.34	4.73	365.89	25.83
10.50	1392.24	8.55	117635.	8188.	1028.75	4.75	370.55	25.79
10.55	1393.72	8.48	113022.	7969.	1029.57	4.71	356.02	25.10
10.60	1396.18	8.30	103889.	8070.	1030.94	4.61	327.25	25.42
10.65	1398.51	8.01	95082.	8636.	1032.23	4.45	299.51	27.20
10.70	1400.19	7.68	87502.	9109.	1033.17	4.27	275.63	28.69
10.75	1400.43	7.44	86967.	8889.	1033.30	4.13	273.95	28.00
10.80	1399.77	7.26	87065.	8446.	1032.93	4.03	274.25	26.60
10.85	1398.73	7.11	85603.	7979.	1032.35	3.95	269.65	25.13
10.90	1397.19	7.01	85817.	7440.	1031.50	3.89	270.32	23.44
10.95	1394.73	6.98	90719.	6846.	1030.13	3.88	285.76	21.56
11.00	1392.33	6.94	91030.	6382.	1028.80	3.86	286.74	20.10
11.05	1390.44	6.87	86898.	6029.	1027.75	3.82	273.73	18.99
11.10	1388.99	6.78	81416.	5769.	1026.94	3.77	256.45	18.17
11.15	1387.26	6.72	80256.	5440.	1025.98	3.73	252.81	17.14
11.20	1385.92	6.64	75845.	5215.	1025.24	3.69	238.91	16.43
11.25	1384.32	6.59	75110.	4918.	1024.35	3.66	236.60	15.49
11.30	1382.65	6.55	74414.	4641.	1023.42	3.64	234.40	14.62
11.35	1380.99	6.51	73269.	4387.	1022.50	3.62	230.80	13.82
11.40	1379.02	6.50	74638.	4106.	1021.40	3.61	235.11	12.93
11.45	1377.48	6.46	71575.	3903.	1020.55	3.59	225.46	12.29
11.50	1376.14	6.41	68419.	3734.	1019.80	3.56	215.52	11.76
11.55	1374.39	6.38	69652.	3491.	1018.83	3.54	219.40	11.00
11.60	1372.89	6.35	67637.	3316.	1018.00	3.53	213.05	10.45
11.65	1371.52	6.31	65484.	3164.	1017.24	3.51	206.27	9.97
11.70	1369.71	6.30	67397.	2952.	1016.23	3.50	212.30	9.30
11.75	1367.74	6.30	68918.	2762.	1015.14	3.50	217.09	8.70
11.80	1365.89	6.29	68626.	2589.	1014.11	3.49	216.17	8.16
11.85	1364.20	6.27	67228.	2447.	1013.17	3.48	211.77	7.71
11.90	1362.59	6.24	65918.	2327.	1012.28	3.47	207.64	7.33
11.95	1361.43	6.20	61834.	2292.	1011.63	3.44	194.78	7.22
12.00	1360.28	6.16	59546.	2231.	1010.99	3.42	187.57	7.03
12.05	1358.94	6.13	59395.	2115.	1010.25	3.41	187.09	6.66
12.10	1357.80	6.10	57207.	2067.	1009.61	3.39	180.20	6.51
12.15	1356.58	6.08	56354.	1985.	1008.94	3.38	177.52	6.25
12.20	1355.16	6.07	57059.	1879.	1008.15	3.37	179.74	5.92
12.25	1353.95	6.04	55334.	1824.	1007.47	3.36	174.30	5.75
12.30	1352.68	6.03	54729.	1754.	1006.77	3.35	172.40	5.55
12.35	1351.64	6.00	52472.	1731.	1006.19	3.33	165.29	5.45
12.40	1350.43	5.98	52362.	1658.	1005.52	3.32	164.94	5.22
12.45	1348.95	5.98	53804.	1573.	1004.70	3.32	169.48	4.95
12.50	1347.27	5.98	55730.	1502.	1003.76	3.32	175.55	4.73
12.55	1345.51	5.98	57095.	1433.	1002.79	3.32	179.85	4.51
12.60	1344.16	5.97	54743.	1352.	1002.04	3.32	172.44	4.26
12.65	1342.44	5.97	56600.	1304.	1001.08	3.32	178.29	4.11
12.70	1340.52	5.98	58695.	1274.	1000.01	3.32	184.89	4.01

Table D.5 (continued)

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
12.75	1338.19	6.00	62839.	1323.	998.72	3.33	197.94	4.17
12.80	1335.95	6.02	64249.	1246.	997.47	3.34	202.38	3.92
12.85	1333.56	6.04	66601.	1234.	996.15	3.36	209.79	3.89
12.90	1331.78	6.02	63474.	1014.	995.16	3.34	199.94	3.19
12.95	1329.91	6.02	63352.	984.	994.12	3.34	199.56	3.10
13.00	1328.04	6.01	63212.	964.	993.08	3.34	199.12	3.04
13.05	1325.82	6.02	65790.	1021.	991.85	3.34	207.24	3.22
13.10	1323.28	6.04	69393.	1156.	990.43	3.36	218.59	3.64
13.15	1320.94	6.05	69765.	1069.	989.13	3.36	219.76	3.37
13.20	1319.00	6.04	67536.	923.	988.06	3.36	212.74	2.91
13.25	1316.93	6.04	67875.	924.	986.91	3.36	213.81	2.91
13.30	1314.51	6.05	70586.	1027.	985.56	3.36	222.35	3.24
13.35	1311.84	6.08	73762.	1154.	984.08	3.38	232.35	3.64
13.40	1309.08	6.10	76151.	1216.	982.54	3.39	239.88	3.83
13.45	1305.50	6.17	83897.	1698.	980.56	3.43	264.28	5.35
13.50	1301.90	6.23	88119.	1783.	978.56	3.46	277.57	5.62
13.55	1298.70	6.26	88169.	1534.	976.78	3.48	277.73	4.83
13.60	1296.35	6.23	83033.	1154.	975.47	3.46	261.55	3.64
13.65	1294.24	6.19	79735.	1062.	974.30	3.44	251.17	3.35
13.70	1291.99	6.17	79155.	1017.	973.05	3.43	249.34	3.20
13.75	1289.54	6.16	80139.	1026.	971.69	3.42	252.44	3.23
13.80	1287.40	6.14	78150.	975.	970.50	3.41	246.17	3.07
13.85	1285.25	6.12	77361.	951.	969.30	3.40	243.69	3.00
13.90	1282.91	6.12	78220.	971.	968.00	3.40	246.39	3.06
13.95	1280.38	6.13	79870.	1033.	966.60	3.41	251.59	3.25
14.00	1278.19	6.11	78136.	961.	965.38	3.39	246.13	3.03
14.05	1275.60	6.12	80484.	1050.	963.94	3.40	253.52	3.31
14.10	1273.22	6.11	79869.	1007.	962.62	3.39	251.59	3.17
14.15	1270.87	6.11	79583.	989.	961.32	3.39	250.69	3.12
14.20	1268.89	6.08	76874.	931.	960.22	3.38	242.15	2.93
14.25	1267.22	6.03	73297.	941.	959.29	3.35	230.89	2.96
14.30	1265.34	6.01	72979.	893.	958.24	3.34	229.88	2.81
14.35	1263.48	5.98	72188.	879.	957.21	3.32	227.39	2.77
14.40	1260.94	6.00	76448.	993.	955.80	3.33	240.81	3.13
14.45	1258.10	6.04	80378.	1191.	954.22	3.36	253.19	3.75
14.50	1254.82	6.09	85609.	1455.	952.40	3.38	269.67	4.58
14.55	1252.06	6.10	84607.	1218.	950.86	3.39	266.51	3.84
14.60	1250.04	6.06	79628.	981.	949.74	3.37	250.83	3.09
14.65	1248.11	6.03	77042.	953.	948.67	3.35	242.68	3.00
14.70	1246.32	5.99	74572.	947.	947.68	3.33	234.90	2.98
14.75	1243.88	5.99	77849.	953.	946.32	3.33	245.22	3.00
14.80	1241.11	6.01	81278.	1112.	944.78	3.34	256.03	3.50
14.85	1238.30	6.04	83214.	1170.	943.22	3.36	262.12	3.69
14.90	1236.04	6.02	80515.	1002.	941.96	3.34	253.62	3.16
14.95	1234.30	5.97	75801.	965.	941.00	3.32	238.77	3.04
15.00	1232.45	5.94	74447.	936.	939.97	3.30	234.51	2.95

