



CALCULATION PACKAGE

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PROJECT NAME:
 NUHOMS 10CFR72 CERTIFICATION
 PROJECT

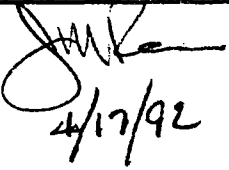

CLIENT:
 PACIFIC NUCLEAR FUEL SERVICES

CALCULATION TITLE:
 NUHOMS®-52B DSC Thermal Analysis

PROBLEM STATEMENT OR OBJECTIVE OF THE CALCULATION:

To perform the thermal analysis of the BWR DSC in the HSM. The maximum fuel cladding temperature will be calculated for the following cases; normal operating conditions at 70, 100, 125 °F, HSM vents blocked at 125 °F ambient, DSC in cask with internal vacuum at 100 °F. The spacer disk temperature distribution is calculated for the normal operating condition, DSC in cask with internal vacuum and DSC in cask with normal operating conditions, all at 100 °F ambient.

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DOCUMENT REVISION	AFFECTED PAGES	REVISION DESCRIPTION	PROJECT ENGINEER APPROVAL/DATE	NAMES AND INITIALS OF PREPARERS AND CHECKERS
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PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

CONTENTS

	<u>Page</u>
1.0 INTRODUCTION.....	3
2.0 METHODOLOGY.....	4
3.0 INPUT PARAMETERS.....	5
3.1 Geometry.....	5
3.2 Thermal Conductivity.....	5
3.3 Heat Generation.....	6
3.4 Boundary Conditions.....	7
4.0 SPACER DISK TEMPERATURE DISTRIBUTION.....	25
4.1 Spacer Disk Temperature Estimation.....	25
5.0 HEATING6 INPUT FILES.....	30
5.1 Input File for BWR42.....	30
5.2 Input File for BWR52.....	40
5.3 Input File for BWRVAC.....	51
6.0 RESULTS.....	64
7.0 REFERENCES.....	73

REVISION	0				PAGE 2 OF 74
PREPARED BY / DATE	<i>Fcot</i> 8/14/91				
CHECKED BY / DATE	<i>KBj</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

1.0 INTRODUCTION

This document performs the thermal analysis of the NUHOMS[®]-52B BWR Dry Shielded Canister (DSC). The peak fuel cladding temperatures are calculated and compared to the limiting value of 421°C (790°F) [1]. The calculations are performed for the following cases;

- A) Normal operating conditions at 70, 100, and 125°F ambient
- B) HSM vents blocked at 125°F ambient
- C) DSC in cask with internal vacuum at 100°F ambient

The spacer disk temperature distributions are calculated for the following 100°F ambient cases;

- A) Normal operating condition
- B) DSC in cask, normal operating condition
- C) DSC in cask, with internal vacuum

The DSC basket and shell were modeled using the HEATING6 computer code. HEATING6 solves steady-state and/or transient heat conduction problems in one, two or three dimensions; and is a functional module within the SCALE system for performing thermal analyses on problems in licensing evaluations of spent fuel casks. The HEATING6 model of the Horizontal Storage Model (HSM) in which the DSC rests, provides the canister shell temperatures used as input in this analysis [2,3].

REVISION	0				PAGE 3 OF 74
PREPARED BY / DATE	<i>Fcd</i> 8/14/91				
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PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

2.0 METHODOLOGY

The DSC is a stainless steel cylinder surrounding a carbon/stainless steel basket which supports the 52 spent fuel assemblies. The DSC basket assembly consists of spacer disks, guide sleeves, poison plates and support rods. The DSC is stored in a pre-fabricated concrete HSM.

The thermal analysis of the DSC in storage is split into separate models for the DSC and HSM. This allows for independent calculation of DSC internal temperatures, using DSC shell temperatures calculated in the HSM model as input.

Due to symmetry, half of the DSC is modeled in HEATING6. The model includes 26 fuel assemblies, 70 poison plates and the DSC shell. The effects of the spacer disks were neglected in this analysis. Fuel thermal conductivities are those used in the E-MAD document [4].

The spacer disk temperature distribution is determined by averaging the temperatures from the two dimensional HEATING6 calculation of the heat transfer across a spacer disk (steel assumed to be between the fuel channels and the DSC shell) and the higher temperatures of the helium on either side of the spacer disk (from the analysis results with helium assumed to be between the fuel channels and the DSC shell). This accounts for the effects of helium heating the surfaces of the spacer disk and provides a more conservative temperature distribution for use in the thermal stress analysis of the DSC spacer disk.

REVISION	0				PAGE 4 OF 74
PREPARED BY / DATE	FOA 8/14/91				
CHECKED BY / DATE	CB 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO: NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO: NUH004.0414

3.0 INPUT PARAMETERS

The input parameters for the HEATING6 code are determined in this section.

3.1 Geometry

HEATING6 models require a common geometrical type and rectangular coordinates were chosen. The basket is modelled as a half cylinder to take advantage of symmetry. Due to a rectangular coordinate system, the DSC shell was split into rectangular pieces.

The fuel assemblies were assumed to sit on the bottom of the spacer disk cutout and touch its right edge. This choice was made to minimize the amount of grid lines in the model. This geometry introduces low conductivity helium regions on the top and left hand sides of the assembly. These low conductivity regions add to the conservatism of the model.

The majority of poison plates were shortened to match the dimensions of the fuel assemblies. 10 of the poison plates are longer than the fuel assemblies but still shorter than their actual length. In both cases these decisions minimize the number of grid lines in the model. These decisions are conservative since high conductivity metal was replaced by low conductivity helium.

The spacer disks and support rods have been deleted to reduce the complexity of the model. The deletion of these parts is again conservative since high conductivity metal was replaced by low conductivity helium.

Figure 3-1 shows the HEATING6 model used in this analysis. The regions are numbered as shown in Table 3-1. The dimensions used in the model are shown in Figure 3-2.

3.2 Thermal Conductivity

3.2.1 Fuel in helium

The temperature dependent thermal conductivity of the fuel in helium was assumed to equal that of the fuel regions in Reference 4. The values used are given in Table 3-2.

3.2.2 Fuel in vacuum

REVISION	0				PAGE 5 OF 74
PREPARED BY / DATE	<i>Flet</i> 8/14/91				
CHECKED BY / DATE	<i>KB</i> 4/17/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

The temperature dependent thermal conductivity of the fuel in a vacuum is taken from test data [4]. The test data in Reference 4 is used to calculate the thermal conductivity as documented in Reference 5. The values used are given in Table 3-3.

3.2.3 Zircaloy-4

The temperature dependent thermal conductivity of Zircaloy-4 was assumed to equal that of Zircaloy-2 used in Reference 6. For the case of DSC in cask with internal vacuum (BWRVAC), higher temperature values of thermal conductivity were needed. The published values were plotted and values for 900, 1000 and 1100°F were extrapolated. The plot is shown in Figure 3-3. The values used are given in Table 3-4.

3.2.4 Stainless Steel

The temperature dependent thermal conductivity of stainless steel (ASME SA-240 Type 304) is the same as that used in Reference 7. The values used are given in Table 3-5.

3.2.5 Helium

The temperature dependent thermal conductivity of pure helium is used for all regions within the DSC. The values used are given in Table 3-6 and are found in Reference 8.

3.3 Heat Generation

The maximum decay heat per DSC is assumed 19.24 kw. The volume used for determining the heat flux input into the HEATING6 input file is calculated assuming a 142.24 inch active fuel length and an 5.294 inch inner fuel assembly width. All heat is assumed to be generated in the active fuel region of the assembly. A peaking factor of 1.08 is used to account for axial variations in heat flux of the assembly [9]. The decay heat flux for each assembly is then equal to,

$$\frac{.37 \text{ kw} \times 1.08 \times 3413 \frac{\text{Btu}}{\text{hr} \times \text{kw}}}{60 \frac{\text{min}}{\text{hr}} \times (5.294 \text{ inches})^2 \times 142.24 \text{ inches}} = 5.70E-3 \frac{\text{Btu}}{\text{min} \times \text{inches}^3}$$

REVISION	0				PAGE 6 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/14/91				
CHECKED BY / DATE	<i>108</i> 4/11/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

3.4 Boundary Conditions

The following boundary conditions are used in the model:

- 1) Insulated surface. This condition is used on the axis of symmetry and on the edges of the DSC shell regions which only exist in the model due to lack of cylindrical elements in the model.

- 3) Provides a radiation linkage between two parallel metal surfaces. Used to model radiation heat transfer between fuel channels and poison plates.

301-320) Constant temperature boundaries on the outside of the sections that compose the DSC shell. These temperatures were determined in the HSM HEATING6 models [2,3].

3.4.1 Temperatures

The temperatures assigned to the regions that compose the DSC shell are taken from the HSM HEATING6 models [2] for the 70, 100, and 125 °F ambient temperature cases. The shell region geometries of the two models are substantially different. The temperatures used in the DSC model were assigned by calculating the DSC shell region midpoint Y coordinate, and estimating the temperature corresponding to that coordinate from the HSM model. The estimates use the highest temperature on each region and are considered conservative. The temperatures used in the input file for boundary conditions 301-320 are given in Table 3-7. A sample calculation for DSC vertical region 305, 70 °F ambient temperature follows;

Midpoint DSC Model

$$(61.219 + 54.169) / 2 = 57.694 \text{ inches}$$

Convert to HSM Model

$$57.975 - 33.415 = 24.279 \text{ inches}$$

24.279 inches in the HSM model is conservatively estimated to be 226.93 deg F [2].

REVISION	0				PAGE 7 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/14/91				
CHECKED BY / DATE	<i>109</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

The calculated HSM coordinates for the remaining regions appear in Table 3-8

Note: 33.415 inches is the y-axis midpoint coordinate of the DSC model. Subtracting it from a particular DSC regions midpoint converts it to an HSM dimension. This allows estimation of temperature from the HSM model. For DSC horizontal regions the outer y coordinate was converted.

Due to a difference in estimation methods, the DSC maximum shell temperatures in the PWR calculation package [13] are 1-2°F higher than those used in this BWR package. The effects of this difference is minimal.

For all blocked vent and vacuum cases the DSC shell temperatures are a constant value. These values are 579 °F [3] for the blocked vent case, 358 °F [3] for the BWRVAC case and 402 °F for the DSC in cask with internal vacuum and steel fill (BWRVACCS) case. The temperatures are the maximum DSC shell temperatures respectively.

Note: Both BWRVAC and BWRVACCS were originally run with a maximum shell temperature of 402°F. This value is the maximum shell temperature for a total decay heat of 24 kW. This analysis is based on a total decay heat of 19.24 kW and the corresponding maximum shell temperature of 358°F. BWRVAC was rerun with the 358°F shell temperature and BWRVACCS was not to save computer cost. The original results of BWRVACCS are conservative as higher shell temperatures yield higher fuel clad temperatures.

3.4.2 Emissivities

The thermal radiation parameter in HEATING6, h_r , is equal to the product of the Stephan Boltzman constant and the effective emissivity of the surface. The Stephan-Boltzman constant is equal to $0.173E-8 \text{ Btu/ft}^2 \cdot \text{hr} \cdot \text{R}^4$ ($2.002E-13 \text{ Btu/in}^2 \cdot \text{min} \cdot \text{R}^4$) [10]. The effective emissivity, E_{eff} , between two parallel surfaces for grey radiation is given by,

$$E_{\text{eff}} = \frac{1}{\frac{1}{E_1} + \frac{1}{E_2} - 1}$$

REVISION	0				PAGE 8 OF 74
PREPARED BY / DATE	<i>Fcd</i> 8/14/91				
CHECKED BY / DATE	<i>lcs/y</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

where E_1 is the emissivity of one surface and E_2 is the emissivity of the opposing surface [11]. The emissivities of steel and zircaloy are 0.587 [12] and .400 [8] respectively.

The effective emissivity and h_r for the fuel channel to poison plate linkage (B.C. #2) are,

$$E_{eff} = \frac{1}{\frac{1}{.587} + \frac{1}{.400} - 1} = .3125$$

$$h_r = .31215 \times 2.002E-13 = 6.249e-14 \frac{Btu}{min \cdot inch^2 \cdot R^4}$$

For the BWRVAC case a Zircaloy emissivity of .8 [13] was used. The lower emissivity of .4 [8] adds to the conservatism of the other cases. The effective emissivity and h_r for the fuel channel to poison plate linkage (B.C. #2) for the BWRVAC case are,

$$E_{eff} = \frac{1}{\frac{1}{.587} + \frac{1}{.800} - 1} = .5119$$

$$h_r = .5119 \times 2.002E-13 = 1.025E-13 \frac{Btu}{min \cdot inch^2 \cdot R^4}$$

REVISION	0				PAGE 9 OF 74
PREPARED BY / DATE	Foot 8/14/91				
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PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT
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FILE NO: NUH004.0414
CALC. NO: NUH004.0414

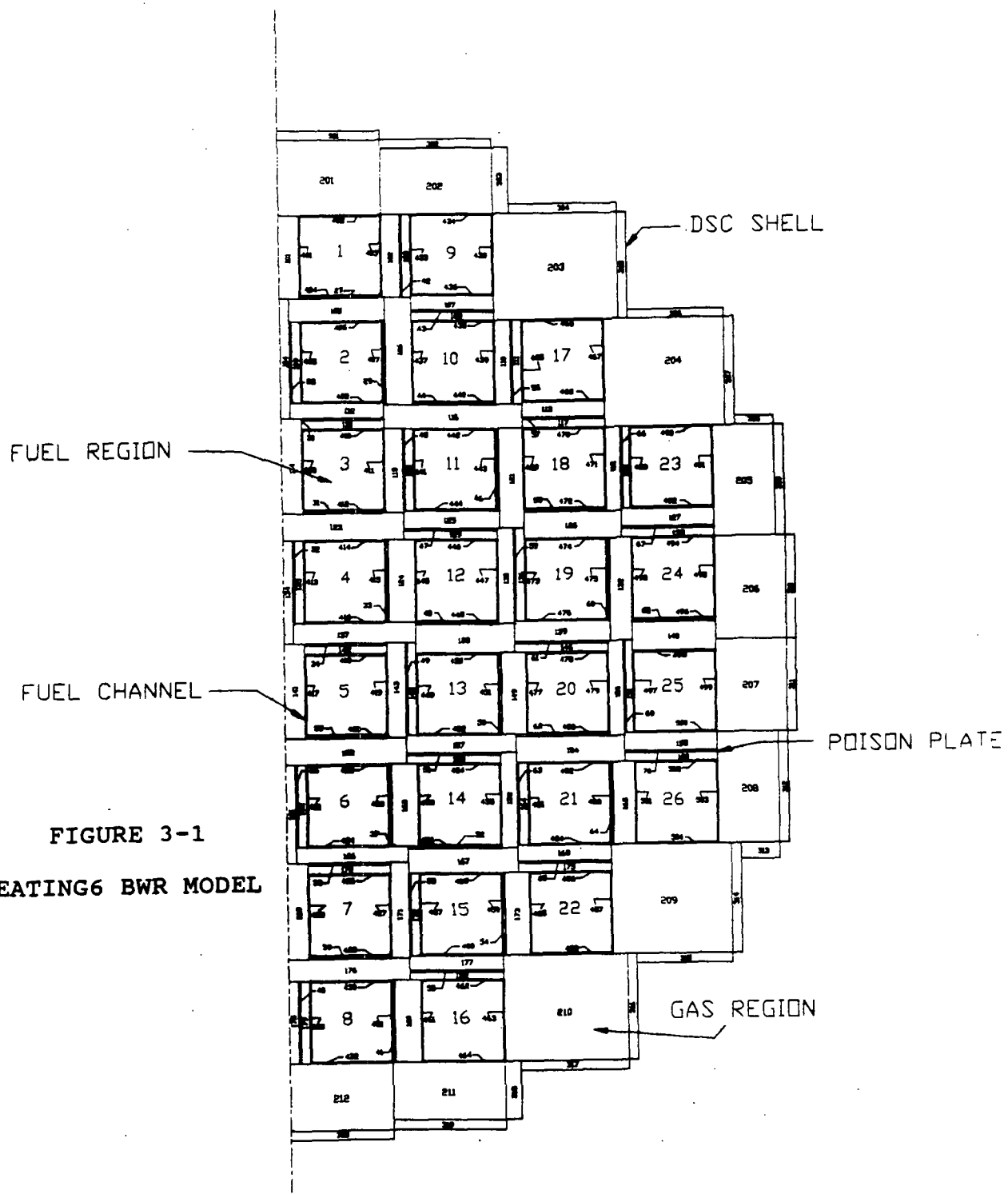
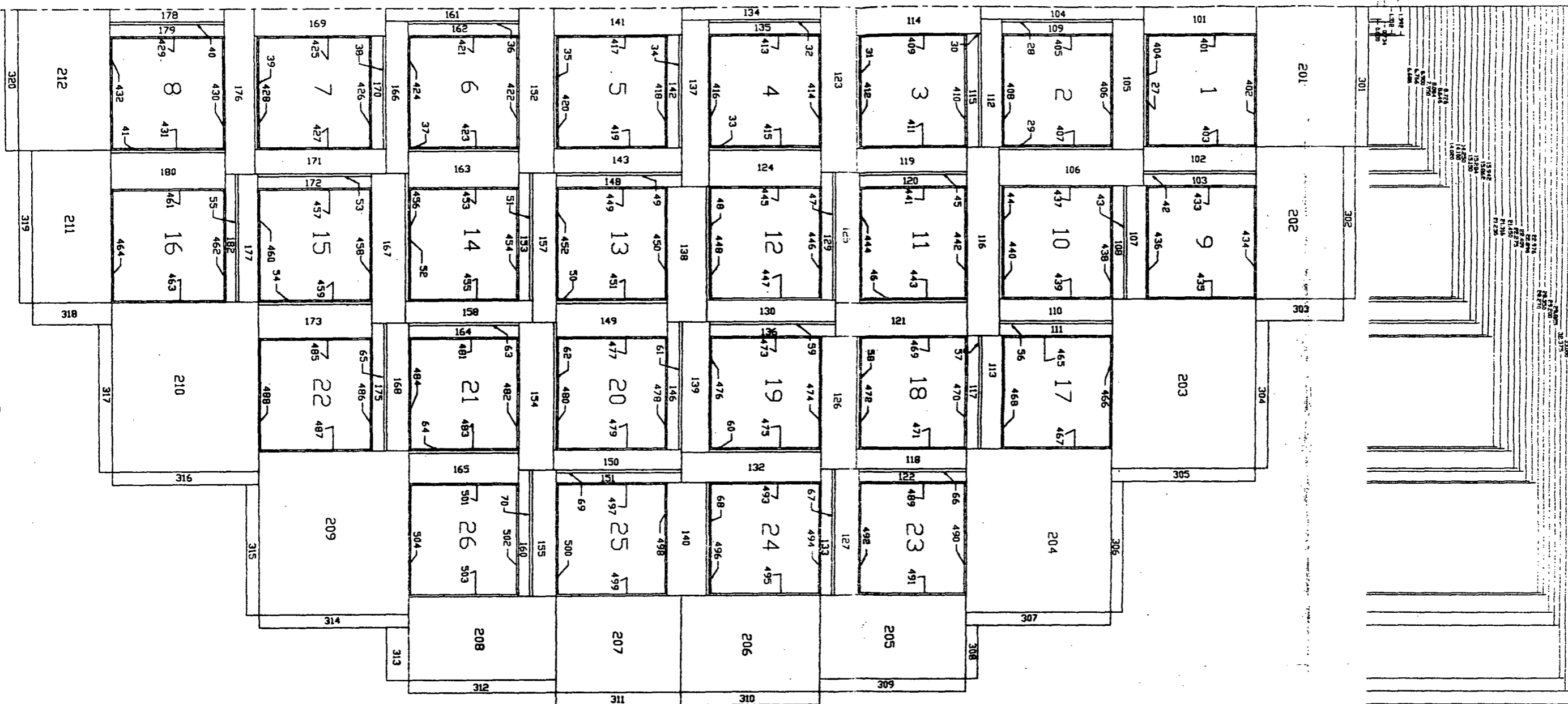


