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TWO-DIMENSIONAL TWO-GROUP CALCULATION
OF THE ARGONAUT ONE SLAB LOADING

by

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PREFACE

This report is written primarily for those persons who as yet have not acquired sophistication in the field of reactor physics. For pedagogical reasons, many calculational details are included. In addition, several problems which should be of general interest are suggested. It is hoped that the reader can think of many more.

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TWO-DIMENSIONAL TWO-GROUP CALCULATIONS OF THE ARGONAUT ONE-SLAB LOADING

Don P. Moon

INTRODUCTION

This report will attempt to set forth in systematic form the two-energy group physics calculations for the Argonaut one-slab configuration. All assumptions will be stated and full calculational details given so that the reader may easily follow the procedure used. Complete point by point flux values from the PDO programming of the problem on the IBM 704 computer will be given. This will provide those interested in this or similar problems a valuable amount of information, all of which would be impossible to present in the form of graphs. A comparison of theoretical and experimental results is also included.

The purpose and constructional details of the Argonaut reactor as well as certain physics calculations are set forth in three reports: 1) Summary Report on the Hazards of the Argonaut Reactor;⁽¹⁾ 2) Argonaut: Engineering Construction and Cost;⁽²⁾ 3) The Theoretical Physics of the Argonaut Reactor.⁽³⁾ To a limited extent these reports were taken as a source of information on the dimensions of the nuclear assembly. However, all dimensions were actually measured when possible and some discrepancies were observed. The source of all other information will be referenced.

Better methods of calculating certain constants (D_1 and τ_f) were developed after most of the PDQ calculations had been performed. These methods are explained in the text. Use of these constants should give even closer agreement between theoretical and experimental results.

CONSTANTS

Dimensions*

The slab configuration consists of six fuel boxes containing 17 fuel plates apiece. The volume between plates is filled with light water while a graphite wedge separates each fuel box from its neighbors. The boxes are arranged such that they take up approximately one-fourth of the volume of a cylindrical annulus of 2 ft inner diameter and 3 ft outer diameter. The height of the reactor is 2 ft. On top and bottom there are 9 in. water reflectors and on all other faces a graphite reflector is present.

Graphite Wedge

$$\begin{aligned}\text{Height} &= 24 \text{ in.} = 60.960 \text{ cm} \\ \text{Length} &= 5\frac{15}{16} \text{ in.} = 15.08125 \text{ cm} \\ \text{Width} & \\ \quad \text{Large end} &= 1\frac{93}{128} \text{ in.} = 4.38547 \text{ cm} \\ \quad \text{Small end} &= 13/64 \text{ in.} = 0.51594 \text{ cm} \\ \quad \text{Average} &= 0.964844 \text{ in.} = 2.45070 \text{ cm} \\ V_{\text{GW}} &= 137.4902 \text{ in.}^3 = 2253.07 \text{ cm}^3\end{aligned}$$

Fuel Plate

$$\begin{aligned}\text{Height} &= 24 \text{ in.} = 60.960 \text{ cm} \\ \text{Width} &= 2.845 \text{ in.} = 7.2263 \text{ cm} \\ \text{Thickness} &= 0.096 \text{ in.} = 0.24384 \text{ cm} \\ V_{\text{FP}} &= 6.5549 \text{ in.}^3 = 107.416 \text{ cm}^3\end{aligned}$$

Core

The core consists of six fuel boxes plus the five graphite wedges which separate these boxes from one another.

$$\begin{aligned}\text{Volume of annulus} &= 24 \times \pi (18^2 - 12^2) \\ V_{\text{A}} &= 13,571.67 \text{ in.}^3 \\ \text{Volume of core} &= \frac{1}{4} V_{\text{A}} - V_{\text{GR}} \\ V_{\text{C}} &= 3,392.92 \text{ in.}^3 - 137.49 \text{ in.}^3 \\ &= 3,255.43 \text{ in.}^3 \\ &= 53,347.25 \text{ cm}^3\end{aligned}$$

H₂O within Core

$$\begin{aligned}V_{\text{H}_2\text{O}} &= V_{\text{C}} - 5 V_{\text{GW}} - 102 V_{\text{FP}} \\ &= 53,347.25 \text{ cm}^3 - 11,265.35 \text{ cm}^3 - 10,956.43 \text{ cm}^3 \\ &= 31,125.47 \text{ cm}^3\end{aligned}$$

*For drawing see section on PDQ programming

Core Composition

The fuel plates are composed of U_3O_8 in a matrix of aluminum, and clad with less than 0.003" of Al. The U_3O_8 is 20 atomic percent enriched in U^{235} and the weight of U^{235} per fuel plate ranges between 15 g and 24 g with the average about 21 g. The core can contain up to 102 fuel plates. If not all 102 are needed aluminum dummies are used in order to keep the total number of plates constant and the water volume constant. In the criticality studies the parameter of interest is the weight of U^{235} in the core; hence this will be considered an unknown and will be designated $W_{U^{25}}$.

U_3O_8

Weight fraction of U^{235} in 20 atomic percent enriched uranium in U_3O_8 is found by:

- 1) Assume an amount of U^{235} present = 1 g
- 2) Weight % enrichment = $\frac{.20(235)}{.80(238) + .20(235)} = 19.8\%$
- 3) Weight of $U^{238} = \frac{80.2}{19.8} \times 1 = 4.0505$ grams
- 4) Weight of oxygen associated with U^{235}
 $= \frac{8 \times 16}{3 \times 235} \times 1 = 0.18156$ grams
- 5) Weight of oxygen associated with U^{238}
 $= \frac{8 \times 16}{3 \times 238} \times 4.0505 = 0.72614$ grams
- 6) Total weight = $1 + 4.0505 + 0.18156 + 0.72614 = 5.9582$ g
- 7) Weight fraction $U^{235} = F_{U^{25}} = \frac{1}{5.9582} = 0.167836$

Density of $U_3O_8 = 8.39$ g/cm³

$V_{U_3O_8}$ = volume of U_3O_8 in core .

Then the weight of U^{235} in the core in terms of $V_{U_3O_8}$ is:

$$W'_{U^{25}} = \rho_{U_3O_8} V_{U_3O_8} F_{U^{25}} = 8.39 \times V_{U_3O_8} \times 0.167836$$

Hence

$$\begin{aligned} V_{U_3O_8} &= \frac{W'_{U^{25}}}{8.39(0.16784)} = 0.71013 W'_{U^{25}} \\ &= 710.13 W_{U^{25}} \end{aligned}$$

where $W_{U^{25}}$ is expressed in kilograms and $V_{U_3O_8}$ in cubic cm.

Aluminum

$$\begin{aligned}
 V_{Al} &= 102 V_{FP} - V_{U_3O_8} \\
 &= 10,956.43 - 710.13 W_{U^{25}} \text{ cm}^3.
 \end{aligned}$$

Volume Fractions

$$\begin{aligned}
 f_{H_2O} &= \frac{31,125.47}{53,347.25} = 0.583450 \\
 f_G &= \frac{11,265.35}{53,347.25} = 0.211170 \\
 f_{Al} &= \frac{10,956.43 - 710.13 W_{U^{25}}}{53,347.25} \\
 &= 0.205380 - 0.0133114 W_{U^{25}} \\
 f_{U_3O_8} &= \frac{710.13 W_{U^{25}}}{53,347.25} = 0.0133114 W_{U^{25}}
 \end{aligned}$$

Number of Atoms per cm³H₂O at 25°C

$$\rho = 0.997044$$

$$N_0 = 6.02322 \times 10^{23}$$

$$A = 18.016$$

$$N = \frac{0.602322 \times 0.997044}{18.016} \times 10^{24}$$

$$= 0.033334 \times 10^{24} \text{ molecules/cm}^3 \text{ of H}_2\text{O} .$$

Graphite

$$\rho \cong 1.60 \text{ g/cm}^3$$

$$A = 12.011$$

$$N = \frac{.602322 \times 1.60}{12.011} \times 10^{24}$$

$$= 0.08024 \times 10^{24} \text{ atoms/cm}^3 \text{ of graphite}$$

Aluminum

$$\rho = 2.699 \text{ gm/cm}^3$$

$$A = 26.98 \text{ gm/gm-atom}$$

$$N = \frac{0.602322 \times 2.699}{26.98} \times 10^{24}$$

$$= 0.060256 \times 10^{24} \text{ atoms/cm}^3 \text{ of Al.}$$

U₃O₈ (20% enriched)

One gram molecular weight of 20% enriched U₃O₈ is equal to

$$3 [0.20(235) + 0.80(238)] + 8(16)$$

$$= 840.2 \text{ gm/gm-mole}$$

$$\rho_{\text{U}_3\text{O}_8} = 8.39 \text{ gm/cm}^3$$

$$N = \frac{0.602322 \times 8.39}{840.2} \times 10^{24}$$

$$= 0.00601462 \times 10^{24} \text{ molecules/cm}^3 \text{ of U}_3\text{O}_8$$

$$N_{\text{U}^{235}} = 0.20 \times 3 N_{\text{U}_3\text{O}_8} = 0.0036088 \times 10^{24} \text{ atoms/cm}^3 \text{ of U}_3\text{O}_8$$

$$N_{\text{U}^{238}} = 0.80 \times 3 N_{\text{U}_3\text{O}_8} = 0.014435 \times 10^{24} \text{ atoms/cm}^3 \text{ of U}_3\text{O}_8$$

$$N_{\text{O}^{16}} = 8 N_{\text{U}_3\text{O}_8} = 0.048117 \times 10^{24} \text{ atoms/cm}^3 \text{ of U}_3\text{O}_8.$$

The number of atoms of a particular kind per cubic centimeter of reactor core volume is equal to the product of volume fraction of that substance in the reactor times the atomic density of the pure substance.

$$N_{\text{H}_2\text{O}} = 0.019449 \times 10^{24} \text{ molecules/cm}^3$$

$$N_{\text{G}} = 0.016944 \times 10^{24} \text{ atoms/cm}^3$$

$$N_{\text{Al}} = 0.012375 \times 10^{24} - 0.0008020 \times 10^{24} W_{\text{U}^{25}} \text{ atoms/cm}^3$$

$$N_{\text{U}^{25}} = 0.000048045 \times 10^{24} W_{\text{U}^{25}} \text{ atoms/cm}^3$$

$$N_{\text{U}^{28}} = 0.00019215 \times 10^{24} W_{\text{U}^{25}} \text{ atoms/cm}^3$$

$$N_{\text{O}^{16}} = 0.00064036 \times 10^{24} W_{\text{U}^{25}} \text{ atoms/cm}^3$$

$$W_{\text{U}^{25}} = \text{kilograms of U}^{235} \text{ in reactor core.}$$

Microscopic Thermal Cross Section

The cross sections at 2200 m/sec are obtained from BNL-325 (1958)⁽⁴⁾ using the World consistent set. All absorption cross sections are corrected to the Maxwellian average at an effective neutron temperature. Two effective temperatures were calculated and used due to the difficulty of interpretation of one of the references. The two temperatures are 49°C and 37°C corresponding to a moderator temperature of 25°C. All cross sections are in barns.

Material	σ_{a2200}	σ_{f2200}	f	$\bar{\sigma}_{a49^\circ\text{C}}$ 37°C	$\bar{\sigma}_{f49^\circ\text{C}}$ 37°C	σ_s
H ₂ O	0.664	0	1	0.562 0.573	0	—*
C	—*	0	1	—*	0	4.8
Al	0.230	0	1	0.195 0.199	0	1.4
O ¹⁶	$<0.2 \times 10^{-3}$	0	1	≈ 0	0	4.2
U ²³⁸	2.71	$<0.5 \times 10^{-3}$	1.02	2.34 2.39	≈ 0	8.3
U ²³⁵	694	582	.975	572 583	480 489	10

* Σ is obtained from experimental measurement of L^2

The equation for $\bar{\sigma}_a$ is:

$$\bar{\sigma}_a = \frac{f}{1.128} \sqrt{\frac{293}{T_N}} \sigma_{a2200}$$

where both the moderator and neutron temperature are given in degrees Kelvin and f is the non 1/v factor.

Effective Neutron Temperature

The effective temperature of the neutrons in a reactor is higher than the moderator temperature due to the preferential absorption of the lower energy neutrons and hence a shift in the Maxwellian peak to a higher energy. The formula and constants used in this calculation are found in Table 3-2 on page 109 of ANL 5800.⁽⁵⁾

$$\frac{KT_N}{KT_M} = 1 + A \frac{\Sigma_a (k T_M)}{\Sigma_s}$$

On page 108 of this reference Σ_s is defined as the asymptotic constant free atom scattering cross section. Using the microscopic asymptotic cross section for H_2O to be 44.2 a neutron temperature $T_N = 49^\circ C$ is obtained. However the original reference⁽⁶⁾ does not define this to be the asymptotic constant free atom scattering cross section. Using the actual Maxwellian average scattering cross section of 85b for H_2O gives a $T_N = 37^\circ C$.

Thermal Cut-Off Energy

The thermal cut-off energy is taken to be the dividing point between fast and thermal energy groups and as such is necessary for the proper averaging of constants over the energy intervals. There are several ways of obtaining such a cut-off energy. One of the more logical ways is to equate the slowing down density at the cut-off energy to the total absorption rate of thermal neutrons. This gives the formula:⁽⁷⁾

$$\left(\frac{E_c}{T_{eff}}\right)^2 e^{-(E_c/T_{eff})} = \overline{\Sigma}_a / \xi \overline{\Sigma}_s(E_c)$$

E_c = cut-off energy

$$T_{eff} = KT_N = 0.02777 \text{ ev } (T_N = 322^\circ K)$$

$$\overline{\Sigma}_a = \sum_i N_i \bar{\sigma}_{ai} = 0.0689 \text{ cm}^{-1}$$

assuming that $W_{U^{25}} = 2.0 \text{ kg}$

$$\xi \overline{\Sigma}_s(E_c) \approx 0.019449 (54.2) + 0.158 (.016944) (4.8) = 1.06 \text{ cm}^{-1}$$

$$E_c = 0.181 \text{ ev}$$

$$E = 10 \text{ Mev}$$

$$U_c = 17.83 \text{ lethargy units}$$

$$U = 0$$

Core Neutron Age

The method followed is that of Deutsch.⁽⁷⁾

$$\tau_f = \tau_1 + \tau_2$$

$$\tau_1 = 24 \left(1 + \sum_{i=1}^n v_i\right)^2 / \left(\rho_{H_2O} + \sum_{i=1}^n v_i y_{1i}\right) \left(\rho_{H_2O} + \sum_{i=1}^n v_i x_{1i}\right)$$

$$\tau_2 = [6.9 + .44(2.08)] \left(1 + \sum_{i=1}^n v_i\right)^2 / \left(\rho_{H_2O} + \sum_{i=1}^n v_i y_{2i}\right) \left(\rho_{H_2O} + \sum_{i=1}^n v_i x_{2i}\right)$$

v_i = ratio of volume of material i to volume of water in the core.

	<u>y₁</u>	<u>y₂</u>	<u>x₁</u>	<u>x₂</u>
Al	0.103	0.006	0.922	0.195
C	0.115	0.046	0.986	0.618
U	1.59	0.027	0.77	1.25

However in the Argonaut the uranium is present in the form of U_3O_8 and also some account must be taken of the oxygen present. In order to correct for the form in which the uranium is present, each of the equivalent factors for U (y_1, y_2, x_1, x_2) is multiplied by the ratio of the number of U atoms per cm^3 in U_3O_8 to the number of U atoms per cm^3 in uranium metal. This ratio is 0.377. Each atom of O^{16} in the U_3O_8 is taken to be equivalent to an atom of carbon. Again the equivalent factors are adjusted by the ratio of atoms of O^{16} per cm^3 of U_3O_8 to the number of C atoms per cm^3 of graphite. This ratio is 0.600. The resulting constants are below.

<u>i</u>	<u>Material</u>	<u>v_i</u>	<u>y_{1i}</u>	<u>y_{2i}</u>	<u>x_{1i}</u>	<u>x_{2i}</u>
1	Al	.3064	0.103	0.006	0.922	0.195
2	C	.3619	0.115	0.046	0.986	0.618
3	U }	.0456	0.599	0.010	0.29	0.471
4	O }		0.069	0.028	0.592	0.371

These constants are based on the assumption that the core contains 2 kg of U^{235} .

$$\tau_1 = 38.23 \text{ cm}^2$$

$$\tau_2 = 17.19 \text{ cm}^2$$

$$\tau = 55.4 \text{ cm}^2$$

In hindsight it would seem that an adjustment of the v_i for U and O instead of the adjustment of the equivalent factors by the same ratio would be a more proper procedure. This would give a slightly lower τ equal to 55.3 cm^2 .

The τ_f computed by this method should be very close to the experimental quantity $\frac{1}{6} r^2$ for the mixture of materials used. The best fit to the experimental distribution of slowing down density in water is obtained by using a convolution of several diffusion kernels. The curve is not fit well by either the single diffusion kernel or by a Gaussian kernel (Fermi Age) but of the two the diffusion kernel is better. For this reason τ_f is used directly in the two group equations instead of

$$\tau_{2G} \equiv (e^{B^2 \tau_f} - 1) / B^2$$

which has little value for a water moderated reactor.

As the thickness of the reactor (i.e., the annular loading) becomes less, using τ_f with two-group theory no longer provides a very good correlation to the experimental critical mass. It is thought that three or four-group theory will be much better. This is being investigated further by the author.

Core Fast Diffusion Coefficient

The fast diffusion coefficient D_f is calculated using the fast transport cross sections given by Deutsch.⁽⁷⁾ His two fast groups must be collapsed to obtain an equivalent diffusion coefficient for a single fast group. Assuming no absorption, neglecting leakage from the fast groups, and identifying the single fast groups by the subscript f and Deutsch's two fast groups by the subscripts 1 and 2, we obtain for the flux

$$\phi_f = \phi_1 + \phi_2 \quad (1)$$

and for the slowing-down current

$$\phi_f \Sigma_f = \phi_1 \Sigma_1 = \phi_2 \Sigma_2 \quad , \quad (2)$$

where Σ_f , Σ_1 , Σ_2 are removal or slowing-down cross sections.

Using the two equations above we can obtain

$$\frac{1}{\Sigma_f} = \frac{1}{\Sigma_1} + \frac{1}{\Sigma_2} \quad ; \quad (3)$$

but

$$\tau_f = \frac{D_f}{\Sigma_f} = \tau_1 + \tau_2 = \frac{D_1}{\Sigma_1} + \frac{D_2}{\Sigma_2} \quad . \quad (4)$$

Hence

$$\begin{aligned} D_f &= \Sigma_f \tau_f = \frac{\Sigma_1 \Sigma_2}{\Sigma_1 + \Sigma_2} \left[\frac{D_1}{\Sigma_1} + \frac{D_2}{\Sigma_2} \right] = \frac{\Sigma_2}{\Sigma_1 + \Sigma_2} D_1 + \frac{\Sigma_1}{\Sigma_1 + \Sigma_2} D_2 \\ &= \frac{D_2/\tau_2}{\frac{D_1}{\tau_1} + \frac{D_2}{\tau_2}} D_1 + \frac{D_1/\tau_1}{\frac{D_1}{\tau_1} + \frac{D_2}{\tau_2}} D_2 \quad . \end{aligned} \quad (5)$$

Multiplying numerator and denominator by $\tau_1 \tau_2 / D_1 D_2$, we obtain

$$D_f = \frac{\tau_1 + \tau_2}{\frac{\tau_1}{D_1} + \frac{\tau_2}{D_2}} = \frac{\tau_f}{3(\tau_1 \Sigma_{tr1} + \tau_2 \Sigma_{tr2})} \quad , \quad (6)$$

where Σ_{tr1} and Σ_{tr2} are the transport cross sections as given by Deutsch.

Using his values for pure water gives $D_f^{H_2O} = 1.20$ cm.

For the Argonaut core:

$$\Sigma_{tr_1} = .019449(6.03) + .016944(2.47) + .01077(3.08) + .00024(6) \\ + .00064(3.09)$$

$$= .19572 \text{ cm}^{-1}$$

$$\Sigma_{tr_2} = .019449(16.44) + .016944(4.37) + .01077(1.78) + .00024(5) \\ + .00064(3.64)$$

$$= .41649 \text{ cm}^{-1}$$

Therefore

$$D_f = \frac{55.42}{3[38.23(.19572) + 17.19(.41649)]} = 1.262 \text{ cm}$$

A value of 1.29 cm is used for D_f in the PDQ calculations since the above method was learned only after the calculations were made. Using $D_f = 1.262$ would have caused a decrease in reactivity of approximately 0.3% $\Delta k/k$ and hence an increase in critical mass of 0.02 kg.⁽⁸⁾

In order to include leakage effects the balance equations for the flux and slowing down current would be written:

$$\phi_f = \phi_1 + \phi_2 \quad (1)$$

$$\phi_f \Sigma_f = \phi_2 \Sigma_2 = \phi_1 \Sigma_1 - \phi_2 D_2 B^2 \quad (2)$$

Then

$$\frac{1}{\Sigma_f} = \frac{(1 + \tau_2 B^2)}{\Sigma_1} + \frac{1}{\Sigma_2} \quad (3)$$

If D_f^* is defined as D_f taking leakage into account, then:

$$\frac{D_f^*}{D_f} = \frac{\Sigma_1 \Sigma_2}{(1 + \tau_2 B^2) \Sigma_2 + \Sigma_1} \cdot \frac{\Sigma_1 + \Sigma_2}{\Sigma_1 \Sigma_2}$$

assuming τ_f is the same with and without leakage.