Table D.6. Test 3.06.6B, rod uncertainties (one standard deviation), TE-327AD

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
5.60	1022.10	11.93	107211.	18640.	823.10	6.63	337.71	58.72
5.65	1029.50	11.92	106372.	18542.	827.21	6.62	335.07	58.41
5.70	1036.69	11.92	107276.	18429.	831.20	6.62	337.92	58.05
5.75	1044.03	11.89	106233.	18326.	835.28	6.61	334.63	57.73
5.80	1051.67	11.83	103266.	18231.	839.53	6.57	325.29	57.43
5.85	1059.08	11.78	102965.	18108.	843.64	6.54	324.34	57.04
5.90	1066.10	11.78	104660.	17972.	847.55	6.54	329.68	56.61
5.95	1072.89	11.79	106270.	17842.	851.32	6.55	334.75	56.20
6.00	1079.16	11.83	110089.	17705.	854.80	6.57	346.78	55.77
6.05	1085.48	11.86	111031.	17584.	858.31	6.59	349.75	55.39
6.10	1091.63	11.88	112565.	17459.	861.73	6.60	354.58	55.00
6.15	1097.59	11.91	114396.	17332.	865.04	6.62	360.35	54.60
6.20	1103.43	11.94	115799.	17204.	868.29	6.63	364.77	54.19
6.25	1109.80	11.90	112628.	17095.	871.82	6.61	354.78	53.85
6.30	1116.25	11.84	110404.	16974.	875.41	6.58	347.77	53.47
6.35	1122.54	11.80	109827.	16837.	878.90	6.56	345.96	53.04
6.40	1128.18	11.82	113415.	16681.	882.04	6.57	357.26	52.55
6.45	1133.75	11.84	114675.	16551.	885.13	6.58	361.23	52.14
6.50	1139.10	11.87	116589.	16420.	888.10	6.59	367.26	51.72
6.55	1144.22	11.90	118695.	16289.	890.95	6.61	373.89	51.31
6.60	1149.72	11.88	116805.	16174.	894.00	6.60	367.94	50.95
6.65	1155.26	11.85	115608.	16052.	897.08	6.58	364.17	50.56
6.70	1161.12	11.78	112207.	15943.	900.34	6.54	353.45	50.22
6.75	1166.35	11.78	114605.	15788.	903.24	6.54	361.01	49.73
6.80	1171.30	11.79	116711.	15647.	905.99	6.55	367.64	49.29
6.85	1176.79	11.74	113358.	15540.	909.04	6.52	357.08	48.95
6.90	1182.48	11.67	110055.	15428.	912.21	6.48	346.67	48.60
6.95	1187.59	11.66	112008.	15269.	915.05	6.48	352.83	48.10
7.00	1192.03	11.70	116583.	15113.	917.51	6.50	367.24	47.61
7.05	1196.15	11.76	120310.	14975.	919.80	6.53	378.98	47.17
7.10	1200.74	11.75	118455.	14851.	922.35	6.53	373.13	46.78
7.15	1205.44	11.72	116862.	14728.	924.96	6.51	368.12	46.39
7.20	1210.01	11.69	116593.	14596.	927.50	6.49	367.27	45.98
7.25	1214.45	11.68	116850.	14461.	929.97	6.49	368.08	45.55
7.30	1218.86	11.65	116531.	14328.	932.42	6.47	367.07	45.13
7.35	1223.80	11.57	112041.	14227.	935.16	6.43	352.93	44.82
7.40	1228.80	11.48	108988.	14114.	937.94	6.38	343.31	44.46
7.45	1233.12	11.47	111481.	13950.	940.34	6.37	351.17	43.94
7.50	1236.74	11.51	116463.	13797.	942.35	6.39	366.86	43.46
7.55	1240.03	11.57	120387.	13656.	944.18	6.43	379.22	43.02
7.60	1243.80	11.57	118554.	13524.	946.28	6.43	373.45	42.60
7.65	1247.67	11.53	116955.	13402.	948.43	6.41	368.41	42.22
7.70	1251.43	11.50	116685.	13274.	950.51	6.39	367.56	41.81
7.75	1255.53	11.43	113407.	13169.	952.79	6.35	357.23	41.48
7.80	1259.61	11.36	111522.	13054.	955.06	6.31	351.29	41.12
7.85	1263.48	11.32	111287.	12927.	957.21	6.29	350.55	40.72
7.90	1267.16	11.28	111616.	12799.	959.25	6.27	351.59	40.32
7.95	1270.29	11.30	114898.	12657.	960.99	6.28	361.93	39.87
8.00	1273.44	11.30	115566.	12526.	962.74	6.28	364.03	39.46
8.05	1276.87	11.26	113484.	12409.	964.65	6.26	357.47	39.09
8.10	1280.59	11.19	110133.	12310.	966.72	6.22	346.92	38.78
8.15	1283.94	11.15	110606.	12184.	968.58	6.19	348.41	38.38
8.20	1286.83	11.15	113204.	12046.	970.18	6.19	356.59	37.94
8.25	1289.95	11.11	111905.	11927.	971.92	6.17	352.50	37.57
8.30	1293.05	11.07	111069.	11809.	973.64	6.15	349.87	37.20
8.35	1295.98	11.05	111304.	11686.	975.27	6.14	350.61	36.81
8.40	1298.76	11.02	111816.	11560.	976.81	6.12	352.22	36.41
8.45	1301.51	11.00	111606.	11438.	978.34	6.11	351.56	36.03
8.50	1304.78	10.91	107086.	11352.	980.16	6.06	337.32	35.76
8.55	1308.13	10.81	104030.	11269.	982.02	6.01	327.69	35.50
8.60	1310.78	10.79	106607.	11136.	983.49	5.99	335.81	35.08
8.65	1313.24	10.78	108097.	11010.	984.86	5.99	340.51	34.68
8.70	1315.37	10.78	110442.	10876.	986.04	5.99	347.89	34.26
8.75	1318.23	10.71	105618.	10773.	987.63	5.95	332.70	33.93
8.80	1320.97	10.63	103973.	10674.	989.15	5.91	327.51	33.62
8.85	1323.26	10.61	105611.	10555.	990.42	5.89	332.67	33.25
8.90	1325.16	10.61	108258.	10422.	991.48	5.89	341.01	32.83
8.95	1326.93	10.60	109645.	10284.	992.46	5.89	345.38	32.39
9.00	1328.73	10.59	109737.	10145.	993.46	5.88	345.67	31.96
9.05	1330.58	10.55	109058.	10014.	994.49	5.86	343.55	31.54
9.10	1332.47	10.50	108057.	9894.	995.54	5.83	340.38	31.17
9.15	1334.38	10.44	107002.	9783.	996.60	5.80	337.06	30.82
9.20	1336.30	10.39	106006.	9679.	997.67	5.77	333.92	30.49

Table D.6 (continued)