FIGURE 3-1
HEATING6 BWR MODEL

REVISION	0				PAGE 10 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/14/91				
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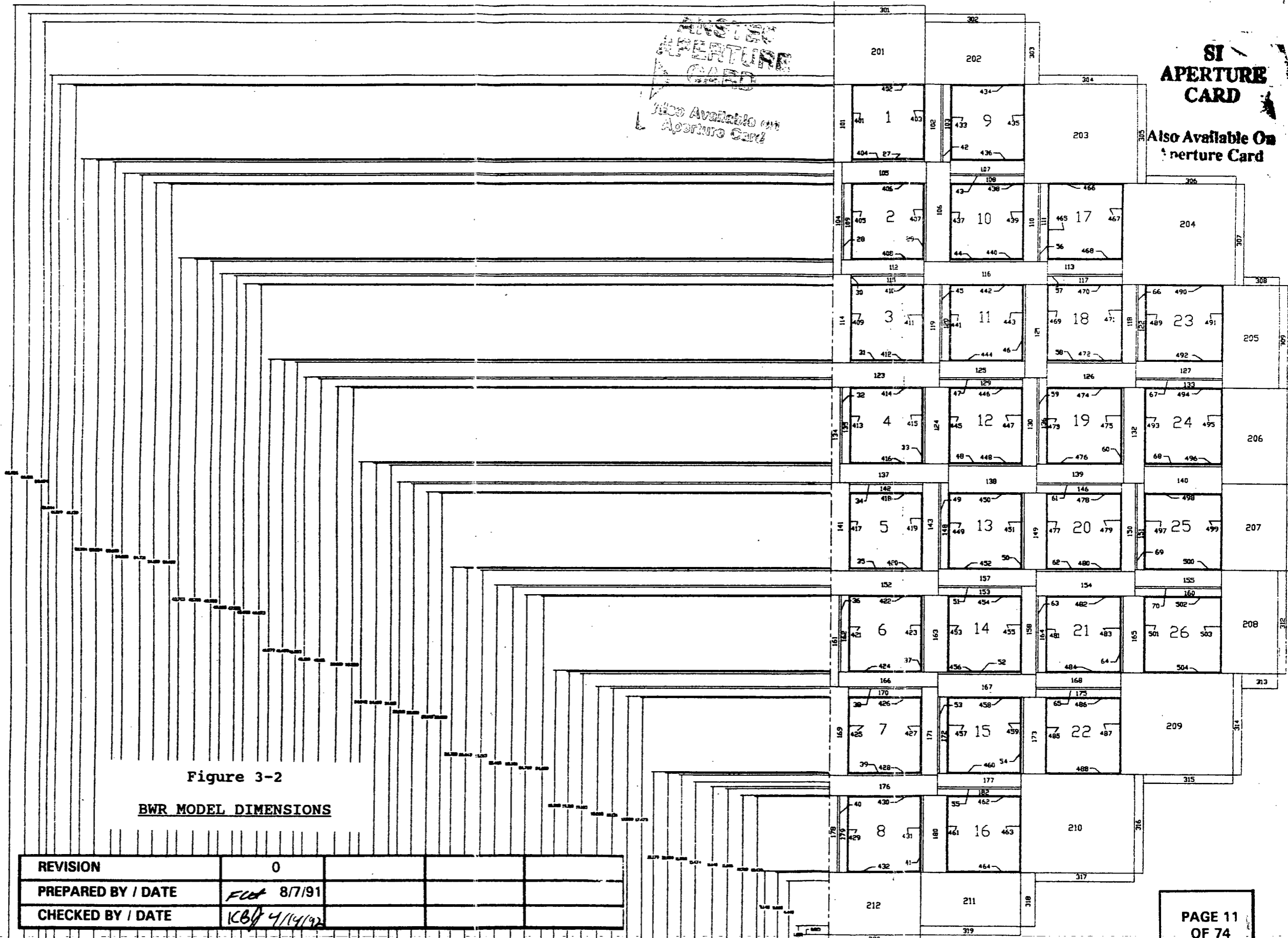
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Figure 3-2 cont.

BWR MODEL DIMENSIONS

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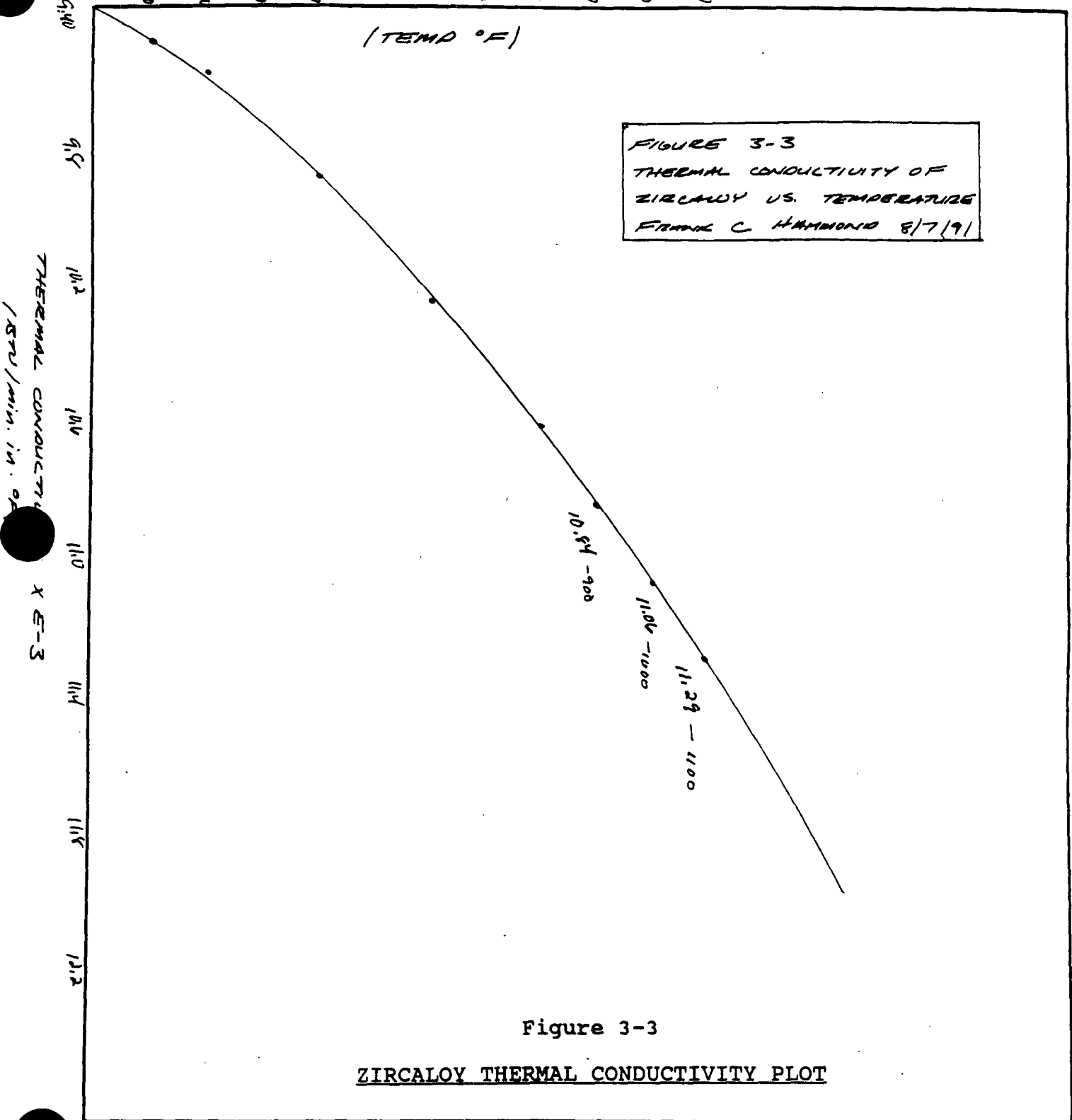


Figure 3-3

ZIRCALOY THERMAL CONDUCTIVITY PLOT

REVISION	0				PAGE 13 OF 74
PREPARED BY / DATE	FCT 8/14/91				
CHECKED BY / DATE	LDJ 4/14/92				

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PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 3-1		
LISTING OF REGION NUMBERS AND MATERIALS FOR HELIUM CASES		
Regions	Materials	Location
1-26	Fuel	Smearred inside fuel channels
27-70	Borated SS	Poison Plates
101-182	Helium	Gaps between fuel channels and poison plates
201-212	Helium	Gaps between fuel channels and DSC shell
301-320	SS304	DSC shell
401-504	Zircaloy-4	Fuel channels

REVISION	0				PAGE 14 OF 74
PREPARED BY / DATE	<i>Fcd</i> 8/14/91				
CHECKED BY / DATE	<i>12/08</i> 7/17/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 3-2	
THERMAL CONDUCTIVITY OF FUEL IN HELIUM	
Temperature (°F)	Thermal Conductivity (Btu/Min·In· °F)
400	2.2222E-3
500	2.9167E-3
600	3.6111E-3
700	4.4444E-3
800	5.4167E-3
900	6.5278E-3
1000	7.6389E-3

REVISION	0				PAGE 15 OF 74
PREPARED BY / DATE	<i>Fid</i> 8/14/91				
CHECKED BY / DATE	<i>ICB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 3-3	
THERMAL CONDUCTIVITY OF FUEL IN A VACUUM	
Temperature (°F)	Thermal Conductivity (Btu/min·in·°F)
200	2.0990E-4
250	2.2218E-4
300	2.4173E-4
350	2.7053E-4
400	3.1069E-4
450	3.6439E-4
500	4.3393E-4
550	5.2168E-4
600	6.3011E-4
650	7.6172E-4
700	9.1914E-4
750	1.1050E-3
800	1.3221E-3
850	1.5731E-3
900	1.8609E-3
950	2.1885E-3
1000	2.5588E-3
1050	2.9747E-3
1100	3.4393E-3

REVISION	0				PAGE 16 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/14/91				
CHECKED BY / DATE	<i>KSJ</i> 4/14/92				

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PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 3-4	
ZIRCALOY-4 THERMAL CONDUCTIVITY	
Temperature (°F)	Thermal Conductivity (Btu/Min·In·°F)
100	9.4722E-3
200	9.5694E-3
400	9.8750E-3
600	10.2361E-3
800	10.6111E-3
900	10.84E-3
1000	11.06E-3
1100	11.29E-3

REVISION	0				PAGE 17 OF 74
PREPARED BY / DATE	<i>FUC</i> 8/14/91				
CHECKED BY / DATE	<i>LBV</i> 9/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 3-5	
SS304 THERMAL CONDUCTIVITY	
Temperature (°F)	Thermal Conductivity (Btu/Min·In· °F)
70	.0119
100	.0121
150	.0125
200	.0129
250	.0133
300	.0136
350	.0140
400	.0144
450	.0147
500	.0151
550	.0154
600	.0157
650	.0161
700	.0164
750	.0164
800	.0169
850	.0174
900	.0176
950	.0179
1000	.0183
1050	.0186
1100	.0189
1150	.0192

REVISION	0				PAGE 18 OF 74
PREPARED BY / DATE	<i>Fcd</i> 8/14/91				
CHECKED BY / DATE	<i>KB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 3-5 cont.	
SS304 THERMAL CONDUCTIVITY	
Temperature (°F)	Thermal Conductivity (Btu/Min·In·°F)
1200	.0194
1250	.0199
1300	.0201
1350	.0204
1400	.0207
1450	.0210
1500	.0213

REVISION	0				PAGE 19 OF 74
PREPARED BY / DATE	<i>Fvt</i> 8/19/91				
CHECKED BY / DATE	<i>LB</i> 4/14/92				

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NUHOMS 10CFR72 CERTIFICATION

PROJECT: PROJECT

FILE NO: NUH004.0414

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

TABLE 3-6

HELIUM THERMAL CONDUCTIVITY

Temperature (°F)	Thermal Conductivity (Btu/Min·In·deg F)
45	1.1535E-4
80	1.2032E-4
98	1.2281E-4
152	1.2996E-4
206	1.3710E-4
260	1.4408E-4
296	1.4874E-4
350	1.5628E-4
404	1.6423E-4
458	1.7258E-4
495	1.7820E-4
549	1.8703E-4
603	1.9505E-4

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PAGE 20
OF 74

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PROJECT: NUHOMS 10CFR72 CERTIFICATION
PROJECT
CLIENT: PACIFIC NUCLEAR FUEL SERVICES

FILE NO: NUH004.0414
CALC. NO: NUH004.0414

TABLE 3-6 cont.

HELIUM THERMAL CONDUCTIVITY

Temperature (°F)	Thermal Conductivity (Btu/Min·In·°F)
657	2.0388E-4
693	2.0950E-4
747	2.1592E-4
801	2.2315E-4
855	2.3037E-4
891	2.3438E-4
909	2.3679E-4
945	2.4161E-4
1017	2.5044E-4
1071	2.5766E-4
1125	2.6408E-4
1197	2.7291E-4
1251	2.8014E-4
1341	2.9138E-4
1431	3.0181E-4
1520	3.1225E-4

REVISION	0				PAGE 21 OF 74
PREPARED BY / DATE	<i>Fict</i> 8/14/91				
CHECKED BY / DATE	<i>1030</i> 7/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 3-7

INITIAL DSC SHELL TEMPERATURES FOR 70, 100 AND 125 °F AMBIENT TEMPERATURES

Region #	Temperature (°F) for 70 °F ambient case	Temperature (°F) for 100 °F ambient case	Temperature (°F) for 125 °F ambient case
301	274.52	303.43	328.33
302	273.39	302.10	326.78
303	271.89	295.26	318.62
304	267.88	275.40	294.59
305	226.93	242.37	254.31
306	219.50	232.98	243.02
307	215.29	227.70	236.69
308	211.86	224.88	233.34
309	214.44	226.87	235.74
310	228.86	244.18	255.59
311	227.31	242.72	254.25
312	207.52	223.72	232.90
313	205.31	217.47	226.18
314	204.56	217.34	226.67
315	206.39	220.08	230.28
316	210.26	235.53	250.02
317	223.08	249.66	268.94
318	229.42	254.53	275.48
319	229.32	255.39	277.19
320	229.94	255.72	277.82

REVISION	0				PAGE 22 OF 74
PREPARED BY / DATE	<i>FCD</i> 8/14/91				
CHECKED BY / DATE	<i>ICB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 3-8	
CALCULATED HSM COORDINATES	
Region #	Coordinate (inches)
301	33.411
302	32.786
303	30.006
304	28.429
305	24.279
306	21.316
307	17.146
308	14.116
309	9.871
310	2.802
311	-3.683
312	-10.433
313	-15.15
314	-17.708
315	-21.941
316	-24.833
317	-28.975
318	-30.258
319	-32.790
320	-33.415

REVISION	0				PAGE 23 OF 74
PREPARED BY / DATE	<i>Fict</i> 8/14/91				
CHECKED BY / DATE	<i>(IB)</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

4.0 SPACER DISK TEMPERATURE DISTRIBUTION

To calculate the spacer disk temperature distributions all helium or vacuum regions, except those between fuel channels and poison plates were assumed to be carbon steel. The HEATING6 code was run and results averaged with the corresponding helium or vacuum case giving the temperature distribution.

For the case of DSC in cask with normal operating conditions, the maximum and minimum spacer disk temperatures were estimated. The details of this estimation appear in section 4.1

The temperature dependent thermal conductivity of carbon steel (ASME SA 516 Grade 70) is the same as that used in Reference 7. The values used are given in Table 4-1.

4.1 Spacer Disk Temperature Estimation

To estimate the maximum and minimum spacer disk temperature when the DSC is in cask (100°F ambient) case, the results for the case of DSC in HSM (100°F ambient) spacer disk temperatures will be utilized.

DSC in HSM (PWR case) [14]:

Maximum spacer disk temperature = 529.3°F

Minimum spacer disk temperature = 221.1°F (Carbon steel cases)

DSC average shell temperature = 270.5°F

The maximum spacer disk temperature is 35% higher than the DSC average temperature.

$$\left(\frac{529.3 - 270.5}{460 + 270.5} \right) \times 100\% = 35\%$$

The minimum spacer disk temperature is 7% lower than the DSC average temperature.

REVISION	0				PAGE 24 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/14/91				
CHECKED BY / DATE	<i>168</i> 4/19/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	<u>NUHOMS 10CFR72 CERTIFICATION PROJECT</u>	FILE NO:	<u>NUH004.0414</u>
CLIENT:	<u>PACIFIC NUCLEAR FUEL SERVICES</u>	CALC. NO:	<u>NUH004.0414</u>

$$\left(\frac{270.5 - 221.1}{460 + 270.5} \right) \times 100\% = 7\%$$

Based on these percentages and the DSC in cask average temperature of 360.6°F

Estimated maximum spacer disk temperature =

$$((360.6 + 460) \times 1.35) - 460 = 648^\circ\text{F}$$

Estimated minimum spacer disk temperature =

$$((360.6 + 460) \times (1-.07)) - 460 = 303^\circ\text{F}$$

Actual values calculated by HEATING6 [14]:

Maximum spacer disk temperature = 605°F

Minimum spacer disk temperature = 277°F

Estimated values are within 5 to 10% of the actual calculated values on the conservative side.

Due to the conservativeness of the PWR estimation the same methodology is applied to the BWR case.

For BWR Fuel (DSC in HSM, 100°F ambient):

Maximum spacer disk temperature = 553°F

Minimum spacer disk temperature = 220°F

Average DSC shell temperature = 270.5°F

The maximum spacer disk temperature is 39% higher than the average temperature

$$\left(\frac{553 - 270.5}{270.5 + 460} \right) \times 100\% = 39\%$$

The minimum spacer disk temperature is 7% lower than the average temperature

REVISION	0				PAGE 25 OF 74
PREPARED BY / DATE	<i>FMT</i> 8/14/91				
CHECKED BY / DATE	<i>LCB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

$$\left(\frac{220 - 270.5}{270.5 + 460} \right) \times 100\% = 7\%$$

For the DSC in cask [3]:

Maximum DSC shell temperature = 437°F

Minimum DSC shell temperature = 267°F

Average DSC shell temperature = 352°F

The estimated spacer disk temperatures are;

Maximum = ((352 + 460) x 1.39) - 460 = 669°F

Minimum = ((352 + 460) x .93) - 460 = 295°F

Average = 482°F

REVISION	0				PAGE 26 OF 74
PREPARED BY / DATE	<i>Flot</i> 8/14/91				
CHECKED BY / DATE	<i>KSJ</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 4-1	
THERMAL CONDUCTIVITY OF CARBON STEEL	
Temperature (°F)	Thermal Conductivity (Btu/Inmin °F)
70	3.2777E-2
100	3.3194E-2
150	3.3611E-2
200	3.3889E-2
250	3.3889E-2
300	3.3889E-2
350	3.3750E-2
400	3.3611E-2
450	3.3194E-2
500	3.2917E-2
550	3.2500E-2
600	3.2083E-2
650	3.1528E-2
700	3.1111E-2
750	3.0556E-2
800	3.0139E-2
850	2.9444E-2
900	2.9028E-2
950	2.8472E-2
1000	2.7778E-2
1050	2.7222E-2
1100	2.6667E-2
1150	2.5972E-2

REVISION	0				PAGE 27 OF 74
PREPARED BY / DATE	<i>FCD</i> 8/14/91				
CHECKED BY / DATE	<i>1/30</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

TABLE 4-1 (cont.)	
THERMAL CONDUCTIVITY OF CARBON STEEL	
Temperature (°F)	Thermal Conductivity (Btu/Min·In·°F)
1200	2.5278E-2
1250	2.4306E-2
1300	2.3194E-2
1350	2.1944E-2
1400	2.1250E-2
1450	2.0972E-2
1500	2.0972E-2

REVISION	0				PAGE 28 OF 74
PREPARED BY / DATE	<i>FCA</i> 8/14/91				
CHECKED BY / DATE	<i>(K91)</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

5.0 HEATING6 INPUT FILES

Seven HEATING6 runs were made as listed in Table 5-1. The input files for BWR42 (storage in the HSM at 100°F ambient and filled with helium), BWR52 (storage in the HSM at 100°F ambient and filled with steel), and BWRVAC (vacuum drying in the cask at 100°F ambient and a vacuum in the DSC cavity) are shown below. The remaining input files differ from these only in the constant temperature boundary conditions discussed above.

