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Attachments XI through XX and XXII have been moved to an independent reference.

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1. Purpose

This analysis documents the Commercial Reactor Critical (CRC) benchmark evaluations performed for Cycles 8 and 9 of the Crystal River Unit 3 pressurized water reactor (PWR). CRC benchmarks are performed at a number of statepoints, representing reactor start-up critical conditions at either beginning of life (BOL), beginning of cycle (BOC), or some mid-cycle point where the reactor shutdown and then resumed operation. CRC benchmarks contribute to the validation of the SAS2H and MCNP 4A analytic tools for use in the Disposal Criticality Methodology (Ref. 5.1).

2. Quality Assurance

The Quality Assurance (QA) program applies to this analysis. The work reported in this document is part of the criticality disposal methodology development that will eventually support the License Application Design phase. This activity, when appropriately confirmed, can impact the proper functioning of the Mined Geologic Disposal System (MGDS) waste package; the waste package has been identified as an MGDS Q-List item important to safety and waste isolation (pp. 4, 15, Ref. 5.2). The waste package is on the Q-List by direct inclusion by the Department of Energy (DOE), without conducting a QAP-2-3 evaluation. As determined by an evaluation performed in accordance with QAP-2-0, *Conduct of Activities*, the work performed for this analysis is subject to *Quality Assurance Requirements and Description* (QARD; Ref. 5.3) requirements. As specified in NLP-3-18, the development of this analysis is subject to QA controls. The applicable procedural controls required by the current revision of QAP-2-0 for this activity are presented in the WP-20 work control activity evaluation entitled "Perform Criticality, Thermal, Structural, and Shielding Analyses."

The work reported in this document is part of the CRC neutronic analyses to support the development of the disposal criticality methodology. All design parameters utilized in this analysis are from a qualified source (Ref. 5.4) which was developed under a U. S. Nuclear Regulatory Commission approved QA program. Therefore, all design parameters utilized in this analysis are qualified.

3. Method

The CRC benchmarks are actual PWR cores which contain fuel loadings that may vary from all fresh fuel (BOL) to a mixture of fresh and burned fuel (BOC) to a mixture of all burned fuel (mid-cycle restart). The SAS2H code in the SCALE 4.3 code system (Ref. 5.5) is used to deplete the fuel as necessary to obtain the burned fuel isotopics for use in the CRC reactivity calculations documented in this analysis. The depletion calculations required for this analysis are documented in other analyses and are referenced accordingly in Section 7.3. The CRC reactivity calculations documented in this analysis are performed with the MCNP 4A code system. The effective multiplication factors (k_{eff}) resulting from the CRC benchmark reactivity calculations may be used to validate the SAS2H and MCNP 4A code systems for predicting spent fuel isotopic concentrations and reactivity worth in similar configurations.

4. Design Inputs

This analysis does not contain or utilize input data for any repository component design. Rather, the calculations documented in this analysis utilize CRC benchmark input data. The CRC benchmarks are used to validate the SAS2H and MCNP 4A analytic tools for use in subsequent repository component design analyses. The CRC benchmark reactivity calculation input data utilized in this analysis are listed in Section 4.1.

4.1 Design Parameters

The CRC benchmark reactivity calculation input parameters utilized in this analysis are listed in this section. All of the input parameters listed in this section other than depleted fuel and depleted burnable poison compositions were obtained from reference 5.4. The location page numbers from reference 5.4 are provided with each listed input. The actual modeled input parameters provided to MCNP 4A are identified explicitly in Section 7.

Reactor Design Information: Dimensions, Core Layout, Materials (pg. 3-5)

Fuel Assembly Design Information: Dimensions, Assembly Layout, Materials (pg. 5-9, 24-25)

Fuel Rod Design Information: Dimensions, Structural Materials (pg. 12-13, 25)

Depleted Fuel and Burnable Poison Material Compositions (see Table 7.3-1 of this document)

Guide Tube Information: Dimensions, Materials (pg. 10, 25)

Instrument Tube Information: Dimension, Materials (pg. 11, 25)

Burnable Poison Rod Assembly (BPRA) Information: Dimensions, Layout, Materials (pg. 22-23, 25)

Rod Control Cluster Assembly (RCCA) (Control Rod Assembly) Information: Dimensions, Layout, Materials (pg. 16-17, 25)

Axial Power Shaping Rod Assembly (APSRA) Information: Dimensions, Layout, Materials (pg. 18-21, 25)

Core Loading Diagrams (pg. 37-38, 48-49)

CRC Statepoint Critical Conditions: Soluble Boron Concentrations, RCCA and APSRA Insertion Positions, Temperatures (pg. 266)

4.2 Criteria

The design of the waste package will depend on waste package configuration criticality analyses performed using an acceptable disposal criticality analysis methodology. Criteria that relate to the development and design of repository and engineered barrier components are derived from the applicable requirements and planning documents. The Engineered Barrier Design Requirements Document (EBDRD, Ref. 5.7) provides requirements for engineered barrier segment design. The Repository Design Requirements Document (RDRD, Ref. 5.8) provides requirements for repository design.

This analysis supports the disposal criticality analysis methodology by providing input, in the form of spent fuel benchmark calculation results, which address the prediction of both spent fuel isotopic compositions and their associated reactivity. These benchmark calculations will contribute to the determination of bias values in the method of critical multiplication factor calculation that is implemented by the analytic tools to be used in the disposal criticality methodology. The requirements for utilizing the bias in the method of calculation of the critical multiplication factor for disposal configurations containing spent nuclear fuel are located in Section 3.2.2.5 of the RDRD and Section 3.2.2.6 of the EBDRD. This analysis does not satisfy these requirements, but the results from this analysis will be used as input to subsequent analyses which will satisfy these requirements.

4.3 Assumptions

Not Used

4.4 Codes and Standards

Not Applicable

5. References

5.1 *Disposal Criticality Analysis Methodology Technical Report.* Document Identifier Number (DI#): B00000000-01717-5705-00020 REV 01, Civilian Radioactive Waste Management System (CRWMS) Management and Operating Contractor (M&O).

5.2 *Q-List.* YMP/90-55Q, REV 04, YMP (Yucca Mountain Site Characterization Project).

5.3 *Quality Assurance Requirements and Description.* DOE/RW-0333P REV 07, DOE (U.S. Department of Energy).

5.4 *Summary Report of Commercial Reactor Criticality Data for Crystal River Unit 3.* DI#: B00000000-01717-5705-00060 REV 00, CRWMS M&O.

5.5 *SCALE 4.3: Modular Code System for Performing Standardized Computer Analyses for Licensing Evaluation.* User's Manual Volumes 0 through 3, Oak Ridge National Laboratory, Document Number: CCC-545.

5.6 *This reference is intentionally left blank.*

5.7 *Engineered Barrier Design Requirements Document.* YMP/CM-0024, REV 0, ICN 1, DOE OCRWM.

5.8 *Repository Design Requirements Document.* YMP/CM-0023, REV 0, ICN 1, DOE OCRWM.

5.9 *MCNP 4A: Monte Carlo N-Particle Transport Code System.* Users manual. Los Alamos National Laboratory, Los Alamos, NM. Distributed by Radiation Shielding Information Center, Oak Ridge National Laboratory, Oak Ridge, TN. Document Number: CCC-200.

5.10 *Software Qualification Report for MCNP 4A, A General Monte Carlo N-Particle Transport Code.* DI#: 30006-2003 REV 02, CRWMS M&O.

5.11 *CRC Depletion Calculations for the Non-Rodded Assemblies in Batches 1, 2, and 3 of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00032 REV00, CRWMS M&O.

5.12 *CRC Depletion Calculations for the Non-Rodded Assemblies in Batches 4 and 5 of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00033 REV00, CRWMS M&O.

5.13 *CRC Depletion Calculations for the Non-Rodded Assemblies in Batches 6A, 6B, 7A, and 7B of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00034 REV00, CRWMS M&O.

5.14 *CRC Depletion Calculations for the Non-Rodded Assemblies in Batches 8 nd 9 of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00035 REV00, CRWMS M&O.

5.15 *CRC Depletion Calculations for the Non-Rodded Assemblies in Batches 10 and 11 of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00036 REV00, CRWMS M&O.

5.16 *CRC Depletion Calculations for the Rodded Assemblies in Batches 1, 2, 3, and 1X of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00040 REV00, CRWMS M&O.

5.17 *CRC Depletion Calculations for the Rodded Assemblies in Batches 4 and 5 of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00041 REV00, CRWMS M&O.

5.18 *CRC Depletion Calculations for the Rodded Assemblies in Batches 6A, 6B, 7A, and 7B of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00042 REV00, CRWMS M&O.

5.19 *CRC Depletion Calculations for the Rodded Assemblies in Batches 8 and 9 of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00043 REV00, CRWMS M&O.

5.20 *CRC Depletion Calculations for the Rodded Assemblies in Batches 10 and 11 of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00044 REV00, CRWMS M&O.

5.21 *Nuclide and Isotopes, Chart of the Nuclides, Fourteenth Edition.* General Electric Company, 1989.

5.22 *Material Compositions and Number Densities for Neutronics Calculations.* DI #: BBA000000-01717-0200-00002 REV 00, CRWMS M&O.

5.23 *Huntington Alloys: Inconel Alloy 718*, Third Edition, 1978.

5.24 S. M. Bowman, O. W. Hermann, and M. C. Brady. *Scale-4 Analysis of Pressurized Water Reactor Critical Configurations: Volume 2-Sequoyah Unit 2 Cycle 3*, Oak Ridge National Laboratory, Document Number: ORNL/TM-12294/V2.

5.25 *Radiological Health Handbook, January 1970 Revision.* Bureau of Radiological Health; U. S. Department of Health, Education, and Welfare; Public Health Service; Food and Drug Administration.

5.26 *CRC Statepoint Reactivity Calculations for Cycles 1A, 1B, 2, 3, and 4 of Crystal River Unit 3.* DI#: BBA000000-01717-0200-00046 REV00, CRWMS M&O.

5.27 CRC Statepoint Reactivity Calculations for Cycles 8 and 9 of Crystal River Unit 3 (DI#: BBA000000-01717-0200-00048 REV 00) - Attachments XI through XX and XXII - 2 Data Cartridges. Batch Number: MOY-970912-04.

6. Use of Computer Software

6.1 Software Approved for QA Work

The MCNP 4A code system was used in this analysis to calculate the effective multiplication factor (k_{eff}) of CRC benchmarks. The MCNP 4A code system is subject to the requirements of the QARD (Ref. 5.3). The MCNP 4A code system was obtained from the Software Configuration Management in accordance with appropriate procedures. The computer software configuration item (CSCI) number for MCNP 4A is 30006 V4A. The media identifier (MI) number for MCNP 4A is 30006-M03-002. The MCNP 4A calculations documented in this analysis were performed on Hewlett Packard (HP) 9000

series workstations. The MCNP 4A code system utilizes a Monte-Carlo calculational technique to perform particle transport calculations. MCNP 4A is capable of simulating particle transport and associated physics within complex three dimensional geometries. MCNP 4A uses psuedo-continuous-energy cross section libraries for each element or isotope to determine necessary parameters at particle interaction sites during transport calculations. Section 7.3.1 contains a detailed listing of all MCNP 4A cross section libraries utilized in the CRC reactivity calculations documented in this analysis. A detailed description of the MCNP 4A code system is provided in reference 5.9. The MCNP 4A code system is appropriate for the engineering application within this analysis and is used within the range of verification and validation as documented in reference 5.10.

The Excel, Version 5.0 spreadsheet package is utilized in this analysis. The user-defined formulas, inputs, and results for all calculations performed with this spreadsheet package are documented, where applicable, throughout this analysis.

6.2 Software Routines

A software routine entitled "MCNP Accessory for CRC Evaluations" (MACE) was written to automate the production of MCNP 4A input decks as required to perform critical multiplication factor calculations for CRC statepoint configurations. The MACE code does not generate data. All calculations performed by the MACE code are verified by either visual inspection or hand calculations or a combination of both. The MACE code, Version 1.0, was utilized in this analysis to create the necessary MCNP 4A CRC input decks. The MACE, Version 1.0, source code ("MACE_V1.f") and executable file ("MACE") exist in the directory "/users/wright/MACE" on the Waste Package Development Department (WPDD) HP 9000 series workstation designated "Opus". The MACE code is subject to the requirements of the QARD as defined by Section I.2.1 Part C of Supplement I Rev. 1 of the QARD. Complete documentation of the MACE code, Version 1.0, including code description, user information, and documentation that the software provides correct results for a specified range of input parameters is included in Attachment I of reference 5.26. Since MACE only operates in conjunction with another software routine entitled "CRAFT", which will ultimately become an addendum to the existing SCALE V4.3 baseline, the MACE software routine will also ultimately be documented as an addendum to the existing SCALE V4.3 baseline and assume the SCALE V4.3 baseline CSCI identifier number of 30011 V4.3.

7. Design Analysis

The CRC benchmark reactivity calculations are performed to contribute to the validation of SAS2H and MCNP 4A for use in repository component design (specifically waste package design). The MCNP 4A CRC reactivity calculations are detailed critical benchmark calculations which represent the actual reactor configurations. This analysis provides the geometry, material, core loading, and calculational control descriptions for each CRC benchmark calculation performed with MCNP 4A. The MCNP 4A input decks for each CRC benchmark calculation documented in this analysis are created with the MACE software routine. The MACE input decks used to create each of the MCNP 4A CRC input decks are presented in Attachments I through X. Complete documentation of the MACE code and MACE

input deck preparation is provided in Attachment I of reference 5.26. The k_{eff} results for each CRC benchmark are presented in Section 7.6.

7.1 CRC Benchmark Reactivity Calculations

This analysis documents the CRC benchmark MCNP 4A reactivity calculations for Cycles 8 and 9 of Crystal River Unit 3. These cycles contain a total of 10 statepoints at which either BOL, BOC, or mid-cycle reactor start-ups were performed. Table 7.1-1 contains a listing of these 10 CRC statepoints by reactor cycle and effective full-power day (EFPD) value.

Table 7.1-1 CRC Benchmark Statepoints

Cycle	Statepoint EFPD Value
8	0.0
8	97.6
8	139.8
8	404.0
8	409.6
8	515.5
9	0.0
9	158.8
9	219.0
9	363.1

7.2 CRC Benchmark MCNP 4A Geometrical Descriptions

The MCNP 4A CRC benchmark models for the Crystal River Unit 3 PWR incorporate detailed and explicit representations of the fuel assemblies and reactor core components. Extensive fuel assembly and core modeling is incorporated for regions beyond the extent of the active fuel in the axial direction to ensure that neutron leakage is correctly simulated. Actual core loading patterns are utilized in the models. Core symmetry is also used wherever possible to expedite the k_{eff} calculations. The burned fuel in each assembly is composed of 18 unique axial fuel compositions previously calculated with SAS2H. BPRA's, RCCA's, and APSRA's are modeled explicitly in the core locations corresponding to the measured critical conditions at reactor start-up. Appropriate measured average system temperatures and soluble boron concentrations are utilized in each model. Sections 7.2.1 through 7.2.8 discuss the MCNP 4A modeling details for the various components of the Crystal River Unit 3 CRC configurations.

7.2.1 Crystal River Unit 3 Core Description

The Crystal River Unit 3 PWR is a B&W reactor core design consisting of 177, 15x15 cell lattice fuel assemblies. A core liner surrounds the periphery fuel assemblies in the core. The periphery of the reactor consists of the core barrel, the thermal shield, and the pressure vessel (with cladding). Each of these components are separated by a region of water. A radial view of the modeled reactor internals is shown in Figure 7.2.1-1. The height of the active fuel region in the core is 360.172 cm. The assembly pitch in the core is 21.81098 cm. Table 7.2.1-1 provides modeled dimensions from the center of the core to the outside surface of the pressure vessel as shown in Figure 7.2.1-1. An axial view of the modeled reactor core internals is shown in Figure 7.2.1-2. The reactor region above the upper end-fitting of the fuel assemblies is delineated into four regions: the upper plenum region, the control rod guide tube flange region, the upper core grid region, and the upper pad region. The reactor region below the lower end-fitting of the fuel assemblies is delineated into three regions: the lower core pad, the lower core grid, and the region between the lower core grid and reactor vessel plate. The regions above and below the fuel assemblies in the reactor core have a limited effect on system reactivity. However, these regions are modeled with a large amount of detail to evaluate leakage characteristics. The reactor regions above and below the fuel assembly end-fittings are modeled as uniform geometric cells, each containing an appropriately homogenized material composition.

Table 7.2.1-1 Crystal River Unit 3 Radial Dimensions

Description	Thickness (cm)	Outer Dimension (cm)
Core Center	—	0.0
Half of Assembly 1	10.84072	10.84072
Water	0.12954	10.97026
Assembly 2	21.68144	32.65170
Water	0.12954	32.78124
Assembly 3	21.68144	54.46268
Water	0.12954	54.59222
Assembly 4	21.68144	76.27366
Water	0.12954	76.40320
Assembly 5	21.68144	98.08464
Water	0.12954	98.21418
Assembly 6	21.68144	119.89562
Water	0.12954	120.02516
Assembly 7	21.68144	141.70660
Water	0.12954	141.83614
Assembly 8	21.68144	163.51758
Water	0.27442	163.79200
Core Liner	1.905	165.697
Water	13.373	179.070
Core Barrel	5.080	184.150
Water	2.540	186.690
Thermal Shield	5.080	191.770
Water	24.925	216.695
Pressure Vessel Clad	0.478	217.173
Pressure Vessel	21.433	238.606

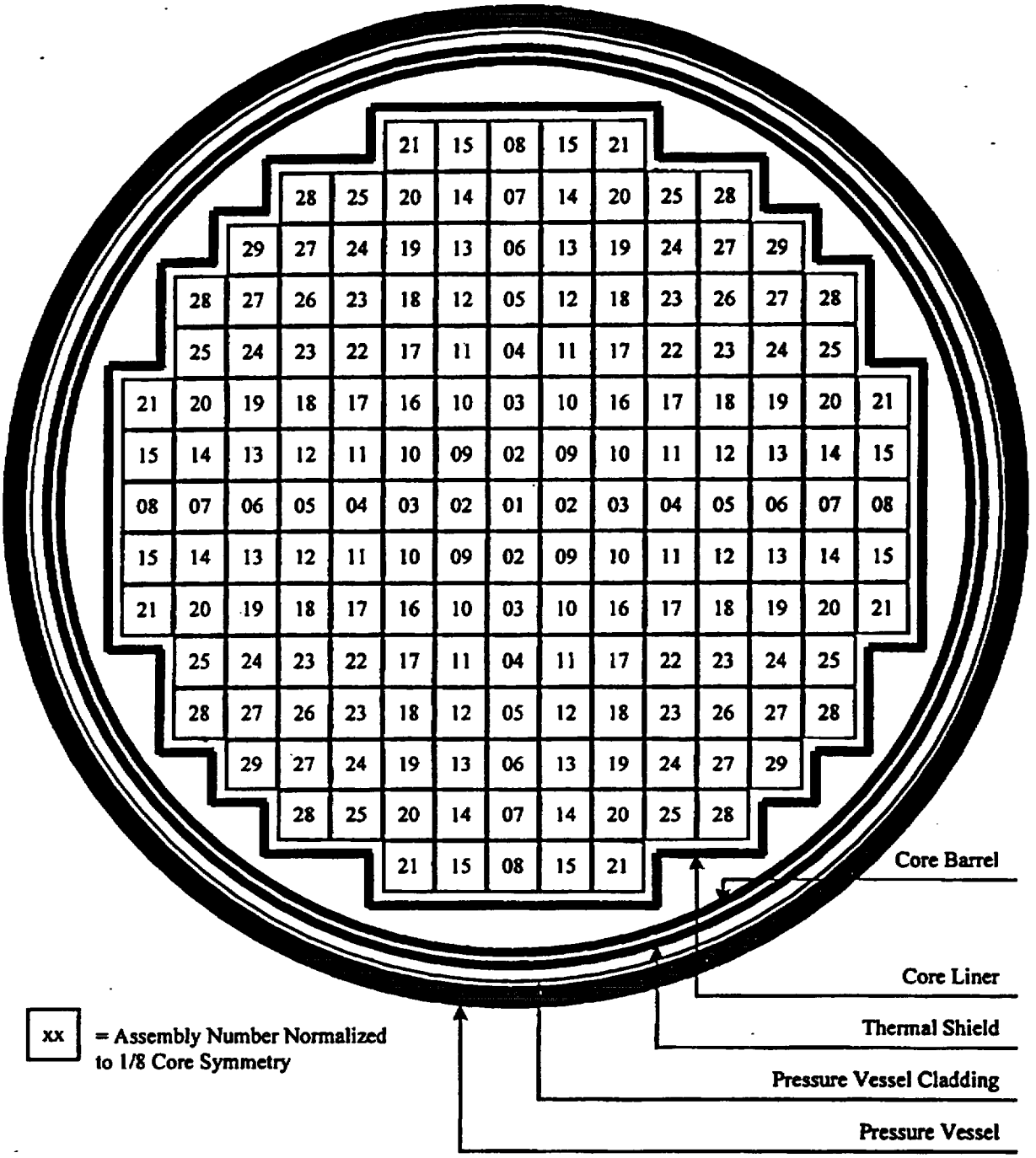
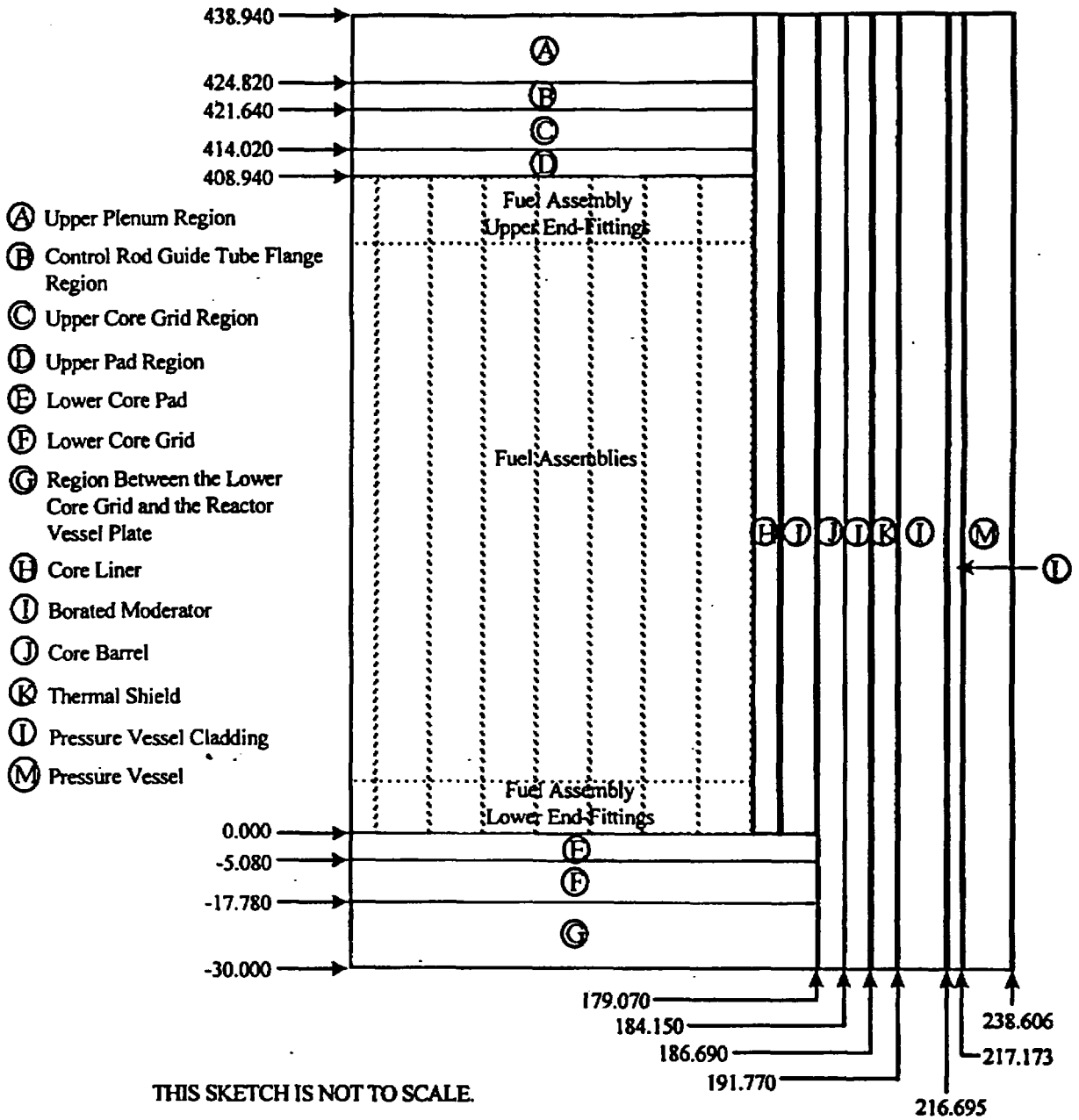


Figure 7.2.1-1 Radial View of the Crystal River Unit 3 Reactor Internals MCNP 4A Model



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ALL DIMENSIONS ARE PRESENTED IN CENTIMETERS.

Figure 7.2.1-2 Axial View of the Crystal River Unit 3 MCNP 4A Model

7.2.2 Fuel Assembly Description

Cycles 8 and 9 of Crystal River Unit 3 contained fuel assemblies from 7 different fuel batches. The fuel batches were inserted into the reactor in various combinations during each cycle. Four different assembly designs compose the various fuel batches: Mark-B3, Mark-B4, Mark-B4Z, and Mark-B9 as presented in Table 7.2.2-1. All of the Mark-B fuel assemblies are 15x15 cell lattice B&W designs. The cell lattice pitch is 1.44272 cm in each assembly design. A single instrument tube is located in the center lattice cell position of each assembly. The modeled instrument tube outer and inner diameters are 1.38193 cm and 1.12014 cm, respectively, for all fuel assembly designs. Each fuel assembly design contains 16 guide tubes. The modeled guide tube outer and inner diameters are 1.34620 cm and 1.26492 cm, respectively, in all fuel assembly designs. The modeled fuel assembly lattice configuration is shown in Figure 7.2.2-1. The Mark-B3 and Mark-B4 fuel assembly designs have 6 intermediate spacer grids made of Inconel. The Mark-B4Z and Mark-B9 fuel assembly designs have 6 intermediate spacer grids made of Zircaloy-4. The modeled Inconel intermediate spacer grids have a height of 3.81 cm and a volume of 88.676 cm^3. The modeled Zircaloy-4 intermediate spacer grids have a height of 5.08 cm and a volume of 125.758 cm^3. Each spacer grid material volume was homogenized with the corresponding borated moderator volume and placed uniformly between the assembly rods and within the assembly pitch boundaries in each intermediate spacer grid location. The position of each intermediate spacer grid is the same in the Mark-B3 and Mark-B4, but different for the Mark-B4Z and Mark-B9 assembly designs as shown in Figure 7.2.2-2. The spacer grid positions shown in Figure 7.2.2-2 correspond to the spacer grid positions in the MCNP 4A models. However, each intermediate spacer grid position shown in Figure 7.2.2-2 is 16.723 cm lower than its actual referenced position (Ref. 5.4). The Cycle 8, 0.0 EFPD statepoint k_{eff} was re-calculated with the spacer grids located in their referenced positions. The MACE input deck for this re-calculation case is located in Attachment XXI. The corresponding MCNP 4A output file is located in Attachment XXII (moved to reference 5.27). The result was a 0.00043 difference in k_{eff}. Therefore, the lower placement of the homogenized spacer grids in the MCNP 4A models has no significant effect on system reactivity. The top spacer grid in each assembly design is made of Inconel with a height of 8.573 cm and a volume of 115.698 cm^3. The extension of the fuel rods, guide tubes, and instrument tubes into the top spacer grid in each assembly design is modeled explicitly. The top spacer grid is homogenized with the borated moderator and distributed uniformly between the rods in the actual axial height that the grid normally occupies. The lower spacer grid in each assembly design is homogenized with the lower end-fitting. The lower end-fitting of each fuel assembly design is modeled as a homogenized region, 16.723 cm in height, distributed uniformly between and below the fuel rods, guide tubes, and instrument tubes. The upper end-fitting of each fuel assembly design is modeled as a homogenized region, 8.731 cm in height, distributed uniformly between and above the fuel rods, guide tubes, instrument tubes, burnable poison rods (BPRs), rod control cluster assemblies (RCCAs), and axial power shaping rods (APSRs).

Table 7.2.2-1 Assembly Design for Each Fuel Batch

Fuel Batch Identifier	Fuel Assembly Type
1	Mark-B3
5	Mark-B4
7A	Mark-B4
8	Mark-B4
9	Mark-B4Z
10	Mark-B4Z
11	Mark-B9

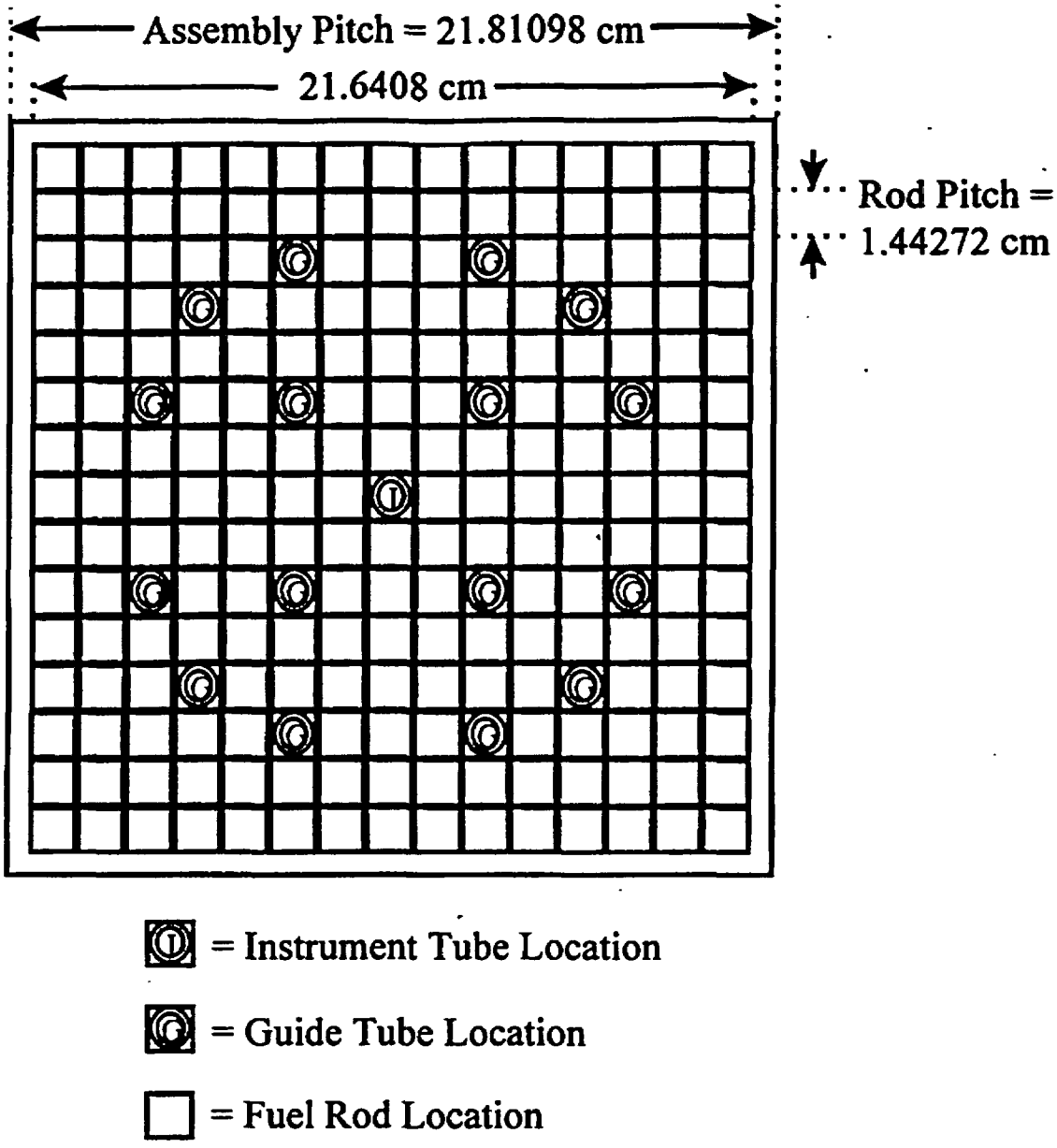

Figure 7.2.2-1 Fuel Assembly Lattice Configuration MCNP 4A Model

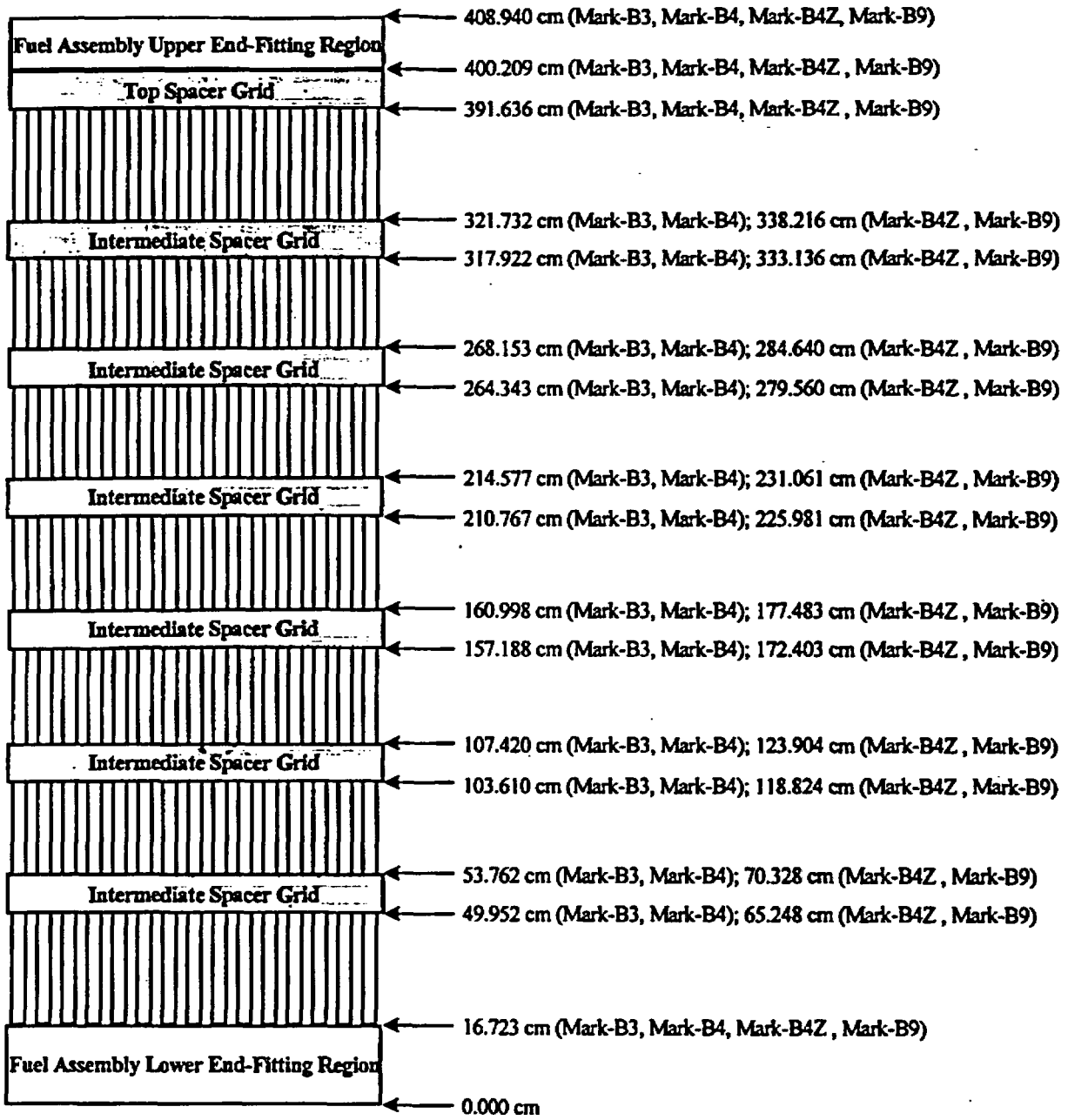

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Figure 7.2.2-2 Axial View of the Mark-B3, Mark-B4, Mark-B4Z, and Mark-B9 Assembly MCNP 4A Model

7.2.3 Fuel Rod Description

The fuel rod modeling description is shown in Figure 7.2.3-1. The fuel rods in each assembly design are modeled with 18 axial fuel nodes, each representing a unique fuel composition corresponding to fuel depletion. The top axial fuel node is 17.7800 cm high; the 16 intermediate axial fuel nodes are all 20.0025 cm high; the bottom axial fuel node is 22.3520 cm high (Ref. 5.4). The MCNP 4A modeling specifications for the fuel pellet outer diameter of each fuel batch are shown in Table 7.2.3-1. The modeled fuel clad outer and inner diameter is 1.09220 cm and 0.95758 cm, respectively, for all fuel assembly designs. The fuel rod upper plenum is modeled with a height of 18.447 cm. The upper end-cap of the fuel rod is modeled with a height of 0.714 cm. The fuel rod upper end-cap and upper plenum materials are homogenized and distributed uniformly throughout the plenum and end-cap region. The fuel rod lower plenum is modeled with a height of 10.319 cm. The fuel rod lower end-cap is modeled with a height of 0.714 cm. The fuel rod lower end-cap and lower plenum materials are homogenized and distributed uniformly throughout the plenum and end-cap region.

Table 7.2.3-1 Fuel Pellet Diameter for the Fuel Batches of Crystal River Unit 3

Fuel Batch Identifier	Pellet Diameter (cm)	Fuel Batch Identifier	Pellet Diameter (cm)
1	0.939800	9	0.936244
5	0.936244	10	0.936244
7A	0.936244	11	0.939800
8	0.936244	—	—

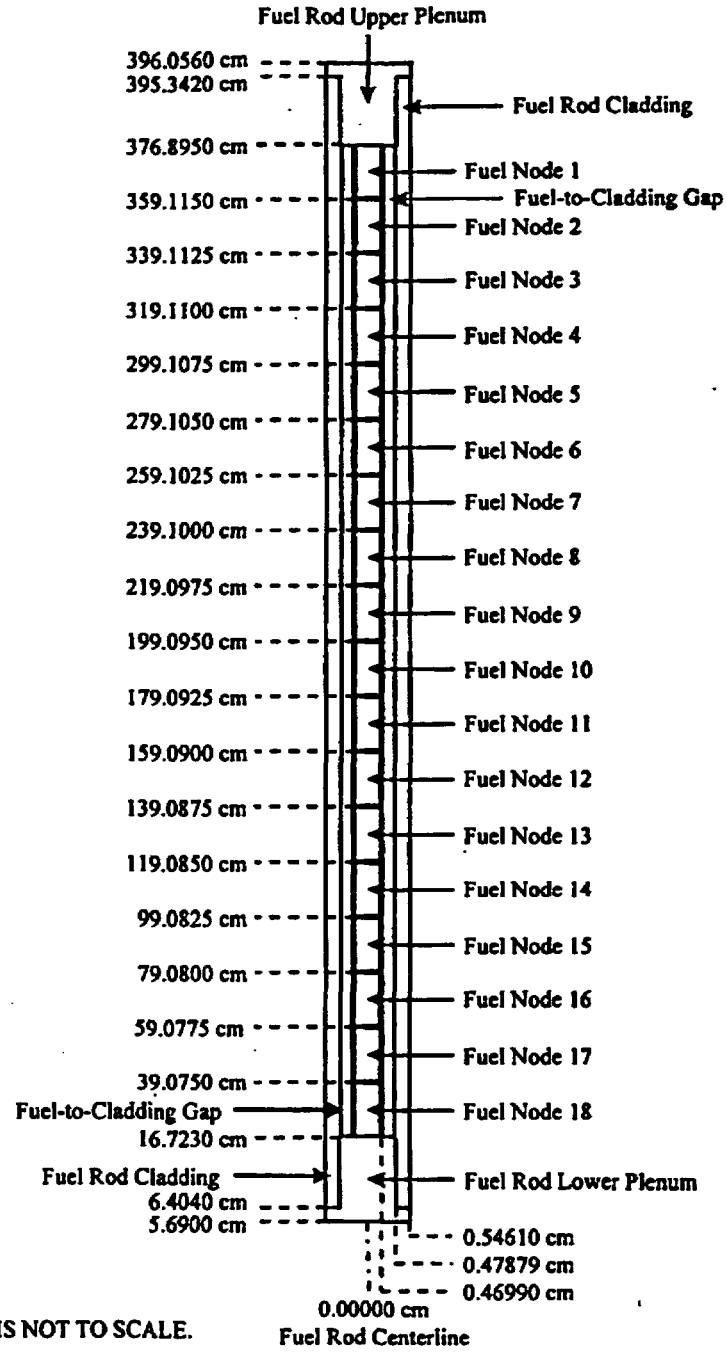

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Figure 7.2.3-1 Fuel Rod MCNP 4A Model

7.2.4 Guide Tube Description

The guide tube modeling description is shown in Figure 7.2.4-1. All guide tubes in each fuel assembly design are modeled identically with outer and inner diameters of 1.34620 cm and 1.26492 cm, respectively. The guide tubes are modeled explicitly into the upper and lower end-fittings of the fuel assembly as shown in Figure 7.2.4-1.

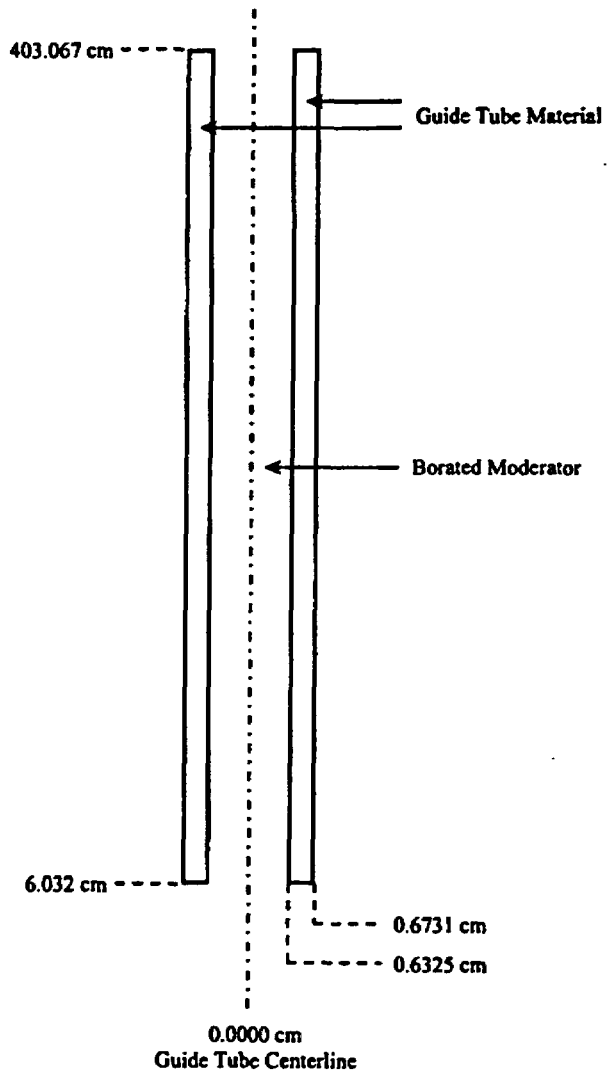

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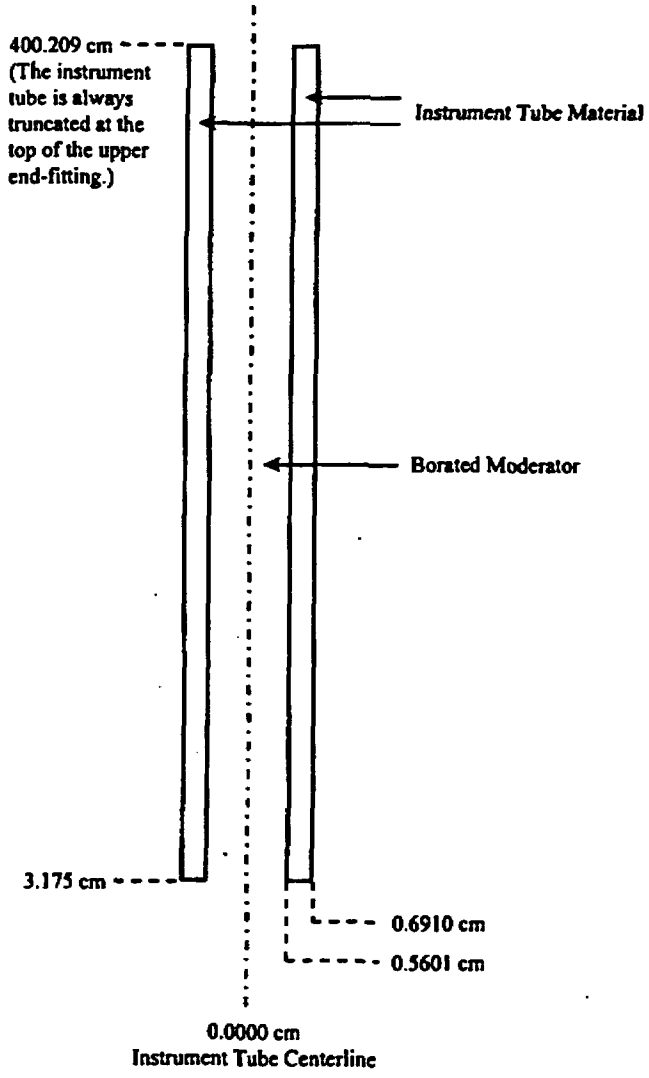
Figure 7.2.4-1 Guide Tube MCNP 4A Model

7.2.5 Instrument Tube Description

The instrument tube modeling description is shown in Figure 7.2.5-1. The instrument tube in each fuel assembly is modeled with outer and inner diameters of 1.38193 cm and 1.12014 cm, respectively. The instrument tubes are modeled explicitly up to the bottom of the upper end-fitting and into the lower end-fitting of the fuel assembly as shown in Figure 7.2.5-1.



THIS SKETCH IS NOT TO SCALE.

Figure 7.2.5-1 Instrument Tube MCNP 4A Model

7.2.6 Burnable Poison Rod Assembly (BPRA) Description

The BPR modeling description is shown in Figure 7.2.6-1. The BPRA is composed of 16 identical BPR's. The 16 BPR's are inserted into the guide tubes of an assembly to a prescribed height during reactor startup and operation. Each BPR has inner and outer diameters of 1.0922 cm and 0.9144 cm, respectively. The burnable poison (BP) pellet diameter is uniformly modeled as 0.8636 cm. The BP in each BPR is delineated into axial regions with the same surface delineations as the axial fuel nodes numbered 1 through 17. The nodal BP description is performed to allow the depleted BP to be modeled in conjunction with the depleted fuel. The top BP axial node does not contain absorbing BP material; Al_2O_3 is modeled instead. The BPRA description in reference 5.4 shows an upper plenum of 49.825 cm extending from the top of BP axial node number 2 to the top of the upper end-fitting region. However, the BPRA model in the MCNP 4A calculations of this analysis includes an upper plenum region of 32.045 cm inside the clad of the BPR above the BP material to the end of the BPR cladding (the top of the upper end-fitting). The replacement of the lower 17.78 cm of BPR upper plenum material with the non-absorbing BP material in the MCNP 4A calculations of this analysis does not affect the critical multiplication factor. The upper BPR plenum contains a spring that is distributed uniformly throughout the plenum region as a homogenized composition. The lower end-plug of the BPR is modeled with a height of 1.914 cm inside the BPR clad to the bottom of the clad. The BPRA is modeled to the top of the fuel assembly upper end-fitting and into the lower end-fitting as shown in Figure 7.2.6-1.