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
9.25	1338.21	10.33	105095.	9580.	998.73	5.74	331.05	30.18
9.30	1340.11	10.28	104292.	9483.	999.79	5.71	328.52	29.87
9.35	1342.48	10.18	99946.	9421.	1001.10	5.66	314.83	29.68
9.40	1344.85	10.09	97632.	9357.	1002.42	5.61	307.54	29.47
9.45	1346.47	10.08	101338.	9253.	1003.32	5.60	319.21	29.15
9.50	1347.83	10.09	104143.	9153.	1004.07	5.61	328.05	28.83
9.55	1348.82	10.13	107947.	9053.	1004.62	5.63	340.03	28.52
9.60	1350.01	10.14	108270.	8942.	1005.29	5.63	341.05	28.17
9.65	1351.55	10.11	106291.	8853.	1006.14	5.62	334.82	27.89
9.70	1353.34	10.06	103688.	8799.	1007.14	5.59	326.52	27.72
9.75	1354.74	10.05	105431.	8738.	1007.91	5.58	332.11	27.52
9.80	1355.62	10.09	109627.	8684.	1008.40	5.61	345.33	27.35
9.85	1356.70	10.11	110033.	8620.	1009.00	5.62	346.60	27.15
9.90	1358.22	10.07	107346.	8572.	1009.85	5.59	338.14	27.00
9.95	1359.56	10.07	107747.	8532.	1010.59	5.59	339.40	26.88
10.00	1360.99	10.05	107155.	8497.	1011.39	5.58	337.54	26.77
10.05	1361.65	10.11	112507.	8467.	1011.75	5.62	354.40	26.67
10.10	1362.48	10.15	113526.	8427.	1012.21	5.64	357.61	26.55
10.15	1363.84	10.12	110556.	8394.	1012.97	5.62	348.25	26.44
10.20	1365.17	10.10	109897.	8372.	1013.71	5.61	346.18	26.37
10.25	1366.15	10.13	112104.	8348.	1014.25	5.63	353.13	26.30
10.30	1367.35	10.12	111355.	8328.	1014.92	5.62	350.77	26.23
10.35	1368.48	10.13	111796.	8310.	1015.55	5.63	352.16	26.18
10.40	1369.37	10.16	113724.	8294.	1016.04	5.64	358.23	26.13
10.45	1370.07	10.20	116117.	8283.	1016.43	5.67	365.77	26.09
10.50	1370.71	10.25	117863.	8274.	1016.79	5.69	371.27	26.06
10.55	1372.30	10.31	112037.	8184.	1017.67	5.73	352.92	25.78
10.60	1375.08	10.45	101054.	9658.	1019.21	5.81	318.32	30.42
10.65	1378.43	10.46	87509.	12530.	1021.08	5.81	275.65	39.47
10.70	1381.23	10.32	78077.	14710.	1022.63	5.73	245.94	46.34
10.75	1382.16	10.16	79620.	15456.	1023.15	5.64	250.80	48.69
10.80	1381.84	9.95	82669.	15298.	1022.97	5.53	260.41	48.19
10.85	1380.50	9.73	86834.	14673.	1022.23	5.41	273.53	46.22
10.90	1379.03	9.49	86592.	13892.	1021.41	5.27	272.76	43.76
10.95	1377.24	9.26	87054.	13116.	1020.41	5.14	274.22	41.32
11.00	1375.60	9.02	84728.	12391.	1019.50	5.01	266.89	39.03
11.05	1373.73	8.82	84507.	11751.	1018.46	4.90	266.20	37.02
11.10	1372.01	8.62	82259.	11155.	1017.51	4.79	259.12	35.14
11.15	1370.55	8.42	78741.	10622.	1016.70	4.68	248.03	33.46
11.20	1368.76	8.26	78825.	10160.	1015.70	4.59	248.30	32.00
11.25	1366.99	8.12	77933.	9681.	1014.72	4.51	245.49	30.50
11.30	1364.90	8.01	79249.	9214.	1013.56	4.45	249.63	29.02
11.35	1362.98	7.89	78150.	8726.	1012.49	4.38	246.17	27.49
11.40	1361.34	7.77	75389.	8267.	1011.58	4.32	237.48	26.04
11.45	1359.91	7.64	72322.	7887.	1010.79	4.24	227.81	24.84
11.50	1358.53	7.52	70083.	7560.	1010.02	4.18	220.76	23.81
11.55	1357.12	7.41	68647.	7256.	1009.24	4.12	216.24	22.86
11.60	1355.67	7.32	67717.	6961.	1008.43	4.07	213.31	21.93
11.65	1354.18	7.24	67044.	6667.	1007.60	4.02	211.19	21.00
11.70	1353.15	7.13	62856.	6384.	1007.03	3.96	198.00	20.11
11.75	1352.10	7.03	60672.	6171.	1006.45	3.91	191.12	19.44
11.80	1350.81	6.96	60830.	5964.	1005.73	3.87	191.61	18.79
11.85	1349.27	6.91	62015.	5723.	1004.87	3.84	195.35	18.03
11.90	1347.63	6.86	62858.	5457.	1003.96	3.81	198.00	17.19
11.95	1345.96	6.82	63170.	5171.	1003.04	3.79	198.99	16.29
12.00	1344.30	6.77	63119.	4889.	1002.11	3.76	198.82	15.40
12.05	1342.65	6.73	62894.	4623.	1001.20	3.74	198.12	14.56
12.10	1341.51	6.66	58996.	4382.	1000.56	3.70	185.84	13.80
12.15	1339.89	6.62	60660.	4249.	999.66	3.68	191.08	13.38
12.20	1338.51	6.57	59087.	4065.	998.90	3.65	186.12	12.80
12.25	1337.15	6.53	58175.	3909.	998.14	3.63	183.25	12.31
12.30	1335.68	6.49	58218.	3790.	997.32	3.61	183.39	11.94
12.35	1334.06	6.46	59086.	3648.	996.42	3.59	186.12	11.49
12.40	1332.37	6.44	59764.	3494.	995.48	3.58	188.26	11.01
12.45	1330.67	6.42	60086.	3326.	994.54	3.57	189.27	10.48
12.50	1328.98	6.40	60152.	3161.	993.60	3.56	189.48	9.96
12.55	1327.30	6.38	60085.	3009.	992.67	3.54	189.27	9.48
12.60	1325.63	6.36	59971.	2873.	991.74	3.53	188.91	9.05
12.65	1323.96	6.33	59850.	2748.	990.81	3.52	188.53	8.66
12.70	1321.81	6.34	63331.	2705.	989.62	3.52	199.49	8.52
12.75	1319.64	6.35	64883.	2552.	988.41	3.53	204.38	8.04
12.80	1317.71	6.34	64152.	2326.	987.34	3.52	202.08	7.33
12.85	1316.02	6.31	62431.	2167.	986.40	3.51	196.66	6.83
12.90	1314.42	6.28	61079.	2082.	985.51	3.49	192.40	6.56
12.95	1312.83	6.26	60282.	2033.	984.63	3.48	189.89	6.40

Table D.6 (continued)

TIME (S)	TW (F)	STW (F)	Q BTU/HR-FT**2)	SQ (BTU/HR-FT**2)	TW (K)	STW (K)	Q (KW/M**2)	SQ (KW/M**2)
13.00	1311.23	6.23	59872.	2003.	983.74	3.46	188.60	6.31
13.05	1309.12	6.24	63250.	2047.	982.57	3.47	199.24	6.45
13.10	1306.49	6.28	68366.	2129.	981.11	3.49	215.35	6.71
13.15	1304.08	6.30	69292.	1904.	979.77	3.50	218.27	6.00
13.20	1301.64	6.32	70527.	1748.	978.41	3.51	222.16	5.51
13.25	1299.02	6.35	72787.	1684.	976.96	3.53	229.28	5.30
13.30	1295.76	6.41	78909.	1882.	975.14	3.56	248.56	5.93
13.35	1292.45	6.47	82423.	1826.	973.31	3.59	259.63	5.75
13.40	1289.41	6.50	82992.	1578.	971.62	3.61	261.42	4.97
13.45	1286.16	6.55	85717.	1610.	969.81	3.64	270.01	5.07
13.50	1283.52	6.54	83095.	1309.	968.34	3.63	261.75	4.12
13.55	1281.17	6.52	80562.	1182.	967.04	3.62	253.77	3.72
13.60	1278.33	6.54	83212.	1264.	965.46	3.63	262.12	3.98
13.65	1275.83	6.53	81900.	1180.	964.07	3.63	257.99	3.72
13.70	1273.50	6.51	80469.	1126.	962.78	3.62	253.48	3.55
13.75	1271.62	6.47	76593.	1070.	961.73	3.59	241.27	3.37
13.80	1269.61	6.44	75763.	1027.	960.62	3.58	238.65	3.24
13.85	1267.30	6.44	77238.	1039.	959.33	3.58	243.30	3.27
13.90	1264.73	6.45	79451.	1132.	957.90	3.58	250.27	3.57
13.95	1262.07	6.47	81081.	1191.	956.43	3.59	255.41	3.75
14.00	1258.92	6.53	85576.	1431.	954.68	3.63	269.56	4.51
14.05	1256.27	6.53	84168.	1217.	953.20	3.63	265.13	3.83
14.10	1253.90	6.51	82178.	1100.	951.89	3.62	258.86	3.47
14.15	1252.04	6.46	77831.	1039.	950.85	3.59	245.17	3.27
14.20	1250.07	6.43	76696.	1001.	949.76	3.57	241.59	3.15
14.25	1247.79	6.42	77993.	997.	948.49	3.57	245.68	3.14
14.30	1245.25	6.43	80100.	1079.	947.08	3.57	252.32	3.40
14.35	1242.62	6.45	81656.	1144.	945.62	3.58	257.22	3.60
14.40	1240.47	6.43	79012.	1011.	944.43	3.57	248.89	3.18
14.45	1238.84	6.37	74287.	1011.	943.52	3.54	234.00	3.18
14.50	1236.53	6.37	77012.	1014.	942.24	3.54	242.59	3.19
14.55	1233.76	6.40	80975.	1206.	940.70	3.56	255.07	3.80
14.60	1231.40	6.39	79761.	1081.	939.39	3.55	251.25	3.41
14.65	1228.69	6.42	82083.	1185.	937.88	3.57	258.56	3.73
14.70	1226.33	6.41	80674.	1072.	936.57	3.56	254.12	3.38
14.75	1224.03	6.39	79850.	1037.	935.29	3.55	251.53	3.27
14.80	1221.66	6.38	80035.	1053.	933.97	3.54	252.11	3.32
14.85	1219.64	6.35	77585.	1005.	932.85	3.53	244.39	3.17
14.90	1217.56	6.33	76876.	1010.	931.70	3.52	242.16	3.18
14.95	1215.23	6.32	78066.	1057.	930.40	3.51	245.91	3.33
15.00	1212.69	6.34	79968.	1144.	928.99	3.52	251.90	3.60