5.1 Input File for BWR42

```
HEAT6,P1.
USER,PNFS103,XPNFSX,NC.
CHARGE,N976301,30023000.
REWIND,OUTPUT.
BEGIN,HEAT6,HEATPRC,DATAFIL=INPUT,TIN=10,CLASS=Z,DATNAME=BWR42,CORE=6400K.
/*EOR
```

```
&OPTION MAXBDC=22,NDIMEN=2,MAXGGL=62,MAXMAT=5,MAXNSN=1,MAXPBT=6,
&MAXPTS=2400,MAXREG=279,MAXRFG=34,MAXSUR=1000,MAXTBL=30,MAXTFG=70,
&MAXZFG=1,MWIDTH=500,DIRECT=T,LBOUND=T,MAXINT=5,MAXPRS=30,&END
PRE-FAB STD CANISTER, Q=1.00KW, KHE=100F, KF=1STIT, 1ST RUN
250 7 1 0.0 0.0 0.0 1 0 0
0 0 0 0 0 0 0 200
```

REGIONS

```
*
* FUEL REGIONS
*
1 1 1.392 6.686 55.904 61.139
1 1 0 0 0 0
2 1 1.392 6.686 48.795 54.089
1 1 0 0 0 0
3 1 1.392 6.686 41.579 46.873
1 1 0 0 0 0
4 1 1.392 6.686 34.245 39.539
1 1 0 0 0 0
5 1 1.392 6.686 26.729 32.023
1 1 0 0 0 0
6 1 1.392 6.686 19.395 24.689
1 1 0 0 0 0
7 1 1.392 6.686 12.179 17.473
1 1 0 0 0 0
8 1 1.392 6.686 5.145 10.439
1 1 0 0 0 0
9 1 8.726 14.020 55.904 61.139
1 1 0 0 0 0
10 1 8.726 14.020 48.795 54.089
1 1 0 0 0 0
11 1 8.726 14.020 41.579 46.873
1 1 0 0 0 0
12 1 8.726 14.020 34.245 39.539
1 1 0 0 0 0
13 1 8.726 14.020 26.729 32.023
1 1 0 0 0 0
14 1 8.726 14.020 19.395 24.689
1 1 0 0 0 0
15 1 8.726 14.020 12.179 17.473
1 1 0 0 0 0
```

REVISION	0				PAGE 29 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/19/91				
CHECKED BY / DATE	<i>LLB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

16	1	8.726	14.020	5.145	10.439
1	1	0	0	0	0
17	1	15.942	21.236	48.795	54.089
1	1	0	0	0	0
18	1	15.942	21.236	41.579	46.873
1	1	0	0	0	0
19	1	15.942	21.236	34.245	39.539
1	1	0	0	0	0
20	1	15.942	21.236	26.729	32.023
1	1	0	0	0	0
21	1	15.942	21.236	19.395	24.689
1	1	0	0	0	0
22	1	15.942	21.236	12.179	17.473
1	1	0	0	0	0
23	1	22.976	28.270	41.579	46.873
1	1	0	0	0	0
24	1	22.976	28.270	34.245	39.539
1	1	0	0	0	0
25	1	22.976	28.270	26.729	32.023
1	1	0	0	0	0
26	1	22.976	28.270	19.395	24.689
1	1	0	0	0	0
* POISON PLATES					
27	2	1.312	6.766	55.690	55.824
2	0	0	0	0	0
28	2	.600	.734	48.715	54.169
2	0	0	0	0	0
29	2	6.766	6.900	48.565	54.169
2	0	0	0	0	0
30	2	1.312	6.766	47.531	47.665
2	0	0	0	0	0
31	2	1.312	6.766	41.365	41.499
2	0	0	0	0	0
32	2	.600	.734	34.165	39.619
2	0	0	0	0	0
33	2	6.766	6.900	34.165	39.619
2	0	0	0	0	0
34	2	1.312	6.766	32.681	32.815
2	0	0	0	0	0
35	2	1.312	6.766	26.515	26.649
2	0	0	0	0	0
36	2	.600	.734	19.315	24.769
2	0	0	0	0	0
37	2	6.766	6.900	19.315	24.769
2	0	0	0	0	0
38	2	1.312	6.766	18.131	18.265
2	0	0	0	0	0
39	2	1.312	6.766	11.965	12.099
2	0	0	0	0	0
40	2	.600	.734	5.065	10.519
2	0	0	0	0	0
41	2	6.766	6.900	5.065	10.519
2	0	0	0	0	0
42	2	7.950	8.084	55.690	61.219
2	0	0	0	0	0
43	2	8.646	14.100	54.731	54.865
2	0	0	0	0	0
44	2	8.646	14.100	48.565	48.715
2	0	0	0	0	0
45	2	7.950	8.084	41.499	46.953
2	0	0	0	0	0
46	2	14.100	14.250	41.499	46.953

REVISION	0				PAGE 30 OF 74
PREPARED BY / DATE	<i>Foot</i> 8/14/91				
CHECKED BY / DATE	<i>ICB</i> 9/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	<u>NUHOMS 10CFR72 CERTIFICATION PROJECT</u>	FILE NO:	<u>NUH004.0414</u>
CLIENT:	<u>PACIFIC NUCLEAR FUEL SERVICES</u>	CALC. NO:	<u>NUH004.0414</u>

2	0	0	0	0	0
47	2	7.950	14.100	40.181	40.315
2	0	0	0	0	0
48	2	8.646	14.100	34.015	34.165
2	0	0	0	0	0
49	2	7.950	8.084	26.649	32.815
2	0	0	0	0	0
50	2	14.100	14.250	26.649	32.103
2	0	0	0	0	0
51	2	7.950	14.100	25.331	25.465
2	0	0	0	0	0
52	2	7.950	14.100	19.165	19.315
2	0	0	0	0	0
53	2	7.950	8.084	12.099	17.553
2	0	0	0	0	0
54	2	14.100	14.250	12.099	17.553
2	0	0	0	0	0
55	2	7.950	14.100	11.006	11.140
2	0	0	0	0	0
56	2	15.150	15.284	48.565	54.169
2	0	0	0	0	0
57	2	15.862	21.316	47.531	47.665
2	0	0	0	0	0
58	2	15.862	21.316	41.365	41.499
2	0	0	0	0	0
59	2	15.150	15.284	34.165	40.315
2	0	0	0	0	0
60	2	21.316	21.450	34.165	39.619
2	0	0	0	0	0
61	2	15.150	21.316	32.681	32.815
2	0	0	0	0	0
62	2	15.150	21.316	26.515	26.649
2	0	0	0	0	0
63	2	15.150	15.284	19.315	24.769
2	0	0	0	0	0
64	2	21.316	21.450	19.315	24.769
2	0	0	0	0	0
65	2	15.150	21.316	18.131	18.265
2	0	0	0	0	0
66	2	22.275	22.409	41.499	46.953
2	0	0	0	0	0
67	2	22.275	28.350	40.181	40.315
2	0	0	0	0	0
68	2	22.896	28.350	34.015	34.165
2	0	0	0	0	0
69	2	22.275	22.409	26.649	32.815
2	0	0	0	0	0
70	2	22.275	28.350	25.331	25.465
2	0	0	0	0	0
*					
* HELIUM (PURE)					
*					
101	3	0	1.312	55.690	61.219
2	0	1	0	0	0
102	3	6.766	7.950	55.690	61.219
2	0	3	3	0	0
103	3	8.084	8.646	55.690	61.219
2	0	3	3	0	0
104	3	0	.600	47.665	55.690
2	0	1	0	0	0
105	3	.600	6.900	54.169	55.690
2	0	0	0	3	3
106	3	6.900	8.646	48.565	55.690
2	0	3	3	0	0

REVISION	0				PAGE 31 OF 74
PREPARED BY / DATE	<i>Fict</i> 8/14/91				
CHECKED BY / DATE	<i>(CS)</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	<u>NUH004.0414</u>
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	<u>NUH004.0414</u>

107	3	8.646	14.100	54.865	55.690
2	0	0	0	3	3
108	3	8.646	14.100	54.169	55.824
2	0	0	0	3	3
109	3	.734	1.312	48.715	54.169
2	0	3	3	0	0
110	3	14.100	15.150	48.565	54.169
2	0	3	3	0	0
111	3	15.284	15.862	48.565	54.169
2	0	3	3	0	0
112	3	.600	6.766	47.665	48.715
2	0	0	0	3	3
113	3	15.862	21.316	47.665	48.715
2	0	0	0	3	3
114	3	0	1.312	41.365	47.665
2	0	1	0	0	0
115	3	1.312	6.766	46.953	47.531
2	0	0	0	3	3
116	3	6.766	15.862	46.953	48.565
2	0	0	0	3	3
117	3	15.862	21.316	46.953	47.531
2	0	0	0	3	3
118	3	21.316	22.275	41.365	46.953
2	0	3	3	0	0
119	3	6.766	7.950	41.365	46.953
2	0	3	3	0	0
120	3	8.084	8.646	41.499	46.953
2	0	3	3	0	0
121	3	14.250	15.862	40.315	46.953
2	0	3	3	0	0
122	3	22.409	22.896	41.499	46.953
2	0	3	3	0	0
123	3	0	7.950	39.619	41.365
2	0	1	0	3	3
124	3	6.900	8.646	34.165	39.619
2	0	3	3	0	0
125	3	7.950	14.250	40.315	41.499
2	0	0	0	3	3
126	3	15.862	22.275	39.619	41.365
2	0	0	0	3	3
127	3	22.275	28.350	40.315	41.499
2	0	0	0	3	3
129	3	7.950	14.100	39.619	40.181
2	0	0	0	3	3
130	3	14.100	15.150	34.015	40.315
2	0	3	3	0	0
132	3	21.450	22.896	32.815	39.619
2	0	3	3	0	0
133	3	22.275	28.350	39.619	40.181
2	0	0	0	3	3
134	3	0	.600	32.815	39.619
2	0	1	0	0	0
135	3	.734	1.312	34.165	39.619
2	0	3	3	0	0
136	3	15.284	15.862	34.165	40.315
2	0	3	3	0	0
137	3	.600	8.646	32.815	34.165
2	0	0	0	3	3
138	3	8.646	15.150	32.103	34.015
2	0	0	0	3	3
139	3	15.150	21.450	32.815	34.165
2	0	0	0	3	3
140	3	22.896	28.350	32.103	34.015
2	0	0	0	3	3

REVISION	0				PAGE 32 OF 74
PREPARED BY / DATE	<i>Fud</i> 8/14/91				
CHECKED BY / DATE	<i>LB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

141	3	0	1.312	26.515	32.815
2	0	1	0	0	0
142	3	1.312	6.766	32.103	32.681
2	0	0	0	3	3
143	3	6.766	7.950	26.515	32.815
2	0	3	3	0	0
146	3	15.150	21.316	32.103	32.681
2	0	0	0	3	3
148	3	8.084	8.646	26.649	32.815
2	0	3	3	0	0
149	3	14.250	15.862	26.649	32.103
2	0	3	3	0	0
150	3	21.316	22.275	26.515	32.815
2	0	3	3	0	0
151	3	22.409	22.896	26.649	32.815
2	0	3	3	0	0
152	3	0	7.950	24.769	26.515
2	0	1	0	3	3
153	3	7.950	14.100	24.769	25.331
2	0	0	0	3	3
154	3	15.150	22.275	24.769	26.515
2	0	0	0	3	3
155	3	22.275	28.350	25.465	26.649
2	0	0	0	3	3
157	3	7.950	15.150	25.465	26.649
2	0	0	0	3	3
158	3	14.100	15.150	19.165	25.465
2	0	3	3	0	0
160	3	22.275	28.350	24.769	25.331
2	0	0	0	3	3
161	3	0	.600	18.265	24.769
2	0	1	0	0	0
162	3	.734	1.312	19.315	24.769
2	0	3	3	0	0
163	3	6.900	8.646	19.315	24.769
2	0	3	3	0	0
164	3	15.284	15.862	19.315	24.769
2	0	3	3	0	0
165	3	21.450	22.896	19.315	24.769
2	0	3	3	0	0
166	3	.600	7.950	18.265	19.315
2	0	0	0	3	3
167	3	7.950	15.150	17.553	19.165
2	0	0	0	3	3
168	3	15.150	21.316	18.265	19.315
2	0	0	0	3	3
169	3	0	1.312	11.965	18.265
2	0	1	0	0	0
170	3	1.312	6.766	17.553	18.131
2	0	0	0	3	3
171	3	6.766	7.950	11.965	18.265
2	0	3	3	0	0
172	3	8.084	8.646	12.099	17.553
2	0	3	3	0	0
173	3	14.250	15.862	12.099	17.553
2	0	3	3	0	0
175	3	15.150	21.316	17.553	18.131
2	0	0	0	3	3
176	3	0	7.950	10.519	11.965
2	0	1	0	3	3
177	3	7.950	14.100	11.140	12.099
2	0	0	0	3	3
178	3	0	.600	5.065	10.519
2	0	1	0	0	0

REVISION	0				PAGE 33 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/14/91				
CHECKED BY / DATE	<i>128</i> 9/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

179	3	.734	1.312	5.065	10.519
2	0	3	3	0	0
180	3	6.900	8.646	5.065	10.519
2	0	3	3	0	0
182	3	7.950	14.100	10.519	11.006
2	0	0	0	3	3

* HELIUM (DSC BOUNDED)

201	3	0	6.766	61.219	66.201
3	0	1	0	3	3
202	3	6.766	14.100	61.219	65.624
3	0	0	0	3	3
203	3	14.100	22.275	54.169	61.219
3	0	3	3	3	3
204	3	21.316	29.200	46.953	54.169
3	0	3	3	3	3
205	3	28.350	32.375	39.619	46.953
3	0	3	3	0	0
206	3	28.350	33.000	32.815	39.619
3	0	3	3	0	0
207	3	28.350	33.000	26.649	32.815
3	0	3	3	0	0
208	3	28.350	32.375	19.315	26.649
3	0	3	3	0	0
209	3	21.316	29.200	12.099	19.315
3	0	3	3	3	3
210	3	14.100	22.275	5.065	12.099
3	0	3	3	3	3
211	3	6.766	14.100	1.250	5.065
3	0	0	0	3	3
212	3	0.	6.766	0.625	5.065
3	0	1	0	3	3

* DSC SHELL

301	4	0	6.766	66.201	66.826
4	0	1	1	0	301
302	4	6.766	14.100	65.624	66.201
4	0	1	1	0	302
303	4	14.100	15.150	61.219	65.624
4	0	0	303	0	1
304	4	15.150	22.275	61.219	61.844
4	0	0	1	0	304
305	4	22.275	22.896	54.169	61.219
4	0	0	305	0	1
306	4	22.896	29.200	54.169	54.731
4	0	0	1	0	306
307	4	29.200	29.825	46.953	54.169
4	0	0	307	0	1
308	4	29.825	32.375	46.953	47.531
4	0	0	1	0	308
309	4	32.375	33.000	39.619	46.953
4	0	0	309	0	1
310	4	33.000	33.625	32.815	39.619
4	0	0	310	0	1
311	4	33.000	33.625	26.649	32.815
4	0	0	311	1	0
312	4	32.375	33.000	19.315	26.649
4	0	0	312	1	0
313	4	29.825	32.375	18.265	19.315
4	0	0	1	313	0
314	4	29.200	29.825	12.099	19.315
4	0	0	314	1	0

REVISION	0				PAGE 34 OF 74
PREPARED BY / DATE	<i>Foot</i> 8/14/91				
CHECKED BY / DATE	<i>1091</i> 8/14/91				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

315	4	22.896	29.200	11.474	12.099
4	0	0	1	315	0
316	4	22.275	22.896	5.065	12.099
4	0	0	316	1	0
317	4	15.150	22.275	4.440	5.065
4	0	0	1	317	0
318	4	14.100	15.150	1.250	5.065
4	0	0	318	1	0
319	4	6.766	14.100	.625	1.250
4	0	0	1	319	0
320	4	0	6.766	0	0.625
4	0	1	1	320	0

* FUEL CHANNELS *

401	5	1.312	1.392	55.824	61.219
2	0	0	0	0	0
402	5	1.392	6.686	61.139	61.219
2	0	0	0	0	0
403	5	6.686	6.766	55.824	61.219
2	0	0	0	0	0
404	5	1.392	6.686	55.824	55.904
2	0	0	0	0	0
405	5	1.312	1.392	48.715	54.169
2	0	0	0	0	0
406	5	1.392	6.686	54.089	54.169
2	0	0	0	0	0
407	5	6.686	6.766	48.715	54.169
2	0	0	0	0	0
408	5	1.392	6.686	48.715	48.795
2	0	0	0	0	0
409	5	1.312	1.392	41.499	41.579
2	0	0	0	0	0
410	5	1.392	6.686	46.873	46.953
2	0	0	0	0	0
411	5	6.686	6.766	41.499	46.953
2	0	0	0	0	0
412	5	1.392	6.686	41.499	41.579
2	0	0	0	0	0
413	5	1.312	1.392	34.165	39.619
2	0	0	0	0	0
414	5	1.392	6.686	39.539	39.619
2	0	0	0	0	0
415	5	6.686	6.766	34.165	39.619
2	0	0	0	0	0
416	5	1.392	6.686	34.165	34.245
2	0	0	0	0	0
417	5	1.312	1.392	26.649	32.103
2	0	0	0	0	0
418	5	1.392	6.686	32.023	32.103
2	0	0	0	0	0
419	5	6.686	6.766	26.649	32.103
2	0	0	0	0	0
420	5	1.392	6.686	26.649	26.729
2	0	0	0	0	0
421	5	1.312	1.392	19.315	24.769
2	0	0	0	0	0
422	5	1.392	6.686	24.689	24.769
2	0	0	0	0	0
423	5	6.686	6.766	19.315	24.769
2	0	0	0	0	0
424	5	1.392	6.686	19.315	19.395
2	0	0	0	0	0
425	5	1.312	1.392	12.099	17.553

REVISION	0				PAGE 35 OF 74
PREPARED BY / DATE	<i>FCA</i> 8/14/91				
CHECKED BY / DATE	<i>1430</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

2	0	0	0	0	0
426	5	1.392	6.686	17.473	17.553
2	0	0	0	0	0
427	5	6.686	6.766	12.099	17.553
2	0	0	0	0	0
428	5	1.392	6.686	12.099	12.179
2	0	0	0	0	0
429	5	1.312	1.392	5.065	10.519
2	0	0	0	0	0
430	5	1.392	6.686	10.439	10.519
2	0	0	0	0	0
431	5	6.686	6.766	5.065	10.519
2	0	0	0	0	0
432	5	1.392	6.686	5.065	5.145
2	0	0	0	0	0
433	5	8.646	8.726	55.824	61.219
2	0	0	0	0	0
434	5	8.726	14.020	61.139	61.219
2	0	0	0	0	0
435	5	14.020	14.100	55.824	61.219
2	0	0	0	0	0
436	5	8.726	14.020	55.824	55.904
2	0	0	0	0	0
437	5	8.646	8.726	48.715	54.169
2	0	0	0	0	0
438	5	8.726	14.020	54.089	54.169
2	0	0	0	0	0
439	5	14.020	14.100	48.715	54.169
2	0	0	0	0	0
440	5	8.726	14.020	48.715	48.795
2	0	0	0	0	0
441	5	8.646	8.726	41.499	46.953
2	0	0	0	0	0
442	5	8.726	14.020	46.873	46.953
2	0	0	0	0	0
443	5	14.020	14.100	41.499	46.953
2	0	0	0	0	0
444	5	8.726	14.020	41.499	41.579
2	0	0	0	0	0
445	5	8.646	8.726	34.165	39.619
2	0	0	0	0	0
446	5	8.726	14.020	39.539	39.619
2	0	0	0	0	0
447	5	14.020	14.100	34.165	39.619
2	0	0	0	0	0
448	5	8.726	14.020	34.165	34.245
2	0	0	0	0	0
449	5	8.646	8.726	26.649	32.103
2	0	0	0	0	0
450	5	8.726	14.020	32.023	32.103
2	0	0	0	0	0
451	5	14.020	14.100	26.649	32.103
2	0	0	0	0	0
452	5	8.726	14.020	26.649	26.729
2	0	0	0	0	0
453	5	8.646	8.726	19.315	24.769
2	0	0	0	0	0
454	5	8.726	14.020	24.689	24.769
2	0	0	0	0	0
455	5	14.020	14.100	19.315	24.769
2	0	0	0	0	0
456	5	8.726	14.020	19.315	19.395
2	0	0	0	0	0
457	5	8.646	8.726	12.099	17.553