Hence

$$\frac{D_f^*}{D_f} = \frac{1}{1 + \frac{D_2 B^2}{\Sigma_1 + \Sigma_2}} = \left(1 + \frac{B^2 \tau_1}{\frac{\Sigma_{tr_2}}{\Sigma_{tr_1}} + \frac{\tau_1}{\tau_2}} \right)^{-1}$$

For the Argonaut

$$B^2 \cong .0099$$

$$\tau_1 = 38.23$$

$$\tau_2 = 17.19$$

$$\Sigma_{tr_1} = .19572$$

$$\Sigma_{tr_2} = .41649$$

Hence

$$\frac{D_f^*}{D_f} = \left(1 + \frac{.3785}{\frac{.41649}{.19572} + \frac{38.23}{17.19}} \right)^{-1} = (1.087)^{-1} = .920$$

Hence

$$D_f^* = .92 D_f = .92(1.265) = 1.164$$

This was arrived at by assuming $\tau_f = \tau_1 + \tau_2$ which is true with no leakage ($B^2 \rightarrow 0$) from the equation $(1 + \tau_f B^2) = (1 + \tau_1 B^2)(1 + \tau_2 B^2)$

However for $B^2 = .0099$

$$\begin{aligned} \tau_f &= \frac{(1 + .0099\tau_1)(1 + .0099\tau_2) - 1}{.0099} = \frac{(1.3785)(1.1702) - 1}{.0099} \\ &= \frac{.6131}{.099} = 61.9 \text{ cm}^2 \end{aligned}$$

Then

$$\frac{D_f^{**}}{D_f} = .92 \frac{\tau_f}{\tau_1 + \tau_2} = .92 \frac{61.9}{55.42} = 1.028$$

$$D_f^{**} = 1.028 (1.265) = 1.300$$

Then

$$\frac{D_f^{**}}{\tau_f} = \frac{1.300}{61.9} = .02100 = \Sigma_1^{**}$$

while

$$\frac{D_f}{\tau_1 + \tau_2} = \frac{1.265}{55.42} = .02283 = \Sigma_1$$

$$\frac{D_f^*}{\tau_1 + \tau_2} = \frac{1.164}{55.42} = .02100 = \Sigma_1^*$$

The correct constants to use would seem to be D_f^{**} , Σ_1^{**} . This would give a critical mass higher than that calculated using the constants $D_f \Sigma_1$. However, if the effect of perturbations were taken into account the agreement between theory and experimental data would probably be better than that obtained using the original constants.

Disadvantage Factors

Fuel Plate Disadvantage Factor (P-3 Method)

When calculating the thermal group constants it is necessary to weigh the volume fractions of materials present by the average flux in each material in order that the number of neutron interactions in each material be correct. Hence it is necessary to find the disadvantage factor for the fuel plate which is defined as $\bar{\phi}_{H_2O}/\bar{\phi}_{FP}$ by the P_3 method and then the disadvantage factor for the graphite wedge $\bar{\phi}_{GW}/\bar{\phi}_{FP}$ by diffusion theory.

Assumptions:

- 1) Half fuel plate thickness = 0.12192 cm
- 2) Cladding is homogeneously mixed with the fuel matrix
- 3) Half H_2O thickness = 0.33909 cm
- 4) Fuel plate contains 20 grams U^{235}
- 5) Fuel and moderator are of infinite extent in the other two directions.
- 6) $T_N = 322^\circ K$

Fuel	$\bar{\sigma}_a$ (b)	σ_s (b)	$N \times 10^{-24}$ (atoms/cm ³)	Σ_a (cm ⁻¹)	Σ_s (cm ⁻¹)	Σ_{total} (cm ⁻¹)	Σ_{tr} (cm ⁻¹)
U^{235}	572	10	0.00047722	0.27297	0.004772	0.27774	0.27773
U^{238}	2.34	8.3	0.0019085	0.004466	0.015841	0.020307	0.020261
Al	0.195	1.4	0.052289	0.010196	0.073205	0.083401	0.081600
O	≈ 0	4.2	0.0063606	0	0.026715	0.026715	0.025601
Total				0.287632	0.120533	0.408163	0.405192

Moderator H_2O	0.562	85.5*	0.033334	0.018734	2.8501	2.8688	2.3691**
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* Calculated by numerically averaging H_2O scattering cross section over a Maxwellian distribution.

** Method of calculation is shown later.

The procedure and symbols used here are exactly those of Murray.⁽⁹⁾ Hence definitions and explanation will be avoided. All numerical work has been double checked for accuracy.

	b	c	κ_1^2	κ_3^2	κ_1	κ_3
Fuel	-12.264864	2.038706	0.1937774	1.168985	0.4402015	1.0811961
Mod.	-290.7537	38.35339	0.1324533	32.173507	0.3639414	5.6721693

	r_{11}	r_{13}	r_{21}	r_{23}	r_{31}	r_{33}
Fuel	-0.6534099	-0.2660313	0.4021656	-0.3504523	-0.1858857	0.3978533
Mod.	-0.05147532	-0.003302793	0.00262296	-0.4979308	-0.0001426086	0.4219301

$$\begin{aligned}
 r_{12} &= -r_{11} & r_{22} &= r_{21} & r_{32} &= -r_{31} \\
 r_{14} &= -r_{13} & r_{24} &= r_{23} & r_{34} &= -r_{33}
 \end{aligned}$$

	R_{11}	R_{13}	R_{21}	R_{23}	R_{31}	R_{33}
Fuel	-0.03508552	-0.03516973	0.4027449	-0.3535015	-0.009981324	0.05259680
Mod.	0.006368649	0.01106091	0.002642956	-1.740302	1.764387×10^{-5}	-1.413025

$$\begin{aligned}
 R_{12} &= R_{11} & R_{22} &= R_{21} & R_{32} &= R_{31} \\
 R_{14} &= R_{13} & R_{24} &= R_{23} & R_{34} &= R_{33}
 \end{aligned}$$

	Δ_1	Δ_3	Δ_1/Δ	Δ_3/Δ
Fuel	-0.003634874	-0.003865274	0.07541629	0.08019662
Mod.	0.03994547	0.0001168547	-0.8287878	-0.002424499

$$\begin{aligned}
 \omega &= 0.12192 \text{ cm} \\
 w &= 0.46101 \text{ cm}
 \end{aligned}$$

$$\begin{aligned}
 \Delta &= \Delta_1 \cosh \kappa_1 \omega + \Delta_3 \cosh \kappa_3 \omega - \overline{\Delta_1} \cosh \overline{\kappa_1} (\omega - w) \\
 &\quad - \overline{\Delta_3} \cosh \overline{\kappa_3} (\omega - w) = -0.048197465
 \end{aligned}$$

The bar over a symbol indicates the moderator.

The thermal neutron flux in the fuel plate and moderator respectively has the form:

$$\phi_0(z) = \frac{\Delta_1}{\Delta} \cosh \kappa_1 z + \frac{\Delta_3}{\Delta} \cosh \kappa_3 z$$

$$\overline{\phi}_0(z) = \frac{\overline{\Delta_1}}{\Delta} \cosh \overline{\kappa_1} (z-w) + \frac{\overline{\Delta_3}}{\Delta} \cosh \overline{\kappa_3} (z-w) + 1$$

The average values can be found by integrating over z .

$$\phi_{0\text{average}} = 0.155885$$

$$\overline{\phi}_{0\text{average}} = 0.164885$$

Hence the disadvantage factor is:

$$\text{D.F.} = \frac{\overline{\phi}_{0\text{average}}}{\phi_{0\text{average}}} = \frac{0.164885}{0.155885} = 1.0577$$

Fuel Plate - Graphite Wedge Disadvantage Factor

This calculation was not actually carried out by the author. The method of attack would be to homogenize the fuel box and consider the graphite wedge to be of rectangular cross section with thickness the mean thickness of the wedge. Then write down the appropriate one-group diffusion equations and calculate $\bar{\phi}_{GW}/\bar{\phi}_{\text{Fuel box}}$. Then using the values calculated in the P-3 problem one can find $\bar{\phi}_{GW}/\bar{\phi}_{FP} = 1.097$.

Effective Thermal Group Core Composition

The simplest and best way to make use of the disadvantage factors is in the definition of effective volume fractions for the materials in the core which will differ slightly from the actual volume fractions.

$$f_G = \frac{V_G \cdot \frac{\bar{\phi}_{GW}}{\bar{\phi}_{FP}}}{V_G \frac{\bar{\phi}_{GW}}{\bar{\phi}_{FP}} + V_{H_2O} \frac{\bar{\phi}_{H_2O}}{\bar{\phi}_{FP}} + V_F}$$

$$f_{H_2O} = \frac{V_{H_2O} \frac{\bar{\phi}_{H_2O}}{\bar{\phi}_{FP}}}{V_{FP} \frac{\bar{\phi}_{GW}}{\bar{\phi}_{FP}} + V_{H_2O} \frac{\bar{\phi}_{H_2O}}{\bar{\phi}_{FP}} + V_F}$$

$$f_F = \frac{V_F}{V_G \frac{\bar{\phi}_{GW}}{\bar{\phi}_{FP}} + V_{H_2O} \frac{\bar{\phi}_{H_2O}}{\bar{\phi}_{FP}} + V_F}$$

$$f_G = 0.210784$$

$$f_{H_2O} = 0.602339$$

$$f_{Al} = 0.186877 - 0.0121122W_{U^{25}}$$

$$f_{U_3O_8} = 0.0121122W_{U^{25}}$$

and for the homogenized core:

$$N_{H_2O} = 0.020078 \times 10^{24} \text{ molecules/cm}^3$$

$$N_G = 0.016913 \times 10^{24} \text{ atoms/cm}^3$$

$$N_{Al} = (0.011260 - 0.00072983 W_{U^{25}}) \times 10^{24} \text{ atoms/cm}^3$$

$$N_{U^{28}} = 0.00017484 W_{U^{25}} \times 10^{24} \text{ atoms/cm}^3$$

$$N_{U^{25}} = 0.000043717 W_{U^{25}} \times 10^{24} \text{ atoms/cm}^3$$

$$N_{O^{16}} = 0.00058267 W_{U^{25}} \times 10^{24} \text{ atoms/cm}^3 .$$

Transport Cross Section of H₂O

$$\Sigma_{tr}^{H_2O} = 1/3 L_{H_2O}^2 \Sigma_a^{H_2O} .$$

From ANL 5800,⁽⁵⁾ page 119 ,

$$L_{H_2O} = \frac{2.719}{\rho_{H_2O}} \left[\frac{T + 273.1}{295.1} \right]^{1/2} \left[\frac{1.0614}{1 + 0.0614 \left[\frac{T + 273.1}{293.1} \right]^{1/2}} \right]^{1/2} ,$$

with T the temperature in °C. Using

$$\rho_{H_2O} = 0.997044$$

$$T = 25^\circ C$$

$$L_{H_2O} = 2.7405 \text{ cm}$$

$$L_{H_2O}^2 = 7.5103 \text{ cm}^2 ,$$

and assuming that $T_N = 49^\circ C$ and $\Sigma_a^{H_2O} = 0.018734 \text{ cm}^{-1}$, there is found

$$\Sigma_{tr}^{H_2O} = 2.3691 \text{ cm}^{-1}$$

and

$$\sigma_{tr}^{H_2O} = 71.072 \text{ b} .$$

If it is assumed that $T_N = 37^\circ C$,

$$\Sigma_{tr}^{H_2O} = 2.3233 \text{ cm}^{-1}$$

and

$$\sigma_{tr}^{H_2O} = 69.699 \text{ b} .$$

Absorption Cross Section of Graphite

The latest measured results for L^2 of the graphite used in the Argonaut is 1700 cm^2 . Earlier estimates were as high as 2500 cm^2 .

Assuming that $D_{th}(\text{graphite}) = 0.916 \text{ cm}$ (which is shown later):

$$\Sigma_a(\text{graphite}) = \frac{D_{th}}{L^2} = \frac{0.916}{1700} = 0.000539 \text{ cm}^{-1}.$$

Core Thermal Diffusion Coefficient

$$\overline{\Sigma}_{tr} = \sum N_i^{\text{eff}} \sigma_{tri} \quad \text{where} \quad \sigma_{tri} \approx \sigma_{si}(1 - \mu_{oi}) + \sigma_{ai}$$

$$\overline{\Sigma}_{tr} = 1.5768 \text{ cm}^{-1} \text{ assuming } T_N = 49^\circ \text{C}$$

$$\overline{\Sigma}_{tr} = 1.5502 \text{ cm}^{-1} \text{ assuming } T_N = 37^\circ \text{C}.$$

These values are approximately independent of $W_{U^{25}}$ since the contribution due to the absorption of U^{235} is $\approx 0.05 \text{ cm}^{-1}$ assuming 2 kg of U^{235} present. Hence varying $W_{U^{25}}$ between 1.5 kg and 2.5 kg would make less than a 2% change in $\overline{\Sigma}_{tr}$.

$$D_{2c} = \frac{1}{3\overline{\Sigma}_{tr}} = 0.21140 \text{ cm} \text{ assuming } T_N = 49^\circ \text{C}$$

$$D_{2c} = 0.21503 \text{ cm} \text{ assuming } T_N = 37^\circ \text{C}.$$

Core Absorption and Fission Cross Sections

For $T_N = 49^\circ \text{C}$

$$\overline{\Sigma}_a = \sum_i N_i^{\text{eff}} \sigma_{ai} = 0.013545 + 0.025273 W_{U^{25}} \text{ cm}^{-1}$$

$$\overline{\Sigma}_f = 0.020984 W_{U^{25}} \text{ cm}^{-1}$$

$$\nu \overline{\Sigma}_f = 2.47 \overline{\Sigma}_f = 0.0518305 W_{U^{25}}.$$

For $T_N = 37^\circ \text{C}$

$$\overline{\Sigma}_a = 0.013812 + 0.025771 W_{U^{25}}$$

$$\nu \overline{\Sigma}_f = 0.0528516 W_{U^{25}}.$$

Core Thermal Diffusion Length

$$L_{\text{core}}^2 = \frac{1}{3\overline{\Sigma}_{tr} \overline{\Sigma}_a} = \frac{1}{0.064073 + 0.11955 W_{U^{25}}} \quad T_N = 49^\circ \text{C}$$

$$L_{\text{core}}^2 = \frac{1}{0.064234 + 0.11985 W_{U^{25}}} \quad T_N = 37^\circ \text{C}$$

Reflector Constants

Graphite

$$L^2 = 1700 \text{ cm}^2 \text{ (experimental)}$$

$$\tau = 365 \text{ cm}^2 \text{ (Reference 9)}$$

$$D_1 = 1.11 \text{ cm} \text{ (Reference 9)}$$

$$D_2 = 1/3\Sigma_{\text{tr}} = 0.916 \text{ cm}$$

$$\Sigma_a = 0.000539 \text{ cm}^{-1}$$

Water

$$L^2 = 7.510 \text{ cm}^2$$

$$\tau = 31.8 \text{ cm}^2 \text{ (calculated using Reference 7)}$$

$$D_1 = 1.143 \text{ cm} \text{ (Reference 9)}$$

$$D_2 = 1/3\Sigma_{\text{tr}} = 0.1435 \text{ cm}$$

$$\Sigma_a = 0.01910 \text{ cm}^{-1}$$

Fast Fission and Resonance Absorption

It is usually assumed with very small error that the product $p\epsilon$ is just equal to 1 in highly enriched reactors. This is assumed here.

TWO-GROUP CALCULATION OF CRITICAL MASS

A complete hand calculation of the critical mass of the Argonaut would be a tedious undertaking and not completely accurate. It would also be impossible to assess the effect of the curvature of the slab loading on the critical mass and the neutron fluxes except by extremely rough perturbation techniques. For these reasons the PDQ code on the IBM 704 was used in this calculation. It would be of interest, however, to compare the hand calculation with the machine calculation. For this reason the steps necessary in the hand calculation are outlined below.

1. Assume a critical mass.
2. Assume reflector savings in the x and y directions using modified one-group theory as a guide.*
3. Calculate the two-group reflector savings in the z direction.
4. Using the assumed reflector savings in the y direction and the calculated savings in the z direction calculate the two-group savings in the x direction.
5. Using the calculated z and x savings calculate the critical length and reflector savings in the y direction.
6. If the critical y dimension is greater than the actual dimension (57.6 cm) of the Argonaut a higher critical mass should be assumed; if it is less a lower critical mass is assumed.
7. Using the new critical mass and the previously calculated two-group savings in the x and y directions calculate a new two-group reflector savings in the z direction.
8. Using the previously calculated savings in the y direction and the new value of savings in the z direction calculate the two-group savings in the x direction.
9. Then calculate the new critical length and reflector savings in the y direction.
10. After making a series of such calculations plot $\frac{Y_{critical} - Y_{actual}}{Y_{actual}}$ vs critical mass. Where this curve intercepts $\frac{Y_{critical} - Y_{actual}}{Y_{actual}} = 0$ should give the correct critical mass if enough points on the curve are calculated.

The dimensions used for the equivalent straight slab in the criticality calculation are 15.24 cm in the x direction; 60.96 cm in the z direction; and

*For x, y, z directions see section on PDQ programing.

57.6 cm in the y direction. In order that the straight slab have the same volume as the actual configuration, the dimension in the y direction should have been 57.42 cm. This small difference should make less than 0.1% difference in the critical mass.

Reflector Savings in the z Direction

Since the two-group savings are larger than the modified one-group savings, assume that the savings in the x and y directions are given by the one-group savings for a large reactor ($B_c \ll 1$) even though the Argonaut is not particularly large. Hence⁽¹⁰⁾

$$\delta = \frac{D_c}{D_r} L_r = \frac{0.21503}{0.916} \times 41.23 = 9.68 \text{ cm} .$$

Thus the total savings will be approximately 19.4 cm in both the x and y directions.

Now assuming $W_{U^{235}} = 2.0 \text{ kg}$, the critical height of the reactor is calculated by two-group theory using as the x dimension $15.24 + 19.4 = 34.64 \text{ cm}$ and as the y dimension $57.6 + 19.4 = 77.0 \text{ cm}$, while taking both the top and bottom water reflector (9 in. thick) to be infinite in extent. The critical height turns out to be 146.6 cm while the equivalent height of a totally bare slab is 162 cm. Hence the reflector savings in the z direction is 15.4 cm. The experimental value of the reflector savings is 11.5 cm. The value used for the z reflector savings in the following work is 14.0 cm, a rough average between the experimental and theoretical values. However, if no experimental value had been available, the value of 15.4 cm could have been used. A better approximation can be made by assuming larger reflector savings in the x and y directions in order to obtain a critical height more nearly equal to the actual height (60.96 cm) in this calculation. Again, one is helped in this calculation by knowing that the critical mass of U^{235} is approximately 2 kg.

PDQ Programming⁽¹¹⁾ and Results

PDQ is an IBM 704 code to solve the two-dimensional few-group neutron diffusion equations. The number of groups is limited to four; the number of different compositions is limited to 35. A grid of arbitrary character is used to specify the geometry of the problem. The only limitation to the grid is that the number of grid points must be less than 2500. To reduce the three-dimensional Argonaut problem to two dimensions, a buckling $B_z^2 = (\pi/H_z)^2$ must be specified for the direction which is not mapped on the grid. From the previous section, $H_z = 60.96 + 14 = 74.96 \text{ cm}$ and $B_z^2 = 0.00176 \text{ cm}^{-2}$.

The output contains all of the input constants, a printed picture of the composition between all grid points, an eigenvalue λ , and a point by point readout of the fast and thermal fluxes. The eigenvalue λ is the ratio of a true number of neutrons per fission to that fictitious ν value required to maintain the calculated assembly just critical. It may be taken as equivalent to k_{eff} near criticality. Hence in order to find the critical mass, several problems must be run on the computer, each with a different assumed $W_{\text{U}25}$. Then λ is plotted versus $W_{\text{U}25}$. Where this curve crosses $\lambda = 1.00$ gives the critical mass of U^{235} .