The sensitivity derivatives can be calculated using a Taylor series. Application of the Taylor series gives:

$$R(X^+) = R(X_o) + \sum \partial R/\partial X_i \; \Delta X_i + 1/2 \sum\sum \partial^2 R/\partial X_i \partial X_j \; \Delta X_i \Delta X_j + \ldots ,$$

and

$$R(X^-) = R(X_o) - \sum \partial R/\partial X_i \Delta X_i + 1/2 \sum\sum \partial^2 R/\partial X_i \partial X_j \; \Delta X_i \Delta X_j - \ldots ,$$

where

$$X^+ = X_o + \Delta X,$$

and

$$X^- = X_o + \Delta X.$$

Thus,

$$R(X^+) - R(X^-) = 2 \sum \partial R/\partial X_i \; \Delta X_i + O(\Delta X^3) ,$$

which gives:

$$\partial R(X)/\partial X_i = \frac{R(X_i^+) - R(X_i^-)}{2\Delta X_i} + O(\Delta X_i^2) ,$$

if only one input (Xi) is varied. It can be shown that

$$\frac{\partial^2 R(X)}{\partial X_i^2} = \frac{R(X_i^+) + R(X_i^-) - 2R_o}{\Delta X_i^2} + O(\Delta Xi) ,$$

and

$$\frac{\partial^2 R(X)}{\partial X_i \partial X_j} = \frac{R(X_i^+, X_j^+) - R(X_i^+, X_j^-) - R(X_i^-, X_j^+) + R(X_i^-, X_j^-)}{4\Delta X_i \Delta X_j} + O(\Delta X_i, \Delta X_j) .$$

Using the input uncertainties and sensitivity derivatives, output uncertainties can be calculated as described.

As mentioned previously, the first step in the uncertainty analysis was the assignment of FRS instrument and property uncertainties. Since many of the FRS physical properties are determined from calculations performed using data taken when the rods are exposed to known fluid conditions (these calculations are performed by the computer code ORTCAL[2]), many of the uncertainties on FRS instrument responses and properties are correlated. To account for this rigorously, one must know the covariances of the uncertainties $\overline{\Delta X_i \Delta X_j}$. Determination of these covariances would have been quite expensive.[3] The following approximate technique produced accurate results at substantially reduced cost. The effect of the in-situ physical property calculations is to calculate properties that counteract inaccuracies in other data. For example, an error in the value of the thickness of the boron-nitride (BN) annulus would result in a variation in the value of the BN conductivity that "balanced" it. Rather than consider the annulus thickness in the uncertainty analysis, the uncertainty used for the thermal conductivity is sized to include the thickness uncertainty. Thus, a reduced number of sources of uncertainty are considered, and those considered are assumed to be uncorrelated ($\overline{\Delta X_i \Delta X_j} = 0$). The remaining input uncertainties include rod property uncertainties in BN core and annulus thermal conductivity, sheath thermocouple-clad contact resistance, and clad density and specific heat. Also remaining are instrument uncertainties in the sheath thermocouple signal and measured electric current. Uncertainties in Inconel cross-sectional area and length and Inconel resistivity are included in the uncertainty in measured current used to assign an uncertainty in rod power. Table D.7 contains input uncertainties used in the analysis.

Using uncertainties in FRS properties and instrument signals, the uncertainty analysis method described previously was employed to calculate uncertainties in rod surface temperature and heat flux. As mentioned previously, the computer code ORINC (Ref. 3) is used to calculate rod surface conditions.

Sources of uncertainties from four inputs were considered in the formal calculation of bundle fluid uncertainties. The inputs considered include: test section inlet mass flow; inlet enthalpy; outlet pressure; and heat flux from the rods to the fluid, which is lumped as one variable. Uncertainties in the first three inputs were ascertained from uncertainties in the following instruments: the test section inlet turbine meter, inlet fluid thermocouple, inlet pressure gage, and outlet pressure gage. Based on the instrument uncertainties, the input uncertainties assigned to inlet mass flow, inlet enthalpy, and outlet pressure are 2.11%, 10.1 J/g (4.35 Btu/lb_m) and 100 kPa (14.5 psi), respectively. The remaining input uncertainty, that of the total bundle heat flux, was calculated as the root-mean-square error of the uncertainties in heat flux of individual FRSs. The uncertainty calculated in total bundle heat flux was 4%.

With the four inputs described, uncertainties in bundle fluid conditions were calculated using the formal uncertainty analysis technique. Details of this analysis have been published.[4] Because of the nonphysical behavior of the second-order sensitivity derivatives, they were eliminated from the calculation of bundle fluid uncertainties. This behavior consisted of the second-order derivatives being negligibly small at the vast

Table D.7. Input uncertainties for rod surface conditions

Input	Typical nominal value	Typical uncertainty (σ)
Core boron nitride thermal conductivity, W/m·K (Btu/h·ft·°F)	20 (12)	10 (6)
Annular boron nitride thermal conductivity, W/m·K (Btu/h·ft·°F)	20 (12)	9 (5)
Sheath thermocouple-clad contact resistance, K·m²/kW (°F·s·ft²/Btu)	4.7 (0.027)	5 (0.2)
Stainless steel clad density, g/cm³ (lb_m/ft^3)	7.8 (490)	0.08 (5)
Stainless steel clad specific heat, J/g·K (Btu/lb_m·°F)	0.59 (0.14)	0.03 (0.007)
Sheath thermocouple signal,[a] K (°F)	810 (1000)	2.7 (4.9)
FRS current, A	450	11.7

[a] $\sigma = 1.8\ K + 0.005\ (T - 623\ K)$.

majority of time points, but being unrealistically large (i.e., "spiking") at occasional isolated time points. These spikes appeared, disappeared, and moved in time in an almost random fashion when such parameters as time-step size were changed. A second derivative may be thought of as the difference in the first derivatives at two nearby points, divided by the separation. If the code response is not sensitive to variations in the inputs (as is the case here), the first derivatives will be calculated by subtracting two quantities whose difference is small compared with the numbers being subtracted. These, then, are again subtracted to get the second derivatives. That this kind of procedure can rapidly lead to a meaningless result when small differences in large quantities are involved is well known. That appears to be the case here, so the second derivatives were ignored.

Since the formal analysis did not consider all sources of input uncertainties, uncertainties in addition to the formally calculated uncertainties in the bundle fluid conditions were assigned. The additional inputs that were not included in the formal uncertainty analysis are "model" inputs. These include the RLPSFLUX time-step size, node size, numerical solution technique, and model of the THTF rod bundle used in the calculation of bundle fluid conditions. Engineering judgement was used to assign the additional bundle fluid uncertainties. The engineering judgment is based on experience with RLPSFLUX and comparisons of bundle fluid conditions calculated using RLPSFLUX and COBRA-THTF. The resulting total bundle fluid uncertainties were obtained by doubling the formally

calculated uncertainties in equilibrium quality and mass flow, adding 28 kPa (4 psi) to the pressure uncertainty, and adding 0.3 K (0.5°F) to the saturated fluid temperature.

The bundle fluid conditions calculated using COBRA-THTF indicate that slip becomes significant at ~12 s in test 3.06.6B. As a result, the RLPSFLUX and COBRA-THTF calculated mass flows and equilibrium qualities are significantly different (~50%) after ~12 s. Before ~12 s the slip is not significant and the RLPSFLUX and COBRA-THTF calculated mass flow and equilibrium quality show good agreement (~6%). Thus, the assumption that slip is one is probably justified through ~12 s, but after ~12 s the assumption is unjustified. However, all uncertainties reported assume that slip is one. Comparisons between RLPSFLUX and COBRA-THTF calculated bundle fluid conditions for tests 3.03.6AR and 3.08.6C indicate that slip is not significant in any portion of these transients.

The calculation of uncertainties in experimentally determined and correlation-predicted heat transfer coefficients was achieved using the required input uncertainties in rod surface conditions and bundle fluid conditions. These input uncertainties were used in the uncertainty analysis technique to calculate the desired output uncertainties.

References

1. Y. Ronen et al., *A Nonlinear Sensitivity and Uncertainty Analysis in Support of the Blowdown Heat Transfer Program*, ORNL/NUREG/TM-412 (1980).