REVISION	0				PAGE 36 OF 74
PREPARED BY / DATE	<i>FCT</i> 8/14/91				
CHECKED BY / DATE	<i>LCB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT
CLIENT: PACIFIC NUCLEAR FUEL SERVICES

FILE NO: NUH004.0414
CALC. NO: NUH004.0414

2	0	0	0	0	0
458	5	8.726	14.020	17.473	17.553
2	0	0	0	0	0
459	5	14.020	14.100	12.099	17.553
2	0	0	0	0	0
460	5	8.726	14.020	12.099	12.179
2	0	0	0	0	0
461	5	8.646	8.726	5.065	10.519
2	0	0	0	0	0
462	5	8.726	14.020	10.439	10.519
2	0	0	0	0	0
463	5	14.020	14.100	5.065	10.519
2	0	0	0	0	0
464	5	8.726	14.020	5.065	5.145
2	0	0	0	0	0
465	5	15.862	15.942	48.715	54.169
2	0	0	0	0	0
466	5	15.942	21.236	54.089	54.169
2	0	0	0	0	0
467	5	21.236	21.316	48.715	54.169
2	0	0	0	0	0
468	5	15.942	21.236	48.715	48.795
2	0	0	0	0	0
469	5	15.862	15.942	41.499	46.953
2	0	0	0	0	0
470	5	15.942	21.316	46.873	46.953
2	0	0	0	0	0
471	5	21.236	21.316	41.499	46.953
2	0	0	0	0	0
472	5	15.942	21.236	41.499	41.579
2	0	0	0	0	0
473	5	15.862	15.942	34.165	39.619
2	0	0	0	0	0
474	5	15.942	21.236	39.539	39.619
2	0	0	0	0	0
475	5	21.236	21.316	34.165	39.619
2	0	0	0	0	0
476	5	15.942	21.236	34.165	34.245
2	0	0	0	0	0
477	5	15.862	15.942	26.649	32.103
2	0	0	0	0	0
478	5	15.942	21.236	32.023	32.103
2	0	0	0	0	0
479	5	21.236	21.316	26.649	32.103
2	0	0	0	0	0
480	5	15.942	21.236	26.649	26.729
2	0	0	0	0	0
481	5	15.862	15.942	19.315	24.769
2	0	0	0	0	0
482	5	15.942	21.236	24.689	24.769
2	0	0	0	0	0
483	5	21.236	21.316	19.315	24.769
2	0	0	0	0	0
484	5	15.942	21.236	19.315	19.395
2	0	0	0	0	0
485	5	15.862	15.942	12.099	17.553
2	0	0	0	0	0
486	5	15.942	21.236	17.473	17.553
2	0	0	0	0	0
487	5	21.236	21.316	12.099	17.553
2	0	0	0	0	0
488	5	15.942	21.236	12.099	12.179
2	0	0	0	0	0
489	5	22.896	22.976	41.499	46.953

REVISION	0				
PREPARED BY / DATE	<i>Fcd</i> 8/14/91				PAGE 37 OF 74
CHECKED BY / DATE	<i>ILBQ</i> 4/14/91				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT
CLIENT: PACIFIC NUCLEAR FUEL SERVICES

FILE NO: NUH004.0414
CALC. NO: NUH004.0414

2	0	0	0	0	0
490	5	22.976	28.270	46.873	46.953
2	0	0	0	0	0
491	5	28.270	28.350	41.499	46.953
2	0	0	0	0	0
492	5	22.976	28.270	41.499	41.579
2	0	0	0	0	0
493	5	22.896	22.976	34.165	39.619
2	0	0	0	0	0
494	5	22.976	28.270	39.539	39.619
2	0	0	0	0	0
495	5	28.270	28.350	34.165	39.619
2	0	0	0	0	0
496	5	22.976	28.270	34.165	34.245
2	0	0	0	0	0
497	5	22.896	22.976	26.649	32.103
2	0	0	0	0	0
498	5	22.976	28.270	32.023	32.103
2	0	0	0	0	0
499	5	28.270	28.350	26.649	32.103
2	0	0	0	0	0
500	5	22.976	28.270	26.649	26.729
2	0	0	0	0	0
501	5	22.896	22.976	19.315	24.769
2	0	0	0	0	0
502	5	22.976	28.270	24.689	24.769
2	0	0	0	0	0
503	5	28.270	28.350	19.315	24.769
2	0	0	0	0	0
504	5	22.976	28.270	19.315	19.395
2	0	0	0	0	0

MATERIALS

1	FUEL	0	0	0	-3
2	POISON	0	0	0	-1
3	HELIUM	0	0	0	-2
4	SS304	0	0	0	-1
5	ZALOY	0	0	0	-4

INITIAL TEMPERATURES

1	550
2	450
3	250
4	200

HEAT GENERATIONS

1	5.70D-3
---	---------

BOUNDARY CONDITIONS

1	0	0.0	0.0	0.0	0		
3	3	0.0	6.249D-14	0.0	0.0	0.0	0
301	2	303.4					
302	2	302.1					
303	2	295.3					
304	2	275.4					
305	2	242.4					
306	2	233.0					
307	2	227.7					
308	2	224.9					

REVISION	0			
PREPARED BY / DATE	FUC 8/14/91			
CHECKED BY / DATE	LBX 4/14/92			

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

```

4 5
  100. 9.472D-3 200. 9.569D-3 400. 9.875D-3 600. 10.24D-3
@ 800. 10.61D-3
STEADY STATE PARAMETERS
-15 0.001
%
  
```

5.2 Input File for BWR52

```

HEAT6,P1.
USER,PNFS103,XPNFSX,NC.
CHARGE,N976301,30023000.
REWIND,OUTPUT.
BEGIN,HEAT6,HEATPRC,DATAFIL=INPUT,TIM=10,CLASS=C,DATNAME=BWR52,CORE=6400K.
/*EOR
  
```

```

&OPTION MAXBDC=22,NDIMEN=2,MAXGGL=62,MAXMAT=6,MAXNSN=1,MAXPBT=6,
@MAXPTS=2400,MAXREG=279,MAXRFG=34,MAXSUR=1000,MAXTBL=10,MAXTFG=70,
@MAXZFG=1,MWIDTH=500,DIRECT=T,LBOUND=T,MAXINT=5,MAXPRS=30,&END
PRE-FAB STD CANISTER, Q=1.00KW, KHE=100F, KF=CSTEEL, 1ST RUN
250 7 1 0.0 0.0 0.0 1 0 0
0 0 0 0 0 0 0 0 200
  
```

REGIONS

* FUEL REGIONS

1	1	1.392	6.686	55.904	61.139
1	1	0	0	0	0
2	1	1.392	6.686	48.795	54.089
1	1	0	0	0	0
3	1	1.392	6.686	41.579	46.873
1	1	0	0	0	0
4	1	1.392	6.686	34.245	39.539
1	1	0	0	0	0
5	1	1.392	6.686	26.729	32.023
1	1	0	0	0	0
6	1	1.392	6.686	19.395	24.689
1	1	0	0	0	0
7	1	1.392	6.686	12.179	17.473
1	1	0	0	0	0
8	1	1.392	6.686	5.145	10.439
1	1	0	0	0	0
9	1	8.726	14.020	55.904	61.139
1	1	0	0	0	0
10	1	8.726	14.020	48.795	54.089
1	1	0	0	0	0
11	1	8.726	14.020	41.579	46.873
1	1	0	0	0	0
12	1	8.726	14.020	34.245	39.539
1	1	0	0	0	0
13	1	8.726	14.020	26.729	32.023
1	1	0	0	0	0
14	1	8.726	14.020	19.395	24.689
1	1	0	0	0	0
15	1	8.726	14.020	12.179	17.473
1	1	0	0	0	0
16	1	8.726	14.020	5.145	10.439
1	1	0	0	0	0
17	1	15.942	21.236	48.795	54.089
1	1	0	0	0	0
18	1	15.942	21.236	41.579	46.873
1	1	0	0	0	0
19	1	15.942	21.236	34.245	39.539
1	1	0	0	0	0
20	1	15.942	21.236	26.729	32.023

REVISION	0				PAGE 40 OF 74
PREPARED BY / DATE	<i>ECB</i> 8/14/91				
CHECKED BY / DATE	<i>KB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

1	1	0	0	0	0
21	1	15.942	21.236	19.395	24.689
1	1	0	0	0	0
22	1	15.942	21.236	12.179	17.473
1	1	0	0	0	0
23	1	22.976	28.270	41.579	46.873
1	1	0	0	0	0
24	1	22.976	28.270	34.245	39.539
1	1	0	0	0	0
25	1	22.976	28.270	26.729	32.023
1	1	0	0	0	0
26	1	22.976	28.270	19.395	24.689
1	1	0	0	0	0

* POISON PLATES

27	2	1.312	6.766	55.690	55.824
2	0	0	0	0	0
28	2	.600	.734	48.715	54.169
2	0	0	0	0	0
29	2	6.766	6.900	48.565	54.169
2	0	0	0	0	0
30	2	1.312	6.766	47.531	47.665
2	0	0	0	0	0
31	2	1.312	6.766	41.365	41.499
2	0	0	0	0	0
32	2	.600	.734	34.165	39.619
2	0	0	0	0	0
33	2	6.766	6.900	34.165	39.619
2	0	0	0	0	0
34	2	1.312	6.766	32.681	32.815
2	0	0	0	0	0
35	2	1.312	6.766	26.515	26.649
2	0	0	0	0	0
36	2	.600	.734	19.315	24.769
2	0	0	0	0	0
37	2	6.766	6.900	19.315	24.769
2	0	0	0	0	0
38	2	1.312	6.766	18.131	18.265
2	0	0	0	0	0
39	2	1.312	6.766	11.965	12.099
2	0	0	0	0	0
40	2	.600	.734	5.065	10.519
2	0	0	0	0	0
41	2	6.766	6.900	5.065	10.519
2	0	0	0	0	0
42	2	7.950	8.084	55.690	61.219
2	0	0	0	0	0
43	2	8.646	14.100	54.731	54.865
2	0	0	0	0	0
44	2	8.646	14.100	48.565	48.715
2	0	0	0	0	0
45	2	7.950	8.084	41.499	46.953
2	0	0	0	0	0
46	2	14.100	14.250	41.499	46.953
2	0	0	0	0	0
47	2	7.950	14.100	40.181	40.315
2	0	0	0	0	0
48	2	8.646	14.100	34.015	34.165
2	0	0	0	0	0
49	2	7.950	8.084	26.649	32.815
2	0	0	0	0	0
50	2	14.100	14.250	26.649	32.103
2	0	0	0	0	0

REVISION	0				PAGE 41 OF 74
PREPARED BY / DATE	<i>FLD</i> 8/14/91				
CHECKED BY / DATE	<i>LRD</i> 4/11/92				

Pacific Nuclear Fuel Services, Inc.

NUHOMS 10CFR72 CERTIFICATION

PROJECT: PROJECT

FILE NO: NUH004.0414

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

51	2	7.950	14.100	25.331	25.465
2	0	0	0	0	0
52	2	7.950	14.100	19.165	19.315
2	0	0	0	0	0
53	2	7.950	8.084	12.099	17.553
2	0	0	0	0	0
54	2	14.100	14.250	12.099	17.553
2	0	0	0	0	0
55	2	7.950	14.100	11.006	11.140
2	0	0	0	0	0
56	2	15.150	15.284	48.565	54.169
2	0	0	0	0	0
57	2	15.862	21.316	47.531	47.665
2	0	0	0	0	0
58	2	15.862	21.316	41.365	41.499
2	0	0	0	0	0
59	2	15.150	15.284	34.165	40.315
2	0	0	0	0	0
60	2	21.316	21.450	34.165	39.619
2	0	0	0	0	0
61	2	15.150	21.316	32.681	32.815
2	0	0	0	0	0
62	2	15.150	21.316	26.515	26.649
2	0	0	0	0	0
63	2	15.150	15.284	19.315	24.769
2	0	0	0	0	0
64	2	21.316	21.450	19.315	24.769
2	0	0	0	0	0
65	2	15.150	21.316	18.131	18.265
2	0	0	0	0	0
66	2	22.275	22.409	41.499	46.953
2	0	0	0	0	0
67	2	22.275	28.350	40.181	40.315
2	0	0	0	0	0
68	2	22.896	28.350	34.015	34.165
2	0	0	0	0	0
69	2	22.275	22.409	26.649	32.815
2	0	0	0	0	0
70	2	22.275	28.350	25.331	25.465
2	0	0	0	0	0

* HELIUM (PURE)
*

101	6	0	1.312	55.690	61.219
2	0	1	0	0	0
102	6	6.766	7.950	55.690	61.219
2	0	0	0	0	0
103	3	8.084	8.646	55.690	61.219
2	0	3	3	0	0
104	6	0	.600	47.665	55.690
2	0	1	0	0	0
105	6	.600	6.900	54.169	55.690
2	0	0	0	0	0
106	6	6.900	8.646	48.565	55.690
2	0	0	0	0	0
107	6	8.646	14.100	54.865	55.690
2	0	0	0	0	0
108	3	8.646	14.100	54.169	55.824
2	0	0	0	3	3
109	3	.734	1.312	48.715	54.169
2	0	3	3	0	0
110	6	14.100	15.150	48.565	54.169
2	0	0	0	0	0
111	3	15.284	15.862	48.565	54.169

REVISION	0				PAGE 42 OF 74
PREPARED BY / DATE	<i>Fcd</i> 8/14/91				
CHECKED BY / DATE	<i>KAD</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

2	0	3	3	0	0
112	6	.600	6.766	47.665	48.715
2	0	0	0	0	0
113	6	15.862	21.316	47.665	48.715
2	0	0	0	0	0
114	6	0	1.312	41.365	47.665
2	0	1	0	0	0
115	3	1.312	6.766	46.953	47.531
2	0	0	0	0	0
116	6	6.766	15.862	46.953	48.565
2	0	0	0	0	0
117	3	15.862	21.316	46.953	47.531
2	0	0	0	3	3
118	6	21.316	22.275	41.365	46.953
2	0	0	0	0	0
119	6	6.766	7.950	41.365	46.953
2	0	0	0	0	0
120	3	8.084	8.646	41.499	46.953
2	0	3	3	0	0
121	6	14.250	15.862	40.315	46.953
2	0	0	0	0	0
122	3	22.409	22.896	41.499	46.953
2	0	3	3	0	0
123	6	0	7.950	39.619	41.365
2	0	1	0	0	0
124	6	6.900	8.646	34.165	39.619
2	0	0	0	0	0
125	6	7.950	14.250	40.315	41.499
2	0	0	0	0	0
126	6	15.862	22.275	39.619	41.365
2	0	0	0	0	0
127	6	22.275	28.350	40.315	41.499
2	0	0	0	0	0
129	3	7.950	14.100	39.619	40.181
2	0	0	0	3	3
130	6	14.100	15.150	34.015	40.315
2	0	0	0	0	0
132	6	21.450	22.896	32.815	39.619
2	0	0	0	0	0
133	3	22.275	28.350	39.619	40.181
2	0	0	0	3	3
134	6	0	.600	32.815	39.619
2	0	1	0	0	0
135	3	.734	1.312	34.165	39.619
2	0	3	3	0	0
136	3	15.284	15.862	34.165	40.315
2	0	3	3	0	0
137	6	.600	8.646	32.815	34.165
2	0	0	0	0	0
138	6	8.646	15.150	32.103	34.015
2	0	0	0	0	0
139	6	15.150	21.450	32.815	34.165
2	0	0	0	0	0
140	6	22.896	28.350	32.103	34.015
2	0	0	0	0	0
141	6	0	1.312	26.515	32.815
2	0	1	0	0	0
142	3	1.312	6.766	32.103	32.681
2	0	0	0	3	3
143	6	6.766	7.950	26.515	32.815
2	0	0	0	0	0
146	3	15.150	21.316	32.103	32.681
2	0	0	0	3	3
148	3	8.084	8.646	26.649	32.815

REVISION	0				PAGE 43 OF 74
PREPARED BY / DATE	<i>FCM</i> 8/14/91				
CHECKED BY / DATE	<i>ICSD</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

2	0	3	3	0	0
149	6	14.250	15.862	26.649	32.103
2	0	0	0	0	0
150	6	21.316	22.275	26.515	32.815
2	0	0	0	0	0
151	3	22.409	22.896	26.649	32.815
2	0	3	3	0	0
152	6	0	7.950	24.769	26.515
2	0	1	0	0	0
153	3	7.950	14.100	24.769	25.331
2	0	0	0	3	3
154	6	15.150	22.275	24.769	26.515
2	0	0	0	0	0
155	6	22.275	28.350	25.465	26.649
2	0	0	0	0	0
157	6	7.950	15.150	25.465	26.649
2	0	0	0	0	0
158	6	14.100	15.150	19.165	25.465
2	0	0	0	0	0
160	3	22.275	28.350	24.769	25.331
2	0	0	0	3	3
161	6	0	.600	18.265	24.769
2	0	1	0	0	0
162	3	.734	1.312	19.315	24.769
2	0	3	3	0	0
163	6	6.900	8.646	19.315	24.769
2	0	0	0	0	0
164	3	15.284	15.862	19.315	24.769
2	0	3	3	0	0
165	6	21.450	22.896	19.315	24.769
2	0	0	0	0	0
166	6	.600	7.950	18.265	19.315
2	0	0	0	0	0
167	6	7.950	15.150	17.553	19.165
2	0	0	0	0	0
168	6	15.150	21.316	18.265	19.315
2	0	0	0	0	0
169	6	0	1.312	11.965	18.265
2	0	1	0	0	0
170	3	1.312	6.766	17.553	18.131
2	0	0	0	3	3
171	6	6.766	7.950	11.965	18.265
2	0	0	0	0	0
172	3	8.084	8.646	12.099	17.553
2	0	3	3	0	0
173	6	14.250	15.862	12.099	17.553
2	0	0	0	0	0
175	3	15.150	21.316	17.553	18.131
2	0	0	0	3	3
176	6	0	7.950	10.519	11.965
2	0	1	0	0	0
177	6	7.950	14.100	11.140	12.099
2	0	0	0	0	0
178	6	0	.600	5.065	10.519
2	0	1	0	0	0
179	3	.734	1.312	5.065	10.519
2	0	3	3	0	0
180	6	6.900	8.646	5.065	10.519
2	0	0	0	0	0
182	3	7.950	14.100	10.519	11.006
2	0	0	0	3	3

* HELIUM (DSC BOUNDED)
*

REVISION	0				PAGE 44 OF 74
PREPARED BY / DATE	<i>Foot</i> 8/14/91				
CHECKED BY / DATE	<i>ICB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

201	6	0	6.766	61.219	66.201
3	0	1	0	0	0
202	6	6.766	14.100	61.219	65.624
3	0	0	0	0	0
203	6	14.100	22.275	54.169	61.219
3	0	0	0	0	0
204	6	21.316	29.200	46.953	54.169
3	0	0	0	0	0
205	6	28.350	32.375	39.619	46.953
3	0	0	0	0	0
206	6	28.350	33.000	32.815	39.619
3	0	0	0	0	0
207	6	28.350	33.000	26.649	32.815
3	0	0	0	0	0
208	6	28.350	32.375	19.315	26.649
3	0	0	0	0	0
209	6	21.316	29.200	12.099	19.315
3	0	0	0	0	0
210	6	14.100	22.275	5.065	12.099
3	0	0	0	0	0
211	6	6.766	14.100	1.250	5.065
3	0	0	0	0	0
212	6	0.	6.766	0.625	5.065
3	0	1	0	0	0

