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NATURAL AND FORCED-CIRCULATION BOILING STUDIES

by

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R. J. Weatherhead, and W. S. Flinn

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ABSTRACT

The tabulated local steam volume fraction data from an investigation of natural and forced-circulation boiling systems are presented. The experimental equipment is described and the correlation of the experimental data is briefly discussed.

The data were taken for natural and forced circulation in $\frac{1}{4}$ in. by 2 in. by 60 in., and $\frac{1}{2}$ in. by 2 in. by 60 in. rectangular channels over a velocity range of 1-6 ft/sec, and a quality range of 0 to 6%.

I. INTRODUCTION

Because of numerous requests for experimental data, the tabulated data from one series of investigations of the density of steam-water mixtures are presented. The correlation of the experimental data has been presented elsewhere[22] but is reviewed briefly for completeness.

The two-phase pressure-drop investigation in conjunction with these studies is reported separately in ANL-5760.[1]

The ability to predict accurately the steam volume fractions in boiling systems is a prerequisite for a competent evaluation of the performance characteristics of such systems. This is especially true in boiling water reactors in which the nuclear aspects are intimately interrelated to the two-phase flow characteristics of the system. The reactor recirculation rate, coolant moderator density, core neutron kinetics, and reactor stability are all dependent upon the steam volume fraction.

Because of the complexity of the boiling process, the approach to the prediction of the density of steam-water mixture is of necessity almost completely empirical. As a result, considerable effort has been expended, during the past few years by a number of investigators, on the experimental measurement of steam volume fractions. Some of the pertinent information derived from these studies are described briefly.

Martinelli et al.[2] obtained liquid holdup data at atmospheric pressure and correlated this data as a function of quality and a physical property parameter. They also presented an extrapolation of their atmospheric pressure correlation to the higher pressure regions. Dengler[3] reported measurements of steam volume fractions at atmospheric pressure, using a radioactive tracer in the water for volume fraction measurement. Data were correlated with the aid of the Martinelli X_{tt} parameter. Isbin et al.[4-7] obtained volume fraction data for both horizontal and vertical flows over a wide pressure range and found that the velocity ratios were a function of mixture quality as well as pressure.

Lottes and Flinn,[8] Cook,[9] Petrick,[10] Richardson,[11] and Marchaterre[12] have reported results from studies at ANL with air-water and with steam-water systems. The superficial velocity and quality were found to affect the velocity ratio; significant differences between horizontal and vertical flows were also found.

Egen, Dingee and Chastain[13] have reported results from narrow rectangular channels at 2000 psi. The volume fractions were found to be dependent upon heat flux well into the net quality region. The velocity ratio was independent of quality and velocity over the ranges of variables tested. Hughes[14] presented volume fraction measurements obtained from large equivalent-diameter adiabatic systems at 1200, 1400, 1800 and 2400 psia. The velocity ratio and velocity difference were shown to be a function of the flow rate and quality. Recently Asyee[15] has reported results for a "cosine-heated" annulus over a considerable pressure range. He also found velocity ratios to be a function of pressure, quality and circulation velocity. Schwartz[16] conducted investigations in horizontal and vertical boiler tubes and observed that the volume fractions were different for the two cases.

Other investigations have been performed and the work is discussed in several extensive literature surveys on the subject of two-phase flow.[17-20]

II. EXPERIMENTAL EQUIPMENT

Figure 1 shows a schematic diagram of the boiling loop on which the tabulated experimental data were taken. The system consists of an electrically heated test section, steam riser, condenser, liquid crossover to the downcomer and a downcomer section. A centrifugal pump near the bottom of the test section could be used for forced-circulation runs. Flow in the system went through the downcomer to the heated test section and riser. Boiling occurred in the test section and the resulting steam-water mixture flowed upwards through the riser section. The steam was separated in the steam separation section and discharged to an atmospheric condenser. The water returned down the downcomer. A feature of this arrangement is that a constant boiling length was maintained automatically for a given system pressure and make-up water temperature, independently of power density or inlet velocity.

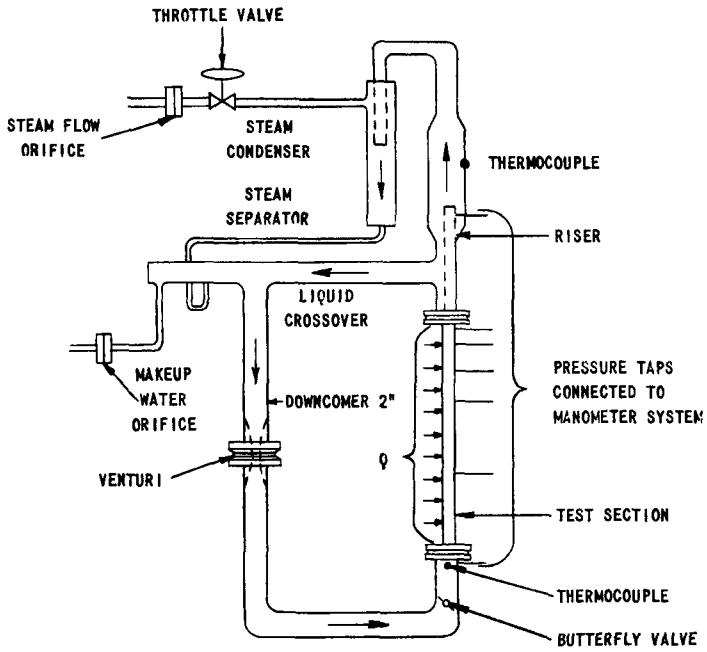

FIG. 1
SCHEMATIC OF NATURAL CIRCULATION BOILING TEST FACILITY

A. Test Section and Riser

The single, rectangular channel sections were fabricated from stainless steel (0.10 in. thick) and heated by passing AC current through them. The dimensions of the flow channels were $\frac{1}{4}$ in. by 2 in. by 60 in. and $\frac{1}{2}$ in. by 2 in. by 60 in. Figure 2 is a plan view of the test section and support plate arrangement for pressurized operation. Heat generation was uniform along the section length and around the periphery of the channel. Higher heat fluxes existed in the corners of the channels.

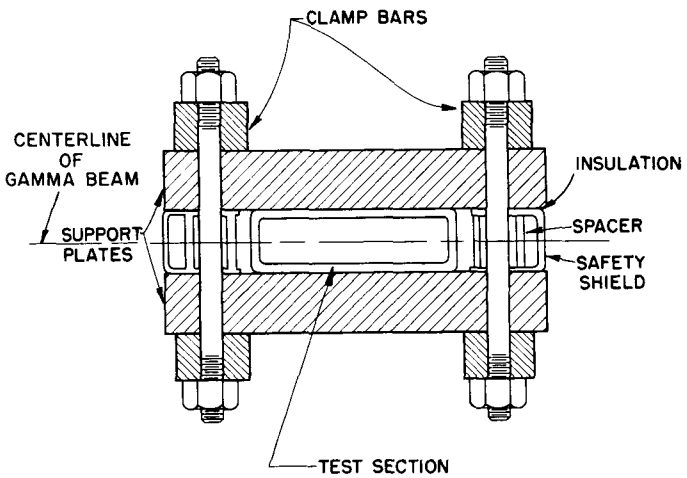

FIG. 2
PLAN VIEWS OF TEST SECTION AND SUPPORT ARRANGEMENT

The cross section of the 29-in. riser was equal in the case of the $\frac{1}{4}$-in. channel, and that of a halved 2-in. circle in the case of the $\frac{1}{2}$-in. channel.

B. Void Measurements

Steam volume fractions were measured by a gamma-attenuation technique. The equipment and instrumentation consisted basically of a Tm^{170} gamma source, a scintillation crystal photomultiplier tube arrangement, amplifier, differential analyzer, count rate meter and recorder. The attenuation of the gamma beam passing through the steam-water mixture was measured and calibrated against the attenuation observed when the section was full of water and when it was full of steam. The gamma-attenuation measurement technique has been described in detail by Petrick[21] and by Hooker and Popper.[22]

C. Recirculating Flow

The flow area of the system piping (2 in. dia) was 3.14 and 6.28 times the flow area of the $\frac{1}{2}$-in. and $\frac{1}{4}$-in. channels, respectively. The pressure drops external to the channels were quite low.

The recirculating flow was measured to an average of $\pm 1\%$ with a venturi section installed in the downcomer, and an inclined manometer filled with fluid having a specific gravity of 1.25. The maximum irrecoverable pressure drop for the downcomer and venturi was of the order of $\frac{1}{4}$ in. of water.

D. Steam and Make-up Flow

Calibrated orifices were used to measure the steam discharge rate and the make-up flow rate within 1%. Steady-state conditions of testing existed when steam discharge and make-up flow rates were equal and pressure was steady within $\frac{1}{2}$ psi.

Make-up water at room temperature was pumped into a hydraulic accumulator with a piston-type make-up pump. The pump operation was controlled by the gas pressure in the accumulator. The pressure in the accumulator was maintained at a value several hundred pounds higher than the loop pressure. Make-up water was added to the system at a constant flow rate by throttling across a valve.

E. Temperature and Pressure Measurements

Temperature measurements were made with calibrated iron-constantan thermocouples which featured solid copper junctions ($1\frac{1}{4}$ in. long)

mounted on stainless steel tubes. Inlet thermocouples in different locations were constant to within $\pm 0.1°F$. Accuracy of temperature measurements was $\pm 0.5°F$.

Pressure measurements were made with calibrated Heise gages. System pressure variations were within $\frac{1}{2}$ psi during any run.

III. EXPERIMENTAL RESULTS

A. General

The tabulated experimental data are presented in the Appendix. The steam volume fraction data for typical runs are presented in Figure 3. The data have been plotted as a function of $L/(L_t - L_b)$ so that the data have a common point at the inception of bulk boiling. These curves indicate the reproducibility of the experimental data.

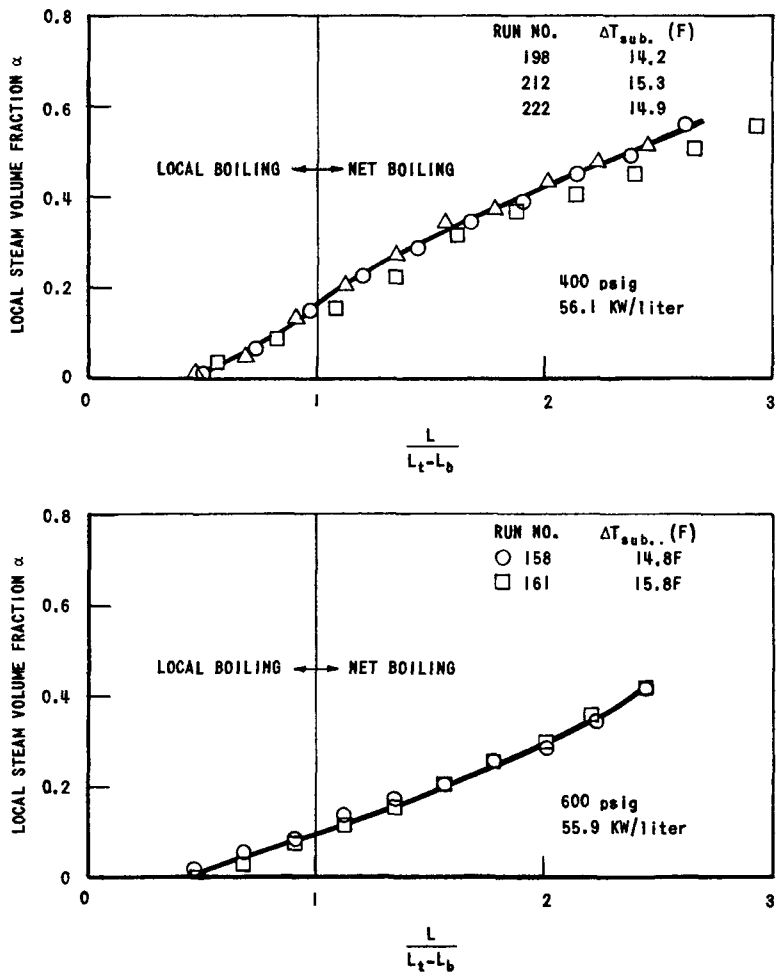

FIG. 3
STEAM VOLUME FRACTION DATA FOR TYPICAL RUNS - $\frac{1}{4}$" x2"x60" CHANNEL

Figure 4 gives the performance data for each geometrical arrangement. The recirculation velocity was plotted as a function of the exit steam volume fraction of the heated section. An analytical method of calculating the performance of systems such as this is presented in detail in Ref. 23. These methods have been applied to data such as this with good results.