2. L. J. Ott and R. A. Hedrick, *ORTCAL — A Code for THTF Heater Rod Thermocouple Calibration*, ORNL/NUREG-51 (1979).

3. ORINC Version 3.1, unpublished — refer to: L. J. Ott and R. A. Hedrick, *ORINC — A One-Dimensional Implicit Approach to the Inverse Heat Conduction Problem*, ORNL/NUREG-23 (1977).

4. E. Wacholder et al., *Nonlinear Time-Dependent Sensitivity and Uncertainty Analysis for Post-CHF Heat Transfer to High-Pressure Water Upflow*, ORNL/TM-7543 (October 1981).

Appendix E

COBRA-THTF TEST SECTION MODEL LISTING: TEST 3.03.6AR

E.1 Steady-State Initialization COBRA-THTF Model

```
RQW,STMFZ,T177,YD1,TPO,P1. R Q WRIGHT    ORNL
ACCOUNT,MULLINS,1752.
REQUEST,TAPE9,*PF.
REQUEST,TRCOMP,*PF.
ATTACH,TAPE4,UPFLOWHFLXC,ID=ZZRDGM.
ATTACH(OLOPL,COBRATHTFU,ID=ZZGORNL)
ATTACH(BIN,COBRATHTFB,ID=ZZGORNL)
UPDATE,I=INPUT,C,L=1.
RFL,160000.
FTN,I=COMPILE,B=NEWB,LCM=I,L=0.
COPYL,BIN,NEWB,RUN.
REDUCE.
SEGLOAD.
LOSET(PRESET=ZERO)
RUN,PL=99999.
CATALOG(TRCOMP,UPFLOWHTRC6AR,ID=ZZRDGM,RP=99)
CATALOG(TAPE9 ,UPFLOWHFLX6AR,ID=ZZRDGM,RP=99)
AUDIT(ID=ZZRDGM)

*ID STHTF
*D HEAT.191
      TGT=TWALL
      CALL PROP(PLL,HVAP,TGT,3)
*D FLUXBC.64
      TGT=TWALL
      CALL PROP(PLL,HVAP,TGT,3)

ROOT    TREE TRAC-(A,INIT,DMPIT,PREP,EDIT,GRAF,G,POST)
A     TREE INPUT-(RDCOMP,RDREST)
G      TREE OUTER-(OUT1DN,OUT3D)
TRAC  INCLUDE INPB=,REWIND=:
TRAC  GLOBAL TWOPHAS,PROPS,LCMSP,HTGEN,RODS,QUEN,MCMX,SPLIT,SIMSOL:
TRAC    GLOBAL  GAPDAT2,MOMEN,XTEMP,GRDDAT,XKVARS,MOMENT,VELS,GRF,MVYDAT
TRAC GLOBAL FLTAB,VLTAB,PTAB,EXTRA,CONTRL,MATPRO,CTRLDP,GRAPH,SSCON
TRAC    GLOBAL  TIMER,ISTAT,UNITS,ABCDT,CONST,DIMEN,DLIM,VARS,HOLL
TRAC  GLOBAL PTRS,PWRS,NMFAIL,XVAR,DF1DC,PSE,CODEBK,ISLVE,LOOP,SINK
TRAC  GLOBAL GAPDAT1,INJECT,JUNCT,ABSORD,ENTRDAT,VEL,SETUPD
TRAC  GLOBAL DUMPER,TF3DC,RESTART,CCELL,CCELL1
TRAC  GLOBAL SIMS1,VW,INTFHT,DROP,PROP1,HTCS,HTINDX
TRAC  GLOBAL TSMSOL,GRFCOM,HLIQ,CCFL,V,REBAL
      END TRAC
                1                                0                1
  *****  OAK RIDGE UPFLOW FILM BOILING TEST -  HEAT FLUX BC. *****
                0                1                3                2                0
    0.001                .00001
                5               40
                1                2                3
BREAK                           1                1
                1                0                0                3
          0.356             .0022              1.0          610.07     1.4040E+07
PIPE                            2                2
                2                0                2                1                6

              .05             .001
          610.07
F    .356       E
F    .0022      E
F    .0062      E
     0.0                1.875          0.0       E
F    0.0        E
F    0.089      E
F               4E
F    0.0        E
F    0.0        E
F    0.0        E
F    540.8      E
F    1.4040E+07E
VESSEL                          3                3
          1  *****  UPFLOW FILM BOILING TEST  *****
     1    16
174.6
2036.30   504.54     0.0        5.5556
     2     5     5
     1 9.5791.89 9.57 9.57     0
     2 9.5791.89 9.57 9.57     1
     2     0     1 7.27
     3 9.5775.53 9.57 9.57     0
     439.2627.5 39.2639.26     1
     2     1     0 7.27
     5 44.6 45.539.2644.6
```

```
     1     1  1.0    -2  1.0
     2    -2  1.0     3  1.0
     3     3  1.0
     4    -4  1.0
     5    -4  1.0     5  1.0
     3     1
     1     3     4 3.563.957 2.0  0.0                1.0
28.

     4     4     1
     1     1    12     2 12.0
     1     2                                  1
     2     1     1     2 8.5
     2     3                                  1
     3     2     1     2 8.06
     3     3                                  2
     4     5                                  4
     4     1     2     2  7.0
     5     5                                  4
     1
    17
     7     7
1.489     2     1
1.489     4     1
1.489     6     1
1.489     8     1
1.489    10     1
1.489    12     1
2.123     2     2
     8     5     2     2
     11.175     1 0.0      2     1     1     2 1.0   1.0   0.0
     2 0.0      616.33     3     2     2       0.0   1.0   1.0
     31.175     3 0.0      2     1     1       0.0   1.0   59.0
     4 0.0      727.49     3     3     2       0.0   1.0   1.0
     5 18.0     5 0.0      3     4     2       0.0   1.0   1.0

     9     4
     1.3364     6     2     3     35000.
  0.0.0726.1158.1318.1500.1682.1683.1871
.0363.1089.1227.1409.1591.1682.1777.1871
     26.689     5     1     0     09999.
2.7082.7862.9043.0803.3453.583
2.7392.8332.9753.1863.3453.583
     35.914     5     1     0     09999.
4.3754.5274.7545.0955.6076.375
4.4364.6184.8915.3005.9146.375
     42.774     2     1     0     09999.
2.7242.7742.849
2.7442.8012.849
    10     2
    10
      400.0 40.490    14.636    400.0     60.8461  .122674    9.14366
      600.0 45.863    14.004    600.0     63.8651  .128760   10.0197
      800.0 50.110    13.385    800.0     66.3083  .133686   10.8717
     1000.0 53.399    12.773   1000.0     68.4438  .137991   11.7180
     1200.0 56.000    12.167   1200.0     70.4794  .142096   12.5769
     1400.0 58.089    11.563   1400.0     72.5628  .146296   13.4669
     1600.0 59.838    10.957   1600.0     74.7813  .150769   14.4064
     1800.0 61.425    11.087   1800.0     77.1621  .155569   15.4137
     2000.0 63.021    11.208   2000.0     79.6718  .160629   16.5071
     2200.0 63.887    11.317   2200.0     82.2172  .16576    17.5630
     5
      200.0 56.9228   8.22517   200.0    56.9228   .114764    8.22517
      800.0 66.3083  10.8717    800.0    66.3083   .133686   10.8717
     1400.0 72.5628  13.4669   1400.0    72.5628   .146296   13.4669
     2000.0 79.6718  16.5071   2000.0    79.6718   .160629   16.5071
     2600.0 86.7397  19.6080   2600.0    86.7397   .174878   19.6080
    11     3     2
0.0  0.0   1.0  1.0   100. 1.0
0.0  1.0   175. 1.0
    13     4     0     2
     3     2
0.0  0.0        0.1  30.910     100. 30.910
0.0  504.32     100. 504.32
     1     1     2     1     2  1.0        1.0
     3     2     3     0     0  0.0
     4     1     3     0     0  0.0
     5     3     3     0     0  0.0
    14     5                     1     2


     2
     2     3     2     1     3
0.0  513.712.  595.  15.   595.
     4     3     3     2     4     5
```

```
0.0  513.7513.7 12. 595. 595. 15.  595. 595.
     1     7    0  0.05     900.      5.7769
0.125      2.0833     4.0417     6.0        7.9583      9.9167    11.875
     1
     5     3    0    2

0.005          0.05          40.0          1.0          200.
 10.0          200.          200.          200.
-.005          0.05          25.0          1.0          100.0
 10.0          200.          200.          200.

//
```