The total number of problem inputs to the IBM 704 was eight. Four of these inputs used the constants for $T_N = 49^\circ\text{C}$ except for two differences. For graphite a $L^2 = 2500 \text{ cm}^2$ was used and in the core the constant $\tau = 58.1 \text{ cm}^2$ instead of 55.4 cm^2 was used. At the time these problems were run the best value available for L_G^2 was 2500 cm^2 . Using a larger τ resulted from a numerical mistake in the input constants. The geometric configuration used in these four calculations was a rectangular slab. The problem numbers were 61456 $\rightarrow$ 61459. The first problem assumed 3.0 kg of U^{235} present, the second 2.5 kg, the third 2.0 kg, and the fourth 1.5 kg. A curve was drawn through the four points (see Fig. 4) to give a critical mass of 1.97 kg U^{235} .

The next two problems approximated the curved shape of the Argonaut and the heterogeneity of the core by replacing the rectangular slab by six smaller rectangular slabs each equal in size to one fuel box. Each fuel box was separated by a constant thickness of graphite equal to the average thickness of one graphite wedge. The six fuel boxes were arranged to approximate the curved shape of the core (see Fig. 2). New constants had to be calculated for the homogenized fuel boxes. This was done using the same general methods as for the totally homogenized core. The first problem (61460) used $L_G^2 = 2500$ and $T_N = 49^\circ\text{C}$. The second problem (61461) used $L_G^2 = 1700$ and $T_N = 37^\circ\text{C}$. Each of these problems was calculated for only one assumed value of $W_{\text{U}25} = 1.97 \text{ kg}$. In order to find the critical mass of these configurations a line of the same slope as that drawn through the points of the first four problems was drawn through the one point given by the output of each of these problems. Where this line intercepts $\lambda = 1.00$ gives the critical mass.

The constants used for these two problems were:

$$\begin{aligned}
61460) \quad T_N &= 49^\circ\text{C} & B_Z^2 &= 0.00176 \text{ cm}^{-2} \\
W_{U25} &= 1.97 \text{ kg} & D_{1G} &= 1.11 \text{ cm} \\
L_G^2 &= 2500 \text{ cm}^2 & D_{2G} &= 0.9163 \text{ cm} \\
\Sigma_{aG} &= 0.000359 \text{ cm}^{-1} & \tau_G &= 365 \text{ cm}^2 \\
D_{1c} &= 1.266 \text{ cm} & \Sigma_{1G} &= \frac{D_{1g}}{\tau_{1g}} = 0.0030411 \text{ cm}^{-1} \\
D_{2c} &= 0.17536 \text{ cm} & \bar{\Sigma}_{ac} &= 0.080163 \text{ cm}^{-1} \\
\tau_c &= 46.4 \text{ cm}^2 & \nu \bar{\Sigma}_{fc} &= 0.0129376 \text{ cm}^{-1} \\
\Sigma_{1c} &= \frac{D_{1c}}{\tau_c} = 0.02728 \text{ cm}^{-1}
\end{aligned}$$

61461) The constants used here are the same as above except for:

$$\begin{aligned}
T_N &= 37^\circ\text{C} & D_{2c} &= 0.17851 \text{ cm} \\
L_G^2 &= 1700 \text{ cm}^2 & \bar{\Sigma}_{ac} &= 0.081742 \text{ cm}^{-1} \\
\Sigma_{aG} &= 0.000539 \text{ cm}^{-1} & \nu \bar{\Sigma}_{fc} &= 0.131925 \text{ cm}^{-1}
\end{aligned}$$

The correction for the change in T_N and L_{graphite}^2 found for the previous system can be applied back to the system with the solid homogeneous rectangular effect in both cases. The next problem (61458c) corrected problem (61458) in which $W_{U25} = 2.0 \text{ kg}$ by changing the one constant $\Sigma_{R1,2}$ the slowing down cross section to correspond to $\tau_c = 55.4 \text{ cm}^2$. Again using the assumption of similar slopes for all problems a critical mass $W_{U25} = 1.90 \text{ kg}$ was obtained when this problem was corrected to give $T_N = 37^\circ\text{C}$, $L_G^2 = 1700 \text{ cm}^2$. This is the best value for the straight slab approximation.

The last problem used the constants for the totally homogenized core with $T_N = 37^\circ\text{C}$ and $L_{\text{graphite}}^2 = 1700 \text{ cm}^2$ but very closely approximated the actual shape of the core by using a very fine mesh spacing and following the actual shape of the core very closely. Again $W_{U25} = 2.0 \text{ kg}$ was assumed and the critical mass was calculated to be 1.86 kg .

FIGURE I

FIGURE 2

FIGURE 3

FIGURE 4

FIGURE 5

FIGURE 6

FIGURE 7

FIGURE 8

FIGURE 9

FIGURE 10

FIGURE II

61458 CRIT. WT. NO. 3 ARG. SLAB - 2KG

XY

PDQ02

2 GROUPS 2 COMPS SS= 41 TT= 60 B.C.=0,0,0,0

B SQ	LAMBDA	EPSILON	CHI 1	CHI 2	CHI 3
0.001760	1.010000	0.050000	1.000000	0.	0.

GROUP	COMP	D	SIGMA A	SIGMA R	NU SIGMA F	PHI
1	1	1.110000	0.	0.003041	0.	50.000
1	2	1.290 00	0.	0.023285	0.	75.000
2	1	0.916300	0.000359		0.	50.000
2	2	0.211400	0.064091		0.103660	30.000

MESH	COL	MESH	COL	MESH	COL	MESH	COL	MESH	COL	MESH	COL
30.0000	3	20.0000	7	1.8000	17	1.5240	27	1.8000	37	20.0000	40
28.0000	41										

MESH	ROW	MESH	ROW	MESH	ROW
4.7400	10	1.4400	50	4.7400	60

61458	CRIT. WT. NO. 3 ARG. SLAB - 2KG					XY	PUJ02	FLJX..GROUP 1		LA 183A 1.018300		
	1	2	3	4	5	6	7	8	9	10	11	12
1	.000	.001	.006	.021	.067	.194	.478	.507	.537	.567	.597	.625
2	.000	.002	.012	.043	.137	.400	.999	1.064	1.129	1.175	1.200	1.223
3	.001	.003	.018	.065	.211	.626	1.610	1.721	1.834	1.948	2.061	2.172
4	.001	.004	.024	.089	.291	.885	2.359	2.536	2.717	2.902	3.087	3.270
5	.001	.005	.031	.113	.379	1.183	3.297	3.570	3.854	4.146	4.441	4.730
6	.001	.006	.037	.139	.475	1.528	4.472	4.889	5.328	5.783	6.250	6.721
7	.001	.007	.044	.166	.578	1.921	5.926	6.553	7.221	7.925	8.657	9.410
8	.001	.008	.050	.194	.688	2.358	7.673	8.599	9.597	10.666	11.801	12.993
9	.001	.009	.056	.222	.801	2.830	9.684	11.006	12.452	14.029	15.742	17.571
10	.002	.010	.062	.249	.914	3.316	11.866	13.665	15.657	17.867	20.324	23.057
11	.002	.010	.064	.256	.947	3.463	12.532	14.480	16.643	19.052	21.745	24.754
12	.002	.011	.066	.264	.970	3.607	13.196	15.294	17.628	20.236	23.159	26.440
13	.002	.011	.067	.272	1.012	3.749	13.852	16.096	18.601	21.405	24.559	28.119
14	.002	.011	.069	.279	1.043	3.888	14.496	16.886	19.555	22.551	25.928	29.770
15	.002	.011	.071	.286	1.074	4.024	15.124	17.654	20.483	23.663	27.254	31.325
16	.002	.011	.072	.292	1.103	4.154	15.730	18.395	21.378	24.734	28.528	32.835
17	.002	.012	.073	.299	1.130	4.279	16.311	19.104	22.233	25.756	29.742	34.266
18	.002	.012	.075	.305	1.157	4.397	16.864	19.777	23.043	26.722	30.887	35.618
19	.002	.012	.076	.310	1.182	4.509	17.384	20.410	23.803	27.628	31.958	36.879
20	.002	.012	.077	.316	1.205	4.614	17.869	20.979	24.510	28.468	32.950	38.044
21	.002	.012	.078	.320	1.226	4.710	18.316	21.542	25.159	29.239	33.860	39.111
22	.002	.012	.079	.325	1.246	4.797	18.723	22.034	25.749	29.938	34.685	40.074
23	.002	.012	.080	.329	1.263	4.875	19.087	22.475	26.275	30.562	35.416	40.932
24	.002	.013	.080	.332	1.278	4.944	19.407	22.861	26.736	31.107	36.058	41.681
25	.002	.013	.081	.335	1.291	5.003	19.681	23.192	27.131	31.574	36.605	42.320
26	.002	.013	.082	.338	1.302	5.052	19.908	23.465	27.456	31.958	37.056	42.846
27	.002	.013	.082	.340	1.310	5.090	20.086	23.679	27.712	32.260	37.409	43.253
28	.002	.013	.082	.341	1.316	5.117	20.215	23.834	27.896	32.477	37.664	43.550
29	.002	.013	.082	.342	1.320	5.134	20.294	23.924	28.009	32.610	37.826	43.736
30	.002	.013	.083	.344	1.321	5.140	20.322	23.963	28.050	32.656	37.871	43.801

61458	CRIT. WT. NO. 3 ARG. SLAB - 2KG				XY	PLW02	FLUX..GROUP 1		LF FLX 1.0.6306			
	13	14	15	16	17	18	19	20	21	22	23	24
1	.652	.678	.702	.723	.741	.753	.763	.770	.775	.776	.774	.770
2	1.382	1.440	1.493	1.539	1.579	1.607	1.629	1.645	1.655	1.658	1.655	1.645
3	2.280	2.381	2.474	2.557	2.629	2.679	2.719	2.748	2.766	2.772	2.766	2.748
4	3.447	3.616	3.772	3.913	4.035	4.121	4.189	4.239	4.269	4.279	4.269	4.239
5	5.024	5.301	5.560	5.795	6.000	6.146	6.263	6.348	6.400	6.417	6.400	6.347
6	7.189	7.644	8.076	8.472	8.821	9.071	9.273	9.421	9.511	9.542	9.511	9.421
7	10.170	10.923	11.651	12.331	12.940	13.381	13.739	14.004	14.166	14.221	14.166	14.004
8	14.228	15.484	16.732	17.932	19.031	19.839	20.501	20.993	21.295	21.507	21.495	20.993
9	19.572	21.668	23.845	26.039	28.141	29.709	30.991	31.936	32.513	32.707	32.514	31.936
10	26.099	29.485	33.250	37.420	41.980	45.343	47.883	49.665	50.723	51.074	50.724	49.665
11	28.132	31.931	36.218	41.020	46.740	50.614	53.477	55.479	56.669	57.065	56.671	55.483
12	30.159	34.363	39.150	44.647	51.056	55.373	58.563	60.794	62.122	62.564	62.124	60.796
13	32.153	36.743	41.992	48.027	55.060	59.779	63.282	65.738	67.202	67.689	67.204	65.743
14	34.091	39.044	44.718	51.250	58.809	63.898	67.698	70.368	71.961	72.492	71.964	70.370
15	35.958	41.248	47.311	54.235	62.330	67.763	71.839	74.710	76.426	76.998	76.428	74.712
16	37.739	43.343	49.764	57.141	65.633	71.384	75.717	78.776	80.606	81.216	80.608	78.781
17	39.426	45.319	52.070	59.817	68.722	74.767	79.338	82.570	84.505	85.151	84.508	82.575
18	41.010	47.170	54.223	62.312	71.597	77.914	82.702	86.094	88.126	88.805	88.129	86.098
19	42.486	48.891	56.221	64.621	74.257	80.822	85.809	89.247	91.468	92.176	91.470	89.250
20	43.848	50.476	58.058	66.743	76.698	83.490	88.658	92.327	94.529	95.264	94.530	92.330
21	45.092	51.922	59.732	68.674	78.919	85.915	91.246	95.034	97.307	98.066	97.309	95.036
22	46.216	53.226	61.240	70.411	80.215	88.094	93.571	97.464	99.802	100.582	99.802	97.465
23	47.214	54.384	62.577	71.952	82.606	90.026	95.630	99.616	102.010	102.809	102.010	99.616
24	48.086	55.393	63.743	73.294	84.227	91.707	97.421	101.488	103.930	104.745	103.929	101.487
25	48.828	56.253	64.725	74.425	85.537	93.135	98.943	103.077	105.560	106.388	105.559	103.075
26	49.439	56.960	65.550	75.372	86.614	94.209	100.193	104.382	106.899	107.738	106.897	104.380
27	49.917	57.513	66.188	76.107	87.456	95.226	101.170	105.403	107.945	108.793	107.943	105.399
28	50.262	57.911	66.647	76.635	88.062	95.887	101.873	106.137	108.697	109.551	108.695	106.132
29	50.472	58.154	66.927	76.956	88.431	96.289	102.301	106.583	109.152	110.013	109.152	106.578
30	50.547	58.240	67.026	77.076	88.542	96.432	102.454	106.742	109.318	110.177	109.315	106.737

61458	CRIT. WT. NO. 3 ARG. SLAB - 2KG					XY	PLD02	FLUX..GROJP 1		LAMBDA 1.018308		
	25	26	27	28	29	30	31	32	33	34	35	36
1	.763	.753	.740	.722	.702	.678	.653	.625	.597	.567	.537	.507
2	1.629	1.607	1.579	1.539	1.492	1.440	1.383	1.322	1.259	1.194	1.129	1.064
3	2.718	2.678	2.628	2.556	2.473	2.379	2.278	2.172	2.060	1.947	1.833	1.720
4	4.188	4.120	4.034	3.912	3.771	3.614	3.446	3.269	3.086	2.901	2.716	2.535
5	6.262	6.145	5.999	5.794	5.559	5.299	5.023	4.734	4.440	4.144	3.853	3.569
6	9.272	9.071	8.821	8.471	8.075	7.643	7.188	6.720	6.248	5.781	5.326	4.888
7	13.739	13.381	12.940	12.331	11.650	10.923	10.169	9.408	8.656	7.923	7.220	6.552
8	20.502	19.840	19.033	17.933	16.733	15.485	14.228	12.992	11.800	10.665	9.595	8.597
9	30.994	29.712	28.145	26.043	23.848	21.671	19.574	17.592	15.742	14.028	12.451	11.004
10	47.888	45.349	41.987	37.426	33.256	29.491	26.103	23.060	20.325	17.867	15.656	13.663
11	53.483	50.621	46.749	41.098	36.225	31.938	28.138	24.758	21.745	19.053	16.643	14.479
12	58.570	55.382	51.065	44.656	39.158	34.370	30.166	26.453	23.163	20.238	17.628	15.293
13	63.289	59.788	55.070	48.046	42.001	36.751	32.160	28.125	24.564	21.408	18.603	16.098
14	67.705	63.908	58.819	51.260	44.727	39.053	34.100	29.757	25.934	22.555	19.558	16.887
15	71.846	67.772	62.340	54.295	47.321	41.257	35.966	31.333	27.261	23.669	20.487	17.656
16	75.724	71.393	65.643	57.151	49.774	43.352	37.748	32.843	28.536	24.741	21.383	18.398
17	79.344	74.775	68.731	59.827	52.079	45.329	39.435	34.277	29.750	25.763	22.239	19.109
18	82.708	77.921	71.606	62.370	54.232	47.180	41.020	35.628	30.896	26.730	23.050	19.783
19	85.814	80.828	74.264	64.628	56.229	48.900	42.495	36.888	31.968	27.637	23.811	20.417
20	88.662	83.494	76.704	66.749	58.065	50.484	43.857	38.053	32.960	28.478	24.519	21.007
21	91.249	85.918	78.923	68.678	59.738	51.929	45.100	39.119	33.869	29.249	25.169	21.550
22	93.572	88.096	80.918	70.414	61.244	53.231	46.222	40.082	34.692	29.947	25.758	22.043
23	95.630	90.026	82.687	71.953	62.580	54.387	47.219	40.938	35.424	30.570	26.284	22.483
24	97.421	91.706	84.226	73.294	63.744	55.395	48.089	41.686	36.064	31.115	26.745	22.869
25	98.941	93.133	85.535	74.433	64.733	56.253	48.829	42.323	36.609	31.580	27.138	23.199
26	100.197	94.305	86.610	75.370	65.547	56.958	49.439	42.847	37.059	31.963	27.462	23.472
27	101.166	95.222	87.451	76.102	66.184	57.509	49.915	43.258	37.410	32.263	27.716	23.685
28	101.868	95.881	88.055	76.629	66.641	57.976	50.258	43.553	37.664	32.478	27.899	23.838
29	102.296	96.282	88.423	76.949	66.920	58.147	50.466	43.732	37.817	32.609	28.010	23.932
30	102.447	96.425	88.554	77.062	67.016	58.232	50.540	43.795	37.871	32.655	28.049	23.964

61458 CRIT. WT. NO. 3 ARG. SLAB - 2KG

XY

PDQ02

FLUX..GROUP 1

LAMBDA 1.018308

	37	38	39	40
1	.478	.194	.067	.019
2	.999	.400	.136	.039
3	1.611	.626	.209	.059
4	2.350	.884	.289	.081
5	3.296	1.183	.376	.103
6	4.471	1.527	.471	.127
7	5.924	1.920	.574	.151
8	7.671	2.357	.684	.177
9	9.682	2.829	.796	.202
10	11.863	3.315	.909	.226
11	12.530	3.461	.942	.233
12	13.194	3.605	.975	.240
13	13.851	3.747	1.007	.247
14	14.496	3.886	1.037	.253
15	15.124	4.021	1.067	.260
16	15.731	4.151	1.096	.266
17	16.314	4.275	1.124	.271
18	16.867	4.394	1.150	.277
19	17.380	4.506	1.174	.282
20	17.875	4.610	1.197	.286
21	18.323	4.706	1.218	.291
22	18.731	4.794	1.237	.295
23	19.095	4.872	1.254	.298
24	19.415	4.941	1.269	.301
25	19.689	5.000	1.282	.304
26	19.915	5.049	1.293	.306
27	20.092	5.088	1.301	.308
28	20.220	5.115	1.307	.309
29	20.297	5.132	1.311	.310
30	20.324	5.138	1.312	.310

61458 CRIT. WT. NO. 3 ARG. SLAB - 2nd					XY	F 302	FLUX..GROUP 2		LA FLA 1.018308			
	1	2	3	4	5	6	7	8	9	10	11	12
1	.004	.018	.066	.164	.370	.762	1.340	1.335	1.441	1.486	1.528	1.560
2	.009	.036	.132	.328	.743	1.536	2.732	2.827	2.924	3.016	3.103	3.186
3	.013	.053	.198	.492	1.121	2.331	4.186	4.330	4.487	4.631	4.768	4.898
4	.017	.070	.263	.656	1.504	3.157	5.738	5.953	6.163	6.367	6.562	6.747
5	.021	.087	.327	.819	1.893	4.017	7.412	7.699	7.981	8.255	8.517	8.766
6	.025	.103	.389	.981	2.286	4.911	9.222	9.521	9.855	10.302	10.649	10.971
7	.029	.119	.449	1.141	2.680	5.835	11.152	11.625	12.083	12.529	12.956	13.359
8	.033	.134	.507	1.295	3.070	6.776	13.211	13.783	14.347	14.873	15.414	15.900
9	.036	.147	.561	1.441	3.448	7.715	15.340	16.028	16.706	17.361	17.978	18.542
10	.039	.160	.610	1.578	3.807	8.628	17.485	18.303	19.109	19.883	20.606	21.249
11	.040	.163	.624	1.616	3.910	8.895	18.126	18.985	19.833	20.649	21.410	22.087
12	.041	.166	.637	1.654	4.010	9.155	18.758	19.661	20.552	21.412	22.214	22.929
13	.041	.169	.650	1.690	4.107	9.409	19.379	20.326	21.263	22.167	23.014	23.771
14	.042	.172	.662	1.724	4.200	9.654	19.986	20.978	21.960	22.912	23.805	24.608
15	.043	.175	.674	1.757	4.289	9.891	20.576	21.613	22.642	23.641	24.582	25.433
16	.043	.178	.684	1.788	4.374	10.118	21.146	22.227	23.303	24.350	25.340	26.240
17	.044	.180	.695	1.818	4.455	10.334	21.693	22.818	23.939	25.033	26.072	27.021
18	.044	.182	.704	1.845	4.531	10.539	22.214	23.381	24.547	25.687	26.773	27.770
19	.045	.184	.713	1.871	4.602	10.731	22.706	23.913	25.122	26.306	27.438	28.481
20	.045	.186	.721	1.895	4.667	10.910	23.165	24.411	25.660	26.886	28.061	29.148
21	.046	.188	.729	1.916	4.728	11.074	23.590	24.872	26.158	27.423	28.638	29.700
22	.046	.190	.735	1.936	4.782	11.223	23.977	25.292	26.613	27.914	29.166	30.331
23	.046	.191	.741	1.953	4.831	11.357	24.325	25.669	27.021	28.355	29.639	30.838
24	.046	.192	.746	1.969	4.874	11.474	24.631	26.001	27.381	28.743	30.057	31.284
25	.047	.193	.751	1.981	4.910	11.575	24.894	26.287	27.689	29.076	30.414	31.667
26	.047	.194	.754	1.992	4.941	11.658	25.111	26.522	27.945	29.351	30.711	31.984
27	.047	.194	.757	2.001	4.964	11.723	25.282	26.708	28.146	29.568	30.944	32.233
28	.047	.195	.759	2.007	4.981	11.770	25.405	26.842	28.291	29.725	31.112	32.413
29	.047	.195	.760	2.010	4.992	11.799	25.481	26.924	28.379	29.820	31.214	32.525
30	.047	.195	.761	2.011	4.996	11.809	25.507	26.953	28.411	29.854	31.251	32.562