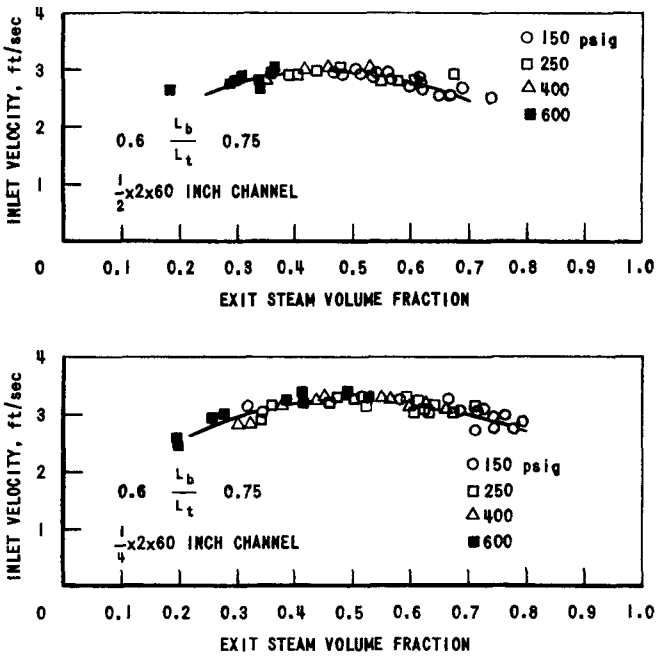

FIG. 4
INLET VELOCITY AS A FUNCTION OF EXIT STEAM VOLUME FRACTION

B. Steam Volume Fraction Data

In the analysis of experimental data, several choices of dependent variables for correlation can be made. The steam volume fraction can be correlated directly as a function of the various parameters or may be reduced to phase velocities. A correlation of the steam volume fraction vs. system parameters is perhaps the easiest to use but has the objectionable feature that extrapolation is difficult and may be misleading. For example, the data of Martinelli's which was presented in this manner predicts steam volume fractions that do not occur in vertical upflow systems, i.e., the steam velocity is less than the water velocity.

A more useful parameter is obtained by using an expression involving the velocity of each phase. The parameters most frequently used are the phase velocity difference, defined by the following equation:

$$V_g - V_f = V_o \left[\frac{x}{\alpha} \frac{\rho_f}{\rho_g} - \frac{1 - x}{1 - \alpha} \right] ,$$

or the velocity ratio

$$V_g/V_f = \left[\frac{x}{1 - x} \right] \left[\frac{1 - \alpha}{\alpha} \right] \left[\frac{\rho_f}{\rho_g} \right] .$$

These parameters have the advantage that they are more sensitive to the variation in other variables, such as superficial velocity and quality. Also, they have the additional advantage that they are more basic parameters, and arguments concerning postulated mechanisms can be made more readily using them. Since the velocity ratio is the more convenient term, it was chosen for correlation. It is recognized that this ratio represents a mean velocity for each phase and is not necessarily the correct velocity to be used in momentum and kinetic energy terms.

It is of interest to see how the phase velocities vary in a typical boiling channel. Figure 5 shows the variation of the liquid velocity, steam

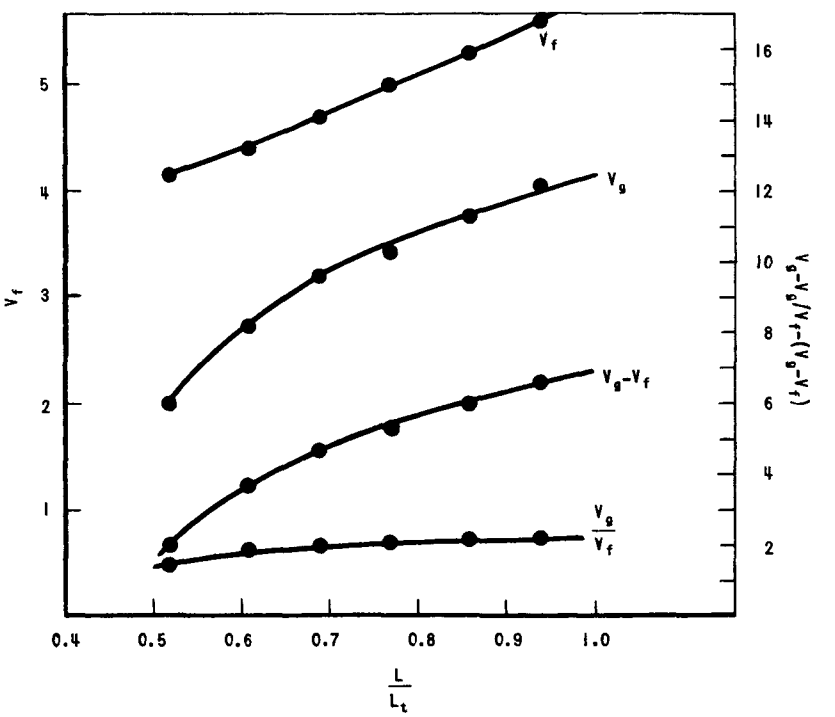

FIG. 5
VARIATION OF LOCAL PHASE VELOCITIES, VELOCITY RATIO, AND VELOCITY DIFFERENCE FOR A TYPICAL BOILING RUN

velocity, velocity ratio, and velocity difference for an experimental run in a $\frac{1}{4}$ by 2 by 60-in. rectangular channel. It can be seen that both the relative velocity and the velocity ratio vary markedly with channel length and hence with mixture quality.

The complete analysis of the experimental data from these studies and others has been presented elsewhere. [23] The analysis will be reviewed briefly here for completeness.

Several effects on the velocity ratio were noted. The experimental data here indicated effects of pressure, velocity, quality and geometrical arrangement. Figures 6-10 show representative trends of these effects. The effect of geometrical arrangement shows a representative difference between data taken with a 2-in. diameter circular channel and data taken with a 0.622-in. diameter circular channel. This is a representative trend, but the effect has not been noted in all cases. Since the effect could not be predicted on the basis of present data, it was not included in the correlation of the data.

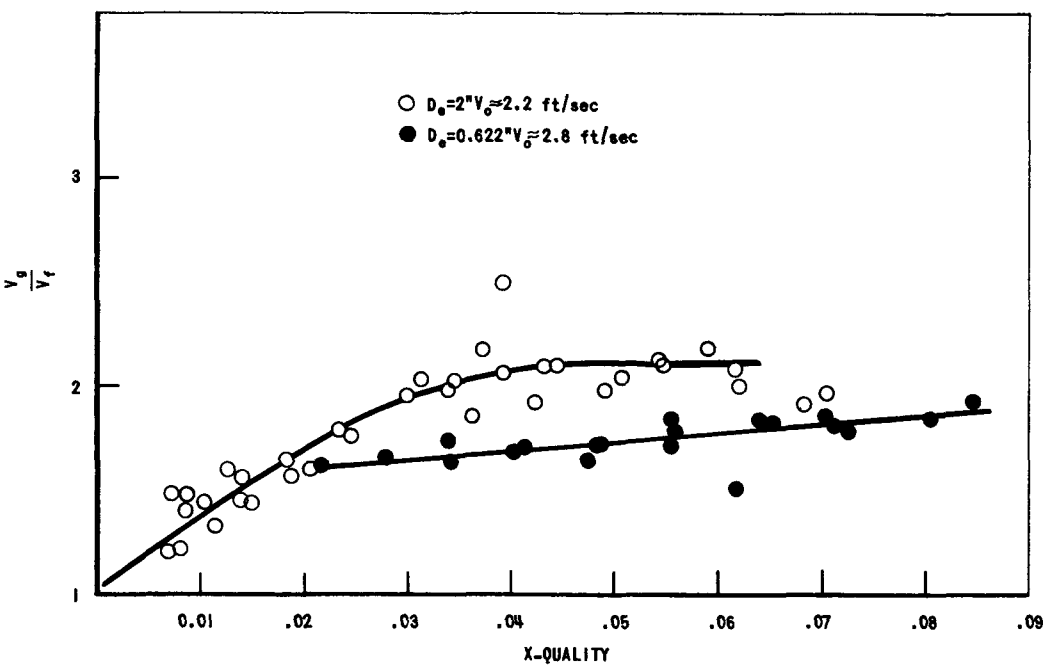

FIG. 6
EFFECT OF GEOMETRY ON VELOCITY RATIO AT 600 psig

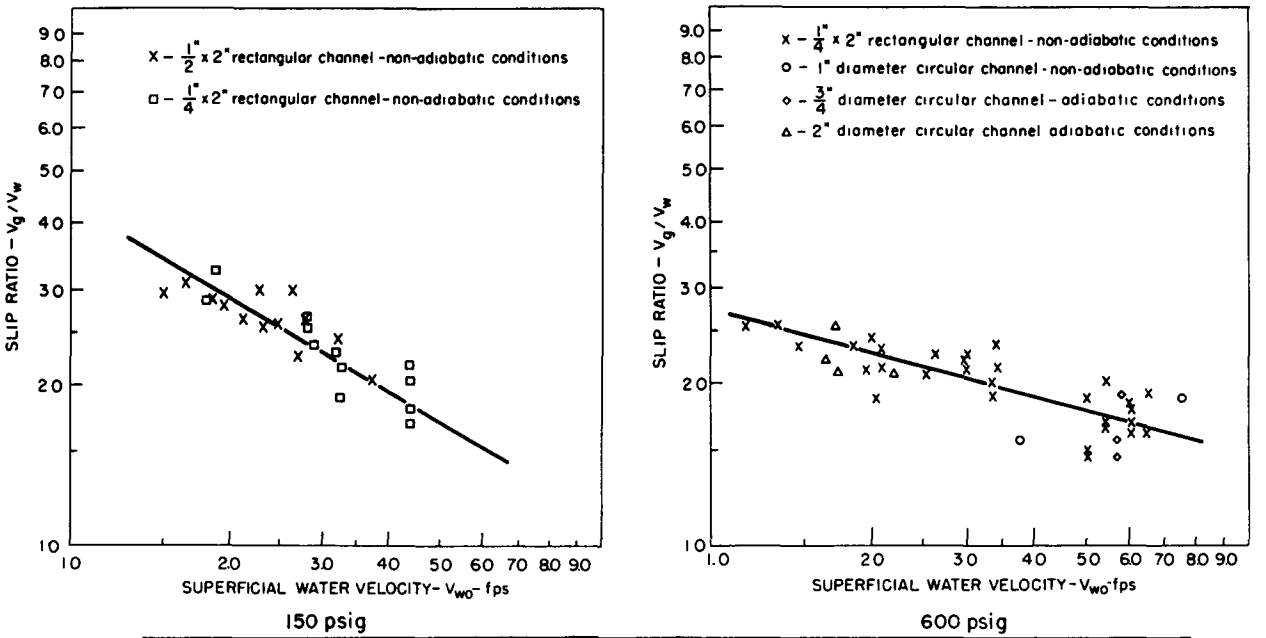

FIG. 7

VELOCITY RATIO AS A FUNCTION OF SUPERFICIAL VELOCITY AT 150 & 600 psig

$X \approx 0.03$

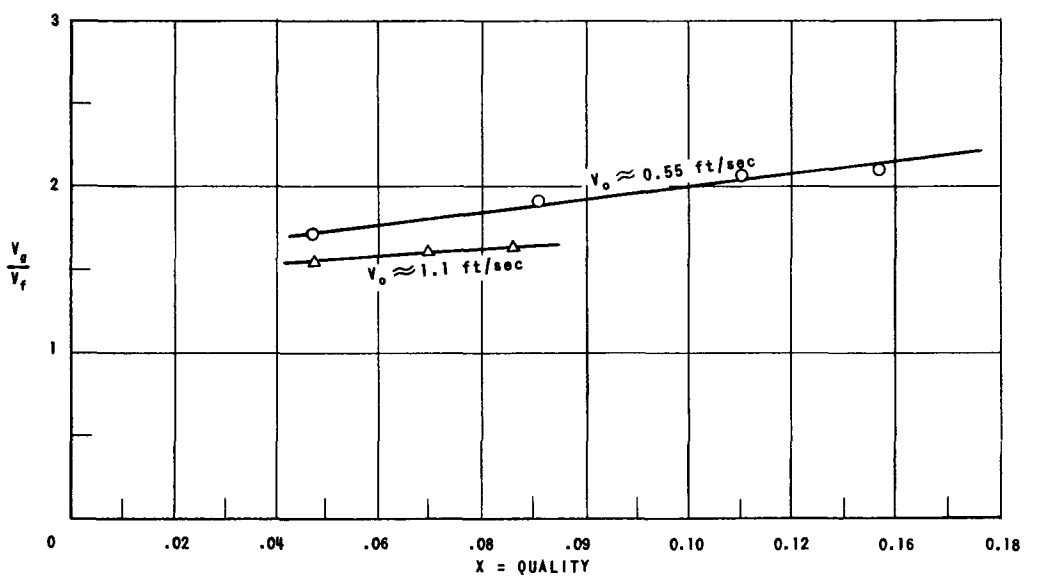

FIG. 8

THE EFFECT OF SUPERFICIAL VELOCITY ON VELOCITY RATIO AT 1200 psia - DATA OF HUGHES

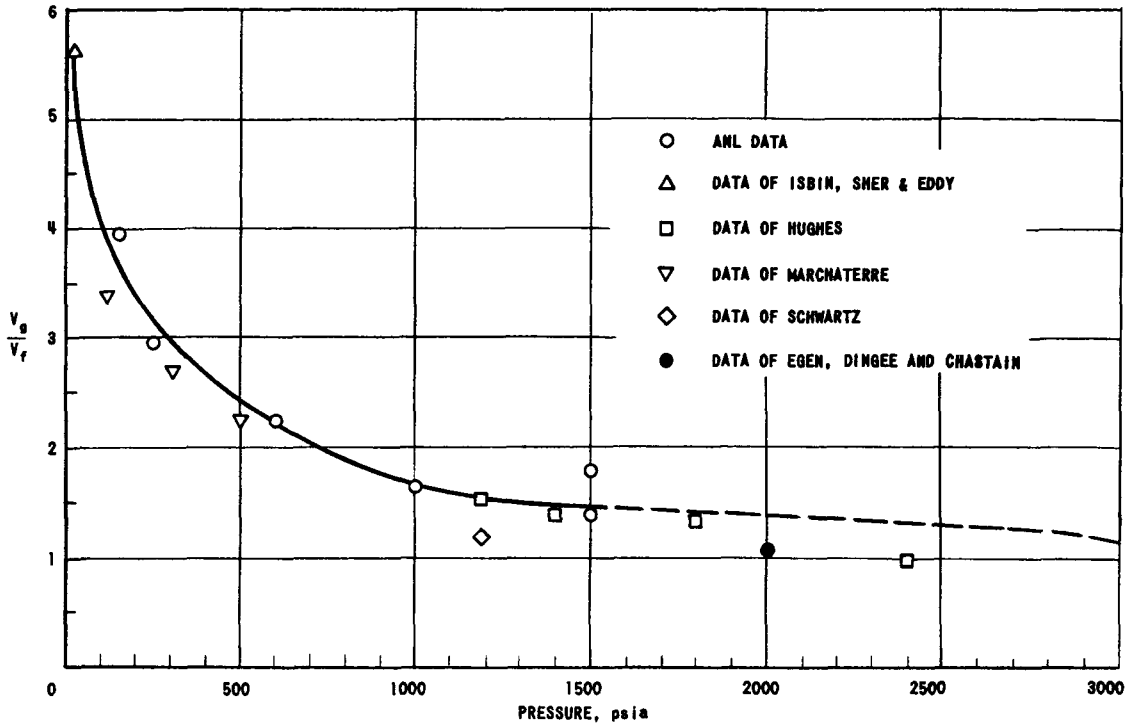

FIG. 9
VELOCITY RATIO AS A FUNCTION OF PRESSURE
$V_o \approx$ 1 TO 3 ft/sec $X \approx 0.05$