E.2 Transient COBRA-THTF Model

```
RQW,STMFZ,T677,YD1,YL1,P1. R Q WRIGHT . ORNL
ACCOUNT,MULLINS,1752.
REQUEST,TAPE9,*PF.
REQUEST,TRCOMP,*PF.
REQUEST,TAPE11,*PF.
ATTACH,TAPE4,UPFLOWHFLXC,ID=ZZRDGM.
ATTACH,TAPE8 ,UPFLOWHFLX6AR,ID=ZZRDGM.
ATTACH,TRCRST,UPFLOWHTRC6AR,ID=ZZRDGM.
ATTACH(OLDPL,COBRATHTFU,ID=ZZGORNL)
ATTACH(BIN,COBRATHTFB,ID=ZZGORNL)
UPDATE,I=INPUT,C,L=1.
RFL,160000.
FTN,I=COMPILE,B=NEWB,LCM=I,L=0.
COPYL,BIN,NEWB,RUN.
REDUCE.
SEGLOAD.
LDSET(PRESET=ZERO)
RUN,PL=99999.
CATALOG(TAPE11,UPFLOWHFLXG6AR,ID=ZZRDGM,RP=99)
AUDIT(ID=ZZRDGM)

*ID THTF
*I COBRAI.241
      ETIME = 0.0
      NPFN(2)=1
      NHFN(2)=2
C
C   HARDWIRED FIXES TO READ COBRA INPUT FORCING FUNCTIONS ON A RESTART.
C
      READ (I2,680) NPT
      NPTS(1) = NPT
      NPTS(2) = NPT
      DO 5000 K=1,NPT
      READ (I2,5001) ABSCIS(1,K),ORDINT(1,K),ORDINT(2,K)
 5001 FORMAT (3E12.5)
      ABSCIS(2,K) = ABSCIS(1,K)
 5000 CONTINUE
      WRITE(I3,5002)
 5002 FORMAT(1X,*COBRATRAC RESTART INLET BOUNDARY CONDITIONS*,/,1X,*TIME
     +(SEC)    FLOW(LBM/SEC) ENTHALPY(BTU/LBM)*)
      DO 5003 K=1,NPT
      WRITE(I3,5004)ABSCIS(1,K),ORDINT(1,K),ORDINT(2,K)
 5004 FORMAT(1X,1E12.5,2X,1E12.5,4X,1E12.5)
 5003 CONTINUE
      NQ = 9
      YQ(1) = 0.0
      YQ(2) = 1.25
      YQ(3) = 1.875
      YQ(4) = 2.5
      YQ(5) = 6.25
      YQ(6) = 12.5
      YQ(7) = 26.85
      YQ(8) = 27.5
      YQ(9) = 30.0
      FQ(1) = 1.0
      FQ(2) = 1.15
      FQ(3) = 1.625
      FQ(4) = 1.6625
      FQ(5) = 1.6425
      FQ(6) = 0.275
      FQ(7) = 0.10
      FQ(8) = 0.0
      FQ(9) = 0.0
```

```
*ID STHTF
*D HEAT.191
      TGT=TWALL
      CALL PROP(PLL,HVAP,TGT,3)
*D FLUXBC.64
      TGT=TWALL
      CALL PROP(PLL,HVAP,TGT,3)

ROOT   TREE TRAC-(A,INIT,DMPIT,PREP,EDIT,GRAF,G,POST)
A        TREE     INPUT-(RDCOMP,RDREST)
G        TREE     OUTER-(OUT1DN,OUT3D)
TRAC    INCLUDE   INPB=,REWIND=:
TRAC    GLOBAL    TWOPHAS,PROPS,LCMSP,HTGEN,RODS,QUEN,MCMX,SPLIT,SIMSOL
TRAC    GLOBAL    GAPDAT2,MOMEN,XTEMP,GRDDAT,XKVARS,MOMENT,VELS,GRF,MVYDAT
TRAC    GLOBAL    FLTAB,VLTAB,PTAB,EXTRA,CONTRL,MATPRO,CTRLDP,GRAPH,SSCON
TRAC    GLOBAL    TIMER,ISTAT,UNITS,ABCDT,CONST,DIMEN,DLIM,VARS,HOLL
TRAC    GLOBAL    PTRS,PWRS,NMFAIL,XVAR,DF1DC,PSE,CODEBK,ISLVE,LOUP,SINK:
TRAC    GLOBAL   GAPDAT1,INJECT,JUNCT,ABSORD,ENTRDAT,VEL,SETUPD
TRAC    GLOBAL   DUMPER,TF3DC,RESTART,CCELL,CCELL1
TRAC    GLOBAL   SIMS1,VW,INTFHT,DROP,PROP1,HTCS,HTINDX
TRAC    GLOBAL    TSMSOL,GRFCOM,HLIQ,CCFL,V,REBAL
          END      TRAC

              1                                0                1
  *****  OAK RIDGE UPFLOW FILM BOILING TEST  *****
            816  0.0
              0              1                3                2                0
    0.001          .00001
              5             40
              1              2                3
BREAK                        1                1
              1              1               56                3
          0.356          .0022              1.0          610.07     1.4040E+07
  0.000000E+00  0.140100E+08  0.999999E-01  0.123590E+08  0.150000E+00
  0.116242E+08  0.200000E+00  0.108910E+08  0.250000E+00  0.107465E+08
  0.300000E+00  0.107259E+08  0.350000E+00  0.106950E+08  0.400000E+00
  0.106847E+08  0.450000E+00  0.106641E+08  0.500000E+00  0.106537E+08
  0.599999E+00  0.106331E+08  0.699999E+00  0.106022E+08  0.799999E+00
  0.105919E+08  0.899999E+00  0.105713E+08  0.999999E+00  0.105507E+08
  0.110000E+01  0.104889E+08  0.120000E+01  0.105094E+08  0.129999E+01
  0.104992E+08  0.139999E+01  0.104992E+08  0.149999E+01  0.104992E+08
  0.159999E+01  0.104992E+08  0.169999E+01  0.105198E+08  0.179999E+01
  0.105404E+08  0.189999E+01  0.105713E+08  0.199998E+01  0.106229E+08
  0.209998E+01  0.106744E+08  0.219998E+01  0.107259E+08  0.229998E+01
  0.107981E+08  0.239998E+01  0.108704E+08  0.249998E+01  0.109426E+08
  0.259997E+01  0.110148E+08  0.269997E+01  0.110870E+08  0.279997E+01
  0.111490E+08  0.289997E+01  0.112109E+08  0.299997E+01  0.112626E+08
  0.319997E+01  0.113142E+08  0.339996E+01  0.113246E+08  0.359996E+01
  0.112522E+08  0.379996E+01  0.111594E+08  0.399995E+01  0.110251E+08
  0.499994E+01  0.103755E+08  0.599992E+01  0.971678E+07  0.699991E+01
  0.940843E+07  0.799989E+01  0.909009E+07  0.899988E+01  0.891565E+07
  0.999986E+01  0.842355E+07  0.109998E+02  0.803447E+07  0.119998E+02
  0.742102E+07  0.129998E+02  0.688002E+07  0.139998E+02  0.635005E+07
  0.149998E+02  0.580055E+07  0.159998E+02  0.541439E+07  0.169995E+02
  0.515042E+07  0.179993E+02  0.505910E+07  0.189990E+02  0.502866E+07
  0.199988E+02  0.496780E+07
VESSEL                       3                3
          4   *****  UPFLOW FILM BOILING TEST  *****

  300
 0.00000E+00 0.30908E+02 0.50454E+03
 0.50000E-01 0.30883E+02 0.50454E+03
 0.10000E+00 0.42997E+02 0.50460E+03
 0.15000E+00 0.31159E+02 0.50264E+03
 0.20000E+00 0.29514E+02 0.50269E+03
 0.25000E+00 0.28953E+02 0.50269E+03
 0.30000E+00 0.29359E+02 0.50270E+03
 0.35000E+00 0.27626E+02 0.50372E+03
 0.40000E+00 0.27628E+02 0.50270E+03
 0.45000E+00 0.26797E+02 0.50270E+03
 0.50000E+00 0.26188E+02 0.50270E+03
 0.55000E+00 0.25845E+02 0.50271E+03
 0.60000E+00 0.24918E+02 0.50271E+03
 0.65000E+00 0.24699E+02 0.50271E+03
 0.70000E+00 0.24088E+02 0.50271E+03
 0.75000E+00 0.23479E+02 0.50271E+03
 0.80000E+00 0.23112E+02 0.50271E+03
 0.85000E+00 0.22551E+02 0.50271E+03
 0.90000E+00 0.22161E+02 0.50271E+03
 0.95000E+00 0.21721E+02 0.50271E+03
 0.10000E+01 0.21380E+02 0.50271E+03
 0.11000E+01 0.20648E+02 0.50272E+03
 0.12000E+01 0.19842E+02 0.50272E+03
 0.13000E+01 0.19135E+02 0.50272E+03
 0.14000E+01 0.18477E+02 0.50272E+03
```