* DSC SHELL

301	4	0	6.766	66.201	66.826
4	0	1	1	0	301
302	4	6.766	14.100	65.624	66.201
4	0	1	1	0	302
303	4	14.100	15.150	61.219	65.624
4	0	0	303	0	1
304	4	15.150	22.275	61.219	61.844
4	0	0	1	0	304
305	4	22.275	22.896	54.169	61.219
4	0	0	305	0	1
306	4	22.896	29.200	54.169	54.731
4	0	0	1	0	306
307	4	29.200	29.825	46.953	54.169
4	0	0	307	0	1
308	4	29.825	32.375	46.953	47.531
4	0	0	1	0	308
309	4	32.375	33.000	39.619	46.953
4	0	0	309	0	1
310	4	33.000	33.625	32.815	39.619
4	0	0	310	0	1
311	4	33.000	33.625	26.649	32.815
4	0	0	311	1	0
312	4	32.375	33.000	19.315	26.649
4	0	0	312	1	0
313	4	29.825	32.375	18.265	19.315
4	0	0	1	313	0
314	4	29.200	29.825	12.099	19.315
4	0	0	314	1	0
315	4	22.896	29.200	11.474	12.099
4	0	0	1	315	0
316	4	22.275	22.896	5.065	12.099
4	0	0	316	1	0
317	4	15.150	22.275	4.440	5.065
4	0	0	1	317	0
318	4	14.100	15.150	1.250	5.065
4	0	0	318	1	0
319	4	6.766	14.100	.625	1.250

REVISION	0				PAGE 45 OF 74
PREPARED BY / DATE	<i>Fict</i> 8/14/91				
CHECKED BY / DATE	<i>KB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT

FILE NO: NUH004.0414

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

4	0	0	1	319	0
320	4	0	6.766	0	0.625
4	0	1	1	320	0
* FUEL CHANNELS					
401	5	1.312	1.392	55.824	61.219
2	0	0	0	0	0
402	5	1.392	6.686	61.139	61.219
2	0	0	0	0	0
403	5	6.686	6.766	55.824	61.219
2	0	0	0	0	0
404	5	1.392	6.686	55.824	55.904
2	0	0	0	0	0
405	5	1.312	1.392	48.715	54.169
2	0	0	0	0	0
406	5	1.392	6.686	54.089	54.169
2	0	0	0	0	0
407	5	6.686	6.766	48.715	54.169
2	0	0	0	0	0
408	5	1.392	6.686	48.715	48.795
2	0	0	0	0	0
409	5	1.312	1.392	41.499	41.579
2	0	0	0	0	0
410	5	1.392	6.686	46.873	46.953
2	0	0	0	0	0
411	5	6.686	6.766	41.499	46.953
2	0	0	0	0	0
412	5	1.392	6.686	41.499	41.579
2	0	0	0	0	0
413	5	1.312	1.392	34.165	39.619
2	0	0	0	0	0
414	5	1.392	6.686	39.539	39.619
2	0	0	0	0	0
415	5	6.686	6.766	34.165	39.619
2	0	0	0	0	0
416	5	1.392	6.686	34.165	34.245
2	0	0	0	0	0
417	5	1.312	1.392	26.649	32.103
2	0	0	0	0	0
418	5	1.392	6.686	32.023	32.103
2	0	0	0	0	0
419	5	6.686	6.766	26.649	32.103
2	0	0	0	0	0
420	5	1.392	6.686	26.649	26.729
2	0	0	0	0	0
421	5	1.312	1.392	19.315	24.769
2	0	0	0	0	0
422	5	1.392	6.686	24.689	24.769
2	0	0	0	0	0
423	5	6.686	6.766	19.315	24.769
2	0	0	0	0	0
424	5	1.392	6.686	19.315	19.395
2	0	0	0	0	0
425	5	1.312	1.392	12.099	17.553
2	0	0	0	0	0
426	5	1.392	6.686	17.473	17.553
2	0	0	0	0	0
427	5	6.686	6.766	12.099	17.553
2	0	0	0	0	0
428	5	1.392	6.686	12.099	12.179
2	0	0	0	0	0
429	5	1.312	1.392	5.065	10.519
2	0	0	0	0	0

REVISION	0			
PREPARED BY / DATE	FCW 8/14/91			PAGE 46 OF 74
CHECKED BY / DATE	KLBY 4/14/92			

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

430	5	1.392	6.686	10.439	10.519
2	0	0	0	0	0
431	5	6.686	6.766	5.065	10.519
2	0	0	0	0	0
432	5	1.392	6.686	5.065	5.145
2	0	0	0	0	0
433	5	8.646	8.726	55.824	61.219
2	0	0	0	0	0
434	5	8.726	14.020	61.139	61.219
2	0	0	0	0	0
435	5	14.020	14.100	55.824	61.219
2	0	0	0	0	0
436	5	8.726	14.020	55.824	55.904
2	0	0	0	0	0
437	5	8.646	8.726	48.715	54.169
2	0	0	0	0	0
438	5	8.726	14.020	54.089	54.169
2	0	0	0	0	0
439	5	14.020	14.100	48.715	54.169
2	0	0	0	0	0
440	5	8.726	14.020	48.715	48.795
2	0	0	0	0	0
441	5	8.646	8.726	41.499	46.953
2	0	0	0	0	0
442	5	8.726	14.020	46.873	46.953
2	0	0	0	0	0
443	5	14.020	14.100	41.499	46.953
2	0	0	0	0	0
444	5	8.726	14.020	41.499	41.579
2	0	0	0	0	0
445	5	8.646	8.726	34.165	39.619
2	0	0	0	0	0
446	5	8.726	14.020	39.539	39.619
2	0	0	0	0	0
447	5	14.020	14.100	34.165	39.619
2	0	0	0	0	0
448	5	8.726	14.020	34.165	34.245
2	0	0	0	0	0
449	5	8.646	8.726	26.649	32.103
2	0	0	0	0	0
450	5	8.726	14.020	32.023	32.103
2	0	0	0	0	0
451	5	14.020	14.100	26.649	32.103
2	0	0	0	0	0
452	5	8.726	14.020	26.649	26.729
2	0	0	0	0	0
453	5	8.646	8.726	19.315	24.769
2	0	0	0	0	0
454	5	8.726	14.020	24.689	24.769
2	0	0	0	0	0
455	5	14.020	14.100	19.315	24.769
2	0	0	0	0	0
456	5	8.726	14.020	19.315	19.395
2	0	0	0	0	0
457	5	8.646	8.726	12.099	17.553
2	0	0	0	0	0
458	5	8.726	14.020	17.473	17.553
2	0	0	0	0	0
459	5	14.020	14.100	12.099	17.553
2	0	0	0	0	0
460	5	8.726	14.020	12.099	12.179
2	0	0	0	0	0
461	5	8.646	8.726	5.065	10.519
2	0	0	0	0	0

REVISION	0				PAGE 47 OF 74
PREPARED BY / DATE	<i>FCA</i> 8/14/91				
CHECKED BY / DATE	<i>LSJ</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT

FILE NO: NUH004.0414

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

462	5	8.726	14.020	10.439	10.519
2	0	0	0	0	0
463	5	14.020	14.100	5.065	10.519
2	0	0	0	0	0
464	5	8.726	14.020	5.065	5.145
2	0	0	0	0	0
465	5	15.862	15.942	48.715	54.169
2	0	0	0	0	0
466	5	15.942	21.236	54.089	54.169
2	0	0	0	0	0
467	5	21.236	21.316	48.715	54.169
2	0	0	0	0	0
468	5	15.942	21.236	48.715	48.795
2	0	0	0	0	0
469	5	15.862	15.942	41.499	46.953
2	0	0	0	0	0
470	5	15.942	21.316	46.873	46.953
2	0	0	0	0	0
471	5	21.236	21.316	41.499	46.953
2	0	0	0	0	0
472	5	15.942	21.236	41.499	41.579
2	0	0	0	0	0
473	5	15.862	15.942	34.165	39.619
2	0	0	0	0	0
474	5	15.942	21.236	39.539	39.619
2	0	0	0	0	0
475	5	21.236	21.316	34.165	39.619
2	0	0	0	0	0
476	5	15.942	21.236	34.165	34.245
2	0	0	0	0	0
477	5	15.862	15.942	26.649	32.103
2	0	0	0	0	0
478	5	15.942	21.236	32.023	32.103
2	0	0	0	0	0
479	5	21.236	21.316	26.649	32.103
2	0	0	0	0	0
480	5	15.942	21.236	26.649	26.729
2	0	0	0	0	0
481	5	15.862	15.942	19.315	24.769
2	0	0	0	0	0
482	5	15.942	21.236	24.689	24.769
2	0	0	0	0	0
483	5	21.236	21.316	19.315	24.769
2	0	0	0	0	0
484	5	15.942	21.236	19.315	19.395
2	0	0	0	0	0
485	5	15.862	15.942	12.099	17.553
2	0	0	0	0	0
486	5	15.942	21.236	17.473	17.553
2	0	0	0	0	0
487	5	21.236	21.316	12.099	17.553
2	0	0	0	0	0
488	5	15.942	21.236	12.099	12.179
2	0	0	0	0	0
489	5	22.896	22.976	41.499	46.953
2	0	0	0	0	0
490	5	22.976	28.270	46.873	46.953
2	0	0	0	0	0
491	5	28.270	28.350	41.499	46.953
2	0	0	0	0	0
492	5	22.976	28.270	41.499	41.579
2	0	0	0	0	0
493	5	22.896	22.976	34.165	39.619
2	0	0	0	0	0

REVISION

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PREPARED BY / DATE

FCC 8/14/91

CHECKED BY / DATE

KBJ 4/14/92

PAGE 48
OF 74

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

494	5	22.976	28.270	39.539	39.619
2	0	0	0	0	0
495	5	28.270	28.350	34.165	39.619
2	0	0	0	0	0
496	5	22.976	28.270	34.165	34.245
2	0	0	0	0	0
497	5	22.896	22.976	26.649	32.103
2	0	0	0	0	0
498	5	22.976	28.270	32.023	32.103
2	0	0	0	0	0
499	5	28.270	28.350	26.649	32.103
2	0	0	0	0	0
500	5	22.976	28.270	26.649	26.729
2	0	0	0	0	0
501	5	22.896	22.976	19.315	24.769
2	0	0	0	0	0
502	5	22.976	28.270	24.689	24.769
2	0	0	0	0	0
503	5	28.270	28.350	19.315	24.769
2	0	0	0	0	0
504	5	22.976	28.270	19.315	19.395
2	0	0	0	0	0

MATERIALS

1	FUEL	0	0	0	-3
2	POISON	0	0	0	-1
3	HELIUM	0	0	0	-2
4	SS304	0	0	0	-1
5	ZALOY	0	0	0	-4
6	CSTEEL	0	0	0	-5

INITIAL TEMPERATURES

1	550
2	450
3	250
4	200

HEAT GENERATIONS

1	5.70D-3
---	---------

BOUNDARY CONDITIONS

1	0				
3	3				
301	2	303.4	0.0	0.0	0.0
302	2	302.1			
303	2	295.3			
304	2	275.4			
305	2	242.4			
306	2	233.0			
307	2	227.7			
308	2	224.9			
309	2	226.9			
310	2	244.2			
311	2	242.7			
312	2	223.7			

REVISION	0				PAGE 49 OF 74
PREPARED BY / DATE	<i>FCT</i> 8/14/91				
CHECKED BY / DATE	<i>LCB</i> 4/14/97				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION

FILE NO: NUH004.0414

PROJECT

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

@ 850. 2.9444D-2 900. 2.9028D-2 950. 2.8472D-2 1000. 2.7778D-2
 @ 1050. 2.7222D-2 1100. 2.6667D-2 1150. 2.5972D-2 1200. 2.5278D-2
 @ 1250. 2.4306D-2 1300. 2.3194D-2 1350. 2.1944D-2 1400. 2.1250D-2
 @ 1450. 2.0972D-2 1500. 2.0972D-2

STEADY STATE PARAMETERS

-15 0.001

%

5.3 Input File for BWRVAC

HEAT6,P1.

USER,PNFS103,XPNSX,NC.

CHARGE,N976301,30023000.

REWIND,OUTPUT.

BEGIN,HEAT6,HEATPRC,DATAFIL=INPUT,TIM=10,CLASS=Z,DATNAME=BWRVAC2,CORE=6400K.

/*EOR

&OPTION MAXBDC=22,NDIMEN=2,MAXGGL=62,MAXMAT=5,MAXNSN=1,MAXPBT=6,

@MAXPTS=2400,MAXREG=279,MAXRFG=34,MAXSUR=1000,MAXTBL=30,MAXTFG=70,

@MAXZFG=1,MWIDTH=500,DIRECT=T,LBOUND=T,MAXINT=5,MAXPRS=30,&END

PRE-FAB STD CANISTER, Q=1.00KW, KHE=BWRVAC2,KF=BWRVAC2,1ST RUN

300 7 1 0.0 0.0 0.0 1 0 0

0 0 0 0 0 0 0 200

REGIONS

*

* FUEL REGIONS

*

1	1	1.392	6.686	55.904	61.139
1	1	0	0	0	0
2	1	1.392	6.686	48.795	54.089
1	1	0	0	0	0
3	1	1.392	6.686	41.579	46.873
1	1	0	0	0	0
4	1	1.392	6.686	34.245	39.539
1	1	0	0	0	0
5	1	1.392	6.686	26.729	32.023
1	1	0	0	0	0
6	1	1.392	6.686	19.395	24.689
1	1	0	0	0	0
7	1	1.392	6.686	12.179	17.473
1	1	0	0	0	0
8	1	1.392	6.686	5.145	10.439
1	1	0	0	0	0
9	1	8.726	14.020	55.904	61.139
1	1	0	0	0	0
10	1	8.726	14.020	48.795	54.089
1	1	0	0	0	0
11	1	8.726	14.020	41.579	46.873
1	1	0	0	0	0
12	1	8.726	14.020	34.245	39.539
1	1	0	0	0	0
13	1	8.726	14.020	26.729	32.023
1	1	0	0	0	0
14	1	8.726	14.020	19.395	24.689
1	1	0	0	0	0
15	1	8.726	14.020	12.179	17.473
1	1	0	0	0	0
16	1	8.726	14.020	5.145	10.439
1	1	0	0	0	0
17	1	15.942	21.236	48.795	54.089
1	1	0	0	0	0
18	1	15.942	21.236	41.579	46.873
1	1	0	0	0	0
19	1	15.942	21.236	34.245	39.539

REVISION	0				
PREPARED BY / DATE	<i>Fect</i> 8/14/91				PAGE 51 OF 74
CHECKED BY / DATE	<i>1LQ</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT

FILE NO: NUH004.0414

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

1	1	0	0	0	0
20	1	15.942	21.236	26.729	32.023
1	1	0	0	0	0
21	1	15.942	21.236	19.395	24.689
1	1	0	0	0	0
22	1	15.942	21.236	12.179	17.473
1	1	0	0	0	0
23	1	22.976	28.270	41.579	46.873
1	1	0	0	0	0
24	1	22.976	28.270	34.245	39.539
1	1	0	0	0	0
25	1	22.976	28.270	26.729	32.023
1	1	0	0	0	0
26	1	22.976	28.270	19.395	24.689
1	1	0	0	0	0

* POISON PLATES

27	2	1.312	6.766	55.690	55.824
2	0	0	0	0	0
28	2	.600	.734	48.715	54.169
2	0	0	0	0	0
29	2	6.766	6.900	48.565	54.169
2	0	0	0	0	0
30	2	1.312	6.766	47.531	47.665
2	0	0	0	0	0
31	2	1.312	6.766	41.365	41.499
2	0	0	0	0	0
32	2	.600	.734	34.165	39.619
2	0	0	0	0	0
33	2	6.766	6.900	34.165	39.619
2	0	0	0	0	0
34	2	1.312	6.766	32.681	32.815
2	0	0	0	0	0
35	2	1.312	6.766	26.515	26.649
2	0	0	0	0	0
36	2	.600	.734	19.315	24.769
2	0	0	0	0	0
37	2	6.766	6.900	19.315	24.769
2	0	0	0	0	0
38	2	1.312	6.766	18.131	18.265
2	0	0	0	0	0
39	2	1.312	6.766	11.965	12.099
2	0	0	0	0	0
40	2	.600	.734	5.065	10.519
2	0	0	0	0	0
41	2	6.766	6.900	5.065	10.519
2	0	0	0	0	0
42	2	7.950	8.084	55.690	61.219
2	0	0	0	0	0
43	2	8.646	14.100	54.731	54.865
2	0	0	0	0	0
44	2	8.646	14.100	48.565	48.715
2	0	0	0	0	0
45	2	7.950	8.084	41.499	46.953
2	0	0	0	0	0
46	2	14.100	14.250	41.499	46.953
2	0	0	0	0	0
47	2	7.950	14.100	40.181	40.315
2	0	0	0	0	0
48	2	8.646	14.100	34.015	34.165
2	0	0	0	0	0
49	2	7.950	8.084	26.649	32.815
2	0	0	0	0	0

REVISION	0				PAGE 52 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/14/91				
CHECKED BY / DATE	<i>ICBY</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	<u>NUHOMS 10CFR72 CERTIFICATION PROJECT</u>	FILE NO:	<u>NUH004.0414</u>
CLIENT:	<u>PACIFIC NUCLEAR FUEL SERVICES</u>	CALC. NO:	<u>NUH004.0414</u>

50	2	14.100	14.250	26.649	32.103
2	0	0	0	0	0
51	2	7.950	14.100	25.331	25.465
2	0	0	0	0	0
52	2	7.950	14.100	19.165	19.315
2	0	0	0	0	0
53	2	7.950	8.084	12.099	17.553
2	0	0	0	0	0
54	2	14.100	14.250	12.099	17.553
2	0	0	0	0	0
55	2	7.950	14.100	11.006	11.140
2	0	0	0	0	0
56	2	15.150	15.284	48.565	54.169
2	0	0	0	0	0
57	2	15.862	21.316	47.531	47.665
2	0	0	0	0	0
58	2	15.862	21.316	41.365	41.499
2	0	0	0	0	0
59	2	15.150	15.284	34.165	40.315
2	0	0	0	0	0
60	2	21.316	21.450	34.165	39.619
2	0	0	0	0	0
61	2	15.150	21.316	32.681	32.815
2	0	0	0	0	0
62	2	15.150	21.316	26.515	26.649
2	0	0	0	0	0
63	2	15.150	15.284	19.315	24.769
2	0	0	0	0	0
64	2	21.316	21.450	19.315	24.769
2	0	0	0	0	0
65	2	15.150	21.316	18.131	18.265
2	0	0	0	0	0
66	2	22.275	22.409	41.499	46.953
2	0	0	0	0	0
67	2	22.275	28.350	40.181	40.315
2	0	0	0	0	0
68	2	22.896	28.350	34.015	34.165
2	0	0	0	0	0
69	2	22.275	22.409	26.649	32.815
2	0	0	0	0	0
70	2	22.275	28.350	25.331	25.465
2	0	0	0	0	0

* HELIUM (PURE)

101	3	0	1.312	55.690	61.219
2	0	1	0	0	0
102	3	6.766	7.950	55.690	61.219
2	0	3	3	0	0
103	3	8.084	8.646	55.690	61.219
2	0	3	3	0	0
104	3	0	.600	47.665	55.690
2	0	1	0	0	0
105	3	.600	6.900	54.169	55.690
2	0	0	0	3	3
106	3	6.900	8.646	48.565	55.690
2	0	3	3	0	0
107	3	8.646	14.100	54.865	55.690
2	0	0	0	3	3
108	3	8.646	14.100	54.169	55.824
2	0	0	0	3	3
109	3	.734	1.312	48.715	54.169
2	0	3	3	0	0
110	3	14.100	15.150	48.565	54.169

REVISION	0			PAGE 53 OF 74
PREPARED BY / DATE	<i>Fcd</i> 8/14/91			
CHECKED BY / DATE	<i>LCB</i> 4/14/92			

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT
CLIENT: PACIFIC NUCLEAR FUEL SERVICES