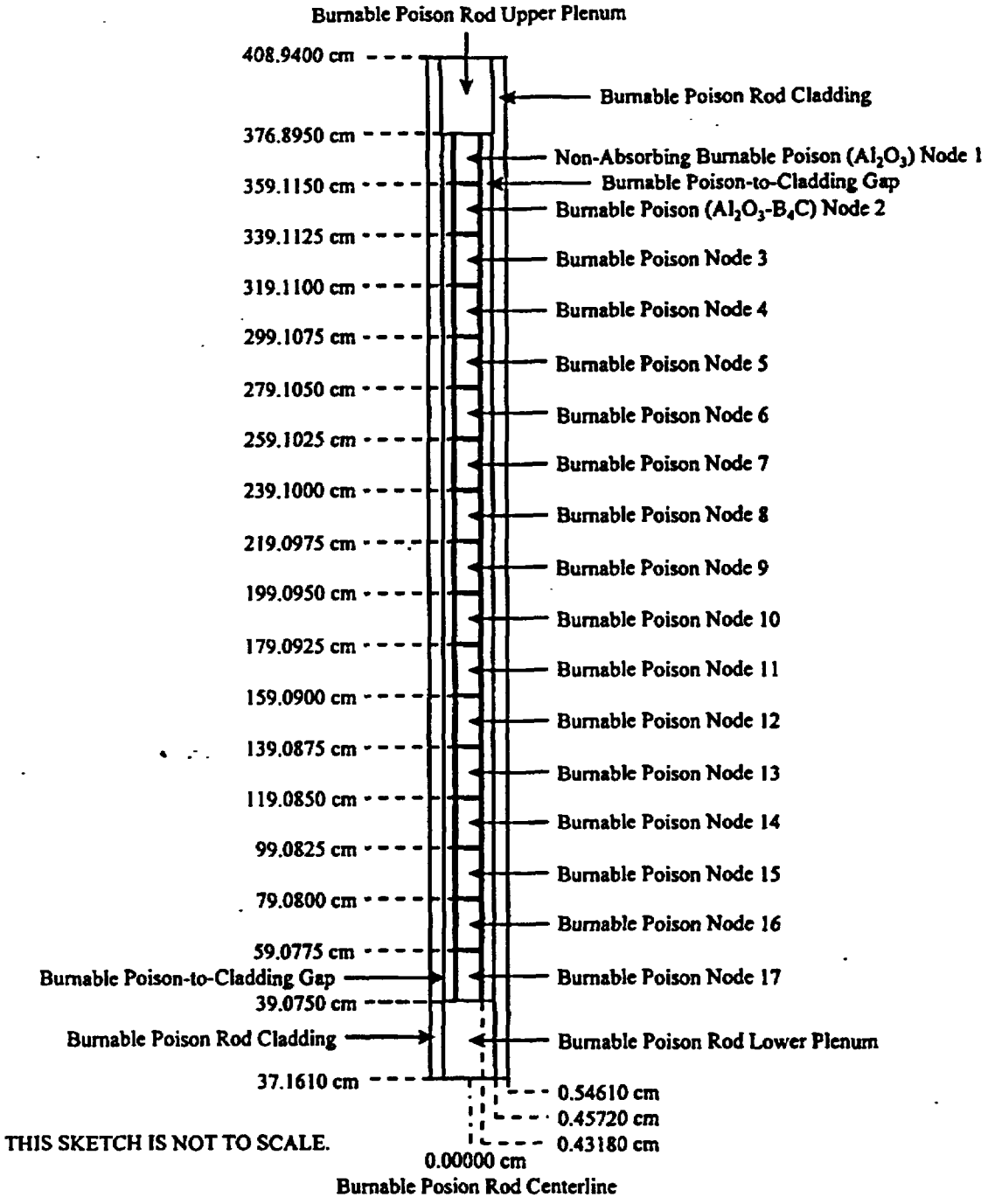


Figure 7.2.6-1 Burnable Poison Rod MCNP 4A Model

7.2.7 Rod Cluster Control Assembly (RCCA) Description

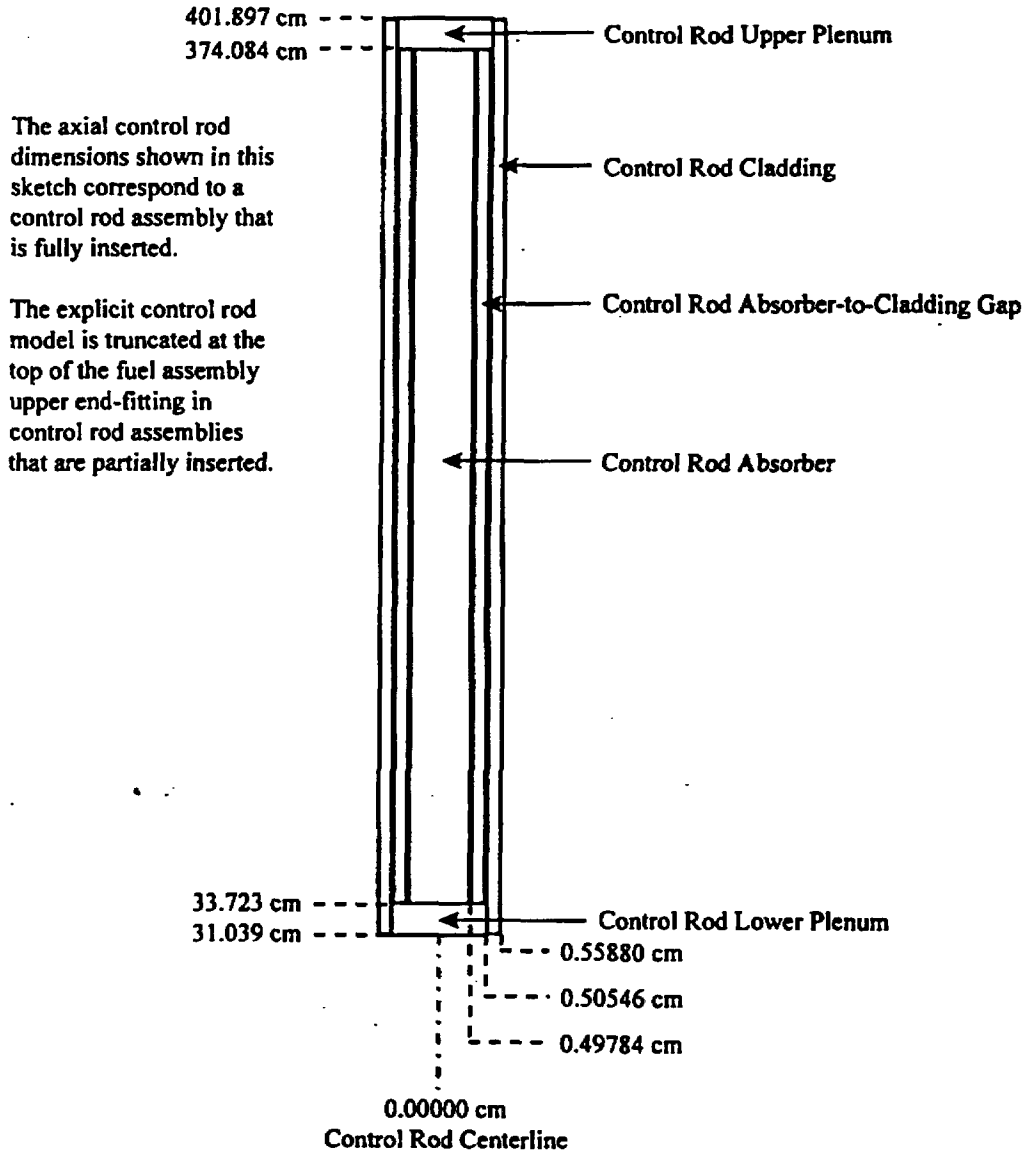
The control rod (CR) modeling description is shown in Figure 7.2.7-1. Each RCCA consists of 16 CR's of uniform composition that are inserted uniformly down through the guide tubes of the fuel assembly to a specified height at reactor startup and during reactor operation. The Crystal River Unit 3 core contains 7 CR banks. The first 4 CR banks are safety banks used to shutdown the reactor. These 4 banks remain fully withdrawn during reactor startup and operation. Banks 5, 6, and 7 are regulating CR banks used to control core reactivity during operation. After Cycle 4 operations of Crystal River Unit 3, the reactor was operated in a non-rodded configuration where CR banks 1 through 7 were fully withdrawn, and the soluble boron in the moderator was used to control reactivity. The CR cladding was modeled with outer and inner diameters of 1.11760 cm and 1.01092 cm, respectively. The absorber material was modeled with a diameter of 0.99568 cm. The absorber material was modeled with a maximum height of 340.361 cm depending on the depth of CR insertion. The CR was always explicitly modeled to the top of the fuel assembly upper end-fitting. If the CR bank was partially inserted, the absorber material was modeled explicitly from the top of the upper end-fitting to the depth of insertion. The CR lower end-plug was modeled inside the CR cladding with a height of 2.684 cm directly below the absorber material as shown in Figure 7.2.7-1. The insertion heights of each RCCA bank in each CRC statepoint reactivity calculation are shown in Table 7.2.7-1.

Table 7.2.7-1 RCCA & APSRA Bank Insertion Heights for Each CRC Statepoint [1]

Cycle	Statepoint EFPD	Safety Banks 1-4	Regulating Bank 5	Regulating Bank 6	Regulating Bank 7	APSR Bank 8
8	0.0	WD [2]	WD	WD	WD	104
8	97.6	WD	WD	227	17	122
8	139.8	WD	WD	122	17	123
8	404.0	WD	331	69	17	122
8	409.6	WD	331	69	17	122
8	515.5	WD	WD	261	17	WD
9	0.0	WD	WD	WD	WD	104
9	158.8	WD	WD	118	17	122
9	219.0	WD	WD	181	17	123
9	363.1	WD	342	80	17	122

[1] The RCCA and APSRA bank insertion heights are presented as the distance in cm between the bottom of the CR's or APSR's and the bottom of the active fuel.

[2] WD means that insertion assembly is 100 % withdrawn (this corresponds to a distance of 363.52 cm in the table).

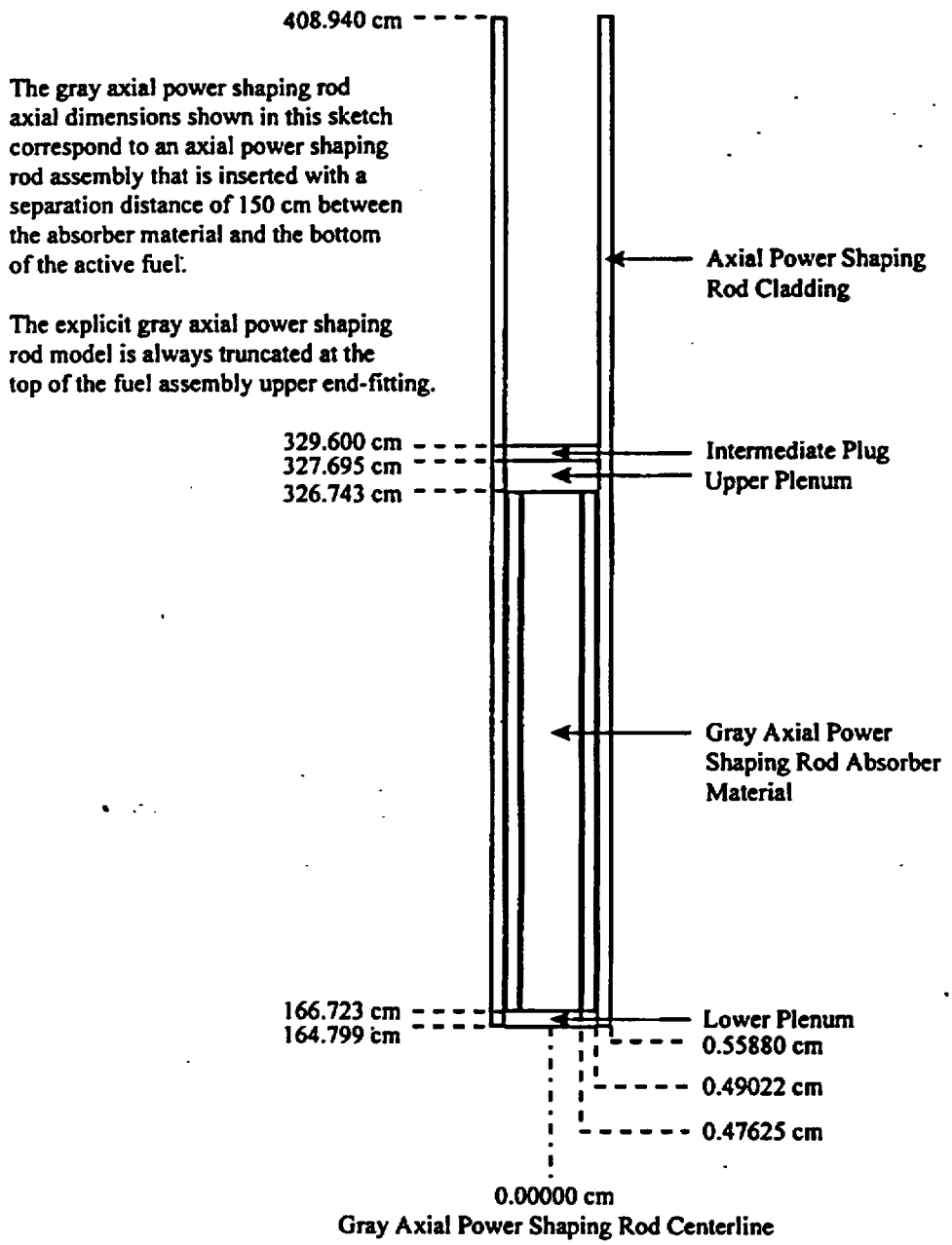


THIS SKETCH IS NOT TO SCALE.

Figure 7.2.7-1 Control Rod MCNP 4A Model

7.2.8 Axial Power Shaping Rod Assembly (APSRA) Description

Gray APSRAs were used in Cycles 8 and 9 of Crystal River Unit 3 operation. The gray axial power shaping rod (APSR) modeling description is shown in Figure 7.2.8-1. The APSRA consists of 16 APSRs of uniform composition that are inserted uniformly down through the guide tubes of the fuel assembly to a specified height at reactor startup and during reactor operation. The Crystal River Unit 3 reactor contains one APSRA bank (Bank 8). The insertion heights of the APSR bank in each CRC statepoint reactivity calculation are shown in Table 7.2.7-1. The gray APSR cladding was modeled with outer and inner diameters of 1.11760 cm and 0.98044 cm, respectively. The gray APSRA absorber materials is Inconel. The absorber material diameter of the gray APSR is 0.95250 cm. The absorber height of the gray APSR is 160.02 cm. The gray APSR contains a lower end-plug region directly below the absorber material with a height of 1.924 cm. The gray APSR contains a spacer region above the absorber material followed by an intermediate plug region. The spacer region is modeled with a height of 0.952 cm in the gray APSR. The intermediate plug is modeled with a height of 1.905 cm in the gray APSR. The region above the intermediate plug in the gray APSRs contains moderator.



THIS SKETCH IS NOT TO SCALE.

Figure 7.2.8-1 Gray Axial Power Shaping Rod MCNP 4A Model

7.3 CRC Benchmark MCNP 4A Materials Description

The material descriptions used in the MCNP 4A CRC statepoint reactivity calculations correspond to the actual reactor component materials. Some component materials having geometrical features that do not require explicit modeling to determine their effect on reactivity were homogenized. The homogenization of these materials approximately preserves the average neutron interaction rate such that the reactivity worth of these materials in the system is well approximated. All homogenizations are based on the explicit volumes of the various component materials in the regions of interest. The depleted fuel and depleted burnable poison materials utilized in the MCNP 4A reactivity calculations are obtained from depletion calculations performed using the SAS2H code in the SCALE 4.3 Modular Code System (Ref. 5.5). The references that document the depletion calculations of the various fuel batches are presented in Table 7.3-1. These references contain detailed descriptions of the fuel and burnable poison depletion calculations.

Table 7.3-1 CRC Depletion Calculation References for Each Fuel Batch

Non-Rodded Assemblies [1]		Rodded Assemblies [2]	
Batch Description	**Reference**	**Batch Description**	**Reference**
Batch 1	5.11	Batch 1	5.16
Batch 5	5.12	Batch 5	5.17
Batch 7A	5.13	Batch 7A	5.18
Batches 8 and 9	5.14	Batches 8 and 9	5.19
Batches 10 and 11	5.15	Batches 10 and 11	5.20

[1] The non-rodded assemblies are fuel assemblies that have never been burned with either a RCCA or an APSRA inserted. The non-rodded assemblies may have been burned with a BPRA inserted.

[2] The rodded assemblies are fuel assemblies that have been burned with either a RCCA or an APSRA inserted.

7.3.1 MCNP 4A Cross Section Libraries

The MCNP 4A cross section libraries utilized in the reactivity calculations are one of the primary components of the calculation that determines whether or not the neutronic behavior of the system is simulated correctly. The k_{eff} results are a direct indicator of the validity of the MCNP 4A cross section library data utilized in the calculations. It is also important to be aware of the source of the cross section libraries utilized in the reactivity calculations because these cross section libraries are a primary component defining the range of applicability of any bias value determined using the associated benchmark k_{eff} results. Table 7.3.1-1 lists all of the MCNP 4A cross section library identifiers (ZAID's) utilized in the CRC benchmark calculations documented in this analysis. The MCNP 4A ZAID's are

used to identify the cross section libraries. The ZAID consists of a 5 integer element and isotope identifier followed by a cross section library designation suffix. The first one or two integers in the ZAID refer to the atomic number of the corresponding element. The three integers preceeding the decimal always refer to the isotopic mass number. The ZAID suffixes presented in Table 7.3.1-1, correspond to libraries compiled from either ENDF/B-V, ENDF/B-VI, LANL/T-2, or LLNL evaluated cross section data sets. The atom percent in nature of the various isotopes presented in Table 7.3.1-1 are obtained from reference 5.21. The atomic weight ratios, temperatures, library names, and data sources are obtained from Attachment IV of reference 5.10.

Table 7.3.1-1 MCNP 4A Cross Section Libraries Used in the CRC Reactivity Calculations

Element / Isotope	MCNP ZAID	Atom % in Nature	Atomic Wt. Ratio [1]	Temp. (K)	Library Name	Data Source
H-1	1001.50c	99.985	0.999167	294.0	rmccs	ENDF/B-V.0
H-3	1003.50c	0.0	2.990140	294.0	rmccs	ENDF/B-V.0
He-4	2004.50c	99.999	3.968219	294.0	rmccs	ENDF/B-V.0
Li-6	3006.50c	7.5	5.963450	294.0	rmccs	ENDF/B-V.0
Li-7	3007.55c	92.5	6.955733	294.0	rmccs	ENDF/B-V.2
Be-9	4009.50c	100.0	8.934763	294.0	rmccs	ENDF/B-V.0
B-10	5010.50c	19.400 [3]	9.926922	294.0	rmccs	ENDF/B-V.0
B-11	5011.56c	80.600 [3]	10.914730	294.0	newxs	LANL/T-2
C-nat	6000.50c	100.0	11.907856	294.0	rmccs	ENDF/B-V.0
N-14	7014.50c	99.630	13.882780	294.0	rmccs	ENDF/B-V.0
O-16	8016.50c	99.760	15.857510	294.0	rmccs	ENDF/B-V.0
Al-27	13027.50c	100.0	26.749756	294.0	rmccs	ENDF/B-V.0
Si-nat	14000.50c	100.0	27.844241	294.0	endf5p	ENDF/B-V.0
P-31	15031.50c	100.0	30.707682	294.0	endf5u	ENDF/B-V.0
S-32	16032.50c	95.02	31.788939 [4]	294.0	endf5u	ENDF/B-V.0
Ti-nat	22000.50c	100.0	47.467124	294.0	endf5u	ENDF/B-V.0
Cr-50	24050.60c	4.345	49.516983	294.0	endf60	ENDF/B-VI.1
Cr-52	24052.60c	83.790	51.494313	294.0	endf60	ENDF/B-VI.1
Cr-53	24053.60c	9.500	52.485863	294.0	endf60	ENDF/B-VI.1
Cr-54	24054.60c	2.365	53.475519	294.0	endf60	ENDF/B-VI.1
Mn-55	25055.50c	100.0	54.466099	294.0	endf5u	ENDF/B-V.0
Fe-54	26054.60c	5.900	53.476242	294.0	endf60	ENDF/B-VI.1

Element / Isotope	MCNP ZAID	Atom % in Nature	Atomic Wt. Ratio [1]	Temp. (K)	Library Name	Data Source
Fe-56	26056.60c	91.720	55.454429	294.0	endf60	ENDF/B-VI.1
Fe-57	26057.60c	2.100	56.446290	294.0	endf60	ENDF/B-VI.1
Fe-58	26058.60c	0.280	57.435600	294.0	endf60	ENDF/B-VI.1
Co-59	27059.50c	100.0	58.426930	294.0	endf5u	ENDF/B-V.0
Ni-58	28058.60c	68.270	57.437652	294.0	endf60	ENDF/B-VI.1
Ni-60	28060.60c	26.100	59.415952	294.0	endf60	ENDF/B-VI.1
Ni-61	28061.60c	1.130	60.407628	294.0	endf60	ENDF/B-VI.1
Ni-62	28062.60c	3.590	61.396349	294.0	endf60	ENDF/B-VI.1
Ni-64	28064.60c	0.910	63.378793	294.0	endf60	ENDF/B-VI.1
Cu-63	29063.60c	69.170	62.389001	294.0	endf60	ENDF/B-VI.2
Cu-65	29065.60c	30.830	64.370028	294.0	endf60	ENDF/B-VI.2
As-75	33075.35c	100.0	74.277979	0.0	rmccsa	ENDF/B-V.0
Kr-80	36080.50c	2.25	79.229851	294.0	rmccsa	ENDF/B-V.0
Kr-82	36082.50c	11.6	81.209803	294.0	rmccsa	ENDF/B-V.0
Kr-83	36083.50c	11.5	82.201858	294.0	rmccsa	ENDF/B-V.0
Kr-84	36084.50c	57.0	83.190662	294.0	rmccsa	ENDF/B-V.0
Kr-86	36086.50c	17.3	85.172596	294.0	rmccsa	ENDF/B-V.0
Y-89	39089.50c	100.0	88.142108	294.0	endf5u	ENDF/B-V.0
Zr-nat	40000.60c	100.0	90.439990	294.0	endf60	ENDF/B-VI.1
Zr-93	40093.50c	0.0	92.108361	294.0	kidman	ENDF/B-V.0
Nb-93	41093.50c	100.0	92.108263	294.0	endf5p	ENDF/B-V.0
Mo-nat	42000.50c	100.0	95.107188	294.0	endf5u	ENDF/B-V.0
Mo-95	42095.50c	15.92	94.090546	294.0	kidman	ENDF/B-V.0
Tc-99	43099.50c	0.0	98.056595	294.0	kidman	ENDF/B-V.0
Ru-101	44101.50c	17.1	100.038748	294.0	kidman	ENDF/B-V.0
Ru-103	44103.50c	0.0	102.022	294.0	kidman	ENDF/B-V.0
Rh-103	45103.50c	100.0	102.021490	294.0	rmccsa	ENDF/B-V.0
Rh-105	45105.50c	0.0	104.005	294.0	kidman	ENDF/B-V.0
Pd-105	46105.50c	22.33	104.003885	294.0	kidman	ENDF/B-V.0
Pd-108	46108.50c	26.46	106.976942	294.0	kidman	ENDF/B-V.0

Element / Isotope	MCNP ZAID	Atom % in Nature	Atomic Wt. Ratio [1]	Temp. (K)	Library Name	Data Source
Ag-107 [2]	47107.60c	51.839	105.986724	294.0	endf60	ENDF/B-VI.0
Ag-109 [2]	47109.60c	48.161	107.969204	294.0	endf60	ENDF/B-VI.0
Ag-107 [2]	47107.50c	51.839	105.986724	294.0	rmccsa	ENDF/B-V.0
Ag-109 [2]	47109.50c	48.161	107.969204	294.0	rmccsa	ENDF/B-V.0
Cd-nat	48000.50c	100.0	111.445880	294.0	endf5u	ENDF/B-V.0
In-nat	49000.60c	100.0	113.831536	294.0	endf60	ENDF/B-VI.0
Sn-nat	50000.35c	100.0	117.690428	0.0	endl85	LLNL
Xe-131	54131.50c	21.2	129.780532	294.0	kidman	ENDF/B-V.0
Xe-134	54134.35c	10.4	132.755077	0.0	endl85	LLNL
Xe-135	54135.53c	0.0	133.748208	587.0	eprixs	ENDF/B-V
Cs-133	55133.50c	100.0	131.763705	294.0	kidman	ENDF/B-V.0
Cs-135	55135.50c	0.0	133.746975	294.0	kidman	ENDF/B-V.0
Ba-138	56138.50c	71.70	136.720557	294.0	rmccs	ENDF/B-V.0
Pr-141	59141.50c	100.0	139.697185	294.0	kidman	ENDF/B-V.0
Nd-143	60143.50c	12.18	141.682152	294.0	kidman	ENDF/B-V.0
Nd-145	60145.50c	8.30	143.667706	294.0	kidman	ENDF/B-V.0
Nd-147	60147.50c	0.0	145.654	294.0	kidman	ENDF/B-V.0
Nd-148	60148.50c	5.76	146.646216	294.0	kidman	ENDF/B-V.0
Pm-147	61147.50c	0.0	145.653	294.0	kidman	ENDF/B-V.0
Pm-148	61148.50c	0.0	146.647	294.0	kidman	ENDF/B-V.0
Pm-149	61149.50c	0.0	147.639	294.0	kidman	ENDF/B-V.0
Sm-147	62147.50c	15.0	145.652830	294.0	kidman	ENDF/B-V.0
Sm-149	62149.50c	13.8	147.637915	294.0	endf5u	ENDF/B-V.0
Sm-150	62150.50c	7.4	148.629416	294.0	kidman	ENDF/B-V.0
Sm-151	62151.50c	0.0	149.623	294.0	kidman	ENDF/B-V.0
Sm-152	62152.50c	26.7	150.614670	294.0	kidman	ENDF/B-V.0
Eu-151	63151.55c	47.8	149.623378	294.0	newxs	LANL/T-2
Eu-152	63152.50c	0.0	150.616668	294.0	endf5u	ENDF/B-V.0
Eu-153	63153.55c	52.2	151.607568	294.0	newxs	LANL/T-2
Eu-154	63154.50c	0.0	152.600719	294.0	endf5u	ENDF/B-V.0

Element / Isotope	MCNP ZAID	Atom % in Nature	Atomic Wt. Ratio [1]	Temp. (K)	Library Name	Data Source
Eu-155	63155.50c	0.0	153.592	294.0	kidman	ENDF/B-V.0
Gd-152	64152.50c	0.20	150.614731	294.0	endf5u	ENDF/B-V.0
Gd-154	64154.50c	2.18	152.598614	294.0	endf5u	ENDF/B-V.0
Gd-155	64155.50c	14.80	153.591761	294.0	endf5u	ENDF/B-V.0
Gd-156	64156.50c	20.47	154.582676	294.0	endf5u	ENDF/B-V.0
Gd-157	64157.50c	15.65	155.575907	294.0	endf5u	ENDF/B-V.0
Gd-158	64158.50c	24.84	156.567459	294.0	endf5u	ENDF/B-V.0
Gd-160	64160.50c	21.86	158.553203	294.0	endf5u	ENDF/B-V.0
Ho-165	67165.55c	100.0	163.513493	294.0	newxs	LANL/T-2
Ta-181	73181.50c	99.988	179.393575	294.0	endf5u	ENDF/B-V.0
Th-232	90232.50c	100.0	230.044724	294.0	endf5u	ENDF/B-V.0
Pa-233	91233.50c	0.0	231.038304	294.0	endf5u	ENDF/B-V.0
U-233	92233.50c	0.0	231.037695	294.0	rmccs	ENDF/B-V.0
U-234	92234.50c	0.0055	232.030412	294.0	endf5p	ENDF/B-V.0
U-235	92235.53c	0.7200	233.024773	587.0	eprixs	ENDF/B-V.0
U-236	92236.50c	0.0	234.017806	294.0	endf5p	ENDF/B-V.0
U-237	92237.50c	0.0	235.012352	294.0	endf5p	ENDF/B-V.0
U-238	92238.53c	99.2745	236.005803	587.0	eprixs	ENDF/B-V.0
Np-235	93235.35c	0.0	233.024904	0.0	endl85	LLNL
Np-236	93236.35c	0.0	234.018854	0.0	endl85	LLNL
Np-237	93237.50c	0.0	235.011799	294.0	endf5p	ENDF/B-V.0
Np-238	93238.35c	0.0	236.005958	0.0	endl85	LLNL
Pu-237	94237.35c	0.0	235.012031	0.0	endl85	LLNL
Pu-238	94238.50c	0.0	236.004583	294.0	endf5p	ENDF/B-V.0
Pu-239	94239.55c	0.0	236.998573	294.0	rmccs	ENDF/B-V.2
Pu-240	94240.50c	0.0	237.991619	294.0	rmccs	ENDF/B-V.0
Pu-241	94241.50c	0.0	238.986041	294.0	endf5p	ENDF/B-V.0
Pu-242	94242.50c	0.0	239.979326	294.0	endf5p	ENDF/B-V.0
Am-241	95241.50c	0.0	238.986019	294.0	endf5u	ENDF/B-V.0
Am-242m	95242.50c	0.0	239.980121	294.0	endf5u	ENDF/B-V.0

Element / Isotope	MCNP ZAID	Atom % in Nature	Atomic Wt. Ratio [1]	Temp. (K)	Library Name	Data Source
Am-243	95243.50c	0.0	240.973348	294.0	endf5u	ENDF/B-V.0
Cm-242	96242.50c	0.0	239.979418	294.0	endf5u	ENDF/B-V.0
Cm-243	96243.35c	0.0	240.973356	0.0	endl85	LLNL
Cm-244	96244.50c	0.0	241.966119	294.0	endf5u	ENDF/B-V.0
Cm-245	96245.35c	0.0	242.960245	0.0	endl85	LLNL
Cm-246	96246.35c	0.0	243.953373	0.0	endl85	LLNL
Cm-247	96247.35c	0.0	244.947884	0.0	endl85	LLNL
Cm-248	96248.35c	0.0	245.941272	0.0	endl85	LLNL

[1] The atomic weight ratio presented for each isotope/element is the ratio of the isotope/element mass to the mass of a neutron. The mass of a neutron is 1.008664904 amu (Ref. 5.21). The atomic weight ratio values are obtained from the "xsdir" file for MCNP 4A as described in reference 5.10.

[2] Both ENDF/B-V and ENDF/B-VI based cross section libraries for Ag-107 and Ag-109 are used in the CRC reactivity calculations documented in this analysis. The ENDF/B-V based cross section libraries for Ag-107 and Ag-109 are only used in the depleted fuel specifications. It was intended that only ENDF/B-VI based cross section libraries for Ag-107 and Ag-109 be used throughout the calculations due to the additional detail included in the cross section library development for these isotopes with respect to the libraries developed from ENDF/B-V data. The use of the ENDF/B-V silver cross sections in the fuel is acceptable because these silver isotopes are present in extremely small quantities (if at all) in the depleted fuel.

[3] The atom percent in nature of B-10 and B-11 varies significantly between different geographical regions of the world. The atom percents in nature that are listed in Table 7.3.1-1 for B-10 and B-11 were obtained from page 232 of reference 5.25.

[4] The atomic weight ratio for natural sulfur is utilized in the determination of the sulfur content in the various materials modeled in the MCNP 4A calculations of this analysis. However, the cross section library for S-32 is used for natural sulfur in the various materials.

7.3.2 Reactor Materials

The reactor components modeled in the MCNP 4A CRC reactivity calculations include the following: core liner, core barrel, thermal shield, pressure vessel cladding, pressure vessel, borated moderator, reactor upper plenum region, control rod guide tube flange region, reactor upper core grid, reactor upper pad region, reactor lower pad region, reactor lower core grid region, and region between the reactor

lower core grid and pressure vessel plate. The material compositions are described in terms of elemental or isotopic weight percents with an overall material density.

The core liner, core barrel, thermal shield, and pressure vessel cladding are composed of stainless steel 304 (SS304). The SS304 composition is shown in Table 7.3.2-1 (Ref. 5.22).

The borated moderator is composed of a homogeneous mixture of boron and water. The boron concentration in water is provided in terms of parts-per-million (ppm) by mass. Since each CRC statepoint has a different boron concentration and water temperature in the moderator, the overall borated moderator composition and density is different. Table 7.3.2-2 presents the borated moderator composition, temperature, and density for each CRC statepoint reactivity calculation. The borated moderator is used throughout the core configuration and between the various reactor components.

The reactor upper regions contain hardware composed of SS304, Inconel, and Zircaloy-4. These regions also contain borated water. Each of these regions is modeled with a homogenized material composition in the MCNP 4A CRC reactivity calculations. The individual material volume fractions in the reactor upper regions depend on whether or not the fuel assembly is empty or has either a BPRA, RCCA, or APSRA inserted. Tables 7.3.2-3, -4, -5, and -6 contain the material volume fractions for the reactor upper regions of a fuel assembly containing no insertion assembly, a BPRA, a RCCA, and an APSRA, respectively. The SS304 material composition is presented in Table 7.3.2-1. The Inconel, Zircaloy-4, and borated moderator compositions are presented in Tables 7.3.2-7, -8, and -2, respectively. These component material compositions are used in conjunction with their volume fractions in each reactor upper region to obtain a homogenized material composition and density to be specified in the MCNP 4A CRC reactivity calculations. The homogenized material compositions for the reactor upper plenum region above a fuel assembly containing no insertion assembly, a BPRA, a RCCA, and an APSRA are presented in Tables 7.3.2-9a through 7.3.2-12b, respectively, for each CRC reactivity calculation documented in this analysis. The homogenized material compositions for the control rod guide tube region above a fuel assembly containing no insertion assembly, a BPRA, a RCCA, and an APSRA are presented in Tables 7.3.2-13a through 7.3.2-16b, respectively, for each CRC reactivity calculation documented in this analysis. The homogenized material compositions for the reactor upper core region above a fuel assembly containing no insertion assembly, a BPRA, a RCCA, and an APSRA are presented in Tables 7.3.2-17a through 7.3.2-20b, respectively, for each CRC reactivity calculation documented in this analysis. The homogenized material compositions for the reactor upper pad region above a fuel assembly containing no insertion assembly, a BPRA, a RCCA, and an APSRA are presented in Tables 7.3.2-21a through 7.3.2-24b, respectively, for each CRC reactivity calculation documented in this analysis.

The three reactor lower core regions contain SS304 hardware and borated moderator. The volume fractions of SS304 and borated moderator in each of the lower core regions are presented in Table 7.3.2-25. The SS304 and borated moderator compositions are presented in Tables 7.3.2-1 and 7.3.2-2, respectively. The homogenized material compositions for the reactor lower pad, the reactor lower core

grid, and the region between the lower core grid and pressure vessel plate are presented in Tables 7.3.2-26, -27, and -28, respectively, for each CRC reactivity calculation documented in this analysis.

Table 7.3.2-1 Type 304 Stainless Steel Composition (Ref. 5.22)

Ele./Iso.	MCNP ZAID	Wt. %	Ele./Iso.	MCNP ZAID	Wt. %
C-nat	6000.50c	0.080	Fe-54	26054.60c	3.918
N-14	7014.50c	0.100	Fe-56	26056.60c	63.156
Si-nat	14000.50c	0.750	Fe-57	26057.60c	1.472
P-31	15031.50c	0.045	Fe-58	26058.60c	0.200
S-nat	16032.50c	0.030	Ni-58	28058.60c	6.234
Cr-50	24050.60c	0.793	Ni-60	28060.60c	2.465
Cr-52	24052.60c	15.903	Ni-61	28061.60c	0.109
Cr-53	24053.60c	1.838	Ni-62	28062.60c	0.350
Cr-54	24054.60c	0.466	Ni-64	28064.60c	0.092
Mn-55	25055.50c	2.000	Density = 7.9 g/cc		

Table 7.3.2-2 Borated Moderator Composition for Each CRC Statepoint Reactivity Calculation [1]

Cycle / EFPD	Temp. (F)	Boron (ppm)	Density (g/cc)	H wt%	O wt%	B-10 wt%	B-11 wt%
8 / 0.0	532	2101	0.768049	11.168022	88.622330	0.037654	0.172006
8 / 97.6	536	1751	0.765111	11.171924	88.653282	0.031392	0.143402
8 / 139.8	535	1612	0.765111	11.173474	88.665588	0.028904	0.132036
8 / 404.0	536	865	0.763942	11.181813	88.731766	0.015522	0.070904
8 / 409.6	536	865	0.763942	11.181813	88.731766	0.015522	0.070904
8 / 515.5	536	675	0.763942	11.183937	88.748619	0.012115	0.055340
9 / 0.0	532	2212	0.768049	11.166785	88.612511	0.039639	0.181073
9 / 158.8	535	1572	0.765111	11.173921	88.669128	0.028188	0.128765
9 / 219.0	535	1481	0.765111	11.174935	88.677185	0.026559	0.121322
9 / 363.1	539	963	0.761035	11.180718	88.723076	0.017278	0.078929

[1] The following set of equations are used to calculate the borated moderator compositions. The atomic weight ratio values for hydrogen, oxygen, boron-10, and boron-11 are obtained from Table 7.3.1-1. The atomic weight ratio for natural boron is 10.718156 (Ref. 5.10).

Equation 7.3.2-1: Boron Weight Percent in Borated Moderator

$$Boron\ wt\ \% = \frac{(Boron\ ppm)(1.0E-4)}{1+(Boron\ ppm)(1.0E-6)}$$

Equation 7.3.2-2: Boron-10 (B-10) Weight Percent in Borated Moderator

$$B\text{-}10\ wt\% = \frac{(B\text{-}10\ atom\%\ in\ B)(B\text{-}10\ Atomic\ Wt.\ Ratio)}{(B\ Atomic\ Wt.\ Ratio)(100.0)}\ (B\ wt\%)$$

where B is natural boron.

Equation 7.3.2-3: Boron-11 (B-11) Weight Percent in Borated Moderator

$$B\text{-}11\ wt\% = \frac{(B\text{-}11\ atom\%\ in\ B)(B\text{-}11\ Atomic\ Wt.\ Ratio)}{(B\ Atomic\ Wt.\ Ratio)(100.0)}\ (B\ wt\%)$$

Equation 7.3.2-4: Hydrogen Weight Percent in Borated Moderator

$$Hydrogen\ wt\% = \frac{(H\ Atomic\ Wt.\ Ratio)(2)(100.0-B\ wt\%)}{[(H\ Atomic\ Wt.\ Ratio)(2)+(O\ Atomic\ Wt.\ Ratio)]}$$

where H is hydrogen, B is natural boron, and O is oxygen.

Equation 7.3.2-5: Oxygen Weight Percent in Borated Moderator

$$Oxygen\ wt\% = \frac{(O\ Atomic\ Wt.\ Ratio)(100.0-B\ wt\%)}{[(H\ Atomic\ Wt.\ Ratio)(2)+(O\ Atomic\ Wt.\ Ratio)]}$$

where H is hydrogen, B is natural boron, and O is oxygen.

Table 7.3.2-3 Upper Reactor Region Material Volume Fractions Above Fuel Assemblies Containing No Insertion Assembly

Upper Reactor Region	Material Volume Fractions	
	Type 304 Stainless Steel	Borated Water
Upper Plenum	0.0578	0.9422
Control Rod Guide Tube Flange	0.1381	0.8619
Upper Core Grid	0.2491	0.7509
Upper Pad	0.3418	0.6582

Table 7.3.2-4 Upper Reactor Region Material Volume Fractions Above Fuel Assemblies Containing a BPRA

Upper Reactor Region	Material Volume Fractions		
	Type 304 Stainless Steel	Borated Water	Zircaloy-4
Upper Plenum	0.0699	0.9301	0.0000
Control Rod Guide Tube Flange	0.1827	0.8173	0.0000
Upper Core Grid	0.2937	0.6994	0.0069
Upper Pad	0.3890	0.5590	0.0120

Table 7.3.2-5 Upper Reactor Region Material Volume Fractions Above Fuel Assemblies Containing a RCCA

Upper Reactor Region	Material Volume Fractions	
	Type 304 Stainless Steel	Borated Water
Upper Plenum	0.0934	0.9066
Control Rod Guide Tube Flange	0.1945	0.8055
Upper Core Grid	0.3481	0.6519
Upper Pad	0.3748	0.6252

Table 7.3.2-6 Upper Reactor Region Material Volume Fractions Above Fuel Assemblies Containing an APSRA

Upper Reactor Region	Material Volume Fractions	
	Type 304 Stainless Steel	Borated Water
Upper Plenum	0.1096	0.8904
Control Rod Guide Tube Flange	0.2212	0.7788

Upper Reactor Region	Material Volume Fractions	
	Type 304 Stainless Steel	Borated Water
Upper Core Grid	0.2828	0.7172
Upper Pad	0.3748	0.6252

Table 7.3.2-7 Inconel 718 Composition (Ref. 5.23)

Ele./Iso.	MCNP ZAID	Wt. %	Ele./Iso.	MCNP ZAID	Wt. %
C-nat	6000.50c	0.080	Ni-60	28060.60c	13.993
Si-nat	14000.50c	0.350	Ni-61	28061.60c	0.616
P-31	15031.50c	0.015	Ni-62	28062.60c	1.989
S-nat	16032.50c	0.015	Ni-64	28064.60c	0.520
Cr-50	24050.60c	0.793	B-10	5010.50c	1.078E-03
Cr-52	24052.60c	15.903	B-11	5011.56c	4.925E-03
Cr-53	24053.60c	1.838	Ti-nat	22000.50c	0.900
Cr-54	24054.60c	0.466	Al-27	13027.50c	0.500
Mn-55	25055.50c	0.350	Co-59	27059.50c	1.000
Fe-54	26054.60c	0.958	Cu-63	29063.60c	0.205
Fe-56	26056.60c	15.442	Cu-65	29065.60c	0.095
Fe-57	26057.60c	0.360	Nb-93	41093.50c	2.563
Fe-58	26058.60c	0.049	Mo-nat	42000.50c	3.050
Ni-58	28058.60c	35.382	Ta-181	73181.50c	2.563
Density = 8.19 g/cc					

Table 7.3.2-8 Zircaloy-4 Composition (Ref. 5.22)

Ele./Iso.	MCNP ZAID	Wt. %	Ele./Iso.	MCNP ZAID	Wt. %
Cr-50	24050.60c	0.004	Fe-57	26057.60c	0.004
Cr-52	24052.60c	0.084	Fe-58	26058.60c	0.001
Cr-53	24053.60c	0.010	O-16	8016.50c	0.120
Cr-54	24054.60c	0.002	Zr-nat	40000.60c	98.180
Fe-54	26054.60c	0.011	Sn-nat	50000.35c	1.400
Fe-56	26056.60c	0.184	Density = 6.56 g/cc		

Table 7.3.2-9a Reactor Upper Plenum Material Composition Above a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.031	0.031	0.031	0.031	0.031
7014.50c	0.039	0.039	0.039	0.039	0.039
14000.50c	0.290	0.291	0.291	0.291	0.291
15031.50c	0.017	0.017	0.017	0.017	0.017
16032.50c	0.012	0.012	0.012	0.012	0.012
24050.60c	0.307	0.308	0.308	0.308	0.308
24052.60c	6.153	6.167	6.167	6.173	6.173
24053.60c	0.711	0.713	0.713	0.713	0.713
24054.60c	0.180	0.181	0.181	0.181	0.181
25055.50c	0.774	0.776	0.776	0.776	0.776
26054.60c	1.516	1.519	1.519	1.521	1.521
26056.60c	24.434	24.491	24.491	24.514	24.514
26057.60c	0.569	0.571	0.571	0.571	0.571
26058.60c	0.077	0.077	0.077	0.078	0.078
28058.60c	2.412	2.417	2.417	2.420	2.420
28060.60c	0.954	0.956	0.956	0.957	0.957
28061.60c	0.042	0.042	0.042	0.042	0.042
28062.60c	0.136	0.136	0.136	0.136	0.136
28064.60c	0.035	0.036	0.036	0.036	0.036
1001.50c	6.847	6.840	6.841	6.842	6.842
5010.50c	2.315E-02	1.926E-02	1.773E-02	9.510E-03	9.510E-03
5011.56c	1.057E-01	8.799E-02	8.100E-02	4.344E-02	4.344E-02
8016.50c	54.336	54.275	54.282	54.291	54.291
Density (g/cc)	1.1803	1.1775	1.1775	1.1764	1.1764

Table 7.3.2-9b Reactor Upper Plenum Material Composition Above a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.031	0.031	0.031	0.031	0.031
7014.50c	0.039	0.039	0.039	0.039	0.039
14000.50c	0.291	0.290	0.291	0.291	0.292
15031.50c	0.017	0.017	0.017	0.017	0.018
16032.50c	0.012	0.012	0.012	0.012	0.012
24050.60c	0.308	0.307	0.308	0.308	0.309
24052.60c	6.173	6.153	6.167	6.167	6.187
24053.60c	0.713	0.711	0.713	0.713	0.715
24054.60c	0.181	0.180	0.181	0.181	0.181
25055.50c	0.776	0.774	0.776	0.776	0.778
26054.60c	1.521	1.516	1.519	1.519	1.524
26056.60c	24.514	24.434	24.491	24.491	24.571
26057.60c	0.571	0.569	0.571	0.571	0.573
26058.60c	0.078	0.077	0.077	0.077	0.078
28058.60c	2.420	2.412	2.417	2.417	2.425
28060.60c	0.957	0.954	0.956	0.956	0.959
28061.60c	0.042	0.042	0.042	0.042	0.042
28062.60c	0.136	0.136	0.136	0.136	0.136
28064.60c	0.036	0.035	0.036	0.036	0.036
1001.50c	6.843	6.847	6.841	6.841	6.831
5010.50c	7.421E-03	2.437E-02	1.729E-02	1.629E-02	1.057E-02
5011.56c	3.390E-02	1.113E-01	7.899E-02	7.442E-02	4.829E-02
8016.50c	54.301	54.330	54.284	54.289	54.205
Density (g/cc)	1.1764	1.1803	1.1775	1.1775	1.1737

Table 7.3.2-10a Reactor Upper Plenum Material Composition Above a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.035	0.035	0.035	0.035	0.035
7014.50c	0.044	0.044	0.044	0.044	0.044
14000.50c	0.327	0.328	0.328	0.328	0.328
15031.50c	0.020	0.020	0.020	0.020	0.020
16032.50c	0.013	0.013	0.013	0.013	0.013
24050.60c	0.346	0.346	0.346	0.347	0.347
24052.60c	6.934	6.949	6.949	6.955	6.955
24053.60c	0.801	0.803	0.803	0.804	0.804
24054.60c	0.203	0.204	0.204	0.204	0.204
25055.50c	0.872	0.874	0.874	0.875	0.875
26054.60c	1.708	1.712	1.712	1.713	1.713
26056.60c	27.535	27.595	27.595	27.619	27.619
26057.60c	0.642	0.643	0.643	0.644	0.644
26058.60c	0.087	0.087	0.087	0.087	0.087
28058.60c	2.718	2.724	2.724	2.726	2.726
28060.60c	1.075	1.077	1.077	1.078	1.078
28061.60c	0.047	0.047	0.047	0.047	0.047
28062.60c	0.153	0.153	0.153	0.153	0.153
28064.60c	0.040	0.040	0.040	0.040	0.040
1001.50c	6.299	6.291	6.291	6.292	6.292
5010.50c	2.129E-02	1.772E-02	1.631E-02	8.745E-03	8.745E-03
5011.56c	9.726E-02	8.092E-02	7.450E-02	3.995E-02	3.995E-02
8016.50c	49.984	49.918	49.925	49.929	49.929
Density (g/cc)	1.2666	1.2638	1.2638	1.2628	1.2628

Table 7.3.2-10b Reactor Upper Plenum Material Composition Above a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.035	0.035	0.035	0.035	0.035
7014.50c	0.044	0.044	0.044	0.044	0.044
14000.50c	0.328	0.327	0.328	0.328	0.329
15031.50c	0.020	0.020	0.020	0.020	0.020
16032.50c	0.013	0.013	0.013	0.013	0.013
24050.60c	0.347	0.346	0.346	0.346	0.348
24052.60c	6.955	6.934	6.949	6.949	6.969
24053.60c	0.804	0.801	0.803	0.803	0.805
24054.60c	0.204	0.203	0.204	0.204	0.204
25055.50c	0.875	0.872	0.874	0.874	0.876
26054.60c	1.713	1.708	1.712	1.712	1.717
26056.60c	27.619	27.535	27.595	27.595	27.678
26057.60c	0.644	0.642	0.643	0.643	0.645
26058.60c	0.087	0.087	0.087	0.087	0.088
28058.60c	2.726	2.718	2.724	2.724	2.732
28060.60c	1.078	1.075	1.077	1.077	1.080
28061.60c	0.047	0.047	0.047	0.047	0.048
28062.60c	0.153	0.153	0.153	0.153	0.154
28064.60c	0.040	0.040	0.040	0.040	0.040
1001.50c	6.293	6.298	6.292	6.292	6.281
5010.50c	6.825E-03	2.242E-02	1.590E-02	1.498E-02	9.720E-03
5011.56c	3.117E-02	1.024E-01	7.265E-02	6.845E-02	4.440E-02
8016.50c	49.938	49.978	49.927	49.931	49.841
Density (g/cc)	1.2628	1.2666	1.2638	1.2638	1.2600

Table 7.3.2-11a Reactor Upper Plenum Material Composition Above a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.041	0.041	0.041	0.041	0.041
7014.50c	0.051	0.052	0.052	0.052	0.052
14000.50c	0.386	0.387	0.387	0.387	0.387
15031.50c	0.023	0.023	0.023	0.023	0.023
16032.50c	0.015	0.015	0.015	0.015	0.015
24050.60c	0.408	0.409	0.409	0.409	0.409
24052.60c	8.182	8.197	8.197	8.203	8.203
24053.60c	0.946	0.947	0.947	0.948	0.948
24054.60c	0.240	0.240	0.240	0.240	0.240
25055.50c	1.029	1.031	1.031	1.032	1.032
26054.60c	2.016	2.019	2.019	2.021	2.021
26056.60c	32.493	32.553	32.553	32.577	32.577
26057.60c	0.757	0.759	0.759	0.759	0.759
26058.60c	0.103	0.103	0.103	0.103	0.103
28058.60c	3.207	3.213	3.213	3.216	3.216
28060.60c	1.268	1.271	1.271	1.272	1.272
28061.60c	0.056	0.056	0.056	0.056	0.056
28062.60c	0.180	0.181	0.181	0.181	0.181
28064.60c	0.047	0.047	0.047	0.047	0.047
1001.50c	5.422	5.413	5.414	5.414	5.414
5010.50c	1.833E-02	1.525E-02	1.403E-02	7.525E-03	7.525E-03
5011.56c	8.373E-02	6.964E-02	6.411E-02	3.438E-02	3.438E-02
8016.50c	43.027	42.958	42.964	42.962	42.962
Density (g/cc)	1.4342	1.4315	1.4315	1.4304	1.4304