61458	CRIT. WT. NO. 3 ARG. SLAB - 2KG					XY	PDW02	FLUX..GROUP 2		LAMBDA 1.018308		
	13	14	15	16	17	18	19	20	21	22	23	24
1	1.606	1.640	1.670	1.697	1.719	1.735	1.747	1.756	1.761	1.762	1.761	1.755
2	3.260	3.333	3.396	3.400	3.497	3.529	3.554	3.572	3.583	3.587	3.583	3.572
3	5.010	5.130	5.229	5.316	5.391	5.440	5.480	5.509	5.526	5.532	5.526	5.509
4	6.910	7.077	7.219	7.343	7.447	7.520	7.576	7.617	7.642	7.650	7.642	7.617
5	8.998	9.216	9.401	9.567	9.707	9.804	9.881	9.936	9.969	9.980	9.969	9.936
6	11.271	11.545	11.790	12.004	12.183	12.306	12.403	12.473	12.515	12.529	12.515	12.473
7	13.733	14.071	14.370	14.627	14.840	14.985	15.098	15.179	15.227	15.243	15.227	15.179
8	16.343	16.734	17.068	17.343	17.560	17.702	17.810	17.887	17.933	17.948	17.933	17.887
9	19.037	19.447	19.758	19.966	20.076	20.124	20.161	20.192	20.215	20.223	20.215	20.193
10	21.780	22.160	22.352	22.479	21.872	21.415	21.226	21.180	21.187	21.195	21.187	21.181
11	22.645	23.040	23.218	23.102	22.575	21.341	21.219	21.384	21.551	21.615	21.551	21.385
12	23.518	23.937	24.127	24.009	23.476	22.208	22.159	22.436	22.689	22.784	22.689	22.437
13	24.399	24.852	25.070	24.981	24.492	23.381	23.442	23.811	24.124	24.241	24.125	23.812
14	25.280	25.775	26.034	25.988	25.558	24.637	24.822	25.275	25.640	25.775	25.641	25.276
15	26.153	26.695	27.001	27.006	26.633	25.891	26.194	26.727	27.139	27.290	27.140	26.728
16	27.009	27.600	27.957	28.012	27.692	27.104	27.515	28.121	28.577	28.742	28.578	28.123
17	27.840	28.481	28.886	28.991	28.716	28.260	28.767	29.439	29.934	30.112	29.935	29.441
18	28.638	29.327	29.780	29.928	29.694	29.349	29.939	30.671	31.202	31.392	31.203	30.672
19	29.395	30.130	30.627	30.816	30.616	30.364	31.028	31.812	32.375	32.575	32.376	31.813
20	30.106	30.884	31.421	31.646	31.474	31.301	32.029	32.860	33.451	33.661	33.452	32.861
21	30.765	31.582	32.155	32.412	32.265	32.158	32.941	33.813	34.430	34.648	34.430	33.814
22	31.366	32.218	32.825	33.109	32.932	32.931	33.762	34.670	35.308	35.534	35.308	34.670
23	31.906	32.790	33.424	33.733	33.523	33.618	34.490	35.429	36.087	36.319	36.086	35.429
24	32.381	33.292	33.951	34.280	34.184	34.217	35.124	36.090	36.763	37.001	36.763	36.089
25	32.788	33.722	34.402	34.748	34.663	34.728	35.663	36.651	37.336	37.581	37.338	36.650
26	33.125	34.078	34.775	35.135	35.059	35.148	36.106	37.112	37.811	38.057	37.810	37.111
27	33.390	34.358	35.068	35.438	35.369	35.477	36.452	37.472	38.180	38.429	38.179	37.471
28	33.581	34.560	35.279	35.657	35.592	35.713	36.702	37.732	38.445	38.696	38.445	37.730
29	33.698	34.683	35.409	35.790	35.728	35.858	36.854	37.889	38.607	38.859	38.606	37.888
30	33.730	34.700	35.453	35.847	35.777	35.909	36.907	37.946	38.664	38.917	38.663	37.944

61458 CRIT. WT. NO. 3 ARG. SLAB - 2K0												
					XY	PJQ02	FLUX..GROUP 2			LAMBDA 1.018308		
	25	26	27	28	29	30	31	32	33	34	35	36
1	1.747	1.734	1.719	1.696	1.670	1.639	1.605	1.568	1.528	1.485	1.441	1.395
2	3.554	3.529	3.496	3.450	3.397	3.332	3.262	3.185	3.102	3.015	2.923	2.828
3	5.480	5.440	5.389	5.316	5.229	5.129	5.018	4.897	4.761	4.629	4.485	4.336
4	7.576	7.519	7.447	7.342	7.219	7.077	6.919	6.746	6.561	6.366	6.162	5.951
5	9.881	9.805	9.707	9.567	9.400	9.210	8.997	8.765	8.516	8.253	7.979	7.697
6	12.403	12.306	12.183	12.004	11.790	11.545	11.271	10.971	10.648	10.308	9.953	9.588
7	15.098	14.985	14.840	14.677	14.370	14.071	13.733	13.359	12.956	12.528	12.082	11.623
8	17.811	17.702	17.560	17.344	17.065	16.734	16.343	15.900	15.414	14.893	14.346	13.782
9	20.101	20.125	20.077	19.900	19.704	19.447	19.038	18.543	17.978	17.361	16.706	16.028
10	21.427	21.416	21.872	22.279	22.352	22.166	21.783	21.250	20.606	19.884	19.109	18.303
11	21.220	21.342	22.575	23.103	23.213	23.041	22.645	22.087	21.411	20.650	19.833	18.985
12	22.107	22.209	23.477	24.002	24.127	23.938	23.513	22.929	22.214	21.412	20.552	19.660
13	23.444	23.382	24.492	24.981	25.071	24.852	24.400	23.771	23.011	22.167	21.262	20.325
14	24.823	24.639	25.558	25.989	26.044	25.775	25.280	24.608	23.801	22.911	21.959	20.976
15	26.195	25.892	26.633	27.006	27.001	26.694	26.157	25.432	24.581	23.640	22.640	21.610
16	27.517	27.106	27.692	28.012	27.956	27.599	27.008	26.238	25.338	24.348	23.300	22.224
17	28.768	28.761	28.716	28.990	28.845	28.479	27.836	27.017	26.069	25.030	23.936	22.813
18	29.941	29.350	29.694	29.927	29.776	29.325	28.635	27.767	26.770	25.683	24.542	23.376
19	31.020	30.365	30.615	30.914	30.602	30.128	29.392	28.478	27.433	26.301	25.116	23.907
20	32.030	31.302	31.473	31.645	31.419	30.881	30.102	29.144	28.056	26.880	25.653	24.404
21	32.941	32.158	32.263	32.410	32.107	31.578	30.760	29.761	28.632	27.416	26.150	24.862
22	33.762	32.830	32.980	33.107	32.821	32.214	31.361	30.324	29.158	27.906	26.603	25.281
23	34.489	33.617	33.670	33.740	33.420	32.784	31.900	30.831	29.631	28.345	27.011	25.657
24	35.123	34.216	34.101	34.270	33.946	33.286	32.374	31.276	30.047	28.732	27.368	25.988
25	35.662	34.726	34.660	34.744	34.397	33.716	32.781	31.658	30.403	29.063	27.676	26.272
26	36.105	35.146	35.055	35.137	34.700	34.071	33.117	31.974	30.69	29.338	27.930	26.506
27	36.451	35.474	35.365	35.43	35.000	34.350	33.380	32.277	30.931	29.554	28.130	26.691
28	36.700	35.711	35.588	35.61	35.273	34.550	33.571	32.401	31.098	29.709	28.274	26.823
29	36.857	35.855	35.724	35.7	35.3	34.672	33.685	32.510	31.200	29.804	28.361	26.904
30	36.905	35.906	35.772	35.83	35.44	34.716	33.777	32.548	31.222	29.837	28.392	26.932

61458 CRIT. WT. NO. 3 ARGO SLAB - LKO

XY

P 002

FLUX..GROUP 2

L EDA 1.010408

	37	38	39	40
1	1.347	.760	.363	.147
2	2.731	1.031	.720	.240
3	4.187	2.324	1.098	.435
4	5.736	3.147	1.474	.581
5	7.400	4.034	1.856	.726
6	9.217	4.897	2.242	.870
7	11.157	5.818	2.629	1.011
8	13.210	6.758	3.013	1.148
9	15.338	7.696	3.386	1.279
10	17.485	8.608	3.739	1.400
11	18.125	8.873	3.840	1.434
12	18.756	9.133	3.939	1.468
13	19.377	9.386	4.034	1.500
14	19.982	9.631	4.125	1.531
15	20.572	9.867	4.213	1.560
16	21.147	10.093	4.297	1.582
17	21.688	10.308	4.376	1.614
18	22.208	10.512	4.451	1.639
19	22.698	10.703	4.521	1.662
20	23.156	10.881	4.586	1.683
21	23.570	11.044	4.645	1.702
22	23.955	11.192	4.699	1.720
23	24.317	11.324	4.746	1.735
24	24.616	11.440	4.788	1.749
25	24.877	11.539	4.824	1.760
26	25.092	11.621	4.852	1.770
27	25.262	11.685	4.876	1.777
28	25.385	11.731	4.892	1.783
29	25.450	11.759	4.902	1.786
30	25.485	11.764	4.905	1.787

61461 ARG. CURVED SLAB NO. 2 - 1.97KG L.T.

XY PDQ02

2 GROUPS 2 COMPS SS= 44 TT= 56 B.C.=0,0,0,0

B SQ LAMBDA EPSILON CHI 1 CHI 2 CHI 3
0.001760 1.000000 0.050000 1.000000 0. 0.

GROUP	COMP	D	SIGMA A	SIGMA R	NU SIGMA F	PHI
1	1	1.110000	0.	0.003041	0.	50.000
1	2	1.266000	0.	0.027280	0.	75.000
2	1	0.916300	0.000539		0.	50.000
2	2	0.178510	0.081742		0.131925	30.000

MESH	COL	MESH	COL	MESH	COL	MESH	COL	MESH	COL	MESH	COL
35.0000	4	18.0000	6	2.0000	12	1.0886	34	2.0000	40	20.0000	43
25.6000	44										

MESH	ROW	MESH	ROW	MESH	ROW	MESH	ROW	MESH	ROW	MESH	ROW
5.9250	8	1.5114	13	1.2260	15	1.5114	20	1.2260	22	1.5114	27
1.2260	29	1.5114	34	1.2260	36	1.5114	41	1.2260	43	1.5114	48
5.9250	56										

61461 ARG. CURVED SLAB NO. 2 - 1.97KG L.T.												
				XY		PDQ02	FLUX..GROUP 1			LAMBDA _ .980050		
1	2	3	4	5	6	7	8	9	10	11	12	
1	.000	.003	.019	.119	.326	.713	.759	.806	.852	.897	.939	.979
2	.001	.006	.039	.246	.689	1.532	1.637	1.744	1.849	1.953	2.052	2.146
3	.001	.008	.059	.306	1.116	2.572	2.765	2.961	3.159	3.354	3.543	3.724
4	.002	.011	.082	.546	1.641	3.965	4.296	4.639	4.987	5.336	5.679	6.009
5	.002	.014	.105	.749	2.291	5.855	6.412	6.995	7.598	8.213	8.828	9.431
6	.002	.017	.131	.937	3.077	8.389	9.305	10.282	11.311	12.380	13.476	14.579
7	.003	.021	.157	1.164	4.029	11.673	13.144	14.737	16.449	18.271	20.191	22.187
8	.003	.023	.182	1.403	5.089	15.709	17.982	20.483	23.240	26.199	29.418	32.875
9	.003	.024	.189	1.463	5.368	16.830	19.349	22.134	25.197	28.545	32.181	36.096
10	.003	.025	.195	1.523	5.649	17.981	20.765	23.854	27.269	31.022	35.115	39.534
11	.003	.025	.201	1.582	5.930	19.155	22.220	25.634	29.428	33.623	38.226	43.210
12	.003	.026	.207	1.640	6.210	20.345	23.703	27.461	31.660	36.337	41.510	47.155
13	.003	.027	.212	1.696	6.486	21.539	25.203	29.319	33.945	39.140	44.953	51.388
14	.003	.027	.217	1.741	6.706	22.504	26.419	30.833	35.816	41.451	47.824	55.009
15	.003	.028	.221	1.784	6.921	23.459	27.628	32.341	37.685	43.766	50.713	58.709
16	.003	.028	.226	1.834	7.177	24.513	29.094	34.174	39.957	46.578	54.205	63.119
17	.004	.029	.231	1.882	7.423	25.729	30.517	35.957	42.168	49.292	57.519	67.143
18	.004	.029	.235	1.927	7.654	26.796	31.884	37.669	44.288	51.803	60.627	70.759
19	.004	.029	.239	1.969	7.874	27.800	33.170	39.294	46.307	54.352	63.565	74.060
20	.004	.030	.242	2.007	8.068	28.729	34.370	40.814	48.212	56.712	66.425	77.288
21	.004	.030	.245	2.034	8.213	29.420	35.265	41.956	49.658	58.546	68.764	80.233
22	.004	.030	.247	2.059	8.345	30.047	36.082	43.002	50.995	60.276	71.099	83.790
23	.004	.031	.250	2.086	8.486	30.725	36.966	44.138	52.451	62.171	73.673	87.580
24	.004	.031	.252	2.108	8.603	31.288	37.699	45.075	53.641	63.689	75.631	90.104
25	.004	.031	.253	2.125	8.694	31.728	38.269	45.796	54.537	64.780	76.921	91.563
26	.004	.031	.255	2.137	8.759	32.040	38.669	46.294	55.136	65.453	77.573	92.002
27	.004	.031	.255	2.144	8.796	32.219	38.877	46.574	55.458	65.770	77.704	91.336
28	.004	.031	.255	2.145	8.806	32.265	38.956	46.646	55.540	65.842	77.664	90.775

61461 ARG. CURVED SLAB NO. 2 - 1.97KG L.T.													XY	PDQ02	FLUX..GROUP 1	LAMBDA	.980050	
	13	14	15	16	17	18	19	20	21	22	23	24						
1	1.000	1.018	1.030	1.052	1.067	1.080	1.091	1.100	1.107	1.112	1.115	1.110						
2	2.193	2.238	2.279	2.318	2.352	2.383	2.409	2.431	2.448	2.461	2.468	2.471						
3	3.814	3.901	3.982	4.057	4.125	4.186	4.239	4.283	4.319	4.344	4.360	4.360						
4	6.179	6.342	6.496	6.639	6.771	6.889	6.992	7.080	7.151	7.203	7.237	7.252						
5	9.748	10.054	10.347	10.623	10.879	11.113	11.320	11.498	11.645	11.756	11.831	11.868						
6	15.172	15.755	16.322	16.807	17.384	17.864	18.299	18.682	19.003	19.255	19.432	19.529						
7	23.294	24.409	25.524	26.630	27.713	28.757	29.740	30.636	31.408	32.026	32.472	32.734						
8	34.858	36.913	39.047	41.264	43.574	45.984	48.495	51.088	53.318	54.969	56.002	56.701						
9	38.342	40.669	43.085	45.603	48.247	51.061	54.116	57.541	60.207	62.042	63.217	63.820						
10	42.062	44.673	47.370	50.166	53.090	56.199	59.577	63.352	66.235	68.174	69.365	69.912						
11	46.053	48.971	51.952	54.995	58.125	61.393	64.889	68.747	71.670	73.589	74.702	75.119						
12	50.373	53.652	56.946	60.225	63.489	66.777	70.171	73.822	76.567	78.306	79.224	79.419						
13	55.091	58.857	62.556	66.100	69.461	72.646	75.677	78.583	80.789	82.161	82.760	82.636						
14	59.246	63.620	67.797	71.624	75.080	78.171	80.891	83.185	84.869	85.844	86.091	85.616						
15	63.629	69.060	73.943	78.102	81.669	84.627	87.193	89.125	90.422	91.030	90.918	90.073						
16	68.733	75.048	80.375	84.804	88.495	91.514	93.877	95.572	96.572	96.845	96.371	95.129						
17	73.191	79.943	85.560	90.175	93.951	96.960	99.224	100.743	101.505	101.495	100.696	99.095						
18	77.039	83.992	89.749	94.442	98.233	101.192	103.345	104.698	105.245	104.979	103.891	101.973						
19	80.385	87.280	92.999	97.646	101.367	104.222	106.236	107.412	107.751	107.245	105.891	103.685						
20	83.459	89.762	95.178	99.647	103.220	105.926	107.773	108.762	108.889	108.148	106.531	104.035						
21	86.397	92.206	97.317	101.604	105.038	107.609	109.310	110.134	110.069	109.105	107.226	104.417						
22	90.371	96.159	101.157	105.333	108.661	111.123	112.700	113.376	113.136	111.960	109.825	106.698						
23	94.459	100.351	105.363	109.513	112.790	115.176	116.649	117.188	116.773	115.382	112.984	109.537						
24	97.147	103.128	108.172	112.317	115.560	117.886	119.272	119.698	119.142	117.580	114.981	111.300						
25	98.662	104.668	109.711	113.833	117.035	119.303	120.618	120.958	120.303	118.629	115.907	112.093						
26	99.036	104.990	109.984	114.054	117.201	119.411	120.668	120.949	120.736	118.506	115.734	111.882						
27	98.120	103.950	108.863	112.866	115.954	118.112	119.324	119.569	118.830	117.085	114.311	110.479						
28	97.308	103.061	107.942	111.924	114.992	117.133	118.329	118.561	117.811	116.058	113.279	109.455						

61461	ARG. CURVED SLAB NO. 2 - 1.97KG L.T.					XY	PDQ02	FLUX.GROUP 1		LAMBDA	.980050	
	25	26	27	28	29	30	31	32	33	34	35	36
1	1.115	1.111	1.106	1.092	1.082	1.078	1.064	1.049	1.032	1.014	.977	.936
2	2.468	2.461	2.448	2.430	2.408	2.381	2.349	2.313	2.274	2.230	2.142	2.045
3	4.362	4.348	4.323	4.289	4.245	4.192	4.130	4.059	3.981	3.896	3.724	3.535
4	7.246	7.221	7.176	7.112	7.023	6.927	6.809	6.674	6.525	6.363	6.036	5.681
5	11.865	11.822	11.740	11.61	11.454	11.262	11.023	10.713	10.485	10.173	9.547	8.876
6	17.543	17.472	17.318	17.081	16.765	16.374	15.914	15.391	14.815	14.194	13.359	12.364
7	24.008	23.852	23.590	23.207	22.751	22.233	21.664	21.051	20.391	19.688	18.859	17.902
8	30.881	30.656	30.332	29.912	29.404	28.817	28.164	27.454	26.703	25.875	24.984	24.045
9	37.903	37.556	37.164	36.725	36.245	35.720	35.154	34.558	33.938	33.200	32.368	31.458
10	45.880	45.418	44.927	44.402	43.848	43.270	42.671	42.051	41.415	40.674	39.845	38.945
11	54.911	54.331	53.726	53.092	52.434	51.753	51.053	50.338	49.613	48.785	47.875	46.915
12	64.957	64.269	63.566	62.845	62.102	61.341	60.566	59.781	58.991	58.103	57.145	56.145
13	76.836	76.032	75.215	74.382	73.531	72.667	71.795	70.919	70.043	69.174	68.245	67.285
14	89.433	88.514	87.584	86.642	85.687	84.724	83.757	82.781	81.810	80.850	79.845	78.845
15	103.486	102.438	101.384	100.322	99.251	98.177	97.095	96.010	94.928	93.854	92.785	91.745
16	118.102	116.928	115.741	114.542	113.338	112.124	110.905	109.687	108.475	107.274	106.085	104.915
17	134.673	133.338	131.994	130.642	129.281	127.917	126.554	125.191	123.833	122.485	121.155	119.845
18	152.212	150.783	149.342	147.892	146.438	144.984	143.531	142.081	140.638	139.205	137.785	136.385
19	170.624	169.098	167.564	166.022	164.477	162.934	161.397	159.861	158.338	156.825	155.325	153.845
20	190.661	188.924	187.180	185.432	183.684	181.941	180.207	178.481	176.765	175.065	173.385	171.725
21	212.669	210.783	208.894	206.992	205.084	203.177	201.277	199.381	197.495	195.625	193.775	191.945
22	236.523	234.403	232.284	230.162	228.038	225.917	223.797	221.681	219.575	217.485	215.415	213.375
23	262.957	260.677	258.397	256.112	253.828	251.549	249.271	246.998	244.735	242.485	240.255	238.045
24	291.448	288.948	286.442	283.932	281.422	278.917	276.417	273.921	271.435	268.955	266.485	264.035
25	322.104	319.465	316.825	314.188	311.551	308.917	306.289	303.661	301.045	298.435	295.845	293.275
26	355.878	352.969	350.059	347.142	344.222	341.304	338.387	335.471	332.565	329.675	326.795	323.935
27	392.553	389.460	386.362	383.262	380.162	377.067	373.977	370.891	367.815	364.745	361.685	358.645
28	432.579	429.307	426.032	422.758	419.484	416.217	412.957	409.701	406.455	403.225	400.015	396.825