FILE NO: NUH004.0414
CALC. NO: NUH004.0414

2	0	3	3	0	0
111	3	15.284	15.862	48.565	54.169
2	0	3	3	0	0
112	3	.600	6.766	47.665	48.715
2	0	0	0	3	3
113	3	15.862	21.316	47.665	48.715
2	0	0	0	3	3
114	3	0	1.312	41.365	47.665
2	0	1	0	0	0
115	3	1.312	6.766	46.953	47.531
2	0	0	0	3	3
116	3	6.766	15.862	46.953	48.565
2	0	0	0	3	3
117	3	15.862	21.316	46.953	47.531
2	0	0	0	3	3
118	3	21.316	22.275	41.365	46.953
2	0	3	3	0	0
119	3	6.766	7.950	41.365	46.953
2	0	3	3	0	0
120	3	8.084	8.646	41.499	46.953
2	0	3	3	0	0
121	3	14.250	15.862	40.315	46.953
2	0	3	3	0	0
122	3	22.409	22.896	41.499	46.953
2	0	3	3	0	0
123	3	0	7.950	39.619	41.365
2	0	1	0	3	3
124	3	6.900	8.646	34.165	39.619
2	0	3	3	0	0
125	3	7.950	14.250	40.315	41.499
2	0	0	0	3	3
126	3	15.862	22.275	39.619	41.365
2	0	0	0	3	3
127	3	22.275	28.350	40.315	41.499
2	0	0	0	3	3
129	3	7.950	14.100	39.619	40.181
2	0	0	0	3	3
130	3	14.100	15.150	34.015	40.315
2	0	3	3	0	0
132	3	21.450	22.896	32.815	39.619
2	0	3	3	0	0
133	3	22.275	28.350	39.619	40.181
2	0	0	0	3	3
134	3	0	.600	32.815	39.619
2	0	1	0	0	0
135	3	.734	1.312	34.165	39.619
2	0	3	3	0	0
136	3	15.284	15.862	34.165	40.315
2	0	3	3	0	0
137	3	.600	8.646	32.815	34.165
2	0	0	0	3	3
138	3	8.646	15.150	32.103	34.015
2	0	0	0	3	3
139	3	15.150	21.450	32.815	34.165
2	0	0	0	3	3
140	3	22.896	28.350	32.103	34.015
2	0	0	0	3	3
141	3	0	1.312	26.515	32.815
2	0	1	0	0	0
142	3	1.312	6.766	32.103	32.681
2	0	0	0	3	3
143	3	6.766	7.950	26.515	32.815
2	0	3	3	0	0
146	3	15.150	21.316	32.103	32.681

REVISION

0

PREPARED BY / DATE

Fut 8/14/91

CHECKED BY / DATE

(LB) 4/14/92

PAGE 54
OF 74

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

2	0	0	0	3	3
148	3	8.084	8.646	26.649	32.815
2	0	3	3	0	0
149	3	14.250	15.862	26.649	32.103
2	0	3	3	0	0
150	3	21.316	22.275	26.515	32.815
2	0	3	3	0	0
151	3	22.409	22.896	26.649	32.815
2	0	3	3	0	0
152	3	0	7.950	24.769	26.515
2	0	1	0	3	3
153	3	7.950	14.100	24.769	25.331
2	0	0	0	3	3
154	3	15.150	22.275	24.769	26.515
2	0	0	0	3	3
155	3	22.275	28.350	25.465	26.649
2	0	0	0	3	3
157	3	7.950	15.150	25.465	26.649
2	0	0	0	3	3
158	3	14.100	15.150	19.165	25.465
2	0	3	3	0	0
160	3	22.275	28.350	24.769	25.331
2	0	0	0	3	3
161	3	0	.600	18.265	24.769
2	0	1	0	0	0
162	3	.734	1.312	19.315	24.769
2	0	3	3	0	0
163	3	6.900	8.646	19.315	24.769
2	0	3	3	0	0
164	3	15.284	15.862	19.315	24.769
2	0	3	3	0	0
165	3	21.450	22.896	19.315	24.769
2	0	3	3	0	0
166	3	.600	7.950	18.265	19.315
2	0	0	0	3	3
167	3	7.950	15.150	17.553	19.165
2	0	0	0	3	3
168	3	15.150	21.316	18.265	19.315
2	0	0	0	3	3
169	3	0	1.312	11.965	18.265
2	0	1	0	0	0
170	3	1.312	6.766	17.553	18.131
2	0	0	0	3	3
171	3	6.766	7.950	11.965	18.265
2	0	3	3	0	0
172	3	8.084	8.646	12.099	17.553
2	0	3	3	0	0
173	3	14.250	15.862	12.099	17.553
2	0	3	3	0	0
175	3	15.150	21.316	17.553	18.131
2	0	0	0	3	3
176	3	0	7.950	10.519	11.965
2	0	1	0	3	3
177	3	7.950	14.100	11.140	12.099
2	0	0	0	3	3
178	3	0	.600	5.065	10.519
2	0	1	0	0	0
179	3	.734	1.312	5.065	10.519
2	0	3	3	0	0
180	3	6.900	8.646	5.065	10.519
2	0	3	3	0	0
182	3	7.950	14.100	10.519	11.006
2	0	0	0	3	3

REVISION	0				PAGE 55 OF 74
PREPARED BY / DATE	<i>Fitt</i> 8/14/91				
CHECKED BY / DATE	<i>ICB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT

FILE NO: NUH004.0414

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

* HELIUM (DSC BOUNDED)

201	3	0	6.766	61.219	66.201
3	0	1	0	3	3
202	3	6.766	14.100	61.219	65.624
3	0	0	0	3	3
203	3	14.100	22.275	54.169	61.219
3	0	3	3	3	3
204	3	21.316	29.200	46.953	54.169
3	0	3	3	3	3
205	3	28.350	32.375	39.619	46.953
3	0	3	3	0	0
206	3	28.350	33.000	32.815	39.619
3	0	3	3	0	0
207	3	28.350	33.000	26.649	32.815
3	0	3	3	0	0
208	3	28.350	32.375	19.315	26.649
3	0	3	3	0	0
209	3	21.316	29.200	12.099	19.315
3	0	3	3	3	3
210	3	14.100	22.275	5.065	12.099
3	0	3	3	3	3
211	3	6.766	14.100	1.250	5.065
3	0	0	0	3	3
212	3	0.	6.766	0.625	5.065
3	0	1	0	3	3

* DSC SHELL

301	4	0	6.766	66.201	66.826
4	0	1	1	0	301
302	4	6.766	14.100	65.624	66.201
4	0	1	1	0	302
303	4	14.100	15.150	61.219	65.624
4	0	0	303	0	1
304	4	15.150	22.275	61.219	61.844
4	0	0	1	0	304
305	4	22.275	22.896	54.169	61.219
4	0	0	305	0	1
306	4	22.896	29.200	54.169	54.731
4	0	0	1	0	306
307	4	29.200	29.825	46.953	54.169
4	0	0	307	0	1
308	4	29.825	32.375	46.953	47.531
4	0	0	1	0	308
309	4	32.375	33.000	39.619	46.953
4	0	0	309	0	1
310	4	33.000	33.625	32.815	39.619
4	0	0	310	0	1
311	4	33.000	33.625	26.649	32.815
4	0	0	311	1	0
312	4	32.375	33.000	19.315	26.649
4	0	0	312	1	0
313	4	29.825	32.375	18.265	19.315
4	0	0	1	313	0
314	4	29.200	29.825	12.099	19.315
4	0	0	314	1	0
315	4	22.896	29.200	11.474	12.099
4	0	0	1	315	0
316	4	22.275	22.896	5.065	12.099
4	0	0	316	1	0
317	4	15.150	22.275	4.440	5.065
4	0	0	1	317	0
318	4	14.100	15.150	1.250	5.065

REVISION	0				PAGE 56 OF 74
PREPARED BY / DATE	<i>FLOT</i> 8/14/91				
CHECKED BY / DATE	<i>ICB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

4	0	0	318	1	0
319	4	6.766	14.100	.625	1.250
4	0	0	1	319	0
320	4	0	6.766	0	0.625
4	0	1	1	320	0

* FUEL CHANNELS *

401	5	1.312	1.392	55.824	61.219
2	0	0	0	0	0
402	5	1.392	6.686	61.139	61.219
2	0	0	0	0	0
403	5	6.686	6.766	55.824	61.219
2	0	0	0	0	0
404	5	1.392	6.686	55.824	55.904
2	0	0	0	0	0
405	5	1.312	1.392	48.715	54.169
2	0	0	0	0	0
406	5	1.392	6.686	54.089	54.169
2	0	0	0	0	0
407	5	6.686	6.766	48.715	54.169
2	0	0	0	0	0
408	5	1.392	6.686	48.715	48.795
2	0	0	0	0	0
409	5	1.312	1.392	41.499	41.579
2	0	0	0	0	0
410	5	1.392	6.686	46.873	46.953
2	0	0	0	0	0
411	5	6.686	6.766	41.499	46.953
2	0	0	0	0	0
412	5	1.392	6.686	41.499	41.579
2	0	0	0	0	0
413	5	1.312	1.392	34.165	39.619
2	0	0	0	0	0
414	5	1.392	6.686	39.539	39.619
2	0	0	0	0	0
415	5	6.686	6.766	34.165	39.619
2	0	0	0	0	0
416	5	1.392	6.686	34.165	34.245
2	0	0	0	0	0
417	5	1.312	1.392	26.649	32.103
2	0	0	0	0	0
418	5	1.392	6.686	32.023	32.103
2	0	0	0	0	0
419	5	6.686	6.766	26.649	32.103
2	0	0	0	0	0
420	5	1.392	6.686	26.649	26.729
2	0	0	0	0	0
421	5	1.312	1.392	19.315	24.769
2	0	0	0	0	0
422	5	1.392	6.686	24.689	24.769
2	0	0	0	0	0
423	5	6.686	6.766	19.315	24.769
2	0	0	0	0	0
424	5	1.392	6.686	19.315	19.395
2	0	0	0	0	0
425	5	1.312	1.392	12.099	17.553
2	0	0	0	0	0
426	5	1.392	6.686	17.473	17.553
2	0	0	0	0	0
427	5	6.686	6.766	12.099	17.553
2	0	0	0	0	0
428	5	1.392	6.686	12.099	12.179
2	0	0	0	0	0

REVISION	0				PAGE 57 OF 74
PREPARED BY / DATE	<i>FCD</i> 8/14/91				
CHECKED BY / DATE	<i>ICB</i> 6/11/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

429	5	1.312	1.392	5.065	10.519
2	0	0	0	0	0
430	5	1.392	6.686	10.439	10.519
2	0	0	0	0	0
431	5	6.686	6.766	5.065	10.519
2	0	0	0	0	0
432	5	1.392	6.686	5.065	5.145
2	0	0	0	0	0
433	5	8.646	8.726	55.824	61.219
2	0	0	0	0	0
434	5	8.726	14.020	61.139	61.219
2	0	0	0	0	0
435	5	14.020	14.100	55.824	61.219
2	0	0	0	0	0
436	5	8.726	14.020	55.824	55.904
2	0	0	0	0	0
437	5	8.646	8.726	48.715	54.169
2	0	0	0	0	0
438	5	8.726	14.020	54.089	54.169
2	0	0	0	0	0
439	5	14.020	14.100	48.715	54.169
2	0	0	0	0	0
440	5	8.726	14.020	48.715	48.795
2	0	0	0	0	0
441	5	8.646	8.726	41.499	46.953
2	0	0	0	0	0
442	5	8.726	14.020	46.873	46.953
2	0	0	0	0	0
443	5	14.020	14.100	41.499	46.953
2	0	0	0	0	0
444	5	8.726	14.020	41.499	41.579
2	0	0	0	0	0
445	5	8.646	8.726	34.165	39.619
2	0	0	0	0	0
446	5	8.726	14.020	39.539	39.619
2	0	0	0	0	0
447	5	14.020	14.100	34.165	39.619
2	0	0	0	0	0
448	5	8.726	14.020	34.165	34.245
2	0	0	0	0	0
449	5	8.646	8.726	26.649	32.103
2	0	0	0	0	0
450	5	8.726	14.020	32.023	32.103
2	0	0	0	0	0
451	5	14.020	14.100	26.649	32.103
2	0	0	0	0	0
452	5	8.726	14.020	26.649	26.729
2	0	0	0	0	0
453	5	8.646	8.726	19.315	24.769
2	0	0	0	0	0
454	5	8.726	14.020	24.689	24.769
2	0	0	0	0	0
455	5	14.020	14.100	19.315	24.769
2	0	0	0	0	0
456	5	8.726	14.020	19.315	19.395
2	0	0	0	0	0
457	5	8.646	8.726	12.099	17.553
2	0	0	0	0	0
458	5	8.726	14.020	17.473	17.553
2	0	0	0	0	0
459	5	14.020	14.100	12.099	17.553
2	0	0	0	0	0
460	5	8.726	14.020	12.099	12.179
2	0	0	0	0	0

REVISION	0				PAGE 58 OF 74
PREPARED BY / DATE	<i>FLA</i> 8/14/91				
CHECKED BY / DATE	<i>VLB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

461	5	8.646	8.726	5.065	10.519
2	0	0	0	0	0
462	5	8.726	14.020	10.439	10.519
2	0	0	0	0	0
463	5	14.020	14.100	5.065	10.519
2	0	0	0	0	0
464	5	8.726	14.020	5.065	5.145
2	0	0	0	0	0
465	5	15.862	15.942	48.715	54.169
2	0	0	0	0	0
466	5	15.942	21.236	54.089	54.169
2	0	0	0	0	0
467	5	21.236	21.316	48.715	54.169
2	0	0	0	0	0
468	5	15.942	21.236	48.715	48.795
2	0	0	0	0	0
469	5	15.862	15.942	41.499	46.953
2	0	0	0	0	0
470	5	15.942	21.316	46.873	46.953
2	0	0	0	0	0
471	5	21.236	21.316	41.499	46.953
2	0	0	0	0	0
472	5	15.942	21.236	41.499	41.579
2	0	0	0	0	0
473	5	15.862	15.942	34.165	39.619
2	0	0	0	0	0
474	5	15.942	21.236	39.539	39.619
2	0	0	0	0	0
475	5	21.236	21.316	34.165	39.619
2	0	0	0	0	0
476	5	15.942	21.236	34.165	34.245
2	0	0	0	0	0
477	5	15.862	15.942	26.649	32.103
2	0	0	0	0	0
478	5	15.942	21.236	32.023	32.103
2	0	0	0	0	0
479	5	21.236	21.316	26.649	32.103
2	0	0	0	0	0
480	5	15.942	21.236	26.649	26.729
2	0	0	0	0	0
481	5	15.862	15.942	19.315	24.769
2	0	0	0	0	0
482	5	15.942	21.236	24.689	24.769
2	0	0	0	0	0
483	5	21.236	21.316	19.315	24.769
2	0	0	0	0	0
484	5	15.942	21.236	19.315	19.395
2	0	0	0	0	0
485	5	15.862	15.942	12.099	17.553
2	0	0	0	0	0
486	5	15.942	21.236	17.473	17.553
2	0	0	0	0	0
487	5	21.236	21.316	12.099	17.553
2	0	0	0	0	0
488	5	15.942	21.236	12.099	12.179
2	0	0	0	0	0
489	5	22.896	22.976	41.499	46.953
2	0	0	0	0	0
490	5	22.976	28.270	46.873	46.953
2	0	0	0	0	0
491	5	28.270	28.350	41.499	46.953
2	0	0	0	0	0
492	5	22.976	28.270	41.499	41.579
2	0	0	0	0	0

REVISION	0				PAGE 59 OF 74
PREPARED BY / DATE	<i>Fut</i> 8/14/91				
CHECKED BY / DATE	<i>LCB</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

493	5	22.896	22.976	34.165	39.619
2	0	0	0	0	0
494	5	22.976	28.270	39.539	39.619
2	0	0	0	0	0
495	5	28.270	28.350	34.165	39.619
2	0	0	0	0	0
496	5	22.976	28.270	34.165	34.245
2	0	0	0	0	0
497	5	22.896	22.976	26.649	32.103
2	0	0	0	0	0
498	5	22.976	28.270	32.023	32.103
2	0	0	0	0	0
499	5	28.270	28.350	26.649	32.103
2	0	0	0	0	0
500	5	22.976	28.270	26.649	26.729
2	0	0	0	0	0
501	5	22.896	22.976	19.315	24.769
2	0	0	0	0	0
502	5	22.976	28.270	24.689	24.769
2	0	0	0	0	0
503	5	28.270	28.350	19.315	24.769
2	0	0	0	0	0
504	5	22.976	28.270	19.315	19.395
2	0	0	0	0	0

MATERIALS

1	FUEL	0	0	0	-3
2	POISON	0	0	0	-1
3	HELIUM	1.00	-10	0	0
4	SS304	0	0	0	-1
5	ZALOY	0	0	0	-4

INITIAL TEMPERATURES

1	550
2	450
3	250
4	200

HEAT GENERATIONS

1	5.700-3
---	---------

BOUNDARY CONDITIONS

1	0				
3	0.0	0.0	0.0	0.0	0
301	2	358.0			
302	2	358.0			
303	2	358.0			
304	2	358.0			
305	2	358.0			
306	2	358.0			
307	2	358.0			
308	2	358.0			
309	2	358.0			
310	2	358.0			
311	2	358.0			

REVISION	0				PAGE 60 OF 74
PREPARED BY / DATE	<i>Red</i> 8/14/91				
CHECKED BY / DATE	<i>LB</i> 7/17/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT FILE NO: NUH004.0414
CLIENT: PACIFIC NUCLEAR FUEL SERVICES CALC. NO: NUH004.0414

STEADY STATE PARAMETERS
-15 0.001
%

REVISION	0				PAGE 62 OF 74
PREPARED BY / DATE	<i>FLO</i> 8/14/91				
CHECKED BY / DATE	<i>KLSD</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT

FILE NO: NUH004.0414

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

TABLE 5-1

HEATING6 RUNS

Case	Input File	Output File	Run ID #
DSC in HSM 70°F ambient Fill = Helium	BWR28.INP	BWR28.OUT	OPHEAT6 91186 13.35.57.14
DSC in HSM 100°F ambient Fill = Helium	BWR42.INP	BWR42.OUT	OPHEAT6 91189 13.43.03.14
DSC in HSM 100°F ambient Fill = Steel	BWR52CS. INP	BWR52CS.OUT	OPHEAT6 91192 12.34.54.14
DSC in HSM 125°F ambient Fill = Helium	BWR44.INP	BWR44.OUT	OPHEAT6 91189 13.42.07.14
DSC in HSM 125°F ambient HSM vent blocked Fill = Helium	BWRBLKV. INP	BLKVENT.OUT	OPHEAT6 91193 12.50.54.14
DSC in Cask 100°F ambient Internal Vacuum	BWRVAC.INP	BWRVAC.OUT	OPHEAT6 91219 15.21.19.14
DSC in Cask 100°F ambient Internal Vacuum Fill = Steel	BWRVACCS. INP	BWRVACCS. OUT	OPHEAT6 91206 07.12.12.14

REVISION

0

PREPARED BY / DATE

FLC 8/14/91

CHECKED BY / DATE

LB 4/14/92

PAGE 63
OF 74

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

6.0 RESULTS

Seven HEATING6 runs were made to calculate the maximum fuel cladding temperatures and spacer disk temperature distributions for the cases defined above. The maximum fuel cladding temperatures are shown in Table 5-1. The temperature distribution for BWR28 (storage in the HSM at 70°F ambient and filled with helium) is shown in Figure 5-1. Spacer disk temperatures are shown in Table 5-2. Spacer disk temperature distributions for BWR52 (storage in HSM at 100°F ambient and filled with steel) and BWRVACCS (vacuum drying in cask at 100°F ambient and filled with steel) are shown in Figures 5-2 and 5-3.