Table 7.3.2-11b Reactor Upper Plenum Material Composition Above a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.041	0.041	0.041	0.041	0.041
7014.50c	0.052	0.051	0.052	0.052	0.052
14000.50c	0.387	0.386	0.387	0.387	0.388
15031.50c	0.023	0.023	0.023	0.023	0.023
16032.50c	0.015	0.015	0.015	0.015	0.016
24050.60c	0.409	0.408	0.409	0.409	0.410
24052.60c	8.203	8.182	8.197	8.197	8.218
24053.60c	0.948	0.946	0.947	0.947	0.950
24054.60c	0.240	0.240	0.240	0.240	0.241
25055.50c	1.032	1.029	1.031	1.031	1.034
26054.60c	2.021	2.016	2.019	2.019	2.024
26056.60c	32.577	32.493	32.553	32.553	32.637
26057.60c	0.759	0.757	0.759	0.759	0.761
26058.60c	0.103	0.103	0.103	0.103	0.103
28058.60c	3.216	3.207	3.213	3.213	3.222
28060.60c	1.272	1.268	1.271	1.271	1.274
28061.60c	0.056	0.056	0.056	0.056	0.056
28062.60c	0.181	0.180	0.181	0.181	0.181
28064.60c	0.047	0.047	0.047	0.047	0.047
1001.50c	5.415	5.422	5.414	5.415	5.403
5010.50c	5.872E-03	1.930E-02	1.369E-02	1.289E-02	8.361E-03
5011.56c	2.682E-02	8.815E-02	6.252E-02	5.890E-02	3.819E-02
8016.50c	42.970	43.023	42.965	42.969	42.873
Density (g/cc)	1.4304	1.4342	1.4315	1.4315	1.4278

Table 7.3.2-12a Reactor Upper Plenum Material Composition Above a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.045	0.045	0.045	0.045	0.045
7014.50c	0.056	0.056	0.056	0.056	0.056
14000.50c	0.419	0.420	0.420	0.420	0.420
15031.50c	0.025	0.025	0.025	0.025	0.025
16032.50c	0.017	0.017	0.017	0.017	0.017
24050.60c	0.443	0.444	0.444	0.444	0.444
24052.60c	8.885	8.900	8.900	8.906	8.906
24053.60c	1.027	1.029	1.029	1.029	1.029
24054.60c	0.260	0.261	0.261	0.261	0.261
25055.50c	1.117	1.119	1.119	1.120	1.120
26054.60c	2.189	2.192	2.192	2.194	2.194
26056.60c	35.286	35.346	35.346	35.369	35.369
26057.60c	0.822	0.824	0.824	0.824	0.824
26058.60c	0.112	0.112	0.112	0.112	0.112
28058.60c	3.483	3.489	3.489	3.491	3.491
28060.60c	1.377	1.380	1.380	1.381	1.381
28061.60c	0.061	0.061	0.061	0.061	0.061
28062.60c	0.196	0.196	0.196	0.196	0.196
28064.60c	0.051	0.051	0.051	0.051	0.051
1001.50c	4.928	4.919	4.920	4.920	4.920
5010.50c	1.666E-02	1.385E-02	1.275E-02	6.838E-03	6.838E-03
5011.56c	7.610E-02	6.329E-02	5.826E-02	3.124E-02	3.124E-02
8016.50c	39.108	39.038	39.043	39.039	39.039
Density (g/cc)	1.5497	1.5471	1.5471	1.5461	1.5461

Table 7.3.2-12b Reactor Upper Plenum Material Composition Above a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.045	0.045	0.045	0.045	0.045
7014.50c	0.056	0.056	0.056	0.056	0.056
14000.50c	0.420	0.419	0.420	0.420	0.421
15031.50c	0.025	0.025	0.025	0.025	0.025
16032.50c	0.017	0.017	0.017	0.017	0.017
24050.60c	0.444	0.443	0.444	0.444	0.445
24052.60c	8.906	8.885	8.900	8.900	8.921
24053.60c	1.029	1.027	1.029	1.029	1.031
24054.60c	0.261	0.260	0.261	0.261	0.261
25055.50c	1.120	1.117	1.119	1.119	1.122
26054.60c	2.194	2.189	2.192	2.192	2.198
26056.60c	35.369	35.286	35.346	35.346	35.429
26057.60c	0.824	0.822	0.824	0.824	0.826
26058.60c	0.112	0.112	0.112	0.112	0.112
28058.60c	3.491	3.483	3.489	3.489	3.497
28060.60c	1.381	1.377	1.380	1.380	1.383
28061.60c	0.061	0.061	0.061	0.061	0.061
28062.60c	0.196	0.196	0.196	0.196	0.197
28064.60c	0.051	0.051	0.051	0.051	0.051
1001.50c	4.921	4.928	4.920	4.921	4.909
5010.50c	5.336E-03	1.754E-02	1.244E-02	1.172E-02	7.597E-03
5011.56c	2.438E-02	8.012E-02	5.682E-02	5.353E-02	3.470E-02
8016.50c	39.047	39.104	39.045	39.048	38.952
Density (g/cc)	1.5461	1.5497	1.5471	1.5471	1.5435

Table 7.3.2-13a Control Rod Guide Tube Region Material Composition Above a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.050	0.050	0.050	0.050	0.050
7014.50c	0.062	0.062	0.062	0.062	0.062
14000.50c	0.467	0.467	0.467	0.468	0.468
15031.50c	0.028	0.028	0.028	0.028	0.028
16032.50c	0.019	0.019	0.019	0.019	0.019
24050.60c	0.494	0.494	0.494	0.495	0.495
24052.60c	9.898	9.912	9.912	9.918	9.918
24053.60c	1.144	1.145	1.145	1.146	1.146
24054.60c	0.290	0.291	0.291	0.291	0.291
25055.50c	1.245	1.247	1.247	1.247	1.247
26054.60c	2.438	2.442	2.442	2.443	2.443
26056.60c	39.306	39.363	39.363	39.386	39.386
26057.60c	0.916	0.917	0.917	0.918	0.918
26058.60c	0.124	0.124	0.124	0.125	0.125
28058.60c	3.880	3.885	3.885	3.888	3.888
28060.60c	1.534	1.537	1.537	1.537	1.537
28061.60c	0.068	0.068	0.068	0.068	0.068
28062.60c	0.218	0.218	0.218	0.219	0.219
28064.60c	0.057	0.057	0.057	0.057	0.057
1001.50c	4.217	4.209	4.209	4.209	4.209
5010.50c	1.426E-02	1.185E-02	1.091E-02	5.850E-03	5.850E-03
5011.56c	6.512E-02	5.414E-02	4.985E-02	2.672E-02	2.672E-02
8016.50c	33.467	33.399	33.403	33.396	33.396
Density (g/cc)	1.7530	1.7504	1.7504	1.7494	1.7494

Table 7.3.2-13b Control Rod Guide Tube Region Material Composition Above a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.050	0.050	0.050	0.050	0.050
7014.50c	0.062	0.062	0.062	0.062	0.062
14000.50c	0.468	0.467	0.467	0.467	0.468
15031.50c	0.028	0.028	0.028	0.028	0.028
16032.50c	0.019	0.019	0.019	0.019	0.019
24050.60c	0.495	0.494	0.494	0.494	0.495
24052.60c	9.918	9.898	9.912	9.912	9.932
24053.60c	1.146	1.144	1.145	1.145	1.148
24054.60c	0.291	0.290	0.291	0.291	0.291
25055.50c	1.247	1.245	1.247	1.247	1.249
26054.60c	2.443	2.438	2.442	2.442	2.447
26056.60c	39.386	39.306	39.363	39.363	39.442
26057.60c	0.918	0.916	0.917	0.917	0.919
26058.60c	0.125	0.124	0.124	0.124	0.125
28058.60c	3.888	3.880	3.885	3.885	3.893
28060.60c	1.537	1.534	1.537	1.537	1.540
28061.60c	0.068	0.068	0.068	0.068	0.068
28062.60c	0.219	0.218	0.218	0.218	0.219
28064.60c	0.057	0.057	0.057	0.057	0.057
1001.50c	4.209	4.217	4.210	4.210	4.198
5010.50c	4.565E-03	1.501E-02	1.064E-02	1.003E-02	6.497E-03
5011.56c	2.085E-02	6.856E-02	4.861E-02	4.579E-02	2.968E-02
8016.50c	33.403	33.463	33.405	33.408	33.314
Density (g/cc)	1.7494	1.7530	1.7504	1.7504	1.7469

Table 7.3.2-14a Control Rod Guide Tube Region Material Composition Above a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.056	0.056	0.056	0.056	0.056
7014.50c	0.070	0.070	0.070	0.070	0.070
14000.50c	0.523	0.523	0.523	0.524	0.524
15031.50c	0.031	0.031	0.031	0.031	0.031
16032.50c	0.021	0.021	0.021	0.021	0.021
24050.60c	0.553	0.553	0.553	0.554	0.554
24052.60c	11.083	11.096	11.096	11.101	11.101
24053.60c	1.281	1.282	1.282	1.283	1.283
24054.60c	0.325	0.325	0.325	0.325	0.325
25055.50c	1.394	1.395	1.395	1.396	1.396
26054.60c	2.730	2.733	2.733	2.735	2.735
26056.60c	44.014	44.065	44.065	44.085	44.085
26057.60c	1.026	1.027	1.027	1.027	1.027
26058.60c	0.139	0.139	0.139	0.139	0.139
28058.60c	4.345	4.350	4.350	4.352	4.352
28060.60c	1.718	1.720	1.720	1.721	1.721
28061.60c	0.076	0.076	0.076	0.076	0.076
28062.60c	0.244	0.244	0.244	0.245	0.245
28064.60c	0.064	0.064	0.064	0.064	0.064
1001.50c	3.385	3.377	3.378	3.376	3.376
5010.50c	1.144E-02	9.510E-03	8.755E-03	4.693E-03	4.693E-03
5011.56c	5.227E-02	4.344E-02	4.000E-02	2.144E-02	2.144E-02
8016.50c	26.861	26.799	26.802	26.794	26.794
Density (g/cc)	2.0711	2.0687	2.0687	2.0677	2.0677

Table 7.3.2-14b Control Rod Guide Tube Region Material Composition Above a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.056	0.056	0.056	0.056	0.056
7014.50c	0.070	0.070	0.070	0.070	0.070
14000.50c	0.524	0.523	0.523	0.523	0.524
15031.50c	0.031	0.031	0.031	0.031	0.031
16032.50c	0.021	0.021	0.021	0.021	0.021
24050.60c	0.554	0.553	0.553	0.553	0.554
24052.60c	11.101	11.083	11.096	11.096	11.114
24053.60c	1.283	1.281	1.282	1.282	1.284
24054.60c	0.325	0.325	0.325	0.325	0.326
25055.50c	1.396	1.394	1.395	1.395	1.398
26054.60c	2.735	2.730	2.733	2.733	2.738
26056.60c	44.085	44.014	44.065	44.065	44.136
26057.60c	1.027	1.026	1.027	1.027	1.029
26058.60c	0.139	0.139	0.139	0.139	0.140
28058.60c	4.352	4.345	4.350	4.350	4.357
28060.60c	1.721	1.718	1.720	1.720	1.723
28061.60c	0.076	0.076	0.076	0.076	0.076
28062.60c	0.245	0.244	0.244	0.244	0.245
28064.60c	0.064	0.064	0.064	0.064	0.064
1001.50c	3.377	3.385	3.378	3.378	3.367
5010.50c	3.662E-03	1.205E-02	8.538E-03	8.044E-03	5.211E-03
5011.56c	1.673E-02	5.503E-02	3.900E-02	3.675E-02	2.380E-02
8016.50c	26.799	26.858	26.803	26.806	26.720
Density (g/cc)	2.0677	2.0711	2.0687	2.0687	2.0653

Table 7.3.2-15a Control Rod Guide Tube Region Material Composition Above a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.057	0.057	0.057	0.057	0.057
7014.50c	0.071	0.071	0.071	0.071	0.071
14000.50c	0.535	0.535	0.535	0.536	0.536
15031.50c	0.032	0.032	0.032	0.032	0.032
16032.50c	0.021	0.021	0.021	0.021	0.021
24050.60c	0.565	0.566	0.566	0.566	0.566
24052.60c	11.338	11.351	11.351	11.355	11.355
24053.60c	1.310	1.312	1.312	1.312	1.312
24054.60c	0.332	0.333	0.333	0.333	0.333
25055.50c	1.426	1.427	1.427	1.428	1.428
26054.60c	2.793	2.796	2.796	2.797	2.797
26056.60c	45.027	45.076	45.076	45.096	45.096
26057.60c	1.049	1.050	1.050	1.051	1.051
26058.60c	0.142	0.143	0.143	0.143	0.143
28058.60c	4.445	4.449	4.449	4.451	4.451
28060.60c	1.758	1.760	1.760	1.760	1.760
28061.60c	0.077	0.077	0.077	0.077	0.077
28062.60c	0.250	0.250	0.250	0.250	0.250
28064.60c	0.065	0.065	0.065	0.065	0.065
1001.50c	3.206	3.198	3.199	3.198	3.198
5010.50c	1.084E-02	9.007E-03	8.292E-03	4.444E-03	4.444E-03
5011.56c	4.950E-02	4.114E-02	3.788E-02	2.030E-02	2.030E-02
8016.50c	25.439	25.379	25.382	25.374	25.374
Density (g/cc)	2.1552	2.1528	2.1528	2.1519	2.1519

Table 7.3.2-15b Control Rod Guide Tube Region Material Composition Above a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.057	0.057	0.057	0.057	0.057
7014.50c	0.071	0.071	0.071	0.071	0.071
14000.50c	0.536	0.535	0.535	0.535	0.536
15031.50c	0.032	0.032	0.032	0.032	0.032
16032.50c	0.021	0.021	0.021	0.021	0.021
24050.60c	0.566	0.565	0.566	0.566	0.567
24052.60c	11.355	11.338	11.351	11.351	11.368
24053.60c	1.312	1.310	1.312	1.312	1.314
24054.60c	0.333	0.332	0.333	0.333	0.333
25055.50c	1.428	1.426	1.427	1.427	1.430
26054.60c	2.797	2.793	2.796	2.796	2.800
26056.60c	45.096	45.027	45.076	45.076	45.145
26057.60c	1.051	1.049	1.050	1.050	1.052
26058.60c	0.143	0.142	0.143	0.143	0.143
28058.60c	4.451	4.445	4.449	4.449	4.456
28060.60c	1.760	1.758	1.760	1.760	1.762
28061.60c	0.077	0.077	0.077	0.077	0.078
28062.60c	0.250	0.250	0.250	0.250	0.250
28064.60c	0.065	0.065	0.065	0.065	0.066
1001.50c	3.198	3.205	3.199	3.199	3.189
5010.50c	3.468E-03	1.141E-02	8.086E-03	7.618E-03	4.934E-03
5011.56c	1.584E-02	5.212E-02	3.694E-02	3.480E-02	2.254E-02
8016.50c	25.378	25.436	25.383	25.386	25.302
Density (g/cc)	2.1519	2.1552	2.1528	2.1528	2.1496

Table 7.3.2-16a Control Rod Guide Tube Region Material Composition Above a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.060	0.060	0.060	0.060	0.060
7014.50c	0.074	0.075	0.075	0.075	0.075
14000.50c	0.559	0.559	0.559	0.560	0.560
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.022	0.022	0.022	0.022	0.022
24050.60c	0.591	0.591	0.591	0.592	0.592
24052.60c	11.848	11.859	11.859	11.864	11.864
24053.60c	1.369	1.370	1.370	1.371	1.371
24054.60c	0.347	0.348	0.348	0.348	0.348
25055.50c	1.490	1.491	1.491	1.492	1.492
26054.60c	2.919	2.921	2.921	2.923	2.923
26056.60c	47.051	47.097	47.097	47.115	47.115
26057.60c	1.096	1.098	1.098	1.098	1.098
26058.60c	0.149	0.149	0.149	0.149	0.149
28058.60c	4.644	4.649	4.649	4.651	4.651
28060.60c	1.837	1.838	1.838	1.839	1.839
28061.60c	0.081	0.081	0.081	0.081	0.081
28062.60c	0.261	0.261	0.261	0.261	0.261
28064.60c	0.068	0.068	0.068	0.068	0.068
1001.50c	2.848	2.841	2.841	2.840	2.840
5010.50c	9.627E-03	8.000E-03	7.365E-03	3.948E-03	3.948E-03
5011.56c	4.398E-02	3.654E-02	3.364E-02	1.803E-02	1.803E-02
8016.50c	22.599	22.543	22.546	22.537	22.537
Density (g/cc)	2.3456	2.3433	2.3433	2.3424	2.3424

Table 7.3.2-16b Control Rod Guide Tube Region Material Composition Above a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.060	0.060	0.060	0.060	0.060
7014.50c	0.075	0.074	0.075	0.075	0.075
14000.50c	0.560	0.559	0.559	0.559	0.560
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.022	0.022	0.022	0.022	0.022
24050.60c	0.592	0.591	0.591	0.591	0.592
24052.60c	11.864	11.848	11.859	11.859	11.875
24053.60c	1.371	1.369	1.370	1.370	1.372
24054.60c	0.348	0.347	0.348	0.348	0.348
25055.50c	1.492	1.490	1.491	1.491	1.493
26054.60c	2.923	2.919	2.921	2.921	2.925
26056.60c	47.115	47.051	47.097	47.097	47.160
26057.60c	1.098	1.096	1.098	1.098	1.099
26058.60c	0.149	0.149	0.149	0.149	0.149
28058.60c	4.651	4.644	4.649	4.649	4.655
28060.60c	1.839	1.837	1.838	1.838	1.841
28061.60c	0.081	0.081	0.081	0.081	0.081
28062.60c	0.261	0.261	0.261	0.261	0.262
28064.60c	0.068	0.068	0.068	0.068	0.068
1001.50c	2.841	2.848	2.841	2.842	2.832
5010.50c	3.080E-03	1.014E-02	7.182E-03	6.767E-03	4.382E-03
5011.56c	1.407E-02	4.630E-02	3.281E-02	3.091E-02	2.002E-02
8016.50c	22.541	22.597	22.547	22.549	22.471
Density (g/cc)	2.3424	2.3456	2.3433	2.3433	2.3402

Table 7.3.2-17a Reactor Upper Core Grid Region Material Composition Above a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.062	0.062	0.062	0.062	0.062
7014.50c	0.077	0.077	0.077	0.077	0.077
14000.50c	0.580	0.581	0.581	0.581	0.581
15031.50c	0.035	0.035	0.035	0.035	0.035
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.613	0.614	0.614	0.614	0.614
24052.60c	12.299	12.309	12.309	12.314	12.314
24053.60c	1.421	1.422	1.422	1.423	1.423
24054.60c	0.360	0.361	0.361	0.361	0.361
25055.50c	1.547	1.548	1.548	1.549	1.549
26054.60c	3.030	3.032	3.032	3.033	3.033
26056.60c	48.842	48.884	48.884	48.901	48.901
26057.60c	1.138	1.139	1.139	1.140	1.140
26058.60c	0.154	0.155	0.155	0.155	0.155
28058.60c	4.821	4.825	4.825	4.827	4.827
28060.60c	1.907	1.908	1.908	1.909	1.909
28061.60c	0.084	0.084	0.084	0.084	0.084
28062.60c	0.271	0.271	0.271	0.271	0.271
28064.60c	0.071	0.071	0.071	0.071	0.071
1001.50c	2.531	2.525	2.525	2.524	2.524
5010.50c	8.556E-03	7.110E-03	6.545E-03	3.508E-03	3.508E-03
5011.56c	3.908E-02	3.248E-02	2.990E-02	1.602E-02	1.602E-02
8016.50c	20.086	20.033	20.036	20.027	20.027
Density (g/cc)	2.5446	2.5424	2.5424	2.5415	2.5415

Table 7.3.2-17b Reactor Upper Core Grid Region Material Composition Above a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.062	0.062	0.062	0.062	0.062
7014.50c	0.077	0.077	0.077	0.077	0.077
14000.50c	0.581	0.580	0.581	0.581	0.581
15031.50c	0.035	0.035	0.035	0.035	0.035
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.614	0.613	0.614	0.614	0.615
24052.60c	12.314	12.299	12.309	12.309	12.324
24053.60c	1.423	1.421	1.422	1.422	1.424
24054.60c	0.361	0.360	0.361	0.361	0.361
25055.50c	1.549	1.547	1.548	1.548	1.550
26054.60c	3.033	3.030	3.032	3.032	3.036
26056.60c	48.901	48.842	48.884	48.884	48.943
26057.60c	1.140	1.138	1.139	1.139	1.141
26058.60c	0.155	0.154	0.155	0.155	0.155
28058.60c	4.827	4.821	4.825	4.825	4.831
28060.60c	1.909	1.907	1.908	1.908	1.911
28061.60c	0.084	0.084	0.084	0.084	0.084
28062.60c	0.271	0.271	0.271	0.271	0.272
28064.60c	0.071	0.071	0.071	0.071	0.071
1001.50c	2.524	2.531	2.525	2.525	2.516
5010.50c	2.737E-03	9.008E-03	6.383E-03	6.013E-03	3.894E-03
5011.56c	1.250E-02	4.115E-02	2.916E-02	2.747E-02	1.779E-02
8016.50c	20.031	20.084	20.037	20.039	19.966
Density (g/cc)	2.5415	2.5446	2.5424	2.5424	2.5394

Table 7.3.2-18a Reactor Upper Core Grid Region Material Composition Above a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.064	0.064	0.064	0.064	0.064
7014.50c	0.080	0.080	0.080	0.080	0.080
14000.50c	0.600	0.600	0.600	0.600	0.600
15031.50c	0.036	0.036	0.036	0.036	0.036
16032.50c	0.024	0.024	0.024	0.024	0.024
24050.60c	0.634	0.634	0.634	0.635	0.635
24052.60c	12.713	12.722	12.722	12.726	12.726
24053.60c	1.469	1.470	1.470	1.471	1.471
24054.60c	0.373	0.373	0.373	0.373	0.373
25055.50c	1.599	1.600	1.600	1.600	1.600
26054.60c	3.132	3.134	3.134	3.135	3.135
26056.60c	50.486	50.522	50.522	50.536	50.536
26057.60c	1.177	1.177	1.177	1.178	1.178
26058.60c	0.160	0.160	0.160	0.160	0.160
28058.60c	4.983	4.987	4.987	4.988	4.988
28060.60c	1.971	1.972	1.972	1.973	1.973
28061.60c	0.087	0.087	0.087	0.087	0.087
28062.60c	0.280	0.280	0.280	0.280	0.280
28064.60c	0.073	0.073	0.073	0.073	0.073
1001.50c	2.067	2.061	2.061	2.060	2.060
5010.50c	6.986E-03	5.804E-03	5.343E-03	2.864E-03	2.864E-03
5011.56c	3.191E-02	2.651E-02	2.441E-02	1.308E-02	1.308E-02
8016.50c	16.402	16.357	16.359	16.351	16.351
40000.60c	1.531	1.532	1.532	1.533	1.533
50000.35c	0.022	0.022	0.022	0.022	0.022
Density (g/cc)	2.9027	2.9006	2.9006	2.8998	2.8998

Table 7.3.2-18b Reactor Upper Core Grid Region Material Composition Above a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.064	0.064	0.064	0.064	0.064
7014.50c	0.080	0.080	0.080	0.080	0.080
14000.50c	0.600	0.600	0.600	0.600	0.601
15031.50c	0.036	0.036	0.036	0.036	0.036
16032.50c	0.024	0.024	0.024	0.024	0.024
24050.60c	0.635	0.634	0.634	0.634	0.635
24052.60c	12.726	12.713	12.722	12.722	12.735
24053.60c	1.471	1.469	1.470	1.470	1.472
24054.60c	0.373	0.373	0.373	0.373	0.373
25055.50c	1.600	1.599	1.600	1.600	1.601
26054.60c	3.135	3.132	3.134	3.134	3.137
26056.60c	50.536	50.486	50.522	50.522	50.572
26057.60c	1.178	1.177	1.177	1.177	1.179
26058.60c	0.160	0.160	0.160	0.160	0.160
28058.60c	4.988	4.983	4.987	4.987	4.992
28060.60c	1.973	1.971	1.972	1.972	1.974
28061.60c	0.087	0.087	0.087	0.087	0.087
28062.60c	0.280	0.280	0.280	0.280	0.281
28064.60c	0.073	0.073	0.073	0.073	0.073
1001.50c	2.061	2.067	2.061	2.062	2.054
5010.50c	2.235E-03	7.355E-03	5.211E-03	4.909E-03	3.178E-03
5011.56c	1.021E-02	3.360E-02	2.380E-02	2.243E-02	1.452E-02
8016.50c	16.354	16.401	16.360	16.361	16.299
40000.60c	1.533	1.531	1.532	1.532	1.534
50000.35c	0.022	0.022	0.022	0.022	0.022
Density (g/cc)	2.8998	2.9027	2.9006	2.9006	2.8978

Table 7.3.2-19a Reactor Upper Core Grid Region Material Composition Above a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.068	0.068	0.068	0.068	0.068
7014.50c	0.085	0.085	0.085	0.085	0.085
14000.50c	0.634	0.635	0.635	0.635	0.635
15031.50c	0.038	0.038	0.038	0.038	0.038
16032.50c	0.025	0.025	0.025	0.025	0.025
24050.60c	0.671	0.671	0.671	0.671	0.671
24052.60c	13.454	13.462	13.462	13.465	13.465
24053.60c	1.555	1.556	1.556	1.556	1.556
24054.60c	0.394	0.395	0.395	0.395	0.395
25055.50c	1.692	1.693	1.693	1.693	1.693
26054.60c	3.314	3.316	3.316	3.317	3.317
26056.60c	53.428	53.460	53.460	53.472	53.472
26057.60c	1.245	1.246	1.246	1.246	1.246
26058.60c	0.169	0.169	0.169	0.169	0.169
28058.60c	5.274	5.277	5.277	5.278	5.278
28060.60c	2.086	2.087	2.087	2.087	2.087
28061.60c	0.092	0.092	0.092	0.092	0.092
28062.60c	0.296	0.297	0.297	0.297	0.297
28064.60c	0.078	0.078	0.078	0.078	0.078
1001.50c	1.720	1.715	1.715	1.714	1.714
5010.50c	5.815E-03	4.830E-03	4.447E-03	2.383E-03	2.383E-03
5011.56c	2.656E-02	2.206E-02	2.031E-02	1.089E-02	1.089E-02
8016.50c	13.650	13.611	13.613	13.605	13.605
Density (g/cc)	3.2507	3.2488	3.2488	3.2480	3.2480

Table 7.3.2-19b Reactor Upper Core Grid Region Material Composition Above a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.068	0.068	0.068	0.068	0.068
7014.50c	0.085	0.085	0.085	0.085	0.085
14000.50c	0.635	0.634	0.635	0.635	0.635
15031.50c	0.038	0.038	0.038	0.038	0.038
16032.50c	0.025	0.025	0.025	0.025	0.025
24050.60c	0.671	0.671	0.671	0.671	0.672
24052.60c	13.465	13.454	13.462	13.462	13.473
24053.60c	1.556	1.555	1.556	1.556	1.557
24054.60c	0.395	0.394	0.395	0.395	0.395
25055.50c	1.693	1.692	1.693	1.693	1.694
26054.60c	3.317	3.314	3.316	3.316	3.319
26056.60c	53.472	53.428	53.460	53.460	53.504
26057.60c	1.246	1.245	1.246	1.246	1.247
26058.60c	0.169	0.169	0.169	0.169	0.169
28058.60c	5.278	5.274	5.277	5.277	5.281
28060.60c	2.087	2.086	2.087	2.087	2.089
28061.60c	0.092	0.092	0.092	0.092	0.092
28062.60c	0.297	0.296	0.297	0.297	0.297
28064.60c	0.078	0.078	0.078	0.078	0.078
1001.50c	1.715	1.720	1.716	1.716	1.709
5010.50c	1.860E-03	6.122E-03	4.336E-03	4.085E-03	2.645E-03
5011.56c	8.495E-03	2.796E-02	1.981E-02	1.866E-02	1.208E-02
8016.50c	13.608	13.649	13.613	13.614	13.560
Density (g/cc)	3.2480	3.2507	3.2488	3.2488	3.2461

Table 7.3.2-20a Reactor Upper Core Grid Region Material Composition Above a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.064	0.064	0.064	0.064	0.064
7014.50c	0.080	0.080	0.080	0.080	0.080
14000.50c	0.602	0.602	0.602	0.602	0.602
15031.50c	0.036	0.036	0.036	0.036	0.036
16032.50c	0.024	0.024	0.024	0.024	0.024
24050.60c	0.636	0.637	0.637	0.637	0.637
24052.60c	12.758	12.767	12.767	12.771	12.771
24053.60c	1.474	1.475	1.475	1.476	1.476
24054.60c	0.374	0.374	0.374	0.374	0.374
25055.50c	1.604	1.606	1.606	1.606	1.606
26054.60c	3.143	3.145	3.145	3.146	3.146
26056.60c	50.664	50.703	50.703	50.718	50.718
26057.60c	1.181	1.182	1.182	1.182	1.182
26058.60c	0.160	0.160	0.160	0.160	0.160
28058.60c	5.001	5.005	5.005	5.006	5.006
28060.60c	1.978	1.979	1.979	1.980	1.980
28061.60c	0.087	0.087	0.087	0.087	0.087
28062.60c	0.281	0.281	0.281	0.281	0.281
28064.60c	0.074	0.074	0.074	0.074	0.074
1001.50c	2.209	2.203	2.203	2.202	2.202
5010.50c	7.467E-03	6.204E-03	5.711E-03	3.061E-03	3.061E-03
5011.56c	3.411E-02	2.834E-02	2.609E-02	1.398E-02	1.398E-02
8016.50c	17.529	17.481	17.483	17.475	17.475
Density (g/cc)	2.7850	2.7829	2.7829	2.7820	2.7820

Table 7.3.2-20b Reactor Upper Core Grid Region Material Composition Above a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.064	0.064	0.064	0.064	0.064
7014.50c	0.080	0.080	0.080	0.080	0.080
14000.50c	0.602	0.602	0.602	0.602	0.603
15031.50c	0.036	0.036	0.036	0.036	0.036
16032.50c	0.024	0.024	0.024	0.024	0.024
24050.60c	0.637	0.636	0.637	0.637	0.637
24052.60c	12.771	12.758	12.767	12.767	12.781
24053.60c	1.476	1.474	1.475	1.475	1.477
24054.60c	0.374	0.374	0.374	0.374	0.375
25055.50c	1.606	1.604	1.606	1.606	1.607
26054.60c	3.146	3.143	3.145	3.145	3.148
26056.60c	50.718	50.664	50.703	50.703	50.756
26057.60c	1.182	1.181	1.182	1.182	1.183
26058.60c	0.160	0.160	0.160	0.160	0.160
28058.60c	5.006	5.001	5.005	5.005	5.010
28060.60c	1.980	1.978	1.979	1.979	1.981
28061.60c	0.087	0.087	0.087	0.087	0.087
28062.60c	0.281	0.281	0.281	0.281	0.282
28064.60c	0.074	0.074	0.074	0.074	0.074
1001.50c	2.203	2.209	2.203	2.204	2.195
5010.50c	2.389E-03	7.861E-03	5.570E-03	5.247E-03	3.397E-03
5011.56c	1.091E-02	3.591E-02	2.544E-02	2.397E-02	1.552E-02
8016.50c	17.478	17.527	17.484	17.486	17.420
Density (g/cc)	2.7820	2.7850	2.7829	2.7829	2.7799

Table 7.3.2-21a Reactor Upper Pad Region Material Composition Above a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.067	0.067	0.067	0.067	0.067
7014.50c	0.084	0.084	0.084	0.084	0.084
14000.50c	0.632	0.632	0.632	0.632	0.632
15031.50c	0.038	0.038	0.038	0.038	0.038
16032.50c	0.025	0.025	0.025	0.025	0.025
24050.60c	0.668	0.668	0.668	0.669	0.669
24052.60c	13.395	13.403	13.403	13.407	13.407
24053.60c	1.548	1.549	1.549	1.549	1.549
24054.60c	0.393	0.393	0.393	0.393	0.393
25055.50c	1.685	1.686	1.686	1.686	1.686
26054.60c	3.300	3.302	3.302	3.303	3.303
26056.60c	53.197	53.229	53.229	53.241	53.241
26057.60c	1.240	1.240	1.240	1.241	1.241
26058.60c	0.168	0.168	0.168	0.168	0.168
28058.60c	5.251	5.254	5.254	5.255	5.255
28060.60c	2.077	2.078	2.078	2.078	2.078
28061.60c	0.091	0.091	0.091	0.091	0.091
28062.60c	0.295	0.295	0.295	0.295	0.295
28064.60c	0.077	0.077	0.077	0.077	0.077
1001.50c	1.761	1.756	1.756	1.755	1.755
5010.50c	5.953E-03	4.945E-03	4.553E-03	2.440E-03	2.440E-03
5011.56c	2.719E-02	2.259E-02	2.080E-02	1.115E-02	1.115E-02
8016.50c	13.975	13.935	13.937	13.929	13.929
Density (g/cc)	3.2057	3.2038	3.2038	3.2030	3.2030

Table 7.3.2-21b Reactor Upper Pad Region Material Composition Above a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.067	0.067	0.067	0.067	0.067
7014.50c	0.084	0.084	0.084	0.084	0.084
14000.50c	0.632	0.632	0.632	0.632	0.633
15031.50c	0.038	0.038	0.038	0.038	0.038
16032.50c	0.025	0.025	0.025	0.025	0.025
24050.60c	0.669	0.668	0.668	0.668	0.669
24052.60c	13.407	13.395	13.403	13.403	13.415
24053.60c	1.549	1.548	1.549	1.549	1.550
24054.60c	0.393	0.393	0.393	0.393	0.393
25055.50c	1.686	1.685	1.686	1.686	1.687
26054.60c	3.303	3.300	3.302	3.302	3.305
26056.60c	53.241	53.197	53.229	53.229	53.273
26057.60c	1.241	1.240	1.240	1.240	1.242
26058.60c	0.168	0.168	0.168	0.168	0.168
28058.60c	5.255	5.251	5.254	5.254	5.259
28060.60c	2.078	2.077	2.078	2.078	2.080
28061.60c	0.091	0.091	0.091	0.091	0.092
28062.60c	0.295	0.295	0.295	0.295	0.296
28064.60c	0.077	0.077	0.077	0.077	0.077
1001.50c	1.756	1.761	1.756	1.757	1.750
5010.50c	1.904E-03	6.268E-03	4.440E-03	4.183E-03	2.708E-03
5011.56c	8.697E-03	2.863E-02	2.028E-02	1.911E-02	1.237E-02
8016.50c	13.932	13.974	13.938	13.939	13.883
Density (g/cc)	3.2030	3.2057	3.2038	3.2038	3.2011

Table 7.3.2-22a Reactor Upper Pad Region Material Composition Above a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.069	0.069	0.069	0.069	0.069
7014.50c	0.086	0.086	0.086	0.086	0.086
14000.50c	0.644	0.644	0.644	0.644	0.644
15031.50c	0.039	0.039	0.039	0.039	0.039
16032.50c	0.026	0.026	0.026	0.026	0.026
24050.60c	0.681	0.681	0.681	0.681	0.681
24052.60c	13.649	13.655	13.655	13.658	13.658
24053.60c	1.577	1.578	1.578	1.578	1.578
24054.60c	0.400	0.400	0.400	0.400	0.400
25055.50c	1.716	1.717	1.717	1.717	1.717
26054.60c	3.362	3.364	3.364	3.364	3.364
26056.60c	54.200	54.225	54.225	54.235	54.235
26057.60c	1.263	1.264	1.264	1.264	1.264
26058.60c	0.171	0.171	0.171	0.171	0.171
28058.60c	5.350	5.352	5.352	5.353	5.353
28060.60c	2.116	2.117	2.117	2.117	2.117
28061.60c	0.093	0.093	0.093	0.093	0.093
28062.60c	0.301	0.301	0.301	0.301	0.301
28064.60c	0.079	0.079	0.079	0.079	0.079
1001.50c	1.339	1.335	1.335	1.334	1.334
5010.50c	4.526E-03	3.759E-03	3.461E-03	1.855E-03	1.855E-03
5011.56c	2.067E-02	1.717E-02	1.581E-02	8.472E-03	8.472E-03
8016.50c	10.627	10.595	10.597	10.590	10.590
40000.60c	2.158	2.159	2.159	2.160	2.160
50000.35c	0.031	0.031	0.031	0.031	0.031
Density (g/cc)	3.5812	3.5795	3.5795	3.5789	3.5789

Table 7.3.2-22b Reactor Upper Pad Region Material Composition Above a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.069	0.069	0.069	0.069	0.069
7014.50c	0.086	0.086	0.086	0.086	0.086
14000.50c	0.644	0.644	0.644	0.644	0.644
15031.50c	0.039	0.039	0.039	0.039	0.039
16032.50c	0.026	0.026	0.026	0.026	0.026
24050.60c	0.681	0.681	0.681	0.681	0.681
24052.60c	13.658	13.649	13.655	13.655	13.664
24053.60c	1.578	1.577	1.578	1.578	1.579
24054.60c	0.400	0.400	0.400	0.400	0.401
25055.50c	1.717	1.716	1.717	1.717	1.718
26054.60c	3.364	3.362	3.364	3.364	3.366
26056.60c	54.235	54.200	54.225	54.225	54.259
26057.60c	1.264	1.263	1.264	1.264	1.264
26058.60c	0.171	0.171	0.171	0.171	0.172
28058.60c	5.353	5.350	5.352	5.352	5.355
28060.60c	2.117	2.116	2.117	2.117	2.118
28061.60c	0.093	0.093	0.093	0.093	0.093
28062.60c	0.301	0.301	0.301	0.301	0.301
28064.60c	0.079	0.079	0.079	0.079	0.079
1001.50c	1.335	1.339	1.335	1.335	1.330
5010.50c	1.447E-03	4.765E-03	3.375E-03	3.180E-03	2.058E-03
5011.56c	6.611E-03	2.177E-02	1.542E-02	1.452E-02	9.400E-03
8016.50c	10.592	10.626	10.597	10.598	10.554
40000.60c	2.160	2.158	2.159	2.159	2.161
50000.35c	0.031	0.031	0.031	0.031	0.031
Density (g/cc)	3.5789	3.5812	3.5795	3.5795	3.5772

Table 7.3.2-23a Reactor Upper Pad Region Material Composition Above a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.069	0.069	0.069	0.069	0.069
7014.50c	0.086	0.086	0.086	0.086	0.086
14000.50c	0.645	0.646	0.646	0.646	0.646
15031.50c	0.039	0.039	0.039	0.039	0.039
16032.50c	0.026	0.026	0.026	0.026	0.026
24050.60c	0.682	0.683	0.683	0.683	0.683
24052.60c	13.684	13.691	13.691	13.694	13.694
24053.60c	1.581	1.582	1.582	1.583	1.583
24054.60c	0.401	0.401	0.401	0.401	0.401
25055.50c	1.721	1.722	1.722	1.722	1.722
26054.60c	3.371	3.373	3.373	3.373	3.373
26056.60c	54.343	54.372	54.372	54.384	54.384
26057.60c	1.266	1.267	1.267	1.267	1.267
26058.60c	0.172	0.172	0.172	0.172	0.172
28058.60c	5.364	5.367	5.367	5.368	5.368
28060.60c	2.121	2.122	2.122	2.123	2.123
28061.60c	0.093	0.093	0.093	0.093	0.093
28062.60c	0.302	0.302	0.302	0.302	0.302
28064.60c	0.079	0.079	0.079	0.079	0.079
1001.50c	1.558	1.554	1.554	1.553	1.553
5010.50c	5.268E-03	4.376E-03	4.028E-03	2.159E-03	2.159E-03
5011.56c	2.406E-02	1.999E-02	1.840E-02	9.862E-03	9.862E-03
8016.50c	12.367	12.330	12.332	12.325	12.325
Density (g/cc)	3.4411	3.4393	3.4393	3.4385	3.4385

Table 7.3.2-23b Reactor Upper Pad Region Material Composition Above a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.069	0.069	0.069	0.069	0.069
7014.50c	0.086	0.086	0.086	0.086	0.086
14000.50c	0.646	0.645	0.646	0.646	0.646
15031.50c	0.039	0.039	0.039	0.039	0.039
16032.50c	0.026	0.026	0.026	0.026	0.026
24050.60c	0.683	0.682	0.683	0.683	0.683
24052.60c	13.694	13.684	13.691	13.691	13.701
24053.60c	1.583	1.581	1.582	1.582	1.583
24054.60c	0.401	0.401	0.401	0.401	0.402
25055.50c	1.722	1.721	1.722	1.722	1.723
26054.60c	3.373	3.371	3.373	3.373	3.375
26056.60c	54.384	54.343	54.372	54.372	54.412
26057.60c	1.267	1.266	1.267	1.267	1.268
26058.60c	0.172	0.172	0.172	0.172	0.172
28058.60c	5.368	5.364	5.367	5.367	5.371
28060.60c	2.123	2.121	2.122	2.122	2.124
28061.60c	0.093	0.093	0.093	0.093	0.093
28062.60c	0.302	0.302	0.302	0.302	0.302
28064.60c	0.079	0.079	0.079	0.079	0.079
1001.50c	1.553	1.558	1.554	1.554	1.548
5010.50c	1.685E-03	5.546E-03	3.928E-03	3.701E-03	2.396E-03
5011.56c	7.696E-03	2.534E-02	1.795E-02	1.691E-02	1.094E-02
8016.50c	12.327	12.365	12.332	12.334	12.283
Density (g/cc)	3.4385	3.4411	3.4393	3.4393	3.4367

Table 7.3.2-24a Reactor Upper Pad Region Material Composition Above a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.069	0.069	0.069	0.069	0.069
7014.50c	0.086	0.086	0.086	0.086	0.086
14000.50c	0.645	0.646	0.646	0.646	0.646
15031.50c	0.039	0.039	0.039	0.039	0.039
16032.50c	0.026	0.026	0.026	0.026	0.026
24050.60c	0.682	0.683	0.683	0.683	0.683
24052.60c	13.684	13.691	13.691	13.694	13.694
24053.60c	1.581	1.582	1.582	1.583	1.583
24054.60c	0.401	0.401	0.401	0.401	0.401
25055.50c	1.721	1.722	1.722	1.722	1.722
26054.60c	3.371	3.373	3.373	3.373	3.373
26056.60c	54.343	54.372	54.372	54.384	54.384
26057.60c	1.266	1.267	1.267	1.267	1.267
26058.60c	0.172	0.172	0.172	0.172	0.172
28058.60c	5.364	5.367	5.367	5.368	5.368
28060.60c	2.121	2.122	2.122	2.123	2.123
28061.60c	0.093	0.093	0.093	0.093	0.093
28062.60c	0.302	0.302	0.302	0.302	0.302
28064.60c	0.079	0.079	0.079	0.079	0.079
1001.50c	1.558	1.554	1.554	1.553	1.553
5010.50c	5.268E-03	4.376E-03	4.028E-03	2.159E-03	2.159E-03
5011.56c	2.406E-02	1.999E-02	1.840E-02	9.862E-03	9.862E-03
8016.50c	12.367	12.330	12.332	12.325	12.325
Density (g/cc)	3.4411	3.4393	3.4393	3.4385	3.4385

Table 7.3.2-24b Reactor Upper Pad Region Material Composition Above a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.069	0.069	0.069	0.069	0.069
7014.50c	0.086	0.086	0.086	0.086	0.086
14000.50c	0.646	0.645	0.646	0.646	0.646
15031.50c	0.039	0.039	0.039	0.039	0.039
16032.50c	0.026	0.026	0.026	0.026	0.026
24050.60c	0.683	0.682	0.683	0.683	0.683
24052.60c	13.694	13.684	13.691	13.691	13.701
24053.60c	1.583	1.581	1.582	1.582	1.583
24054.60c	0.401	0.401	0.401	0.401	0.402
25055.50c	1.722	1.721	1.722	1.722	1.723
26054.60c	3.373	3.371	3.373	3.373	3.375
26056.60c	54.384	54.343	54.372	54.372	54.412
26057.60c	1.267	1.266	1.267	1.267	1.268
26058.60c	0.172	0.172	0.172	0.172	0.172
28058.60c	5.368	5.364	5.367	5.367	5.371
28060.60c	2.123	2.121	2.122	2.122	2.124
28061.60c	0.093	0.093	0.093	0.093	0.093
28062.60c	0.302	0.302	0.302	0.302	0.302
28064.60c	0.079	0.079	0.079	0.079	0.079
1001.50c	1.553	1.558	1.554	1.554	1.548
5010.50c	1.685E-03	5.546E-03	3.928E-03	3.701E-03	2.396E-03
5011.56c	7.696E-03	2.534E-02	1.795E-02	1.691E-02	1.094E-02
8016.50c	12.327	12.365	12.332	12.334	12.283
Density (g/cc)	3.4385	3.4411	3.4393	3.4393	3.4367

Table 7.3.2-25 Lower Reactor Region Material Volume Fractions

Lower Reactor Region	Material Volume Fractions	
	Type 304 Stainless Steel	Borated Water
Lower Core Pad	0.2848	0.7152
Lower Core Grid	0.2400	0.7600
Region Between Lower Core Grid and Reactor Vessel Plate	0.0300	0.9700

Table 7.3.2-26a Reactor Lower Pad Material Composition for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.064	0.064	0.064	0.064	0.064
7014.50c	0.080	0.080	0.080	0.080	0.080
14000.50c	0.603	0.603	0.603	0.603	0.603
15031.50c	0.036	0.036	0.036	0.036	0.036
16032.50c	0.024	0.024	0.024	0.024	0.024
24050.60c	0.637	0.638	0.638	0.638	0.638
24052.60c	12.782	12.792	12.792	12.796	12.796
24053.60c	1.477	1.478	1.478	1.479	1.479
24054.60c	0.375	0.375	0.375	0.375	0.375
25055.50c	1.608	1.609	1.609	1.609	1.609
26054.60c	3.149	3.151	3.151	3.152	3.152
26056.60c	50.763	50.801	50.801	50.816	50.816
26057.60c	1.183	1.184	1.184	1.184	1.184
26058.60c	0.160	0.161	0.161	0.161	0.161
28058.60c	5.011	5.014	5.014	5.016	5.016
28060.60c	1.982	1.983	1.983	1.984	1.984
28061.60c	0.087	0.087	0.087	0.087	0.087
28062.60c	0.282	0.282	0.282	0.282	0.282
28064.60c	0.074	0.074	0.074	0.074	0.074
1001.50c	2.192	2.186	2.186	2.185	2.185

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
5010.50c	7.408E-03	6.155E-03	5.666E-03	3.037E-03	3.037E-03
5011.56c	3.384E-02	2.812E-02	2.588E-02	1.387E-02	1.387E-02
8016.50c	17.391	17.343	17.346	17.337	17.337
Density (g/cc)	2.7992	2.7971	2.7971	2.7963	2.7963

Table 7.3.2-26b Reactor Lower Pad Material Composition for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.064	0.064	0.064	0.064	0.064
7014.50c	0.080	0.080	0.080	0.080	0.081
14000.50c	0.603	0.603	0.603	0.603	0.604
15031.50c	0.036	0.036	0.036	0.036	0.036
16032.50c	0.024	0.024	0.024	0.024	0.024
24050.60c	0.638	0.637	0.638	0.638	0.639
24052.60c	12.796	12.782	12.792	12.792	12.805
24053.60c	1.479	1.477	1.478	1.478	1.480
24054.60c	0.375	0.375	0.375	0.375	0.375
25055.50c	1.609	1.608	1.609	1.609	1.610
26054.60c	3.152	3.149	3.151	3.151	3.154
26056.60c	50.816	50.763	50.801	50.801	50.854
26057.60c	1.184	1.183	1.184	1.184	1.185
26058.60c	0.161	0.160	0.161	0.161	0.161
28058.60c	5.016	5.011	5.014	5.014	5.020
28060.60c	1.984	1.982	1.983	1.983	1.985
28061.60c	0.087	0.087	0.087	0.087	0.087
28062.60c	0.282	0.282	0.282	0.282	0.282
28064.60c	0.074	0.074	0.074	0.074	0.074
1001.50c	2.185	2.191	2.186	2.186	2.178

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
5010.50c	2.370E-03	7.799E-03	5.526E-03	5.206E-03	3.371E-03
5011.56c	1.083E-02	3.563E-02	2.524E-02	2.378E-02	1.540E-02
8016.50c	17.341	17.389	17.346	17.348	17.283
Density (g/cc)	2.7963	2.7992	2.7971	2.7971	2.7942

Table 7.3.2-27a Reactor Lower Core Grid Material Composition for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.061	0.061	0.061	0.061	0.061
7014.50c	0.076	0.077	0.077	0.077	0.077
14000.50c	0.573	0.574	0.574	0.574	0.574
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.606	0.607	0.607	0.607	0.607
24052.60c	12.160	12.171	12.171	12.175	12.175
24053.60c	1.405	1.406	1.406	1.407	1.407
24054.60c	0.356	0.357	0.357	0.357	0.357
25055.50c	1.529	1.531	1.531	1.531	1.531
26054.60c	2.995	2.998	2.998	2.999	2.999
26056.60c	48.289	48.333	48.333	48.350	48.350
26057.60c	1.125	1.126	1.126	1.127	1.127
26058.60c	0.153	0.153	0.153	0.153	0.153
28058.60c	4.767	4.771	4.771	4.773	4.773
28060.60c	1.885	1.887	1.887	1.887	1.887
28061.60c	0.083	0.083	0.083	0.083	0.083
28062.60c	0.268	0.268	0.268	0.268	0.268
28064.60c	0.070	0.070	0.070	0.070	0.070
1001.50c	2.629	2.622	2.622	2.621	2.621

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
5010.50c	8.886E-03	7.384E-03	6.798E-03	3.644E-03	3.644E-03
5011.56c	4.059E-02	3.373E-02	3.105E-02	1.664E-02	1.664E-02
8016.50c	20.861	20.808	20.810	20.802	20.802
Density (g/cc)	2.4797	2.4775	2.4775	2.4766	2.4766

Table 7.3.2-27b Reactor Lower Core Grid Material Composition for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.061	0.061	0.061	0.061	0.061
7014.50c	0.077	0.076	0.077	0.077	0.077
14000.50c	0.574	0.573	0.574	0.574	0.575
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.607	0.606	0.607	0.607	0.608
24052.60c	12.175	12.160	12.171	12.171	12.186
24053.60c	1.407	1.405	1.406	1.406	1.408
24054.60c	0.357	0.356	0.357	0.357	0.357
25055.50c	1.531	1.529	1.531	1.531	1.533
26054.60c	2.999	2.995	2.998	2.998	3.002
26056.60c	48.350	48.289	48.333	48.333	48.393
26057.60c	1.127	1.125	1.126	1.126	1.128
26058.60c	0.153	0.153	0.153	0.153	0.153
28058.60c	4.773	4.767	4.771	4.771	4.777
28060.60c	1.887	1.885	1.887	1.887	1.889
28061.60c	0.083	0.083	0.083	0.083	0.083
28062.60c	0.268	0.268	0.268	0.268	0.269
28064.60c	0.070	0.070	0.070	0.070	0.070
1001.50c	2.622	2.629	2.623	2.623	2.613

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
5010.50c	2.843E-03	9.356E-03	6.629E-03	6.246E-03	4.045E-03
5011.56c	1.299E-02	4.274E-02	3.028E-02	2.853E-02	1.848E-02
8016.50c	20.806	20.859	20.811	20.813	20.739
Density (g/cc)	2.4766	2.4797	2.4775	2.4775	2.4744

Table 7.3.2-28a Material Composition for Region Between Reactor Lower Core Grid and Reactor Vessel Plate for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.019	0.019	0.019	0.019	0.019
7014.50c	0.024	0.024	0.024	0.024	0.024
14000.50c	0.181	0.182	0.182	0.182	0.182
15031.50c	0.011	0.011	0.011	0.011	0.011
16032.50c	0.007	0.007	0.007	0.007	0.007
24050.60c	0.191	0.192	0.192	0.192	0.192
24052.60c	3.838	3.849	3.849	3.854	3.854
24053.60c	0.444	0.445	0.445	0.445	0.445
24054.60c	0.112	0.113	0.113	0.113	0.113
25055.50c	0.483	0.484	0.484	0.485	0.485
26054.60c	0.945	0.948	0.948	0.949	0.949
26056.60c	15.242	15.287	15.287	15.304	15.304
26057.60c	0.355	0.356	0.356	0.357	0.357
26058.60c	0.048	0.048	0.048	0.048	0.048
28058.60c	1.505	1.509	1.509	1.511	1.511
28060.60c	0.595	0.597	0.597	0.597	0.597
28061.60c	0.026	0.026	0.026	0.026	0.026
28062.60c	0.085	0.085	0.085	0.085	0.085
28064.60c	0.022	0.022	0.022	0.022	0.022
1001.50c	8.473	8.468	8.469	8.472	8.472

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
5010.50c	2.864E-02	2.385E-02	2.195E-02	1.178E-02	1.178E-02
5011.56c	1.308E-01	1.089E-01	1.003E-01	5.379E-02	5.379E-02
8016.50c	67.234	67.195	67.204	67.230	67.230
Density (g/cc)	0.9820	0.9792	0.9792	0.9780	0.9780

Table 7.3.2-28b Material Composition for Region Between Reactor Lower Core Grid and Reactor Vessel Plate for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.019	0.019	0.019	0.019	0.019
7014.50c	0.024	0.024	0.024	0.024	0.024
14000.50c	0.182	0.181	0.182	0.182	0.182
15031.50c	0.011	0.011	0.011	0.011	0.011
16032.50c	0.007	0.007	0.007	0.007	0.007
24050.60c	0.192	0.191	0.192	0.192	0.193
24052.60c	3.854	3.838	3.849	3.849	3.865
24053.60c	0.445	0.444	0.445	0.445	0.447
24054.60c	0.113	0.112	0.113	0.113	0.113
25055.50c	0.485	0.483	0.484	0.484	0.486
26054.60c	0.949	0.945	0.948	0.948	0.952
26056.60c	15.304	15.242	15.287	15.287	15.349
26057.60c	0.357	0.355	0.356	0.356	0.358
26058.60c	0.048	0.048	0.048	0.048	0.049
28058.60c	1.511	1.505	1.509	1.509	1.515
28060.60c	0.597	0.595	0.597	0.597	0.599
28061.60c	0.026	0.026	0.026	0.026	0.026
28062.60c	0.085	0.085	0.085	0.085	0.085
28064.60c	0.022	0.022	0.022	0.022	0.022
1001.50c	8.474	8.472	8.469	8.470	8.464

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
5010.50c	9.189E-03	3.015E-02	2.141E-02	2.017E-02	1.310E-02
5011.56c	4.198E-02	1.377E-01	9.780E-02	9.214E-02	5.983E-02
8016.50c	67.243	67.226	67.207	67.213	67.161
Density (g/cc)	0.9780	0.9820	0.9792	0.9792	0.9752

7.3.3 Fuel Assembly Materials

The fuel assembly materials listing in this section refer to the upper and lower end-fitting materials and the spacer grid materials. The upper and lower end-fittings of the fuel assemblies contain amounts of SS304, Inconel, Zircaloy-4, and borated moderator. The relative volume fractions of these materials in the upper end-fitting depend on whether or not the fuel assembly contains an insertion assembly. Table 7.3.3-1 contains the upper end-fitting component volume fractions for the fuel assemblies that contain no insertion assembly, a BPRA, a RCCA, and an APSRA. Tables 7.3.2-1, -7, -8, and -2 contain the material composition for SS304, Inconel, Zircaloy-4, and borated moderator at each CRC statepoint. Tables 7.3.3-2, -3, -4, and -5 present the fuel assembly upper end-fitting homogenized compositions for assemblies containing no insertion assembly, a BPRA, a RCCA, and an APSRA, respectively. The fuel assembly lower end-fitting component material volume fractions are presented in Table 7.3.3-6. The fuel assembly lower end-fitting composition is the same for every fuel assembly design regardless of the presence of an insertion assembly. Table 7.3.3-7 presents the homogenized composition for the fuel assembly lower end-fitting. The fuel assembly intermediate spacer grid material is Inconel. For each spacer grid (excluding the bottom grid), the material volume of the spacer grid is homogenized with the borated moderator and distributed uniformly through the fuel assembly (between rods and out to the assembly pitch boundary) over the explicit height of the spacer grid. The top spacer grid is always Inconel and is larger (has more volume) than the intermediate spacer grids. The Inconel volume fraction in the top spacer grid homogenized composition is modeled as 0.05260. Table 7.3.3-8 presents the homogenized composition for the top Inconel spacer grid. The Inconel material composition is presented in Table 7.3.2-7. The Inconel volume fraction in each intermediate spacer grid homogenized composition is modeled as 0.09071. Table 7.3.3-9 presents the homogenized composition for the intermediate Inconel spacer grids. The Zircaloy-4 material composition is presented in Table 7.3.2-8. The Zircaloy-4 volume fraction in each intermediate spacer grid homogenized composition is modeled as 0.09649. Table 7.3.3-10 presents the homogenized composition for the intermediate Zircaloy-4 spacer grids. The lower spacer grid in each fuel assembly design is always Inconel. The material volume of the lower spacer grid is homogenized with the lower end-fitting and borated moderator in the MCNP 4A models.