61461 ARG. CURVED SLAB NO. 2 - 1.97KG L.T. XY PDQ02 FLUX. GROUP 1 LAMBDA .980050							
	37	38	39	40	41	42	43
1	.891	.845	.798	.751	.306	.104	.030
2	1.941	1.834	1.724	1.615	.640	.214	.061
3	3.335	3.128	2.920	2.715	1.026	.333	.093
4	5.309	4.930	4.553	4.187	1.487	.465	.127
5	8.184	7.490	6.813	6.167	2.035	.611	.163
6	12.361	11.090	9.879	8.749	2.668	.767	.199
7	18.212	15.908	13.796	11.881	3.355	.928	.235
8	25.478	21.561	18.166	15.193	4.037	1.083	.270
9	27.090	22.815	19.145	15.948	4.197	1.120	.278
10	28.539	23.959	20.051	16.657	4.352	1.156	.286
11	29.776	24.966	20.868	17.313	4.499	1.190	.293
12	30.779	25.824	21.589	17.911	4.638	1.223	.301
13	31.559	26.535	22.213	18.449	4.768	1.254	.307
14	32.058	27.018	22.655	18.841	4.867	1.277	.313
15	32.466	27.429	23.042	19.196	4.960	1.300	.318
16	32.876	27.854	23.455	19.585	5.067	1.326	.324
17	33.216	28.210	23.807	19.923	5.163	1.350	.329
18	33.506	28.511	24.108	20.216	5.251	1.372	.334
19	33.755	28.768	24.365	20.468	5.328	1.392	.339
20	33.969	28.986	24.584	20.684	5.397	1.410	.343
21	34.119	29.138	24.735	20.833	5.446	1.423	.346
22	34.250	29.270	24.866	20.962	5.489	1.434	.348
23	34.386	29.405	25.001	21.095	5.534	1.446	.351
24	34.495	29.514	25.109	21.201	5.571	1.456	.353
25	34.589	29.597	25.191	21.261	5.598	1.463	.355
26	34.639	29.655	25.248	21.337	5.618	1.469	.356
27	34.674	29.690	25.281	21.369	5.629	1.472	.357
28	34.685	29.700	25.291	21.378	5.632	1.472	.357

61461	ARG. CURVED SLAB NO. 2 - 1.97KG L.T.					XY	PDQ02	FLUX..GROUP 2		LAMBDA	.980050	
1	2	3	4	5	6	7	8	9	10	11	12	
1	.006	.031	.141	.565	1.109	1.823	1.891	1.956	2.017	2.074	2.125	2.171
2	.013	.062	.281	1.140	2.252	3.733	3.875	4.011	4.139	4.258	4.367	4.463
3	.019	.093	.423	1.730	3.461	5.813	6.040	6.259	6.466	6.658	6.834	6.990
4	.025	.123	.564	2.339	4.759	8.131	8.462	8.781	9.083	9.365	9.621	9.849
5	.030	.153	.704	2.967	6.154	10.733	11.191	11.632	12.050	12.440	12.794	13.105
6	.036	.180	.841	3.606	7.638	13.628	14.237	14.824	15.381	15.897	16.361	16.763
7	.041	.206	.971	4.241	9.181	16.771	17.553	18.308	19.022	19.677	20.254	20.736
8	.045	.229	1.022	4.851	10.723	20.044	21.015	21.952	22.832	23.628	24.312	24.849
9	.046	.235	1.120	4.997	11.103	20.869	21.888	22.870	23.790	24.618	25.324	25.874
10	.047	.240	1.148	5.140	11.476	21.686	22.752	23.778	24.736	25.594	26.318	26.875
11	.048	.245	1.174	5.279	11.841	22.492	23.603	24.672	25.666	26.548	27.282	27.833
12	.049	.250	1.199	5.412	12.196	23.280	24.437	25.547	26.574	27.475	28.207	28.730
13	.049	.254	1.223	5.540	12.538	24.049	25.250	26.399	27.456	28.370	29.087	29.551
14	.050	.258	1.242	5.639	12.806	24.653	25.889	27.070	28.150	29.073	29.772	30.165
15	.051	.261	1.260	5.734	13.064	25.239	26.509	27.720	28.823	29.756	30.438	30.756
16	.051	.265	1.280	5.845	13.367	25.931	27.241	28.490	29.623	30.573	31.247	31.513
17	.052	.268	1.299	5.949	13.652	26.586	27.935	29.220	30.384	31.357	32.046	32.321
18	.053	.272	1.317	6.045	13.917	27.198	28.584	29.903	31.097	32.097	32.817	33.146
19	.053	.275	1.333	6.132	14.160	27.763	29.182	30.532	31.753	32.776	33.529	33.938
20	.054	.277	1.347	6.211	14.380	28.277	29.725	31.101	32.340	33.373	34.134	34.607
21	.054	.279	1.358	6.269	14.541	28.653	30.122	31.514	32.762	33.787	34.511	34.913
22	.054	.281	1.367	6.320	14.685	28.991	30.478	31.884	33.135	34.140	34.788	34.937
23	.055	.283	1.377	6.375	14.839	29.353	30.859	32.280	33.534	34.514	35.067	34.938
24	.055	.284	1.385	6.419	14.965	29.651	31.174	32.609	33.871	34.844	35.366	35.184
25	.055	.285	1.391	6.454	15.063	29.883	31.422	32.871	34.147	35.137	35.683	35.540
26	.055	.286	1.395	6.478	15.133	30.048	31.598	33.061	34.355	35.381	36.002	35.995
27	.055	.287	1.398	6.492	15.172	30.143	31.701	33.173	34.484	35.549	36.285	36.668
28	.055	.287	1.398	6.496	15.183	30.168	31.728	33.203	34.519	35.596	36.373	36.911

01461 ARG. CURVED SLAB NO. 2 - 1.97KG L.I. -												
XY				PDQ02				FLUX. GROUP 2				
LAMBDA .980050												
13	14	15	16	17	18	19	20	21	22	23	24	
1	2.194	2.214	2.233	2.249	2.263	2.275	2.284	2.292	2.296	2.299	2.299	2.296
2	4.510	4.552	4.592	4.626	4.655	4.680	4.699	4.714	4.724	4.729	4.728	4.723
3	7.065	7.134	7.196	7.251	7.298	7.337	7.368	7.391	7.406	7.412	7.410	7.400
4	9.959	10.059	10.148	10.227	10.293	10.348	10.391	10.422	10.441	10.447	10.441	10.422
5	13.255	13.389	13.508	13.611	13.696	13.765	13.816	13.850	13.867	13.866	13.849	13.815
6	16.951	17.117	17.258	17.376	17.467	17.534	17.575	17.592	17.586	17.558	17.509	17.441
7	20.949	21.125	21.261	21.354	21.404	21.410	21.372	21.296	21.190	21.064	20.925	20.774
8	25.063	25.214	25.294	25.289	25.186	24.967	24.612	24.094	23.453	22.974	22.608	22.309
9	26.092	26.245	26.326	26.321	26.218	25.996	25.630	25.087	23.318	22.694	22.461	22.327
10	27.094	27.250	27.335	27.341	27.254	27.054	26.717	26.208	24.442	23.831	23.639	23.543
11	28.046	28.198	28.286	28.306	28.249	28.098	27.825	27.393	25.885	25.387	25.240	25.151
12	28.920	29.048	29.124	29.155	29.139	29.061	28.896	28.598	27.539	27.236	27.149	27.065
13	29.686	29.749	29.772	29.795	29.822	29.841	29.846	29.863	29.921	29.933	29.902	29.820
14	30.218	30.163	30.067	30.058	30.118	30.206	30.295	30.377	30.440	30.458	30.423	30.334
15	30.699	30.420	30.018	29.985	30.109	30.285	30.460	30.605	30.701	30.731	30.687	30.576
16	31.394	31.028	29.896	29.945	30.392	30.917	31.386	31.735	31.937	31.976	31.849	31.574
17	32.210	31.869	30.832	30.978	31.542	32.176	32.724	33.113	33.311	33.305	33.099	32.716
18	33.085	32.808	31.992	32.255	32.880	33.541	34.090	34.459	34.619	34.562	34.295	33.843
19	33.973	33.813	33.334	33.735	34.384	35.017	35.520	35.840	35.958	35.870	35.587	35.138
20	34.808	35.021	35.516	36.075	36.636	37.131	37.512	37.750	37.837	37.778	37.599	37.339
21	35.138	35.474	35.957	36.503	37.043	37.515	37.875	38.099	38.178	38.123	37.963	37.747
22	35.020	35.407	35.958	36.563	37.142	37.635	38.001	38.217	38.276	38.191	37.996	37.757
23	34.337	34.849	35.716	36.625	37.430	38.058	38.471	38.652	38.600	38.332	37.903	37.437
24	34.593	35.161	36.119	37.118	37.987	38.648	39.063	39.215	39.105	38.757	38.236	37.695
25	35.025	35.634	36.616	37.623	38.492	39.144	39.544	39.675	39.540	39.165	38.617	38.053
26	35.626	36.270	37.215	38.162	38.973	39.583	39.957	40.082	39.962	39.620	39.115	38.584
27	37.113	37.760	38.495	39.217	39.854	40.352	40.681	40.829	40.800	40.620	40.336	40.021
28	37.384	38.000	38.693	39.380	39.991	40.473	40.797	40.949	40.934	40.780	40.532	40.259

61461 ARG. CURVED SLAB NO. 2 - 1.97KG L.T. - - - XY - - - PDQ02 FLUX.GROUP 2 LAMBDA .980050 - - -												
	25	26	27	28	29	30	31	32	33	34	35	36
1	2.291	2.284	2.274	2.263	2.248	2.232	2.213	2.193	2.170	2.146	2.097	2.042
2	4.712	4.696	4.676	4.650	4.620	4.585	4.546	4.502	4.455	4.403	4.299	4.184
3	7.382	7.355	7.320	7.278	7.228	7.170	7.106	7.034	6.956	6.872	6.703	6.516
4	10.392	10.350	10.296	10.231	10.155	10.068	9.972	9.866	9.750	9.626	9.376	9.103
5	13.765	13.699	13.618	13.523	13.413	13.290	13.154	13.005	12.845	12.674	12.332	11.958
6	17.354	17.250	17.129	16.993	16.841	16.677	16.499	16.309	16.106	15.892	15.469	15.004
7	20.614	20.443	20.263	20.075	19.881	19.682	19.483	19.283	19.085	18.885	18.492	18.030
8	22.044	21.790	21.537	21.283	21.034	20.805	20.622	20.517	20.533	20.711	20.939	20.809
9	22.177	21.964	21.676	21.312	20.886	20.425	19.989	19.702	19.857	21.180	21.685	21.626
10	23.408	23.180	22.844	22.403	21.875	21.294	20.738	20.367	20.533	22.008	22.579	22.517
11	25.002	24.746	24.371	23.883	23.298	22.653	22.025	21.579	21.681	23.137	23.648	23.495
12	26.905	26.645	26.284	25.827	25.279	24.662	24.033	23.523	23.452	24.641	24.899	24.551
13	29.690	29.529	29.358	29.181	28.954	28.642	28.251	27.802	27.323	26.781	26.298	25.651
14	30.208	30.076	29.980	29.946	29.866	29.675	29.378	28.999	28.565	28.102	27.358	26.519
15	30.420	30.272	30.229	30.491	30.659	30.602	30.389	30.063	29.659	29.207	28.327	27.345
16	31.195	30.822	30.704	31.434	31.670	31.687	31.530	31.240	30.849	30.386	29.402	28.291
17	32.215	31.734	31.580	32.425	32.696	32.740	32.600	32.314	31.915	31.429	30.366	29.156
18	33.274	32.733	32.551	33.462	33.746	33.780	33.622	33.313	32.887	32.369	31.233	29.939
19	34.583	34.046	33.815	34.634	34.862	34.825	34.606	34.247	33.777	33.220	32.010	30.643
20	37.045	36.761	36.491	36.224	36.076	35.857	35.533	35.105	34.584	33.982	32.703	31.270
21	37.539	37.393	37.257	37.077	36.864	36.576	36.197	35.724	35.166	34.532	33.201	31.721
22	37.583	37.666	37.756	37.680	37.483	37.177	36.768	36.266	35.679	35.019	33.643	32.121
23	37.227	37.973	38.221	38.237	38.076	37.774	37.351	36.827	36.215	35.529	34.108	32.543
24	37.479	38.350	38.641	38.693	38.549	38.248	37.817	37.278	36.648	35.943	34.485	32.886
25	37.829	38.731	39.030	39.081	38.932	38.621	38.178	37.625	36.981	36.261	34.776	33.150
26	38.339	39.143	39.402	39.411	39.231	38.899	38.439	37.872	37.216	36.485	34.980	33.335
27	39.778	39.736	39.764	39.665	39.432	39.071	38.595	38.017	37.352	36.613	35.097	33.442
28	40.042	39.940	39.878	39.740	39.489	39.119	38.637	38.055	37.388	36.647	35.127	33.469

61461 ARG. CURVED SLAB NO. 2 - 1.97KG L.T.								XY	PDQ02	FLUX., GROUP 2	LAMBDA	.980050
	37	38	39	40	41	42	43					
1	1.983	1.920	1.853	1.784	.995	.466	.181					
2	4.059	3.927	3.788	3.644	2.014	.937	.362					
3	6.314	6.100	5.877	5.646	3.076	1.417	.544					
4	8.808	8.497	8.173	7.840	4.192	1.905	.725					
5	11.558	11.135	10.694	10.242	5.361	2.399	.904					
6	14.502	13.967	13.406	12.828	6.566	2.890	1.078					
7	17.490	16.883	16.223	15.529	7.775	3.367	1.243					
8	20.400	19.793	19.060	18.258	8.940	3.813	1.394					
9	21.212	20.573	19.795	18.944	9.221	3.919	1.429					
10	22.063	21.368	20.532	19.624	9.494	4.021	1.463					
11	22.953	22.178	21.269	20.293	9.759	4.120	1.496					
12	23.873	22.994	21.999	20.948	10.014	4.214	1.527					
13	24.802	23.804	22.715	21.585	10.258	4.304	1.557					
14	25.539	24.445	23.279	22.083	10.447	4.373	1.580					
15	26.250	25.065	23.824	22.563	10.628	4.439	1.601					
16	27.078	25.791	24.464	23.127	10.839	4.516	1.627					
17	27.844	26.468	25.062	23.655	11.035	4.587	1.650					
18	28.544	27.091	25.614	24.143	11.217	4.652	1.671					
19	29.177	27.656	26.117	24.590	11.382	4.712	1.691					
20	29.741	28.161	26.568	24.991	11.531	4.766	1.708					
21	30.148	28.526	26.895	25.283	11.638	4.804	1.721					
22	30.509	28.851	27.185	25.542	11.735	4.839	1.732					
23	30.890	29.194	27.494	25.818	11.837	4.875	1.744					
24	31.200	29.474	27.745	26.043	11.920	4.905	1.753					
25	31.440	29.690	27.939	26.218	11.985	4.928	1.761					
26	31.607	29.842	28.076	26.340	12.030	4.945	1.766					
27	31.704	29.929	28.154	26.410	12.056	4.954	1.769					
28	31.729	29.952	28.175	26.429	12.063	4.956	1.770					

61462 ARG. CURVED SLAB NO. 3-2.0KG XY PDQ02

2 GROUPS 2 COMPS SS= 54 TT= 46 B.C.=1,0,0,0

B SQ	LAMBDA	EPSILON	CHI 1	CHI 2	CHI 3
0.001760	1.000000	0.050000	1.000000	0.	0.

GROUP	COMP	D	SIGMA A	SIGMA R	NU SIGMA F	PHI
1	1	1.110000	0.	0.003041	0.	50.000
1	2	1.290000	0.	0.023285	0.	75.000
2	1	0.916300	0.000539		0.	50.000
2	2	0.215030	0.065354		0.105703	30.000

MESH	COL	MESH	COL	MESH	COL	MESH	COL	MESH	COL	MESH	COL
30.0000	5	10.0000	7	2.0000	17	1.0000	40	0.5000	41	2.0000	50
10.0000	52	30.5000	54								

MESH	ROW	MESH	ROW	MESH	ROW
1.0000	31	2.0000	41	5.5000	46

61462	ARG. CURVED SLAB NO. 3-2.0KG				XY	PDQ02	FLUX..GROUP 1		LAMBDA 1.019735			
	1	2	3	4	5	6	7	8	9	10	11	12
1	.002	.012	.076	.498	3.320	7.977	17.297	20.426	24.059	28.294	33.244	39.047
2	.002	.012	.076	.497	3.316	7.966	17.270	20.392	24.017	28.242	33.181	38.969
3	.002	.012	.076	.496	3.309	7.945	17.215	20.324	23.933	28.138	33.054	38.814
4	.002	.012	.076	.495	3.298	7.913	17.133	20.222	23.807	27.984	32.864	38.582
5	.002	.012	.076	.494	3.283	7.871	17.024	20.087	23.641	27.779	32.613	38.274
6	.002	.012	.075	.491	3.265	7.818	16.889	19.920	23.435	27.526	32.302	37.893
7	.002	.012	.075	.489	3.244	7.756	16.729	19.722	23.190	27.225	31.932	37.439
8	.002	.012	.075	.486	3.219	7.683	16.544	19.493	22.908	26.878	31.507	36.916
9	.002	.012	.074	.483	3.191	7.602	16.336	19.235	22.590	26.487	31.027	36.328
10	.002	.011	.074	.479	3.160	7.511	16.105	18.949	22.238	26.055	30.497	35.677
11	.002	.011	.073	.475	3.126	7.411	15.852	18.637	21.855	25.585	29.919	34.968
12	.002	.011	.073	.470	3.089	7.304	15.580	18.300	21.441	25.077	29.298	34.206
13	.002	.011	.072	.466	3.049	7.188	15.289	17.941	21.000	24.537	28.636	33.395
14	.002	.011	.071	.460	3.006	7.066	14.980	17.561	20.534	23.966	27.938	32.542
15	.002	.011	.071	.455	2.961	6.937	14.656	17.162	20.045	23.369	27.209	31.650
16	.002	.011	.070	.449	2.913	6.801	14.317	16.746	19.535	22.747	26.450	30.725
17	.002	.011	.069	.443	2.864	6.660	13.966	16.314	19.009	22.105	25.668	29.773
18	.002	.011	.068	.437	2.812	6.513	13.603	15.870	18.467	21.445	24.866	28.799
19	.002	.011	.067	.430	2.758	6.362	13.231	15.415	17.912	20.771	24.049	27.806
20	.002	.011	.067	.423	2.703	6.207	12.851	14.951	17.347	20.087	23.219	26.802
21	.002	.010	.066	.416	2.646	6.048	12.464	14.479	16.775	19.394	22.381	25.789
22	.002	.010	.065	.409	2.587	5.887	12.072	14.003	16.198	18.696	21.539	24.773
23	.002	.010	.064	.401	2.528	5.723	11.677	13.523	15.618	17.996	20.696	23.759
24	.002	.010	.063	.394	2.467	5.557	11.280	13.041	15.037	17.297	19.856	22.750
25	.002	.010	.062	.386	2.405	5.390	10.882	12.560	14.457	16.601	19.021	21.749
26	.002	.010	.061	.378	2.343	5.222	10.484	12.081	13.881	15.911	18.195	20.762
27	.001	.010	.059	.370	2.280	5.053	10.089	11.605	13.310	15.228	17.380	19.790
28	.001	.009	.058	.361	2.217	4.885	9.696	11.133	12.746	14.555	16.579	18.838