0.15000E+01	0.17673E+02	0.50272E+03
0.16000E+01	0.17185E+02	0.50272E+03
0.17000E+01	0.16528E+02	0.50272E+03
0.18000E+01	0.15846E+02	0.50272E+03
0.19000E+01	0.15456E+02	0.50271E+03
0.20000E+01	0.14946E+02	0.50271E+03
0.21000E+01	0.14484E+02	0.50270E+03
0.22000E+01	0.14046E+02	0.50270E+03
0.23000E+01	0.13668E+02	0.50372E+03
0.24000E+01	0.13342E+02	0.50269E+03
0.25000E+01	0.12940E+02	0.50371E+03
0.26000E+01	0.12638E+02	0.50268E+03
0.27000E+01	0.12346E+02	0.50267E+03
0.28000E+01	0.12140E+02	0.50369E+03
0.29000E+01	0.11824E+02	0.50369E+03
0.30000E+01	0.11655E+02	0.50369E+03
0.31000E+01	0.11325E+02	0.50266E+03
0.32000E+01	0.11130E+02	0.50266E+03
0.33000E+01	0.10838E+02	0.50266E+03
0.34000E+01	0.10559E+02	0.50368E+03
0.35000E+01	0.10631E+02	0.50368E+03
0.36000E+01	0.10275E+02	0.50266E+03
0.37000E+01	0.10079E+02	0.50267E+03
0.38000E+01	0.97364E+01	0.50267E+03
0.39000E+01	0.95890E+01	0.50267E+03
0.40000E+01	0.93439E+01	0.50268E+03
0.41000E+01	0.91967E+01	0.50268E+03
0.42000E+01	0.89274E+01	0.50269E+03
0.42999E+01	0.88774E+01	0.50270E+03
0.43999E+01	0.86084E+01	0.50270E+03
0.44999E+01	0.86072E+01	0.50271E+03
0.45999E+01	0.85328E+01	0.50271E+03
0.46999E+01	0.84184E+01	0.50169E+03
0.47999E+01	0.83115E+01	0.50272E+03
0.48999E+01	0.82132E+01	0.50273E+03
0.49999E+01	0.80173E+01	0.50273E+03
0.50999E+01	0.78703E+01	0.50274E+03
0.51999E+01	0.76502E+01	0.50274E+03
0.52999E+01	0.74301E+01	0.50274E+03
0.53999E+01	0.71858E+01	0.50275E+03
0.54999E+01	0.70460E+01	0.50173E+03
0.55999E+01	0.71109E+01	0.50276E+03
0.56499E+01	0.70934E+01	0.50174E+03
0.56999E+01	0.70443E+01	0.50174E+03
0.57499E+01	0.68490E+01	0.50174E+03
0.57999E+01	0.68416E+01	0.50277E+03
0.58499E+01	0.67750E+01	0.50175E+03
0.58999E+01	0.66772E+01	0.50175E+03
0.59499E+01	0.65550E+01	0.50175E+03
0.59999E+01	0.65301E+01	0.50176E+03
0.60499E+01	0.64811E+01	0.50176E+03
0.60999E+01	0.63104E+01	0.50176E+03
0.61499E+01	0.55308E+01	0.50176E+03
0.61999E+01	0.53846E+01	0.50176E+03
0.62499E+01	0.58229E+01	0.50176E+03
0.62999E+01	0.62611E+01	0.50176E+03
0.63499E+01	0.65046E+01	0.50176E+03
0.63999E+01	0.62609E+01	0.50176E+03
0.64499E+01	0.63094E+01	0.50177E+03
0.64999E+01	0.62848E+01	0.50177E+03
0.65499E+01	0.61630E+01	0.50177E+03
0.65999E+01	0.61627E+01	0.50177E+03
0.66499E+01	0.60895E+01	0.50177E+03
0.66999E+01	0.59677E+01	0.50177E+03
0.67499E+01	0.59675E+01	0.50177E+03
0.67999E+01	0.55348E+01	0.50075E+03
0.68499E+01	0.56507E+01	0.50177E+03
0.68999E+01	0.60402E+01	0.50177E+03
0.69499E+01	0.60886E+01	0.50178E+03
0.69999E+01	0.61857E+01	0.50178E+03
0.70499E+01	0.61368E+01	0.50178E+03
0.70999E+01	0.56014E+01	0.50178E+03
0.71499E+01	0.50223E+01	0.50075E+03
0.71999E+01	0.52115E+01	0.50178E+03
0.72499E+01	0.62399E+01	0.50076E+03
0.72999E+01	0.64526E+01	0.50179E+03
0.73499E+01	0.55034E+01	0.50178E+03
0.73999E+01	0.46027E+01	0.50178E+03
0.74499E+01	0.53623E+01	0.50076E+03
0.74999E+01	0.63123E+01	0.50077E+03
0.75499E+01	0.61353E+01	0.50179E+03
0.75999E+01	0.56056E+01	0.50077E+03
0.76499E+01	0.46748E+01	0.50179E+03
0.76999E+01	0.49666E+01	0.50179E+03
0.77499E+01	0.60189E+01	0.50077E+03
0.77999E+01	0.61404E+01	0.50078E+03

0.78499E+01	0.58481E+01	0.50078E+03
0.78999E+01	0.49469E+01	0.50077E+03
0.79499E+01	0.40127E+01	0.50282E+03
0.79999E+01	0.48437E+01	0.50180E+03
0.80499E+01	0.63098E+01	0.50078E+03
0.80999E+01	0.63517E+01	0.50181E+03
0.81499E+01	0.58225E+01	0.50078E+03
0.81999E+01	0.43860E+01	0.50078E+03
0.82499E+01	0.31157E+01	0.50180E+03
0.82999E+01	0.33830E+01	0.50180E+03
0.83499E+01	0.63329E+01	0.50079E+03
0.83999E+01	0.63581E+01	0.50079E+03
0.84499E+01	0.42106E+01	0.50180E+03
0.84999E+01	0.33827E+01	0.50181E+03
0.85499E+01	0.57479E+01	0.50080E+03
0.85999E+01	0.65757E+01	0.50080E+03
0.86499E+01	0.55778E+01	0.50079E+03
0.86999E+01	0.37760E+01	0.50078E+03
0.87499E+01	0.25091E+01	0.50079E+03
0.87999E+01	0.43062E+01	0.50182E+03
0.88499E+01	0.69884E+01	0.50081E+03
0.88999E+01	0.65262E+01	0.50080E+03
0.89499E+01	0.41651E+01	0.50079E+03
0.89999E+01	0.26089E+01	0.49977E+03
0.90499E+01	0.24329E+01	0.50182E+03
0.90999E+01	0.59652E+01	0.50081E+03
0.91499E+01	0.62334E+01	0.50081E+03
0.91999E+01	0.48458E+01	0.50080E+03
0.92499E+01	0.37256E+01	0.50080E+03
0.92999E+01	0.39932E+01	0.50081E+03
0.93499E+01	0.50397E+01	0.50081E+03
0.93999E+01	0.48206E+01	0.50081E+03
0.94499E+01	0.49419E+01	0.50081E+03
0.94999E+01	0.51069E+01	0.50184E+03
0.95499E+01	0.44306E+01	0.50082E+03
0.95999E+01	0.46493E+01	0.50082E+03
0.96499E+01	0.43086E+01	0.50082E+03
0.96999E+01	0.40164E+01	0.50082E+03
0.97499E+01	0.44298E+01	0.50082E+03
0.97999E+01	0.46485E+01	0.50083E+03
0.98499E+01	0.52807E+01	0.50083E+03
0.98999E+01	0.53050E+01	0.50083E+03
0.99499E+01	0.37967E+01	0.50083E+03
0.99999E+01	0.32125E+01	0.50083E+03
0.10050E+02	0.39419E+01	0.50084E+03
0.10100E+02	0.48906E+01	0.50084E+03
0.10150E+02	0.52608E+01	0.49981E+03
0.10200E+02	0.41612E+01	0.50083E+03
0.10250E+02	0.27497E+01	0.50083E+03
0.10300E+02	0.36251E+01	0.50084E+03
0.10350E+02	0.57651E+01	0.50085E+03
0.10400E+02	0.58200E+01	0.49982E+03
0.10450E+02	0.36290E+01	0.49981E+03
0.10500E+02	0.27305E+01	0.49879E+03
0.10550E+02	0.29921E+01	0.50085E+03
0.10600E+02	0.52293E+01	0.50085E+03
0.10650E+02	0.51377E+01	0.49983E+03
0.10700E+02	0.40907E+01	0.49983E+03
0.10750E+02	0.31866E+01	0.50085E+03
0.10800E+02	0.37212E+01	0.50086E+03
0.10850E+02	0.49367E+01	0.50086E+03
0.10900E+02	0.53552E+01	0.49984E+03
0.10950E+02	0.49853E+01	0.50086E+03
0.11000E+02	0.32623E+01	0.49983E+03
0.11050E+02	0.28209E+01	0.50086E+03
0.11100E+02	0.41333E+01	0.50087E+03
0.11150E+02	0.52080E+01	0.49985E+03
0.11200E+02	0.53782E+01	0.49985E+03
0.11250E+02	0.39186E+01	0.49984E+03
0.11300E+02	0.26500E+01	0.50087E+03
0.11350E+02	0.30145E+01	0.50088E+03
0.11400E+02	0.45940E+01	0.50088E+03
0.11450E+02	0.48369E+01	0.50088E+03
0.11500E+02	0.43553E+01	0.49986E+03
0.11550E+02	0.38443E+01	0.49986E+03
0.11600E+02	0.33055E+01	0.50089E+03
0.11650E+02	0.38195E+01	0.49986E+03
0.11700E+02	0.41842E+01	0.49987E+03
0.11750E+02	0.45000E+01	0.49987E+03
0.11800E+02	0.44755E+01	0.49987E+03
0.11850E+02	0.42519E+01	0.50090E+03
0.11900E+02	0.43246E+01	0.50090E+03
0.11950E+02	0.40129E+01	0.49988E+03
0.12000E+02	0.38181E+01	0.49988E+03
0.12050E+02	0.39151E+01	0.49988E+03
0.12100E+02	0.40122E+01	0.49989E+03