Table 7.3.3-1 Fuel Assembly Upper End-Fitting Material Volume Fractions

Type of Insertion Assembly Present in Fuel Assembly	Material Volume Fractions			
	Type 304 Stainless Steel	Borated Water	Inconel	Zircaloy-4
None	0.2756	0.6722	0.0441	0.0081
BPRA	0.2874	0.6593	0.0450	0.0083
RCCA	0.2981	0.6497	0.0441	0.0081
APSRA	0.2960	0.6518	0.0441	0.0081

Table 7.3.3-2a Upper End-Fitting Material Composition for a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.065	0.065	0.065	0.065	0.065
7014.50c	0.070	0.070	0.070	0.070	0.070
14000.50c	0.566	0.566	0.566	0.567	0.567
15031.50c	0.033	0.033	0.033	0.033	0.033
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.648	0.648	0.648	0.648	0.648
24052.60c	12.991	12.999	12.999	13.002	13.002
24053.60c	1.501	1.502	1.502	1.503	1.503
24054.60c	0.381	0.381	0.381	0.381	0.381
25055.50c	1.442	1.443	1.443	1.443	1.443
26054.60c	2.856	2.858	2.858	2.859	2.859
26056.60c	46.043	46.072	46.072	46.084	46.084
26057.60c	1.073	1.074	1.074	1.074	1.074
26058.60c	0.146	0.146	0.146	0.146	0.146
28058.60c	8.479	8.485	8.485	8.487	8.487
28060.60c	3.353	3.355	3.355	3.356	3.356
28061.60c	0.148	0.148	0.148	0.148	0.148
28062.60c	0.477	0.477	0.477	0.477	0.477

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
28064.60c	0.125	0.125	0.125	0.125	0.125
1001.50c	1.855	1.850	1.850	1.849	1.849
5010.50c	6.397E-03	5.335E-03	4.922E-03	2.696E-03	2.696E-03
5011.56c	2.922E-02	2.437E-02	2.248E-02	1.231E-02	1.231E-02
8016.50c	14.724	14.682	14.684	14.677	14.677
13027.50c	0.058	0.058	0.058	0.058	0.058
22000.50c	0.105	0.105	0.105	0.105	0.105
27059.50c	0.116	0.116	0.116	0.116	0.116
29063.60c	0.024	0.024	0.024	0.024	0.024
29065.60c	0.011	0.011	0.011	0.011	0.011
41093.50c	0.298	0.298	0.298	0.298	0.298
42000.50c	0.354	0.355	0.355	0.355	0.355
73181.50c	0.298	0.298	0.298	0.298	0.298
40000.60c	1.679	1.680	1.680	1.680	1.680
50000.35c	0.024	0.024	0.024	0.024	0.024
Density (g/cc)	3.1078	3.1059	3.1059	3.1051	3.1051

Table 7.3.3-2b Upper End-Fitting Material Composition for a Fuel Assembly Containing No Insertion Assembly for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.065	0.065	0.065	0.065	0.065
7014.50c	0.070	0.070	0.070	0.070	0.070
14000.50c	0.567	0.566	0.566	0.566	0.567
15031.50c	0.033	0.033	0.033	0.033	0.033
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.648	0.648	0.648	0.648	0.649
24052.60c	13.002	12.991	12.999	12.999	13.011
24053.60c	1.503	1.501	1.502	1.502	1.504

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
24054.60c	0.381	0.381	0.381	0.381	0.381
25055.50c	1.443	1.442	1.443	1.443	1.444
26054.60c	2.859	2.856	2.858	2.858	2.860
26056.60c	46.084	46.043	46.072	46.072	46.113
26057.60c	1.074	1.073	1.074	1.074	1.075
26058.60c	0.146	0.146	0.146	0.146	0.146
28058.60c	8.487	8.479	8.485	8.485	8.492
28060.60c	3.356	3.353	3.355	3.355	3.358
28061.60c	0.148	0.148	0.148	0.148	0.148
28062.60c	0.477	0.477	0.477	0.477	0.477
28064.60c	0.125	0.125	0.125	0.125	0.125
1001.50c	1.850	1.855	1.850	1.850	1.843
5010.50c	2.131E-03	6.728E-03	4.803E-03	4.532E-03	2.978E-03
5011.56c	9.735E-03	3.073E-02	2.194E-02	2.070E-02	1.360E-02
8016.50c	14.679	14.723	14.685	14.686	14.629
13027.50c	0.058	0.058	0.058	0.058	0.058
22000.50c	0.105	0.105	0.105	0.105	0.105
27059.50c	0.116	0.116	0.116	0.116	0.116
29063.60c	0.024	0.024	0.024	0.024	0.024
29065.60c	0.011	0.011	0.011	0.011	0.011
41093.50c	0.298	0.298	0.298	0.298	0.298
42000.50c	0.355	0.354	0.355	0.355	0.355
73181.50c	0.298	0.298	0.298	0.298	0.298
40000.60c	1.680	1.679	1.680	1.680	1.681
50000.35c	0.024	0.024	0.024	0.024	0.024
Density (g/cc)	3.1051	3.1078	3.1059	3.1059	3.1031

Table 7.3.3-3a Upper End-Fitting Material Composition for a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.066	0.066	0.066	0.066	0.066
7014.50c	0.071	0.071	0.071	0.071	0.071
14000.50c	0.572	0.573	0.573	0.573	0.573
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.654	0.654	0.654	0.655	0.655
24052.60c	13.117	13.125	13.125	13.128	13.128
24053.60c	1.516	1.517	1.517	1.517	1.517
24054.60c	0.384	0.385	0.385	0.385	0.385
25055.50c	1.459	1.460	1.460	1.461	1.461
26054.60c	2.890	2.892	2.892	2.893	2.893
26056.60c	46.594	46.623	46.623	46.634	46.634
26057.60c	1.086	1.087	1.087	1.087	1.087
26058.60c	0.147	0.147	0.147	0.147	0.147
28058.60c	8.499	8.504	8.504	8.506	8.506
28060.60c	3.361	3.363	3.363	3.364	3.364
28061.60c	0.148	0.148	0.148	0.148	0.148
28062.60c	0.478	0.478	0.478	0.478	0.478
28064.60c	0.125	0.125	0.125	0.125	0.125
1001.50c	1.767	1.762	1.763	1.762	1.762
5010.50c	6.098E-03	5.087E-03	4.693E-03	2.573E-03	2.573E-03
5011.56c	2.786E-02	2.324E-02	2.144E-02	1.175E-02	1.175E-02
8016.50c	14.026	13.986	13.988	13.981	13.981
13027.50c	0.058	0.058	0.058	0.058	0.058
22000.50c	0.104	0.104	0.104	0.104	0.104
27059.50c	0.115	0.115	0.115	0.115	0.115
29063.60c	0.024	0.024	0.024	0.024	0.024

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
29065.60c	0.011	0.011	0.011	0.011	0.011
41093.50c	0.295	0.295	0.295	0.295	0.295
42000.50c	0.351	0.352	0.352	0.352	0.352
73181.50c	0.295	0.295	0.295	0.295	0.295
40000.60c	1.671	1.672	1.672	1.672	1.672
50000.35c	0.024	0.024	0.024	0.024	0.024
Density (g/cc)	3.1998	3.1979	3.1979	3.1971	3.1971

Table 7.3.3-3b Upper End-Fitting Material Composition for a Fuel Assembly Containing a BPRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.066	0.066	0.066	0.066	0.066
7014.50c	0.071	0.071	0.071	0.071	0.071
14000.50c	0.573	0.572	0.573	0.573	0.573
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.655	0.654	0.654	0.654	0.655
24052.60c	13.128	13.117	13.125	13.125	13.136
24053.60c	1.517	1.516	1.517	1.517	1.518
24054.60c	0.385	0.384	0.385	0.385	0.385
25055.50c	1.461	1.459	1.460	1.460	1.462
26054.60c	2.893	2.890	2.892	2.892	2.894
26056.60c	46.634	46.594	46.623	46.623	46.662
26057.60c	1.087	1.086	1.087	1.087	1.087
26058.60c	0.147	0.147	0.147	0.147	0.148
28058.60c	8.506	8.499	8.504	8.504	8.511
28060.60c	3.364	3.361	3.363	3.363	3.366
28061.60c	0.148	0.148	0.148	0.148	0.148

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
28062.60c	0.478	0.478	0.478	0.478	0.478
28064.60c	0.125	0.125	0.125	0.125	0.125
1001.50c	1.762	1.767	1.763	1.763	1.756
5010.50c	2.035E-03	6.414E-03	4.580E-03	4.322E-03	2.841E-03
5011.56c	9.296E-03	2.930E-02	2.092E-02	1.974E-02	1.298E-02
8016.50c	13.983	14.025	13.989	13.990	13.934
13027.50c	0.058	0.058	0.058	0.058	0.058
22000.50c	0.104	0.104	0.104	0.104	0.104
27059.50c	0.115	0.115	0.115	0.115	0.115
29063.60c	0.024	0.024	0.024	0.024	0.024
29065.60c	0.011	0.011	0.011	0.011	0.011
41093.50c	0.295	0.295	0.295	0.295	0.296
42000.50c	0.352	0.351	0.352	0.352	0.352
73181.50c	0.295	0.295	0.295	0.295	0.296
40000.60c	1.672	1.671	1.672	1.672	1.673
50000.35c	0.024	0.024	0.024	0.024	0.024
Density (g/cc)	3.1971	3.1998	3.1979	3.1979	3.1952

Table 7.3.3-4a Upper End-Fitting Material Composition for a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.066	0.067	0.067	0.067	0.067
7014.50c	0.072	0.072	0.072	0.072	0.072
14000.50c	0.579	0.579	0.579	0.580	0.580
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.659	0.659	0.659	0.660	0.660
24052.60c	13.218	13.226	13.226	13.229	13.229

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
24053.60c	1.527	1.528	1.528	1.529	1.529
24054.60c	0.387	0.388	0.388	0.388	0.388
25055.50c	1.480	1.481	1.481	1.481	1.481
26054.60c	2.929	2.931	2.931	2.931	2.931
26056.60c	47.217	47.244	47.244	47.255	47.255
26057.60c	1.100	1.101	1.101	1.101	1.101
26058.60c	0.149	0.149	0.149	0.149	0.149
28058.60c	8.402	8.407	8.407	8.409	8.409
28060.60c	3.323	3.325	3.325	3.325	3.325
28061.60c	0.146	0.146	0.146	0.146	0.146
28062.60c	0.472	0.473	0.473	0.473	0.473
28064.60c	0.124	0.124	0.124	0.124	0.124
1001.50c	1.705	1.700	1.700	1.699	1.699
5010.50c	5.883E-03	4.907E-03	4.527E-03	2.481E-03	2.481E-03
5011.56c	2.687E-02	2.242E-02	2.068E-02	1.134E-02	1.134E-02
8016.50c	13.533	13.493	13.495	13.488	13.488
13027.50c	0.055	0.055	0.055	0.055	0.055
22000.50c	0.099	0.100	0.100	0.100	0.100
27059.50c	0.111	0.111	0.111	0.111	0.111
29063.60c	0.023	0.023	0.023	0.023	0.023
29065.60c	0.010	0.010	0.010	0.010	0.010
41093.50c	0.283	0.283	0.283	0.283	0.283
42000.50c	0.337	0.337	0.337	0.337	0.337
73181.50c	0.283	0.283	0.283	0.283	0.283
40000.60c	1.596	1.597	1.597	1.598	1.598
50000.35c	0.023	0.023	0.023	0.023	0.023
Density (g/cc)	3.2683	3.2664	3.2664	3.2656	3.2656

Table 7.3.3-4b Upper End-Fitting Material Composition for a Fuel Assembly Containing a RCCA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.067	0.066	0.067	0.067	0.067
7014.50c	0.072	0.072	0.072	0.072	0.072
14000.50c	0.580	0.579	0.579	0.579	0.580
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.660	0.659	0.659	0.659	0.660
24052.60c	13.229	13.218	13.226	13.226	13.236
24053.60c	1.529	1.527	1.528	1.528	1.530
24054.60c	0.388	0.387	0.388	0.388	0.388
25055.50c	1.481	1.480	1.481	1.481	1.482
26054.60c	2.931	2.929	2.931	2.931	2.933
26056.60c	47.255	47.217	47.244	47.244	47.283
26057.60c	1.101	1.100	1.101	1.101	1.102
26058.60c	0.149	0.149	0.149	0.149	0.149
28058.60c	8.409	8.402	8.407	8.407	8.414
28060.60c	3.325	3.323	3.325	3.325	3.327
28061.60c	0.146	0.146	0.146	0.146	0.146
28062.60c	0.473	0.472	0.473	0.473	0.473
28064.60c	0.124	0.124	0.124	0.124	0.124
1001.50c	1.700	1.705	1.700	1.701	1.694
5010.50c	1.963E-03	6.187E-03	4.418E-03	4.169E-03	2.741E-03
5011.56c	8.965E-03	2.826E-02	2.018E-02	1.904E-02	1.252E-02
8016.50c	13.491	13.531	13.496	13.497	13.443
13027.50c	0.055	0.055	0.055	0.055	0.055
22000.50c	0.100	0.099	0.100	0.100	0.100
27059.50c	0.111	0.111	0.111	0.111	0.111
29063.60c	0.023	0.023	0.023	0.023	0.023

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
29065.60c	0.010	0.010	0.010	0.010	0.010
41093.50c	0.283	0.283	0.283	0.283	0.284
42000.50c	0.337	0.337	0.337	0.337	0.338
73181.50c	0.283	0.283	0.283	0.283	0.284
40000.60c	1.598	1.596	1.597	1.597	1.598
50000.35c	0.023	0.023	0.023	0.023	0.023
Density (g/cc)	3.2656	3.2683	3.2664	3.2664	3.2637

Table 7.3.3-5a Upper End-Fitting Material Composition for a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.066	0.066	0.066	0.066	0.066
7014.50c	0.072	0.072	0.072	0.072	0.072
14000.50c	0.578	0.578	0.578	0.578	0.578
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.658	0.658	0.658	0.659	0.659
24052.60c	13.198	13.205	13.205	13.208	13.208
24053.60c	1.525	1.526	1.526	1.526	1.526
24054.60c	0.387	0.387	0.387	0.387	0.387
25055.50c	1.476	1.477	1.477	1.478	1.478
26054.60c	2.922	2.924	2.924	2.925	2.925
26056.60c	47.112	47.140	47.140	47.151	47.151
26057.60c	1.098	1.099	1.099	1.099	1.099
26058.60c	0.149	0.149	0.149	0.149	0.149
28058.60c	8.409	8.414	8.414	8.416	8.416
28060.60c	3.325	3.327	3.327	3.328	3.328
28061.60c	0.146	0.146	0.146	0.147	0.147

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
28062.60c	0.473	0.473	0.473	0.473	0.473
28064.60c	0.124	0.124	0.124	0.124	0.124
1001.50c	1.719	1.714	1.714	1.713	1.713
5010.50c	5.929E-03	4.945E-03	4.562E-03	2.501E-03	2.501E-03
5011.56c	2.708E-02	2.259E-02	2.084E-02	1.142E-02	1.142E-02
8016.50c	13.639	13.599	13.601	13.594	13.594
13027.50c	0.056	0.056	0.056	0.056	0.056
22000.50c	0.100	0.100	0.100	0.100	0.100
27059.50c	0.111	0.111	0.111	0.111	0.111
29063.60c	0.023	0.023	0.023	0.023	0.023
29065.60c	0.010	0.010	0.010	0.011	0.011
41093.50c	0.284	0.285	0.285	0.285	0.285
42000.50c	0.339	0.339	0.339	0.339	0.339
73181.50c	0.284	0.285	0.285	0.285	0.285
40000.60c	1.604	1.604	1.604	1.605	1.605
50000.35c	0.023	0.023	0.023	0.023	0.023
Density (g/cc)	3.2533	3.2514	3.2514	3.2507	3.2507

Table 7.3.3-5b Upper End-Fitting Material Composition for a Fuel Assembly Containing an APSRA for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.066	0.066	0.066	0.066	0.066
7014.50c	0.072	0.072	0.072	0.072	0.072
14000.50c	0.578	0.578	0.578	0.578	0.579
15031.50c	0.034	0.034	0.034	0.034	0.034
16032.50c	0.023	0.023	0.023	0.023	0.023
24050.60c	0.659	0.658	0.658	0.658	0.659
24052.60c	13.208	13.198	13.205	13.205	13.216

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
24053.60c	1.526	1.525	1.526	1.526	1.527
24054.60c	0.387	0.387	0.387	0.387	0.387
25055.50c	1.478	1.476	1.477	1.477	1.478
26054.60c	2.925	2.922	2.924	2.924	2.926
26056.60c	47.151	47.112	47.140	47.140	47.178
26057.60c	1.099	1.098	1.099	1.099	1.099
26058.60c	0.149	0.149	0.149	0.149	0.149
28058.60c	8.416	8.409	8.414	8.414	8.421
28060.60c	3.328	3.325	3.327	3.327	3.330
28061.60c	0.147	0.146	0.146	0.146	0.147
28062.60c	0.473	0.473	0.473	0.473	0.473
28064.60c	0.124	0.124	0.124	0.124	0.124
1001.50c	1.713	1.718	1.714	1.714	1.707
5010.50c	1.978E-03	6.236E-03	4.452E-03	4.201E-03	2.762E-03
5011.56c	9.034E-03	2.848E-02	2.034E-02	1.919E-02	1.262E-02
8016.50c	13.597	13.637	13.602	13.603	13.549
13027.50c	0.056	0.056	0.056	0.056	0.056
22000.50c	0.100	0.100	0.100	0.100	0.100
27059.50c	0.111	0.111	0.111	0.111	0.111
29063.60c	0.023	0.023	0.023	0.023	0.023
29065.60c	0.011	0.010	0.010	0.010	0.011
41093.50c	0.285	0.284	0.285	0.285	0.285
42000.50c	0.339	0.339	0.339	0.339	0.339
73181.50c	0.285	0.284	0.285	0.285	0.285
40000.60c	1.605	1.604	1.604	1.604	1.606
50000.35c	0.023	0.023	0.023	0.023	0.023
Density (g/cc)	3.2507	3.2533	3.2514	3.2514	3.2488

Table 7.3.3-6 Fuel Assembly Lower End-Fitting Material Volume Fractions

Type 304 Stainless Steel	Borated Water	Inconel	Zircaloy-4
0.1656	0.7913	0.0306	0.0125

Table 7.3.3-7a Fuel Assembly Lower End-Fitting Material Composition for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.055	0.056	0.056	0.056	0.056
7014.50c	0.058	0.058	0.058	0.058	0.058
14000.50c	0.475	0.476	0.476	0.476	0.476
15031.50c	0.028	0.028	0.028	0.028	0.028
16032.50c	0.019	0.019	0.019	0.019	0.019
24050.60c	0.550	0.550	0.550	0.551	0.551
24052.60c	11.028	11.039	11.039	11.044	11.044
24053.60c	1.274	1.276	1.276	1.276	1.276
24054.60c	0.323	0.324	0.324	0.324	0.324
25055.50c	1.203	1.204	1.204	1.204	1.204
26054.60c	2.386	2.389	2.389	2.390	2.390
26056.60c	38.472	38.512	38.512	38.528	38.528
26057.60c	0.897	0.897	0.897	0.898	0.898
26058.60c	0.122	0.122	0.122	0.122	0.122
28058.60c	7.570	7.578	7.578	7.581	7.581
28060.60c	2.994	2.997	2.997	2.998	2.998
28061.60c	0.132	0.132	0.132	0.132	0.132
28062.60c	0.426	0.426	0.426	0.426	0.426
28064.60c	0.111	0.111	0.111	0.112	0.112
1001.50c	3.018	3.011	3.012	3.010	3.010
5010.50c	1.032E-02	8.600E-03	7.927E-03	4.305E-03	4.305E-03
5011.56c	4.716E-02	3.929E-02	3.621E-02	1.966E-02	1.966E-02
8016.50c	23.957	23.899	23.902	23.893	23.893

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
13027.50c	0.056	0.056	0.056	0.056	0.056
22000.50c	0.100	0.100	0.100	0.100	0.100
27059.50c	0.111	0.112	0.112	0.112	0.112
29063.60c	0.023	0.023	0.023	0.023	0.023
29065.60c	0.011	0.011	0.011	0.011	0.011
41093.50c	0.286	0.286	0.286	0.286	0.286
42000.50c	0.340	0.340	0.340	0.340	0.340
73181.50c	0.286	0.286	0.286	0.286	0.286
40000.60c	3.580	3.584	3.584	3.586	3.586
50000.35c	0.051	0.051	0.051	0.051	0.051
Density (g/cc)	2.2486	2.2463	2.2463	2.2454	2.2454

Table 7.3.3-7b Fuel Assembly Lower End-Fitting Material Composition for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.056	0.055	0.056	0.056	0.056
7014.50c	0.058	0.058	0.058	0.058	0.058
14000.50c	0.476	0.475	0.476	0.476	0.477
15031.50c	0.028	0.028	0.028	0.028	0.028
16032.50c	0.019	0.019	0.019	0.019	0.019
24050.60c	0.551	0.550	0.550	0.550	0.551
24052.60c	11.044	11.028	11.039	11.039	11.055
24053.60c	1.276	1.274	1.276	1.276	1.278
24054.60c	0.324	0.323	0.324	0.324	0.324
25055.50c	1.204	1.203	1.204	1.204	1.206
26054.60c	2.390	2.386	2.389	2.389	2.392
26056.60c	38.528	38.472	38.512	38.512	38.567
26057.60c	0.898	0.897	0.897	0.897	0.899

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
26058.60c	0.122	0.122	0.122	0.122	0.122
28058.60c	7.581	7.570	7.578	7.578	7.589
28060.60c	2.998	2.994	2.997	2.997	3.001
28061.60c	0.132	0.132	0.132	0.132	0.132
28062.60c	0.426	0.426	0.426	0.426	0.427
28064.60c	0.112	0.111	0.111	0.111	0.112
1001.50c	3.011	3.018	3.012	3.012	3.002
5010.50c	3.386E-03	1.086E-02	7.733E-03	7.292E-03	4.766E-03
5011.56c	1.547E-02	4.962E-02	3.533E-02	3.331E-02	2.177E-02
8016.50c	23.898	23.955	23.903	23.905	23.824
13027.50c	0.056	0.056	0.056	0.056	0.056
22000.50c	0.100	0.100	0.100	0.100	0.101
27059.50c	0.112	0.111	0.112	0.112	0.112
29063.60c	0.023	0.023	0.023	0.023	0.023
29065.60c	0.011	0.011	0.011	0.011	0.011
41093.50c	0.286	0.286	0.286	0.286	0.286
42000.50c	0.340	0.340	0.340	0.340	0.341
73181.50c	0.286	0.286	0.286	0.286	0.286
40000.60c	3.586	3.580	3.584	3.584	3.589
50000.35c	0.051	0.051	0.051	0.051	0.051
Density (g/cc)	2.2454	2.2486	2.2463	2.2463	2.2431

Table 7.3.3-8a Homogenized Material Composition of the Top Inconel Spacer Grid for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.030	0.030	0.030	0.030	0.030
14000.50c	0.130	0.130	0.130	0.131	0.131
15031.50c	0.006	0.006	0.006	0.006	0.006

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
16032.50c	0.006	0.006	0.006	0.006	0.006
24050.60c	0.295	0.296	0.296	0.296	0.296
24052.60c	5.914	5.928	5.928	5.934	5.934
24053.60c	0.683	0.685	0.685	0.686	0.686
24054.60c	0.173	0.174	0.174	0.174	0.174
25055.50c	0.130	0.130	0.130	0.131	0.131
26054.60c	0.356	0.357	0.357	0.357	0.357
26056.60c	5.743	5.756	5.756	5.762	5.762
26057.60c	0.134	0.134	0.134	0.134	0.134
26058.60c	0.018	0.018	0.018	0.018	0.018
28058.60c	13.158	13.189	13.189	13.202	13.202
28060.60c	5.204	5.216	5.216	5.221	5.221
28061.60c	0.229	0.230	0.230	0.230	0.230
28062.60c	0.740	0.741	0.741	0.742	0.742
28064.60c	0.194	0.194	0.194	0.194	0.194
1001.50c	7.015	7.007	7.008	7.010	7.010
5010.50c	2.411E-02	2.014E-02	1.857E-02	1.015E-02	1.015E-02
5011.56c	1.101E-01	9.198E-02	8.482E-02	4.634E-02	4.634E-02
8016.50c	55.666	55.606	55.614	55.624	55.624
13027.50c	0.186	0.186	0.186	0.187	0.187
22000.50c	0.335	0.335	0.335	0.336	0.336
27059.50c	0.372	0.373	0.373	0.373	0.373
29063.60c	0.076	0.077	0.077	0.077	0.077
29065.60c	0.035	0.035	0.035	0.035	0.035
41093.50c	0.953	0.955	0.955	0.956	0.956
42000.50c	1.134	1.137	1.137	1.138	1.138
73181.50c	0.953	0.955	0.955	0.956	0.956
Density (g/cc)	1.1584	1.1557	1.1557	1.1546	1.1546

Table 7.3.3-8b Homogenized Material Composition of the Top Inconel Spacer Grid for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.030	0.030	0.030	0.030	0.030
14000.50c	0.131	0.130	0.130	0.130	0.131
15031.50c	0.006	0.006	0.006	0.006	0.006
16032.50c	0.006	0.006	0.006	0.006	0.006
24050.60c	0.296	0.295	0.296	0.296	0.297
24052.60c	5.934	5.914	5.928	5.928	5.948
24053.60c	0.686	0.683	0.685	0.685	0.687
24054.60c	0.174	0.173	0.174	0.174	0.174
25055.50c	0.131	0.130	0.130	0.130	0.131
26054.60c	0.357	0.356	0.357	0.357	0.358
26056.60c	5.762	5.743	5.756	5.756	5.776
26057.60c	0.134	0.134	0.134	0.134	0.135
26058.60c	0.018	0.018	0.018	0.018	0.018
28058.60c	13.202	13.158	13.189	13.189	13.234
28060.60c	5.221	5.204	5.216	5.216	5.234
28061.60c	0.230	0.229	0.230	0.230	0.230
28062.60c	0.742	0.740	0.741	0.741	0.744
28064.60c	0.194	0.194	0.194	0.194	0.195
1001.50c	7.011	7.014	7.009	7.009	6.999
5010.50c	8.005E-03	2.537E-02	1.812E-02	1.709E-02	1.123E-02
5011.56c	3.657E-02	1.159E-01	8.277E-02	7.808E-02	5.132E-02
8016.50c	55.634	55.660	55.616	55.621	55.539
13027.50c	0.187	0.186	0.186	0.186	0.187
22000.50c	0.336	0.335	0.335	0.335	0.337
27059.50c	0.373	0.372	0.373	0.373	0.374
29063.60c	0.077	0.076	0.077	0.077	0.077
29065.60c	0.035	0.035	0.035	0.035	0.035
41093.50c	0.956	0.953	0.955	0.955	0.958
42000.50c	1.138	1.134	1.137	1.137	1.141
73181.50c	0.956	0.953	0.955	0.955	0.958
Density (g/cc)	1.1546	1.1584	1.1557	1.1557	1.1518

Table 7.3.3-9a Homogenized Material Composition of the Intermediate Inconel Spacer Grid for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
6000.50c	0.041	0.041	0.041	0.041	0.041
14000.50c	0.180	0.181	0.181	0.181	0.181
15031.50c	0.008	0.008	0.008	0.008	0.008
16032.50c	0.008	0.008	0.008	0.008	0.008
24050.60c	0.409	0.410	0.410	0.410	0.410
24052.60c	8.197	8.212	8.212	8.219	8.219
24053.60c	0.947	0.949	0.949	0.950	0.950
24054.60c	0.240	0.241	0.241	0.241	0.241
25055.50c	0.180	0.181	0.181	0.181	0.181
26054.60c	0.494	0.495	0.495	0.495	0.495
26056.60c	7.960	7.975	7.975	7.980	7.980
26057.60c	0.185	0.186	0.186	0.186	0.186
26058.60c	0.025	0.025	0.025	0.025	0.025
28058.60c	18.238	18.272	18.272	18.285	18.285
28060.60c	7.213	7.226	7.226	7.231	7.231
28061.60c	0.317	0.318	0.318	0.318	0.318
28062.60c	1.025	1.027	1.027	1.028	1.028
28064.60c	0.268	0.269	0.269	0.269	0.269
1001.50c	5.411	5.403	5.403	5.403	5.403
5010.50c	1.885E-02	1.577E-02	1.456E-02	8.067E-03	8.067E-03
5011.56c	8.610E-02	7.204E-02	6.653E-02	3.685E-02	3.685E-02
8016.50c	42.942	42.872	42.878	42.876	42.876
13027.50c	0.258	0.258	0.258	0.258	0.258
22000.50c	0.464	0.465	0.465	0.465	0.465
27059.50c	0.515	0.516	0.516	0.517	0.517
29063.60c	0.106	0.106	0.106	0.106	0.106
29065.60c	0.049	0.049	0.049	0.049	0.049
41093.50c	1.321	1.323	1.323	1.324	1.324
42000.50c	1.572	1.575	1.575	1.576	1.576
73181.50c	1.321	1.323	1.323	1.324	1.324

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
Density (g/cc)	1.4413	1.4386	1.4386	1.4376	1.4376

Table 7.3.3-9b Homogenized Material Composition of the Intermediate Inconel Spacer Grid for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
6000.50c	0.041	0.041	0.041	0.041	0.041
14000.50c	0.181	0.180	0.181	0.181	0.181
15031.50c	0.008	0.008	0.008	0.008	0.008
16032.50c	0.008	0.008	0.008	0.008	0.008
24050.60c	0.410	0.409	0.410	0.410	0.411
24052.60c	8.219	8.197	8.212	8.212	8.234
24053.60c	0.950	0.947	0.949	0.949	0.952
24054.60c	0.241	0.240	0.241	0.241	0.241
25055.50c	0.181	0.180	0.181	0.181	0.181
26054.60c	0.495	0.494	0.495	0.495	0.496
26056.60c	7.980	7.960	7.975	7.975	7.995
26057.60c	0.186	0.185	0.186	0.186	0.186
26058.60c	0.025	0.025	0.025	0.025	0.025
28058.60c	18.285	18.238	18.272	18.272	18.319
28060.60c	7.231	7.213	7.226	7.226	7.245
28061.60c	0.318	0.317	0.318	0.318	0.319
28062.60c	1.028	1.025	1.027	1.027	1.030
28064.60c	0.269	0.268	0.269	0.269	0.269
1001.50c	5.404	5.411	5.404	5.404	5.392
5010.50c	6.418E-03	1.981E-02	1.422E-02	1.343E-02	8.903E-03
5011.56c	2.932E-02	9.051E-02	6.494E-02	6.133E-02	4.067E-02
8016.50c	42.884	42.937	42.880	42.884	42.787
13027.50c	0.258	0.258	0.258	0.258	0.259
22000.50c	0.465	0.464	0.465	0.465	0.466
27059.50c	0.517	0.515	0.516	0.516	0.518
29063.60c	0.106	0.106	0.106	0.106	0.106

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
29065.60c	0.049	0.049	0.049	0.049	0.049
41093.50c	1.324	1.321	1.323	1.323	1.327
42000.50c	1.576	1.572	1.575	1.575	1.579
73181.50c	1.324	1.321	1.323	1.323	1.327
Density (g/cc)	1.4376	1.4413	1.4386	1.4386	1.4349

Table 7.3.3-10a Homogenized Material Composition of the Intermediate Zircaloy-4 Spacer Grid for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 0.0 EFPD	Cycle 8 97.6 EFPD	Cycle 8 139.8 EFPD	Cycle 8 404.0 EFPD	Cycle 8 409.6 EFPD
24050.60c	0.002	0.002	0.002	0.002	0.002
24052.60c	0.040	0.040	0.040	0.040	0.040
24053.60c	0.005	0.005	0.005	0.005	0.005
24054.60c	0.001	0.001	0.001	0.001	0.001
26054.60c	0.005	0.005	0.005	0.005	0.005
26056.60c	0.088	0.088	0.088	0.088	0.088
26057.60c	0.002	0.002	0.002	0.002	0.002
26058.60c	0.000	0.000	0.000	0.000	0.000
1001.50c	5.841	5.832	5.833	5.833	5.833
5010.50c	1.974E-02	1.642E-02	1.512E-02	8.107E-03	8.107E-03
5011.56c	9.018E-02	7.502E-02	6.907E-02	3.703E-02	3.703E-02
8016.50c	46.404	46.336	46.342	46.343	46.343
40000.60c	46.835	46.928	46.928	46.966	46.966
50000.35c	0.668	0.669	0.669	0.670	0.670
Density (g/cc)	1.3269	1.3243	1.3243	1.3232	1.3232

Table 7.3.3-10b Homogenized Material Composition of the Intermediate Zircaloy-4 Spacer Grid for Each CRC Statepoint Reactivity Calculation

MCNP ZAID	Wt. % of Element/Isotope in Material Composition				
	Cycle 8 515.5 EFPD	Cycle 9 0.0 EFPD	Cycle 9 158.8 EFPD	Cycle 9 219.0 EFPD	Cycle 9 363.1 EFPD
24050.60c	0.002	0.002	0.002	0.002	0.002
24052.60c	0.040	0.040	0.040	0.040	0.040
24053.60c	0.005	0.005	0.005	0.005	0.005
24054.60c	0.001	0.001	0.001	0.001	0.001
26054.60c	0.005	0.005	0.005	0.005	0.005
26056.60c	0.088	0.088	0.088	0.088	0.088
26057.60c	0.002	0.002	0.002	0.002	0.002
26058.60c	0.000	0.000	0.000	0.000	0.000
1001.50c	5.834	5.840	5.833	5.833	5.822
5010.50c	6.327E-03	2.079E-02	1.474E-02	1.389E-02	9.009E-03
5011.56c	2.890E-02	9.495E-02	6.735E-02	6.346E-02	4.116E-02
8016.50c	46.352	46.399	46.344	46.348	46.254
40000.60c	46.966	46.835	46.928	46.928	47.059
50000.35c	0.670	0.668	0.669	0.669	0.671
Density (g/cc)	1.3232	1.3269	1.3243	1.3243	1.3206

7.3.4 Fuel Rod Materials

The fuel rod components include the fuel rod cladding, the upper and lower fuel rod plenums (including end-caps), and the fuel. The fuel rod cladding is modeled as Zircaloy-4 as presented in Table 7.3.2-8. The upper and lower fuel rod plenum regions contain SS304 springs. The Zircaloy-4 end-caps are also homogenized in the upper and lower fuel rod plenum. Fission gases present in the upper and lower fuel rod plenum region are modeled as void. Table 7.3.4-1 contains the component material volume fraction for the fuel rod plenum regions. Table 7.3.4-2 contains the homogenized material compositions for the upper and lower fuel rod plenum (with end-cap) regions. The gap between the fuel rod cladding and the fuel is modeled as void. The fresh fuel composition is uniform along the axial length of the fuel rod. The weight percent (wt%) enrichment of U-235 in the uranium of the fabricated UO_2 is presented in Table 7.3.4-3 for each fuel batch. The mass loading of uranium in the entire fuel assembly is also presented in Table 7.3.4-3. The compositions of the fresh fuel are presented in Table 7.3.4-4. The isotopic weight percentages in the fresh fuel composition are calculated using the following equations.

- The weight percentages of the various isotopes in the enriched uranium of the UO_2 fuel composition are calculated using the following equations (Ref. 5.24).

$$U^{234}\ wt\% = (0.007731)*(U^{235}\ wt\%)^{1.0837}$$

$$U^{236}\ wt\% = (0.0046)*(U^{235}\ wt\%)$$

$$U^{238}\ wt\% = 100 - U^{234}\ wt\% - U^{235}\ wt\% - U^{236}\ wt\%$$

- The initial mass loading of uranium in an axial node is calculated using the following equation.

$$Initial\ Uranium\ Mass\ in\ Node = \frac{(Initial\ Uranium\ Mass\ in\ Assembly)*(CRC\ Node\ Height)}{CRC\ Total\ Active\ Fuel\ Height}$$

- The following equation is used to calculate the mass of oxygen in the fuel. The weight percentages of the uranium isotopes (U-234, U-235, U-236, and U-238) in uranium are calculated using the equations previously presented.

$$Oxygen\ Mass\ in\ UO_2 = \frac{[(Mass\ of\ Uranium\ in\ UO_2)*(2)*(15.994915)*(0.01)]}{[(wt\%\ U^{235})*(235.043915) + (wt\%\ U^{234})*(234.040904) + (wt\%\ U^{236})*(236.045637) + (wt\%\ U^{238})*(238.05077)]}$$

- The wt% of each uranium isotope in the fresh UO_2 composition is determined by multiplying the wt% of each uranium isotope in the enriched uranium by the weight fraction of uranium in the UO_2. The wt% of oxygen in the UO_2 is the weight fraction of oxygen in UO_2 multiplied by 100.

The burned fuel is delineated into 18 axial regions (Ref. 5.4) each having a unique material composition. The top axial fuel region is modeled with a height of 17.7800 cm. The 16 intermediate fuel regions are modeled with a height of 20.0025 cm. The bottom fuel region is modeled with a height of 22.3520 cm. These nodal heights correspond directly to the nodal heights utilized in the fuel depletion calculations. Each nodal (axial region) fuel composition is obtained from SAS2H depletion calculations as previously identified in Table 7.3-1. The burned fuel compositions may contain up to 85 isotopes from the list presented in Table 7.3.4-5. The isotopes listed in Table 7.3.4-5 were selected based on detail and availability. Each burned fuel composition is modeled in terms of isotopic weight percents and an overall nodal fuel density. The weight percent of each isotope in the nodal fuel composition is calculated based on the total mass of all isotopes in the nodal composition. The mass of oxygen in each nodal fuel composition is calculated based on the fresh fuel characteristics as previously described. This mass of oxygen is combined with the total isotopic mass obtained from the depletion calculations to

determine the various isotopic weight percents. The MCNP 4A output files are contained in Attachments XI through XX (moved to reference 5.27). These output files contain an echo of the MCNP 4A input decks for each CRC statepoint reactivity calculation. The nodal fuel isotopic compositions are listed in the input decks in terms of ZAID's, weight percents, and density (g/cc). Each nodal fuel composition is identified by assembly and node in the material specifications section of the input decks. The nodal fuel densities are shown on the geometric cell specifications for each fuel node. The nodal fuel densities are based on the fuel mass and fuel volume in each nodal region. The fuel volume is calculated using the number of fuel rods, nodal height, and pellet diameter. Therefore, dishing and chamfering of the fresh fuel pellets are accounted for on a mass basis by a slightly adjusted fuel density. However, the geometrical features of the fresh fuel pellet dishing and chamfering are not captured in the MCNP 4A models. The purpose of the pellet dishing and chamfering is to enhance fuel performance. These geometrical features have no significant impact on system reactivity. The most important concern in determining system reactivity is to assure that fuel mass preservation is maintained. The fuel densities used in the MCNP 4A models ensure preservation of mass.

Table 7.3.4-1 Fuel Rod Plenum Material Volume Fractions

Plenum Location	Type 304 Stainless Steel	Gas (modeled as void)	Zircaloy-4
Upper End of Rod	0.0811	0.7793	0.1396
Lower End of Rod	0.1569	0.5973	0.2458

Table 7.3.4-2 Fuel Rod Plenum Homogenized Material Compositions

MCNP ZAID	Wt. % of Element/Isotope in Material Composition	
	Upper Fuel Rod Plenum	Lower Fuel Rod Plenum
6000.50c	0.033	0.035
7014.50c	0.041	0.043
14000.50c	0.309	0.326
15031.50c	0.019	0.020
16032.50c	0.012	0.013
24050.60c	0.329	0.347
24052.60c	6.595	6.959
24053.60c	0.762	0.804
24054.60c	0.193	0.204
25055.50c	0.823	0.869
26054.60c	1.619	1.709
26056.60c	26.105	27.553

MCNP ZAID	Wt. % of Element/Isotope in Material Composition	
	Upper Fuel Rod Plenum	Lower Fuel Rod Plenum
26057.60c	0.608	0.642
26058.60c	0.083	0.087
28058.60c	2.566	2.709
28060.60c	1.015	1.071
28061.60c	0.045	0.047
28062.60c	0.144	0.152
28064.60c	0.038	0.040
8016.50c	0.071	0.068
40000.60c	57.766	55.509
50000.35c	0.824	0.792
Density (g/cc)	1.5565	2.8520

Table 7.3.4-3 Fuel Batch Enrichment and Uranium Mass Loading (Ref. 5.4)

Fuel Batch Identifier	U-235 wt. % in Uranium	Mass of Uranium per Fuel Assembly (kg)
1	1.93	463.63
5	2.62	463.63
7A	3.29	463.63
8	3.49	463.63
9	3.84	463.63
10	3.94	463.63
11	3.90	463.605

Table 7.3.4-4 Fresh Fuel Material Composition for Each Fuel Batch

Fuel Batch Identifier	Wt. % of Element/Isotope in Material Composition				
	U-234	U-235	U-236	U-238	Oxygen
1	0.013897	1.701311	0.007826	86.427773	11.849200
5	0.019540	2.309527	0.010624	85.810364	11.850123
7A	0.024771	2.900101	0.013340	85.210770	11.851020
8	0.026407	3.076390	0.014151	85.031769	11.851289
9	0.029288	3.384892	0.015571	84.718491	11.851759
10	0.030115	3.473035	0.015976	84.628967	11.851894
11	0.029784	3.437779	0.015814	84.664787	11.851838
Fresh Fuel Pressed Density = 10.41 g/cc					

Table 7.3.4-5 Isotope Set from which MCNP 4A Spent Fuel Compositions are Developed

Isotope	MCNP ZAID	Isotope	MCNP ZAID	Isotope	MCNP ZAID
H-3	1003.50c	Cs-135	55135.50c	Pa-233	91233.50c
He-4	2004.50c	Ba-138	56138.50c	U-233	92233.50c
Li-6	3006.50c	Pr-141	59141.50c	U-234	92234.50c
Li-7	3007.55c	Nd-143	60143.50c	U-235	92235.53c
Be-9	4009.50c	Nd-145	60145.50c	U-236	92236.50c
O-16	8016.50c	Nd-147	60147.50c	U-237	92237.50c
As-75	33075.35c	Nd-148	60148.50c	U-238	92238.53c
Kr-80	36080.50c	Pm-147	61147.50c	Np-235	93235.35c
Kr-82	36082.50c	Pm-148	61148.50c	Np-236	93236.35c
Kr-83	36083.50c	Pm-149	61149.50c	Np-237	93237.50c
Kr-84	36084.50c	Sm-147	62147.50c	Np-238	93238.35c
Kr-86	36086.50c	Sm-149	62149.50c	Pu-237	94237.35c
Y-89	39089.50c	Sm-150	62150.50c	Pu-238	94238.50c
Zr-93	40093.50c	Sm-151	62151.50c	Pu-239	94239.55c
Nb-93	41093.50c	Sm-152	62152.50c	Pu-240	94240.50c
Mo-95	42095.50c	Eu-151	63151.55c	Pu-241	94241.50c
Tc-99	43099.50c	Eu-152	63152.50c	Pu-242	94242.50c
Ru-101	44101.50c	Eu-153	63153.55c	Am-241	95241.50c

Ru-103	44103.50c	Eu-154	63154.50c	Am-242	95242.50c
Rh-103	45103.50c	Eu-155	63155.50c	Am-243	95243.50c
Rh-105	45105.50c	Gd-152	64152.50c	Cm-242	96242.50c
Pd-105	46105.50c	Gd-154	64154.50c	Cm-243	96243.35c
Pd-108	46108.50c	Gd-155	64155.50c	Cm-244	96244.50c
Ag-107	47107.50c	Gd-156	64156.50c	Cm-245	96245.35c
Ag-109	47109.50c	Gd-157	64157.50c	Cm-246	96246.35c
Xe-131	54131.50c	Gd-158	64158.50c	Cm-247	96247.35c
Xe-134	54134.35c	Gd-160	64160.50c	Cm-248	96248.35c
Xe-135	54135.53c	Ho-165	67165.55c		
Cs-133	55133.50c	Th-232	90232.50c		

7.3.5 Guide Tube Materials and Instrument Tube Materials

The guide tubes and instrument tubes are composed of Zircaloy-4. The modeled material composition of Zircaloy-4 is presented in Table 7.3.2-8. The guide tubes and instrument tubes contain borated moderator as presented in Table 7.3.2-2.