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 1		LAMBDA 1.019736			
	1	2	3	4	5	6	7	8	9	10	11	12	
29	.001	.009	.057	.353	2.153	4.717	9.308	10.668	12.191	13.894	15.794	17.906	
30	.001	.009	.056	.345	2.090	4.550	8.924	10.210	11.646	13.247	15.027	16.999	
31	.001	.009	.055	.336	2.026	4.385	8.547	9.760	11.111	12.614	14.279	16.117	
32	.001	.009	.052	.319	1.899	4.059	7.812	8.887	10.079	11.397	12.847	14.435	
33	.001	.008	.050	.302	1.773	3.742	7.110	8.058	9.103	10.252	11.507	12.872	
34	.001	.008	.048	.284	1.650	3.437	6.445	7.276	8.188	9.184	10.265	11.432	
35	.001	.007	.045	.267	1.530	3.145	5.819	6.545	7.337	8.196	9.123	10.115	
36	.001	.007	.043	.250	1.413	2.867	5.234	5.865	6.550	7.289	8.080	8.921	
37	.001	.007	.040	.233	1.301	2.604	4.691	5.238	5.827	6.460	7.133	7.843	
38	.001	.006	.038	.217	1.193	2.356	4.189	4.661	5.167	5.707	6.277	6.875	
39	.001	.006	.035	.201	1.090	2.124	3.728	4.133	4.566	5.025	5.507	6.009	
40	.001	.006	.033	.185	.992	1.908	3.305	3.653	4.022	4.411	4.817	5.237	
41	.001	.005	.030	.170	.899	1.706	2.919	3.216	3.530	3.858	4.200	4.551	
42	.001	.004	.024	.131	.667	1.227	2.036	2.227	2.426	2.632	2.844	3.058	
43	.001	.003	.017	.095	.469	.839	1.358	1.476	1.599	1.724	1.852	1.980	
44	.000	.002	.011	.061	.297	.521	.827	.895	.965	1.037	1.109	1.180	
45	.000	.001	.006	.030	.144	.249	.390	.422	.453	.486	.518	.550	

61462	ARG. CURVED SLAB NO. 3-2.0KG				XY	PDQ02	FLUX..GROUP 1		LAMBDA 1.019736			
	13	14	15	16	17	18	19	20	21	22	23	24
1	45.864	53.884	63.331	74.462	87.563	93.264	98.218	102.472	106.040	108.917	111.092	112.549
2	45.769	53.769	63.194	74.304	87.387	93.082	98.034	102.287	105.857	108.739	110.920	112.384
3	45.579	53.540	62.921	73.986	87.033	92.718	97.663	101.917	105.491	108.381	110.574	112.055
4	45.296	53.196	62.510	73.507	86.497	92.166	97.104	101.358	104.939	107.842	110.054	111.560
5	44.920	52.739	61.959	72.859	85.769	91.420	96.352	100.608	104.199	107.120	109.358	110.895
6	44.453	52.168	61.268	72.036	84.837	90.470	95.399	99.662	103.269	106.213	108.482	110.060
7	43.896	51.486	60.435	71.030	83.674	89.302	94.238	98.516	102.145	105.119	107.426	109.051
8	43.254	50.696	59.461	69.830	82.231	87.903	92.865	97.168	100.826	103.836	106.186	107.865
9	42.530	49.804	58.355	68.437	80.388	86.285	91.281	95.619	99.312	102.363	104.763	106.500
10	41.730	48.816	57.128	66.885	78.275	84.399	89.482	93.869	97.605	100.701	103.154	104.955
11	40.858	47.742	55.797	65.225	76.227	82.370	87.499	91.930	95.708	98.852	101.360	103.227
12	39.922	46.590	54.373	63.465	74.095	80.151	85.331	89.803	93.625	96.817	99.382	101.317
13	38.928	45.368	52.868	61.606	71.802	77.593	82.981	87.487	91.355	94.598	97.221	99.225
14	37.883	44.085	51.290	59.660	69.370	74.757	80.352	84.970	88.902	92.199	94.881	96.952
15	36.793	42.750	49.653	57.647	66.895	72.049	77.599	82.292	86.277	89.626	92.364	94.501
16	35.664	41.371	47.965	55.581	64.367	69.271	74.579	79.466	83.484	86.882	89.675	91.875
17	34.504	39.956	46.238	53.471	61.788	66.401	71.307	76.374	80.508	83.968	86.817	89.078
18	33.319	38.514	44.482	51.332	59.184	63.536	68.194	73.198	77.392	80.899	83.797	86.114
19	32.115	37.052	42.705	49.172	56.561	60.653	65.041	69.795	74.140	77.672	80.616	82.989
20	30.898	35.577	40.917	47.003	53.929	57.747	61.815	66.131	70.591	74.264	77.276	79.706
21	29.674	34.097	39.127	44.836	51.302	54.850	58.618	62.620	66.892	70.734	73.785	76.272
22	28.449	32.620	37.344	42.681	48.695	51.979	55.453	59.121	62.973	66.922	70.123	72.688
23	27.228	31.150	35.574	40.550	46.124	49.151	52.343	55.703	59.241	63.001	66.341	68.970
24	26.016	29.695	33.827	38.450	43.599	46.380	49.300	52.359	55.553	58.869	62.224	65.105
25	24.818	28.261	32.110	36.393	41.134	43.679	46.340	49.114	51.993	54.961	57.980	60.997
26	23.639	26.852	30.428	34.385	38.736	41.358	43.476	45.985	48.579	51.250	53.999	56.880
27	22.481	25.474	28.787	32.433	36.415	38.527	40.716	42.978	45.306	47.692	50.130	52.611
28	21.349	24.130	27.193	30.544	34.177	36.091	38.067	40.099	42.178	44.297	46.444	48.603

01462	ARG. CURVED SLAB NO. 3-2.0KG				XY	PDQ02	FLUX..GROUP 1		LAMBDA 1.019736			
	13	14	15	16	17	18	19	20	21	22	23	24
29	20.246	22.825	25.650	28.721	32.026	33.757	35.534	37.352	39.201	41.072	42.954	44.837
30	19.174	21.560	24.160	26.969	29.968	31.528	33.121	34.741	36.378	38.021	39.658	41.275
31	18.136	20.340	22.727	25.290	28.005	29.407	30.831	32.269	33.712	35.148	36.561	37.934
32	16.165	18.035	20.038	22.158	24.370	25.494	26.623	27.748	28.859	29.942	30.982	31.958
33	14.345	15.922	17.591	19.335	21.124	22.020	22.909	23.784	24.635	25.450	26.215	26.914
34	12.680	14.002	15.387	16.814	18.256	18.967	19.666	20.346	20.998	21.613	22.182	22.691
35	11.168	12.273	13.417	14.581	15.740	16.305	16.855	17.384	17.887	18.355	18.782	19.160
36	9.805	10.725	11.667	12.616	13.547	13.996	14.430	14.844	15.233	15.593	15.917	16.201
37	8.584	9.347	10.122	10.894	11.643	12.001	12.344	12.669	12.972	13.251	13.500	13.717
38	7.494	8.127	8.763	9.391	9.994	10.279	10.551	10.808	11.046	11.263	11.456	11.623
39	6.525	7.049	7.571	8.081	8.567	8.795	9.012	9.215	9.403	9.573	9.724	9.853
40	5.667	6.099	6.527	6.941	7.333	7.516	7.689	7.850	7.998	8.132	8.251	8.352
41	4.907	5.263	5.613	5.950	6.265	6.412	6.550	6.678	6.796	6.901	6.994	7.074
42	3.273	3.485	3.690	3.885	4.065	4.148	4.225	4.296	4.361	4.420	4.470	4.514
43	2.107	2.231	2.350	2.461	2.564	2.610	2.653	2.693	2.729	2.762	2.790	2.813
44	1.251	1.319	1.384	1.445	1.500	1.525	1.548	1.570	1.589	1.606	1.621	1.633
45	.582	.612	.641	.667	.692	.703	.713	.722	.730	.738	.744	.750

61462	ARG. CURVED SLAB NO. 3-2.0KG				XY	PDQ02	FLUX..GROUP 1		LAMBDA 1.019736			
	25	26	27	28	29	30	31	32	33	34	35	36
1	113.270	113.241	112.444	110.865	108.482	105.267	101.174	96.120	89.835	83.955	78.444	73.272
2	113.116	113.099	112.317	110.755	108.391	105.198	101.127	96.097	89.833	83.965	78.457	73.285
3	112.807	112.815	112.063	110.534	108.210	105.060	101.038	96.056	89.838	83.992	78.489	73.312
4	112.342	112.387	111.678	110.200	107.935	104.855	100.910	96.011	89.876	84.053	78.546	73.358
5	111.718	111.811	111.159	109.749	107.564	104.578	100.746	95.983	90.008	84.176	78.639	73.423
6	110.932	111.084	110.502	109.174	107.087	104.219	100.537	95.980	90.401	84.381	78.764	73.504
7	109.980	110.200	109.699	108.467	106.491	103.758	100.244	95.913	90.719	84.566	78.885	73.586
8	108.859	109.155	108.744	107.617	105.765	103.176	99.833	95.703	90.728	84.658	78.980	73.659
9	107.564	107.944	107.631	106.617	104.897	102.461	99.295	95.366	90.608	84.740	79.074	73.729
10	106.094	106.562	106.353	105.459	103.878	101.602	98.622	94.913	90.420	85.000	79.202	73.802
11	104.445	105.006	104.904	104.135	102.698	100.589	97.802	94.323	90.119	85.146	79.290	73.858
12	102.615	103.270	103.279	102.639	101.349	99.410	96.819	93.569	89.635	84.965	79.310	73.896
13	100.604	101.355	101.475	100.963	99.822	98.054	95.661	92.640	88.975	84.622	79.448	73.954
14	98.411	99.257	99.487	99.104	98.110	96.512	94.315	91.521	88.127	84.114	79.441	73.996
15	96.038	96.976	97.315	97.057	96.208	94.776	92.770	90.197	87.063	83.364	79.073	74.095
16	93.487	94.514	94.956	94.820	94.111	92.839	91.015	88.653	85.765	82.359	78.434	73.980
17	90.761	91.872	92.414	92.394	91.817	90.696	89.044	86.879	84.218	81.076	77.466	73.391
18	87.865	89.055	89.691	89.778	89.326	88.346	86.855	84.872	82.417	79.511	76.172	72.409
19	84.803	86.068	86.790	86.977	86.639	85.791	84.447	82.630	80.362	77.665	74.563	71.073
20	81.581	82.916	83.718	83.997	83.764	83.035	81.825	80.157	78.054	75.541	72.644	69.387
21	78.207	79.607	80.483	80.846	80.708	80.085	78.995	77.458	75.499	73.145	70.422	67.358
22	74.688	76.152	77.096	77.535	77.481	76.952	75.965	74.541	72.706	70.486	67.907	64.998
23	71.033	72.560	73.568	74.075	74.095	73.645	72.746	71.417	69.684	67.571	65.107	62.315
24	67.245	68.841	69.912	70.479	70.561	70.178	69.350	68.096	66.442	64.410	62.024	59.313
25	63.320	65.007	66.141	66.762	66.896	66.565	65.789	64.589	62.987	61.005	58.656	55.994
26	59.329	61.078	62.268	62.936	63.111	62.816	62.073	60.903	59.324	57.363	54.965	52.224
27	55.068	57.041	58.296	59.011	59.216	58.942	58.210	57.040	55.437	53.285	50.770	48.235
28	50.741	52.804	54.223	54.994	55.218	54.946	54.198	53.001	51.224	49.039	46.824	44.570

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 1		LAMBDA 1.019736		
	25	26	27	28	29	30	31	32	33	34	35	36
29	46.715	48.639	50.118	50.896	51.113	50.818	50.010	48.671	46.897	45.045	43.127	41.156
30	42.856	44.385	45.796	46.683	46.866	46.385	45.424	44.263	42.861	41.317	39.679	37.972
31	39.241	40.448	41.490	42.275	42.429	41.971	41.244	40.297	39.157	37.871	36.478	35.007
32	32.846	33.611	34.211	34.593	34.694	34.513	34.098	33.488	32.716	31.812	30.803	29.713
33	27.529	28.039	28.421	28.653	28.717	28.610	28.343	27.932	27.393	26.746	26.009	25.197
34	23.130	23.485	23.745	23.898	23.939	23.864	23.677	23.385	22.997	22.524	21.977	21.367
35	19.480	19.736	19.920	20.027	20.052	19.996	19.859	19.644	19.357	19.003	18.591	18.128
36	16.440	16.629	16.763	16.839	16.856	16.812	16.707	16.545	16.328	16.060	15.745	15.389
37	13.897	14.039	14.138	14.194	14.205	14.170	14.089	13.964	13.798	13.591	13.348	13.072
38	11.761	11.869	11.944	11.985	11.992	11.964	11.901	11.804	11.674	11.514	11.324	11.108
39	9.960	10.043	10.100	10.131	10.135	10.112	10.062	9.986	9.885	9.759	9.610	9.440
40	8.435	8.499	8.543	8.566	8.569	8.550	8.511	8.450	8.370	8.271	8.153	8.019
41	7.138	7.188	7.222	7.240	7.241	7.226	7.194	7.147	7.083	7.004	6.911	6.805
42	4.548	4.575	4.593	4.602	4.602	4.593	4.575	4.549	4.513	4.470	4.418	4.359
43	2.832	2.847	2.856	2.861	2.861	2.856	2.845	2.831	2.811	2.787	2.758	2.725
44	1.643	1.651	1.656	1.658	1.658	1.655	1.650	1.642	1.631	1.618	1.603	1.585
45	.754	.757	.759	.760	.760	.759	.757	.753	.748	.743	.736	.728

61462	ARG. CURVED SLAB NO. 3-2.0KG				XY	PDQ02	FLUX..GROUP 1		LAMBDA 1.019736			
	37	38	39	40	41	42	43	44	45	46	47	48
1	68.417	63.860	59.583	55.571	53.659	46.616	40.438	35.026	30.292	26.156	22.545	19.396
2	68.427	63.866	59.586	55.571	53.657	46.610	40.428	35.013	30.278	26.142	22.532	19.382
3	68.448	63.880	59.592	55.571	53.654	46.597	40.408	34.989	30.251	26.114	22.505	19.356
4	68.480	63.899	59.601	55.569	53.648	46.576	40.377	34.952	30.210	26.072	22.463	19.317
5	68.523	63.924	59.610	55.566	53.638	46.547	40.335	34.900	30.155	26.015	22.407	19.264
6	68.574	63.952	59.619	55.558	53.623	46.509	40.279	34.834	30.083	25.942	22.336	19.196
7	68.625	63.978	59.623	55.543	53.601	46.458	40.208	34.751	29.994	25.852	22.249	19.114
8	68.672	63.999	59.621	55.520	53.568	46.392	40.120	34.649	29.886	25.744	22.145	19.016
9	68.714	64.014	59.610	55.485	53.522	46.310	40.012	34.526	29.757	25.616	22.022	18.902
10	68.751	64.019	59.587	55.437	53.461	46.208	39.881	34.380	29.605	25.467	21.881	18.771
11	68.776	64.014	59.551	55.371	53.382	46.081	39.724	34.206	29.428	25.294	21.718	18.622
12	68.772	63.997	59.499	55.285	53.280	45.926	39.535	34.002	29.222	25.095	21.533	18.454
13	68.809	63.972	59.430	55.175	53.152	45.737	39.310	33.762	28.983	24.869	21.324	18.265
14	68.829	63.939	59.342	55.037	52.992	45.507	39.042	33.482	28.709	24.612	21.090	18.056
15	68.879	63.900	59.228	54.862	52.790	45.227	38.723	33.156	28.395	24.321	20.828	17.824
16	69.004	63.842	59.074	54.639	52.537	44.886	38.344	32.777	28.038	23.996	20.538	17.569
17	68.846	63.677	58.854	54.351	52.218	44.469	37.895	32.338	27.632	23.632	20.217	17.291
18	68.203	63.452	58.578	53.994	51.871	43.958	37.362	31.832	27.174	23.228	19.866	16.989
19	67.193	62.927	58.274	53.561	51.326	43.329	36.730	31.251	26.660	22.782	19.483	16.663
20	65.787	61.856	57.606	53.042	50.686	42.544	35.984	30.589	26.088	22.293	19.069	16.312
21	63.975	60.292	56.324	52.080	49.763	41.556	35.108	29.842	25.457	21.762	18.623	15.939
22	61.780	58.273	54.482	50.470	48.247	40.314	34.094	29.009	24.768	21.191	18.148	15.543
23	59.215	55.824	52.065	48.106	46.088	38.827	32.950	28.094	24.025	20.581	17.645	15.127
24	56.274	52.771	49.024	45.443	43.683	37.168	31.699	27.110	23.233	19.936	17.116	14.692
25	52.840	49.381	46.039	42.824	41.264	35.414	30.370	26.070	22.401	19.262	16.565	14.240
26	49.133	46.095	43.134	40.268	38.876	33.618	28.993	24.989	21.538	18.564	15.997	13.774
27	45.592	42.942	40.329	37.782	36.541	31.815	27.590	23.882	20.653	17.848	15.414	13.297
28	42.264	39.943	37.640	35.380	34.273	30.030	26.183	22.762	19.754	17.120	14.820	12.812

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 1		LAMBDA 1.019736		WAVE -- -	
	37	38	39	40	41	42	43	44	45	46	47	48	
29	39.142	37.107	35.077	33.073	32.088	28.282	24.787	21.643	18.850	16.386	14.221	12.321	
30	36.216	34.433	32.645	30.869	29.993	26.583	23.414	20.532	17.948	15.651	13.619	11.827	
31	33.480	31.920	30.346	28.775	27.996	24.943	22.575	19.440	17.056	14.920	13.018	11.333	
32	28.562	27.369	26.149	24.919	24.304	21.861	19.521	17.331	15.315	13.482	11.831	10.352	
33	24.327	23.414	22.469	21.506	21.021	19.071	17.169	15.358	13.666	12.107	10.685	9.398	
34	20.706	20.004	19.270	18.515	18.132	16.577	15.034	13.543	12.131	10.812	9.596	8.485	
35	17.621	17.078	16.506	15.912	15.609	14.368	13.118	11.894	10.719	9.610	8.576	7.622	
36	14.997	14.574	14.126	13.658	13.418	12.425	11.413	10.409	9.435	8.505	7.630	6.815	
37	12.766	12.435	12.082	11.711	11.520	10.724	9.904	9.083	8.276	7.500	6.761	6.068	
38	10.868	10.607	10.327	10.032	9.879	9.241	8.576	7.904	7.238	6.590	5.969	5.382	
39	9.250	9.043	8.821	8.585	8.463	7.950	7.411	6.860	6.311	5.772	5.252	4.755	
40	7.869	7.704	7.527	7.338	7.241	6.827	6.390	5.940	5.487	5.040	4.605	4.187	
41	6.686	6.555	6.413	6.262	6.184	5.851	5.496	5.129	4.756	4.386	4.023	3.672	
42	4.292	4.219	4.140	4.055	4.010	3.820	3.615	3.400	3.179	2.956	2.735	2.518	
43	2.687	2.646	2.602	2.554	2.528	2.420	2.303	2.179	2.050	1.918	1.786	1.655	
44	1.565	1.543	1.519	1.493	1.480	1.421	1.357	1.289	1.218	1.145	1.071	.997	
45	.720	.710	.699	.688	.682	.657	.628	.598	.567	.534	.501	.468	

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 1	LAMBDA 1.019736
	49	50	51	52	53				
1	16.646	14.245	6.749	2.863	.417				
2	16.634	14.233	6.743	2.860	.417				
3	16.609	14.211	6.732	2.856	.416				
4	16.573	14.177	6.714	2.848	.416				
5	16.523	14.132	6.691	2.839	.414				
6	16.461	14.075	6.663	2.827	.413				
7	16.385	14.006	6.628	2.813	.411				
8	16.295	13.925	6.588	2.796	.409				
9	16.191	13.832	6.541	2.778	.406				
10	16.073	13.725	6.489	2.757	.404				
11	15.938	13.605	6.431	2.733	.401				
12	15.787	13.472	6.367	2.708	.398				
13	15.620	13.325	6.298	2.681	.394				
14	15.435	13.164	6.222	2.651	.390				
15	15.232	12.988	6.141	2.619	.386				
16	15.011	12.798	6.055	2.585	.382				
17	14.772	12.593	5.962	2.550	.378				
18	14.514	12.374	5.865	2.512	.373				
19	14.237	12.141	5.762	2.473	.368				
20	13.942	11.894	5.654	2.432	.363				
21	13.630	11.633	5.542	2.390	.357				
22	13.301	11.361	5.425	2.345	.352				
23	12.957	11.076	5.304	2.300	.346				
24	12.598	10.781	5.179	2.253	.340				
25	12.227	10.477	5.051	2.205	.334				
26	11.845	10.164	4.920	2.156	.328				
27	11.454	9.844	4.786	2.105	.321				
28	11.056	9.519	4.649	2.054	.315				