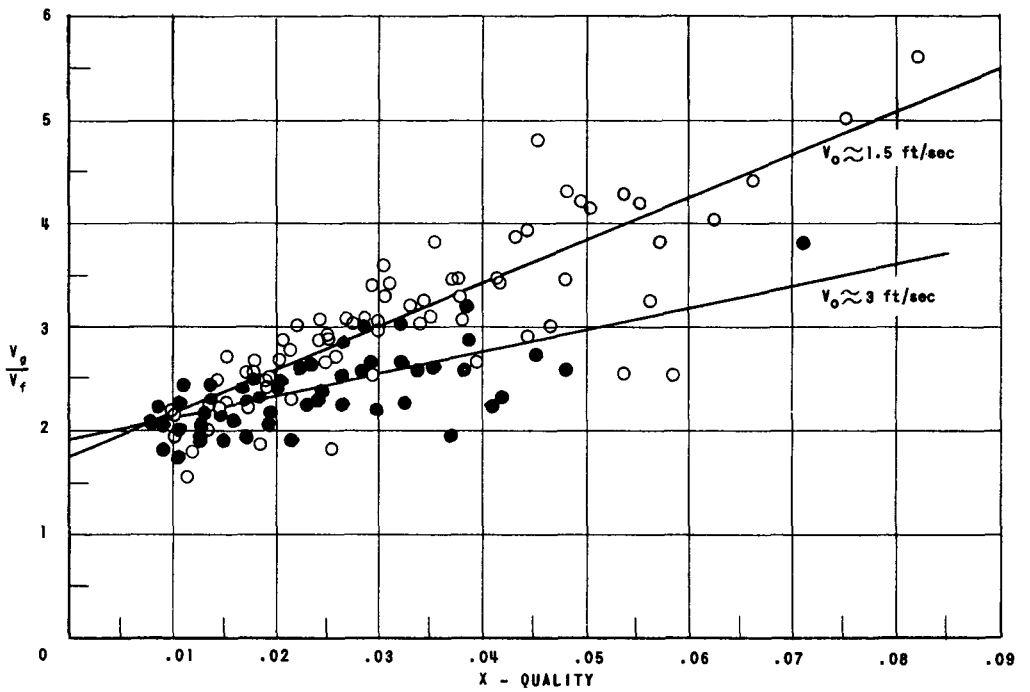

FIG. 10
THE EFFECT OF QUALITY ON VELOCITY RATIO AT 150 psig

The working curves for predicting velocity ratios at 150, 250 and 600 psig were prepared by smoothing the velocity ratio data with respect to quality and velocity at each pressure. These working curves are presented in Figures 11, 12, and 13. These curves do not attempt to correlate all the factors that may affect the velocity ratio, but are a useful tool for predicting velocity ratios for engineering calculations.

Steam volume fractions have been measured locally in the subcooled boiling region in $\frac{1}{4}$ by 60 by 2-in. vertical channels. This volume fraction was found to be a function of the bulk water temperature, velocity, heat flux, pressure and channel dimensions. The effects of heat flux and velocity in a $\frac{1}{4}$-in. rectangular channel are shown in Figures 14 and 15. It can be seen that the steam volume fraction is dependent upon the heat flux well into the net quality region. Because of this effect, the data have been plotted as a function of x + 0.02 in order to give a continuous function through x = 0.