7.3.6 BPRA Materials

Each BPRA contains 16 identical BPR's. The BPR components include cladding, upper plenum, upper and lower end-plugs, and BP. The BPR cladding is modeled as Zircaloy-4 as presented in Table 7.3.2-8. The upper BPR plenum region contain a stainless steel spring with a volume fraction of 0.2090 inside of the cladding. The upper plenum region also contains a Zircaloy-4 end-plug. The SS304 spring and Zircaloy-4 end-plug are modeled as single homogenized material composition in the upper plenum region (inside of the cladding as presented in Figure 7.2.6-1). Table 7.3.6-1 contains the BPR upper plenum component material volume fractions. Table 7.3.6-2 contains the homogenized material composition for the BPR upper plenum region. The BPR upper plenum homogenized composition has a density of 1.9030 g/cc. The lower end-plug is modeled as Zircaloy-4. The fresh BP is uniform along the axial length of the BPR. The BP material is Al_2O_3-B_4C with an initial density of 3.7 g/cc (Ref. 5.4). The wt% of B_4C in the Al_2O_3-B_4C mixture varies between BPRA's. Table 7.3.6-3 presents the BP compositions for the various wt% loadings of B_4C used in the CRC reactivity calculations. The placements of the various BPRA's (delineated by the wt% B_4C loading) in the core for each CRC statepoint are presented in Section 7.4. The depleted BP material is delineated axially like the burned fuel as described in Section 7.3.4 with the exception that the bottom axial fuel node does not have a corresponding BP node. The Boron-10 (B-10) and B-11 isotopic concentrations in the depleted BP are obtained from the SAS2H depletion calculations. The masses of aluminum, oxygen, and carbon in the depleted BP are modeled with the same masses as in the fresh BP. The SAS2H calculated B-10 and B-

11 nodal BP masses are added to the aluminum, oxygen, and carbon masses to obtain a total mass for the depleted nodal BP composition. The weight percent of each element and isotope are calculated based on the total mass loading of depleted BP in a given node. The depleted BP density is calculated based on the mass of depleted BP in a given nodal volume. The fresh BP is modeled with the initial density of 3.7 g/cc. The MCNP 4A output files in Attachments XI through XX (moved to reference 5.27) contain an echo of the input decks for each CRC statepoint reactivity calculation. The nodal depleted BP isotopic compositions are listed in the input decks in terms of ZAID's, weight percents, and density (g/cc). Each nodal BP composition is identified by assembly and node in the material specifications section of the input decks. The nodal BP densities are shown on the geometric cell specifications for each fuel node. The top BP node in each BPR is modeled only as Al_2O_3 with a density of 3.7 g/cc.

Table 7.3.6-1 BPR Upper Plenum Material Volume Fractions

Type 304 Stainless Steel	Gas (modeled as void)	Zircaloy-4
0.2090	0.7526	0.0384

Table 7.3.6-2 BPR Upper Plenum Homogenized Material Composition

MCNP ZAID	Wt. % of Element/Isotope in Material Composition
6000.50c	0.069
7014.50c	0.087
14000.50c	0.651
15031.50c	0.039
16032.50c	0.026
24050.60c	0.689
24052.60c	13.809
24053.60c	1.596
24054.60c	0.405
25055.50c	1.735
26054.60c	3.400
26056.60c	54.820
26057.60c	1.278
26058.60c	0.173
28058.60c	5.409
28060.60c	2.139
28061.60c	0.094

MCNP ZAID	Wt. % of Element/Isotope in Material Composition
28062.60c	0.304
28064.60c	0.080
8016.50c	0.016
40000.60c	12.996
50000.35c	0.185

Table 7.3.6-3 Fresh Burnable Poison Material Composition

Element / Isotope	Wt. % of Element/Isotope in Material Composition					
	Non-Absorbing (Al_2O_3)	0.50 wt % B_4C in Al_2O_3-B_4C	1.40 wt % B_4C in Al_2O_3-B_4C	1.70 wt % B_4C in Al_2O_3-B_4C	2.00 wt % B_4C in Al_2O_3-B_4C	2.10 wt % B_4C in Al_2O_3-B_4C
13027.50c	52.932	52.667	52.190	52.032	51.873	51.820
8016.50c	47.068	46.833	46.410	46.268	46.127	46.080
6000.50c	—	0.109	0.304	0.369	0.434	0.456
5010.50c	—	0.070	0.197	0.239	0.281	0.132
5011.56c	—	0.321	0.899	1.092	1.285	1.471

7.3.7 RCCA Materials

Each RCCA contains 16 identical control rods (CR). The CR components include cladding, upper plenum, lower end-plug, and absorber material. The CR cladding is modeled as SS304 as presented in Table 7.3.2-1. The CR upper plenum contains a SS304 spring with a volume fraction of 0.3090 inside the CR cladding. The lower end-plug was modeled as SS304. The CR absorber material is Ag-In-Cd with a density of 10.17 g/cc (Ref. 5.4) as presented in Table 7.3.7-1.

Table 7.3.7-1 Ag-In-Cd Material Composition (Ref. 5.4)

Element / Isotope	MCNP ZAID	Wt. %
Silver-107	47107.60c	41.101
Silver-109	47109.60c	38.899
Cadmium	48000.50c	5.000
Indium	49000.60c	15.000

7.3.8 APSRA Materials

Each APSRA contains 16 identical APSRs. The fuel batches modeled in the CRC benchmarks of this analysis contain only gray APSRAs. The gray APSRs contain Inconel as the absorber material. The components of the gray APSRs include cladding, intermediate-plug, upper spacer, lower end-plug, and absorber material. Refer to Figure 7.2.8-1 for the gray APSR geometrical modeling specification. The APSR cladding is modeled as SS304 as presented in Table 7.3.2-1. The intermediate plug is modeled as SS304 with a volume fraction of 0.9869. The upper spacer region is modeled as a gap filled with helium at a density of 0.001 g/cc. The lower end-plug is modeled as SS304. The composition of the Inconel absorber material in the gray APSR is presented in Table 7.3.2-7.

7.4 Core Loading Descriptions

The core loading description for each CRC statepoint reactivity calculation includes the specification of the various fuel assembly locations, RCCA locations, APSRA locations, and BPRA locations. A core loading description is provided for each cycle of Crystal River Unit 3. All CRC statepoint reactivity calculations in a given reactor cycle utilize the same core loading description. Figures 7.4-1 and 7.4-2 present the core loading descriptions for Cycles 8 and 9, respectively. Each fuel assembly has a unique identifier corresponding to the identifiers used in the SAS2H depletion analyses. The fuel assembly placements in each core loading description are presented in Figures 7.4-3 and 7.4-4. The fuel assembly identifiers shown in Figures 7.4-3 through 7.4-4 refer to the assembly identifiers used in the depletion analyses as referenced in Table 7.3-1. The distances between the bottom of the RCCAs and APSRAs and the bottom of the active fuel are presented in Table 7.2.7-1.

	08	09	10	11	12	13	14	15
H	L12 F (1A) 1	N13 F (7) 9	H11 / H13 F (7) 9	F (8) 10	M13 F (3) 5	F (8) 10	H09 F (7) 9	N14 F (6) 8
K		L13 F (7) 9	F (8) 10	K10 F (7) 9	F (8) 10	K12 F (7) 9	F (8) 10	L14 F (6) 8
L			M13 F (3) 5	F (8) 10	L11 F (7) 9	F (8) 10	K14 F (7) 9	L15 F (6) 8
M				L13 F (7) 9	F (8) 10	M14 F (7) 9	F (8) 10	
N					N14 F(6) 8	F (8) 10	M12 F (7) 9	
O						M13 F (5) 7A		

Note: This cycle must be modeled in at least 1/4 core symmetry because assemblies from both H11 and H13 of Cycle 7 were used in position H10.

RC	= Previous Fuel Assembly Position, Row (R), Column (C), (normalized to 1/8 core)
F(c)	= Cycle (c) in which the Fuel Assembly was Fresh
B	= Fuel Batch Identifier (B)

Wt. % U-235 Enrichments		
Fresh Cycle	Batch	Wt. %
1A	1	1.93
3	5	2.62
5	7A	3.29
6	8	3.49
7	9	3.84
8	10	3.94

Burnable Poison Rod Assembly (BPRA) Locations	
Wt. % B_4C in BPRA	1/8 Core Row & Column
1.70	H13, K10
2.00	H11, K12, L11, L13, M12

Rod Cluster Control Assembly (RCCA) Locations			
RCCA Bank Identifier	1/8 Core Row & Column	RCCA Bank Identifier	1/8 Core Row & Column
Banks 1-4 (Safety)	H10, K09, K11, L14, M13	Bank 7 (Regulating)	H12, N12
Bank 5 (Regulating)	K13, M11	Bank 8 (Gray Axial Power Shaping Rod)	L12
Bank 6 (Regulating)	H14, L10		

Figure 7.4-1 Core Loading Description for Cycle 8

	08	09	10	11	12	13	14	15
H	L12 F (1A) 1	H15 F (7) 9	N13 F (8) 10	F (9) 11	N13 F (8) 10	F (9) 11	H11 F (8) 10	H14 F (7) 9
K		H11 / H13 F (7) 9	F (9) 11	N14 F (7) 9	F (9) 11	K14 F (8) 10	F (9) 11	L11 F (8) 10
L			M12 F (8) 10	F (9) 11	K12 F (8) 10	F (9) 11	L13 F (8) 10	M13 F (7) 9
M				H13 F (8) 10	F (9) 11	M14 F (8) 10	K10 F (8) 10	
N					N13 F(7) 9	F (9) 11	L14 F (7) 9	
O						M12 F (8) 10		

Note: This cycle must be modeled in full core symmetry because assemblies from both H11 and H13 of Cycle 7 were used in position K09.

RC	= Previous Fuel Assembly Position, Row (R), Column (C), (normalized to 1/8 core)
F(c)	= Cycle (c) in which the Fuel Assembly was Fresh
B	= Fuel Batch Identifier (B)

Wt. % U-235 Enrichments		
Fresh Cycle	Batch	Wt. %
1A	1	1.93
7	9	3.84
8	10	3.94
9	11	3.90

Burnable Poison Rod Assembly (BPRA) Locations	
Wt. % B_4C in BPRA	1/8 Core Row & Column
0.50	L13
1.40	H13
2.00	H11, K12, L11
2.10	K10, M12

Rod Cluster Control Assembly (RCCA) Locations			
RCCA Bank Identifier	1/8 Core Row & Column	RCCA Bank Identifier	1/8 Core Row & Column
Banks 1-4 (Safety)	H10, K09, K11, L14, M13	Bank 7 (Regulating)	H12, N12
Bank 5 (Regulating)	K13, M11	Bank 8 (Gray Axial Power Shaping Rod)	L12
Bank 6 (Regulating)	H14, L10		

Figure 7.4-2 Core Loading Description for Cycle 9

Fuel Assembly Identifiers & Locations in Cycle-8 of Crystal River Unit 3

	08	09	10	11	12	13	14	15
H	A18 Cycle 1A	G27	G04 / G06	H04	C20 Cycle 4	H06	G02	F19
K		G19	H10	G10	H12	G12	H14	F27
L			C20a Cycle 4	H17	G17	H19	G14	F23
M				G19a	H23	G25	H25	
N					F19a	H27	G23	
O						E19 Cycle 6		

XXX cycle	= Fuel Assembly Identifier = Previous Cycle Of Insertion If Other Than Preceding Cycle

Figure 7.4-3 Fuel Assembly Placements in Cycle 8

Fuel Assembly Identifiers & Locations in Cycle-9 of Crystal River Unit 3

	08	09	10	11	12	13	14	15
H	A18a Cycle 1A	G08 Cycle 7	H27	I04	H27a	I06	H04	G02
K		G04a/G06a Cycle 7	I10	G23	I12	H14	I14	H17
L			H23	I17	H12	I19	H19	G25
M				H06	I23	H25	H10	
N					G27a Cycle 7	I27	G14	
O						H23a		

XXX cycle	= Fuel Assembly Identifier = Previous Cycle Of Insertion If Other Than Preceding Cycle

Figure 7.4-4 Fuel Assembly Placements in Cycle 9

7.5 Calculation Control Description

Each CRC reactivity calculation followed the histories of 225 cycles of 10000 neutrons. The first 25 cycles were discarded to ensure that the neutron distribution had converged to the equivalent of the normal spatial mode for the fission source prior to tallying interaction rates for the k_{eff} calculation. MCNP 4A provides a check for convergence to the normal spatial mode for the fission source by comparing the estimated combined k_{eff} and its standard deviation for the first and second halves of the active cycles. If the difference in the estimated combined k_{eff} from the two halves does not appear to be zero, MCNP 4A will issue a WARNING message in the output. The 25 inactive cycles utilized in the calculations of this analysis are sufficient for convergence to the normal spatial mode for the fission source. The initial inactive cycle of each calculation utilized mulitple neutron source points that were positioned one per fuel region in a central rod of each fuel assembly axial node.

7.6 CRC k_{eff} Results

The CRC k_{eff} results for each statepoint reactivity calculation are presented in Table 7.6-1. The reported k_{eff} result is the combined collision, track length, and absorption estimate (combined estimator) calculated by MCNP 4A. The reported standard deviation (σ) corresponds to the reported combined estimator result.

Table 7.6-1 CRC Statepoint k_{eff} Results for Cycles 8 and 9 of Crystal River Unit 3

Cycle	Statepoint EFPD	Output Filename	k_{eff}	σ
8	0.0	inp22b.O	0.99337	0.00046
8	0.0	inp22c.O	0.99380	0.00049
8	97.6	inp23b.O	0.99161	0.00045
8	139.8	inp24b.O	0.99177	0.00049
8	404.0	inp25b.O	0.99381	0.00044
8	409.6	inp26b.O	0.99550	0.00048
8	515.5	inp27b.O	0.99407	0.00042
9	0.0	inp28b.O	0.99302	0.00048
9	158.8	inp29b.O	0.99111	0.00043
9	219.0	inp30b.O	0.98941	0.00046
9	363.1	inp31b.O	0.98968	0.00047

8. Conclusions

The k_{eff} results presented in Table 7.6-1 demonstrate that the SAS2H depletion calculations performed using the 44 group library of the SCALE 4.3 code system in conjunction with the ORIGEN-S cross

section library provide good prediction of burned fuel isotopic compositions. In addition, the k_{eff} results presented in Table 7.6-1 demonstrate that the MCNP 4A reactivity calculations performed using the cross section libraries presented in Table 7.3.1-1 provide good prediction of both fresh fuel and burned fuel reactivity in PWR systems having a thermal neutron energy spectrum.

9. Attachments

This analysis contains twenty attachments as shown in Table 9-1. Attachments I through X are the MACE input decks for each CRC benchmark calculation. Attachments XI through XX are ASCII datafile attachments of the CRC benchmark MCNP 4A output files. These output files are provided on a single magnetic tape media which has been moved to reference 5.27. The attachment tape was created using an HP Colorado T1000e parallel port model tape drive. Table 9-2 identifies the MCNP 4A output filenames of each attachment, file dates and times, and file sizes.

Table 9-1 Attachment Listing

Attachment	Number of Pages	Description
I	37	MACE Input Deck for the Cycle-8, 0.0 EFPD Statepoint
II	43	MACE Input Deck for the Cycle-8, 97.6 EFPD Statepoint
III	43	MACE Input Deck for the Cycle-8, 139.8 EFPD Statepoint
IV	46	MACE Input Deck for the Cycle-8, 404.0 EFPD Statepoint
V	46	MACE Input Deck for the Cycle-8, 409.6 EFPD Statepoint
VI	43	MACE Input Deck for the Cycle-8, 515.5 EFPD Statepoint
VII	40	MACE Input Deck for the Cycle-9, 0.0 EFPD Statepoint
VIII	48	MACE Input Deck for the Cycle-9, 158.8 EFPD Statepoint
IX	48	MACE Input Deck for the Cycle-9, 219.0 EFPD Statepoint
X	51	MACE Input Deck for the Cycle-9, 363.1 EFPD Statepoint
XI	Not Required	Cycle-8, 0.0 EFPD MCNP 4A Output File Moved to reference 5.27.

Attachment	Number of Pages	Description
XII	Not Required	Cycle-8, 97.6 EFPD MCNP 4A Output File Moved to reference 5.27.
XIII	Not Required	Cycle-8, 139.8 EFPD MCNP 4A Output File Moved to reference 5.27.
XIV	Not Required	Cycle-8, 404.0 EFPD MCNP 4A Output File Moved to reference 5.27.
XV	Not Required	Cycle-8, 409.6 EFPD MCNP 4A Output File Moved to reference 5.27.
XVI	Not Required	Cycle-8, 515.5 EFPD MCNP 4A Output File Moved to reference 5.27.
XVII	Not Required	Cycle-9, 0.0 EFPD MCNP 4A Output File Moved to reference 5.27.
XVIII	Not Required	Cycle-9, 158.8 EFPD MCNP 4A Output File Moved to reference 5.27.
XIX	Not Required	Cycle-9, 219.0 EFPD MCNP 4A Output File Moved to reference 5.27.
XX	Not Required	Cycle-9, 363.1 EFPD MCNP 4A Output File Moved to reference 5.27.
XXI	37	MACE Input Deck for the Cycle-8, 0.0 EFPD Statepoint Re-Calculation with Re-positioned Spacer Grids
XXII	Not Required	Cycle-8, 0.0 EFPD Re-Calculation MCNP 4A Output File Moved to reference 5.27.

Table 9-2 Attachment Listing

Attachment	MCNP 4A Output Filename	File Date and Time	File Size (Bytes)
XI	inp22b.O	08/11/97; 19:06:01	10440377
XII	inp23b.O	08/11/97; 19:07:41	13116146
XIII	inp24b.O	08/11/97; 19:03:50	13193058
XIV	inp25b.O	08/11/97; 19:12:41	13276910
XV	inp26b.O	08/12/97; 06:47:41	13280306
XVI	inp27b.O	08/12/97; 03:43:32	13411529

Attachment	MCNP 4A Output Filename	File Date and Time	File Size (Bytes)
XVII	inp28b.O	08/12/97; 11:17:15	10410116
XVIII	inp29b.O	08/12/97; 11:18:54	13306856
XIX	inp30b.O	08/12/97; 11:07:37	12858660
XX	inp31b.O	08/12/97; 18:31:46	13633178
XXII	inp22c.O	09/04/97; 13:41:52	10441437

```
1 : BEW core design
2 : 1/4th core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
08 : Cycle identifier
0.0 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
532.0 2200.0 2101.0 : Mod. temp.(F), System press.(psi), ppmb
A18z  G27   G04   H04   C20   H06   G02   F19
G27   G19   H10   G10   H12   G12   H14   F27
G06   H10   C20a  H17   G17   H19   G14   F23
H04   G10   H17   G19a  H23   G25   H25
C20   H12   G17   H23   F19a  H27   G23
H06   G12   H19   G25   H27   E19
G02   H14   G14   H25   G23
F19   F27   F23
11 : Number of different fuel assembly designs
1  2  3  4  5  6  3  7    (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
2  3  6  3  4  3  8  7
3  6  5  4  9  4  3  7
4  3  4  3  4  3  8
5  4  9  4  10 8  2
6  3  4  3  8  11
3  8  3  8  2
7  7  7
4 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-7
02 APSRA 104.000   APSRA Bank 8
03 BPRA  22.352    1.700 wt% B4C
04 BPRA  22.352    2.000 wt% B4C
00 00 01 04 01 03 01 00
00 01 03 01 04 01 00 00
01 03 01 04 02 04 01 00
04 01 04 01 04 01 00
01 04 02 04 01 00 00
03 01 04 01 00 00
01 00 01 00 00
00 00 00
1.93 3.84 3.84 3.94 2.62 3.94 3.84 3.49
3.84 3.84 3.94 3.84 3.94 3.84 3.94 3.49
3.84 3.94 2.62 3.94 3.84 3.94 3.84 3.49
3.94 3.84 3.94 3.84 3.94 3.84 3.94
2.62 3.94 3.84 3.94 3.49 3.94 3.84
3.94 3.84 3.94 3.84 3.94 3.29
3.84 3.94 3.84 3.94 3.84
3.49 3.49 3.49
B B B F B F B B
B B F B F B F B
```

```
B F B F B F B B
F B F B F B F
B F B F B F B
F B F B F B
B F B F B
B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7992 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.782
24053.60c 1.477
24054.60c 0.375
25055.50c 1.608
26054.60c 3.149
26056.60c 50.763
26057.60c 1.183
26058.60c 0.160
28058.60c 5.011
28060.60c 1.982
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.192
5010.50c  7.408E-03
5011.56c  3.384E-02
8016.50c  17.391
12.70 2.4797 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.076
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.606
24052.60c 12.160
24053.60c 1.405
24054.60c 0.356
25055.50c 1.529
26054.60c 2.995
26056.60c 48.289
26057.60c 1.125
26058.60c 0.153
28058.60c 4.767
28060.60c 1.885
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.629
5010.50c  8.886E-03
5011.56c  4.059E-02
8016.50c  20.861
12.22 0.9820 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.181
15031.50c 0.011
16032.50c 0.007
24050.60c 0.191
24052.60c 3.838
24053.60c 0.444
24054.60c 0.112
25055.50c 0.483
26054.60c 0.945
26056.60c 15.242
26057.60c 0.355
26058.60c 0.048
```

```
28058.60c 1.505
28060.60c 0.595
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.473
5010.50c  2.864E-02
5011.56c  1.308E-01
8016.50c  67.234
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
```

```
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2666 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.327
15031.50c 0.020
16032.50c 0.013
24050.60c 0.346
24052.60c 6.934
24053.60c 0.801
24054.60c 0.203
25055.50c 0.872
26054.60c 1.708
26056.60c 27.535
26057.60c 0.642
26058.60c 0.087
28058.60c 2.718
28060.60c 1.075
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.299
5010.50c  2.129E-02
5011.56c  9.726E-02
8016.50c  49.984
3.18 2.0711 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.523
15031.50c 0.031
16032.50c 0.021
24050.60c 0.553
24052.60c 11.083
24053.60c 1.281
24054.60c 0.325
25055.50c 1.394
26054.60c 2.730
```

```
26056.60c 44.014
26057.60c 1.026
26058.60c 0.139
28058.60c 4.345
28060.60c 1.718
28061.60c 0.076
28062.60c 0.244
28064.60c 0.064
1001.50c  3.385
5010.50c  1.144E-02
5011.56c  5.227E-02
8016.50c  26.861
7.62 2.9027 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.634
24052.60c 12.713
24053.60c 1.469
24054.60c 0.373
25055.50c 1.599
26054.60c 3.132
26056.60c 50.486
26057.60c 1.177
26058.60c 0.160
28058.60c 4.983
28060.60c 1.971
28061.60c 0.087
28062.60c 0.280
28064.60c 0.073
1001.50c  2.067
5010.50c  6.986E-03
5011.56c  3.191E-02
8016.50c  16.402
40000.60c 1.531
50000.35c 0.022
5.08 3.5812 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.30c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.649
24053.60c 1.577
24054.60c 0.400
25055.50c 1.716
26054.60c 3.362
26056.60c 54.200
26057.60c 1.263
26058.60c 0.171
28058.60c 5.350
28060.60c 2.116
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.339
5010.50c  4.526E-03
5011.56c  2.067E-02
8016.50c  10.627
40000.60c 2.158
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4342 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.051
14000.50c 0.386
15031.50c 0.023
```

```
16032.50c 0.015
24050.60c 0.408
24052.60c 8.182
24053.60c 0.946
24054.60c 0.240
25055.50c 1.029
26054.60c 2.016
26056.60c 32.493
26057.60c 0.757
26058.60c 0.103
28058.60c 3.207
28060.60c 1.268
28061.60c 0.056
28062.60c 0.180
28064.60c 0.047
1001.50c  5.422
5010.50c  1.833E-02
5011.56c  8.373E-02
8016.50c  43.027
3.18 2.1552 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.535
15031.50c 0.032
16032.50c 0.021
24050.60c 0.565
24052.60c 11.338
24053.60c 1.310
24054.60c 0.332
25055.50c 1.426
26054.60c 2.793
26056.60c 45.027
26057.60c 1.049
26058.60c 0.142
28058.60c 4.445
28060.60c 1.758
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.206
5010.50c  1.084E-02
5011.56c  4.950E-02
8016.50c  25.439
7.62 3.2507 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.634
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.454
24053.60c 1.555
24054.60c 0.394
25055.50c 1.692
26054.60c 3.314
26056.60c 53.428
26057.60c 1.245
26058.60c 0.169
28058.60c 5.274
28060.60c 2.086
28061.60c 0.092
28062.60c 0.296
28064.60c 0.078
1001.50c  1.720
5010.50c  5.815E-03
5011.56c  2.656E-02
8016.50c  13.650
5.08 3.4411 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
```

```
14000.50c 0.645
15031.50c 0.039
16032.50c 0.026
24050.60c 0.682
24052.60c 13.684
24053.60c 1.581
24054.60c 0.401
25055.50c 1.721
26054.60c 3.371
26056.60c 54.343
26057.60c 1.266
26058.60c 0.172
28058.60c 5.364
28060.60c 2.121
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.558
5010.50c  5.268E-03
5011.56c  2.406E-02
8016.50c  12.367
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5497 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.419
15031.50c 0.025
16032.50c 0.017
24050.60c 0.443
24052.60c 8.885
24053.60c 1.027
24054.60c 0.260
25055.50c 1.117
26054.60c 2.189
26056.60c 35.286
26057.60c 0.822
26058.60c 0.112
28058.60c 3.483
28060.60c 1.377
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.928
5010.50c  1.666E-02
5011.56c  7.610E-02
8016.50c  39.108
3.18 2.3456 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.074
14000.50c 0.559
15031.50c 0.034
16032.50c 0.022
24050.60c 0.591
24052.60c 11.848
24053.60c 1.369
24054.60c 0.347
25055.50c 1.490
26054.60c 2.919
26056.60c 47.051
26057.60c 1.096
26058.60c 0.149
28058.60c 4.644
28060.60c 1.837
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.848
5010.50c  9.627E-03
5011.56c  4.398E-02
8016.50c  22.599
```

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7.62 2.785 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.636
24052.60c 12.758
24053.60c 1.474
24054.60c 0.374
25055.50c 1.604
26054.60c 3.143
26056.60c 50.664
26057.60c 1.181
26058.60c 0.160
28058.60c 5.001
28060.60c 1.978
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.209
5010.50c  7.467E-03
5011.56c  3.411E-02
8016.50c  17.529
5.08 3.4411 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.645
15031.50c 0.039
16032.50c 0.026
24050.60c 0.682
24052.60c 13.684
24053.60c 1.581
24054.60c 0.401
25055.50c 1.721
26054.60c 3.371
26056.60c 54.343
26057.60c 1.266
26058.60c 0.172
28058.60c 5.364
28060.60c 2.121
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.558
5010.50c  5.268E-03
5011.56c  2.406E-02
8016.50c  12.367
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1803 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.290
15031.50c 0.017
16032.50c 0.012
24050.60c 0.307
24052.60c 6.153
24053.60c 0.711
24054.60c 0.180
25055.50c 0.774
26054.60c 1.516
26056.60c 24.434
26057.60c 0.569
26058.60c 0.077
28058.60c 2.412
28060.60c 0.954
28061.60c 0.042
28062.60c 0.136
28064.60c 0.035
1001.50c  6.847
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5010.50c  2.315E-02
5011.56c  1.057E-01
8016.50c  54.336
3.18 1.753 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.467
15031.50c 0.028
16032.50c 0.019
24050.60c 0.494
24052.60c 9.898
24053.60c 1.144
24054.60c 0.290
25055.50c 1.245
26054.60c 2.438
26056.60c 39.306
26057.60c 0.916
26058.60c 0.124
28058.60c 3.880
28060.60c 1.534
28061.60c 0.068
28062.60c 0.218
28064.60c 0.057
1001.50c  4.217
5010.50c  1.426E-02
5011.56c  6.512E-02
8016.50c  33.467
7.62 2.5446 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.580
15031.50c 0.035
16032.50c 0.023
24050.60c 0.613
24052.60c 12.299
24053.60c 1.421
24054.60c 0.360
25055.50c 1.547
26054.60c 3.030
26056.60c 48.842
26057.60c 1.138
26058.60c 0.154
28058.60c 4.821
28060.60c 1.907
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.531
5010.50c  8.556E-03
5011.56c  3.908E-02
8016.50c  20.086
5.08 3.2057 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.668
24052.60c 13.395
24053.60c 1.548
24054.60c 0.393
25055.50c 1.685
26054.60c 3.300
26056.60c 53.197
26057.60c 1.240
26058.60c 0.168
28058.60c 5.251
28060.60c 2.077
28061.60c 0.091
28062.60c 0.295
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28064.60c 0.077
1001.50c  1.761
5010.50c  5.953E-03
5011.56c  2.719E-02
8016.50c  13.975
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
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24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
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1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of NCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
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28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
```

```
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
```

```
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2683 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.218
24053.60c 1.527
24054.60c 0.387
25055.50c 1.480
26054.60c 2.929
26056.60c 47.217
26057.60c 1.100
26058.60c 0.149
28058.60c 8.402
28060.60c 3.323
28061.60c 0.146
28062.60c 0.472
28064.60c 0.124
1001.50c  1.705
5010.50c  5.883E-03
5011.56c  2.687E-02
8016.50c  13.533
13027.50c 0.055
22000.50c 0.099
```

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27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.596
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 10, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
```

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19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.572
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.117
24053.60c 1.516
24054.60c 0.384
25055.50c 1.459
26054.60c 2.890
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26056.60c 46.594
26057.60c 1.086
26058.60c 0.147
28058.60c 8.499
28060.60c 3.361
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.767
5010.50c  6.098E-03
5011.56c  2.786E-02
8016.50c  14.026
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.351
73181.50c 0.295
40000.60c 1.671
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
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9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
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40000.60c 55.509
50000.35c 0.792
3.2683 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.218
24053.60c 1.527
24054.60c 0.387
25055.50c 1.480
26054.60c 2.929
26056.60c 47.217
26057.60c 1.100
26058.60c 0.149
28058.60c 8.402
28060.60c 3.323
28061.60c 0.146
28062.60c 0.472
28064.60c 0.124
1001.50c  1.705
5010.50c  5.883E-03
5011.56c  2.687E-02
8016.50c  13.533
13027.50c 0.055
22000.50c 0.099
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.596
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
```

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3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of NCNP axial active fuel nodes for assembly design 6 (Batch 10, 1.7 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
```

```
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.572
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.117
24053.60c 1.516
24054.60c 0.384
25055.50c 1.459
26054.60c 2.890
26056.60c 46.594
26057.60c 1.086
26058.60c 0.147
28058.60c 8.499
28060.60c 3.361
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.767
5010.50c  6.098E-03
5011.56c  2.786E-02
8016.50c  14.026
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.351
73181.50c 0.295
40000.60c 1.671
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
```

```
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 8, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
```

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28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
```

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24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes.for assembly design 8 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
```

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7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
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27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 9, APSRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
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19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2533 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.658
24052.60c 13.198
24053.60c 1.525
24054.60c 0.387
25055.50c 1.476
26054.60c 2.922
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26056.60c 47.112
26057.60c 1.098
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.719
5010.50c  5.929E-03
5011.56c  2.708E-02
8016.50c  13.639
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.284
42000.50c 0.339
73181.50c 0.284
40000.60c 1.604
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 8, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
```

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9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
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40000.60c 55.509
50000.35c 0.792
3.2683 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.218
24053.60c 1.527
24054.60c 0.387
25055.50c 1.480
26054.60c 2.929
26056.60c 47.217
26057.60c 1.100
26058.60c 0.149
28058.60c 8.402
28060.60c 3.323
28061.60c 0.146
28062.60c 0.472
28064.60c 0.124
1001.50c  1.705
5010.50c  5.883E-03
5011.56c  2.687E-02
8016.50c  13.533
13027.50c 0.055
22000.50c 0.099
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.596
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
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3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 7A, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
```

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24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
```

```
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
2 : Number of different BPRA banks
03 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.700 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
```

```
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
04 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
```

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1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
1 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
```

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6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
02 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
104.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```

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1 : B&W core design
2 : 1/4th core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
08 : Cycle identifier
97.6 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
535.0 2200.0 1751.0 : Mod. temp.(F), System press.(psi), ppmb
A18z  G27   G04   N04   C20   N06   G02   F19
G27   G19   N10   G10   N12   G12   N14   F27
G06   N10   C20a  N17   G17   N19   G14   F23
N04   G10   N17   G19a  N23   G25   N25
C20   N12   G17   N23   F19a  N27   G23
N06   G12   N19   G25   N27   E19
G02   N14   G14   N25   G23
F19   F27   F23
13 : Number of different fuel assembly designs
1  2  3  4  5  6  7  8    (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
2  3  6  3  4  3  9  8
3  6  10 4  11 4  3  8
4  3  4  3  4  3  9
5  4  11 4  12 9  2
6  3  4  3  9  13
7  9  3  9  2
8  8  8
6 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-5
02 CRA   227.000   CRA Banks 6
03 CRA   17.000    CRA Banks 7
04 APSRA 122.000   APSRA Bank 8
05 BPRA  22.352    1.700 wt% B4C
06 BPRA  22.352    2.000 wt% B4C
00 00 01 06 03 05 02 00
00 01 05 01 06 01 00 00
01 05 02 06 04 06 01 00
06 01 06 01 06 01 00
03 06 04 06 03 00 00
05 01 06 01 00 00
02 00 01 00 00
00 00 00
1.93 3.84 3.84 3.94 2.62 3.94 3.84 3.49
3.84 3.84 3.94 3.84 3.94 3.84 3.94 3.49
3.84 3.94 2.62 3.94 3.84 3.94 3.84 3.49
3.94 3.84 3.94 3.84 3.94 3.84 3.94
2.62 3.94 3.84 3.94 3.49 3.94 3.84
3.94 3.84 3.94 3.84 3.94 3.29
3.84 3.94 3.84 3.94 3.84
3.49 3.49 3.49
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B B B B B B B B
B B B B B B B B
B B B B B B B B
B B B B B B B
B B B B B B B
B B B B B B
B B B B B
B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7971 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.638
24052.60c 12.792
24053.60c 1.478
24054.60c 0.375
25055.50c 1.609
26054.60c 3.151
26056.60c 50.801
26057.60c 1.184
26058.60c 0.161
28058.60c 5.014
28060.60c 1.983
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.186
5010.50c  6.155E-03
5011.56c  2.812E-02
8016.50c  17.343
12.70 2.4775 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.077
14000.50c 0.574
15031.50c 0.034
16032.50c 0.023
24050.60c 0.607
24052.60c 12.171
24053.60c 1.406
24054.60c 0.357
25055.50c 1.531
26054.60c 2.998
26056.60c 48.333
26057.60c 1.126
26058.60c 0.153
28058.60c 4.771
28060.60c 1.887
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.622
5010.50c  7.384E-03
5011.56c  3.373E-02
8016.50c  20.808
12.22 0.9792 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.182
15031.50c 0.011
16032.50c 0.007
24050.60c 0.192
24052.60c 3.849
24053.60c 0.445
24054.60c 0.113
25055.50c 0.484
26054.60c 0.948
26056.60c 15.287
```

```
26057.60c 0.356
26058.60c 0.048
28058.60c 1.509
28060.60c 0.597
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.468
5010.50c  2.385E-02
5011.56c  1.089E-01
8016.50c  67.195
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
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```
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2638 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.328
15031.50c 0.020
16032.50c 0.013
24050.60c 0.346
24052.60c 6.949
24053.60c 0.803
24054.60c 0.204
25055.50c 0.874
26054.60c 1.712
26056.60c 27.595
26057.60c 0.643
26058.60c 0.087
28058.60c 2.724
28060.60c 1.077
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.291
5010.50c  1.772E-02
5011.56c  8.092E-02
8016.50c  49.918
3.18 2.0687 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.523
15031.50c 0.031
16032.50c 0.021
24050.60c 0.553
24052.60c 11.096
24053.60c 1.282
24054.60c 0.325
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25055.50c 1.395
26054.60c 2.733
26056.60c 44.065
26057.60c 1.027
26058.60c 0.139
28058.60c 4.350
28060.60c 1.720
28061.60c 0.076
28062.60c 0.244
28064.60c 0.064
1001.50c  3.377
5010.50c  9.310E-03
5011.56c  4.344E-02
8016.50c  26.799
7.62 2.9006 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.634
24052.60c 12.722
24053.60c 1.470
24054.60c 0.373
25055.50c 1.600
26054.60c 3.134
26056.60c 50.522
26057.60c 1.177
26058.60c 0.160
28058.60c 4.987
28060.60c 1.972
28061.60c 0.087
28062.60c 0.280
28064.60c 0.073
1001.50c  2.061
5010.50c  5.804E-03
5011.56c  2.651E-02
8016.50c  16.357
40000.60c 1.532
50000.35c 0.022
5.08 3.5795 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.655
24053.60c 1.578
24054.60c 0.400
25055.50c 1.717
26054.60c 3.364
26056.60c 54.225
26057.60c 1.264
26058.60c 0.171
28058.60c 5.352
28060.60c 2.117
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.335
5010.50c  3.759E-03
5011.56c  1.717E-02
8016.50c  10.595
40000.60c 2.159
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4315 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.052
```

```
14000.50c 0.387
15031.50c 0.023
16032.50c 0.015
24050.60c 0.409
24052.60c 8.197
24053.60c 0.947
24054.60c 0.240
25055.50c 1.031
26054.60c 2.019
26056.60c 32.553
26057.60c 0.759
26058.60c 0.103
28058.60c 3.213
28060.60c 1.271
28061.60c 0.056
28062.60c 0.181
28064.60c 0.047
1001.50c  5.413
5010.50c  1.525E-02
5011.56c  6.964E-02
8016.50c  42.958
3.18 2.1528 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.535
15031.50c 0.032
16032.50c 0.021
24050.60c 0.566
24052.60c 11.351
24053.60c 1.312
24054.60c 0.333
25055.50c 1.427
26054.60c 2.796
26056.60c 45.076
26057.60c 1.050
26058.60c 0.143
28058.60c 4.449
28060.60c 1.760
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.198
5010.50c  9.007E-03
5011.56c  4.114E-02
8016.50c  25.379
7.62 3.2488 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.635
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.462
24053.60c 1.556
24054.60c 0.395
25055.50c 1.693
26054.60c 3.316
26056.60c 53.460
26057.60c 1.246
26058.60c 0.169
28058.60c 5.277
28060.60c 2.087
28061.60c 0.092
28062.60c 0.297
28064.60c 0.078
1001.50c  1.715
5010.50c  4.830E-03
5011.56c  2.206E-02
8016.50c  13.611
5.08 3.4393 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
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```
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.691
24053.60c 1.582
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.372
26057.60c 1.267
26058.60c 0.172
28058.60c 5.367
28060.60c 2.122
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.554
5010.50c  4.376E-03
5011.56c  1.999E-02
8016.50c  12.330
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5471 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.420
15031.50c 0.025
16032.50c 0.017
24050.60c 0.444
24052.60c 8.900
24053.60c 1.029
24054.60c 0.261
25055.50c 1.119
26054.60c 2.192
26056.60c 35.346
26057.60c 0.824
26058.60c 0.112
28058.60c 3.489
28060.60c 1.380
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.919
5010.50c  1.385E-02
5011.56c  6.329E-02
8016.50c  39.038
3.18 2.3433 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.075
14000.50c 0.559
15031.50c 0.034
16032.50c 0.022
24050.60c 0.591
24052.60c 11.859
24053.60c 1.370
24054.60c 0.348
25055.50c 1.491
26054.60c 2.921
26056.60c 47.097
26057.60c 1.098
26058.60c 0.149
28058.60c 4.649
28060.60c 1.838
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.841
5010.50c  8.000E-03
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5011.56c  3.654E-02
8016.50c  22.543
7.62 2.7829 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.767
24053.60c 1.475
24054.60c 0.374
25055.50c 1.606
26054.60c 3.145
26056.60c 50.703
26057.60c 1.182
26058.60c 0.160
28058.60c 5.005
28060.60c 1.979
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.203
5010.50c  6.204E-03
5011.56c  2.834E-02
8016.50c  17.481
5.08 3.4393 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.691
24053.60c 1.582
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.372
26057.60c 1.267
26058.60c 0.172
28058.60c 5.367
28060.60c 2.122
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.554
5010.50c  4.376E-03
5011.56c  1.999E-02
8016.50c  12.330
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1775 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.291
15031.50c 0.017
16032.50c 0.012
24050.60c 0.308
24052.60c 6.167
24053.60c 0.713
24054.60c 0.181
25055.50c 0.776
26054.60c 1.519
26056.60c 24.491
26057.60c 0.571
26058.60c 0.077
28058.60c 2.417
28060.60c 0.956
28061.60c 0.042
28062.60c 0.136
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28064.60c 0.036
1001.50c  6.840
5010.50c  1.926E-02
5011.56c  8.799E-02
8016.50c  54.275
3.18 1.7504 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.467
15031.50c 0.028
16032.50c 0.019
24050.60c 0.494
24052.60c 9.912
24053.60c 1.145
24054.60c 0.291
25055.50c 1.247
26054.60c 2.442
26056.60c 39.363
26057.60c 0.917
26058.60c 0.124
28058.60c 3.885
28060.60c 1.537
28061.60c 0.068
28062.60c 0.218
28064.60c 0.057
1001.50c  4.209
5010.50c  1.185E-02
5011.56c  5.414E-02
8016.50c  33.399
7.62 2.5424 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.581
15031.50c 0.035
16032.50c 0.023
24050.60c 0.614
24052.60c 12.309
24053.60c 1.422
24054.60c 0.361
25055.50c 1.548
26054.60c 3.032
26056.60c 48.884
26057.60c 1.139
26058.60c 0.155
28058.60c 4.825
28060.60c 1.908
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.525
5010.50c  7.110E-03
5011.56c  3.248E-02
8016.50c  20.033
5.08 3.2038 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.668
24052.60c 13.403
24053.60c 1.549
24054.60c 0.393
25055.50c 1.686
26054.60c 3.302
26056.60c 53.229
26057.60c 1.240
26058.60c 0.168
28058.60c 5.254
28060.60c 2.078
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28061.60c 0.091
28062.60c 0.295
28064.60c 0.077
1001.50c  1.756
5010.50c  4.945E-03
5011.56c  2.259E-02
8016.50c  13.935
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
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16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  5.335E-03
5011.56c  2.437E-02
8016.50c  14.682
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
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28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
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26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  5.335E-03
5011.56c  2.437E-02
8016.50c  14.682
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
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15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
```

```
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.907E-03
5011.56c  2.242E-02
8016.50c  13.493
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13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer-grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 10, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
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463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
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25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.762
5010.50c  5.087E-03
5011.56c  2.324E-02
8016.50c  13.986
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
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7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
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28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.907E-03
5011.56c  2.242E-02
8016.50c  13.493
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
```

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40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 10, 1.7 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm); Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
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```
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.762
5010.50c  5.087E-03
5011.56c  2.324E-02
8016.50c  13.986
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
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28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.36c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.3565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
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26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.907E-03
5011.56c  2.242E-02
8016.50c  13.493
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
```

```
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 8, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
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1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  5.335E-03
5011.56c  2.437E-02
8016.50c  14.682
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13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
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463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.3565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
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25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  5.335E-03
5011.56c  2.437E-02
8016.50c  14.682
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
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7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
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28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.907E-03
5011.56c  2.242E-02
8016.50c  13.493
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
```

```
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 9, APSRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.30c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
```

```
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.658
24052.60c 13.205
24053.60c 1.526
24054.60c 0.387
25055.50c 1.477
26054.60c 2.924
26056.60c 47.140
26057.60c 1.099
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.714
5010.50c  4.945E-03
5011.56c  2.259E-02
8016.50c  13.599
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.285
42000.50c 0.339
73181.50c 0.285
40000.60c 1.604
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
```

```
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 12 (Batch 8, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
```

```
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.907E-03
5011.56c  2.242E-02
8016.50c  13.493
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
```

```
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 13 (Batch 7A, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
```

```
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  5.335E-03
5011.56c  2.437E-02
8016.50c  14.682
```

```
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.011
5010.50c  8.600E-03
5011.56c  3.929E-02
8016.50c  23.899
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
2 : Number of different BPRA banks
05 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
```

```
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.700 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
```

```
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.36 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
```

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3 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
02 : CRA bank identifier
0.49784 0.50546 0.55880 227.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
```