REVISION	0				PAGE 64 OF 74
PREPARED BY / DATE	<i>FCD</i> 8/14/91				
CHECKED BY / DATE	<i>VCD</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

Figure 5-1

DSC IN HSM 70°F AMBIENT TEMPERATURE DISTRIBUTION

PRE-FAB STD CANISTER, Q=1.00KW, KHE=1STIT, KF=1STIT, 1ST RUN

UNMSUJ3/ U
20.12.04 07-05-91

PRE-FAB STD CANISTER, Q=1.00KW

STEADY STATE TEMPERATURE DISTRIBUTION AFTER 6 ITERATIONS, TIME = 0.0

STEADY STATE TEMPERATURE DISTRIBUTION

CROSS GRID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
FINE GRID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISTANCE	0.0	0.60	0.73	1.31	1.39	4.04	6.69	6.77	6.90	7.95	8.08	8.65	8.73	14.02	14.25	15.15	15.28
1 1	0.0	229190	229190	229190	229190	229190	229190	229190	229190	229190	229190	229190	229190	229190	229190	229190	229190
2 2	0.63	231159	231159	231159	231159	231159	231159	231159	231159	231159	231159	231159	231159	231159	231159	231159	231159
3 3	1.25	265190	266.04	266.04	266.09	266.07	263.06	235.65	231197	231.61	230.61	230.54	229.42	229.40	229.50	229150	0.0
4 4	4.44	426110	426.95	427.54	430.03	430.31	428.98	408.32	406.63	403.65	372.10	369.06	358.77	357.32	243.96	234139	236.05
5 5	5.06	434139	456165	456181	462111	463.15	461.85	458.26	449193	448159	382.25	379.12	381183	381.69	278.68	256153	249.50
6 6	5.14	444129	457183	457186	463148	463151	462.17	458159	450143	450120	390.08	386.55	381183	381172	278152	277179	264.59
7 7	7.79	495190	496124	496125	500183	500186	498.81	486114	485198	485181	448.17	443.36	423115	423101	352162	352166	349.33
8 8	10.44	532171	526135	526136	531165	531166	529.64	516176	516157	516143	496.44	490.11	457122	457103	398151	398132	400.66
9 9	10.52	537164	527101	527101	532165	531.93	529.71	517.85	516193	517137	502.98	494.74	458139	457.26	398176	398162	405.19
10 10	11.01	550164	549.64	550.43	557.54	558.26	558.73	545.29	543.82	541.22	513105	512.57	507.87	507.19	454.65	453166	443.98
11 11	11.14	554143	554.93	556.05	564.72	565.67	566.68	553.34	551.49	548.20	513160	512.70	508.12	507.45	454.92	454120	451.01
12 12	11.47	563159	566.44	568.50	583.14	584.62	586.43	574.19	571.49	566.42	538.89	537.43	531.76	531.00	478.00	465.69	468.67
13 13	11.96	573178	577.35	580.87	613182	614.55	615.32	608.66	607177	588.70	569.90	572.22	565.21	564.77	521.51	508.68	513.26
14 14	12.10	582135	587.12	590.33	614174	614.98	615.62	608.82	608181	598.72	585117	585109	573128	573.68	535.62	534162	532181
15 15	12.18	587122	592.54	595.50	615120	615124	615.92	609116	609106	603.79	586112	586104	574118	574113	535171	535137	534193
16 16	14.83	639186	640.30	640.50	641179	641179	640.63	634192	634184	632.30	612197	612189	598199	598192	565194	565170	565143
17 17	17.47	673195	671.62	670.30	661127	661125	658.79	653161	653154	652.60	634164	634153	621115	621107	589149	589121	588193
18 18	17.55	676138	674.30	672.96	661182	661.44	658.96	653.79	653170	655.20	635129	635113	622119	621.31	589173	589146	589166
19 19	18.13	695198	696.84	696.83	693161	693.65	690.15	685.55	685131	682.87	664.11	659.97	647.01	645.40	612.00	609160	605.33
20 20	18.26	700126	702.22	703.04	694122	693.85	690.33	685.72	685185	689.16	668.68	664.56	652.23	650.67	617.63	614.29	607.56
21 21	19.16	723177	725.57	725.67	725.03	725.06	722.95	715.46	714.75	713.39	683142	683.22	683.18	683.27	648.73	649194	643.38
22 22	19.31	726187	729193	729181	729176	730.27	728.39	726.71	726147	719180	683167	683.37	683139	683.56	641.66	640181	630.70
23 23	19.39	728137	730119	730119	730145	730146	728.57	726188	720170	720150	688.03	686.44	683195	683188	641132	641115	633.97
24 24	22.04	741128	741133	741134	742130	742130	740.33	733105	732191	732177	713.45	711.10	701151	701139	679103	678187	673.43
25 25	24.69	751188	751012	751020	750198	750198	748.04	742108	741195	741182	727.26	724.63	711159	711161	689107	688191	684.48
26 26	24.77	753122	750141	750140	751135	751.68	749.64	742.19	742187	742110	728.99	725.37	711199	711.49	685.15	684164	685.40
27 27	25.33	755190	755.72	755.89	757.39	757.53	756.28	748.23	747.35	745.78	728182	727.68	723111	723.73	685.96	684150	680.19
28 28	25.46	756159	756.78	757.03	758.95	759.14	758.05	749.94	748.92	747.05	728117	727.79	725.19	724.83	685.88	684188	681.20
29 29	26.51	761131	762.38	763.43	772171	773.00	772.64	767.68	767128	761.13	744.53	744.27	740.22	739.63	717.91	716.33	713.59
30 30	26.65	763170	765.10	766.05	773187	773.13	772.55	767.63	767169	763.84	750177	750160	741130	741.42	720.19	719188	719124
31 31	26.73	765106	766.62	767.48	773124	773126	772.67	767196	767187	765.23	751106	750198	741155	741150	720127	720101	719170
32 32	29.38	778161	778.88	779.01	779184	779184	778.80	774148	774139	772.48	757192	757184	746175	746168	725180	725150	725134
33 33	32.02	781133	781.43	781.47	781178	781179	780.58	776117	776109	774.26	760156	760148	749125	749117	727186	727162	727134
34 34	32.10	781136	781.45	781.49	781178	781.78	780.57	776.16	775184	774.19	760161	760153	749152	749.19	727.87	727161	727118
35 35	32.68	781146	781.49	781.50	781152	781.51	780.66	775.47	775127	773.80	760189	760182	753150	753.83	726.11	725.89	719.48
36 36	32.81	781148	781.50	781.51	781153	781.52	780.66	775.47	775133	773.97	760196	760176	753.30	752.15	726.11	725.68	718.86
37 37	34.01	781151	781.58	781.64	782.22	782.27	780.91	775.40	774.98	774.20	761.33	759.69	752135	752.24	733.66	733131	727.66
38 38	34.16	781147	781150	781151	782143	782.45	781.87	775.63	775149	775131	761.36	759.78	751130	751.27	733.78	733153	728.09
39 39	34.24	781145	781149	781150	782145	782146	781.88	775143	775151	775139	761.42	759.70	752140	752130	733173	733156	728.28
40 40	36.89	779196	780107	780107	781129	781130	779.93	774136	774125	774114	760.20	758.54	751190	751180	732188	732171	727.53
41 41	39.54	774123	775165	775165	776175	776175	775.37	769134	769121	769106	747.21	746.24	746116	746109	726163	726144	720.55
42 42	39.62	773119	773149	773150	776142	776142	775.85	769134	769121	768163	744.29	743.63	743176	743.99	726.31	725172	719.03
43 43	40.18	771136	771.65	771.60	771.04	770.98	768.86	760.96	759.97	758.15	733128	732.86	730135	730.54	708.21	707187	703.83
44 44	40.31	770184	770.86	770.74	769.73	769.61	767.34	759.30	758.28	756.43	733117	732.81	730.73	730.44	708.09	707159	699.34
45 45	41.36	766174	766.16	765.45	758187	758.66	756.66	750.72	750174	751.45	730.48	727.26	713.96	712.54	686.51	683.95	678.41
46 46	41.50	764161	763.81	763.22	758162	758.54	756.54	750.60	750156	749.33	726171	726145	710134	709.86	684124	684121	683169
47 47	41.58	763138	762.48	761.98	758168	758144	756.88	750152	750141	748.24	726145	726133	709186	709176	684144	684119	683195
48 48	44.23	740152	740.56	740.57	740162	740168	747.99	741169	741157	738.75	717112	717101	700154	700145	675172	675152	675128
49 49	46.87	716107	717.82	718.74	724153	724189	724.08	720153	720138	721.92	702101	701191	686182	686176	661160	661135	661103
50 50	46.95	714127	715.95	717.10	727188	727187	726.37	720157	720154	715.98	701139	701131	686182	686176	661160	661135	661103
51 51	47.53	699138	699.32	699.78	704113	704.19	703.88	701.88	701180	700.89	686.91	684.51	671.64	670.09	640.15	638.62	633.76
52 52	47.66	695193	694.99	694.72	703162	703.88	703.67	701.66	701148	697.89	683.89	681.25	667.69	666.00	635.54	633.33	629.00
53 53	48.56	675102	673.67	673.83	678.70	678.67	675.93	668.94	668161	666181							

Pacific Nuclear Fuel Services, Inc.

HEATING 01/23/85 KME=1871T, KP=1871T, 1ST RUN
OHEAT6

18M3033/ 0
20.12.04 07-05-91

PRE-FAB STD CANISTER, G=1.000U, KME=1871T, KP=1871T, 1ST R

CROSS GRID	IN	AFTER 6 ITERATIONS, TIME = 0.0						STEADY STATE TEMPERATURE DISTRIBUTION						AFTER 6 ITERATIONS					
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33		
		19.00	19.94	21.24	21.32	21.45	22.27	22.41	22.90	22.98	28.27	28.35	29.20	29.62	32.38	33.00	33.43		
1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
2	2	0.63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
3	3	1.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
4	4	4.44	223.10	223.10	223.10	223.10	223.10	223.10	223.10	223.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
5	5	5.06	225.67	225.28	223.88	223.59	222.94	217.64	212.77	218.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
6	6	5.14	229.11	228.39	224.11	223.53	222.50	212.93	212.45	210.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
7	7	7.79	320.30	318.98	242.76	240.53	236.71	211.26	211.36	210.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
8	8	10.44	397.00	396.33	293.88	288.38	278.85	211.96	211.62	210.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
9	9	10.52	399.69	398.99	297.34	291.64	281.77	212.04	211.69	210.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
10	10	11.01	416.43	415.54	320.77	313.77	301.58	212.70	212.22	210.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
11	11	11.14	421.33	420.15	328.19	320.84	308.00	212.92	212.41	210.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
12	12	11.47	432.40	431.69	348.55	340.43	326.10	213.64	213.00	209.95	206.48	206.48	206.48	206.48	0.0	0.0	0.0		
13	13	11.96	448.67	448.92	384.01	376.56	361.20	216.60	215.40	209.86	208.77	207.08	207.01	206.19	0.0	0.0	0.0		
14	14	12.10	453.81	453.88	394.73	394.73	374.77	219.62	218.38	218.28	209.21	207.27	207.19	206.94	206.60	0.0	0.0		
15	15	12.18	454.126	454.112	394.199	394.165	375.38	243.72	236.96	217.09	216.58	208.03	207.87	205.90	204.60	0.0	0.0		
16	16	16.83	489.149	489.128	429.119	428.910	421.92	378.98	372.53	350.45	346.98	234.06	231.76	206.11	204.60	0.0	0.0		
17	17	17.47	512.87	512.162	451.194	451.162	449.14	428.66	425.06	411.51	409.29	275.40	270.12	206.176	204.60	0.0	0.0		
18	18	17.55	513.182	512.79	452.87	451.106	451.32	430.53	426.87	413.19	410.96	278.20	272.74	206.187	204.60	0.0	0.0		
19	19	18.13	559.26	549.36	486.66	489.127	477.44	444.68	440.10	425.02	422.62	301.14	294.21	207.190	204.60	0.0	0.0		
20	20	18.26	558.64	548.54	486.83	489.129	481.49	447.33	442.60	427.54	425.16	307.48	300.23	208.132	205.127	205.130	0.0		
21	21	19.16	590.59	588.93	531.78	516.72	519.91	458.36	452.41	441.87	440.58	360.25	352.14	212.137	208.14	204.68	0.0		
22	22	19.31	594.83	593.88	544.18	543.132	541.81	454.86	448.19	442.65	443.89	371.28	369.135	213.142	208.31	207.111	207.150		
23	23	19.39	595.138	595.125	544.141	544.101	543.58	445.95	448.52	443.59	443.137	371.53	371.116	236.82	213.97	207.157	207.150		
24	24	22.04	612.139	612.125	566.95	566.166	563.36	513.21	504.62	473.66	473.120	404.100	403.173	251.74	213.38	208.184	207.150		
25	25	24.69	626.154	626.138	582.117	581.183	581.50	529.03	520.14	488.34	488.08	419.169	419.139	379.32	347.99	209.110	207.150		
26	26	24.77	627.134	626.93	582.31	581.195	581.61	529.74	519.79	488.91	488.14	419.75	418.84	380.35	348.92	209.112	207.150		
27	27	25.33	644.44	641.98	592.05	587.83	580.36	515.55	514.32	507.72	506.64	434.37	433.17	388.40	355.47	209.130	207.150		
28	28	25.46	647.66	645.26	595.10	590.41	582.06	515.84	514.62	507.81	506.72	434.43	433.00	390.19	357.04	209.136	207.150		
29	29	26.31	666.13	665.97	629.83	629.101	615.38	565.60	560.57	532.92	529.54	456.47	445.64	404.84	369.29	210.124	207.150		
30	30	26.65	666.642	666.12	630.82	629.171	619.26	571.57	571.03	531.88	531.37	462.79	461.38	407.45	370.86	210.178	207.150		
31	31	26.73	666.146	666.128	638.118	629.195	621.19	571.90	571.65	531.86	531.68	462.90	462.153	408.92	371.78	216.41	215.139		
32	32	29.38	671.629	671.62	639.150	639.127	631.35	581.98	581.74	539.85	539.63	472.32	471.98	446.88	395.64	259.06	228.184		
33	33	32.02	677.124	677.105	640.110	640.115	632.32	585.85	585.61	544.116	543.92	472.617	472.109	427.38	396.08	263.75	229.130		
34	34	32.10	677.129	677.83	648.36	639.140	631.57	585.94	585.71	544.198	543.95	472.43	471.876	426.76	396.01	263.83	229.134		
35	35	32.68	675.48	674.83	634.11	633.138	624.42	586.31	586.31	542.45	543.94	455.98	444.20	421.12	395.42	264.36	229.173		
36	36	32.81	675.44	674.82	634.08	633.121	620.37	586.64	586.12	545.90	547.58	454.39	442.16	420.66	395.48	264.48	230.01		
37	37	34.01	673.87	671.80	628.67	623.87	614.83	580.97	574.40	547.75	546.66	479.86	477.137	431.99	399.90	265.46	230.179		
38	38	34.16	671.111	670.75	629.94	629.147	628.63	581.82	574.53	547.88	546.65	479.13	478.14	432.86	400.29	265.49	230.184		
39	39	34.24	670.188	670.173	629.94	629.159	629.124	582.20	574.64	546.95	546.67	479.119	478.183	433.28	400.48	265.50	230.186		
40	40	36.89	668.177	668.162	628.80	628.132	628.122	581.40	573.80	546.116	545.89	478.144	478.111	432.39	398.44	261.82	230.139		
41	41	39.54	663.171	663.155	622.104	621.171	621.135	562.35	555.52	536.99	536.74	469.116	468.177	414.72	376.82	223.01	220.135		
42	42	39.62	664.111	663.47	621.95	621.152	620.166	556.68	550.26	536.174	536.83	469.89	467.139	413.35	375.78	217.65	214.48		
43	43	40.18	667.44	662.22	607.88	603.49	595.67	523.36	522.81	515.93	514.93	445.43	444.143	402.19	368.00	216.60	214.40		
44	44	40.31	667.13	660.96	605.27	600.57	592.24	523.28	521.94	515.83	514.82	445.32	443.73	399.71	366.13	216.644	214.40		
45	45	41.36	636.114	635.32	595.84	593.50	589.98	532.68	526.60	491.00	486.82	417.53	409.15	380.12	351.47	215.196	214.40		
46	46	41.50	635.145	635.19	595.74	593.52	587.60	527.86	526.44	482.76	482.82	416.62	415.81	378.74	349.76	215.193	214.40		
47	47	41.58	635.126	635.108	595.163	593.138	586.39	526.74	526.67	482.14	481.92	416.137	416.129	377.93	348.75	215.192	214.40		
48	48	44.23	623.127	623.108	581.133	581.109	571.61	512.45	512.20	466.157	466.134	401.158	401.132	351.58	318.77	215.167	214.40		
49	49	46.87	604.103	603.88	557.148	557.112	542.33	483.25	483.01	439.88	439.68	371.113	370.78	261.83	219.08	213.199	214.40		
50	50	46.95	603.108	603.06	557.22	554.40	531.99	482.05	481.74	439.141	439.42	370.98	368.87	219.67	213.53	213.128	214.40		
51	51	47.53	562.166	562.24	588.15	586.183	580.34	446.98	441.29	437.31	435.92	333.96	326.28	217.152	212.87	211.90	0.0		
52	52	47.56	562.125	562.84	587.93	586.112	498.78	443.20	437.43	435.59	432.20	326.58	318.79	217.164	213.30	0.0	0.0		
53	53	48.56	528.28	521.90	440.34	449.95	453.08	436.46	433.12	418.84	416.50	289.33	283.84	217.131	215.130	0.0	0.0		
54	54	48.71	513.87	513.84	455.67	455.104	452.18	433.23	429.69	415.92	413.67	284.27	279.12	217.128	215.130	0.0	0.0		
55	55	48.79	513.105	512.86	455.133	455.123	451.77	431.67	427.90	414.35	412.14	281.69	276.72	217.126	215.130	0.0	0.0		
56	56	51.44	490.149	490.133	434.112	433.183	427.01	385.06	378.76	357.16	353.77								