01462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PJQ02	FLUX..GROUP 1	LAMBDA 1.019736
	49	50	51	52	53				
29	10.653	9.189	4.511	2.003	.308				
30	10.248	8.857	4.372	1.950	.301				
31	9.842	8.524	4.231	1.897	.295				
32	9.032	7.957	3.949	1.790	.281				
33	8.240	7.201	3.668	1.682	.267				
34	7.475	6.564	3.390	1.575	.252				
35	6.748	5.953	3.120	1.468	.238				
36	6.063	5.374	2.858	1.363	.224				
37	5.423	4.829	2.607	1.261	.209				
38	4.831	4.320	2.368	1.162	.195				
39	4.287	3.850	2.142	1.066	.181				
40	3.790	3.416	1.928	.973	.168				
41	3.337	3.019	1.729	.885	.154				
42	2.907	2.606	1.548	.801	.141				
43	2.527	2.243	1.366	.727	.128				
44	.924	.853	.532	.297	.056				
45	.435	.403	.254	.144	.028				

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 2		LAMBDA 1.019736		
	1	2	3	4	5	6	7	8	9	10	11	12
1	.034	.147	.591	2.335	8.806	14.206	21.513	23.140	24.805	26.483	28.143	29.744
2	.034	.147	.591	2.333	8.799	14.194	21.491	23.117	24.780	26.456	28.114	29.713
3	.034	.146	.590	2.330	8.786	14.169	21.449	23.071	24.729	26.401	28.055	29.649
4	.034	.146	.589	2.326	8.766	14.133	21.387	23.002	24.654	26.319	27.966	29.555
5	.034	.146	.588	2.320	8.740	14.084	21.304	22.911	24.554	26.211	27.849	29.430
6	.034	.145	.586	2.313	8.708	14.023	21.201	22.798	24.431	26.076	27.704	29.274
7	.034	.145	.584	2.305	8.669	13.951	21.079	22.663	24.283	25.916	27.531	29.090
8	.034	.144	.582	2.295	8.623	13.867	20.936	22.507	24.113	25.731	27.332	28.876
9	.034	.144	.580	2.284	8.572	13.773	20.776	22.330	23.920	25.521	27.105	28.635
10	.033	.143	.577	2.271	8.514	13.667	20.596	22.133	23.705	25.287	26.854	28.366
11	.033	.142	.574	2.257	8.451	13.550	20.399	21.917	23.468	25.031	26.577	28.071
12	.033	.141	.570	2.242	8.382	13.423	20.185	21.682	23.211	24.752	26.277	27.751
13	.033	.141	.567	2.226	8.307	13.286	19.954	21.429	22.935	24.452	25.954	27.406
14	.033	.140	.563	2.208	8.227	13.140	19.708	21.159	22.640	24.132	25.609	27.038
15	.032	.139	.559	2.189	8.142	12.985	19.447	20.873	22.328	23.793	25.244	26.648
16	.032	.138	.554	2.169	8.052	12.820	19.172	20.571	21.998	23.436	24.859	26.237
17	.032	.136	.549	2.148	7.957	12.648	18.883	20.254	21.654	23.062	24.456	25.807
18	.032	.135	.544	2.126	7.857	12.467	18.582	19.925	21.294	22.672	24.036	25.358
19	.031	.134	.539	2.102	7.753	12.279	18.269	19.582	20.921	22.268	23.601	24.893
20	.031	.133	.533	2.078	7.645	12.084	17.945	19.228	20.535	21.850	23.151	24.413
21	.031	.131	.528	2.052	7.532	11.883	17.612	18.864	20.139	21.420	22.689	23.919
22	.030	.130	.522	2.026	7.416	11.675	17.270	18.490	19.732	20.980	22.215	23.413
23	.030	.129	.515	1.999	7.297	11.462	16.920	18.108	19.316	20.530	21.731	22.896
24	.030	.127	.509	1.971	7.174	11.245	16.563	17.716	18.892	20.071	21.238	22.370
25	.029	.125	.502	1.942	7.049	11.022	16.199	17.321	18.461	19.606	20.737	21.836
26	.029	.124	.495	1.912	6.920	10.796	15.830	16.919	18.025	19.134	20.231	21.296
27	.029	.122	.488	1.881	6.783	10.565	15.457	16.512	17.584	18.658	19.720	20.750
28	.028	.121	.481	1.850	6.656	10.332	15.080	16.102	17.137	18.178	19.205	20.202

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 2		LAMBDA 1.019736		
	1	2	3	4	5	6	7	8	9	10	11	12
29	.028	.119	.474	1.818	6.520	10.096	14.700	15.689	16.691	17.696	18.688	19.651
30	.027	.117	.466	1.785	6.382	9.858	14.318	15.274	16.242	17.212	18.169	19.099
31	.027	.115	.458	1.752	6.243	9.618	13.935	14.858	15.792	16.727	17.650	18.547
32	.026	.111	.442	1.684	5.961	9.134	13.167	14.025	14.892	15.759	16.615	17.446
33	.025	.107	.426	1.614	5.674	8.648	12.402	13.196	13.998	14.800	15.590	16.357
34	.024	.103	.408	1.542	5.384	8.162	11.644	12.377	13.116	13.854	14.581	15.287
35	.023	.099	.391	1.470	5.094	7.679	10.897	11.572	12.251	12.927	13.594	14.241
36	.022	.095	.373	1.396	4.803	7.201	10.165	10.784	11.405	12.024	12.632	13.223
37	.021	.090	.354	1.321	4.514	6.730	9.451	10.016	10.583	11.146	11.700	12.238
38	.020	.086	.335	1.245	4.226	6.267	8.756	9.270	9.786	10.298	10.800	11.287
39	.019	.081	.316	1.170	3.942	5.814	8.083	8.549	9.016	9.479	9.933	10.373
40	.018	.076	.297	1.094	3.661	5.372	7.431	7.853	8.274	8.691	9.100	9.496
41	.017	.071	.277	1.018	3.384	4.941	6.803	7.182	7.561	7.935	8.301	8.656
42	.014	.058	.223	.809	2.645	3.815	5.191	5.469	5.745	6.017	6.282	6.538
43	.010	.043	.167	.603	1.944	2.774	3.739	3.931	4.122	4.310	4.493	4.669
44	.007	.029	.112	.400	1.275	1.806	2.416	2.537	2.657	2.775	2.889	2.999
45	.003	.015	.056	.199	.631	.889	1.185	1.243	1.301	1.357	1.412	1.465

61462	ARG. CURVED SLAB NO. 3-2.0KG				XY	PJQ02	FLUX..GROUP 2		LAMBDA 1.019736			
	13	14	15	16	17	18	19	20	21	22	23	24
1	31.232	32.539	33.578	34.242	34.400	34.569	35.261	36.152	37.059	37.872	38.528	38.988
2	31.198	32.503	33.540	34.202	34.355	34.517	35.204	36.093	36.999	37.812	38.468	38.932
3	31.131	32.432	33.465	34.122	34.267	34.413	35.090	35.974	36.878	37.691	38.350	38.818
4	31.031	32.327	33.354	34.004	34.138	34.259	34.921	35.796	36.696	37.510	38.173	38.647
5	30.898	32.187	33.209	33.851	33.970	34.056	34.696	35.559	36.455	37.269	37.937	38.419
6	30.734	32.015	33.031	33.666	33.770	33.809	34.420	35.267	36.155	36.969	37.642	38.133
7	30.539	31.812	32.822	33.454	33.545	33.530	34.101	34.923	35.798	36.609	37.287	37.788
8	30.314	31.578	32.585	33.219	33.313	33.244	33.753	34.533	35.387	36.192	36.872	37.384
9	30.059	31.315	32.320	32.965	33.097	33.026	33.394	34.104	34.924	35.717	36.399	36.922
10	29.776	31.022	32.027	32.690	32.906	32.862	33.019	33.634	34.411	35.186	35.868	36.401
11	29.465	30.701	31.704	32.382	32.634	32.577	32.591	33.118	33.847	34.602	35.279	35.819
12	29.128	30.352	31.352	32.040	32.308	32.231	32.137	32.572	33.242	33.967	34.635	35.181
13	28.765	29.976	30.971	31.667	31.952	31.865	31.739	32.022	32.606	33.287	33.939	34.486
14	28.377	29.573	30.563	31.266	31.587	31.572	31.476	31.486	31.946	32.567	33.194	33.738
15	27.965	29.146	30.128	30.836	31.182	31.186	31.073	30.924	31.264	31.814	32.406	32.939
16	27.531	28.694	29.667	30.378	30.741	30.749	30.605	30.415	30.588	31.039	31.581	32.094
17	27.077	28.220	29.182	29.893	30.275	30.308	30.232	30.084	29.945	30.255	30.726	31.207
18	26.603	27.726	28.674	29.384	29.779	29.826	29.765	29.596	29.290	29.465	29.852	30.288
19	26.111	27.212	28.146	28.852	29.257	29.311	29.248	29.025	28.726	28.709	28.978	29.349
20	25.602	26.681	27.599	28.301	28.714	28.781	28.742	28.590	28.361	28.034	28.132	28.407
21	25.080	26.134	27.036	27.731	28.154	28.233	28.213	28.080	27.807	27.463	27.339	27.484
22	24.544	25.573	26.458	27.146	27.577	27.668	27.668	27.567	27.362	27.090	26.643	26.613
23	23.997	25.001	25.867	26.547	26.985	27.088	27.106	27.027	26.839	26.513	26.084	25.846
24	23.440	24.418	25.265	25.937	26.380	26.495	26.529	26.474	26.321	26.060	25.694	25.302
25	22.875	23.827	24.654	25.316	25.765	25.889	25.939	25.908	25.789	25.578	25.284	24.951
26	22.304	23.229	24.036	24.688	25.140	25.274	25.338	25.328	25.237	25.057	24.781	24.380
27	21.728	22.625	23.412	24.053	24.508	24.649	24.728	24.737	24.670	24.522	24.282	23.940
28	21.148	22.018	22.784	23.413	23.870	24.019	24.109	24.136	24.094	23.976	23.777	23.492

61462	ARG. CURVED SLAB NO. 3-2.0KG											XY	PDQ02	FLUX..GROUP 2	LAMBDA 1.019736		
	13	14	15	16	17	18	19	20	21	22	23	24					
29	20.565	21.408	22.153	22.770	23.227	23.382	23.484	23.528	23.508	23.421	23.261	23.022					
30	19.982	20.798	21.521	22.126	22.582	22.743	22.855	22.914	22.916	22.858	22.736	22.544					
31	19.399	20.187	20.889	21.480	21.935	22.100	22.221	22.295	22.318	22.287	22.201	22.057					
32	18.237	18.971	19.630	20.193	20.639	20.812	20.948	21.045	21.103	21.120	21.097	21.034					
33	17.088	17.769	18.384	18.917	19.351	19.525	19.670	19.784	19.866	19.917	19.937	19.927					
34	15.960	16.589	17.160	17.660	18.076	18.249	18.397	18.519	18.616	18.687	18.732	18.754					
35	14.858	15.437	15.964	16.430	16.824	16.991	17.137	17.261	17.364	17.445	17.505	17.544					
36	13.788	14.317	14.801	15.232	15.601	15.759	15.899	16.021	16.125	16.209	16.275	16.322					
37	12.752	13.234	13.676	14.072	14.413	14.561	14.694	14.810	14.910	14.993	15.060	15.110					
38	11.753	12.190	12.592	12.953	13.266	13.403	13.526	13.635	13.730	13.809	13.874	13.924					
39	10.793	11.188	11.552	11.879	12.164	12.289	12.402	12.503	12.590	12.665	12.726	12.774					
40	9.874	10.229	10.557	10.851	11.109	11.222	11.325	11.417	11.497	11.566	11.622	11.667					
41	8.995	9.313	9.606	9.870	10.102	10.204	10.297	10.380	10.452	10.515	10.566	10.607					
42	6.782	7.011	7.222	7.413	7.580	7.653	7.720	7.781	7.834	7.879	7.917	7.948					
43	4.836	4.993	5.138	5.268	5.382	5.432	5.478	5.519	5.556	5.587	5.613	5.634					
44	3.103	3.200	3.290	3.370	3.441	3.472	3.501	3.526	3.549	3.568	3.585	3.598					
45	1.514	1.561	1.604	1.642	1.676	1.691	1.705	1.717	1.728	1.737	1.745	1.751					

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PLQ02	FLUX..GROUP 2		LAMEDA 1.019736		
	25	26	27	28	29	30	31	32	33	34	35	36
1	39.237	39.268	39.090	38.733	38.255	37.765	37.460	37.694	37.798	37.748	37.567	37.270
2	39.183	39.217	39.043	38.690	38.214	37.724	37.416	37.640	37.740	37.690	37.509	37.214
3	39.075	39.116	38.949	38.602	38.131	37.641	37.326	37.529	37.624	37.573	37.374	37.102
4	38.912	38.963	38.806	38.469	38.004	37.514	37.187	37.356	37.444	37.393	37.218	36.932
5	38.675	38.758	38.614	38.288	37.831	37.339	36.991	37.113	37.194	37.145	36.979	36.704
6	38.422	38.499	38.371	38.059	37.606	37.108	36.723	36.779	36.861	36.822	36.675	36.417
7	38.091	38.186	38.077	37.781	37.337	36.819	36.351	36.128	36.351	36.412	36.306	36.072
8	37.763	37.819	37.730	37.453	37.021	36.498	35.993	35.689	35.896	35.974	35.888	35.673
9	37.258	37.393	37.326	37.074	36.662	36.146	35.626	35.283	35.436	35.504	35.421	35.221
10	36.753	36.911	36.872	36.644	36.254	35.750	35.222	34.830	34.941	34.986	34.893	34.711
11	36.189	36.370	36.358	36.159	35.774	35.302	34.758	34.284	34.060	34.241	34.272	34.137
12	35.566	35.771	35.787	35.612	35.240	34.807	34.261	33.743	33.425	33.589	33.634	33.515
13	34.886	35.113	35.156	35.017	34.709	34.261	33.723	33.187	32.820	32.963	32.977	32.839
14	34.148	34.395	34.465	34.357	34.061	33.659	33.133	32.574	32.102	31.890	32.066	32.069
15	33.255	33.619	33.714	33.638	33.374	33.000	32.491	31.923	31.374	31.071	31.290	31.295
16	32.504	32.786	32.905	32.857	32.645	32.282	31.734	31.225	30.648	30.179	29.995	30.286
17	31.614	31.901	32.039	32.018	31.836	31.504	31.040	30.479	29.875	29.309	28.899	28.784
18	30.678	30.965	31.118	31.120	30.969	30.667	30.251	29.687	29.076	28.464	27.952	27.714
19	29.708	29.987	30.148	30.169	30.043	29.771	29.365	28.844	28.243	27.621	27.026	26.614
20	28.716	28.975	29.135	29.169	29.065	28.821	28.445	27.953	27.371	26.740	26.117	25.590
21	27.719	27.941	28.088	28.127	28.040	27.822	27.476	27.017	26.465	25.854	25.230	24.659
22	26.741	26.902	27.021	27.054	26.978	26.782	26.467	26.044	25.533	24.962	24.376	23.833
23	25.817	25.883	25.952	25.966	25.891	25.714	25.431	25.050	24.591	24.085	23.576	23.133
24	24.937	24.916	24.905	24.882	24.800	24.637	24.388	24.059	23.670	23.254	22.868	22.506
25	24.312	24.042	23.914	23.829	23.729	23.579	23.370	23.108	22.814	22.529	22.218	22.299
26	23.835	23.335	23.029	22.848	22.716	22.581	22.425	22.257	22.105	22.009	22.045	22.180
27	23.486	22.953	22.314	21.990	21.813	21.705	21.626	21.601	21.671	21.830	21.946	22.035
28	23.122	22.703	21.792	21.314	21.099	21.052	21.081	21.274	21.498	21.661	21.756	21.805

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 2		LAMBDA 1.019736			
	25	26	27	28	29	30	31	32	33	34	35	36	
29	22.694	22.254	21.628	20.936	20.688	20.608	20.949	21.164	21.337	21.448	21.509	21.520	
30	22.278	21.930	21.494	21.001	20.690	20.816	20.929	21.043	21.134	21.188	21.203	21.182	
31	21.855	21.598	21.299	20.993	20.773	20.779	20.809	20.847	20.875	20.880	20.857	20.803	
32	20.936	20.809	20.665	20.524	20.400	20.332	20.278	20.231	20.181	20.118	20.037	19.935	
33	19.892	19.835	19.764	19.685	19.605	19.529	19.455	19.377	19.291	19.194	19.082	18.953	
34	18.754	18.735	18.700	18.652	18.597	18.526	18.449	18.364	18.268	18.156	18.031	17.890	
35	17.563	17.564	17.548	17.517	17.471	17.414	17.342	17.258	17.160	17.048	16.921	16.780	
36	16.351	16.363	16.358	16.335	16.300	16.252	16.187	16.108	16.014	15.907	15.784	15.648	
37	15.144	15.161	15.163	15.149	15.120	15.077	15.019	14.946	14.860	14.759	14.645	14.516	
38	13.950	13.979	13.984	13.975	13.951	13.913	13.861	13.796	13.717	13.625	13.520	13.402	
39	12.806	12.829	12.836	12.829	12.810	12.777	12.731	12.673	12.602	12.518	12.423	12.316	
40	11.679	11.720	11.728	11.723	11.707	11.679	11.639	11.587	11.523	11.448	11.362	11.266	
41	10.638	10.657	10.665	10.663	10.649	10.624	10.589	10.543	10.486	10.420	10.343	10.257	
42	7.971	7.986	7.993	7.992	7.983	7.967	7.942	7.910	7.870	7.823	7.769	7.707	
43	5.650	5.661	5.666	5.666	5.660	5.650	5.633	5.612	5.585	5.553	5.517	5.475	
44	3.608	3.615	3.618	3.610	3.610	3.608	3.598	3.585	3.569	3.549	3.527	3.501	
45	1.756	1.759	1.761	1.761	1.759	1.756	1.751	1.745	1.737	1.728	1.717	1.705	

61462	ARG. CUPVEL SLAB NO. 3-2.0KG				XY	PUG02	FLUX..GROUP 2		LAMBDA 1.019736			
	37	38	39	40	41	42	43	44	45	46	47	48
1	36.873	36.389	35.829	35.205	34.872	33.415	31.818	30.134	28.403	26.659	24.928	23.231
2	36.819	36.337	35.779	35.157	34.825	33.372	31.780	30.099	28.372	26.631	24.903	23.208
3	36.711	36.233	35.681	35.063	34.733	33.289	31.704	30.031	28.310	26.576	24.853	23.163
4	36.549	36.078	35.533	34.922	34.596	33.164	31.591	29.929	28.218	26.493	24.779	23.096
5	36.331	35.871	35.335	34.734	34.417	32.997	31.440	29.793	28.096	26.383	24.680	23.008
6	36.059	35.612	35.088	34.498	34.182	32.789	31.252	29.623	27.943	26.246	24.557	22.897
7	35.732	35.301	34.792	34.216	33.907	32.540	31.077	29.420	27.761	26.082	24.410	22.765
8	35.351	34.938	34.446	33.886	33.565	32.248	30.765	29.185	27.549	25.892	24.239	22.612
9	34.918	34.523	34.050	33.509	33.217	31.816	30.465	28.916	27.308	25.676	24.046	22.439
10	34.429	34.056	33.604	33.084	32.802	31.542	30.130	28.615	27.039	25.434	23.823	22.245
11	33.883	33.535	33.107	32.611	32.341	31.127	29.758	28.284	26.741	25.168	23.591	22.032
12	33.284	32.960	32.558	32.089	31.832	30.671	29.350	27.919	26.417	24.879	23.332	21.800
13	32.626	32.329	31.956	31.517	31.270	30.174	28.908	27.526	26.067	24.566	23.052	21.549
14	31.902	31.637	31.298	30.893	30.666	29.636	28.453	27.105	25.673	24.234	22.753	21.281
15	31.121	30.881	30.581	30.218	30.015	29.061	27.977	26.658	25.275	23.877	22.436	20.996
16	30.246	30.046	29.801	29.490	29.311	28.448	27.391	26.186	24.877	23.504	22.101	20.696
17	29.086	29.116	28.962	28.713	28.562	27.804	26.829	25.693	24.437	23.113	21.751	20.382
18	28.136	28.225	28.091	27.899	27.769	27.124	26.246	25.182	23.986	22.706	21.387	20.054
19	26.566	27.080	27.155	27.022	26.932	26.423	25.647	24.657	23.519	22.289	21.010	19.714
20	25.277	25.329	25.962	26.079	26.046	25.708	25.040	24.123	23.042	21.860	20.622	19.363
21	24.227	24.041	24.228	24.938	25.102	24.995	24.434	23.586	22.558	21.421	20.224	19.002
22	23.410	23.199	23.278	23.878	24.182	24.315	23.841	23.050	22.070	20.975	19.818	18.633
23	22.849	22.848	23.024	23.424	23.609	23.710	23.270	22.520	21.580	20.525	19.405	18.256
24	22.575	22.754	22.931	23.122	23.191	23.168	22.722	21.996	21.089	20.070	18.986	17.872
25	22.459	22.609	22.717	22.791	22.804	22.662	22.192	21.479	20.599	19.613	18.563	17.483
26	22.311	22.395	22.437	22.434	22.412	22.174	21.675	20.967	20.110	19.153	18.136	17.090
27	22.098	22.124	22.110	22.052	22.005	21.691	21.164	20.459	19.621	18.692	17.706	16.692
28	21.824	21.803	21.744	21.644	21.578	21.206	20.656	19.953	19.132	18.229	17.273	16.291