0.12150E+02	0.42065E+01	0.49989E+03
0.12200E+02	0.40362E+01	0.49989E+03
0.12250E+02	0.33798E+01	0.49989E+03
0.12300E+02	0.34731E+01	0.50092E+03
0.12350E+02	0.41572E+01	0.49990E+03
0.12400E+02	0.43028E+01	0.49990E+03
0.12450E+02	0.39625E+01	0.49990E+03
0.12500E+02	0.35492E+01	0.49990E+03
0.12550E+02	0.36219E+01	0.49990E+03
0.12600E+02	0.40834E+01	0.49991E+03
0.12650E+02	0.42532E+01	0.49991E+03
0.12700E+02	0.40831E+01	0.49991E+03
0.12750E+02	0.34755E+01	0.49991E+03
0.12800E+02	0.36900E+01	0.50094E+03
0.12850E+02	0.42525E+01	0.49992E+03
0.12900E+02	0.43978E+01	0.49992E+03
0.12950E+02	0.44460E+01	0.49993E+03
0.13000E+02	0.37901E+01	0.49993E+03
0.13050E+02	0.32070E+01	0.49993E+03
0.13100E+02	0.34011E+01	0.49993E+03
0.13150E+02	0.39353E+01	0.49993E+03
0.13200E+02	0.38380E+01	0.49993E+03
0.13250E+02	0.33037E+01	0.49993E+03
0.13300E+02	0.32549E+01	0.49994E+03
0.13350E+02	0.38618E+01	0.49994E+03
0.13400E+02	0.44442E+01	0.49995E+03
0.13450E+02	0.41770E+01	0.49995E+03
0.13500E+02	0.30390E+01	0.49892E+03
0.13550E+02	0.31813E+01	0.49995E+03
0.13600E+02	0.34725E+01	0.49995E+03
0.13650E+02	0.37880E+01	0.49995E+03
0.13700E+02	0.40834E+01	0.49893E+03
0.13750E+02	0.30596E+01	0.49995E+03
0.13800E+02	0.33506E+01	0.49996E+03
0.13850E+02	0.33955E+01	0.50098E+03
0.13900E+02	0.37388E+01	0.49996E+03
0.13950E+02	0.39570E+01	0.49996E+03
0.14000E+02	0.36897E+01	0.49997E+03
0.14050E+02	0.38593E+01	0.49997E+03
0.14100E+02	0.37377E+01	0.49997E+03
0.14150E+02	0.36404E+01	0.49998E+03
0.14200E+02	0.35674E+01	0.49998E+03
0.14250E+02	0.30610E+01	0.49895E+03
0.14300E+02	0.32274E+01	0.49998E+03
0.14350E+02	0.35668E+01	0.49999E+03
0.14400E+02	0.36636E+01	0.49999E+03
0.14450E+02	0.36673E+01	0.49897E+03
0.14500E+02	0.33514E+01	0.49897E+03
0.14600E+02	0.32506E+01	0.50000E+03
0.14700E+02	0.30111E+01	0.49897E+03
0.14800E+02	0.33991E+01	0.49898E+03
0.14900E+02	0.32775E+01	0.49898E+03
0.15000E+02	0.31802E+01	0.49899E+03
0.15100E+02	0.33255E+01	0.49899E+03
0.15200E+02	0.28612E+01	0.50002E+03
0.15300E+02	0.31311E+01	0.49899E+03
0.15400E+02	0.31793E+01	0.49900E+03
0.15500E+02	0.32033E+01	0.49900E+03
0.15600E+02	0.32273E+01	0.49901E+03
0.15700E+02	0.32756E+01	0.49901E+03
0.15800E+02	0.30747E+01	0.50863E+03
0.15900E+02	0.30291E+01	0.50806E+03
0.16000E+02	0.32750E+01	0.49904E+03
0.16100E+02	0.33475E+01	0.49902E+03
0.16200E+02	0.31085E+01	0.50561E+03
0.16300E+02	0.31983E+01	0.50009E+03
0.16400E+02	0.32984E+01	0.49906E+03
0.16500E+02	0.33091E+01	0.50316E+03
0.16600E+02	0.34809E+01	0.50220E+03
0.16700E+02	0.35562E+01	0.50139E+03
0.16800E+02	0.35096E+01	0.50087E+03
0.16900E+02	0.34863E+01	0.50070E+03
0.17000E+02	0.36588E+01	0.49988E+03
0.17099E+02	0.39509E+01	0.49891E+03
0.17200E+02	0.38136E+01	0.49891E+03
0.17299E+02	0.36921E+01	0.49863E+03
0.17399E+02	0.35941E+01	0.49882E+03
0.17499E+02	0.35119E+01	0.49863E+03
0.17599E+02	0.36805E+01	0.49818E+03
0.17699E+02	0.39434E+01	0.49763E+03
0.17799E+02	0.38705E+01	0.49824E+03
0.17899E+02	0.41389E+01	0.49818E+03
0.17999E+02	0.36832E+01	0.49888E+03
0.18099E+02	0.37936E+01	0.49893E+03
0.18199E+02	0.44510E+01	0.49861E+03
0.18299E+02	0.41920E+01	0.49911E+03

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 0.18399E+02 0.42141E+01 0.49911E+03
 0.18499E+02 0.36263E+01 0.49997E+03
 0.18599E+02 0.41157E+01 0.49945E+03
 0.18699E+02 0.45774E+01 0.49925E+03
 0.18799E+02 0.43840E+01 0.49953E+03
 0.18899E+02 0.49415E+01 0.49922E+03
 0.18999E+02 0.46848E+01 0.49925E+03
 0.19099E+02 0.39795E+01 0.49993E+03
 0.19199E+02 0.54707E+01 0.49925E+03
 0.19299E+02 0.53701E+01 0.49882E+03
 0.19399E+02 0.50906E+01 0.49922E+03
 0.19499E+02 0.52237E+01 0.49858E+03
 0.19599E+02 0.46442E+01 0.49946E+03
 0.19699E+02 0.47287E+01 0.49906E+03
 0.19799E+02 0.50627E+01 0.49943E+03
 0.19899E+02 0.47698E+01 0.49943E+03
 0.19999E+02 0.51134E+01 0.49854E+03
    1     7     1   0.05      900.          5.8748
0.125      2.0833     4.0417     6.0        7.9583      9.9167    11.875
    1
    5     3     0     2
END

    2
    2     3
0.0002          0.05            20.0            1.0                 200.0
  10.0           0.25           200.            200.
-.005           0.05            25.0            1.0                 100.0
 10.0           200.            200.            200.

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