```
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
03 : CRA bank identifier
0.49784 0.50546 0.55880 17.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
```

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28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
04 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
122.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
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1 : B&W core design
2 : 1/4th core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
08 : Cycle identifier
139.8 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
535.0 2200.0 1612.0 : Mod. temp.(F), System press.(psi), ppmb
A18z  G27   G04   N04   C20   N06   G02   F19
G27   G19   N10   G10   N12   G12   N14   F27
G06   N10   C20a  N17   G17   N19   G14   F23
N04   G10   N17   G19a  N23   G25   N25
C20   N12   G17   N23   F19a  N27   G23
N06   G12   N19   G25   N27   E19
G02   N14   G14   N25   G23
F19   F27   F23
13 : Number of different fuel assembly designs
1  2  3  4  5  6  7  8    (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
2  3  6  3  4  3  9  8
3  6  10 4  11 4  3  8
4  3  4  3  4  3  9
5  4  11 4  12 9  2
6  3  4  3  9  13
7  9  3  9  2
8  8  8
6 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-5
02 CRA   122.000   CRA Banks 6
03 CRA   17.000    CRA Banks 7
04 APSRA 123.000   APSRA Bank 8
05 BPRA  22.352    1.700 wt% B4C
06 BPRA  22.352    2.000 wt% B4C
00 00 01 06 03 05 02 00
00 01 05 01 06 01 00 00
01 05 02 06 04 06 01 00
06 01 06 01 06 01 00
03 06 04 06 03 00 00
05 01 06 01 00 00
02 00 01 00 00
00 00 00
1.93 3.84 3.84 3.94 2.62 3.94 3.84 3.49
3.84 3.84 3.94 3.84 3.94 3.84 3.94 3.49
3.84 3.94 2.62 3.94 3.84 3.94 3.84 3.49
3.94 3.84 3.94 3.84 3.94 3.84 3.94
2.62 3.94 3.84 3.94 3.49 3.94 3.84
3.94 3.84 3.94 3.84 3.94 3.29
3.84 3.94 3.84 3.94 3.84
3.49 3.49 3.49
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B B B B B B B B
B B B B B B B B
B B B B B B B B
B B B B B B B
B B B B B B B
B B B B B B
B B B B B
B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7971 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.638
24052.60c 12.792
24053.60c 1.478
24054.60c 0.375
25055.50c 1.609
26054.60c 3.151
26056.60c 50.801
26057.60c 1.184
26058.60c 0.161
28058.60c 5.014
28060.60c 1.983
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.186
5010.50c  5.666E-03
5011.56c  2.588E-02
8016.50c  17.346
12.70 2.4775 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.077
14000.50c 0.574
15031.50c 0.034
16032.50c 0.023
24050.60c 0.607
24052.60c 12.171
24053.60c 1.406
24054.60c 0.357
25055.50c 1.531
26054.60c 2.998
26056.60c 48.333
26057.60c 1.126
26058.60c 0.153
28058.60c 4.771
28060.60c 1.887
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.622
5010.50c  6.798E-03
5011.56c  3.105E-02
8016.50c  20.810
12.22 0.9792 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.182
15031.50c 0.011
16032.50c 0.007
24050.60c 0.192
24052.60c 3.849
24053.60c 0.445
24054.60c 0.113
25055.50c 0.484
26054.60c 0.948
26056.60c 15.287
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26057.60c 0.356
26058.60c 0.048
28058.60c 1.509
28060.60c 0.597
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.469
5010.50c  2.195E-02
5011.56c  1.003E-01
8016.50c  67.204
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
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28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2638 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.328
15031.50c 0.020
16032.50c 0.013
24050.60c 0.346
24052.60c 6.949
24053.60c 0.803
24054.60c 0.204
25055.50c 0.874
26054.60c 1.712
26056.60c 27.595
26057.60c 0.643
26058.60c 0.087
28058.60c 2.724
28060.60c 1.077
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.291
5010.50c  1.631E-02
5011.56c  7.450E-02
8016.50c  49.925
3.18 2.0687 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.523
15031.50c 0.031
16032.50c 0.021
24050.60c 0.553
24052.60c 11.096
24053.60c 1.282
24054.60c 0.325
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25055.50c 1.395
26054.60c 2.733
26056.60c 44.065
26057.60c 1.027
26058.60c 0.139
28058.60c 4.350
28060.60c 1.720
28061.60c 0.076
28062.60c 0.244
28064.60c 0.064
1001.50c  3.378
5010.50c  8.755E-03
5011.56c  4.000E-02
8016.50c  26.802
7.62 2.9006 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.634
24052.60c 12.722
24053.60c 1.470
24054.60c 0.373
25055.50c 1.600
26054.60c 3.134
26056.60c 50.522
26057.60c 1.177
26058.60c 0.160
28058.60c 4.987
28060.60c 1.972
28061.60c 0.087
28062.60c 0.280
28064.60c 0.073
1001.50c  2.061
5010.50c  5.343E-03
5011.56c  2.441E-02
8016.50c  16.359
40000.60c 1.532
50000.35c 0.022
5.08 3.5795 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.655
24053.60c 1.578
24054.60c 0.400
25055.50c 1.717
26054.60c 3.364
26056.60c 54.225
26057.60c 1.264
26058.60c 0.171
28058.60c 5.352
28060.60c 2.117
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.335
5010.50c  3.461E-03
5011.56c  1.581E-02
8016.50c  10.597
40000.60c 2.159
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4315 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.052
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14000.50c 0.387
15031.50c 0.023
16032.50c 0.015
24050.60c 0.409
24052.60c 8.197
24053.60c 0.947
24054.60c 0.240
25055.50c 1.031
26054.60c 2.019
26056.60c 32.353
26057.60c 0.759
26058.60c 0.103
28058.60c 3.213
28060.60c 1.271
28061.60c 0.056
28062.60c 0.181
28064.60c 0.047
1001.50c  5.414
5010.50c  1.403E-02
5011.56c  6.411E-02
8016.50c  42.964
3.18 2.1528 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.535
15031.50c 0.032
16032.50c 0.021
24050.60c 0.566
24052.60c 11.351
24053.60c 1.312
24054.60c 0.333
25055.50c 1.427
26054.60c 2.796
26056.60c 45.076
26057.60c 1.050
26058.60c 0.143
28058.60c 4.449
28060.60c 1.760
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.199
5010.50c  8.292E-03
5011.56c  3.788E-02
8016.50c  25.382
7.62 3.2488 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.635
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.462
24053.60c 1.556
24054.60c 0.395
25055.50c 1.693
26054.60c 3.316
26056.60c 53.460
26057.60c 1.246
26058.60c 0.169
28058.60c 5.277
28060.60c 2.087
28061.60c 0.092
28062.60c 0.297
28064.60c 0.078
1001.50c  1.715
5010.50c  4.447E-03
5011.56c  2.031E-02
8016.50c  13.613
5.08 3.4393 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
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6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.691
24053.60c 1.582
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.372
26057.60c 1.267
26058.60c 0.172
28058.60c 5.367
28060.60c 2.122
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.554
5010.50c  4.028E-03
5011.56c  1.840E-02
8016.50c  12.332
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5471 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.420
15031.50c 0.025
16032.50c 0.017
24050.60c 0.444
24052.60c 8.900
24053.60c 1.029
24054.60c 0.261
25055.50c 1.119
26054.60c 2.192
26056.60c 35.346
26057.60c 0.824
26058.60c 0.112
28058.60c 3.489
28060.60c 1.380
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.920
5010.50c  1.275E-02
5011.56c  5.826E-02
8016.50c  39.043
3.18 2.3433 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.075
14000.50c 0.559
15031.50c 0.034
16032.50c 0.022
24050.60c 0.591
24052.60c 11.859
24053.60c 1.370
24054.60c 0.348
25055.50c 1.491
26054.60c 2.921
26056.60c 47.097
26057.60c 1.098
26058.60c 0.149
28058.60c 4.649
28060.60c 1.838
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.841
5010.50c  7.365E-03
```

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5011.56c  3.364E-02
8016.50c  22.546
7.62 2.7829 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.767
24053.60c 1.475
24054.60c 0.374
25055.50c 1.606
26054.60c 3.145
26056.60c 50.703
26057.60c 1.182
26058.60c 0.160
28058.60c 5.005
28060.60c 1.979
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.203
5010.50c  5.711E-03
5011.56c  2.609E-02
8016.50c  17.483
5.08 3.4393 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.691
24053.60c 1.582
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.372
26057.60c 1.267
26058.60c 0.172
28058.60c 5.367
28060.60c 2.122
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.554
5010.50c  4.028E-03
5011.56c  1.840E-02
8016.50c  12.332
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1775 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.291
15031.50c 0.017
16032.50c 0.012
24050.60c 0.308
24052.60c 6.167
24053.60c 0.713
24054.60c 0.181
25055.50c 0.776
26054.60c 1.519
26056.60c 24.491
26057.60c 0.571
26058.60c 0.077
28058.60c 2.417
28060.60c 0.956
28061.60c 0.042
28062.60c 0.136
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28064.60c 0.036
1001.50c  6.841
5010.50c  1.773E-02
5011.56c  8.100E-02
8016.50c  54.282
3.18 1.7504 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.467
15031.50c 0.028
16032.50c 0.019
24050.60c 0.494
24052.60c 9.912
24053.60c 1.145
24054.60c 0.291
25055.50c 1.247
26054.60c 2.442
26056.60c 39.363
26057.60c 0.917
26058.60c 0.124
28058.60c 3.885
28060.60c 1.537
28061.60c 0.068
28062.60c 0.218
28064.60c 0.057
1001.50c  4.209
5010.50c  1.091E-02
5011.56c  4.985E-02
8016.50c  33.403
7.62 2.5424 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.581
15031.50c 0.035
16032.50c 0.023
24050.60c 0.614
24052.60c 12.309
24053.60c 1.422
24054.60c 0.361
25055.50c 1.548
26054.60c 3.032
26056.60c 48.884
26057.60c 1.139
26058.60c 0.155
28058.60c 4.825
28060.60c 1.908
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.525
5010.50c  6.345E-03
5011.56c  2.990E-02
8016.50c  20.036
5.08 3.2038 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.668
24052.60c 13.403
24053.60c 1.549
24054.60c 0.393
25055.50c 1.686
26054.60c 3.302
26056.60c 53.229
26057.60c 1.240
26058.60c 0.168
28058.60c 5.254
28060.60c 2.078
```

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28061.60c 0.091
28062.60c 0.295
28064.60c 0.077
1001.50c  1.756
5010.50c  4.553E-03
5011.56c  2.080E-02
8016.50c  13.937
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
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16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.922E-03
5011.56c  2.248E-02
8016.50c  14.684
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
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28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of NCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
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26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.922E-03
5011.56c  2.248E-02
8016.50c  14.684
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
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15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
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1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.527E-03
5011.56c  2.068E-02
8016.50c  13.495
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13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer-grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 10, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
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463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
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25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.693E-03
5011.56c  2.144E-02
8016.50c  13.988
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
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7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
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28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.527E-03
5011.56c  2.068E-02
8016.50c  13.495
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
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40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 10, 1.7 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
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16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.693E-03
5011.56c  2.144E-02
8016.50c  13.988
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
```

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28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
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26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.527E-03
5011.56c  2.068E-02
8016.50c  13.495
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
```

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15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 8, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
```

```
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.922E-03
5011.56c  2.248E-02
8016.50c  14.684
```

```
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
```

```
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
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25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.922E-03
5011.56c  2.248E-02
8016.50c  14.684
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
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7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
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28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.527E-03
5011.56c  2.068E-02
8016.50c  13.495
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
```

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40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.36007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 9, APSRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
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```
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2514 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.658
24052.60c 13.205
24053.60c 1.526
24054.60c 0.387
25055.50c 1.477
26054.60c 2.924
26056.60c 47.140
26057.60c 1.099
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.714
5010.50c  4.562E-03
5011.56c  2.084E-02
8016.50c  13.601
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.285
42000.50c 0.339
73181.50c 0.285
40000.60c 1.604
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
```

```
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 12 (Batch 8, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
```

```
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.527E-03
5011.56c  2.068E-02
8016.50c  13.495
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
```

```
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 13 (Batch 7A, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
```

```
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.922E-03
5011.56c  2.248E-02
8016.50c  14.684
```

```
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.927E-03
5011.56c  3.621E-02
8016.50c  23.902
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
2 : Number of different BPRA banks
05 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
```

```
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.700 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
```

```
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
```

```
3 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
02 : CRA bank identifier
0.49784 0.50546 0.55880 122.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
```

```
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
03 : CRA bank identifier
0.49784 0.50546 0.55880 17.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
```

```
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
04 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
123.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
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1 : B&W core design
2 : 1/4th core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
08 : Cycle identifier
404.0 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
536.0 2200.0 865.0 : Nod. temp.(F), System press.(psi), ppmb
A18z  G27   G04   N04   C20   N06   G02   F19
G27   G19   N10   G10   N12   G12   N14   F27
G06   N10   C20a  N17   G17   N19   G14   F23
N04   G10   N17   G19a  N23   G25   N25
C20   N12   G17   N23   F19a  N27   G23
N06   G12   N19   G25   N27   E19
G02   N14   G14   N25   G23
F19   F27   F23
14 : Number of different fuel assembly designs
1  2  3  4  5  6  7  8    (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
2  3  6  3  4  9  10 8
3  6  11 4  12 4  3  8
4  3  4  9  4  3  10
5  4  12 4  13 10 2
6  9  4  3  10 14
7  10 3  10 2
8  8  8
7 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-5
02 CRA   331.000   CRA Banks 6
03 CRA   69.000    CRA Banks 6
04 CRA   17.000    CRA Banks 7
05 APSRA 122.000   APSRA Bank 8
06 BPRA  22.352    1.700 wt% B4C
07 BPRA  22.352    2.000 wt% B4C
00 00 01 07 04 06 03 00
00 01 06 01 07 02 00 00
01 06 03 07 05 07 01 00
07 01 07 02 07 01 00
04 07 05 07 04 00 00
06 02 07 01 00 00
03 00 01 00 00
00 00 00
1.93 3.84 3.84 3.94 2.62 3.94 3.84 3.49
3.84 3.84 3.94 3.84 3.94 3.84 3.94 3.49
3.84 3.94 2.62 3.94 3.84 3.94 3.84 3.49
3.94 3.84 3.94 3.84 3.94 3.84 3.94
2.62 3.94 3.84 3.94 3.49 3.94 3.84
3.94 3.84 3.94 3.84 3.94 3.29
3.84 3.94 3.84 3.94 3.84
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3.49 3.49 3.49
B B B B B B B
B B B B B B B
B B B B B B B
B B B B B B
B B B B B B
B B B B B
B B B B
B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7963 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.638
24052.60c 12.796
24053.60c 1.479
24054.60c 0.375
25055.50c 1.609
26054.60c 3.152
26056.60c 50.816
26057.60c 1.184
26058.60c 0.161
28058.60c 5.016
28060.60c 1.984
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.185
5010.50c  3.037E-03
5011.56c  1.387E-02
8016.50c  17.337
12.70 2.4766 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.077
14000.50c 0.574
15031.50c 0.034
16032.50c 0.023
24050.60c 0.607
24052.60c 12.175
24053.60c 1.407
24054.60c 0.357
25055.50c 1.531
26054.60c 2.999
26056.60c 48.350
26057.60c 1.127
26058.60c 0.153
28058.60c 4.773
28060.60c 1.887
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.621
5010.50c  3.644E-03
5011.56c  1.664E-02
8016.50c  20.802
12.22 0.9780 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.182
15031.50c 0.011
16032.50c 0.007
24050.60c 0.192
24052.60c 3.854
24053.60c 0.445
24054.60c 0.113
25055.50c 0.485
26054.60c 0.949
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26056.60c 15.304
26057.60c 0.357
26058.60c 0.048
28058.60c 1.511
28060.60c 0.597
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.472
5010.50c  1.178E-02
5011.56c  5.379E-02
8016.50c  67.230
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
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28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2628 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.328
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.955
24053.60c 0.804
24054.60c 0.204
25055.50c 0.875
26054.60c 1.713
26056.60c 27.619
26057.60c 0.644
26058.60c 0.087
28058.60c 2.726
28060.60c 1.078
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.292
5010.50c  8.745E-03
5011.56c  3.995E-02
8016.50c  49.929
3.18 2.0677 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.524
15031.50c 0.031
16032.50c 0.021
24050.60c 0.554
24052.60c 11.101
24053.60c 1.283
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24054.60c 0.325
25055.50c 1.396
26054.60c 2.735
26056.60c 44.085
26057.60c 1.027
26058.60c 0.139
28058.60c 4.352
28060.60c 1.721
28061.60c 0.076
28062.60c 0.245
28064.60c 0.064
1001.50c  3.376
5010.50c  4.693E-03
5011.56c  2.144E-02
8016.50c  26.794
7.62 2.8998 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.635
24052.60c 12.726
24053.60c 1.471
24054.60c 0.373
25055.50c 1.600
26054.60c 3.135
26056.60c 50.536
26057.60c 1.178
26058.60c 0.160
28058.60c 4.988
28060.60c 1.973
28061.60c 0.087
28062.60c 0.280
28064.60c 0.073
1001.50c  2.060
5010.50c  2.864E-03
5011.56c  1.308E-02
8016.50c  16.351
40000.60c 1.533
50000.35c 0.022
5.08 3.5789 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.658
24053.60c 1.578
24054.60c 0.400
25055.50c 1.717
26054.60c 3.364
26056.60c 54.235
26057.60c 1.264
26058.60c 0.171
28058.60c 5.353
28060.60c 2.117
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.334
5010.50c  1.855E-03
5011.56c  8.472E-03
8016.50c  10.590
40000.60c 2.160
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4304 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
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7014.50c  0.052
14000.50c 0.387
15031.50c 0.023
16032.50c 0.015
24050.60c 0.409
24052.60c 8.203
24053.60c 0.948
24054.60c 0.240
25055.50c 1.032
26054.60c 2.021
26056.60c 32.577
26057.60c 0.759
26058.60c 0.103
28058.60c 3.216
28060.60c 1.272
28061.60c 0.056
28062.60c 0.181
28064.60c 0.047
1001.50c  5.414
5010.50c  7.525E-03
5011.56c  3.438E-02
8016.50c  42.962
3.18 2.1519 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.536
15031.50c 0.032
16032.50c 0.021
24050.60c 0.566
24052.60c 11.355
24053.60c 1.312
24054.60c 0.333
25055.50c 1.428
26054.60c 2.797
26056.60c 45.096
26057.60c 1.051
26058.60c 0.143
28058.60c 4.451
28060.60c 1.760
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.198
5010.50c  4.444E-03
5011.56c  2.030E-02
8016.50c  25.374
7.62 3.2480 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.635
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.465
24053.60c 1.556
24054.60c 0.395
25055.50c 1.693
26054.60c 3.317
26056.60c 53.472
26057.60c 1.246
26058.60c 0.169
28058.60c 5.278
28060.60c 2.087
28061.60c 0.092
28062.60c 0.297
28064.60c 0.078
1001.50c  1.714
5010.50c  2.383E-03
5011.56c  1.089E-02
8016.50c  13.605
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5.08 3.4385 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.694
24053.60c 1.583
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.384
26057.60c 1.267
26058.60c 0.172
28058.60c 5.368
28060.60c 2.123
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.553
5010.50c  2.159E-03
5011.56c  9.862E-03
8016.50c  12.325
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5461 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.420
15031.50c 0.025
16032.50c 0.017
24050.60c 0.444
24052.60c 8.906
24053.60c 1.029
24054.60c 0.261
25055.50c 1.120
26054.60c 2.194
26056.60c 35.369
26057.60c 0.824
26058.60c 0.112
28058.60c 3.491
28060.60c 1.381
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.920
5010.50c  6.838E-03
5011.56c  3.124E-02
8016.50c  39.039
3.18 2.3424 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.075
14000.50c 0.560
15031.50c 0.034
16032.50c 0.022
24050.60c 0.592
24052.60c 11.864
24053.60c 1.371
24054.60c 0.348
25055.50c 1.492
26054.60c 2.923
26056.60c 47.115
26057.60c 1.098
26058.60c 0.149
28058.60c 4.651
28060.60c 1.839
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.840
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5010.50c  3.948E-03
5011.56c  1.803E-02
8016.50c  22.537
7.62 2.7820 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.771
24053.60c 1.476
24054.60c 0.374
25055.50c 1.606
26054.60c 3.146
26056.60c 50.718
26057.60c 1.182
26058.60c 0.160
28058.60c 5.006
28060.60c 1.980
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.202
5010.50c  3.061E-03
5011.56c  1.398E-02
8016.50c  17.475
5.08 3.4385 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.694
24053.60c 1.583
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.384
26057.60c 1.267
26058.60c 0.172
28058.60c 5.368
28060.60c 2.123
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.553
5010.50c  2.159E-03
5011.56c  9.862E-03
8016.50c  12.325
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1764 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.291
15031.50c 0.017
16032.50c 0.012
24050.60c 0.308
24052.60c 6.173
24053.60c 0.713
24054.60c 0.181
25055.50c 0.776
26054.60c 1.521
26056.60c 24.514
26057.60c 0.571
26058.60c 0.078
28058.60c 2.420
28060.60c 0.957
28061.60c 0.042
```

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28062.60c 0.136
28064.60c 0.036
1001.50c  6.842
5010.50c  9.510E-03
5011.56c  4.344E-02
8016.50c  54.291
3.18 1.7494 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.468
15031.50c 0.028
16032.50c 0.019
24050.60c 0.495
24052.60c 9.918
24053.60c 1.146
24054.60c 0.291
25055.50c 1.247
26054.60c 2.443
26056.60c 39.386
26057.60c 0.918
26058.60c 0.125
28058.60c 3.888
28060.60c 1.537
28061.60c 0.068
28062.60c 0.219
28064.60c 0.057
1001.50c  4.209
5010.50c  5.850E-03
5011.56c  2.672E-02
8016.50c  33.396
7.62 2.5415 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.581
15031.50c 0.035
16032.50c 0.023
24050.60c 0.614
24052.60c 12.314
24053.60c 1.423
24054.60c 0.361
25055.50c 1.549
26054.60c 3.033
26056.60c 48.901
26057.60c 1.140
26058.60c 0.155
28058.60c 4.827
28060.60c 1.909
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.524
5010.50c  3.508E-03
5011.56c  1.602E-02
8016.50c  20.027
5.08 3.2030 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.669
24052.60c 13.407
24053.60c 1.549
24054.60c 0.393
25055.50c 1.686
26054.60c 3.303
26056.60c 53.241
26057.60c 1.241
26058.60c 0.168
28058.60c 5.255
```

```
28060.60c 2.078
28061.60c 0.091
28062.60c 0.295
28064.60c 0.077
1001.50c  1.755
5010.50c  2.440E-03
5011.56c  1.115E-02
8016.50c  13.929
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
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15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
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28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Incenel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
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26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.587
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
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14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
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1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
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8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 10, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
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1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1971 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.128
24053.60c 1.517
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24054.60c 0.385
25055.50c 1.461
26054.60c 2.893
26056.60c 46.634
26057.60c 1.087
26058.60c 0.147
28058.60c 8.506
28060.60c 3.364
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.762
5010.50c  2.573E-03
5011.56c  1.175E-02
8016.50c  13.981
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
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6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
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28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
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73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 10, 1.7 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
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15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1971 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.128
24053.60c 1.517
24054.60c 0.385
25055.50c 1.461
26054.60c 2.893
26056.60c 46.634
26057.60c 1.087
26058.60c 0.147
28058.60c 8.506
28060.60c 3.364
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.762
5010.50c  2.573E-03
5011.56c  1.175E-02
8016.50c  13.981
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
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28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
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26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
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14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 8, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.373 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
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1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.353
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
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8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
```

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1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
```

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24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
```

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6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
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28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
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73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
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15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
```

```
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 12 (Batch 9, APSRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
```

```
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2507 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.208
24053.60c 1.526
24054.60c 0.387
25055.50c 1.478
26054.60c 2.925
26056.60c 47.151
26057.60c 1.099
26058.60c 0.149
28058.60c 8.416
28060.60c 3.328
28061.60c 0.147
28062.60c 0.473
28064.60c 0.124
1001.50c  1.713
5010.50c  2.501E-03
5011.56c  1.142E-02
8016.50c  13.594
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.285
42000.50c 0.339
73181.50c 0.285
40000.60c 1.605
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
```

```
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 13 (Batch 8, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
```

```
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
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8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 14 (Batch 7A; Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
```

```
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
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24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
2 : Number of different BPRA banks
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
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4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.700 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
```

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26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
07 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
```

```
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
4 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
02 : CRA bank identifier
0.49784 0.50546 0.55880 331.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
```

```
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
03 : CRA bank identifier
0.49784 0.50546 0.55880 69.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
```

```
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
04 : CRA bank identifier
0.49784 0.50546 0.55880 17.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
05 : APSRA bank identifier
```

```
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
122.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```

```
1 : B&W core design
2 : 1/4th core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
08 : Cycle identifier
409.6 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
536.0 2200.0 865.0 : Mod. temp.(F), System press.(psi), ppmb
A18z  G27   G04   N04   C20   N06   G02   F19
G27   G19   N10   G10   N12   G12   N14   F27
G06   N10   C20a  N17   G17   N19   G14   F23
N04   G10   N17   G19a  N23   G25   N25
C20   N12   G17   N23   F19a  N27   G23
N06   G12   N19   G25   N27   E19
G02   N14   G14   N25   G23
F19   F27   F23
14 : Number of different fuel assembly designs
1  2  3  4  5  6  7  8    (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
2  3  6  3  4  9  10 8
3  6  11 4  12 4  3  8
4  3  4  9  4  3  10
5  4  12 4  13 10 2
6  9  4  3  10 14
7  10 3  10 2
8  8  8
7 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-5
02 CRA   331.000   CRA Banks 6
03 CRA   69.000    CRA Banks 6
04 CRA   17.000    CRA Banks 7
05 APSRA 122.000   APSRA Bank 8
06 BPRA  22.352    1.700 wt% B4C
07 BPRA  22.352    2.000 wt% B4C
00 00 01 07 04 06 03 00
00 01 06 01 07 02 00 00
01 06 03 07 05 07 01 00
07 01 07 02 07 01 00
04 07 05 07 04 00 00
06 02 07 01 00 00
03 00 01 00 00
00 00 00
1.93 3.84 3.84 3.94 2.62 3.94 3.84 3.49
3.84 3.84 3.94 3.84 3.94 3.84 3.94 3.49
3.84 3.94 2.62 3.94 3.84 3.94 3.84 3.49
3.94 3.84 3.94 3.84 3.94 3.84 3.94
2.62 3.94 3.84 3.94 3.49 3.94 3.84
3.94 3.84 3.94 3.84 3.94 3.29
3.84 3.94 3.84 3.94 3.84
```

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3.49 3.49 3.49
B B B B B B B B
B B B B B B B B
B B B B B B B B
B B B B B B B
B B B B B B B
B B B B B B
B B B B B
B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7963 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.638
24052.60c 12.796
24053.60c 1.479
24054.60c 0.375
25055.50c 1.609
26054.60c 3.152
26056.60c 50.816
26057.60c 1.184
26058.60c 0.161
28058.60c 5.016
28060.60c 1.984
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.185
5010.50c  3.037E-03
5011.56c  1.387E-02
8016.50c  17.337
12.70 2.4766 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.077
14000.50c 0.574
15031.50c 0.034
16032.50c 0.023
24050.60c 0.607
24052.60c 12.175
24053.60c 1.407
24054.60c 0.357
25055.50c 1.531
26054.60c 2.999
26056.60c 48.350
26057.60c 1.127
26058.60c 0.153
28058.60c 4.773
28060.60c 1.887
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.621
5010.50c  3.644E-03
5011.56c  1.664E-02
8016.50c  20.802
12.22 0.9780 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.182
15031.50c 0.011
16032.50c 0.007
24050.60c 0.192
24052.60c 3.854
24053.60c 0.445
24054.60c 0.113
25055.50c 0.485
26054.60c 0.949
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26056.60c 15.304
26057.60c 0.357
26058.60c 0.048
28058.60c 1.511
28060.60c 0.597
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.472
5010.50c  1.178E-02
5011.56c  5.379E-02
8016.50c  67.230
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
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28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2628 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.328
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.955
24053.60c 0.804
24054.60c 0.204
25055.50c 0.875
26054.60c 1.713
26056.60c 27.619
26057.60c 0.644
26058.60c 0.087
28058.60c 2.726
28060.60c 1.078
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.292
5010.50c  8.745E-03
5011.56c  3.995E-02
8016.50c  49.929
3.18 2.0677 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.524
15031.50c 0.031
16032.50c 0.021
24050.60c 0.554
24052.60c 11.101
24053.60c 1.283
```

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24054.60c 0.325
25055.50c 1.396
26054.60c 2.735
26056.60c 44.085
26057.60c 1.027
26058.60c 0.139
28058.60c 4.352
28060.60c 1.721
28061.60c 0.076
28062.60c 0.245
28064.60c 0.064
1001.50c  3.376
5010.50c  4.693E-03
5011.56c  2.144E-02
8016.50c  26.794
7.62 2.8998 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.635
24052.60c 12.726
24053.60c 1.471
24054.60c 0.373
25055.50c 1.600
26054.60c 3.135
26056.60c 50.536
26057.60c 1.178
26058.60c 0.160
28058.60c 4.988
28060.60c 1.973
28061.60c 0.087
28062.60c 0.280
28064.60c 0.073
1001.50c  2.060
5010.50c  2.864E-03
5011.56c  1.308E-02
8016.50c  16.351
40000.60c 1.533
50000.35c 0.022
5.08 3.5789 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.658
24053.60c 1.578
24054.60c 0.400
25055.50c 1.717
26054.60c 3.364
26056.60c 54.235
26057.60c 1.264
26058.60c 0.171
28058.60c 5.353
28060.60c 2.117
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.334
5010.50c  1.855E-03
5011.56c  8.472E-03
8016.50c  10.590
40000.60c 2.160
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4304 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
```

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7014.50c  0.052
14000.50c 0.387
15031.50c 0.023
16032.50c 0.015
24050.60c 0.409
24052.60c 8.203
24053.60c 0.948
24054.60c 0.240
25055.50c 1.032
26054.60c 2.021
26056.60c 32.577
26057.60c 0.759
26058.60c 0.103
28058.60c 3.216
28060.60c 1.272
28061.60c 0.056
28062.60c 0.181
28064.60c 0.047
1001.50c  5.414
5010.50c  7.525E-03
5011.56c  3.438E-02
8016.50c  42.962
3.18 2.1519 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.536
15031.50c 0.032
16032.50c 0.021
24050.60c 0.566
24052.60c 11.355
24053.60c 1.312
24054.60c 0.333
25055.50c 1.428
26054.60c 2.797
26056.60c 45.096
26057.60c 1.051
26058.60c 0.143
28058.60c 4.451
28060.60c 1.760
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.198
5010.50c  4.444E-03
5011.56c  2.030E-02
8016.50c  25.374
7.62 3.2480 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.635
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.465
24053.60c 1.556
24054.60c 0.395
25055.50c 1.693
26054.60c 3.317
26056.60c 53.472
26057.60c 1.246
26058.60c 0.169
28058.60c 5.278
28060.60c 2.087
28061.60c 0.092
28062.60c 0.297
28064.60c 0.078
1001.50c  1.714
5010.50c  2.383E-03
5011.56c  1.089E-02
8016.50c  13.605
```

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5.08 3.4385 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.694
24053.60c 1.583
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.384
26057.60c 1.267
26058.60c 0.172
28058.60c 5.368
28060.60c 2.123
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.553
5010.50c  2.159E-03
5011.56c  9.862E-03
8016.50c  12.325
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5461 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.420
15031.50c 0.025
16032.50c 0.017
24050.60c 0.444
24052.60c 8.906
24053.60c 1.029
24054.60c 0.261
25055.50c 1.120
26054.60c 2.194
26056.60c 35.369
26057.60c 0.824
26058.60c 0.112
28058.60c 3.491
28060.60c 1.381
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.920
5010.50c  6.838E-03
5011.56c  3.124E-02
8016.50c  39.039
3.18 2.3424 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.075
14000.50c 0.560
15031.50c 0.034
16032.50c 0.022
24050.60c 0.592
24052.60c 11.864
24053.60c 1.371
24054.60c 0.348
25055.50c 1.492
26054.60c 2.923
26056.60c 47.115
26057.60c 1.098
26058.60c 0.149
28058.60c 4.651
28060.60c 1.839
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.840
```

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5010.50c  3.948E-03
5011.56c  1.803E-02
8016.50c  22.537
7.62 2.7820 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.771
24053.60c 1.476
24054.60c 0.374
25055.50c 1.606
26054.60c 3.146
26056.60c 50.718
26057.60c 1.182
26058.60c 0.160
28058.60c 5.006
28060.60c 1.980
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.202
5010.50c  3.061E-03
5011.56c  1.398E-02
8016.50c  17.475
5.08 3.4385 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.694
24053.60c 1.583
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.384
26057.60c 1.267
26058.60c 0.172
28058.60c 5.368
28060.60c 2.123
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.553
5010.50c  2.159E-03
5011.56c  9.862E-03
8016.50c  12.325
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1764 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.291
15031.50c 0.017
16032.50c 0.012
24050.60c 0.308
24052.60c 6.173
24053.60c 0.713
24054.60c 0.181
25055.50c 0.776
26054.60c 1.521
26056.60c 24.514
26057.60c 0.571
26058.60c 0.078
28058.60c 2.420
28060.60c 0.957
28061.60c 0.042
```

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28062.60c 0.136
28064.60c 0.036
1001.50c  6.842
5010.50c  9.510E-03
5011.56c  4.344E-02
8016.50c  54.291
3.18 1.7494 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.468
15031.50c 0.028
16032.50c 0.019
24050.60c 0.495
24052.60c 9.918
24053.60c 1.146
24054.60c 0.291
25055.50c 1.247
26054.60c 2.443
26056.60c 39.386
26057.60c 0.918
26058.60c 0.125
28058.60c 3.888
28060.60c 1.537
28061.60c 0.068
28062.60c 0.219
28064.60c 0.057
1001.50c  4.209
5010.50c  5.850E-03
5011.56c  2.672E-02
8016.50c  33.396
7.62 2.5415 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.581
15031.50c 0.035
16032.50c 0.023
24050.60c 0.614
24052.60c 12.314
24053.60c 1.423
24054.60c 0.361
25055.50c 1.549
26054.60c 3.033
26056.60c 48.901
26057.60c 1.140
26058.60c 0.155
28058.60c 4.827
28060.60c 1.909
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.524
5010.50c  3.508E-03
5011.56c  1.602E-02
8016.50c  20.027
5.08 3.2030 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.669
24052.60c 13.407
24053.60c 1.549
24054.60c 0.393
25055.50c 1.686
26054.60c 3.303
26056.60c 53.241
26057.60c 1.241
26058.60c 0.168
28058.60c 5.255
```

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28060.60c 2.078
28061.60c 0.091
28062.60c 0.295
28064.60c 0.077
1001.50c  1.755
5010.50c  2.440E-03
5011.56c  1.115E-02
8016.50c  13.929
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
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15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
```

```
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
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26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
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14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
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1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.353
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
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8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 10, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
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1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1971 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.128
24053.60c 1.517
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24054.60c 0.385
25055.50c 1.461
26054.60c 2.893
26056.60c 46.634
26057.60c 1.087
26058.60c 0.147
28058.60c 8.506
28060.60c 3.364
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.762
5010.50c  2.573E-03
5011.56c  1.175E-02
8016.50c  13.981
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
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6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
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28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
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73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of NCNP axial active fuel nodes for assembly design 6 (Batch 10, 1.7 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
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15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1971 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.128
24053.60c 1.517
24054.60c 0.385
25055.50c 1.461
26054.60c 2.893
26056.60c 46.634
26057.60c 1.087
26058.60c 0.147
28058.60c 8.506
28060.60c 3.364
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.762
5010.50c  2.573E-03
5011.56c  1.175E-02
8016.50c  13.981
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
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28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
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26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
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14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 8, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
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1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
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8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
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1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
```

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24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
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6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
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28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
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73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
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15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.30c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
```

```
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 12 (Batch 9, APSRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c 0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
```

```
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.208
24053.60c 1.526
24054.60c 0.387
25055.50c 1.478
26054.60c 2.925
26056.60c 47.151
26057.60c 1.099
26058.60c 0.149
28058.60c 8.416
28060.60c 3.328
28061.60c 0.147
28062.60c 0.473
28064.60c 0.124
1001.50c  1.713
5010.50c  2.501E-03
5011.56c  1.142E-02
8016.50c  13.594
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.285
42000.50c 0.339
73181.50c 0.285
40000.60c 1.605
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
```

```
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 13 (Batch 8, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
```

```
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.699
5010.50c  2.481E-03
5011.56c  1.134E-02
```

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8016.50c  13.488
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 14 (Batch 7A, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
```

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1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
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24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.849
5010.50c  2.696E-03
5011.56c  1.231E-02
8016.50c  14.677
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.010
5010.50c  4.305E-03
5011.56c  1.966E-02
8016.50c  23.893
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
2 : Number of different BPRA banks
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
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4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.700 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
```

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26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
07 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
```

```
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
4 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
02 : CRA bank identifier
0.49784 0.50546 0.55880 331.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
```

```
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
03 : CRA bank identifier
0.49784 0.50546 0.55880 69.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
```

```
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
04 : CRA bank identifier
0.49784 0.50546 0.55880 17.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
05 : APSRA bank identifier
```

```
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
122.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```

```
1 : BEW core design
2 : 1/4th core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
08 : Cycle identifier
515.5 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
536.0 2200.0 675.0 : Mod. temp.(F), System press.(psi), ppmb
A18z  G27   G04   N04   C20   N06   G02   F19
G27   G19   N10   G10   N12   G12   N14   F27
G06   N10   C20a  N17   G17   N19   G14   F23
N04   G10   N17   G19a  N23   G25   N25
C20   N12   G17   N23   F19a  N27   G23
N06   G12   N19   G25   N27   E19
G02   N14   G14   N25   G23
F19   F27   F23
13 : Number of different fuel assembly designs
1  2  3  4  5  6  7  8    (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
2  3  6  3  4  3  9  8
3  6  10 4  11 4  3  8
4  3  4  3  4  3  9
5  4  11 4  12 9  2
6  3  4  3  9  13
7  9  3  9  2
8  8  8
6 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-5
02 CRA   261.000   CRA Banks 6
03 CRA   17.000    CRA Banks 7
04 APSRA 366.206   APSRA Bank 8
05 BPRA  22.352    1.700 wt% B4C
06 BPRA  22.352    2.000 wt% B4C
00 00 01 06 03 05 02 00
00 01 05 01 06 01 00 00
01 05 02 06 04 06 01 00
06 01 06 01 06 01 00
03 06 04 06 03 00 00
05 01 06 01 00 00
02 00 01 00 00
00 00 00
1.93 3.84 3.84 3.94 2.62 3.94 3.84 3.49
3.84 3.84 3.94 3.84 3.94 3.84 3.94 3.49
3.84 3.94 2.62 3.94 3.84 3.94 3.84 3.49
3.94 3.84 3.94 3.84 3.94 3.84 3.94
2.62 3.94 3.84 3.94 3.49 3.94 3.84
3.94 3.84 3.94 3.84 3.94 3.29
3.84 3.94 3.84 3.94 3.84
3.49 3.49 3.49
```

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B B B B B B B B
B B B B B B B B
B B B B B B B B
B B B B B B B
B B B B B B B B
B B B B B B.
B B B B B
B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7963 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.638
24052.60c 12.796
24053.60c 1.479
24054.60c 0.375
25055.50c 1.609
26054.60c 3.152
26056.60c 50.816
26057.60c 1.184
26058.60c 0.161
28058.60c 5.016
28060.60c 1.984
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.185
5010.50c  2.370E-03
5011.56c  1.083E-02
8016.50c  17.341
12.70 2.4766 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.077
14000.50c 0.574
15031.50c 0.034
16032.50c 0.023
24050.60c 0.607
24052.60c 12.175
24053.60c 1.407
24054.60c 0.357
25055.50c 1.531
26054.60c 2.999
26056.60c 48.350
26057.60c 1.127
26058.60c 0.153
28058.60c 4.773
28060.60c 1.887
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.622
5010.50c  2.843E-03
5011.56c  1.299E-02
8016.50c  20.806
12.22 0.9780 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.182
15031.50c 0.011
16032.50c 0.007
24050.60c 0.192
24052.60c 3.854
24053.60c 0.445
24054.60c 0.113
25055.50c 0.485
26054.60c 0.949
26056.60c 15.304
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26057.60c 0.357
26058.60c 0.048
28058.60c 1.511
28060.60c 0.597
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.474
5010.50c  9.189E-03
5011.56c  4.198E-02
8016.50c  67.243
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
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28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2628 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.328
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.955
24053.60c 0.804
24054.60c 0.204
25055.50c 0.875
26054.60c 1.713
26056.60c 27.619
26057.60c 0.644
26058.60c 0.087
28058.60c 2.726
28060.60c 1.078
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.293
5010.50c  6.825E-03
5011.56c  3.117E-02
8016.50c  49.938
3.18 2.0677 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.524
15031.50c 0.031
16032.50c 0.021
24050.60c 0.554
24052.60c 11.101
24053.60c 1.283
24054.60c 0.325
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25055.50c 1.396
26054.60c 2.735
26056.60c 44.085
26057.60c 1.027
26058.60c 0.139
28058.60c 4.352
28060.60c 1.721
28061.60c 0.076
28062.60c 0.245
28064.60c 0.064
1001.50c  3.377
5010.50c  3.662E-03
5011.56c  1.673E-02
8016.50c  26.799
7.62 2.8998 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.635
24052.60c 12.726
24053.60c 1.471
24054.60c 0.373
25055.50c 1.600
26054.60c 3.135
26056.60c 50.536
26057.60c 1.178
26058.60c 0.160
28058.60c 4.988
28060.60c 1.973
28061.60c 0.087
28062.60c 0.280
28064.60c 0.073
1001.50c  2.061
5010.50c  2.235E-03
5011.56c  1.021E-02
8016.50c  16.354
40000.60c 1.533
50000.35c 0.022
5.08 3.5789 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.658
24053.60c 1.578
24054.60c 0.400
25055.50c 1.717
26054.60c 3.364
26056.60c 54.235
26057.60c 1.264
26058.60c 0.171
28058.60c 5.353
28060.60c 2.117
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.335
5010.50c  1.447E-03
5011.56c  6.611E-03
8016.50c  10.592
40000.60c 2.160
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4304 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.052
```

```
14000.50c 0.387
15031.50c 0.023
16032.50c 0.015
24050.60c 0.409
24052.60c 8.203
24053.60c 0.948
24054.60c 0.240
25055.50c 1.032
26054.60c 2.021
26056.60c 32.577
26057.60c 0.759
26058.60c 0.103
28058.60c 3.216
28060.60c 1.272
28061.60c 0.056
28062.60c 0.181
28064.60c 0.047
1001.50c  5.415
5010.50c  5.872E-03
5011.56c  2.682E-02
8016.50c  42.970
3.18 2.1519 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.30c  0.057
7014.50c  0.071
14000.50c 0.536
15031.50c 0.032
16032.50c 0.021
24050.60c 0.566
24052.60c 11.355
24053.60c 1.312
24054.60c 0.333
25055.50c 1.428
26054.60c 2.797
26056.60c 45.096
26057.60c 1.051
26058.60c 0.143
28058.60c 4.451
28060.60c 1.760
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.198
5010.50c  3.468E-03
5011.56c  1.584E-02
8016.50c  25.378
7.62 3.2480 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.635
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.465
24053.60c 1.556
24054.60c 0.395
25055.50c 1.693
26054.60c 3.317
26056.60c 53.472
26057.60c 1.246
26058.60c 0.169
28058.60c 5.278
28060.60c 2.087
28061.60c 0.092
28062.60c 0.297
28064.60c 0.078
1001.50c  1.715
5010.50c  1.860E-03
5011.56c  8.495E-03
8016.50c  13.608
5.08 3.4385 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
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```
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.694
24053.60c 1.583
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.384
26057.60c 1.267
26058.60c 0.172
28058.60c 5.368
28060.60c 2.123
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.553
5010.50c  1.685E-03
5011.56c  7.696E-03
8016.50c  12.327
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5461 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.420
15031.50c 0.025
16032.50c 0.017
24050.60c 0.444
24052.60c 8.906
24053.60c 1.029
24054.60c 0.261
25055.50c 1.120
26054.60c 2.194
26056.60c 35.369
26057.60c 0.824
26058.60c 0.112
28058.60c 3.491
28060.60c 1.381
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.921
5010.50c  5.336E-03
5011.56c  2.438E-02
8016.50c  39.047
3.18 2.3424 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.075
14000.50c 0.560
15031.50c 0.034
16032.50c 0.022
24050.60c 0.592
24052.60c 11.864
24053.60c 1.371
24054.60c 0.348
25055.50c 1.492
26054.60c 2.923
26056.60c 47.115
26057.60c 1.098
26058.60c 0.149
28058.60c 4.651
28060.60c 1.839
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.841
5010.50c  3.080E-03
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5011.56c  1.407E-02
8016.50c  22.541
7.62 2.7820 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.771
24053.60c 1.476
24054.60c 0.374
25055.50c 1.606
26054.60c 3.146
26056.60c 50.718
26057.60c 1.182
26058.60c 0.160
28058.60c 5.006
28060.60c 1.980
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.203
5010.50c  2.389E-03
5011.56c  1.091E-02
8016.50c  17.478
5.08 3.4385 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.694
24053.60c 1.583
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.384
26057.60c 1.267
26058.60c 0.172
28058.60c 5.368
28060.60c 2.123
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.553
5010.50c  1.685E-03
5011.56c  7.696E-03
8016.50c  12.327
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1764 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.291
15031.50c 0.017
16032.50c 0.012
24050.60c 0.308
24052.60c 6.173
24053.60c 0.713
24054.60c 0.181
25055.50c 0.776
26054.60c 1.521
26056.60c 24.514
26057.60c 0.571
26058.60c 0.078
28058.60c 2.420
28060.60c 0.957
28061.60c 0.042
28062.60c 0.136
```

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28064.60c 0.036
1001.50c  6.843
5010.50c  7.421E-03
5011.56c  3.390E-02
8016.50c  54.301
3.18 1.7494 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.468
15031.50c 0.028
16032.50c 0.019
24050.60c 0.495
24052.60c 9.918
24053.60c 1.146
24054.60c 0.291
25055.50c 1.247
26054.60c 2.443
26056.60c 39.386
26057.60c 0.918
26058.60c 0.125
28058.60c 3.888
28060.60c 1.537
28061.60c 0.068
28062.60c 0.219
28064.60c 0.057
1001.50c  4.209
5010.50c  4.565E-03
5011.56c  2.085E-02
8016.50c  33.403
7.62 2.5415 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.581
15031.50c 0.035
16032.50c 0.023
24050.60c 0.614
24052.60c 12.314
24053.60c 1.423
24054.60c 0.361
25055.50c 1.549
26054.60c 3.033
26056.60c 48.901
26057.60c 1.140
26058.60c 0.155
28058.60c 4.827
28060.60c 1.909
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.524
5010.50c  2.737E-03
5011.56c  1.250E-02
8016.50c  20.031
5.08 3.2030 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.669
24052.60c 13.407
24053.60c 1.549
24054.60c 0.393
25055.50c 1.686
26054.60c 3.303
26056.60c 53.241
26057.60c 1.241
26058.60c 0.168
28058.60c 5.255
28060.60c 2.078
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28061.60c 0.091
28062.60c 0.295
28064.60c 0.077
1001.50c  1.756
5010.50c  1.904E-03
5011.56c  8.697E-03
8016.50c  13.932
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
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16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  2.131E-03
5011.56c  9.735E-03
8016.50c  14.679
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
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28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
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26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  2.131E-03
5011.56c  9.735E-03
8016.50c  14.679
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
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15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
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1.3565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  1.963E-03
5011.56c  8.965E-03
8016.50c  13.491
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13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 10, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
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463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1971 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.128
24053.60c 1.517
24054.60c 0.385
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25055.50c 1.461
26054.60c 2.893
26056.60c 46.634
26057.60c 1.087
26058.60c 0.147
28058.60c 8.506
28060.60c 3.364
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.762
5010.50c  2.035E-03
5011.56c  9.296E-03
8016.50c  13.983
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
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7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
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28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  1.963E-03
5011.56c  8.965E-03
8016.50c  13.491
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
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40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 10, 1.7 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
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16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1971 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.128
24053.60c 1.517
24054.60c 0.385
25055.50c 1.461
26054.60c 2.893
26056.60c 46.634
26057.60c 1.087
26058.60c 0.147
28058.60c 8.506
28060.60c 3.364
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.762
5010.50c  2.035E-03
5011.56c  9.296E-03
8016.50c  13.983
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
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28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
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26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  1.963E-03
5011.56c  8.965E-03
8016.50c  13.491
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
```

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15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 8, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
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1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  2.131E-03
5011.56c  9.735E-03
8016.50c  14.679
```

```
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
```

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463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
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25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  2.131E-03
5011.56c  9.735E-03
8016.50c  14.679
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
```

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7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
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28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  1.963E-03
5011.56c  8.965E-03
8016.50c  13.491
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
```

```
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 9, APSRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
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```
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2507 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.208
24053.60c 1.526
24054.60c 0.387
25055.50c 1.478
26054.60c 2.925
26056.60c 47.151
26057.60c 1.099
26058.60c 0.149
28058.60c 8.416
28060.60c 3.328
28061.60c 0.147
28062.60c 0.473
28064.60c 0.124
1001.50c  1.713
5010.50c  1.978E-03
5011.56c  9.034E-03
8016.50c  13.597
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.285
42000.50c 0.339
73181.50c 0.285
40000.60c 1.605
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
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28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.347E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 12 (Batch 8, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
```

```
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2656 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.229
24053.60c 1.529
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.255
26057.60c 1.101
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  1.963E-03
5011.56c  8.965E-03
8016.50c  13.491
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.598
50000.35c 0.023
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
```

```
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 13 (Batch 7A, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
```

```
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1051 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 13.002
24053.60c 1.503
24054.60c 0.381
25055.50c 1.443
26054.60c 2.859
26056.60c 46.084
26057.60c 1.074
26058.60c 0.146
28058.60c 8.487
28060.60c 3.356
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  2.131E-03
5011.56c  9.735E-03
8016.50c  14.679
```

```
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2454 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.044
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.390
26056.60c 38.528
26057.60c 0.898
26058.60c 0.122
28058.60c 7.581
28060.60c 2.998
28061.60c 0.132
28062.60c 0.426
28064.60c 0.112
1001.50c  3.011
5010.50c  3.386E-03
5011.56c  1.547E-02
8016.50c  23.898
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.586
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
2 : Number of different BPRA banks
05 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
```

```
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.700 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
```

```
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
```

```
3 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
02 : CRA bank identifier
0.49784 0.50546 0.55880 261.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
```

```
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
03 : CRA bank identifier
0.49784 0.50546 0.55880 17.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
```

```
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
04 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
366.206 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```