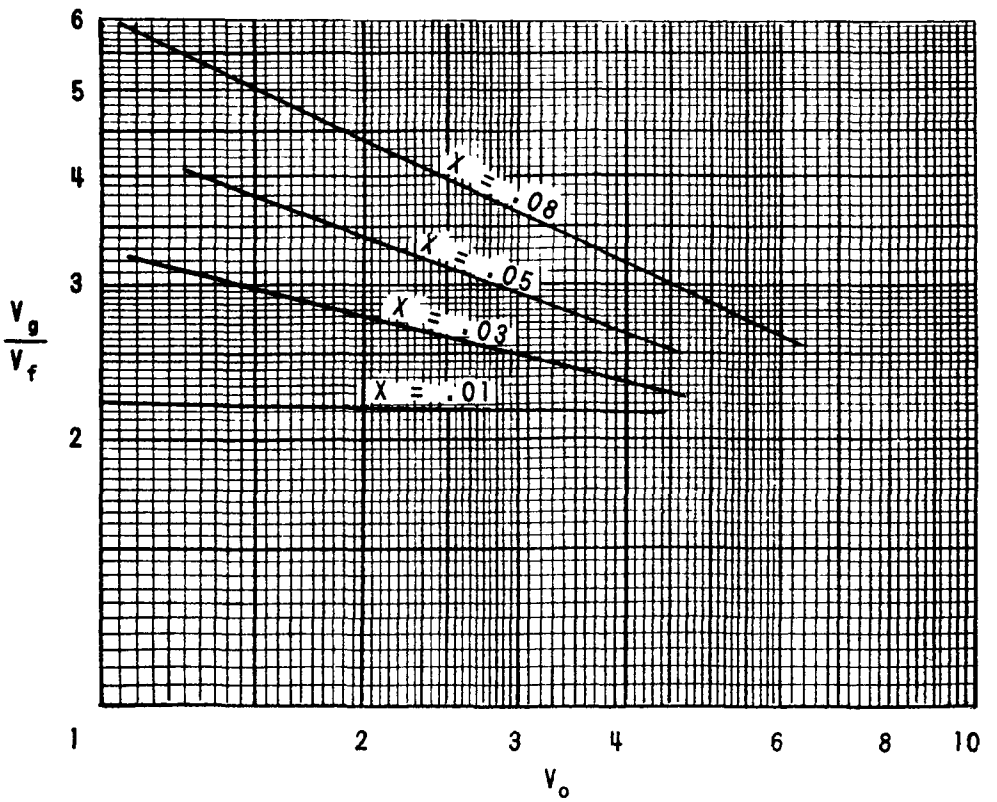

FIG. 11
WORKING CURVE FOR PREDICTION OF VELOCITY RATIOS AT 150 psig

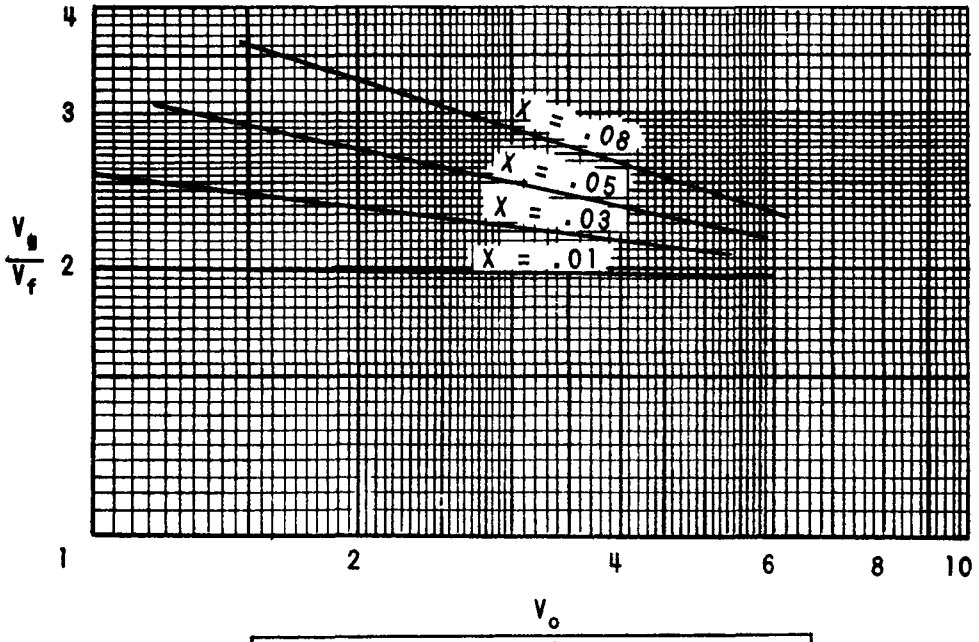

FIG. 12
WORKING CURVE FOR PREDICTION OF VELOCITY RATIOS AT 250 psig

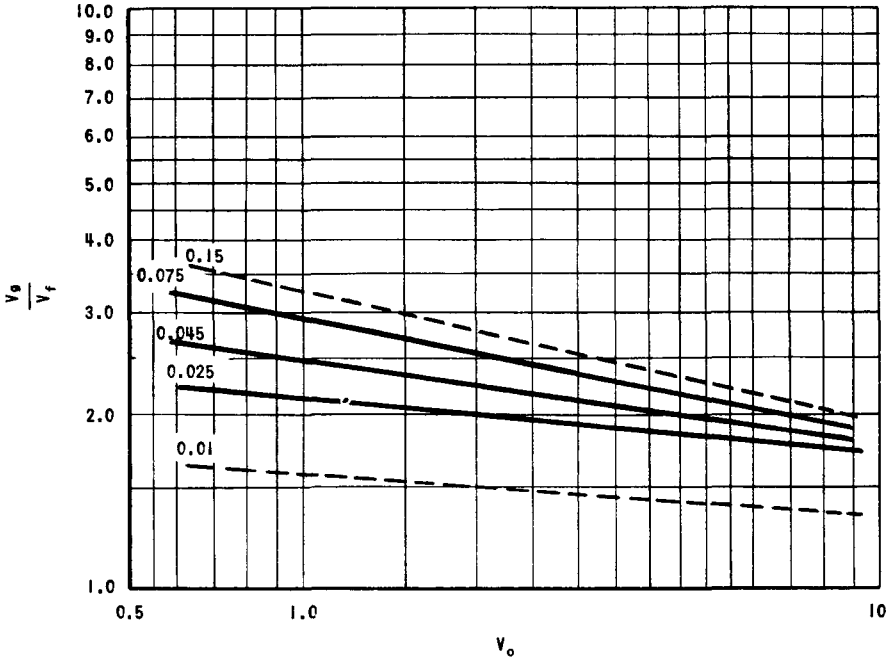

FIG. 13
WORKING CURVE FOR THE PREDICTION OF VELOCITY RATIOS AT 600 psig

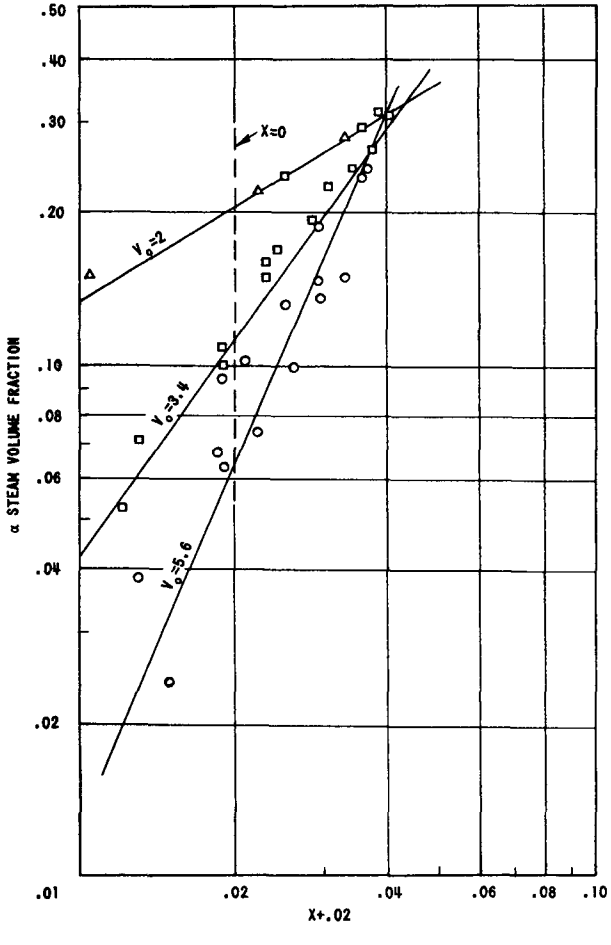

FIG. 14
EFFECT OF VELOCITY ON STEAM VOLUME FRACTIONS IN LOCAL BOILING IN $\frac{1}{4}$"x2" CHANNEL

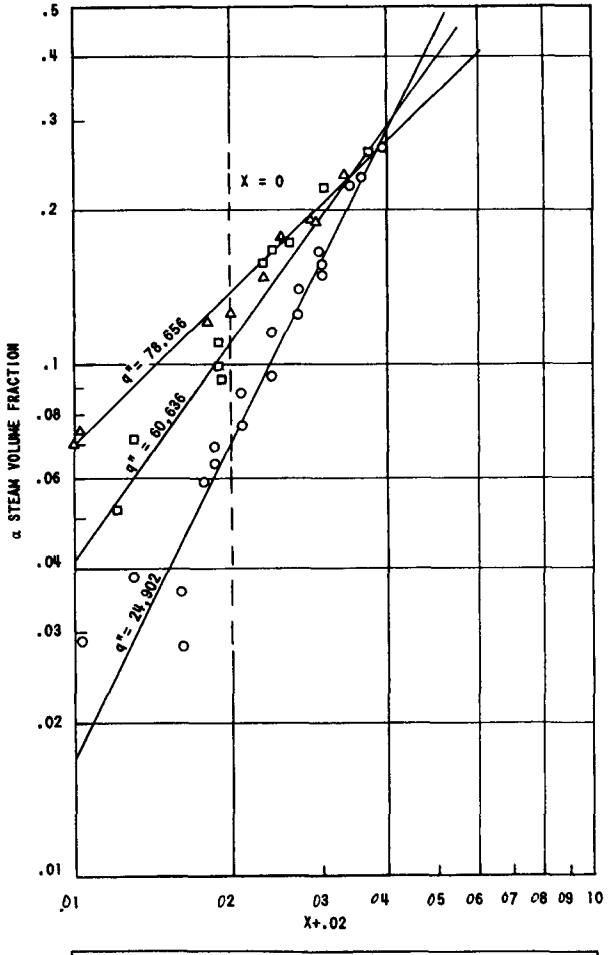

FIG. 15
EFFECT OF HEAT FLUX ON STEAM VOLUME FRACTIONS IN LOCAL BOILING IN $\frac{1}{4}$"x2" CHANNEL

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NOMENCLATURE

V_g	Steam or gas velocity, ft/sec
V_f	Water velocity, ft/sec
V_0	Superficial velocity (defined as G/ρ_f), ft/sec
G	Mass flow rate, lb mixture/(hr)(ft^2)
ρ_g	Density of gas, lb/ft^3
ρ_f	Density of liquid, lb/ft^3
x	Quality, lb steam/lb mixture
α	Steam volume fraction
q"	Heat flux, Btu/(hr)(ft^2)
P	Pressure, psia

APPENDIX

Measured and Calculated Natural and Forced-circulation Boiling Water Data for $\frac{1}{4}$-inch and $\frac{1}{2}$-inch Vertical Channels

The tabulation of experimental data at 150, 250, and 600 psig for the $\frac{1}{4}$ by 2 by 60-in. channel and the $\frac{1}{2}$ by 2 by 60-in channel are presented. All of the experimental data have not been presented, but representative runs, which give a good coverage of the range of parameters studied, have been chosen.

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
		1/4-Inch Channel - Unrestricted Flow; Natural Circulation							
155	163	56.6	3.09	0.122	-	-	12.5	0.698	0.27
				0.240	0.003	1.37			0.36
				0.334	0.007	2.23			0.44
				0.419	0.012	2.51			0.52
				0.485	0.016	2.67			0.61
				0 540	0.021	2.75			0.69
				0.578	0.025	2.87			0.77
				0.633	0.029	2.70			0.86
				0.688	0.034	2.44			0.94
184	263	75.7	3.18	0.115	-	-	17.5	0.667	0.27
				0.210	0.0025	0.878			0.36
				0.306	0.009	1.86			0.44
				0.405	0.015	2.08			0.52
				0.472	0.021	2.26			0.61
				0.543	0.027	2.21			0.69
				0.587	0.034	2.28			0.77
				0.629	0.040	2.29			0.86
				0.715	0.046	1.80			0.94
185	263	56.4	3.27	0.065	-	-	13.3	0.664	0.27
				0.146	0.001	0.57			0.36
				0.231	0.005	1.74			0.44
				0.293	0.010	2.30			0.52
				0.373	0.015	2.32			0.61
				0.424	0.019	2.48			0.69
				0.487	0.024	2.38			0.77
				0.541	0.028	2.30			0.86
				0.619	0.033	1.94			0.94
186	263	37.1	3.28	-	-	-	9.2	0.646	0.27
				0.045	-	-			0.36
				0.103	0.003	2.45			0.44
				0.159	0.006	2.93			0.52
				0.207	0.009	3.20			0.61
				0.272	0.012	3.00			0.69
				0.360	0.015	2.49			0.77
				0.427	0.018	2.27			0.86
				0.504	0.025	1.95			0.94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
224	263	56 4	3 06	0 121	-	-	13 4	0 682	0 27
				0 196	0 002	0 83			0 36
				0 301	0 007	1 53			0 44
				0 375	0 012	1 87			0 52
				0 422	0 017	2 17			0 61
				0 474	0 022	2 28			0 69
				0 529	0 027	2 25			0 77
				0 588	0 031	2 11			0 86
				0 632	0 036	2 04			0 94
225	263	37 0	3 12	0 043	-	-	8 7	0 629	0 27
				0 100	-	0 81			0 36
				0 167	0 004	1 86			0 44
				0 242	0 009	2 07			0 52
				0 328	0 014	1 95			0 61
				0 391	0 019	1 93			0 69
				0 432	0 024	2 01			0 77
				0 489	0 029	1 91			0 86
				0 524	0 034	1 93			0 94
226	263	17 8	2 98	-	-	-	5 9	0 568	0 27
				0 011	-	-			0 36
				0 037	0 001	0 34			0 44
				0 079	0 002	1 85			0 52
				0 130	0 003	2 05			0 61
				0 183	0 005	2 03			0 69
				0 229	0 006	2 03			0 77
				0 309	0 008	1 68			0 86
				0 342	0 009	1 73			0 94
227	264	56 4	3 05	-	-	-	13 9	0 671	0 27
				0 192	0 002	0 62			0 36
				0 293	0 006	1 44			0 44
				0 357	0 011	1 92			0 52
				0 437	0 016	1 97			0 61
				0 473	0 021	2 23			0 69
				0 525	0 026	2 24			0 77
				0 558	0 031	2 34			0 86
				0 610	0 035	2 20			0 94
228	262	37 1	3 23	0 072	-	-	9 0	0 656	0 27
				0 129	-	-			0 36
				0 215	0 003	1 20			0 44
				0 279	0 006	1 59			0 52
				0 334	0 010	1 80			0 61
				0 374	0 013	2 00			0 69
				0 432	0 016	1 94			0 77
				0 475	0 019	1 96			0 86
				0 518	0 021	1 92			0 94
229	262	17 7	3 02	0 017	-	-	5 8	0 574	0 27
				0 040	-	-			0 36
				0 056	-	0 39			0 44
				0 114	-	1 31			0 52
				0 151	-	1 76			0 61
				0 192	-	1 94			0 69
				0 247	-	1 85			0 77
				0 297	-	1 78			0 86
				0 349	-	1 68			0 94

Run No	Pressure psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
188	263	66 1	3 09	0 132	-	-	15 6	0 68	0 27
				0 226	0 002	0 77			0 36
				0 355	0 008	1 37			0 44
				0 417	0 014	1 81			0 52
				0 487	0 019	1 91			0 61
				0 534	0 025	2 07			0 69
				0 573	0 030	2 18			0 77
				0 619	0 036	2 14			0 86
				0 678	0 041	1 93			0 94
189	263	46 7	3 30	0 083	-	-	11 3	0 651	0 27
				0 149	0 0003	0 18			0 36
				0 238	0 004	1 22			0 44
				0 303	0 008	1 68			0 52
				0 382	0 011	1 75			0 61
				0 433	0 015	1 88			0 69
				0 493	0 019	1 84			0 77
				0 542	0 022	1 83			0 86
				0 593	0 026	1 73			0 94
191	263	27 4	3 31	0 038	-	-	7 0	0 629	0 27
				0 077	-	-			0 36
				0 133	0 002	1 06			0 44
				0 193	0 004	1 53			0 52
				0 261	0 006	1 61			0 61
				0 300	0 008	1 81			0 69
				0 367	0 014	1 70			0 77
				0 426	0 012	1 60			0 86
				0 471	0 015	1 57			0 94
192	263	66 0	3 14	0 123	-	-	15 1	0 685	0 27
				0 220	0 003	0 91			0 36
				0 329	0 008	1 58			0 44
				0 422	0 014	1 79			0 52
				0 471	0 019	2 07			0 61
				0 511	0 025	2 28			0 69
				0 543	0 030	2 46			0 77
				0 596	0 036	2 36			0 86
				0 644	0 041	2 23			0 94
193	263	17 7	3 05	-	-	-	5 7	0 571	0 27
				0 009	-	-			0 36
				0 047	0 0002	0 34			0 44
				0 058	0 002	2 62			0 52
				0 105	0 003	2 60			0 61
				0 147	0 005	2 60			0 69
				0 203	0 006	2 33			0 77
				0 273	0 008	1 96			0 86
				0 317	0 009	1 90			0 94
223	263	56 4	3 06	0 112	-	-	13 1	0 686	0 27
				0 214	0 002	0 86			0 36
				0 304	0 007	1 57			0 44
				0 389	0 012	1 80			0 52
				0 440	0 017	2 06			0 61
				0 479	0 022	2 27			0 69
				0 527	0 027	2 30			0 77
				0 582	0 031	2 18			0 86
				0 628	0 036	2 08			0 94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
234	264	37 1	3 25	0 068	-	-	9 8	0 626	0 27
				0 118	-	-			0 36
				0 199	0 002	0 90			0 44
				0 259	0 005	1 44			0 52
				0 324	0 008	1 64			0 61
				0 381	0 011	1 74			0 69
				0 428	0 014	1 82			0 77
				0 465	0 017	1 90			0 86
				0 521	0 020	1 78			0 94
235	264	17 8	3 12	0 007	-	-	5 9	0 565	0 27
				0 034	-	-			0 36
				0 068	0 001	0 09			0 44
				0 101	0 002	1 33			0 52
				0 133	0 003	1 92			0 61
				0 188	0 005	1 90			0 69
				0 231	0 006	1 94			0 77
				0 289	0 008	1 80			0 86
				0 363	0 009	1 54			0 94
237	264	66 1	2 97	0 125	-	-	16 6	0 674	0 27
				0 230	0 002	0 64			0 36
				0 322	0 008	1 56			0 44
				0 406	0 014	1 90			0 52
				0 465	0 020	2 14			0 61
				0 499	0 025	2 44			0 69
				0 542	0 031	2 54			0 77
				0 583	0 037	2 57			0 86
				0 646	0 042	2 30			0 94
238	264	27 4	3 24	0 035	-	-	7 5	0 614	0 27
				0 086	-	-			0 36
				0 127	-	0 90			0 44
				0 179	-	1 56			0 52
				0 229	-	1 84			0 61
				0 311	-	1 68			0 69
				0 344	-	1 85			0 77
				0 399	-	1 78			0 86
				0 465	-	1 61			0 94
194	413	65 8	3 28	0 071	-	-	16 8	0 635	0 27
				0 138	-	-			0 36
				0 242	0 005	0 93			0 44
				0 302	0 011	1 47			0 52
				0 287	0 017	2 42			0 61
				0 319	0 022	2 82			0 69
				0 424	0 028	2 27			0 77
				0 516	0 034	1 90			0 86
				0 566	0 039	1 82			0 94
195	413	94 8	3 10	0 126	-	-	24 2	0 656	0 27
				0 210	0 001	0 28			0 36
				0 327	0 010	1 21			0 44
				0 411	0 019	1 59			0 52
				0 350	0 028	3 04			0 61
				0 388	0 036	3 45			0 69
				0 514	0 045	2 58			0 77
				0 612	0 054	2 08			0 86
				0 659	0 062	2 00			0 94