SPACER DISK TEMP. DISTRIBUTION

Disc in NSM
100° Ambient
Normal Operation Conditions

DISTANCE	0	0.6	0.73	1.31	1.39	4.04	6.69	6.77	6.9	7.95	8.08	8.65	8.73	14.02	14.1	14.25	15.15	15.28	15.86
0.63	257.28	257.32	257.325	257.335	257.335	257.165	255.915	255.4											
1.25	273.75	273.785	273.79	273.79	273.78	272.215	259.07	257.35	257.19	256.7	256.665	256.58	256.57	255.38	255.315				
4.44	350.16	351.485	351.755	352.87	353	352.115	342.28	341.48	340.065	325.06	323.62	318.775	318.085	261.645	258.035				
5.06	355.34	366.165	366.085	368.415	368.915	367.975	362.52	362.395	361.815	330.06	328.62	329.93	330.075	277.66	267.365	263.89	255.02	253.87	251.535
5.14	360.325	366.925	368.93					362.76	362.705	334.01	332.38	330.475			277.295	270.965	257.64	256.4	253.16
7.79	390.735	390.91	390.925					384.525	384.38	366.395	364.11	354.58			312.7	311.13	302.495	301.275	298.235
10.44	413.535	410.505	410.52					403.135	402.89	392.82	389.7	373.665			335.955	338.9	336.26	335.835	333.175
10.52	416.04	410.985	411.185	414.32	413.995	412.14	403.64	403.455	403.46	396.1	391.945	374.245			336.055	339.12	337.775	337.27	334.45
11.01	422.845	422.43	422.855	426.5	428.865	426.265	417.585	416.81	415.455	401.42	401.24	398.555	398.15	364.015	362.88	358.05	347.495	348.375	342.59
11.14	424.8	425.105	425.68	430.035	430.51	430.14	421.56	420.61	418.925	401.795	401.385	398.685	398.285	364.17	363.515	361.53	348.885	348.645	344.82
11.47	429.525	430.93	431.945	439.125	439.84	439.8	431.855	430.495	427.96	414.16	413.35	410.05	409.6	375.105	368.76	370.055	355.135	353.715	350.35
11.96	434.845	436.56	438.27	454.31	454.615	453.955	448.715	448.38	439.025	429.485	430.43	426.215	425.905	396.085	389.535	391.75	380.41	358.4	358.335
12.1	439.16	441.465	443.03	454.8	454.81	454.185	449	448.905	444.055	437.09	436.76	430.085	430.31	402.845	402.37	401.355	380.18	357.91	360.555
12.18	441.615	444.2	445.64	455.215				449.2	446.61	437.695	437.63				402.785	402.445	368.075	363.56	361.35
14.83	470.285	470.515	470.825	471.315				465.49	464.22	454.61	454.57				421.81	421.545	399.875	398.84	383.525
17.47	489.255	488.12	487.485	483.1				477.28	476.825	467.845	467.805				437.2	436.77	418.825	414.98	387.885
17.55	490.505	489.5	488.85	483.43				477.42	478.145	468.225	468.165	461.595	461.125	437.765	437.46	437.15	420.605	418.085	398.38
18.13	500.535	500.98	500.99	499.495	499.655	497.885	493.91	493.51	492.26	482.605	480.5	473.795	472.955	448.82	447.275	444.235	420.65	420.02	415.705
18.26	502.73	503.71	504.135	499.91	499.77	497.985	494.03	493.985	495.485	484.895	482.785	476.38	475.56	451.615	449.865	446.36	420.855	420.11	415.8
19.16	514.82	515.645	515.65	515.25	515.26	514.05	508.825	508.445	507.73	492.51	492.31	491.85	491.815	472.97	472.525	464.245	448.565	445.825	435.51
19.31	516.46	517.895	517.725	517.58	517.855	516.74	511.425	511.29	510.945	492.775	492.59	492.25	492.13	473.195	473.015	467.845	452.88	452.05	437.555
19.39	517.26	518.115	518.105					511.46	511.345	494.89	494.155	492.61			473.225	469.615	453.18	453.05	
22.04	526.46	526.49	526.505					520.45	520.315	510.58	508.41	504.655			485.455	482.715	468.375	468.28	
24.69	534.24	533.45	533.46					527.165	526.98	519.325	517.875	511.42			492.41	490.16	474.78	474.885	
24.77	534.95	533.64	533.73	534.45	534.34	532.785	527.455	527.31	527.19	520.225	518.34	511.64			492.315	490.775	475.04	474.715	460.815
25.33	536.585	536.53	536.63	537.45	537.52	536.315	530.585	530.095	529.235	519.875	519.755	518.08	517.84	500.32	499.745	497.48	483.525	480.355	489.325
25.46	536.98	537.105	537.24	538.23	538.33	537.185	531.48	530.905	529.91	520.085	519.8	518.125	517.88	500.38	500.15	499.09	483.655	481.085	470.845
26.51	539.73	540.24	540.75	545.24	545.38	543.37	540.43	540.215	537.135	528.485	529.21	525.595	525.22	507.815	507.06	505.47	483.705	483.17	480.58
26.85	540.865	541.845	542.1	545.495	545.485	544.495	540.55	540.455	538.53	531.895	531.405	526.115	526.105	508.84	508.725	508.28	483.915	483.365	480.905
26.73	541.87	542.425	542.845	545.63				540.575	539.245	531.83	531.87				508.8	508.525	488.875	485.245	481.03
28.38	549.83	549.98	550.055	550.52				545.88	544.71	537.35	537.305				513.82	513.585	499.175	497.125	488.575
32.02	551.98	552.035	552.07	552.275				547.38	546.445	539.475	539.43				516.225	515.935	499.57	497.55	490.48
32.1	552.005	552.065	552.09	552.275				547.265	546.43	539.505	539.46	533.23	533.06	516.495	516.27	515.895	499.885	496.885	490.515
32.68	552.16	552.18	552.185	552.21	552.23	551.1	547.365	547.135	546.415	539.615	539.56	535.24	534.395	515.66	514.48	512.14	492.255	491.59	488.275
32.81	552.185	552.205	552.21	552.235	552.235	551.095	547.37	547.25	546.495	539.62	539.43	535.22	534.575	518.665	514.38	511.84	492.19	491.58	488.285
34.01	552.395	552.415	552.435	552.69	552.71	551.585	547.415	547.17	546.725	539.93	539.045	535.015	534.88	518.425	518.17	516.24	500.355	498.28	487.475
34.18	552.41	552.405	552.38	552.8	552.82	551.685	547.535	547.43	547.285	539.99	539.15	535.14	535	519.43	519.24	518.45	500.53	500.03	488.085
34.24	552.415	552.43	552.425					547.44	547.325	540.045	539.135	535.24			519.235	516.55	500.845	500.52	
36.89	552.435	552.5	552.51					547.925	547.805	540.72	539.89	536.585			519.35	516.73	501.155	501.08	
39.54	550.1	550.805	550.81					545.875	545.545	534.475	533.985	533.945			515.315	512.33	497.185	497.07	
39.82	549.8	550.745	550.775	551.32	551.46	550.39	545.75	545.62	545.335	533	532.89	533.745			514.885	511.53	496.95	496.855	481.41
40.18	548.75	548.91	548.89	548.85	548.625	547.18	541.855	541.12	540.145	527.275	526.83	525.1	524.85	506.01	505.735	503.665	495.265	495.15	483.175
40.31	548.51	548.525	548.47	548.01	547.95	546.44	540.835	540.285	539.28	527.13	526.785	525.045	524.795	505.955	505.63	501.38	494.895	494.495	483.205
41.36	546.525	546.25	545.91	542.715	542.615	540.98	536.59	536.55	536.82	525.87	524.125	518.785	515.975	495.155	493.76	490.785	481.635	479.58	488.085
41.5	545.475	545.09	544.81	542.58	542.62	540.995	536.52	538.415	535.75	524.09	523.78	514.985	514.665	494.17	493.875	493.38	480.725	478.565	487.89
41.58	544.87	544.435	544.19	542.57				536.32	535.2	524.015	523.935				493.795	493.435	480.215	478.03	487.875
44.23	533.39	533.41	533.415	533.44				532.08	530.825	519.71	519.645				488.76	488.515	473.495	471.325	482.185
46.87	521.12	521.98	522.435	525.295				524.515	521.27	510.99	510.915				480.43	480.135	458.34	454.41	450.845
46.85	520.225	521.05	521.62	526.91				524.05	518.3	510.595	510.37	502.07	502.13	480.54	480.305	479.705	453.15	451.31	450.28
47.53	512.855	512.815	513.035	516.145	516.135	515.705	511.365	511.27	510.77	503.23	501.915	494.925	494.06	470.05	468.885	466.575	445.295	442.35	428.855
47.66	511.15	510.675	510.535	515.855	516.025	515.605	511.28	511.145	509.3	501.72	500.29	492.995	492.07	467.765	466.57	464.205	443.285	440.41	428.195
48.58	500.84	500.2	500.285	501.715	501.795	500.615	495.245	494	494.065	494.24	492.34	477.69	477.265	454.055	453.95	454.485	427.325	428.69	411.025
48.71	499.39	498.065	498.155	499.685	499.48	498.135	493.32	493.39	493.31	490.425	488.87	477.45	477.235	453.825	453.575	451.49	426.89	428.47	403.855
48.79	498.68	497.825	497.93					493.11	492.975	488.54	486.89	477.375			453.335	450.115	426.375	428.245	
51.44	490.38	490.41	490.425					485.28	485.13	475.145	473.88	468.585			438.525	434.6	411.215		
54.09	479.74	480.865	480.855					474.935	474.825	459.8	458.875	455.8			418.78	408.82	388.205	388.075	
54.17	478.74	480.845	480.535	479.91	480.285	479.5	474.865	474.78	474.41	458.21	457.185	455.69			415.11	401.59	387.255	388.79	389.53
54.73	469.7	469.78	469.525	467.53	467.32	465.435	458.1												

SPACER DISK TEMPERATURE DISTRIBUTION:

DSC IN CASE
INTERNAL VACUUM
100°F AMBIENT

DISTANCE	0	0.6	0.73	1.31	1.39	4.04	6.69	6.77	6.9	7.95	8.08	8.65	8.73	14.02	14.1	14.25	15.15	15.28	15.86	
0.63	381.435	381.92	381.97	381.935	381.935	381.86	380.615	380												
1.25	392.13	392.405	392.455	392.625	392.64	391.29	382.87	381.725	381.725	381.13	381.18	381.545	381.59	380.465	380.465	380.465	382.845			
4.44	437.485	446.73	447.945	449.965	450.17	446.585	443.95	442.825	441.07	419.725	418.87	427.595	428.49	384.425	384.425	387.49	386.37	382.37	382.185	382.37
5.08	385.235	477.84	477.58	484.35	484.81	457.28	488.24	486.31	485.805	384.145	384.125	448.08	448.34	381.395	381.395					
5.14	422.43	478.93	478.885					486.78	486.875	402.255	404.805	448.9								
7.79	520.395	522.01	522.04					517.78	517.685	510.28	509.88	509.57								
10.44	555.68	552.28	552.34					557.4	557.04	570.005	585	545.185								
10.52	558.815	552.52	552.85	576.015	575.635	581.445	558.2	557.77	557.265	580.97	588.015	545.57								
11.01	561.185	582.09	584.015	580.52	582.22	588.83	589.32	588.415	588.985	587.28	587.345	584.785	584.34	503.805	502.24	479.305	449.27	448.685	454.915	
11.14	561.6	583.27	585.43	582.88	584.805	580.78	572.495	571.14	588.89	587.53	587.475	584.875	584.45	503.945	502.9	472.485	445.73	445.89	458.41	
11.47	581.845	583.38	585.935	589.45	581.805	586.34	581	577.775	571.59	574.42	574.7	572.225	571.76	471.78	389.505	429.735	432.215	435.22	480.51	
11.98	580.84	554.345	554.385	808.255	808.515	805.12	598.63	588.52	558.84	584.785	588.11	583.925	583.49	500.595	390.025	489.285	404.84	407.385	470.565	
12.1	587.995	586.145	570.71	808.885	808.855	805.32	598.98	599.005	581.42	588.855	588.05	586.82	588.85	529.78	529.19	527.845	389.84	389.34	478.48	
12.18	572.255	575.845	579.41	807.28				599.345	592.785	599.03	598.985				529.75	529.485	420.88	421.955	480.74	
14.83	839.48	840.305	840.72	843.41				833.285	832.41	827	828.975				570.845	570.425	554.225	552.68	548.855	
17.47	873.63	872.425	871.885	868.585				856.835	856.31	848.885	848.88				803.41	802.86	589.85	583.81	578.34	
17.55	875.385	874.45	873.635	866.785				856.65	857.89	849.215	849.36	848.535	848.18	804.185	803.895	803.045	810.34	589.74	578.59	
18.13	889.085	891.42	890.78	880.845	880.79	878.255	871.785	871.455	874.91	871.1	884.375	855.415	854.355	812.185	810.475	807.235	590.74	590.5	587.005	
18.26	891.645	896.47	896.475	881.035	880.915	878.335	871.88	871.78	881.225	883.885	883.165	858.6	855.7	814.275	812.18	807.91	590.885	590.805	587.09	
19.18	896.34	898.58	898.18	891.805	891.47	888.075	880.585	880.425	880.175	883.49	883.435	884.025	884.09	831.53	831.365	804.1	814.485	813.85	802.815	
19.31	897.02	897.31	897.155	892.775	893.065	889.745	881.955	881.915	881.87	883.73	883.715	884.41	884.39	831.77	831.7	819.78	821.875	820.84	804.265	
19.39	897.37	897.435	897.405					882.04	881.88	886.305	885.84	884.955			831.8	826.71	822.03	821.81		
22.04	707.585	707.83	707.84					898.825	898.505	891.13	890.545	888.355			855.785	853.905	843.81	843.54		
24.69	718.225	715.79	715.815					707.91	707.715	707.365	705.37	699.425			689.74	688.19	657.225	657.14		
24.77	718.745	715.9	718.035	719.4	719.295	717.98	708.285	708.055	707.805	710.535	704.48	699.585			689.55	689.02	657.45	657.235	648.82	
25.33	717.505	717.71	717.985	720.22	720.44	719.48	710.64	710.18	708.41	704.89	704.8	703.45	703.24	677.825	677.285	678.03	678.645	688.695	653.78	
25.46	717.635	717.92	718.215	720.575	720.82	718.87	711.285	710.71	708.68	704.95	704.845	703.49	703.28	677.68	677.505	680.78	681.47	682.18	654.27	
26.51	717.84	716.705	718.175	725.285	725.365	723.755	718.135	718.045	708.41	711.845	711.71	708.28	707.905	681.015	680.425	679.215	659.505	659.36	658.73	
26.85	718.845	719.05	719.48	725.49	725.48	723.865	718.24	718.185	713.845	713.905	713.585	708.48	708.51	681.505	681.335	681.11	659.645	659.515	659.035	
26.73	718.72	720.38	720.98	725.815				718.28	718.275	714.05	713.89				681.385	681.13	682.88	681.535	658.41	
28.38	732.09	732.345	732.485	733.285				725.835	725.015	720.75	720.725				688.27	688.065	678.7	678.815	674.445	
32.02	734.72	734.82	734.875	735.24				727.8	727.21	723.22	723.175				691.72	691.475	680.885	677.815	675.08	
32.1	734.735	734.83	734.88	735.225				727.65	727.18	723.265	723.22	718.285	718.11	691.955	691.755	691.495	683.27	672.235	674.945	
32.88	734.745	734.77	734.785	734.87	734.88	733.25	727.83	727.655	726.82	723.545	723.51	722.955	719.81	691.52	690.49	688.47	671.805	671.49	669.41	
32.81	734.745	734.75	734.755	734.865	734.86	733.235	727.83	727.745	728.48	723.51	723.395	719.255	718.315	691.58	690.43	688.22	671.78	671.505	669.395	
34.01	734.865	734.73	734.775	735.13	735.16	733.55	726.855	726.88	726.37	723.28	722.875	718.475	718.41	694.51	694.37	691.34	684.295	681.09	870.4	
34.18	734.825	734.86	734.895	735.235	735.275	733.88	728.715	728.8	726.485	723.52	723.45	718.8	718.495	694.49	694.31	691.85	681.195	680.725	689.315	
34.24	734.6	734.84	734.84					726.575	726.455	723.21	722.61				694.25	692.205	681.295	681.175		
36.89	733.045	733.115	733.13					725.38	725.255	721.305	720.81				692.055	690.34	680.47	680.395		
38.54	728.99	729.535	729.53					720.105	720.08	710.185	708.21				683.98	682.13	673.695	673.595		
38.62	728.53	729.495	729.48	728.035	728.19	728.335	720.055	720.025	720.005	708.4	704.88				683.585	681.27	673.585	673.49	657.785	
40.18	728.255	728.27	728.125	728.88	728.725	724.435	717.51	717.09	718.33	704.145	703.83	703.07	702.935	678.155	678.085	672.845	673	672.84	671.445	
40.31	728.18	728.12	727.98	728.51	728.35	724.01	718.99	718.6	715.92	703.985	703.805	703.02	702.88	678.08	675.98	688.91	672.78	672.54	667.635	
41.38	727.82	728.85	728.87	722.875	722.885	721.11	713.93	713.885	719.315	708.885	705.935	699.27	698.54	685.305	680.17	648.995	655.475	654.78	647.705	
41.5	726.395	728.81	728.38	722.61	722.88	721.135	713.795	713.855	715.43	704.085	703.93	698.125	697.895	665.635	685.315	684.88	655.185	654.025	647.79	
41.58	725.535	725.32	725.01	722.48				713.49	713.455	704.03	703.98				685.17	684.805	654.98	653.635	647.845	
44.23	701.47	701.47	701.47					702.345	701.385	694.885	694.835				651.96	651.755	641.885	640.78	638.89	
48.87	877.175	877.77	878.12	880.315				887.085	875.88	881.075	880.98				833.2	833.1	594.22	593.935	608.68	
48.95	878.08	878.57	877.045	881.12				886.885	858.745	880.895	880.555	887.065	887.245	833.09	833.055	833.005	584.12	584.04	608.255	
47.53	867.87	868.5	867.41	880.54	880.485	880.03	873.965	874.12	870.78	874.285	873.1	863.58	862.39	825.725	824.505	822.01	591.1	588.4	580.285	
47.68	868.025	868.03	868.035	880.225	880.35	879.84	873.845	873.87	871.255	873.78	872.475	882.395	881.13	824.185	823.1	821.075	591.405	588.8	579.78	
48.58	862.75	862.98	863.59	889.785	870.275	870.53	859.125	857.52	857.325	879.55	879.44	851.4	851.145	814.78	814.59	831.89	582.645	582.49	601.325	
48.71	882.105	882.075	882.315	889.14	888.95	888.095	857.585	857.34	857.115	870.33	869.135	851.095	851.035	814.49	814.145	818.38	582.38	582.225	584.915	
48.79	881.785	881.805	881.845					857.17	856.875	865.75	864.28	850.965			813.8	812.285	582.165	582.02		
51.44	847.89	847.77	847.85					837.825	837.715	833.025	832.42	829.87			575.855	571.85	551.755	551.885		
54.09	830.59	830.715	830.87					812.1	812.18	801.28	800.215	598.41			524.74	472.875	500.475	500.33		
54.17	830.005	830.325	830.325	820.835	821.28	817.47	811.72	811.795	811.755	599.82	598.92	598.44			522.75	391.68	498.79	498.48	484.59	
54.73	825.345	824.																		

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION PROJECT **FILE NO:** NUH004.0414
CLIENT: PACIFIC NUCLEAR FUEL SERVICES **CALC. NO:** NUH004.0414

TABLE 5-1			
NUHOMS-52B DSC THERMAL ANALYSIS RESULTS SUMMARY			
Case	Max. DSC Shell Temperature (°F)	Max. Fuel Cladding Temperature (°F/°C)	Fuel Cladding Acceptance Criteria (°F/°C)
DSC in HSM 70°F ambient Fill = Helium	275	782/417	790/421
DSC in HSM 100°F ambient Fill = Helium	303	788/420	1058/570
DSC in HSM 100°F ambient Fill = Steel	303	324/162	1058/570
DSC in HSM 125°F ambient Fill = Helium	328	793/423	1058/570
DSC in HSM 125°F ambient HSM vent blocked Fill = Helium	579	923/495	1058/570
DSC in Cask 100°F ambient Internal Vacuum	358	988/531	1058/570
DSC in Cask 100°F ambient Internal Vacuum Fill = Steel	402	542/283	1058/570

REVISION	0				PAGE 71 OF 74
PREPARED BY / DATE	<i>FLC</i> 8/14/91				
CHECKED BY / DATE	<i>100</i> 4/11/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT: NUHOMS 10CFR72 CERTIFICATION

FILE NO: NUH004.0414

PROJECT

CLIENT: PACIFIC NUCLEAR FUEL SERVICES

CALC. NO: NUH004.0414

TABLE 5-2

SPACER DISK TEMPERATURES

Case	Maximum Temperature (°F)	Minimum Temperature (°F)	Average Temperature (°F)
DSC in HSM 100°F ambient Fill = Steel	553	220	387
DSC in Cask 100°F ambient Internal Vacuum Fill = Steel	735	380	558
DSC in Cask 100°F Ambient Fill = Steel	669*	295*	482*

* Estimated. See section 4.1

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PREPARED BY / DATE

FLO 8/14/91

CHECKED BY / DATE

128 4/14/92

PAGE 72
OF 74

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

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REVISION	0				PAGE 73 OF 74
PREPARED BY / DATE	<i>FLD</i> 4/14/92				
CHECKED BY / DATE	<i>LDY</i> 4/14/92				

Pacific Nuclear Fuel Services, Inc.

PROJECT:	NUHOMS 10CFR72 CERTIFICATION PROJECT	FILE NO:	NUH004.0414
CLIENT:	PACIFIC NUCLEAR FUEL SERVICES	CALC. NO:	NUH004.0414

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REVISION	0				PAGE 74 OF 74
PREPARED BY / DATE	<i>FJA</i> 4/14/92				
CHECKED BY / DATE	<i>IBY</i> 4/14/92				