```
1 : BEW core design
3 : Full core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
09 : Cycle identifier
0.0 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
532.0 2200.0 2212.0 : Mod. temp.(F), System press.(psi), ppmb
                                G25  N17  G02  N17  G25
                     G14  N10   N19  I14  N04  I14  N19  N10  G14
            N23a     I27  N25   I19  N14  I06  N14  I19  N25  I27  N23a
      G14   I27      G27a I23   N12  I12  N27a I12  N12  I23  G27a I27  G14
      N10   N25      I23  N06   I17  G23  I04  G23  I17  N06  I23  N25  N10
G25   N19   I19      N12  I17   N23  I10  N27  I10  N23  I17  N12  I19  N19  G25
N17   I14   N14      I12  G23   I10  G04a G08  G06a I10  G23  I12  N14  I14  N17
G02   N04   I06      N27a I04   N27  G08  A18az G08  N27  I04  N27a I06  N04  G02
N17   I14   N14      I12  G23   I10  G06a G08  G04a I10  G23  I12  N14  I14  N17
G25   N19   I19      N12  I17   N23  I10  N27  I10  N23  I17  N12  I19  N19  G25
      N10   N25      I23  N06   I17  G23  I04  G23  I17  N06  I23  N25  N10
      G14   I27      G27a I23   N12  I12  N27a I12  N12  I23  G27a I27  G14
            N23a     I27  N25   I19  N14  I06  N14  I19  N25  I27  N23a
                     G14  N10   N19  I14  N04  I14  N19  N10  G14
                                G25  N17  G02  N17  G25
11 : Number of different fuel assembly designs (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
                2  9  2  9  2
        2  9  3  8  3  8  3  9  2
     9  8  3  11 3  5  3  11 3  8  9
   2 8  6  7  10 4  3  4  10 7  6  8  2
   9 3  7  3  4  6  4  6  4  3  7  3  9
2  3  11 10 4  3  7  3  7  3  4  10 11 3  2
9  8  3  4  6  7  6  2  6  7  6  4  3  8  9
2  3  5  3  4  3  2  1  2  3  4  3  5  3  2
9  8  3  4  6  7  6  2  6  7  6  4  3  8  9
2  3  11 10 4  3  7  3  7  3  4  10 11 3  2
   9 3  7  3  4  6  4  6  4  3  7  3  9
   2 8  6  7  10 4  3  4  10 7  6  8  2
     9  8  3  11 3  5  3  11 3  8  9
        2  9  3  8  3  8  3  9  2
                2  9  2  9  2
6 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-7
02 APSRA 104.000   APSRA Bank 8
03 BPRA  22.352    0.500 wt% B4C
04 BPRA  22.352    1.400 wt% B4C
05 BPRA  22.352    2.000 wt% B4C
06 BPRA  22.352    2.100 wt% B4C
                00 00 00 00 00
         00 00 01 00 01 00 01 00 00
```

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      00 00 01 03 01 04 01 03 01 00 00
   00 00 01 06 02 05 01 05 02 06 01 00 00
   00 01 06 01 05 01 05 01 05 01 06 01 00
00 01 03 02 05 01 06 01 06 01 05 02 03 01 00
00 00 01 05 01 06 01 00 01 06 01 05 01 00 00
00 01 04 01 05 01 00 00 00 01 05 01 04 01 00
00 00 01 05 01 06 01 00 01 06 01 05 01 00 00
00 01 03 02 05 01 06 01 06 01 05 02 03 01 00
   00 01 06 01 05 01 05 01 05 01 06 01 00
   00 00 01 06 02 05 01 05 02 06 01 00 00
      00 00 01 03 01 04 01 03 01 00 00
         00 00 01 00 01 00 01 00 00
               00 00 00 00 00
                        3.84 3.94 3.84 3.94 3.84
               3.84 3.94 3.94 3.90 3.94 3.90 3.94 3.94 3.84
          3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94
     3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.84 3.90 3.84
     3.94 3.94 3.90 3.94 3.90 3.94 3.84 3.90 3.84 3.90 3.94 3.90 3.94
3.84 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.84
3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.84 3.84 3.90 3.84 3.90 3.94 3.90 3.94
3.84 3.94 3.90 3.94 3.90 3.94 3.84 1.93 3.84 3.94 3.90 3.94 3.90 3.94 3.84
3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.84 3.84 3.90 3.84 3.90 3.94 3.90 3.94
3.84 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.84
     3.94 3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.94
     3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.84 3.90 3.84
          3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94
               3.84 3.94 3.94 3.90 3.94 3.90 3.94 3.94 3.84
                        3.84 3.94 3.84 3.94 3.84
          B B B B B
      B B B F B F B B B
    B F B F B F B F B F B
  B F B F B F B F B F B F B
  B B F B F B F B F B F B B
B B F B F B F B F B F B F B B
B F B F B F B B B F B F B F B
B F B F B F B B B F B F B F B
B B F B F B F B F B F B F B B
  B B F B F B F B F B F B B
  B F B F B F B F B F B F B
    B F B F B F B F B F B
      B B B F B F B B B
          B B B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7992 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.782
24053.60c 1.477
24054.60c 0.375
25055.50c 1.608
26054.60c 3.149
26056.60c 50.763
26057.60c 1.183
26058.60c 0.160
28058.60c 5.011
28060.60c 1.982
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.191
5010.50c  7.799E-03
5011.56c  3.563E-02
8016.50c  17.389
12.70 2.4797 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
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7014.50c  0.076
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.606
24052.60c 12.160
24053.60c 1.405
24054.60c 0.356
25055.50c 1.529
26054.60c 2.995
26056.60c 48.289
26057.60c 1.125
26058.60c 0.153
28058.60c 4.767
28060.60c 1.885
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.629
5010.50c  9.356E-03
5011.56c  4.274E-02
8016.50c  20.859
12.22 0.9820 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.181
15031.50c 0.011
16032.50c 0.007
24050.60c 0.191
24052.60c 3.838
24053.60c 0.444
24054.60c 0.112
25055.50c 0.483
26054.60c 0.945
26056.60c 15.242
26057.60c 0.355
26058.60c 0.048
28058.60c 1.505
28060.60c 0.595
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.472
5010.50c  3.015E-02
5011.56c  1.377E-01
8016.50c  67.226
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
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7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
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4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2666 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.327
15031.50c 0.020
16032.50c 0.013
24050.60c 0.346
24052.60c 6.934
24053.60c 0.801
24054.60c 0.203
25055.50c 0.872
26054.60c 1.708
26056.60c 27.535
26057.60c 0.642
26058.60c 0.087
28058.60c 2.718
28060.60c 1.075
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.298
5010.50c  2.242E-02
5011.56c  1.024E-01
8016.50c  49.978
3.18 2.0711 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.523
15031.50c 0.031
16032.50c 0.021
24050.60c 0.553
24052.60c 11.083
24053.60c 1.281
24054.60c 0.325
25055.50c 1.394
26054.60c 2.730
26056.60c 44.014
26057.60c 1.026
26058.60c 0.139
28058.60c 4.345
28060.60c 1.718
28061.60c 0.076
28062.60c 0.244
28064.60c 0.064
1001.50c  3.385
5010.50c  1.205E-02
5011.56c  5.503E-02
8016.50c  26.858
7.62 2.9027 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.634
24052.60c 12.713
24053.60c 1.469
24054.60c 0.373
25055.50c 1.599
26054.60c 3.132
26056.60c 50.486
26057.60c 1.177
26058.60c 0.160
28058.60c 4.983
28060.60c 1.971
28061.60c 0.087
28062.60c 0.280
28064.60c 0.073
1001.50c  2.067
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5010.50c  7.355E-03
5011.56c  3.360E-02
8016.50c  16.401
40000.60c 1.531
50000.35c 0.022
5.08 3.5812 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.649
24053.60c 1.577
24054.60c 0.400
25055.50c 1.716
26054.60c 3.362
26056.60c 54.200
26057.60c 1.263
26058.60c 0.171
28058.60c 5.350
28060.60c 2.116
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.339
5010.50c  4.765E-03
5011.56c  2.177E-02
8016.50c  10.626
40000.60c 2.158
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4342 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.051
14000.50c 0.386
15031.50c 0.023
16032.50c 0.015
24050.60c 0.408
24052.60c 8.182
24053.60c 0.946
24054.60c 0.240
25055.50c 1.029
26054.60c 2.016
26056.60c 32.493
26057.60c 0.757
26058.60c 0.103
28058.60c 3.207
28060.60c 1.268
28061.60c 0.056
28062.60c 0.180
28064.60c 0.047
1001.50c  5.422
5010.50c  1.930E-02
5011.56c  8.815E-02
8016.50c  43.023
3.18 2.1552 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.535
15031.50c 0.032
16032.50c 0.021
24050.60c 0.565
24052.60c 11.338
24053.60c 1.310
24054.60c 0.332
25055.50c 1.426
26054.60c 2.793
26056.60c 45.027
26057.60c 1.049
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26058.60c 0.142
28058.60c 4.445
28060.60c 1.758
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.205
5010.50c  1.141E-02
5011.56c  5.212E-02
8016.50c  25.436
7.62 3.2507 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.634
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.454
24053.60c 1.555
24054.60c 0.394
25055.50c 1.692
26054.60c 3.314
26056.60c 53.428
26057.60c 1.245
26058.60c 0.169
28058.60c 5.274
28060.60c 2.086
28061.60c 0.092
28062.60c 0.296
28064.60c 0.078
1001.50c  1.720
5010.50c  6.122E-03
5011.56c  2.796E-02
8016.50c  13.649
5.08 3.4411 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.645
15031.50c 0.039
16032.50c 0.026
24050.60c 0.682
24052.60c 13.684
24053.60c 1.581
24054.60c 0.401
25055.50c 1.721
26054.60c 3.371
26056.60c 54.343
26057.60c 1.266
26058.60c 0.172
28058.60c 5.364
28060.60c 2.121
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.558
5010.50c  5.546E-03
5011.56c  2.534E-02
8016.50c  12.365
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5497 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.419
15031.50c 0.025
16032.50c 0.017
24050.60c 0.443
24052.60c 8.885
24053.60c 1.027
24054.60c 0.260
25055.50c 1.117
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26054.60c 2.189
26056.60c 35.286
26057.60c 0.822
26058.60c 0.112
28058.60c 3.483
28060.60c 1.377
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.928
5010.50c  1.754E-02
5011.56c  8.012E-02
8016.50c  39.104
3.18 2.3456 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.074
14000.50c 0.559
15031.50c 0.034
16032.50c 0.022
24050.60c 0.591
24052.60c 11.848
24053.60c 1.369
24054.60c 0.347
25055.50c 1.490
26054.60c 2.919
26056.60c 47.051
26057.60c 1.096
26058.60c 0.149
28058.60c 4.644
28060.60c 1.837
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.848
5010.50c  1.014E-02
5011.56c  4.630E-02
8016.50c  22.597
7.62 2.785 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.636
24052.60c 12.758
24053.60c 1.474
24054.60c 0.374
25055.50c 1.604
26054.60c 3.143
26056.60c 50.664
26057.60c 1.181
26058.60c 0.160
28058.60c 5.001
28060.60c 1.978
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.209
5010.50c  7.861E-03
5011.56c  3.591E-02
8016.50c  17.527
5.08 3.4411 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.645
15031.50c 0.039
16032.50c 0.026
24050.60c 0.682
24052.60c 13.684
24053.60c 1.581
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24054.60c 0.401
25055.50c 1.721
26054.60c 3.371
26056.60c 54.343
26057.60c 1.266
26058.60c 0.172
28058.60c 5.364
28060.60c 2.121
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.558
5010.50c  5.546E-03
5011.56c  2.534E-02
8016.50c  12.365
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1803 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.290
15031.50c 0.017
16032.50c 0.012
24050.60c 0.307
24052.60c 6.153
24053.60c 0.711
24054.60c 0.180
25055.50c 0.774
26054.60c 1.516
26056.60c 24.434
26057.60c 0.569
26058.60c 0.077
28058.60c 2.412
28060.60c 0.954
28061.60c 0.042
28062.60c 0.136
28064.60c 0.035
1001.50c  6.847
5010.50c  2.437E-02
5011.56c  1.113E-01
8016.50c  54.330
3.18 1.753 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.467
15031.50c 0.028
16032.50c 0.019
24050.60c 0.494
24052.60c 9.898
24053.60c 1.144
24054.60c 0.290
25055.50c 1.245
26054.60c 2.438
26056.60c 39.306
26057.60c 0.916
26058.60c 0.124
28058.60c 3.880
28060.60c 1.534
28061.60c 0.068
28062.60c 0.218
28064.60c 0.057
1001.50c  4.217
5010.50c  1.501E-02
5011.56c  6.856E-02
8016.50c  33.463
7.62 2.5446 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.580
15031.50c 0.035
16032.50c 0.023
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24050.60c 0.613
24052.60c 12.299
24053.60c 1.421
24054.60c 0.360
25055.50c 1.547
26054.60c 3.030
26056.60c 48.842
26057.60c 1.138
26058.60c 0.154
28058.60c 4.821
28060.60c 1.907
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.531
5010.50c  9.008E-03
5011.56c  4.115E-02
8016.50c  20.084
5.08 3.2057 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.668
24052.60c 13.395
24053.60c 1.548
24054.60c 0.393
25055.50c 1.685
26054.60c 3.300
26056.60c 53.197
26057.60c 1.240
26058.60c 0.168
28058.60c 5.251
28060.60c 2.077
28061.60c 0.091
28062.60c 0.295
28064.60c 0.077
1001.50c  1.761
5010.50c  6.268E-03
5011.56c  2.863E-02
8016.50c  13.974
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
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2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
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28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.728E-03
5011.56c  3.073E-02
8016.50c  14.723
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
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14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
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14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.728E-03
5011.56c  3.073E-02
8016.50c  14.723
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
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18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
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26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2683 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.218
24053.60c 1.527
24054.60c 0.387
25055.50c 1.480
26054.60c 2.929
26056.60c 47.217
26057.60c 1.100
26058.60c 0.149
28058.60c 8.402
28060.60c 3.323
28061.60c 0.146
28062.60c 0.472
28064.60c 0.124
1001.50c  1.705
5010.50c  6.187E-03
5011.56c  2.826E-02
8016.50c  13.531
13027.50c 0.055
22000.50c 0.099
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.596
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
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22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 11, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
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40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.572
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.117
24053.60c 1.516
24054.60c 0.384
25055.50c 1.459
26054.60c 2.890
26056.60c 46.594
26057.60c 1.086
26058.60c 0.147
28058.60c 8.499
28060.60c 3.361
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.767
5010.50c  6.414E-03
5011.56c  2.930E-02
8016.50c  14.025
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.351
73181.50c 0.295
40000.60c 1.671
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
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26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 11, 1.40 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
```

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24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.572
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.117
24053.60c 1.516
24054.60c 0.384
25055.50c 1.459
26054.60c 2.890
26056.60c 46.594
26057.60c 1.086
26058.60c 0.147
28058.60c 8.499
28060.60c 3.361
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.767
5010.50c  6.414E-03
5011.56c  2.930E-02
8016.50c  14.025
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.351
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73181.50c 0.295
40000.60c 1.671
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
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2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2683 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.218
24053.60c 1.527
24054.60c 0.387
25055.50c 1.480
26054.60c 2.929
26056.60c 47.217
26057.60c 1.100
26058.60c 0.149
28058.60c 8.402
28060.60c 3.323
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28061.60c 0.146
28062.60c 0.472
28064.60c 0.124
1001.50c  1.705
5010.50c  6.187E-03
5011.56c  2.826E-02
8016.50c  13.531
13027.50c 0.055
22000.50c 0.099
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.596
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 11, 2.10 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
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14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
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14000.50c 0.572
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.117
24053.60c 1.516
24054.60c 0.384
25055.50c 1.459
26054.60c 2.890
26056.60c 46.594
26057.60c 1.086
26058.60c 0.147
28058.60c 8.499
28060.60c 3.361
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.767
5010.50c  6.414E-03
5011.56c  2.930E-02
8016.50c  14.025
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.351
73181.50c 0.295
40000.60c 1.671
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
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18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 11, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
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26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.728E-03
5011.56c  3.073E-02
8016.50c  14.723
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
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22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
```

```
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.728E-03
5011.56c  3.073E-02
8016.50c  14.723
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
```

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26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 10, APSR)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
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24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2533 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.658
24052.60c 13.198
24053.60c 1.525
24054.60c 0.387
25055.50c 1.476
26054.60c 2.922
26056.60c 47.112
26057.60c 1.098
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.718
5010.50c  6.236E-03
5011.56c  2.848E-02
8016.50c  13.637
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.284
42000.50c 0.339
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73181.50c 0.284
40000.60c 1.604
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 11, 0.50 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
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2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.572
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.117
24053.60c 1.516
24054.60c 0.384
25055.50c 1.459
26054.60c 2.890
26056.60c 46.594
26057.60c 1.086
26058.60c 0.147
28058.60c 8.499
28060.60c 3.361
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28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.767
5010.50c  6.414E-03
5011.56c  2.930E-02
8016.50c  14.025
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.351
73181.50c 0.295
40000.60c 1.671
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.086E-02
5011.56c  4.962E-02
8016.50c  23.955
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
4 : Number of different BPRA banks
03 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
```

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12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 0.500 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
04 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
```

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2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.400 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
```

```
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
05 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
```

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28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.100 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
```

```
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
1 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
```

```
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
02 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
104.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```

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1 : B&W core design
3 : Full core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
09 : Cycle identifier
158.8 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
535.0 2200.0 1572.0 : Mod. temp.(F), System press.(psi), ppmb
                        G25   H17   G02   H17   G25
              G14   H10   H19   I14   H04   I14   H19   H10   G14
        H23a  I27   H25   I19   H14   I06   H14   I19   H25   I27   H23a
  G14   I27   G27a  I23   H12   I12   H27a  I12   H12   I23   G27a  I27   G14
  H10   H25   I23   H06   I17   G23   I04   G23   I17   H06   I23   H25   H10
G25 H19   I19   H12   I17   H23   I10   H27   I10   H23   I17   H12   I19   H19   G25
H17 I14   H14   I12   G23   I10   G04a  G08   G06a  I10   G23   I12   H14   I14   H17
G02 H04   I06   H27a  I04   H27   G08   A18az G08   H27   I04   H27a  I06   H04   G02
H17 I14   H14   I12   G23   I10   G06a  G08   G04a  I10   G23   I12   H14   I14   H17
G25 H19   I19   H12   I17   H23   I10   H27   I10   H23   I17   H12   I19   H19   G25
  H10   H25   I23   H06   I17   G23   I04   G23   I17   H06   I23   H25   H10
  G14   I27   G27a  I23   H12   I12   H27a  I12   H12   I23   G27a  I27   G14
        H23a  I27   H25   I19   H14   I06   H14   I19   H25   I27   H23a
              G14   H10   H19   I14   H04   I14   H19   H10   G14
                        G25   H17   G02   H17   G25
14 : Number of different fuel assembly designs (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
              2  11 2  11 2
         2  11 3  10 7  10 3  11 2
      11 10 3  13 3  6  3  13 3  10 11
   2  10 14 9  12 4  5  4  12 9  14 10 2
   11 3  9  3  4  8  4  8  4  3  9  3  11
2  3  13 12 4  7  9  3  9  7  4  12 13 3  2
11 10 3  4  8  9  8  2  8  9  8  4  3  10 11
2  7  6  5  4  3  2  1  2  3  4  5  6  7  2
11 10 3  4  8  9  8  2  8  9  8  4  3  10 11
2  3  13 12 4  7  9  3  9  7  4  12 13 3  2
   11 3  9  3  4  8  4  8  4  3  9  3  11
   2  10 14 9  12 4  5  4  12 9  14 10 2
      11 10 3  13 3  6  3  13 3  10 11
         2  11 3  10 7  10 3  11 2
              2  11 2  11 2
8 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-5
02 CRA   118.000   CRA Bank 6
03 CRA   17.000    CRA Bank 7
04 APSRA 122.000   APSRA Bank 8
05 BPRA  22.352    0.500 wt% B4C
06 BPRA  22.352    1.400 wt% B4C
07 BPRA  22.352    2.000 wt% B4C
08 BPRA  22.352    2.100 wt% B4C
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                00 00 00 00 00
           00 00 01 00 02 00 01 00 00
        00 00 01 05 01 06 01 05 01 00 00
     00 00 03 08 04 07 03 07 04 08 03 00 00
     00 01 08 01 07 01 07 01 07 01 08 01 00
  00 01 05 04 07 02 08 01 08 02 07 04 05 01 00
  00 00 01 07 01 08 01 00 01 08 01 07 01 00 00
  00 02 06 03 07 01 00 00 00 01 07 03 06 02 00
  00 00 01 07 01 08 01 00 01 08 01 07 01 00 00
  00 01 05 04 07 02 08 01 08 02 07 04 05 01 00
     00 01 08 01 07 01 07 01 07 01 08 01 00
     00 00 03 08 04 07 03 07 04 08 03 00 00
        00 00 01 05 01 06 01 05 01 00 00
           00 00 01 00 02 00 01 00 00
                00 00 00 00 00
                          3.84 3.94 3.84 3.94 3.84
                3.84 3.94 3.94 3.90 3.94 3.90 3.94 3.94 3.84
           3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94
        3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.84 3.90 3.84
        3.94 3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.94
3.84 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.84
3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.84 3.84 3.90 3.84 3.90 3.94 3.90 3.94
3.84 3.94 3.90 3.94 3.90 3.94 3.84 1.93 3.84 3.94 3.90 3.94 3.90 3.94 3.84
3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.84 3.84 3.90 3.84 3.90 3.94 3.90 3.94
3.84 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.84
        3.94 3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.94
        3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.84 3.90 3.84
           3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94
                3.84 3.94 3.94 3.90 3.94 3.90 3.94 3.94 3.84
                          3.84 3.94 3.84 3.94 3.84
           B B B B B
        B B B B B B B B B
     B B B B B B B B B B B
  B B B B B B B B B B B B B
  B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
  B B B B B B B B B B B B B
  B B B B B B B B B B B B B
    B B B B B B B B B B B
      B B B B B B B B B
           B B B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7971 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.638
24052.60c 12.792
24053.60c 1.478
24054.60c 0.375
25055.50c 1.609
26054.60c 3.151
26056.60c 50.801
26057.60c 1.184
26058.60c 0.161
28058.60c 5.014
28060.60c 1.983
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.186
5010.50c  5.526E-03
5011.56c  2.524E-02
8016.50c  17.346
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12.70 2.4775 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.077
14000.50c 0.574
15031.50c 0.034
16032.50c 0.023
24050.60c 0.607
24052.60c 12.171
24053.60c 1.406
24054.60c 0.357
25055.50c 1.531
26054.60c 2.998
26056.60c 48.333
26057.60c 1.126
26058.60c 0.153
28058.60c 4.771
28060.60c 1.887
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.623
5010.50c  6.629E-03
5011.56c  3.028E-02
8016.50c  20.811
12.22 0.9792 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.182
15031.50c 0.011
16032.50c 0.007
24050.60c 0.192
24052.60c 3.849
24053.60c 0.445
24054.60c 0.113
25055.50c 0.484
26054.60c 0.948
26056.60c 15.287
26057.60c 0.356
26058.60c 0.048
28058.60c 1.509
28060.60c 0.597
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.469
5010.50c  2.141E-02
5011.56c  9.780E-02
8016.50c  67.207
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
```

```
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
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26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2638 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.328
15031.50c 0.020
16032.50c 0.013
24050.60c 0.346
24052.60c 6.949
24053.60c 0.803
24054.60c 0.204
25055.50c 0.874
26054.60c 1.712
26056.60c 27.595
26057.60c 0.643
26058.60c 0.087
28058.60c 2.724
28060.60c 1.077
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.292
5010.50c  1.590E-02
5011.56c  7.265E-02
8016.50c  49.927
3.18 2.0687 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.523
15031.50c 0.031
16032.50c 0.021
24050.60c 0.553
24052.60c 11.096
24053.60c 1.282
24054.60c 0.325
25055.50c 1.395
26054.60c 2.733
26056.60c 44.065
26057.60c 1.027
26058.60c 0.139
28058.60c 4.350
28060.60c 1.720
28061.60c 0.076
28062.60c 0.244
28064.60c 0.064
1001.50c  3.378
5010.50c  8.538E-03
5011.56c  3.900E-02
8016.50c  26.803
7.62 2.9006 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.634
24052.60c 12.722
24053.60c 1.470
24054.60c 0.373
25055.50c 1.600
26054.60c 3.134
26056.60c 50.522
26057.60c 1.177
26058.60c 0.160
28058.60c 4.987
28060.60c 1.972
28061.60c 0.087
28062.60c 0.280
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28064.60c 0.073
1001.50c  2.061
5010.50c  5.211E-03
5011.56c  2.380E-02
8016.50c  16.360
40000.60c 1.532
50000.35c 0.022
5.08 3.5795 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.655
24053.60c 1.578
24054.60c 0.400
25055.50c 1.717
26054.60c 3.364
26056.60c 54.225
26057.60c 1.264
26058.60c 0.171
28058.60c 5.352
28060.60c 2.117
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.335
5010.50c  3.375E-03
5011.56c  1.542E-02
8016.50c  10.597
40000.60c 2.159
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4315 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.052
14000.50c 0.387
15031.50c 0.023
16032.50c 0.015
24050.60c 0.409
24052.60c 8.197
24053.60c 0.947
24054.60c 0.240
25055.50c 1.031
26054.60c 2.019
26056.60c 32.553
26057.60c 0.759
26058.60c 0.103
28058.60c 3.213
28060.60c 1.271
28061.60c 0.056
28062.60c 0.181
28064.60c 0.047
1001.50c  5.414
5010.50c  1.369E-02
5011.56c  6.252E-02
8016.50c  42.965
3.18 2.1528 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.535
15031.50c 0.032
16032.50c 0.021
24050.60c 0.566
24052.60c 11.351
24053.60c 1.312
24054.60c 0.333
25055.50c 1.427
26054.60c 2.796
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26056.60c 45.076
26057.60c 1.050
26058.60c 0.143
28058.60c 4.449
28060.60c 1.760
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.199
5010.50c  8.086E-03
5011.56c  3.694E-02
8016.50c  25.383
7.62 3.2488 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.635
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.462
24053.60c 1.556
24054.60c 0.395
25055.50c 1.693
26054.60c 3.316
26056.60c 53.460
26057.60c 1.246
26058.60c 0.169
28058.60c 5.277
28060.60c 2.087
28061.60c 0.092
28062.60c 0.297
28064.60c 0.078
1001.50c  1.716
5010.50c  4.336E-03
5011.56c  1.981E-02
8016.50c  13.613
5.08 3.4393 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.691
24053.60c 1.582
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.372
26057.60c 1.267
26058.60c 0.172
28058.60c 5.367
28060.60c 2.122
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.554
5010.50c  3.928E-03
5011.56c  1.795E-02
8016.50c  12.332
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5471 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.420
15031.50c 0.025
16032.50c 0.017
24050.60c 0.444
24052.60c 8.900
24053.60c 1.029
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24054.60c 0.261
25055.50c 1.119
26054.60c 2.192
26056.60c 35.346
26057.60c 0.824
26058.60c 0.112
28058.60c 3.489
28060.60c 1.380
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.920
5010.50c  1.244E-02
5011.56c  5.682E-02
8016.50c  39.045
3.18 2.3433 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.075
14000.50c 0.559
15031.50c 0.034
16032.50c 0.022
24050.60c 0.591
24052.60c 11.859
24053.60c 1.370
24054.60c 0.348
25055.50c 1.491
26054.60c 2.921
26056.60c 47.097
26057.60c 1.098
26058.60c 0.149
28058.60c 4.649
28060.60c 1.838
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.841
5010.50c  7.182E-03
5011.56c  3.281E-02
8016.50c  22.547
7.62 2.7829 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.767
24053.60c 1.475
24054.60c 0.374
25055.50c 1.606
26054.60c 3.145
26056.60c 50.703
26057.60c 1.182
26058.60c 0.160
28058.60c 5.005
28060.60c 1.979
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.203
5010.50c  5.570E-03
5011.56c  2.544E-02
8016.50c  17.484
5.08 3.4393 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
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24052.60c 13.691
24053.60c 1.582
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.372
26057.60c 1.267
26058.60c 0.172
28058.60c 5.367
28060.60c 2.122
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.554
5010.50c  3.928E-03
5011.56c  1.795E-02
8016.50c  12.332
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1775 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.291
15031.50c 0.017
16032.50c 0.012
24050.60c 0.308
24052.60c 6.167
24053.60c 0.713
24054.60c 0.181
25055.50c 0.776
26054.60c 1.519
26056.60c 24.491
26057.60c 0.571
26058.60c 0.077
28058.60c 2.417
28060.60c 0.956
28061.60c 0.042
28062.60c 0.136
28064.60c 0.036
1001.50c  6.841
5010.50c  1.729E-02
5011.56c  7.899E-02
8016.50c  54.284
3.18 1.7504 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.467
15031.50c 0.028
16032.50c 0.019
24050.60c 0.494
24052.60c 9.912
24053.60c 1.145
24054.60c 0.291
25055.50c 1.247
26054.60c 2.442
26056.60c 39.363
26057.60c 0.917
26058.60c 0.124
28058.60c 3.885
28060.60c 1.537
28061.60c 0.068
28062.60c 0.218
28064.60c 0.057
1001.50c  4.210
5010.50c  1.064E-02
5011.56c  4.861E-02
8016.50c  33.405
7.62 2.5424 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.581
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15031.50c 0.035
16032.50c 0.023
24050.60c 0.614
24052.60c 12.309
24053.60c 1.422
24054.60c 0.361
25055.50c 1.548
26054.60c 3.032
26056.60c 48.884
26057.60c 1.139
26058.60c 0.155
28058.60c 4.825
28060.60c 1.908
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.525
5010.50c  6.383E-03
5011.56c  2.916E-02
8016.50c  20.037
5.08 3.2038 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.668
24052.60c 13.403
24053.60c 1.549
24054.60c 0.393
25055.50c 1.686
26054.60c 3.302
26056.60c 53.229
26057.60c 1.240
26058.60c 0.168
28058.60c 5.254
28060.60c 2.078
28061.60c 0.091
28062.60c 0.295
28064.60c 0.077
1001.50c  1.756
5010.50c  4.440E-03
5011.56c  2.028E-02
8016.50c  13.938
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
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7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
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28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.803E-03
5011.56c  2.194E-02
8016.50c  14.685
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.30c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
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12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
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6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.803E-03
5011.56c  2.194E-02
8016.50c  14.685
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
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0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
```

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25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.418E-03
5011.56c  2.018E-02
8016.50c  13.496
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
```

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8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 11, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
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28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.580E-03
5011.56c  2.092E-02
8016.50c  13.989
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
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24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
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16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.418E-03
5011.56c  2.018E-02
8016.50c  13.496
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
```

```
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 11, 1.40 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
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```
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
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28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.580E-03
5011.56c  2.092E-02
8016.50c  13.989
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
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12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
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6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.418E-03
5011.56c  2.018E-02
8016.50c  13.496
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
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0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
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25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.418E-03
5011.56c  2.018E-02
8016.50c  13.496
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
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8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 11, 2.10 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
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28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.580E-03
5011.56c  2.092E-02
8016.50c  13.989
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
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24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 11, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
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16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.803E-03
5011.56c  2.194E-02
8016.50c  14.685
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
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41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
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7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
```

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28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.803E-03
5011.56c  2.194E-02
8016.50c  14.685
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 12 (Batch 10, APSR)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
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12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2514 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
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6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.658
24052.60c 13.205
24053.60c 1.526
24054.60c 0.387
25055.50c 1.477
26054.60c 2.924
26056.60c 47.140
26057.60c 1.099
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.714
5010.50c  4.452E-03
5011.56c  2.034E-02
8016.50c  13.602
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.285
42000.50c 0.339
73181.50c 0.285
40000.60c 1.604
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
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0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 13 (Batch 11, 0.50 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
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25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.580E-03
5011.56c  2.092E-02
8016.50c  13.989
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
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8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 14 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
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28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.700
5010.50c  4.418E-03
5011.56c  2.018E-02
8016.50c  13.496
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
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24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.733E-03
5011.56c  3.533E-02
8016.50c  23.903
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
4 : Number of different BPRA banks
05 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
```

```
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 0.500 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
```

```
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.400 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
07 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
```

```
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
08 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
```

```
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.100 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
```

```
50000.35c 1.400
3 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
02 : CRA bank identifier
0.49784 0.50546 0.55880 118.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
```

```
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
03 : CRA bank identifier
0.49784 0.50546 0.55880 17.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
```

```
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
04 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
122.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```

```
1 : B&W core design
3 : Full core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
09 : Cycle identifier
219.0 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
535.0 2200.0 1481.0 : Mod. temp.(F), System press.(psi), ppmb
                                G25  H17  G02  H17  G25
                     G14  H10   H19  I14  H04  I14  H19  H10  G14
            H23a  I27  H25   I19  H14  I06  H14  I19  H25  I27  H23a
      G14   I27  G27a I23   H12  I12  H27a I12  H12  I23  G27a I27  G14
      H10   H25  I23  H06   I17  G23  I04  G23  I17  H06  I23  H25  H10
G25   H19   I19  H12  I17   H23  I10  H27  I10  H23  I17  H12  I19  H19  G25
H17   I14   H14  I12  G23   I10  G04a G08  G06a I10  G23  I12  H14  I14  H17
G02   H04   I06  H27a I04   H27  G08  A18az G08  H27  I04  H27a I06  H04  G02
H17   I14   H14  I12  G23   I10  G06a G08  G04a I10  G23  I12  H14  I14  H17
G25   H19   I19  H12  I17   H23  I10  H27  I10  H23  I17  H12  I19  H19  G25
      H10   H25  I23  H06   I17  G23  I04  G23  I17  H06  I23  H25  H10
      G14   I27  G27a I23   H12  I12  H27a I12  H12  I23  G27a I27  G14
            H23a I27  H25   I19  H14  I06  H14  I19  H25  I27  H23a
                 G14  H10   H19  I14  H04  I14  H19  H10  G14
                           G25  H17  G02  H17  G25
14 : Number of different fuel assembly designs (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
                2  11 2  11 2
          2  11 3  10 7  10 3  11 2
       11 10 3  13 3  6  3  13 3  10 11
    2  10 14 9  12 4  5  4  12 9  14 10 2
    11 3  9  3  4  8  4  8  4  3  9  3  11
2  3  13 12 4  7  9  3  9  7  4  12 13 3  2
11 10 3  4  8  9  8  2  8  9  8  4  3  10 11
2  7  6  5  4  3  2  1  2  3  4  5  6  7  2
11 10 3  4  8  9  8  2  8  9  8  4  3  10 11
2  3  13 12 4  7  9  3  9  7  4  12 13 3  2
    11 3  9  3  4  8  4  8  4  3  9  3  11
    2  10 14 9  12 4  5  4  12 9  14 10 2
       11 10 3  13 3  6  3  13 3  10 11
          2  11 3  10 7  10 3  11 2
                2  11 2  11 2
8 : Number of insertion rod assembly banks
01 CRA    366.204   CRA Banks 1-5
02 CRA    181.000   CRA Bank 6
03 CRA    17.000    CRA Bank 7
04 APSRA  123.000   APSRA Bank 8
05 BPRA   22.352    0.500 wt% B4C
06 BPRA   22.352    1.400 wt% B4C
07 BPRA   22.352    2.000 wt% B4C
08 BPRA   22.352    2.100 wt% B4C
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            00 00 01 00 02 00 01 00 00
         00 00 01 05 01 06 01 05 01 00 00
      00 00 03 08 04 07 03 07 04 08 03 00 00
      00 01 08 01 07 01 07 01 07 01 08 01 00
   00 01 05 04 07 02 08 01 08 02 07 04 05 01 00
   00 00 01 07 01 08 01 00 01 08 01 07 01 00 00
   00 02 06 03 07 01 00 00 00 01 07 03 06 02 00
   00 00 01 07 01 08 01 00 01 08 01 07 01 00 00
   00 01 05 04 07 02 08 01 08 02 07 04 05 01 00
      00 01 08 01 07 01 07 01 07 01 08 01 00
      00 00 03 08 04 07 03 07 04 08 03 00 00
         00 00 01 05 01 06 01 05 01 00 00
            00 00 01 00 02 00 01 00 00
                00 00 00 00 00
                         3.84 3.94 3.84 3.94 3.84
                3.84 3.94 3.94 3.90 3.94 3.90 3.94 3.94 3.84
            3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94
        3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.84 3.90 3.84
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   3.84 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.84
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   3.84 3.94 3.90 3.94 3.90 3.94 3.84 1.93 3.84 3.94 3.90 3.94 3.90 3.94 3.84
   3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.84 3.84 3.90 3.84 3.90 3.94 3.90 3.94
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                3.84 3.94 3.94 3.90 3.94 3.90 3.94 3.94 3.84
                         3.84 3.94 3.84 3.94 3.84
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            B B B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7971 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.638
24052.60c 12.792
24053.60c 1.478
24054.60c 0.375
25055.50c 1.609
26054.60c 3.151
26056.60c 50.801
26057.60c 1.184
26058.60c 0.161
28058.60c 5.014
28060.60c 1.983
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.186
5010.50c  5.206E-03
5011.56c  2.378E-02
8016.50c  17.348
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12.70 2.4775 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.077
14000.50c 0.574
15031.50c 0.034
16032.50c 0.023
24050.60c 0.607
24052.60c 12.171
24053.60c 1.406
24054.60c 0.357
25055.50c 1.531
26054.60c 2.998
26056.60c 48.333
26057.60c 1.126
26058.60c 0.153
28058.60c 4.771
28060.60c 1.887
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.623
5010.50c  6.246E-03
5011.56c  2.853E-02
8016.50c  20.813
12.22 0.9792 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.182
15031.50c 0.011
16032.50c 0.007
24050.60c 0.192
24052.60c 3.849
24053.60c 0.445
24054.60c 0.113
25055.50c 0.484
26054.60c 0.948
26056.60c 15.287
26057.60c 0.356
26058.60c 0.048
28058.60c 1.509
28060.60c 0.597
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.470
5010.50c  2.017E-02
5011.56c  9.214E-02
8016.50c  67.213
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
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5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
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26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2638 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.328
15031.50c 0.020
16032.50c 0.013
24050.60c 0.346
24052.60c 6.949
24053.60c 0.803
24054.60c 0.204
25055.50c 0.874
26054.60c 1.712
26056.60c 27.595
26057.60c 0.643
26058.60c 0.087
28058.60c 2.724
28060.60c 1.077
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.292
5010.50c  1.498E-02
5011.56c  6.845E-02
8016.50c  49.931
3.18 2.0687 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.523
15031.50c 0.031
16032.50c 0.021
24050.60c 0.553
24052.60c 11.096
24053.60c 1.282
24054.60c 0.325
25055.50c 1.395
26054.60c 2.733
26056.60c 44.065
26057.60c 1.027
26058.60c 0.139
28058.60c 4.350
28060.60c 1.720
28061.60c 0.076
28062.60c 0.244
28064.60c 0.064
1001.50c  3.378
5010.50c  8.044E-03
5011.56c  3.675E-02
8016.50c  26.806
7.62 2.9006 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.634
24052.60c 12.722
24053.60c 1.470
24054.60c 0.373
25055.50c 1.600
26054.60c 3.134
26056.60c 50.522
26057.60c 1.177
26058.60c 0.160
28058.60c 4.987
28060.60c 1.972
28061.60c 0.087
28062.60c 0.280
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28064.60c 0.073
1001.50c  2.062
5010.50c  4.909E-03
5011.56c  2.243E-02
8016.50c  16.361
40000.60c 1.532
50000.35c 0.022
5.08 3.5795 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.655
24053.60c 1.578
24054.60c 0.400
25055.50c 1.717
26054.60c 3.364
26056.60c 54.225
26057.60c 1.264
26058.60c 0.171
28058.60c 5.352
28060.60c 2.117
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.335
5010.50c  3.180E-03
5011.56c  1.452E-02
8016.50c  10.598
40000.60c 2.159
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4315 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.052
14000.50c 0.387
15031.50c 0.023
16032.50c 0.015
24050.60c 0.409
24052.60c 8.197
24053.60c 0.947
24054.60c 0.240
25055.50c 1.031
26054.60c 2.019
26056.60c 32.553
26057.60c 0.759
26058.60c 0.103
28058.60c 3.213
28060.60c 1.271
28061.60c 0.056
28062.60c 0.181
28064.60c 0.047
1001.50c  5.415
5010.50c  1.289E-02
5011.56c  5.890E-02
8016.50c  42.969
3.18 2.1528 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.535
15031.50c 0.032
16032.50c 0.021
24050.60c 0.566
24052.60c 11.351
24053.60c 1.312
24054.60c 0.333
25055.50c 1.427
26054.60c 2.796
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26056.60c 45.076
26057.60c 1.050
26058.60c 0.143
28058.60c 4.449
28060.60c 1.760
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.199
5010.50c  7.618E-03
5011.56c  3.480E-02
8016.50c  25.386
7.62 3.2488 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.635
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.462
24053.60c 1.556
24054.60c 0.395
25055.50c 1.693
26054.60c 3.316
26056.60c 53.460
26057.60c 1.246
26058.60c 0.169
28058.60c 5.277
28060.60c 2.087
28061.60c 0.092
28062.60c 0.297
28064.60c 0.078
1001.50c  1.716
5010.50c  4.085E-03
5011.56c  1.866E-02
8016.50c  13.614
5.08 3.4393 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.691
24053.60c 1.582
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.372
26057.60c 1.267
26058.60c 0.172
28058.60c 5.367
28060.60c 2.122
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.554
5010.50c  3.701E-03
5011.56c  1.691E-02
8016.50c  12.334
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5471 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.420
15031.50c 0.025
16032.50c 0.017
24050.60c 0.444
24052.60c 8.900
24053.60c 1.029
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24054.60c 0.261
25055.50c 1.119
26054.60c 2.192
26056.60c 35.346
26057.60c 0.824
26058.60c 0.112
28058.60c 3.489
28060.60c 1.380
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.921
5010.50c  1.172E-02
5011.56c  5.353E-02
8016.50c  39.048
3.18 2.3433 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.075
14000.50c 0.559
15031.50c 0.034
16032.50c 0.022
24050.60c 0.591
24052.60c 11.859
24053.60c 1.370
24054.60c 0.348
25055.50c 1.491
26054.60c 2.921
26056.60c 47.097
26057.60c 1.098
26058.60c 0.149
28058.60c 4.649
28060.60c 1.838
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.842
5010.50c  6.767E-03
5011.56c  3.091E-02
8016.50c  22.549
7.62 2.7829 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.767
24053.60c 1.475
24054.60c 0.374
25055.50c 1.606
26054.60c 3.145
26056.60c 50.703
26057.60c 1.182
26058.60c 0.160
28058.60c 5.005
28060.60c 1.979
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.204
5010.50c  5.247E-03
5011.56c  2.397E-02
8016.50c  17.486
5.08 3.4393 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
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24052.60c 13.691
24053.60c 1.582
24054.60c 0.401
25055.50c 1.722
26054.60c 3.373
26056.60c 54.372
26057.60c 1.267
26058.60c 0.172
28058.60c 5.367
28060.60c 2.122
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.554
5010.50c  3.701E-03
5011.56c  1.691E-02
8016.50c  12.334
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1775 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.291
15031.50c 0.017
16032.50c 0.012
24050.60c 0.308
24052.60c 6.167
24053.60c 0.713
24054.60c 0.181
25055.50c 0.776
26054.60c 1.519
26056.60c 24.491
26057.60c 0.571
26058.60c 0.077
28058.60c 2.417
28060.60c 0.956
28061.60c 0.042
28062.60c 0.136
28064.60c 0.036
1001.50c  6.841
5010.50c  1.629E-02
5011.56c  7.442E-02
8016.50c  54.289
3.18 1.7504 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.467
15031.50c 0.028
16032.50c 0.019
24050.60c 0.494
24052.60c 9.912
24053.60c 1.145
24054.60c 0.291
25055.50c 1.247
26054.60c 2.442
26056.60c 39.363
26057.60c 0.917
26058.60c 0.124
28058.60c 3.885
28060.60c 1.537
28061.60c 0.068
28062.60c 0.218
28064.60c 0.057
1001.50c  4.210
5010.50c  1.003E-02
5011.56c  4.579E-02
8016.50c  33.408
7.62 2.5424 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.581
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15031.50c 0.035
16032.50c 0.023
24050.60c 0.614
24052.60c 12.309
24053.60c 1.422
24054.60c 0.361
25055.50c 1.548
26054.60c 3.032
26056.60c 48.884
26057.60c 1.139
26058.60c 0.155
28058.60c 4.825
28060.60c 1.908
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.525
5010.50c  6.013E-03
5011.56c  2.747E-02
8016.50c  20.039
5.08 3.2038 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.668
24052.60c 13.403
24053.60c 1.549
24054.60c 0.393
25055.50c 1.686
26054.60c 3.302
26056.60c 53.229
26057.60c 1.240
26058.60c 0.168
28058.60c 5.254
28060.60c 2.078
28061.60c 0.091
28062.60c 0.295
28064.60c 0.077
1001.50c  1.757
5010.50c  4.183E-03
5011.56c  1.911E-02
8016.50c  13.939
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
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7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
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28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.532E-03
5011.56c  2.070E-02
8016.50c  14.686
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
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12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
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6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.532E-03
5011.56c  2.070E-02
8016.50c  14.686
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
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0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
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25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.701
5010.50c  4.169E-03
5011.56c  1.904E-02
8016.50c  13.497
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
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8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 11, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
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28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.322E-03
5011.56c  1.974E-02
8016.50c  13.990
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
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24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
```

```
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.701
5010.50c  4.169E-03
5011.56c  1.904E-02
8016.50c  13.497
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
```

```
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 11, 1.40 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
```

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7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
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28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.322E-03
5011.56c  1.974E-02
8016.50c  13.990
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
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12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
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```
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.701
5010.50c  4.169E-03
5011.56c  1.904E-02
8016.50c  13.497
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
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0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
```

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25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.701
5010.50c  4.169E-03
5011.56c  1.904E-02
8016.50c  13.497
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
```

```
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 11, 2.10 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
```

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28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.322E-03
5011.56c  1.974E-02
8016.50c  13.990
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
```

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24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 11, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
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```
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.532E-03
5011.56c  2.070E-02
8016.50c  14.686
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
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41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
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7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1059 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.999
24053.60c 1.502
24054.60c 0.381
25055.50c 1.443
26054.60c 2.858
26056.60c 46.072
26057.60c 1.074
26058.60c 0.146
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28058.60c 8.485
28060.60c 3.355
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.850
5010.50c  4.532E-03
5011.56c  2.070E-02
8016.50c  14.686
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.680
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 12 (Batch 10, APSR)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
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12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2514 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
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```
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.658
24052.60c 13.205
24053.60c 1.526
24054.60c 0.387
25055.50c 1.477
26054.60c 2.924
26056.60c 47.140
26057.60c 1.099
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.714
5010.50c  4.201E-03
5011.56c  1.919E-02
8016.50c  13.603
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.285
42000.50c 0.339
73181.50c 0.285
40000.60c 1.604
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
```

```
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 13 (Batch 11, 0.50 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
```

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25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1979 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.125
24053.60c 1.517
24054.60c 0.385
25055.50c 1.460
26054.60c 2.892
26056.60c 46.623
26057.60c 1.087
26058.60c 0.147
28058.60c 8.504
28060.60c 3.363
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.763
5010.50c  4.322E-03
5011.56c  1.974E-02
8016.50c  13.990
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.352
73181.50c 0.295
40000.60c 1.672
50000.35c 0.024
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
```

```
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 14 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
```

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28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2664 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.226
24053.60c 1.528
24054.60c 0.388
25055.50c 1.481
26054.60c 2.931
26056.60c 47.244
26057.60c 1.101
26058.60c 0.149
28058.60c 8.407
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.701
5010.50c  4.169E-03
5011.56c  1.904E-02
8016.50c  13.497
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.597
50000.35c 0.023
2.2463 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.476
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.039
24053.60c 1.276
```

```
24054.60c 0.324
25055.50c 1.204
26054.60c 2.389
26056.60c 38.512
26057.60c 0.897
26058.60c 0.122
28058.60c 7.578
28060.60c 2.997
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.012
5010.50c  7.292E-03
5011.56c  3.331E-02
8016.50c  23.905
13027.50c 0.056
22000.50c 0.100
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.584
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
4 : Number of different BPRA banks
05 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
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49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 0.500 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
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09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.400 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
07 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
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39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
08 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
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8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.100 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
```

```
50000.35c 1.400
3 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
02 : CRA bank identifier
0.49784 0.50546 0.55880 181.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
```

```
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
03 : CRA bank identifier
0.49784 0.50546 0.55880 17.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
```

```
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
04 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
123.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```

```
1 : BEW core design
3 : Full core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
09 : Cycle identifier
363.1 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
539.0 2200.0 963.0 : Mod. temp.(F), System press.(psi), ppmb
                          G25  K17  G02  K17  G25
                G14  K10  K19  I14  K04  I14  K19  K10  G14
           N23a I27  K25  I19  K14  I06  K14  I19  K25  I27  N23a
      G14  I27  G27a I23  K12  I12  N27a I12  K12  I23  G27a I27  G14
      K10  K25  I23  K06  I17  G23  I04  G23  I17  K06  I23  K25  K10
G25   K19  I19  K12  I17  K23  I10  K27  I10  K23  I17  K12  I19  K19  G25
K17   I14  K14  I12  G23  I10  G04a G08  G06a I10  G23  I12  K14  I14  K17
G02   K04  I06  N27a I04  K27  G08  A18az G08  K27  I04  N27a I06  K04  G02
K17   I14  K14  I12  G23  I10  G06a G08  G04a I10  G23  I12  K14  I14  K17
G25   K19  I19  K12  I17  K23  I10  K27  I10  K23  I17  K12  I19  K19  G25
      K10  K25  I23  K06  I17  G23  I04  G23  I17  K06  I23  K25  K10
      G14  I27  G27a I23  K12  I12  N27a I12  K12  I23  G27a I27  G14
           N23a I27  K25  I19  K14  I06  K14  I19  K25  I27  N23a
                G14  K10  K19  I14  K04  I14  K19  K10  G14
                          G25  K17  G02  K17  G25
15 : Number of different fuel assembly designs (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
                2  12 2  12 2
          2  12 3  11 7  11 3  12 2
       12 11 3  14 10 6  10 14 3  11 12
    2  11 15 9  13 4  5  4  13 9  15 11 2
   12 3  9  10 4  8  4  8  4  10 9  3  12
2  3  14 13 4  7  9  3  9  7  4  13 14 3  2
12 11 10 4  8  9  8  2  8  9  8  4  10 11 12
2  7  6  5  4  3  2  1  2  3  4  5  6  7  2
12 11 10 4  8  9  8  2  8  9  8  4  10 11 12
2  3  14 13 4  7  9  3  9  7  4  13 14 3  2
   12 3  9  10 4  8  4  8  4  10 9  3  12
   2  11 15 9  13 4  5  4  13 9  15 11 2
       12 11 3  14 10 6  10 14 3  11 12
          2  12 3  11 7  11 3  12 2
                2  12 2  12 2
9 : Number of insertion rod assembly banks
01 CRA    366.204   CRA Banks 1-5
02 CRA    342.000   CRA Bank 6
03 CRA    80.000    CRA Bank 7
04 CRA    17.000    CRA Bank 7
05 APSRA  122.000   APSRA Bank 8
06 BPRA   22.352    0.500 wt% B4C
07 BPRA   22.352    1.400 wt% B4C
08 BPRA   22.352    2.000 wt% B4C
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```
09 BPRA  22.352    2.100 wt% B4C
                00 00 00 00 00
             00 00 01 00 03 00 01 00 00
          00 00 01 06 02 07 02 06 01 00 00
       00 00 04 09 05 08 04 08 05 09 04 00 00
       00 01 09 02 08 01 08 01 08 02 09 01 00
    00 01 06 05 08 03 09 01 09 03 08 05 06 01 00
    00 00 02 08 01 09 01 00 01 09 01 08 02 00 00
    00 03 07 04 08 01 00 00 00 01 08 04 07 03 00
    00 00 02 08 01 09 01 00 01 09 01 08 02 00 00
    00 01 06 05 08 03 09 01 09 03 08 05 06 01 00
       00 01 09 02 08 01 08 01 08 02 09 01 00
       00 00 04 09 05 08 04 08 05 09 04 00 00
          00 00 01 06 02 07 02 06 01 00 00
             00 00 01 00 03 00 01 00 00
                00 00 00 00 00
                         3.84 3.94 3.84 3.94 3.84
                3.84 3.94 3.94 3.90 3.94 3.90 3.94 3.94 3.84
             3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94
        3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.84 3.90 3.84
        3.94 3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.94
    3.84 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.84
    3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.84 3.84 3.90 3.84 3.90 3.94 3.90 3.94
    3.84 3.94 3.90 3.94 3.90 3.94 3.84 1.93 3.84 3.94 3.90 3.94 3.90 3.94 3.84
    3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.84 3.84 3.90 3.84 3.90 3.94 3.90 3.94
    3.84 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.84
        3.94 3.94 3.90 3.94 3.90 3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.94
        3.84 3.90 3.84 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.84 3.90 3.84
             3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94 3.90 3.94
                3.84 3.94 3.94 3.90 3.94 3.90 3.94 3.94 3.84
                         3.84 3.94 3.84 3.94 3.84
             B B B B B
        B B B B B B B B B
     B B B B B B B B B B B
   B B B B B B B B B B B B B
   B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
B B B B B B B B B B B B B B B
   B B B B B B B B B B B B
   B B B B B B B B B B B B
     B B B B B B B B B B B
       B B B B B B B B B
             B B B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7942 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.081
14000.50c 0.604
15031.50c 0.036
16032.50c 0.024
24050.60c 0.639
24052.60c 12.805
24053.60c 1.480
24054.60c 0.375
25055.50c 1.610
26054.60c 3.154
26056.60c 50.854
26057.60c 1.185
26058.60c 0.161
28058.60c 5.020
28060.60c 1.985
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.178
5010.50c  3.371E-03
5011.56c  1.540E-02
```

```
8016.50c  17.283
12.70 2.4744 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.077
14000.50c 0.575
15031.50c 0.034
16032.50c 0.023
24050.60c 0.608
24052.60c 12.186
24053.60c 1.408
24054.60c 0.357
25055.50c 1.533
26054.60c 3.002
26056.60c 48.393
26057.60c 1.128
26058.60c 0.153
28058.60c 4.777
28060.60c 1.889
28061.60c 0.083
28062.60c 0.269
28064.60c 0.070
1001.50c  2.613
5010.50c  4.045E-03
5011.56c  1.848E-02
8016.50c  20.739
12.22 0.9752 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.182
15031.50c 0.011
16032.50c 0.007
24050.60c 0.193
24052.60c 3.865
24053.60c 0.447
24054.60c 0.113
25055.50c 0.486
26054.60c 0.952
26056.60c 15.349
26057.60c 0.358
26058.60c 0.049
28058.60c 1.515
28060.60c 0.599
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.464
5010.50c  1.310E-02
5011.56c  5.983E-02
8016.50c  67.161
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
```