Run No	Pressure psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
159	613	94 5	3 42	0 052	-		23 7	0 628	0 27
				0 120	-	-			0 36
				0 189	0 007	1 16			0 44
				0 250	0 016	1 81			0 52
				0 281	0 025	2 42			0 61
				0 331	0 033	2 61			0 69
				0 377	0 042	2 73			0 77
				0 430	0 051	2 66			0 86
				0 495	0 060	2 42			0 94
160	613	17 2	2 56	0 018	-	-	7 0	0 547	0 27
				0 018	-	-			0 36
				0 036	-	-			0 44
				0 053	0 002	1 20			0 52
				0 053	0 004	2 65			0 61
				0 070	0 006	3 00			0 69
				0 104	0 008	2 65			0 77
				0 158	0 010	2 08			0 86
				0 199	0 012	1 90			0 94
161	613	55 9	3 35	0 026	-	-	15 0	0 606	0 27
				0 075	-	-			0 36
				0 112	0 003	0 872			0 44
				0 153	0 008	1 71			0 52
				0 207	0 013	1 96			0 61
				0 253	0 019	2 11			0 69
				0 297	0 024	2 17			0 77
				0 357	0 029	2 02			0 86
				0 415	0 035	1 88			0 94
162	612	94 5	3 36	0 037	-	-	24 4	0 625	0 27
				0 110	-	-			0 36
				0 182	0 007	1 14			0 44
				0 246	0 016	1 82			0 52
				0 300	0 024	2 19			0 61
				0 337	0 033	2 54			0 69
				0 413	0 042	2 35			0 77
				0 479	0 051	2 19			0 86
				0 534	0 060	2 08			0 94
163	613	17 2	2 44	0 00	-	-	8 4	0 485	0 27
				0 008	-	-			0 36
				0 027	-	-			0 44
				0 037	0 000	0 23			0 52
				0 056	0 002	1 57			0 61
				0 086	0 005	1 88			0 69
				0 111	0 007	2 08			0 77
				0 132	0 009	2 27			0 86
				0 197	0 011	1 76			0 94
164	613	65 5	3 43	0 038	-	-	17 5	0 602	0 27
				0 093	-	-			0 36
				0 149	0 003	0 648			0 44
				0 186	0 009	1 50			0 52
				0 236	0 015	1 85			0 61
				0 291	0 021	1 97			0 69
				0 341	0 027	2 01			0 77
				0 376	0 033	2 12			0 86
				0 442	0 039	1 93			0 94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
165	612	84.9	3.40	0.074	-	-	21.7	0.621	0.27
				0.111	-	-			0.36
				0.173	0.006	1.05			0.44
				0.225	0.014	1.79			0.52
				0.276	0.022	2.17			0.61
				0.325	0.029	2.36			0.69
				0.375	0.037	2.42			0.77
				0.455	0.045	2.12			0.86
				0.487	0.053	2.21			0.94
166	613	26.9	2.97	0.008	-	-	10.2	0.512	0.27
				0.027	-	-			0.36
				0.068	-	-			0.44
				0.076	0.001	0.558			0.52
				0.094	0.004	1.47			0.61
				0.125	0.007	1.83			0.69
				0.158	0.010	1.98			0.77
				0.207	0.013	1.83			0.86
				0.256	0.016	1.72			0.94
167	613	65.5	3.43	0.071	-	-	17.6	0.600	0.27
				0.097	-	-			0.36
				0.158	0.003	0.568			0.44
				0.187	0.009	1.47			0.52
				0.232	0.015	1.88			0.61
				0.285	0.021	2.01			0.69
				0.336	0.027	2.05			0.77
				0.372	0.033	2.15			0.86
				0.410	0.039	2.19			0.94
168	613	84.9	3.40	0.070	-	-	22.0	0.618	0.27
				0.121	-	-			0.36
				0.177	0.005	0.952			0.44
				0.236	0.013	1.64			0.52
				0.277	0.021	2.12			0.61
				0.345	0.029	2.14			0.69
				0.357	0.037	2.59			0.77
				0.420	0.045	2.44			0.86
				0.492	0.053	2.16			0.94
169	613	26.9	3.02	0.029	-	-	9.82	0.520	0.27
				0.036	-	-			0.36
				0.064	-	-			0.44
				0.088	0.001	0.564			0.52
				0.116	0.004	1.22			0.61
				0.140	0.007	1.64			0.69
				0.167	0.010	1.86			0.77
				0.212	0.013	1.78			0.86
				0.279	0.016	1.52			0.94
172	613	75.2	3.42	0.037	-	-	20.6	0.595	0.27
				0.098	-	-			0.36
				0.161	0.003	0.554			0.44
				0.211	0.010	1.38			0.52
				0.271	0.016	1.71			0.61
				0.328	0.024	1.86			0.69
				0.373	0.031	1.99			0.77
				0.402	0.037	2.17			0.86
				0.480	0.045	1.89			0.94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
174	613	36 5	3 10	0 036	-		12 3	0 549	0 27
				0 054	-	-			0 36
				0 090	-	-			0 44
				0 114	0 003	0 919			0 52
				0 132	0 007	1 71			0 61
				0 183	0 011	1 79			0 69
				0 240	0 014	1 72			0 77
				0 287	0 018	1 71			0 86
				0 324	0 021	1 74			0 94
175	613	75 2	3 34	0 047	-	-	20 6	0 604	0 27
				0 083	-	-			0 36
				0 154	0 004	0 745			0 44
				0 212	0 011	1 51			0 52
				0 261	0 018	1 92			0 61
				0 296	0 025	2 27			0 69
				0 357	0 032	2 23			0 77
				0 412	0 039	2 18			0 86
				0 476	0 046	2 00			0 94
176	613	46 2	3 30	0 036	-	-	13 6	0 578	0 27
				0 062	-	-			0 36
				0 101	0 001	0 324			0 44
				0 137	0 005	1 28			0 52
				0 182	0 010	1 66			0 61
				0 222	0 014	1 90			0 69
				0 259	0 019	2 04			0 77
				0 314	0 023	1 94			0 86
				0 384	0 028	1 70			0 94
230	614	94 5	3 22	0 051	-	-	25 7	0 621	0 27
				0 102	-	-			0 36
				0 177	0 007	1 17			0 44
				0 245	0 016	1 87			0 52
				0 295	0 025	2 31			0 61
				0 335	0 035	2 65			0 69
				0 391	0 044	2 66			0 77
				0 459	0 053	2 46			0 86
				0 520	0 062	2 29			0 94
231	613	65 5	3 29	0 052	-	-	17 7	0 615	0 27
				0 109	-	-			0 36
				0 168	0 004	0 75			0 44
				0 222	0 010	1 38			0 52
				0 260	0 017	1 80			0 61
				0 313	0 023	1 93			0 69
				0 366	0 029	1 95			0 77
				0 406	0 036	2 02			0 86
				0 475	0 042	1 80			0 94
232	613	46 2	3 25	0 042	-	-	13 4	0 589	0 27
				0 080	-	-			0 36
				0 120	0 002	0 43			0 44
				0 178	0 006	1 05			0 52
				0 214	0 011	1 46			0 61
				0 253	0 015	1 69			0 69
				0 312	0 020	1 64			0 77
				0 348	0 024	1 72			0 86
				0 389	0 029	1 72			0 94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
284	612.1	65.6	1.96	0.028	-	-	32.73	0.5838	0.178
				0.075	-	-			0.2631
				0.148	-	-			0.3478
				0.216	0.0020	0.28			0.4326
				0.286	0.0125	1.18			0.5173
				0.347	0.0230	1.65			0.602
				0.379	0.0336	2.12			0.6868
				0.441	0.0440	2.18			0.7715
				0.517	0.0546	2.01			0.8562
				0.582	0.0651	1.87			0.9409
285	612.1	75.3	2.02	0.018	-	-	34.94	0.6044	0.094
				0.029	-	-			0.18
				0.098	-	-			0.26
				0.172	-	-			0.35
				0.232	0.0051	0.64			0.43
				0.304	0.0170	1.48			0.52
				0.372	0.0288	1.87			0.60
				0.425	0.0406	2.14			0.69
				0.473	0.0524	2.30			0.77
				0.540	0.0642	2.18			0.86
				0.610	0.076	1.95			0.94
290	613.2	65.49	~4.45	0.011	-	-	12.36	0.6025	0.26
				0.064	-	-			0.35
				0.093	0.0017	0.64			0.43
				0.118	0.0059	1.67			0.52
				0.147	0.0102	2.21			0.60
				0.173	0.0144	2.59			0.69
				0.242	0.0186	2.20			0.77
				0.326	0.0228	1.80			0.86
				0.395	0.0270	1.59			0.94
			1/4-Inch Channel - Forced Circulation						
291	614.4	75.16	4.98	0.030	-	-	14.27	0.5988	0.26
				0.064	-	-			0.35
				0.111	0.0018	0.53			0.43
				0.147	0.0066	1.43			0.52
				0.192	0.0114	1.80			0.60
				0.224	0.0162	2.12			0.69
				0.304	0.0210	1.83			0.77
				0.370	0.0258	1.68			0.86
				0.449	0.0306	1.44			0.94
294	613.3	84.82	5.04	0.004	0.0372	-	16.02	0.592	0.26
				0.041	-	-			0.35
				0.091	0.0016	0.611			0.43
				0.123	0.0069	1.86			0.52
				0.152	0.0122	2.58			0.60
				0.216	0.0176	2.42			0.69
				0.275	0.0229	2.31			0.77
				0.365	0.0282	1.88			0.86
				0.467	0.0335	1.48			0.94
296	613.3	75.14	5.94	0.011	-	-	11.96	5.96	0.26
				0.030	-	-			0.35
				0.075	0.0014	0.633			0.43
				0.100	0.0053	1.82			0.52
				0.125	0.0094	2.47			0.60
				0.176	0.0134	2.38			0.65
				0.219	0.0173	2.36			0.77
				0.291	0.0214	1.99			0.86
				0.402	0.0254	1.45			0.94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
297	613.3	75.14	5.94	0.030	-	-	11.96		0.35
				0.078	0.0014	0.658			0.43
				0.096	0.0053	1.95			0.52
				0.139	0.0092	2.24			0.60
				0.173	0.0130	2.45			0.69
				0.214	0.0169	2.46			0.77
				0.322	0.0208	1.74			0.86
				0.400	0.0246	1.47			0.94
298	613.3	84.8	5.94	0.004	-	-	13.1	0.6091	0.26
				0.044	-	-			0.35
				0.073	0.0022	1.05			0.43
				0.102	0.0068	2.24			0.52
				0.136	0.0112	2.7			0.60
				0.187	0.0157	2.61			0.69
				0.237	0.0203	2.48			0.77
				0.308	0.0248	2.14			0.85
				0.400	0.0294	1.69			0.94
299	614.3	94.46	5.94	0.030	-	-	14.58	0.6115	0.35
				0.074	0.0026	1.24			0.43
				0.092	0.0077	3.32			0.52
				0.127	0.0128	3.52			0.60
				0.161	0.0178	2.50			0.69
				0.259	0.0229	2.10			0.77
				0.338	0.0280	1.79			0.86
				0.415	0.0330	1.99			0.94
300	611.4	65.48	5.88	0.024	-	-	9.83	0.622	0.26
				0.063	-	-			0.35
				0.073	0.0023	1.08			0.43
				0.097	0.0058	2.03			0.52
				0.133	0.0093	2.30			0.60
				0.148	0.0128	2.80			0.60
				0.235	0.0164	2.03			0.77
				0.306	0.0199	1.72			0.86
				0.384	0.0234	1.43			0.94
397	163.4	37.30	4.80	0.027	0.0157	6.57	5.3		0.35
				0.072	-	6.15			0.44
				0.114		5.92			0.52
				0.176	-	4.96			0.61
				0.247	-	4.12			0.69
				0.344	-	3.14			0.77
				0.416	-	2.72			0.86
				0.495	-	2.28			0.94
316	163.4	47.03	1.87	0.011	-	-	17.54	0.7050	0.094
				0.046	-	-			0.18
				0.110	-	-			0.26
				0.211	0.00382	2.22			0.35
				0.361	0.00995	2.75			0.43
				0.464	0.0161	2.92			0.52
				0.536	0.0222	3.04			0.60
				0.581	0.0283	3.24			0.69
				0.628	0.0345	3.27			0.77
				0.688	0.0406	2.97			0.86
				0.727	0.0467	2.85			0.94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
317	163.4	37.36	1.82	0.029	-	-	14.35	0.6972	0.18
				0.090	-	-			0.26
				0.162	0.0026	2.08			0.35
				0.289	0.0077	2.86			0.43
				0.408	0.0126	2.81			0.52
				0.464	0.0176	3.14			0.60
				0.530	0.0226	3.11			0.69
				0.601	0.0276	2.84			0.77
				0.654	0.0326	2.69			0.86
				0.680	0.0376	2.77			0.94
349	163.4	56.65	3.18	0.017	-	-	11.49	0.7247	
				0.068	-	-			0.18
				0.142	-	-			0.26
				0.233	0.003705	1.88			0.35
				0.358	0.008031	2.23			0.43
				0.432	0.0124	2.53			0.52
				0.498	0.0167	2.63			0.60
				0.541	0.0210	2.80			0.69
				0.591	0.0254	2.76			0.77
				0.672	0.0297	2.30			0.86
				0.710	0.0340	2.21			0.94
350	163.4	66.30	3.18	0.017	-	-	12.40	0.7462	0.004
				0.075	-	-			0.18
				0.167	0.00056	0.43			0.26
				0.255	0.00567	2.54			0.35
				0.349	0.0108	3.10			0.43
				0.421	0.0159	3.39			0.52
				0.487	0.0210	3.45			0.60
				0.531	0.0261	3.61			0.69
				0.575	0.0312	3.62			0.77
				0.647	0.0363	3.13			0.86
				0.681	0.04144	3.08			0.94
351	163.4	37.32	3.13	0.003	-	-	7.83	0.7171	0.094
				0.017	-	-			0.18
				0.065	-	-			0.26
				0.113	0.00217	2.65			0.35
				0.185	0.00501	3.46			0.43
				0.252	0.0078	3.65			0.52
				0.321	0.0107	3.56			0.60
				0.393	0.0135	3.30			0.69
				0.454	0.0164	3.12			0.77
				0.528	0.0192	2.73			0.86
				0.566	0.02202	2.69			0.94
353	163.4	27.66	3.13	0.016	-	-	6.52	0.6830	0.18
				0.042	-	-			0.26
				0.074	0.00077	1.5			0.35
				0.129	0.0029	3.04			0.43
				0.186	0.005	3.42			0.52
				0.265	0.0071	3.08			0.60
				0.342	0.0092	2.79			0.69
				0.405	0.0113	2.62			0.77
				0.470	0.0134	2.39			0.86
				0.528	0.0155	2.20			0.94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
354	163.4	18.	3.13	0.010	-	-	4.82	0.6405	0.18
				0.010	-	-			0.26
				0.029	-	-			0.35
				0.051	0.0013	3.43			0.43
				0.048	0.0028	7.85			0.62
				0.119	0.0042	4.58			0.60
				0.184	0.0056	3.68			0.69
				0.249	0.0071	3.16			0.77
				0.307	0.6085	2.86			0.86
				0.375	0.010	2.47			0.94
386	163.4	46.96	4.34	0.007	-	-	5.46	0.7835	0.18
				0.050	0.0014	4.24			0.26
				0.092	0.0040	6.17			0.35
				0.161	0.0066	5.37			0.43
				0.229	0.0092	4.84			0.52
				0.309	0.0118	4.14			0.60
				0.378	0.0144	3.74			0.69
				0.457	0.0170	3.18			0.77
				0.513	0.0196	2.94			0.86
				0.592	0.0222	2.42			0.94
387	163.4	66.29	4.34	0.043	-	-	10.15	0.7136	0.094
				0.052	-	-			0.18
				0.090	-	-			0.26
				0.153	0.0027	2.28			0.35
				0.233	0.0063	3.23			0.43
				0.316	0.0100	3.38			0.52
				0.386	0.0137	3.39			0.60
				0.437	0.0174	3.51			0.69
				0.510	0.0211	3.18			0.77
				0.568	0.0248	2.96			0.86
				0.635	0.0284	2.56			0.94
389	163.5	56.63	4.34	0.034	-	-	8.18	0.7318	0.18
				0.093	-	-			0.26
				0.158	0.0029	2.45			0.35
				0.241	0.0061	2.99			0.43
				0.309	0.0092	3.23			0.52
				0.384	0.0123	3.12			0.60
				0.445	0.0154	3.04			0.69
				0.511	0.0186	2.82			0.77
				0.584	0.0217	2.46			0.86
				0.657	0.0248	2.07			0.94
392	163 3	66.29	4.34	0.017	-	-	10.05	0.7182	0.18
				0.068	-	-			0.26
				0.134	0.0029	2.87			0.35
				0.229	0.0067	3.44			0.43
				0.305	0.0105	3.64			0.52
				0.375	0.0143	3.64			0.60
				0.436	0.0180	3.59			0.69
				0.506	0.0218	3.28			0.77
				0.574	0.0256	2.93			0.86
				0.656	0.0294	2.39			0.74

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
407	163.5	56.6	5.66	0.023	-	-	6.49	0.7212	0.26
				0.055	0.002	5.17			0.35
				0.112	0.0044	5.34			0.43
				0.172	0.00681	5.05			0.52
				0.238	0.00923	4.57			0.60
				0.301	0.01165	4.19			0.69
				0.390	0.0141	3.42			0.77
				0.463	0.01649	2.98			0.86
				0.536	0.0189	2.56			0.94
408	164.5	37.3	5.66	0.007	0.0011	25.2	4.43	0.7109	0.35
				0.023	0.0027	17.4			0.43
				0.056	0.0043	11.2			0.52
				0.103	0.0058	7.88			0.60
				0.173	0.0074	5.50			0.69
				0.264	0.0091	3.91			0.77
				0.363	0.0107	2.89			0.86
				0.442	0.0123	2.39			0.94
409	163.4	46.95	5.66	0.01	-	-	5.22	0.7294	0.26
				0.049	0.0018	5.43			0.35
				0.091	0.0039	5.90			0.43
				0.138	0.0059	5.64			0.52
				0.211	0.0079	4.55			0.60
				0.277	0.0099	3.99			0.69
				0.350	0.0119	3.43			0.77
				0.431	0.014	2.85			0.86
				0.515	0.016	2.33			0.94
410	163.4	27.64	5.66	0.007	0.0022	52.1	3.04	0.7315	0.43
				0.023	0.0035	22.3			0.52
				0.055	0.0046	12.2			0.60
				0.097	0.0058	8.34			0.69
				0.176	0.0070	5.07			0.77
				0.266	0.0082	3.49			0.86
				0.345	0.0094	2.75			0.94

Run No	Pressure psia	Power Density kw/liter	Heat Flux Btu/hr ft^2	Inlet Water Velocity ft/sec	Void Fraction	Steam Quality, x	Slip Ratio V_s/V_f	Inlet Subcooling °F	Fractional Boiling Length L_b/L_t	L/L_t
315	163 3	95 31	8 53 x 10^4	2 88	0 007	-	-	19 8	0 746	-
					0 060	-	-			-
					0 155	0 00082	0 686			0 27
					0 266	0 00889	3 81			0 36
					0 389	0 017	4 17			0 44
					0 468	0 0250	4 48			0 52
					0 502	0 0331	5 22			0 61
					0 539	0 0412	5 65			0 69
					0 593	0 0492	5 47			0 77
					0 653	0 0573	4 96			0 86
					0 714	0 0654	4 30			0 94
318	163 4	56 7	5 07 x 10^4	1 87	0 018	-	-	19 9	0 716	-
					0 096	-	-			-
					0 184	-	-			0 27
					0 305	0 00542	1 92			0 36
					0 445	0 01264	2 46			0 44
					0 539	0 0199	2 68			0 52
					0 590	0 0271	2 98			0 61
					0 616	0 0343	3 42			0 69
					0 668	0 0415	3 33			0 77
					0 709	0 0487	3 24			0 86
					0 756	0 056	2 95			0 94
345	163 6	56 67	5 07 x 10^4	2 37	0 010	-	-	15 7	0 722	-
					0 018	-	-			-
					0 142	-	-			0 27
					0 257	0 00481	2 13			0 36
					0 375	0 01068	2 75			0 44
					0 474	0 0166	2 85			0 52
					0 526	0 0224	3 15			0 61
					0 563	0 0283	3 44			0 69
					0 610	0 0342	3 46			0 77
					0 677	0 0400	3 03			0 86
					0 727	0 0459	2 76			0 94
384	163 2	85 61	7 66 x 10^4	3 79	0 027	-	-	13 9	0 739	-
					0 081	-	-			-
					0 167	0 0001	0 083			0 27
					0 240	0 0056	2 75			0 36
					0 356	0 0111	3 13			0 44
					0 426	0 0166	3 5			0 52
					0 483	0 0221	3 73			0 61
					0 509	0 0276	4 22			0 69
					0 568	0 0331	4 01			0 77
					0 652	0 0386	3 29			0 86
					0 721	0 0442	2 75			0 94

Run No.	Pressure psia	Power Density kw/liter	Heat Flux Btu/hr ft^2	Inlet Water Velocity ft/sec	Void Fraction	Steam Quality, x	Slip Ratio V_s/V_f	Inlet Subcooling °F	Fractional Boiling Length L_b/L_t	L/L_t
388	163.4	50.17	4.49×10^4	4.34	-	-	-	7.38	0.631	-
					0.017	-	-			0.27
					0.066	-	-			0.36
					0.107	0.0016	2.0			0.44
					0.161	0.0038	2.92			0.52
					0.225	0.0059	3.04			0.61
					0.311	0.0081	2.68			0.69
					0.379	0.0102	2.51			0.77
					0.456	0.0124	2.22			0.86
					0.516	0.0145	2.05			0.94
390	163.5	27.64	2.47×10^4	4.29	0.010	-	-	4.52	0.697	-
					0.010	-	-			-
					0.027	-	-			0.27
					0.037	0.0008	3.29			0.36
					0.076	0.0024	4.44			0.44
					0.114	0.004	4.68			0.52
					0.160	0.0056	4.43			0.61
					0.208	0.0072	4.13			0.69
					0.284	0.0087	3.34			0.77
					0.369	0.0103	2.68			0.86
					0.455	0.0119	2.18			0.94
393	163.3	75.96	6.78×10^4	4.34	0.024	-	-	12.2		-
					0.072	-	-			-
					0.130	-	-			0.27
					0.195	0.0025	1.58			0.36
					0.291	0.0069	2.54			0.44
					0.349	0.011	3.18			0.52
					0.414	0.0152	3.36			0.61
					0.468	0.0194	3.46			0.69
					0.531	0.0235	3.29			0.77
					0.588	0.0273	3.10			0.86
					0.655	0.032	2.70			0.94
395	163.4	95.27	8.53×10^4	4.34	-	-	-	13.3		-
					0.050	-	-			-
					0.099	0.0001	2.99			0.27
					0.198	0.0055	3.46			0.36
					0.288	0.011	4.17			0.44
					0.369	0.016	4.32			0.52
					0.432	0.022	4.44			0.61
					0.478	0.027	4.63			0.69
					0.539	0.032	4.37			0.77
					0.599	0.038	4.00			0.86
					0.659	0.043	3.56			0.94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
		1/2-Inch Vertical Channels - Unrestricted Flow, Natural Circulation							
180	263 1	49 2	2 83	0 050	-	-	12 03	0 706	0 19
				0 160	-	-			0 27
				0 230	0 0033	1 10			0 35
				0 300	0 0079	1 75			0 44
				0 360	0 0125	2 10			0 52
				0 440	0 0172	2 12			0 61
				0 460	0 0216	2 38			0 69
				0 490	0 0263	2 60			0 77
				0 520	0 0309	2 80			0 86
				0 540	0 0355	2 92			0 94
245	262 5	45 2	2 87	0 130	-	-	9 85	0 733	0 19
				0 195	0 0006	-			0 27
				0 265	0 0044	1 15			0 35
				0 335	0 0085	1 58			0 44
				0 390	0 0126	1 88			0 52
				0 450	0.0167	1 95			0 61
				0 495	0 0208	2 05			0 69
				0 525	0 0250	2 19			0 77
				0 550	0 0290	2 30			0 86
				0 590	0 0332	2 23			0 94
246	262 5	35 2	2 98	0 105	-	-	7 85	0 717	0 19
				0 160		-			0 27
				0 220	0 0027	-			0 35
				0 280	0 0058	1 42			0 44
				0 320	0 0089	1 81			0 52
				0 375	0 0120	1 87			0 61
				0 420	0 0151	2 01			0 69
				0 475	0 0182	1 94			0 77
				0 510	0.0213	1 98			0 86
				0 535	0.0244	2 05			0 94
247	263 0	29 2	3 01	0 090	-	-	5 85	0 743	0 19
				0 120	0 0005	-			0 27
				0 185	0 0030	1 28			0 35
				0 235	0 0055	1 32			0 44
				0 280	0 0080	1 98			0 52
				0 330	0 0106	2 05			0 61
				0 375	0 0131	2 10			0 69
				0 420	0 0156	2 08			0 77
				0 445	0 0182	2 17			0 86
				0 480	0 0206	2 15			0 94
248	262 5	17 2	2 95	0 050	-		3 65	0 734	0 19
				0 090	0 0002	-			0 27
				0 120	0 0016	1 12			0 35
				0 170	0 0031	1 43			0 44
				0 185	0 0047	1 03			0 52
				0 220	0 0062	2 08			0 61
				0 270	0 0077	1 99			0 69
				0 305	0 0092	2 01			0 77
				0 330	0 0108	1 90			0 86
				0 365	0 0123	2 04			0 94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
252	263 4	26.2	3.02	0.090	-	-	5 5	0 730	0 19
				0.125	0.0004	-			0 27
				0.190	0 0023	-			0 35
				0 225	0 0046	1 47			0 44
				0 280	0 0068	1.68			0 52
				0.325	0 0091	1 82			0 61
				0.360	0 0114	1 93			0 69
				0.400	0 0136	1.97			0 77
				0.440	0.0159	1.92			0 86
									0 94
253	263.03	23.2	3.00	0.085	-	-	4 82	0.735	0 19
				0.115	0.0001	-			0 27
				0 165	0.0022	1 03			0.35
				0.195	0.0042	1.59			0 44
				0.230	0.0062	1 98			0 52
				0 280	0.0083	2 01			0 61
				0.335	0.0103	1 95			0 69
				0.365	0.0123	2 03			0 77
				0 400	0 0143	2 07			0 86
				0 425	0.0163	2.10			0 94
254	263.0	20 2	2.99	0.050	-	-	4 62	0.710	0 19
				0.100	-	-			0 27
				0 150	0 0014	-			0 35
				0 185	0 0032	1.32			0 44
				0.230	0.0049	1.57			0 52
				0.265	0 0067	1 77			0.61
				0 305	0 6085	1.84			0 69
				0.345	0 0102	1 85			0 77
				0.385	0 0120	1 83			0 86
				0 410	0 0138	1.91			0 94
257	263 0	47 2	2.86	0.140	-	-	10.5	0 734	0 19
				0.200	0 0003	-			0.27
				0.260	0 0046	1 31			0.35
				0 310	0.0090	1 88			0 44
				0 380	0 0133	2 12			0 52
				0 420	0 0176	2.35			0 61
				0 460	0 0220	2.49			0 69
				0 465	0 0263	2 85			0 77
				0 520	0.0307	2.81			0 86
									0.94
258	262 5	45.2	2 90	0 130	-	-	9 46	0 747	0 19
				0.225	0 0011	-			0 27
				0 280	0.0051	1 32			0 35
				0 340	0 0093	1 73			0 44
				0.395	0 00135	2 02			0.52
				0 440	0 0177	2 13			0.61
				0 470	0 0220	2 46			0 69
				0 510	0 0261	2 43			0 77
				0.540	0.0303	2 62			0.86
				0.560	0 0345	2 66			0.94