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179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
```

```
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2600 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.329
15031.50c 0.020
16032.50c 0.013
24050.60c 0.348
24052.60c 6.969
24053.60c 0.805
24054.60c 0.204
25055.50c 0.876
26054.60c 1.717
26056.60c 27.678
26057.60c 0.645
26058.60c 0.088
28058.60c 2.732
28060.60c 1.080
28061.60c 0.048
28062.60c 0.154
28064.60c 0.040
1001.50c  6.281
5010.50c  9.720E-03
5011.56c  4.440E-02
8016.50c  49.841
3.18 2.0653 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.524
15031.50c 0.031
16032.50c 0.021
24050.60c 0.554
24052.60c 11.114
24053.60c 1.284
24054.60c 0.326
25055.50c 1.398
26054.60c 2.738
26056.60c 44.136
26057.60c 1.029
26058.60c 0.140
28058.60c 4.357
28060.60c 1.723
28061.60c 0.076
28062.60c 0.245
28064.60c 0.064
1001.50c  3.367
5010.50c  5.211E-03
5011.56c  2.380E-02
8016.50c  26.720
7.62 2.8978 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.601
15031.50c 0.036
16032.50c 0.024
24050.60c 0.635
24052.60c 12.735
24053.60c 1.472
24054.60c 0.373
25055.50c 1.601
26054.60c 3.137
26056.60c 50.572
26057.60c 1.179
26058.60c 0.160
28058.60c 4.992
28060.60c 1.974
28061.60c 0.087
```

```
28062.60c 0.281
28064.60c 0.073
1001.50c  2.054
5010.50c  3.178E-03
5011.56c  1.452E-02
8016.50c  16.299
40000.60c 1.534
50000.35c 0.022
5.08 3.5772 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.664
24053.60c 1.579
24054.60c 0.401
25055.50c 1.718
26054.60c 3.366
26056.60c 54.259
26057.60c 1.264
26058.60c 0.172
28058.60c 5.355
28060.60c 2.118
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.330
5010.50c  2.058E-03
5011.56c  9.400E-03
8016.50c  10.554
40000.60c 2.161
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4278 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.052
14000.50c 0.388
15031.50c 0.023
16032.50c 0.016
24050.60c 0.410
24052.60c 8.218
24053.60c 0.950
24054.60c 0.241
25055.50c 1.034
26054.60c 2.024
26056.60c 32.637
26057.60c 0.761
26058.60c 0.103
28058.60c 3.222
28060.60c 1.274
28061.60c 0.056
28062.60c 0.181
28064.60c 0.047
1001.50c  5.403
5010.50c  8.361E-03
5011.56c  3.819E-02
8016.50c  42.873
3.18 2.1496 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.536
15031.50c 0.032
16032.50c 0.021
24050.60c 0.567
24052.60c 11.368
24053.60c 1.314
24054.60c 0.333
25055.50c 1.430
```

```
26054.60c 2.800
26056.60c 45.145
26057.60c 1.052
26058.60c 0.143
28058.60c 4.456
28060.60c 1.762
28061.60c 0.078
28062.60c 0.250
28064.60c 0.066
1001.50c  3.189
5010.50c  4.934E-03
5011.56c  2.254E-02
8016.50c  25.302
7.62 3.2461 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.635
15031.50c 0.038
16032.50c 0.025
24050.60c 0.672
24052.60c 13.473
24053.60c 1.557
24054.60c 0.395
25055.50c 1.694
26054.60c 3.319
26056.60c 53.504
26057.60c 1.247
26058.60c 0.169
28058.60c 5.281
28060.60c 2.089
28061.60c 0.092
28062.60c 0.297
28064.60c 0.078
1001.50c  1.709
5010.50c  2.645E-03
5011.56c  1.208E-02
8016.50c  13.560
5.08 3.4367 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
24050.60c 0.683
24052.60c 13.701
24053.60c 1.583
24054.60c 0.402
25055.50c 1.723
26054.60c 3.375
26056.60c 54.412
26057.60c 1.268
26058.60c 0.172
28058.60c 5.371
28060.60c 2.124
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.548
5010.50c  2.396E-03
5011.56c  1.094E-02
8016.50c  12.283
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5435 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.421
15031.50c 0.025
16032.50c 0.017
24050.60c 0.445
24052.60c 8.921
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24053.60c 1.031
24054.60c 0.261
25055.50c 1.122
26054.60c 2.198
26056.60c 35.429
26057.60c 0.826
26058.60c 0.112
28058.60c 3.497
28060.60c 1.383
28061.60c 0.061
28062.60c 0.197
28064.60c 0.051
1001.50c  4.909
5010.50c  7.597E-03
5011.56c  3.470E-02
8016.50c  38.952
3.18 2.3402 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.075
14000.50c 0.560
15031.50c 0.034
16032.50c 0.022
24050.60c 0.592
24052.60c 11.875
24053.60c 1.372
24054.60c 0.348
25055.50c 1.493
26054.60c 2.925
26056.60c 47.160
26057.60c 1.099
26058.60c 0.149
28058.60c 4.655
28060.60c 1.841
28061.60c 0.081
28062.60c 0.262
28064.60c 0.068
1001.50c  2.832
5010.50c  4.382E-03
5011.56c  2.002E-02
8016.50c  22.471
7.62 2.7799 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.781
24053.60c 1.477
24054.60c 0.375
25055.50c 1.607
26054.60c 3.148
26056.60c 50.756
26057.60c 1.183
26058.60c 0.160
28058.60c 5.010
28060.60c 1.981
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.195
5010.50c  3.397E-03
5011.56c  1.552E-02
8016.50c  17.420
5.08 3.4367 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.646
15031.50c 0.039
16032.50c 0.026
```

```
24050.60c 0.683
24052.60c 13.701
24053.60c 1.583
24054.60c 0.402
25055.50c 1.723
26054.60c 3.375
26056.60c 54.412
26057.60c 1.268
26058.60c 0.172
28058.60c 5.371
28060.60c 2.124
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.548
5010.50c  2.396E-03
5011.56c  1.094E-02
8016.50c  12.283
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1737 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.292
15031.50c 0.018
16032.50c 0.012
24050.60c 0.309
24052.60c 6.187
24053.60c 0.715
24054.60c 0.181
25055.50c 0.778
26054.60c 1.524
26056.60c 24.571
26057.60c 0.573
26058.60c 0.078
28058.60c 2.425
28060.60c 0.959
28061.60c 0.042
28062.60c 0.136
28064.60c 0.036
1001.50c  6.831
5010.50c  1.057E-02
5011.56c  4.829E-02
8016.50c  54.205
3.18 1.7469 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.468
15031.50c 0.028
16032.50c 0.019
24050.60c 0.495
24052.60c 9.932
24053.60c 1.148
24054.60c 0.291
25055.50c 1.249
26054.60c 2.447
26056.60c 39.442
26057.60c 0.919
26058.60c 0.125
28058.60c 3.893
28060.60c 1.540
28061.60c 0.068
28062.60c 0.219
28064.60c 0.057
1001.50c  4.198
5010.50c  6.497E-03
5011.56c  2.968E-02
8016.50c  33.314
7.62 2.5394 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
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14000.50c 0.581
15031.50c 0.035
16032.50c 0.023
24050.60c 0.615
24052.60c 12.324
24053.60c 1.424
24054.60c 0.361
25055.50c 1.550
26054.60c 3.036
26056.60c 48.943
26057.60c 1.141
26058.60c 0.155
28058.60c 4.831
28060.60c 1.911
28061.60c 0.084
28062.60c 0.272
28064.60c 0.071
1001.50c  2.516
5010.50c  3.894E-03
5011.56c  1.779E-02
8016.50c  19.966
5.08 3.2011 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.633
15031.50c 0.038
16032.50c 0.025
24050.60c 0.669
24052.60c 13.415
24053.60c 1.550
24054.60c 0.393
25055.50c 1.687
26054.60c 3.305
26056.60c 53.273
26057.60c 1.242
26058.60c 0.168
28058.60c 5.259
28060.60c 2.080
28061.60c 0.092
28062.60c 0.296
28064.60c 0.077
1001.50c  1.750
5010.50c  2.708E-03
5011.56c  1.237E-02
8016.50c  13.883
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
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8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 321.732 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 268.153 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 214.577 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 160.998 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 107.420 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 53.762 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1031 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.649
24052.60c 13.011
24053.60c 1.504
24054.60c 0.381
25055.50c 1.444
26054.60c 2.860
26056.60c 46.113
26057.60c 1.075
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26058.60c 0.146
28058.60c 8.492
28060.60c 3.358
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.843
5010.50c  2.978E-03
5011.56c  1.360E-02
8016.50c  14.629
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.681
50000.35c 0.024
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
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11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
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3.1031 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.649
24052.60c 13.011
24053.60c 1.504
24054.60c 0.381
25055.50c 1.444
26054.60c 2.860
26056.60c 46.113
26057.60c 1.075
26058.60c 0.146
28058.60c 8.492
28060.60c 3.358
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.843
5010.50c  2.978E-03
5011.56c  1.360E-02
8016.50c  14.629
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.681
50000.35c 0.024
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
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1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
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24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2637 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.236
24053.60c 1.530
24054.60c 0.388
25055.50c 1.482
26054.60c 2.933
26056.60c 47.283
26057.60c 1.102
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.694
5010.50c  2.741E-03
5011.56c  1.252E-02
8016.50c  13.443
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.284
42000.50c 0.338
73181.50c 0.284
40000.60c 1.598
50000.35c 0.023
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
```

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5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 11, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
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28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1952 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.136
24053.60c 1.518
24054.60c 0.385
25055.50c 1.462
26054.60c 2.894
26056.60c 46.662
26057.60c 1.087
26058.60c 0.148
28058.60c 8.511
28060.60c 3.366
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.756
5010.50c  2.841E-03
5011.56c  1.298E-02
8016.50c  13.934
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.296
42000.50c 0.352
73181.50c 0.296
40000.60c 1.673
50000.35c 0.024
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
```

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24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 5 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
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15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2637 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.236
24053.60c 1.530
24054.60c 0.388
25055.50c 1.482
26054.60c 2.933
26056.60c 47.283
26057.60c 1.102
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.694
5010.50c  2.741E-03
5011.56c  1.252E-02
8016.50c  13.443
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
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29065.60c 0.010
41093.50c 0.284
42000.50c 0.338
73181.50c 0.284
40000.60c 1.598
50000.35c 0.023
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 11, 1.40 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
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8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1952 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.136
24053.60c 1.518
24054.60c 0.385
25055.50c 1.462
26054.60c 2.894
26056.60c 46.662
26057.60c 1.087
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26058.60c 0.148
28058.60c 8.511
28060.60c 3.366
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.756
5010.50c  2.841E-03
5011.56c  1.298E-02
8016.50c  13.934
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.296
42000.50c 0.352
73181.50c 0.296
40000.60c 1.673
50000.35c 0.024
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
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11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
```

```
3.2637 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.236
24053.60c 1.530
24054.60c 0.388
25055.50c 1.482
26054.60c 2.933
26056.60c 47.283
26057.60c 1.102
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.694
5010.50c  2.741E-03
5011.56c  1.252E-02
8016.50c  13.443
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.284
42000.50c 0.338
73181.50c 0.284
40000.60c 1.598
50000.35c 0.023
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
```

```
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
```

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24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2637 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.236
24053.60c 1.530
24054.60c 0.388
25055.50c 1.482
26054.60c 2.933
26056.60c 47.283
26057.60c 1.102
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.694
5010.50c  2.741E-03
5011.56c  1.252E-02
8016.50c  13.443
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.284
42000.50c 0.338
73181.50c 0.284
40000.60c 1.598
50000.35c 0.023
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
```

```
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 11, 2.10 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 185.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
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28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1952 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.136
24053.60c 1.518
24054.60c 0.385
25055.50c 1.462
26054.60c 2.894
26056.60c 46.662
26057.60c 1.087
26058.60c 0.148
28058.60c 8.511
28060.60c 3.366
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.756
5010.50c  2.841E-03
5011.56c  1.298E-02
8016.50c  13.934
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.296
42000.50c 0.352
73181.50c 0.296
40000.60c 1.673
50000.35c 0.024
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
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24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 10 (Batch 10, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
```

```
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2637 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.236
24053.60c 1.530
24054.60c 0.388
25055.50c 1.482
26054.60c 2.933
26056.60c 47.283
26057.60c 1.102
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.694
5010.50c  2.741E-03
5011.56c  1.252E-02
8016.50c  13.443
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
```

```
29065.60c 0.010
41093.50c 0.284
42000.50c 0.338
73181.50c 0.284
40000.60c 1.598
50000.35c 0.023
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 11, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
```

```
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1031 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.649
24052.60c 13.011
24053.60c 1.504
24054.60c 0.381
25055.50c 1.444
26054.60c 2.860
26056.60c 46.113
26057.60c 1.075
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26058.60c 0.146
28058.60c 8.492
28060.60c 3.358
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.843
5010.50c  2.978E-03
5011.56c  1.360E-02
8016.50c  14.629
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.681
50000.35c 0.024
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 12 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
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11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
```

```
3.1031 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.567
15031.50c 0.033
16032.50c 0.023
24050.60c 0.649
24052.60c 13.011
24053.60c 1.504
24054.60c 0.381
25055.50c 1.444
26054.60c 2.860
26056.60c 46.113
26057.60c 1.075
26058.60c 0.146
28058.60c 8.492
28060.60c 3.358
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.843
5010.50c  2.978E-03
5011.56c  1.360E-02
8016.50c  14.629
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.355
73181.50c 0.298
40000.60c 1.681
50000.35c 0.024
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
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1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 13 (Batch 10, APSR)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
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24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2488 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.216
24053.60c 1.527
24054.60c 0.387
25055.50c 1.478
26054.60c 2.926
26056.60c 47.178
26057.60c 1.099
26058.60c 0.149
28058.60c 8.421
28060.60c 3.330
28061.60c 0.147
28062.60c 0.473
28064.60c 0.124
1001.50c  1.707
5010.50c  2.762E-03
5011.56c  1.262E-02
8016.50c  13.549
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.285
42000.50c 0.339
73181.50c 0.285
40000.60c 1.606
50000.35c 0.023
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
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5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 14 (Batch 11, 0.50 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463605.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
```

```
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1952 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.655
24052.60c 13.136
24053.60c 1.518
24054.60c 0.385
25055.50c 1.462
26054.60c 2.894
26056.60c 46.662
26057.60c 1.087
26058.60c 0.148
28058.60c 8.511
28060.60c 3.366
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.756
5010.50c  2.841E-03
5011.56c  1.298E-02
8016.50c  13.934
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.296
42000.50c 0.352
73181.50c 0.296
40000.60c 1.673
50000.35c 0.024
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
```

```
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 15 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 321.493 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 267.917 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 214.338 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 160.760 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 107.181 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 53.605 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
```

```
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2637 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.072
14000.50c 0.580
15031.50c 0.034
16032.50c 0.023
24050.60c 0.660
24052.60c 13.236
24053.60c 1.530
24054.60c 0.388
25055.50c 1.482
26054.60c 2.933
26056.60c 47.283
26057.60c 1.102
26058.60c 0.149
28058.60c 8.414
28060.60c 3.327
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.694
5010.50c  2.741E-03
5011.56c  1.252E-02
8016.50c  13.443
13027.50c 0.055
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
```

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29065.60c 0.010
41093.50c 0.284
42000.50c 0.338
73181.50c 0.284
40000.60c 1.598
50000.35c 0.023
2.2431 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.058
14000.50c 0.477
15031.50c 0.028
16032.50c 0.019
24050.60c 0.551
24052.60c 11.055
24053.60c 1.278
24054.60c 0.324
25055.50c 1.206
26054.60c 2.392
26056.60c 38.567
26057.60c 0.899
26058.60c 0.122
28058.60c 7.589
28060.60c 3.001
28061.60c 0.132
28062.60c 0.427
28064.60c 0.112
1001.50c  3.002
5010.50c  4.766E-03
5011.56c  2.177E-02
8016.50c  23.824
13027.50c 0.056
22000.50c 0.101
27059.50c 0.112
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.341
73181.50c 0.286
40000.60c 3.589
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
4 : Number of different BPRA banks
06 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
```

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04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 0.500 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
07 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
```

```
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15.20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.400 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
08 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
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3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
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26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.600
09 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.100 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
```

```
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
4 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
02 : CRA bank identifier
0.49784 0.50546 0.55880 342.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
```

```
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
03 : CRA bank identifier
0.49784 0.50546 0.55880 80.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
```

```
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
04 : CRA bank identifier
0.49784 0.50546 0.55880 17.000 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
```

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05 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
122.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```

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1 : B&W core design
2 : 1/4th core symmetry utilized
Crystal River Unit 3 : Reactor name
CR3 : Reactor prefix for filenames
08 : Cycle identifier
0.0 : CRC statepoint EFPD value
1 : Largest isotope set utilized
OFF : Fuel Density Option
10000 25 225 : Control specifications
18 : Number of CRC axial active fuel nodes per assembly
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
21.81098 : Assembly pitch in core (cm)
532.0 2200.0 2101.0 : Mod. temp.(F), System press.(psi), ppmb
A18z  G27   G04   H04   C20   H06   G02   F19
G27   G19   H10   G10   H12   G12   H14   F27
G06   H10   C20a  H17   G17   H19   G14   F23
H04   G10   H17   G19a  H23   G25   H25
C20   H12   G17   H23   F19a  H27   G23
H06   G12   H19   G25   H27   E19
G02   H14   G14   H25   G23
F19   F27   F23
11 : Number of different fuel assembly designs
1  2  3  4  5  6  3  7    (INSERTION ROD ASSEMBLIES DEFINE ASSEMBLY DESIGNS)
2  3  6  3  4  3  8  7
3  6  5  4  9  4  3  7
4  3  4  3  4  3  8
5  4  9  4  10 8  2
6  3  4  3  8  11
3  8  3  8  2
7  7  7
4 : Number of insertion rod assembly banks
01 CRA   366.204   CRA Banks 1-7
02 APSRA 104.000   APSRA Bank 8
03 BPRA  22.352    1.700 wt% B4C
04 BPRA  22.352    2.000 wt% B4C
00 00 01 04 01 03 01 00
00 01 03 01 04 01 00 00
01 03 01 04 02 04 01 00
04 01 04 01 04 01 00
01 04 02 04 01 00 00
03 01 04 01 00 00
01 00 01 00 00
00 00 00
1.93 3.84 3.84 3.94 2.62 3.94 3.84 3.49
3.84 3.84 3.94 3.84 3.94 3.84 3.94 3.49
3.84 3.94 2.62 3.94 3.84 3.94 3.84 3.49
3.94 3.84 3.94 3.84 3.94 3.84 3.94
2.62 3.94 3.84 3.94 3.49 3.94 3.84
3.94 3.84 3.94 3.84 3.94 3.29
3.84 3.94 3.84 3.94 3.84
3.49 3.49 3.49
B B B F B F B B
B B F B F B F B
```

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B F B F B F B B
F B F B F B F
B F B F B F B
F B F B F B
B F B F B
B B B
3 : Number of lower regions in MCNP model (below lower end-fittings)
5.08 2.7992 23 : Lower region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.603
15031.50c 0.036
16032.50c 0.024
24050.60c 0.637
24052.60c 12.782
24053.60c 1.477
24054.60c 0.375
25055.50c 1.608
26054.60c 3.149
26056.60c 50.763
26057.60c 1.183
26058.60c 0.160
28058.60c 5.011
28060.60c 1.982
28061.60c 0.087
28062.60c 0.282
28064.60c 0.074
1001.50c  2.192
5010.50c  7.408E-03
5011.56c  3.384E-02
8016.50c  17.391
12.70 2.4797 23 : Lower region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.061
7014.50c  0.076
14000.50c 0.573
15031.50c 0.034
16032.50c 0.023
24050.60c 0.606
24052.60c 12.160
24053.60c 1.405
24054.60c 0.356
25055.50c 1.529
26054.60c 2.995
26056.60c 48.289
26057.60c 1.125
26058.60c 0.153
28058.60c 4.767
28060.60c 1.885
28061.60c 0.083
28062.60c 0.268
28064.60c 0.070
1001.50c  2.629
5010.50c  8.886E-03
5011.56c  4.059E-02
8016.50c  20.861
12.22 0.9820 23 : Lower region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.019
7014.50c  0.024
14000.50c 0.181
15031.50c 0.011
16032.50c 0.007
24050.60c 0.191
24052.60c 3.838
24053.60c 0.444
24054.60c 0.112
25055.50c 0.483
26054.60c 0.945
26056.60c 15.242
26057.60c 0.355
26058.60c 0.048
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28058.60c 1.505
28060.60c 0.595
28061.60c 0.026
28062.60c 0.085
28064.60c 0.022
1001.50c  8.473
5010.50c  2.864E-02
5011.56c  1.308E-01
8016.50c  67.234
0.27442 : Distance (cm) between the core baffle and the outer fuel assembly
1.905 7.9 19 : Core baffle thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
179.07 : Core barrel inner radius (cm)
5.08 7.9 19 : Core barrel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
186.69 : Thermal shield inner radius (cm)
5.08 7.9 19 : Thermal shield thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
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28062.60c 0.350
28064.60c 0.092
216.695 : Pressure vessel cladding inner radius (cm)
0.478 7.9 19 : Pressure vessel cladding thickness (cm), density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
21.433 7.832 9 : Pressure vessel thickness (cm), density (g/cc), # of isotopes
6000.50c  0.220
14000.50c 0.275
15031.50c 0.035
16032.50c 0.035
25055.50c 0.900
26054.60c 5.615
26056.60c 90.524
26057.60c 2.110
26058.60c 0.286
4 : Number of regions above upper end-fitting of assembly containing a BPRA
14.12 1.2666 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.044
14000.50c 0.327
15031.50c 0.020
16032.50c 0.013
24050.60c 0.346
24052.60c 6.934
24053.60c 0.801
24054.60c 0.203
25055.50c 0.872
26054.60c 1.708
26056.60c 27.535
26057.60c 0.642
26058.60c 0.087
28058.60c 2.718
28060.60c 1.075
28061.60c 0.047
28062.60c 0.153
28064.60c 0.040
1001.50c  6.299
5010.50c  2.129E-02
5011.56c  9.726E-02
8016.50c  49.984
3.18 2.0711 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.056
7014.50c  0.070
14000.50c 0.523
15031.50c 0.031
16032.50c 0.021
24050.60c 0.553
24052.60c 11.083
24053.60c 1.281
24054.60c 0.325
25055.50c 1.394
26054.60c 2.730
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26056.60c 44.014
26057.60c 1.026
26058.60c 0.139
28058.60c 4.345
28060.60c 1.718
28061.60c 0.076
28062.60c 0.244
28064.60c 0.064
1001.50c  3.385
5010.50c  1.144E-02
5011.56c  5.227E-02
8016.50c  26.861
7.62 2.9027 25 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.600
15031.50c 0.036
16032.50c 0.024
24050.60c 0.634
24052.60c 12.713
24053.60c 1.469
24054.60c 0.373
25055.50c 1.599
26054.60c 3.132
26056.60c 50.486
26057.60c 1.177
26058.60c 0.160
28058.60c 4.983
28060.60c 1.971
28061.60c 0.087
28062.60c 0.280
28064.60c 0.073
1001.50c  2.067
5010.50c  6.986E-03
5011.56c  3.191E-02
8016.50c  16.402
40000.60c 1.531
50000.35c 0.022
5.08 3.5812 25 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.644
15031.50c 0.039
16032.50c 0.026
24050.60c 0.681
24052.60c 13.649
24053.60c 1.577
24054.60c 0.400
25055.50c 1.716
26054.60c 3.362
26056.60c 54.200
26057.60c 1.263
26058.60c 0.171
28058.60c 5.350
28060.60c 2.116
28061.60c 0.093
28062.60c 0.301
28064.60c 0.079
1001.50c  1.339
5010.50c  4.526E-03
5011.56c  2.067E-02
8016.50c  10.627
40000.60c 2.158
50000.35c 0.031
4 : Number of regions above upper end-fitting of assembly containing a CRA
14.12 1.4342 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.041
7014.50c  0.051
14000.50c 0.386
15031.50c 0.023
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16032.50c 0.015
24050.60c 0.408
24052.60c 8.182
24053.60c 0.946
24054.60c 0.240
25055.50c 1.029
26054.60c 2.016
26056.60c 32.493
26057.60c 0.757
26058.60c 0.103
28058.60c 3.207
28060.60c 1.268
28061.60c 0.056
28062.60c 0.180
28064.60c 0.047
1001.50c  5.422
5010.50c  1.833E-02
5011.56c  8.373E-02
8016.50c  43.027
3.18 2.1552 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.057
7014.50c  0.071
14000.50c 0.535
15031.50c 0.032
16032.50c 0.021
24050.60c 0.565
24052.60c 11.338
24053.60c 1.310
24054.60c 0.332
25055.50c 1.426
26054.60c 2.793
26056.60c 45.027
26057.60c 1.049
26058.60c 0.142
28058.60c 4.445
28060.60c 1.758
28061.60c 0.077
28062.60c 0.250
28064.60c 0.065
1001.50c  3.206
5010.50c  1.084E-02
5011.56c  4.950E-02
8016.50c  25.439
7.62 3.2507 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.068
7014.50c  0.085
14000.50c 0.634
15031.50c 0.038
16032.50c 0.025
24050.60c 0.671
24052.60c 13.454
24053.60c 1.555
24054.60c 0.394
25055.50c 1.692
26054.60c 3.314
26056.60c 53.428
26057.60c 1.245
26058.60c 0.169
28058.60c 5.274
28060.60c 2.086
28061.60c 0.092
28062.60c 0.296
28064.60c 0.078
1001.50c  1.720
5010.50c  5.815E-03
5011.56c  2.656E-02
8016.50c  13.650
5.08 3.4411 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
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```
14000.50c 0.645
15031.50c 0.039
16032.50c 0.026
24050.60c 0.682
24052.60c 13.684
24053.60c 1.581
24054.60c 0.401
25055.50c 1.721
26054.60c 3.371
26056.60c 54.343
26057.60c 1.266
26058.60c 0.172
28058.60c 5.364
28060.60c 2.121
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.558
5010.50c  5.268E-03
5011.56c  2.406E-02
8016.50c  12.367
4 : Number of regions above upper end-fitting of assembly containing an APSRA
14.12 1.5497 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.045
7014.50c  0.056
14000.50c 0.419
15031.50c 0.025
16032.50c 0.017
24050.60c 0.443
24052.60c 8.885
24053.60c 1.027
24054.60c 0.260
25055.50c 1.117
26054.60c 2.189
26056.60c 35.286
26057.60c 0.822
26058.60c 0.112
28058.60c 3.483
28060.60c 1.377
28061.60c 0.061
28062.60c 0.196
28064.60c 0.051
1001.50c  4.928
5010.50c  1.666E-02
5011.56c  7.610E-02
8016.50c  39.108
3.18 2.3456 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.060
7014.50c  0.074
14000.50c 0.559
15031.50c 0.034
16032.50c 0.022
24050.60c 0.591
24052.60c 11.848
24053.60c 1.369
24054.60c 0.347
25055.50c 1.490
26054.60c 2.919
26056.60c 47.051
26057.60c 1.096
26058.60c 0.149
28058.60c 4.644
28060.60c 1.837
28061.60c 0.081
28062.60c 0.261
28064.60c 0.068
1001.50c  2.848
5010.50c  9.627E-03
5011.56c  4.398E-02
8016.50c  22.599
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7.62 2.785 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.064
7014.50c  0.080
14000.50c 0.602
15031.50c 0.036
16032.50c 0.024
24050.60c 0.636
24052.60c 12.758
24053.60c 1.474
24054.60c 0.374
25055.50c 1.604
26054.60c 3.143
26056.60c 50.664
26057.60c 1.181
26058.60c 0.160
28058.60c 5.001
28060.60c 1.978
28061.60c 0.087
28062.60c 0.281
28064.60c 0.074
1001.50c  2.209
5010.50c  7.467E-03
5011.56c  3.411E-02
8016.50c  17.529
5.08 3.4411 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.086
14000.50c 0.645
15031.50c 0.039
16032.50c 0.026
24050.60c 0.682
24052.60c 13.684
24053.60c 1.581
24054.60c 0.401
25055.50c 1.721
26054.60c 3.371
26056.60c 54.343
26057.60c 1.266
26058.60c 0.172
28058.60c 5.364
28060.60c 2.121
28061.60c 0.093
28062.60c 0.302
28064.60c 0.079
1001.50c  1.558
5010.50c  5.268E-03
5011.56c  2.406E-02
8016.50c  12.367
4 : Number of regions above upper end-fitting of regular assembly
14.12 1.1803 23 : Upper region 1 height (cm), density (g/cc), # of isotopes
6000.50c  0.031
7014.50c  0.039
14000.50c 0.290
15031.50c 0.017
16032.50c 0.012
24050.60c 0.307
24052.60c 6.153
24053.60c 0.711
24054.60c 0.180
25055.50c 0.774
26054.60c 1.516
26056.60c 24.434
26057.60c 0.569
26058.60c 0.077
28058.60c 2.412
28060.60c 0.954
28061.60c 0.042
28062.60c 0.136
28064.60c 0.035
1001.50c  6.847
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5010.50c  2.315E-02
5011.56c  1.057E-01
8016.50c  54.336
3.18 1.753 23 : Upper region 2 height (cm), density (g/cc), # of isotopes
6000.50c  0.050
7014.50c  0.062
14000.50c 0.467
15031.50c 0.028
16032.50c 0.019
24050.60c 0.494
24052.60c 9.898
24053.60c 1.144
24054.60c 0.290
25055.50c 1.245
26054.60c 2.438
26056.60c 39.306
26057.60c 0.916
26058.60c 0.124
28058.60c 3.880
28060.60c 1.534
28061.60c 0.068
28062.60c 0.218
28064.60c 0.057
1001.50c  4.217
5010.50c  1.426E-02
5011.56c  6.512E-02
8016.50c  33.467
7.62 2.5446 23 : Upper region 3 height (cm), density (g/cc), # of isotopes
6000.50c  0.062
7014.50c  0.077
14000.50c 0.580
15031.50c 0.035
16032.50c 0.023
24050.60c 0.613
24052.60c 12.299
24053.60c 1.421
24054.60c 0.360
25055.50c 1.547
26054.60c 3.030
26056.60c 48.842
26057.60c 1.138
26058.60c 0.154
28058.60c 4.821
28060.60c 1.907
28061.60c 0.084
28062.60c 0.271
28064.60c 0.071
1001.50c  2.531
5010.50c  8.556E-03
5011.56c  3.908E-02
8016.50c  20.086
5.08 3.2057 23 : Upper region 4 height (cm), density (g/cc), # of isotopes
6000.50c  0.067
7014.50c  0.084
14000.50c 0.632
15031.50c 0.038
16032.50c 0.025
24050.60c 0.668
24052.60c 13.395
24053.60c 1.548
24054.60c 0.393
25055.50c 1.685
26054.60c 3.300
26056.60c 53.197
26057.60c 1.240
26058.60c 0.168
28058.60c 5.251
28060.60c 2.077
28061.60c 0.091
28062.60c 0.295
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28064.60c 0.077
1001.50c  1.761
5010.50c  5.953E-03
5011.56c  2.719E-02
8016.50c  13.975
18 : Number of MCNP axial active fuel nodes for assembly design 1 (Batch 1, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.4699 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 338.455 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 284.876 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 231.300 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 177.721 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 124.143 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 70.485 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
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```
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
```

```
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 2 (Batch 9, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 338.216 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 284.640 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 231.061 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 177.483 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 123.904 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 70.328 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
```

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28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
```

```
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 3 (Batch 9, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 338.216 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 284.640 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 231.061 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 177.483 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 123.904 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 70.328 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
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7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2683 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.218
24053.60c 1.527
24054.60c 0.387
25055.50c 1.480
26054.60c 2.929
26056.60c 47.217
26057.60c 1.100
26058.60c 0.149
28058.60c 8.402
28060.60c 3.323
28061.60c 0.146
28062.60c 0.472
28064.60c 0.124
1001.50c  1.705
5010.50c  5.883E-03
5011.56c  2.687E-02
8016.50c  13.533
13027.50c 0.055
22000.50c 0.099
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27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.596
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 4 (Batch 10, 2.0 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
```

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19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 338.216 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 284.640 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 231.061 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 177.483 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 123.904 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 70.328 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.572
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.117
24053.60c 1.516
24054.60c 0.384
25055.50c 1.459
26054.60c 2.890
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26056.60c 46.594
26057.60c 1.086
26058.60c 0.147
28058.60c 8.499
28060.60c 3.361
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.767
5010.50c  6.098E-03
5011.56c  2.786E-02
8016.50c  14.026
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.351
73181.50c 0.295
40000.60c 1.671
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of NCNP axial active fuel nodes for assembly design 5 (Batch 5, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
```

```
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 338.455 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 284.876 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 231.300 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 177.721 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 124.143 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 70.485 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
```

```
40000.60c 55.509
50000.35c 0.792
3.2683 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c 0.066
7014.50c 0.072
14000.50c 0,579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.218
24053.60c 1.527
24054.60c 0.387
25055.50c 1.480
26054.60c 2.929
26056.60c 47.217
26057.60c 1.100
26058.60c 0.149
28058.60c 8.402
28060.60c 3.323
28061.60c 0.146
28062.60c 0.472
28064.60c 0.124
1001.50c 1.705
5010.50c 5.883E-03
5011.56c 2.687E-02
8016.50c 13.533
13027.50c 0.055
22000.50c 0.099
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.596
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c 0.055
7014.50c 0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c 3.018
5010.50c 1.032E-02
5011.56c 4.716E-02
8016.50c 23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
```

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3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 6 (Batch 10, 1.7 wt% B4C)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 338.216 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 284.640 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 231.061 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 177.483 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 123.904 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 70.328 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
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24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1998 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.071
14000.50c 0.572
15031.50c 0.034
16032.50c 0.023
24050.60c 0.654
24052.60c 13.117
24053.60c 1.516
24054.60c 0.384
25055.50c 1.459
26054.60c 2.890
26056.60c 46.594
26057.60c 1.086
26058.60c 0.147
28058.60c 8.499
28060.60c 3.361
28061.60c 0.148
28062.60c 0.478
28064.60c 0.125
1001.50c  1.767
5010.50c  6.098E-03
5011.56c  2.786E-02
8016.50c  14.026
13027.50c 0.058
22000.50c 0.104
27059.50c 0.115
29063.60c 0.024
29065.60c 0.011
41093.50c 0.295
42000.50c 0.351
73181.50c 0.295
40000.60c 1.671
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
```

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1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 7 (Batch 8, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 338.455 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 284.876 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 231.300 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 177.721 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 124.143 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 70.485 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
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28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
```

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24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 8 (Batch 10, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
663630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 338.216 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 284.640 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 231.061 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 177.483 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 123.904 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 70.328 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
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```
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
```

```
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 9 (Batch 9, APSRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
```

```
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 5.08 338.216 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
3 5.08 284.640 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
4 5.08 231.061 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
5 5.08 177.483 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
6 5.08 123.904 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vol
7 5.08 70.328 125.758 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.2533 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.578
15031.50c 0.034
16032.50c 0.023
24050.60c 0.658
24052.60c 13.198
24053.60c 1.525
24054.60c 0.387
25055.50c 1.476
26054.60c 2.922
```

```
26056.60c 47.112
26057.60c 1.098
26058.60c 0.149
28058.60c 8.409
28060.60c 3.325
28061.60c 0.146
28062.60c 0.473
28064.60c 0.124
1001.50c  1.719
5010.50c  5.929E-03
5011.56c  2.708E-02
8016.50c  13.639
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.284
42000.50c 0.339
73181.50c 0.284
40000.60c 1.604
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
1 : Zirc-4 spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of NCWP axial active fuel nodes for assembly design 10 (Batch 8, CRA)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
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9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 338.455 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 284.876 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 231.300 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 177.721 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 124.143 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 70.485 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
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40000.60c 55.509
50000.35c 0.792
3.2683 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.066
7014.50c  0.072
14000.50c 0.579
15031.50c 0.034
16032.50c 0.023
24050.60c 0.659
24052.60c 13.218
24053.60c 1.527
24054.60c 0.387
25055.50c 1.480
26054.60c 2.929
26056.60c 47.217
26057.60c 1.100
26058.60c 0.149
28058.60c 8.402
28060.60c 3.323
28061.60c 0.146
28062.60c 0.472
28064.60c 0.124
1001.50c  1.705
5010.50c  5.883E-03
5011.56c  2.687E-02
8016.50c  13.533
13027.50c 0.055
22000.50c 0.099
27059.50c 0.111
29063.60c 0.023
29065.60c 0.010
41093.50c 0.283
42000.50c 0.337
73181.50c 0.283
40000.60c 1.596
50000.35c 0.023
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
```

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3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
18 : Number of MCNP axial active fuel nodes for assembly design 11 (Batch 7A, Empty)
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
18 22.3520 : Node number and height (cm)
208 : Number of fuel rods in assembly
1.44272 : Pin-pitch in assembly (cm)
463630.0 : Initial mass of uranium in assembly (g)
0.468122 0.47879 0.5461 : Fuel pellet radius (cm), clad inner radius (cm), clad outer radius (cm)
19.161 11.033 : Upper and lower fuel rod plenum heights (cm)
0.714 0.714 : Upper and lower fuel rod end-cap heights (cm)
8.731 16.723 : Upper and lower fuel assembly end-fitting heights (cm)
7 : Number of spacer grids (excluding the lower grid)
1 8.573 383.486 115.698 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Vo
2 3.81 338.455 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
3 3.81 284.876 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
4 3.81 231.300 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
5 3.81 177.721 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
6 3.81 124.143 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volu
7 3.81 70.485 88.676 : Spacer #, spacer height (cm), distance between top of spacer and bottom of active fuel (cm), Volum
1 : Zirc-4 fuel rod cladding specification
1.5565 22 : Fuel rod upper plenum density (g/cc), # of isotopes
6000.50c  0.033
7014.50c  0.041
14000.50c 0.309
15031.50c 0.019
16032.50c 0.012
24050.60c 0.329
24052.60c 6.595
24053.60c 0.762
24054.60c 0.193
25055.50c 0.823
26054.60c 1.619
26056.60c 26.105
26057.60c 0.608
26058.60c 0.083
28058.60c 2.566
28060.60c 1.015
28061.60c 0.045
28062.60c 0.144
28064.60c 0.038
8016.50c  0.071
40000.60c 57.766
50000.35c 0.824
2.8520 22 : Fuel rod lower plenum density (g/cc), # of isotopes
6000.50c  0.035
7014.50c  0.043
14000.50c 0.326
15031.50c 0.020
16032.50c 0.013
24050.60c 0.347
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24052.60c 6.959
24053.60c 0.804
24054.60c 0.204
25055.50c 0.869
26054.60c 1.709
26056.60c 27.553
26057.60c 0.642
26058.60c 0.087
28058.60c 2.709
28060.60c 1.071
28061.60c 0.047
28062.60c 0.152
28064.60c 0.040
8016.50c  0.068
40000.60c 55.509
50000.35c 0.792
3.1078 33 : Fuel assembly upper end-fitting density (g/cc), # of isotopes
6000.50c  0.065
7014.50c  0.070
14000.50c 0.566
15031.50c 0.033
16032.50c 0.023
24050.60c 0.648
24052.60c 12.991
24053.60c 1.501
24054.60c 0.381
25055.50c 1.442
26054.60c 2.856
26056.60c 46.043
26057.60c 1.073
26058.60c 0.146
28058.60c 8.479
28060.60c 3.353
28061.60c 0.148
28062.60c 0.477
28064.60c 0.125
1001.50c  1.855
5010.50c  6.397E-03
5011.56c  2.922E-02
8016.50c  14.724
13027.50c 0.058
22000.50c 0.105
27059.50c 0.116
29063.60c 0.024
29065.60c 0.011
41093.50c 0.298
42000.50c 0.354
73181.50c 0.298
40000.60c 1.679
50000.35c 0.024
2.2486 33 : Fuel assembly lower end-fitting density (g/cc), # of isotopes
6000.50c  0.055
7014.50c  0.058
14000.50c 0.475
15031.50c 0.028
16032.50c 0.019
24050.60c 0.550
24052.60c 11.028
24053.60c 1.274
24054.60c 0.323
25055.50c 1.203
26054.60c 2.386
26056.60c 38.472
26057.60c 0.897
26058.60c 0.122
28058.60c 7.570
28060.60c 2.994
28061.60c 0.132
28062.60c 0.426
28064.60c 0.111
```

```
1001.50c  3.018
5010.50c  1.032E-02
5011.56c  4.716E-02
8016.50c  23.957
13027.50c 0.056
22000.50c 0.100
27059.50c 0.111
29063.60c 0.023
29065.60c 0.011
41093.50c 0.286
42000.50c 0.340
73181.50c 0.286
40000.60c 3.580
50000.35c 0.051
3 : Inconel spacer grid material specification
0.63246 0.67310 403.067 6.032 : GT IR, OR, GT top to lower pad top, GT bot to lower pad bot
1 : Zirc-4 GT material specification
0.56007 0.690965 393.065 3.175 : IT IR, OR, IT top to lower pad top, IT bot to lower pad bot
1 : Zirc-4 IT material specification
2 : Number of different BPRA banks
03 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
1 : BPR absorber material specification (Al2O3-B4C)
3.7 1.700 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
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```
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
04 : BPRA bank identifier
17 : Number of BPRA axial nodes
1  17.7800 : Node number and height (cm)
2  20.0025 : Node number and height (cm)
3  20.0025 : Node number and height (cm)
4  20.0025 : Node number and height (cm)
5  20.0025 : Node number and height (cm)
6  20.0025 : Node number and height (cm)
7  20.0025 : Node number and height (cm)
8  20.0025 : Node number and height (cm)
9  20.0025 : Node number and height (cm)
10 20.0025 : Node number and height (cm)
11 20.0025 : Node number and height (cm)
12 20.0025 : Node number and height (cm)
13 20.0025 : Node number and height (cm)
14 20.0025 : Node number and height (cm)
15 20.0025 : Node number and height (cm)
16 20.0025 : Node number and height (cm)
17 20.0025 : Node number and height (cm)
39.075 : Dist. between top of lower pad and bottom of bottom BP node (cm)
Y : Flag for non-absorbing BP nodes
01 Y : Node #, Flag for non-absorbing BP material
02 N : Node #, Flag for non-absorbing BP material
03 N : Node #, Flag for non-absorbing BP material
04 N : Node #, Flag for non-absorbing BP material
05 N : Node #, Flag for non-absorbing BP material
06 N : Node #, Flag for non-absorbing BP material
07 N : Node #, Flag for non-absorbing BP material
08 N : Node #, Flag for non-absorbing BP material
09 N : Node #, Flag for non-absorbing BP material
10 N : Node #, Flag for non-absorbing BP material
11 N : Node #, Flag for non-absorbing BP material
12 N : Node #, Flag for non-absorbing BP material
13 N : Node #, Flag for non-absorbing BP material
14 N : Node #, Flag for non-absorbing BP material
15 N : Node #, Flag for non-absorbing BP material
16 N : Node #, Flag for non-absorbing BP material
17 N : Node #, Flag for non-absorbing BP material
0.4318 0.4572 0.5461 : BP absorber radius (cm), BPR IR (cm), BPR OR (cm)
49.825 1.914 : BPR upper plenum height (cm), BPR lower plenum height (cm)
```

```
1 : BPR absorber material specification (Al2O3-B4C)
3.7 2.000 : BP density (g/cc), B4C wt% in BP
1 : Non-absorbing BP material specification (Al2O3)
3.7 : Non-absorbing BP density (g/cc)
1 : Zirc-4 BPR clad material specification
1.9030 22 : BPR upper plenum density (g/cc), # of isotopes
6000.50c  0.069
7014.50c  0.087
14000.50c 0.651
15031.50c 0.039
16032.50c 0.026
24050.60c 0.689
24052.60c 13.809
24053.60c 1.596
24054.60c 0.405
25055.50c 1.735
26054.60c 3.400
26056.60c 54.820
26057.60c 1.278
26058.60c 0.173
28058.60c 5.409
28060.60c 2.139
28061.60c 0.094
28062.60c 0.304
28064.60c 0.080
8016.50c  0.016
40000.60c 12.996
50000.35c 0.185
6.56 11 : BPR lower plenum density (g/cc), # of isotopes
24050.60c 0.004
24052.60c 0.084
24053.60c 0.010
24054.60c 0.002
26054.60c 0.011
26056.60c 0.184
26057.60c 0.004
26058.60c 0.001
8016.50c  0.120
40000.60c 98.180
50000.35c 1.400
1 : Number of different CRA banks
01 : CRA bank identifier
0.49784 0.50546 0.55880 366.204 340.361 2.684 27.813 : CR dimensions (cm)
10.17 4 : CR absorber material density (g/cc), # of isotopes
47107.60c 41.101
47109.60c 38.899
48000.50c 5.000
49000.60c 15.000
2 : SS304 CR clad material specification
3.2035 19 : CR upper plenum density (g/cc), # of isotopes
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
7.9 19 : CR lower plenum density (g/cc), # of isotopes
```

```
6000.50c  0.080
7014.50c  0.100
14000.50c 0.750
15031.50c 0.045
16032.50c 0.030
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 2.000
26054.60c 3.918
26056.60c 63.156
26057.60c 1.472
26058.60c 0.200
28058.60c 6.234
28060.60c 2.465
28061.60c 0.109
28062.60c 0.350
28064.60c 0.092
1 : Number of different APSRA banks
02 : APSRA bank identifier
0.47625 0.49022 0.5588 0.49022 0.5588 : APSR dimensions (cm)
0.9902 : APSR intermediate plug volume fraction
104.000 160.02 1.905 1.924 0.952 0.001 : APSR dimensions (cm)
8.19 28 : APSR absorber density (g/cc), # of isotopes
6000.50c  0.080
14000.50c 0.350
15031.50c 0.015
16032.50c 0.015
24050.60c 0.793
24052.60c 15.903
24053.60c 1.838
24054.60c 0.466
25055.50c 0.350
26054.60c 0.958
26056.60c 15.442
26057.60c 0.360
26058.60c 0.049
28058.60c 35.382
28060.60c 13.993
28061.60c 0.616
28062.60c 1.989
28064.60c 0.520
5010.50c  1.078E-03
5011.56c  4.925E-03
22000.50c 0.900
13027.50c 0.500
27059.50c 1.000
29063.60c 0.205
29065.60c 0.095
41093.50c 2.563
42000.50c 3.050
73181.50c 2.563
2 : SS304 APSR clad material specification
2 : SS304 APSR follow rod material specification
1.0E-3   1 : APSR upper plenum density (g/cc), # of isotopes
2004.50c  100.0
1.0E-3   1 : APSR lower plenum density (g/cc), # of isotopes
2004.50c  100.0
```