Run No	Pressure psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
260	262 0	41 2	2 97	0 140	-	-	8 18	0 758	0 19
				0 195	0 0014	-			0 27
				0 300	0 0051	1 15			0 35
				0 330	0 0088	1 73			0 44
				0 400	0 0125	1 78			0 52
				0 450	0 0162	1 90			0 61
				0 490	0 0200	2 02			0 69
				0 525	0 0237	2 08			0 77
				0 530	0 0275	2 38			0 86
				0 570	0 0312	2 32			0 94
113	613 3	28 9	2 88	0 070	-	-	9 3	0 599	0 35
				0 105	0 0014	-			0 44
				0 115	0 0045	1 26			0 52
				0 160	0 0074	1 43			0 61
				0 200	0 0106	1 63			0 69
				0 265	0 0145	1 53			0 77
				0 305	0 0167	1 45			0 86
				0 330	0 0198	7 53			0 94
114	612 45	28 9	2 93	0 005	-	-	9 15	0 601	0 19
				0 045	-	-			0 27
				0 080	-	-			0 35
				0 080	0 0016	-			0 44
				0 110	0 0046	1 39			0 52
				0 195	0 0076	1 19			0 61
				0 190	0 0106	1 69			0 69
				0 240	0 0137	1 66			0 77
				0 255	0 0167	1 87			0 86
				0 220	0 0198	2 70			0 94
115	612 4	33 0	3 00	0 030	-	-	10 65	0 599	0 19
				0 060	-	-			0 27
				0 080	-	-			0 35
				0 110	0 0017	-			0 44
				0 145	0 0051	1 10			0 52
				0 190	0 0086	1 40			0 61
				0 235	0 0120	1 52			0 69
				0 250	0 0155	1 75			0 77
				0 300	0 0189	1 67			0 86
				0 345	0 0226	1 65			0 94
118	-	23 9	2 68	0 030	-	-	8 3	0 599	0 27
				0 065	-	-			0 35
				0 100	0 0014	-			0 44
				0 115	0 0041	1 28			0 52
				0 160	0 0079	1 58			0 61
				0 200	0 0097	1 48			0 69
				0 250	0 0124	1 38			0 77
				0 250	0 0152	1 72			0 86
				0 295	0 0180	1 63			0 94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
119	614	15 9	2 67	0 010	-	-	6 6	0 540	0 19
				0 010	-	-			0 27
				0 040	-	-			0 35
				0 070		-			0 44
				0 100	0 0015	-			0 52
				0 120	0 0032	-			0 61
				0 140	0 0051	1 18			0 69
				0 140	0 0069	1 62			0 77
				0 170	0 0092	1 73			0 86
				0 180	0 0106	1 75			0 94
120	613 5	18 9	2 75	0 060	-	-	6 62	0 585	0 35
				0 060	0 0014	-			0 44
				0 100	0 0028	-			0 52
				0 140	0 0048	1 12			0 61
				0 170	0 0069	1 26			0 69
				0 230	0 0093	1 18			0 77
				0 260	0 0111	1 20			0 86
				0 280	0 0130	1 28			0 94
121	613 5	20 9	2 80	0 020	-	-	6 82	0 602	0 27
				0 040	-	-			0 35
				0 100	0 0015	-			0 44
				0 110	0 0034	1 03			0 52
				0 120	0 0057	1 60			0 61
				0 160	0 0080	1 57			0 69
				0 190	0 0102	1 68			0 77
				0 190	0 0124	2 00			0 86
				0 240	0 0147	1 75			0 94
153	614 4	28 9	2 90	0 060	-	-	8 6	0 634	0 27
				0 070	-	-			0 35
				0 100	0 0029	-			0 44
				0 140	0 0060	1 38			0 52
				0 160	0 0090	1 82			0 61
				0 210	0 0121	1 74			0 69
				0 210	0 0152	2 18			0 77
				0 255	0 0183	2 04			0 86
				0 295	0 0214	1 97			0 94
154	611 4	38 9	2 95	0 020	-	-	10 66	0 653	0 19
				0 080	-	-			0 27
				0 085	0 0054	-			0 35
				0 120	0 0046	1 24			0 44
				0 150	0 0087	1 85			0 52
				0 210	0 0126	1 80			0 61
				0 270	0 0160	1 70			0 69
				0 290	0 0206	1 93			0 77
				0 320	0 0247	2 04			0 86
				0 350	0 0287	2 08			0 94
155	613 9	43 9	2 98	0 020	-	-	12 4	0 636	0 19
				0 080	-	-			0 27
				0 085	-	-			0 35
				0 140	0 0043	1 00			0 44
				0 170	0 0088	1 64			0 52
				0 200	0 0132	2 02			0 61
				0 270	0 0177	1 82			0 69
				0 290	0 0222	2 12			0 77
				0 320	0 0267	2 18			0 86
				0 360	0 0312	2 16			0 94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
156	612.4	48.9	3.0	0.020	-	-	13.45	0.641	0.19
				0.070	-	-			0.27
				0.090	0.0004	-			0.35
				0.130	0.0050	1.25			0.44
				0.160	0.0100	1.98			0.52
				0.200	0.0149	2.28			0.61
				0.245	0.0199	2.32			0.69
				0.300	0.0248	2.22			0.77
				0.340	0.0299	2.25			0.86
				0.390	0.0348	2.12			0.94
169	612.9	38.0	3.0	0.030	-	-	10.92	0.638	0.19
				0.060	-	-			0.27
				0.080	-	-			0.35
				0.135	0.0037	-			0.44
				0.150	0.0073	1.59			0.52
				0.190	0.0118	1.92			0.61
				0.240	0.0162	1.96			0.69
				0.260	0.0198	2.13			0.77
				0.310	0.0236	2.01			0.86
				0.305	0.0278	2.42			0.94
174	611.8	16.9	2.63	0.040	-	-	5.2	0.649	0.27
				0.070	0.0001	-			0.35
				0.100	0.0021	-			0.44
				0.100	0.0043	1.46			0.52
				0.120	0.0063	1.77			0.61
				0.150	0.0080	1.73			0.69
				0.160	0 0100	1.98			0.77
				0.190	0.0119	1.89			0.86
				0.220	0.0139	1.86			0.94
177	612.8	30.9	2.87	0.050	-	-	9.22	0.630	0.27
				0.060	-	-			0.35
				0.120	0.0028	-			0.44
				0.130	0.0060	1.52			0.52
				0.180	0.0090	1.64			0.61
				0.215	0.0127	1.84			0.69
				0.230	0.0160	2.08			0.77
				0.250	0.0193	2.21			0.86
				0.270	0.0227	2.36			0.94
179	612.8	45.9	2.99	0.020	-	-	11.42	0.680	0.19
				0.080	-	-			0.27
				0.080	0.0018	-			0.35
				0.120	0.0066	1.82			0.44
				0.170	0.0113	2.12			0.52
				0.190	0.0161	2.62			0.61
				0.240	0.0209	2.50			0.69
				0.300	0.0253	2.25			0.77
				0.320	0.0304	2.53			0.86
				0.350	0.0350	2.52			0.94
183	613	48.9	3.03	0.020	-	-	13.76	0.638	0.19
				0.060	-	-			0.27
				0.090	-	-			0.35
				0.150	0.0049	1.05			0.44
				0.195	0.0103	1.68			0.52
				0.220	0.0158	2.13			0.61
				0.270	0.0212	2.21			0.69
				0.310	0.0266	2.33			0.77
				0.320	0.0320	2.64			0.86
				0.350	0.0374	2.66			0.94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
142	164	37.3	2.77	0.120	-	-	8.9	0.726	0.19
				0.210	0.0002	-			0.27
				0.270	0.0035	1.46			0.35
				0.360	0.0068	1.86			0.44
				0.420	0.0101	2.15			0.52
				0.460	0.013	2.42			0.61
				0.530	0.017	2.24			0.69
				0.570	0.020	2.32			0.77
				0.580	0.023	2.62			0.86
				0.590	0.026	2.87			0.94
205	163	49.3	2.57	0.210	-	-	11.28	0.745	0.19
				0.300	0.0008	-			0.27
				0.415	0.005	1.26			0.35
				0.470	0.0103	1.75			0.44
				0.540	0.0150	1.96			0.52
				0.600	0.0192	2.03			0.61
				0.620	0.0244	2.40			0.69
				0.630	0.0291	2.63			0.77
				0.670	0.0338	2.58			0.86
				0.710	0.0384	2.56			0.94
212	163	39.3	2.70	0.160	-	-	7.6	0.773	0.19
				0.270	0.0019	-			0.27
				0.360	0.0054	1.47			0.35
				0.430	0.0089	1.81			0.44
				0.500	0.0125	1.90			0.52
				0.540	0.0159	2.10			0.61
				0.580	0.0194	2.16			0.69
				0.615	0.0232	2.25			0.77
				0.650	0.0264	2.25			0.86
				0.675	0.0298	2.20			0.94
220	163	29.3	2.88	0.120	-	-	5.7	0.759	0.19
				0.190	0.0008	-			0.27
				0.255	0.0032	1.53			0.35
				0.320	0.0057	1.85			0.44
				0.380	0.0082	2.04			0.52
				0.435	0.0106	2.12			0.61
				0.475	0.0131	2.25			0.69
				0.520	0.0155	2.28			0.77
				0.535	0.0180	2.52			0.86
				0.560	0.0205	2.50			0.94
229	163	24.3	2.90	0.100	-	-	4.9	0.750	0.19
				0.150	0.0005	-			0.27
				0.225	0.0025	1.02			0.36
				0.290	0.0046	1.76			0.44
				0.320	0.0064	2.08			0.52
				0.390	0.0087	2.09			0.61
				0.440	0.0107	2.09			0.69
				0.470	0.0127	2.18			0.77
				0.510	0.0148	2.16			0.86
				0.530	0.0169	2.30			0.94
255	164	45.3	2.58	0.185	-	-	10.10	0.755	0.19
				0.270	0.0013	-			0.27
				0.350	0.0057	1.63			0.36
				0.440	0.0099	1.95			0.44
				0.500	0.0141	2.18			0.52
				0.550	0.0184	2.32			0.61
				0.595	0.0227	2.45			0.69
				0.630	0.0269	2.52			0.77
				0.650	0.0312	2.67			0.86
				0.665	0.0354	2.78			0.94

Run No	Pressure psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
256	163	42 3	2 62	0 190	-	-	9 35	0 752	0 19
				0 270	0 0011	-			0 27
				0 355	0 0050	1 52			0 36
				0 430	0 0093	1 88			0 44
				0 490	0 0128	2 05			0 52
				0 540	0 0167	2 18			0 61
				0 570	0 0206	2 42			0 69
				0 615	0 0244	2 40			0 77
				0 640	0 0284	2 54			0 86
				0 660	0 0322	2 62			0 94
		1/2-Inch Channels		Restricted Flow		Natural Circulation			
233	162 9	24 3	2 10	0 110	-	-	7 15	0 735	0 19
				0 160	0 0003	-			0 27
				0 250	0 0030	1 46			0 35
				0 325	0 0058	1 93			0 44
				0 375	0 0086	2 23			0 52
				0 450	0 0114	2 15			0 61
				0 500	0 0145	2 23			0 69
				0 500	0 0170	2 60			0 77
				0 530	0 0198	2 78			0 86
				0 545	0 0226	2 98			0 94
234	162 9	24 3	1 95	0 100	-	-	7 45	0 746	0 19
				0 180	0 0006				0 27
				0 250	0 0035	1 69			0 35
				0 325	0 0062	2 14			0 44
				0 400	0 0098	2 28			0 52
				0 460	0 0128	2 45			0 61
				0 505	0 0158	2 38			0 69
				0 525	0 0188	2 75			0 77
				0 560	0 0218	2 78			0 86
				0 570	0 0248	2 82			0 94
236	162 9	24 3	1 50	0 110	-	-	9 65	0 732	0 19
				0 200	0 0003	-			0 27
				0 280	0 0037	1 45			0 35
				0 375	0 0076	1 95			0 44
				0 460	0 0109	2 03			0 52
				0 480	0 0145	2 48			0 61
				0 530	0 0181	2 68			0 69
				0 550	0 0217	2 80			0 77
				0 570	0 0252	2 95			0 86
				0 600	0 0288	3 05			0 94
237	162 9	2 43	1 32	0 100	-		10 94	0 741	0 19
				0 190	0 0010	-			0 27
				0 300	0 0050	1 73			0 35
				0 420	0 0094	1 98			0 44
				0 510	0 0136	2 00			0 52
				0 515	0 0180	2 58			0 61
				0 545	0 223	3 01			0 69
				0 570	0 0266	3 05			0 77
				0 590	0 0310	3 30			0 86
				0 640	0 0352	3 10			0 94
189	261 8	39 2	2 36	0 130	-	-	10 5	0 732	0 19
				0 185	0 0002	-			0 27
				0 260	0 0046	1 24			0 35
				0 330	0 0089	1 72			0 44
				0 370	0 0132	2 15			0 52
				0 420	0 0176	2 35			0 61
				0 480	0 0220	2 30			0 69
				0 505	0 0263	2 50			0 77
				0 530	0 0307	2 65			0 86
				0 560	0 0350	2 67			0 94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
190	262.8	49.2	2.28	0.145	-	-	13.8	0.728	0.19
				0.210	0.0005	-			0.27
				0.305	0.0057	1.23			0.35
				0.380	0.0113	1.75			0.44
				0.450	0.0170	1.98			0.52
				0.520	0.0227	2.02			0.61
				0.550	0.0284	2.27			0.69
				0.580	0.0340	2.38			0.77
				0.610	0.0397	2.48			0.86
				0.650	0.0453	2.30			0.94
192	262.3	49.2	1.71	0.195	-	-	18.6	0.725	0.19
				0.240	-	-			0.27
				0.350	0.0072	1.26			0.35
				0.440	0.0149	1.82			0.44
				0.520	0.0224	2.00			0.52
				0.560	0.0229	2.30			0.61
				0.600	0.0376	2.44			0.69
				0.630	0.0456	2.65			0.77
				0.660	0.0526	2.70			0.86
				0.695	0.0602	2.63			0.94
193	263.2	49.2	1.42	0.110	-	-	24.2	0.705	0.19
				0.195	-	-			0.27
				0.310	0.0066	1.39			0.35
				0.410	0.0158	2.17			0.44
				0.515	0.0249	2.23			0.52
				0.570	0.0339	2.46			0.61
				0.600	0.0431	2.84			0.69
				0.620	0.0521	3.15			0.77
				0.660	0.0613	3.15			0.86
				0.680	0.0704	3.32			0.94
197	263.2	39.2	1.74	0.112	-	-	14.3	0.730	0.19
				0.205	0.0001	-			0.27
				0.280	0.0060	1.50			0.35
				0.380	0.0118	1.82			0.44
				0.440	0.0178	2.17			0.52
				0.500	0.0236	2.24			0.61
				0.515	0.295	2.66			0.69
				0.560	0.353	2.70			0.77
				0.625	0.0412	2.43			0.86
				0.640	0.0471	2.61			0.94
199	262.7	39.2	1.58	0.120	-	-	15.5	0.721	0.19
				0.195	-	-			0.27
				0.290	0.0057	1.32			0.35
				0.375	0.0118	1.85			0.44
				0.440	0.0181	2.21			0.52
				0.505	0.0243	2.28			0.61
				0.528	0.0305	2.65			0.69
				0.550	0.0367	2.03			0.77
				0.575	0.0429	3.14			0.86
				0.595	0.0492	3.32			0.94
201	263.2	29.2	2.30	0.080	-	-	8.7	0.721	0.19
				0.140	-	-			0.27
				0.215	0.0030	1.05			0.35
				0.270	0.0072	1.87			0.44
				0.320	0.0096	1.95			0.52
				0.395	0.0130	1.93			0.61
				0.440	0.0163	2.00			0.69
				0.465	0.0196	2.19			0.77
				0.505	0.0230	2.16			0.86
				0.515	0.0263	2.38			0.94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length L_b/L_t	L/L_t
203	261 6	29 2	1 65	0 100	-	-	11 4	0 731	0 19
				0 140	0 0002	-			0 27
				0 240	0 0040	1 48			0 35
				0 330	0 0097	1 87			0 44
				0 405	0 0143	2 05			0 52
				0 445	0 0183	2 28			0 61
				0 495	0 0234	2 30			0 69
				0 495	0 0281	2 70			0 77
				0 530	0 0329	2 85			0 86
				0 550	0 0374	3 00			0 94
204	262 6	29 2	1 38	0 100	-	-	14 5	0 707	0 19
				0 160	-	-			0 27
				0 220	0 0053	1 90			0 35
				0 345	0 0098	1 79			0 44
				0 420	0 0151	2 04			0 52
				0 460	0 0207	2 38			0 61
				0 495	0 0252	2 48			0 69
				0 510	0 0316	2 93			0 77
				0 550	0 0372	2 96			0 86
				0 585	0 0426	2 95			0 94
167	612 8	28 9	1 64	0 025	-	-	16 1	0 614	0 19
				0 060	-	-			0 27
				0 085	-	-			0 35
				0 130	0 0037	-			0 44
				0 180	0 0093	1 63			0 52
				0 225	0 0148	1 94			0 61
				0 280	0 0204	2 05			0 69
				0 320	0 0258	2 07			0 77
				0 350	0 0314	2 26			0 86
				0 375	0 0369	2 38			0 94
168	612 8	28 9	1 33	0 015	-	-	20 9	0 604	0 19
				0 050	-	-			0 27
				0 090	-	-			0 35
				0 140	0 0038	-			0 44
				0 205	0 0155	2 29			0 52
				0 255	0 0172	1 94			0 61
				0 295	0 0240	2 23			0 69
				0 325	0 0308	2 53			0 77
				0 350	0 0377	2 56			0 86
				0 390	0 0442	2 67			0 94
172	612 9	38 7	1 46	0 025	-	-	22 9	0 638	0 19
				0 080	-	-			0 27
				0 140	-	-			0 35
				0 200	0 0076	1 14			0 44
				0 230	0 0160	2 03			0 52
				0 330	0 0244	1 95			0 61
				0 360	0 0334	2 32			0 69
				0 400	0 0408	2 43			0 77
				0 420	0 0488	2 61			0 86
				0 440	0 0575	2 84			0 94
173	612 9	38 9	1 16	0 060	-		28 7	0 637	0 27
				0 120	-	-			0 35
				0 200	0 0094	1 40			0 44
				0 280	0 0202	2 02			0 52
				0 320	0 0302	2 52			0 61
				0 370	0 0417	2 82			0 69
				0 390	0 0516	3 18			0 77
				0 420	0 0603	3 38			0 86
				0 480	0 0720	3 12			0 94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
186	614	48.9	1.85	0.030	-	-	22.02	0.642	0.19
				0.060	-	-			0.27
				0.110	-	-			0.35
				0.180	0.0082	1.40			0.44
				0.230	0.0162	2.04			0.52
				0.310	0.0245	2.08			0.61
				0.350	0.0326	2.34			0.69
				0.385	0.0403	2.52			0.77
				0.400	0.0490	2.93			0.86
				0.420	0.0566	3.10			0.94
187	613	48.9	1.53	0.060	-	-	25.26	0.667	0.27
				0.110	0.0020	-			0.35
				0.190	0.0120	1.94			0.44
				0.260	0.0220	2.42			0.52
				0.335	0.0320	2.47			0.61
				0.375	0.0420	2.71			0.69
				0.400	0.0520	3.07			0.77
				0.415	0.0620	3.47			0.86
				0.460	0.0720	3.40			0.94
206	163	49.3	2.38	0.215	-	-	12.48	0.746	0.19
				0.310	0.0011	-			0.27
				0.390	0.0063	1.48			0.35
				0.490	0.0114	1.83			0.44
				0.560	0.0164	2.00			0.52
				0.620	0.0216	2.12			0.61
				0.640	0.0268	2.40			0.69
				0.680	0.0318	2.32			0.77
				0.700	0.0368	2.50			0.86
				0.725	0.0420	2.55			0.94
207	163	49.3	2.13	0.170	-	-	14.08	0.737	0.19
				0.270	0.0006	-			0.27
				0.480	0.0074	1.20			0.35
				0.450	0.0118	2.18			0.44
				0.560	0.0171	2.10			0.52
				0.610	0.0228	2.32			0.61
				0.630	0.0285	2.66			0.69
				0.670	0.0340	2.60			0.77
				0.695	0.0396	2.69			0.86
				0.710	0.452	2.96			0.94
209	163	49.3	1.74	0.240	-	-	16.28	0.755	0.19
				0.380	0.0022	-			0.27
				0.450	0.0091	1.75			0.35
				0.540	0.0161	2.15			0.44
				0.620	0.0229	2.25			0.52
				0.640	0.0299	2.66			0.61
				0.685	0.0368	2.66			0.69
				0.660	0.0437	3.55			0.77
				0.700	0.0507	3.54			0.86
				0.710	0.0575	3.90			0.94
211	163	49.3	1.30	0.160	-	-	23.1	0.745	0.19
				0.290	0.0021	-			0.27
				0.430	0.0101	2.08			0.35
				0.570	0.0205	2.43			0.44
				0.640	0.0296	2.57			0.52
				0.680	0.0390	2.86			0.61
				0.690	0.0481	3.45			0.69
				0.710	0.0573	3.82			0.77
				0.715	0.0665	4.4			0.86
				0.710	0.0756	5.0			0.94

Run No	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
213	163	39.3	2.48	0.190	-	-	8.6	0.766	0.19
				0.270	0.0018	-			0.27
				0.380	0.0056	1.40			0.35
				0.450	0.0094	1.76			0.44
				0.500	0.0133	2.03			0.52
				0.545	0.0171	2.34			0.61
				0.590	0.021	2.30			0.69
				0.615	0.025	2.44			0.77
				0.635	0.029	2.57			0.86
				0.680	0.034	2.35			0.94
215	163	39.3	2.10	0.160	-	-	10.3	0.766	0.19
				0.290	0.0020	-			0.27
				0.400	0.0067	1.54			0.35
				0.490	0.0110	1.70			0.44
				0.535	0.0154	2.06			0.52
				0.580	0.0199	2.18			0.61
				0.580	0.0244	2.68			0.69
				0.655	0.0288	2.42			0.77
				0.660	0.0332	2.62			0.86
				0.700	0.0376	2.52			0.94
217	162	39.3	1.75	0.170	-	-	13.75	0.740	0.19
				0.260	0.0008	-			0.27
				0.370	0.0061	1.60			0.35
				0.450	0.01155	2.18			0.44
				0.520	0.0170	2.43			0.52
				0.550	0.0225	2 92			0.61
				0.590	0.0280	3.08			0.69
				0.605	0.0334	3.49			0.77
				0.610	0.0388	3.91			0.86
				0 630	0.0443	3 83			0.94
219	163	39.3	1.46	0.190	-	-	17.9	0.715	0.19
				0.210	-	-			0.27
				0.400	0.0059	1.23			0.35
				0.510	0.0120	1.80			0.44
				0.540	0.0196	2.53			0.52
				0.595	0.0250	2.68			0.61
				0.610	0.0315	3.20			0.69
				0.640	0.0381	3.46			0.77
				0.640	0.0445	3.92			0.86
				0.665	0.0509	4.15			0.94
221	163	29.3	2.65	0.115	-	-	6.2	0.756	0.19
				0.180	0.0010	-			0.27
				0.220	0.0036	1.90			0.35
				0.330	0.0062	1.94			0.44
				0.390	0.0088	2.14			0.52
				0.440	0.0115	2.22			0.61
				0.490	0.0142	2 28			0.69
				0.520	0.0167	2.35			0.77
				0.535	0.0194	2.60			0.86
				0.570	0.0219	2.50			0.94
222	163	29.3	2.53	0.120	-	-	7.7	0.717	0.19
				0.180	-	-			0.27
				0.260	0.0024	-			0.35
				0.330	0.0053	1.64			0.44
				0.410	0.0080	1.84			0.52
				0.440	0.0109	2.12			0.61
				0.470	0.0137	2.38			0.69
				0.510	0.0165	2.38			0.77
				0.560	0.0193	2.38			0.86
				0.570	0.0221	2.62			0.94

Run No.	Pressure, psia	Power Density, kw/liter	Inlet Water Velocity, ft/sec	Void Fraction, α	Steam Quality, x	Slip Ratio, V_g/V_f	Inlet Subcooling, ΔT, °F	Fractional Boiling Length, L_b/L_t	L/L_t
225	162	29.3	1.85	0.130	-	-	9.15	0.754	0.19
				0.210	-	-			0.27
				0.290	0.0033	1.30			0.35
				0.360	0.0067	1.83			0.44
				0.430	0.0101	2.08			0.52
				0.490	0.0134	2.18			0.61
				0.515	0.0168	2.43			0.69
				0.550	0.0201	2.61			0.77
				0.580	0.0235	2.63			0.86
				0.600	0.0268	2.81			0.94
226	163	29.3	1.70	0.120	-	-	10.4	0.744	0.19
				0.220	0.0007	-			0.27
				0.320	0.0049	1.58			0.35
				0.430	0.0093	1.90			0.44
				0.485	0.0134	2.18			0.52
				0.550	0.0176	2.23			0.61
				0.595	0.0218	2.32			0.69
				0.600	0.0261	2.72			0.77
				0.620	0.0303	2.98			0.86
				0.640	0.0344	3.05			0.94
227	164	29.3	1.50	0.130	-	-	11.75	0.741	0.19
				0.230	0.0007	-			0.27
				0.340	0.0054	1.62			0.35
				0.420	0.0102	2.18			0.44
				0.500	0.0148	2.23			0.52
				0.560	0.0195	2.42			0.61
				0.570	0.0242	2.90			0.69
				0.590	0.0289	3.12			0.77
				0.620	0.0336	3.22			0.86
				0.645	0.0383	3.30			0.94
228	163	29.3	1.40	0.130	-	-	13.1	0.734	0.19
				0.260	0.0004	-			0.27
				0.360	0.0053	1.45			0.35
				0.460	0.0105	1.96			0.44
				0.500	0.0156	2.72			0.52
				0.550	0.0206	2.70			0.61
				0.570	0.0257	2.96			0.69
				0.570	0.0308	3.60			0.77
				0.585	0.0359	3.82			0.86
				0.660	0.0420	3.41			0.94
230	164	24.3	2.72	0.090	-	-	5.35	0.744	0.19
				0.145	0.0004	-			0.27
				0.240	0.0026	-			0.35
				0.290	0.0049	1.86			0.44
				0.310	0.0072	2.36			0.52
				0.390	0.0094	2.22			0.61
				0.460	0.0117	2.10			0.69
				0.480	0.0139	2.29			0.77
				0.520	0.0162	2.30			0.86
				0.550	0.0184	2.35			0.94
231	164	24.3	2.5	0.090	-	-	5.7	0.750	0.19
				0.150	0.0006	-			0.27
				0.225	0.0030	1.46			0.35
				0.300	0.0054	1.92			0.44
				0.360	0.0075	2.06			0.52
				0.420	0.0101	2.34			0.61
				0.460	0.0125	2.26			0.69
				0.490	0.0148	2.36			0.77
				0.520	0.0172	2.48			0.86
				0.545	0.0197	2.53			0.94

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