61462	ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 2	LAMBDA 1.019736			
	37	38	39	40	41	42	43	44	45	46	47	48
29	21.497	21.439	21.344	21.212	21.132	20.716	20.148	19.448	18.644	17.765	16.839	15.887
30	21.127	21.038	20.915	20.759	20.668	20.219	19.638	18.943	18.156	17.301	16.403	15.482
31	20.720	20.606	20.461	20.285	20.186	19.713	19.126	18.437	17.667	16.836	15.966	15.075
32	19.810	19.660	19.486	19.286	19.177	18.680	18.091	17.423	16.689	15.907	15.092	14.259
33	18.804	18.636	18.446	18.237	18.124	17.623	17.048	16.407	15.714	14.980	14.220	13.444
34	17.733	17.557	17.365	17.154	17.042	16.553	16.001	15.395	14.745	14.061	13.354	12.634
35	16.622	16.449	16.260	16.056	15.949	15.481	14.960	14.392	13.787	13.153	12.499	11.834
36	15.497	15.331	15.151	14.958	14.856	14.417	13.931	13.404	12.845	12.261	11.659	11.047
37	14.375	14.220	14.052	13.872	13.778	13.370	12.922	12.437	11.924	11.388	10.837	10.276
38	13.271	13.129	12.975	12.809	12.722	12.349	11.938	11.495	11.027	10.538	10.035	9.524
39	12.197	12.067	11.927	11.776	11.697	11.357	10.984	10.582	10.157	9.714	9.258	8.793
40	11.159	11.041	10.915	10.779	10.707	10.401	10.064	9.701	9.317	8.917	8.505	8.085
41	10.161	10.056	9.942	9.820	9.756	9.481	9.179	8.853	8.509	8.149	7.778	7.401
42	7.639	7.564	7.482	7.395	7.349	7.151	6.934	6.699	6.449	6.188	5.919	5.643
43	5.429	5.378	5.323	5.263	5.232	5.097	4.948	4.787	4.616	4.437	4.251	4.060
44	3.473	3.441	3.407	3.370	3.351	3.267	3.175	3.075	2.969	2.857	2.740	2.621
45	1.692	1.677	1.661	1.643	1.634	1.594	1.550	1.502	1.451	1.397	1.342	1.284

61462 ARG. CURVED SLAB NO. 3-2.0KG					XY	PDQ02	FLUX..GROUP 2			LAMBDA I.019736	
	49	50	51	52	53		49	50	51	52	53
1	21.583	19.995	13.107	8.077	1.986	29	14.929	13.979	9.532	6.091	1.558
2	21.562	19.977	13.096	8.071	1.984	30	14.554	13.635	9.319	5.969	1.530
3	21.522	19.941	13.075	8.059	1.982	31	14.178	13.288	9.104	5.845	1.503
4	21.462	19.887	13.044	8.042	1.978	32	13.421	12.590	8.667	5.592	1.446
5	21.382	19.816	13.002	8.020	1.973	33	12.664	11.891	8.226	5.334	1.387
6	21.283	19.727	12.951	7.992	1.968	34	11.912	11.194	7.782	5.072	1.327
7	21.165	19.621	12.890	7.959	1.960	35	11.167	10.503	7.338	4.808	1.265
8	21.028	19.499	12.819	7.920	1.952	36	10.433	9.822	6.896	4.543	1.203
9	20.873	19.360	12.738	7.876	1.943	37	9.713	9.152	6.459	4.277	1.140
10	20.699	19.204	12.648	7.827	1.933	38	9.010	8.498	6.027	4.012	1.076
11	20.508	19.033	12.549	7.773	1.921	39	8.326	7.860	5.601	3.748	1.011
12	20.300	18.847	12.441	7.714	1.909	40	7.662	7.240	5.184	3.486	.946
13	20.075	18.646	12.324	7.650	1.895	41	7.019	6.638	4.776	3.228	.881
14	19.835	18.431	12.198	7.581	1.881	42	5.364	5.084	3.701	2.533	.702
15	19.580	18.202	12.065	7.508	1.865	43	3.866	3.671	2.699	1.866	.524
16	19.311	17.960	11.924	7.430	1.849	44	2.499	2.376	1.760	1.227	.348
17	19.028	17.706	11.775	7.348	1.831	45	1.226	1.166	.868	.608	.173
18	18.723	17.440	11.618	7.262	1.813						
19	18.426	17.164	11.456	7.172	1.793						
20	18.109	16.878	11.286	7.078	1.773						
21	17.782	16.583	11.111	6.981	1.752						
22	17.447	16.279	10.929	6.880	1.730						
23	17.104	15.967	10.743	6.775	1.708						
24	16.754	15.649	10.551	6.668	1.684						
25	16.398	15.324	10.355	6.558	1.660						
26	16.036	14.994	10.154	6.445	1.636						
27	15.671	14.660	9.950	6.329	1.610						
28	15.301	14.321	9.743	6.211	1.584						

Equivalent One-Reflector and Bare Core

Reflector Savings

Using the critical mass $W_{U25} = 1.90$ kg found by the machine calculation for the homogeneous straight slab, one can reduce the totally reflected reactor to an equivalent slab reflected on the two opposite sides in the x direction and bare elsewhere. The totally bare equivalent reactor can likewise be found. This can be done in a straightforward manner without the necessity of iteration techniques.

Using $W_{U25} = 1.90$ kg one can calculate all constants. Then one assumes an infinite reflector on both sides in the x direction which is quite reasonable since the actual dimensions of the two reflectors in this direction are 188 cm and 106 cm of graphite. Then the only unknown is the reflector savings in the y direction which will make this configuration just critical.

Core Constants

$$\begin{array}{ll} W_{U25} = 1.90 \text{ kg} & L_c^2 = 3.4253 \text{ cm}^2 \\ \Sigma_a = 0.062777 \text{ cm}^{-1} & D_{1c} = 1.29 \text{ cm} \\ \nu \Sigma_f = 0.100418 \text{ cm}^{-1} & D_{2c} = 0.21503 \text{ cm} \\ k_{\infty} = \frac{\nu \Sigma_f}{\Sigma_a} = 1.5996 & \tau_c = 55.4 \text{ cm}^2 \end{array}$$

Calculations

$$\mu^2 = -\frac{1}{2} \left(\frac{1}{\tau_c} + \frac{1}{L_c^2} \right) + \frac{1}{2} \sqrt{\left(\frac{1}{\tau_c} + \frac{1}{L_c^2} \right)^2 + \frac{4(k_{\infty}-1)}{\tau_c L_c^2}} = 0.00987815 \text{ cm}^{-2}$$

$$\nu^2 = +\frac{1}{2} \left(\frac{1}{\tau_c} + \frac{1}{L_c^2} \right) + \frac{1}{2} \sqrt{\left(\frac{1}{\tau_c} + \frac{1}{L_c^2} \right)^2 + \frac{4(k_{\infty}-1)}{\tau_c L_c^2}} = 0.3198738 \text{ cm}^{-2}$$

$$\kappa_{1r}^2 = \frac{1}{\tau_r} = 0.0027397 \text{ cm}^{-2}$$

$$\kappa_{2r}^2 = \frac{1}{L_r^2} = 0.00058824 \text{ cm}^{-2}$$

$$B^2 = \left(\frac{\pi}{H} \right)^2 + \left(\frac{\pi}{L} \right)^2 = 0.00176 + \frac{9.8696}{L^2}$$

where L^2 is the unknown.

$$\bar{\mu}^2 = \mu^2 - B^2 = 0.00811815 - \frac{9.8696}{L^2}$$

$$\bar{\nu}^2 = \nu^2 + B^2 = 0.321634 + \frac{9.8696}{L^2}$$

$$\bar{\kappa}_{1r}^2 = \kappa_{1r}^2 + B^2 = 0.0044997 + \frac{9.8696}{L^2}$$

$$\bar{\kappa}_{2r}^2 = \kappa_{2r}^2 + B^2 = 0.0023482 + \frac{9.8696}{L^2}$$

$$\phi_{1c} = AX + CY$$

$$\phi_{2c} = S_1AX + S_2CY$$

$$\left. \begin{array}{l} X = \cos \bar{\mu}x \\ Y = \cosh \bar{\nu}x \end{array} \right\} \text{ Due to symmetry of the core}$$

$$\phi_{1r} = FZ_1$$

$$\phi_{2r} = S_3FZ_1 + GZ_2$$

$$\left. \begin{array}{l} Z_1 = e^{-\bar{\kappa}_{1r}x} \\ Z_2 = e^{-\bar{\kappa}_{2r}x} \end{array} \right\} \text{ Due to infinite reflector}$$

For criticality

$$\left. \begin{array}{l} \phi_{1c} = \phi_{1r} \\ \phi_{2c} = \phi_{2r} \\ D_{1c}\phi'_{1c} = D_{1r}\phi'_{1r} \\ D_{2c}\phi'_{2c} = D_{2r}\phi'_{2r} \end{array} \right\} \text{ All evaluated at } x = W/2 = 7.62 \text{ cm.}$$

These equations can be expressed in matrix form such that:

$$Y_c \begin{pmatrix} A \\ C \end{pmatrix} = Y_r \begin{pmatrix} F \\ G \end{pmatrix} \text{ at interface.}$$

Hence

$$QY_c \begin{pmatrix} A \\ C \end{pmatrix} = QY_r \begin{pmatrix} F \\ G \end{pmatrix}$$

Now define Q such that $QY_r = 0$.

Hence the critical equation becomes

$$QY_c \left(\frac{A}{C} \right) = 0 \quad \text{or} \quad |QY_c| = \left| \frac{\alpha}{\gamma\delta} \right| = 0$$

Hence

$$\frac{\alpha/\beta}{\gamma/\delta} - 1 = 0 \text{ at criticality.}$$

Where

$$\alpha = \frac{X}{X'} - \frac{D_{1c}}{D_{1r}} \frac{Z_1}{Z_1'}$$

$$\beta = \frac{Y}{Y'} - \frac{D_{1c}}{D_{1r}} \frac{Z_1}{Z_1'}$$

$$\gamma = S_1 \frac{X}{X'} - \left[S_3 \frac{D_{1c}}{D_{1r}} \frac{Z_1}{Z_1'} + \left(S_1 \frac{D_{2c}}{D_{2r}} - S_3 \frac{D_{1c}}{D_{1r}} \right) \frac{Z_2}{Z_2'} \right]$$

$$\delta = S_2 \frac{Y}{Y'} - \left[S_3 \frac{D_{1c}}{D_{1r}} \frac{Z_1}{Z_1'} + \left(S_2 \frac{D_{2c}}{D_{2r}} - S_3 \frac{D_{1c}}{D_{1r}} \right) \frac{Z_2}{Z_2'} \right]$$

$$\frac{X}{X'} = -\frac{1}{\bar{\mu}} \cot (7.62\bar{\mu})$$

$$\frac{Y}{Y'} = \frac{1}{\bar{\nu}} \coth (7.62\bar{\nu})$$

$$\frac{Z_1}{Z_1'} = -\frac{1}{\bar{\kappa}_{1r}}$$

$$\frac{Z_2}{Z_2'} = -\frac{1}{\bar{\kappa}_{2r}}$$

$$\frac{D_{1c}}{D_{1r}} = 1.162$$

$$\frac{D_{2c}}{D_{2r}} = 0.2347$$

$$S_1 = 0.34608$$

$$S_2 = -3.8368$$

$$S_3 = -1.5426$$

R_x	L	L^2	$\frac{9.8696}{L^2}$	$\bar{\mu}^2$	$\bar{\nu}^2$	$\bar{\mu}$	$\bar{\nu}$
70	127.6	16,282	.0006062	.00751195	.322240	.086672	.56766
50	107.6	11,578	.0008524	.00726575	.322486	.085239	.56788
30	87.6	7,673.8	.0012861	.00683205	.322920	.082656	.56826
20	77.6	6,021.8	.0016390	.00647915	.323273	.080493	.56857
23.5	81.1	6,577.2	.0015006	.00661755	.323135	.081348	.56845

$7.62 \bar{\mu}$	$7.62 \bar{\nu}$	$\bar{\kappa}_{1r}^2$	$\bar{\kappa}_{2r}^2$	$\bar{\kappa}_{1r}$	$\bar{\kappa}_{2r}$	$\frac{Z_1}{Z_1'}$	$\frac{Z_2}{Z_2'}$
.66044	4.326	.0051059	.0029544	.0714556	.0543544	-13.995	-18.398
.64952	4.327	.0053521	.0032006	.0731580	.0565738	-13.669	-17.676
.62984	4.330	.0057858	.0036343	.0760644	.0602852	-13.147	-16.588
.61336	4.333	.0061387	.0039872	.0783499	.0631443	-12.763	-15.837
.61987	4.332	.0060003	.0038488	.0774616	.0620387	-12.910	-16.119

I $1.162 \frac{Z_1}{Z_1'}$	II $-1.7925 \frac{Z_1}{Z_1'}$	III $1.87373 \frac{Z_2}{Z_2'}$	IV $0.89200 \frac{Z_2}{Z_2'}$	V $\frac{II + III}{Z_1'}$	VI $\frac{II + IV}{Z_1'}$	$\cot (7.62 \bar{\mu})$	$\coth (7.62 \bar{\nu})$
-16.262	+25.079	-34.473	-16.411	-9.394	+8.668	1.2874	1.00037
-15.883	+24.502	-33.120	-15.767	-8.618	+8.735	1.3168	1.00037
-15.277	+23.566	-31.081	-14.796	-7.515	+8.770	1.3721	1.00037
-14.831	+22.878	-29.674	-14.127	-7.196	+8.751	1.4205	1.00037
-15.001	+23.141	-30.203	-14.378	-7.001	+8.763	1.4010	1.00037

$\frac{1}{\bar{\mu}}$	$\frac{X}{X'}$	$\frac{Y}{Y'}$	$S_1 \frac{X}{X'}$	$S_2 \frac{Y}{Y'}$	$\frac{X}{X'} - I$	$\frac{Y}{Y'} - I$	$S_1 \frac{X}{X'} - V$
11.538	-14.854	1.7616	-5.1407	-6.7589	1.408	18.024	4.253
11.732	-15.449	1.7609	-5.3466	-6.7562	0.434	17.644	3.271
12.098	-16.600	1.7598	-5.7449	-6.7520	-1.323	17.037	1.770
12.423	-17.647	1.7588	-6.1073	-6.7482	-2.816	16.590	1.089
12.293	-17.222	1.7592	-5.9602	-6.7497	-2.221	16.760	1.041

$S_2 \frac{Y}{Y'} - VI$	$\frac{\alpha}{\beta}$	$\frac{\gamma}{\delta}$	$\frac{\alpha/\beta}{\gamma/\delta} - 1$
-15.427	.07812	-.2757	-1.283
-15.491	.0246	-.2112	-1.116
-15.522	-.07765	-.11403	-0.319
-15.499	-.16974	-.07026	+1.416
-15.513	-.1325	-.067105	+0.975

FIGURE 12

Totally Bare Core - Reflector Savings in x Direction

$$L = 86.1 \text{ cm}$$

$$H = 74.96 \text{ cm}$$

$$W = 15.24 + R_x \text{ cm}$$

$$\text{critical condition } \mu^2 = B_g^2$$

$$\therefore 0.00987815 = 0.00176 + 0.00133135 + \left(\frac{\pi}{W}\right)^2$$

$$\left(\frac{\pi}{W}\right)^2 = 0.0067868 \text{ cm}^{-2}$$

$$W^2 = \frac{9.8696}{0.0067868} = 1454.23 \text{ cm}^2$$

$$W = 38.13 \text{ cm}$$

$$R_x = 38.13 - 15.24 = 22.89 \text{ cm.}$$

This is the total reflector savings in the x direction.

CONCLUSIONS

The constants calculated for the totally homogenized core represented as a straight slab give a critical mass within 1.5% of the experimental critical mass. The attempts at refinement of this calculation by approximating the curvature and the nonhomogeneity of the core produce critical masses which lie further from the experimental value but still very close.

It must be remembered that two small reactivity effects which partly compensate one another have been neglected. The first is caused by the use of dummy Al plates at the north edge of the core where the neutron flux is lowest. Hence the fuel is more concentrated in the region of higher flux than is assumed in the calculation. This would tend to make the experimental critical mass less than the calculated critical mass. The second is caused by the extra absorption due to the aluminum core tanks and the extra neutron leakage due to the slots for the control plates in the graphite reflector. This would tend to make the experimental critical mass greater than the calculated critical mass. It is expected that the first effect will outweigh the second.

The magnitude of these reactivity effects would be of interest. These could be calculated by perturbation methods. Other perturbation calculations of interest would include the effect of core curvature on the critical mass, the effect of various changes in core and reflector constants and the effect of various non-uniformities in the fuel loading. The adjoint flux can be obtained by hand using the equivalent slab reflected in the x direction only or by machine using the PDQ code. This code is not set up for the calculation of adjoint fluxes; however, they can be obtained by switching certain fast and thermal group constants and by using a fictitious fast group absorption cross section which may be either positive or negative depending upon the material in each region.

Also of general interest is the comparison between the calculated slope of λ near critical and the experimentally determined slope of k . The slope of λ is $0.000125 \Delta\lambda/\lambda$ per gram U^{235} while the experimental value is $0.000080 \delta k/k$ per gram U^{235} . The calculated value agrees well with Kelber's formula $d \ln K = \frac{1}{4} d \ln M$ where $M = W_U^{25}$. However, the experimental data would give $d \ln K = .156 d \ln M$ near critical. An investigation to find the reason for the difference in slopes would be worthwhile.

In general the flux plots from PDQ 61462 agree well with the experimentally measured flux shapes although the experimental plots tend to be somewhat flatter. However, the uncertainty in the experimental curves is large.

The change in critical mass with τ_{core} is known at one point. The critical mass fell from 1.99 kg to 1.9 kg as τ_{core} changed from 58.1 cm² to 55.4 cm². Hence $(\partial W_{\text{U}^{25}} / \partial \tau_{\text{core}})_{D_{1c}} = 0.0333 \text{ kg/cm}^2$ at least in the range 55 to 60 cm² for τ_{core} .

It is noted that these two group calculations are quite accurate. Slightly less accuracy has been obtained by two group calculations for the MTR.⁽¹²⁾ In general, as the thickness of the reactor is reduced such that it becomes close to the slowing-down length, two-group theory becomes inadequate, since the leakage is not correctly accounted for. This is already the case for the Argonaut one-slab loading and even more so for the annular loading. Hence the correct choice of τ becomes difficult. Using a greater number of energy groups is perhaps the best solution to this problem.

SUMMARY OF CORRECT TWO-GROUP CONSTANTS FOR ARGONAUT ONE-SLAB LOADING

(Assuming Homogenized Core)

Core

$T_N = 49^\circ\text{C}$	$\Sigma_a = 0.013545 + 0.025273 W_{U25} \text{ cm}^{-1}$
$E_c = 0.181 \text{ ev}$	$\Sigma_f = 0.020984 W_{U25} \text{ cm}^{-1}$
$\tau_1 = 38.23 \text{ cm}^2$	$\nu\Sigma_f = 0.0518305 W_{U25} \text{ cm}^{-1}$
$\tau_2 = 17.19 \text{ cm}^2$	$L^2 = \frac{1}{0.064073 + 0.11955 W_{U25}} \text{ cm}^2$
$\tau_f = 61.3 \text{ cm}^2$	$R_z = 14.0 \text{ cm}$
$D_1 = 1.300 \text{ cm}$	$R_y = 28.5 \text{ cm}$
$\Sigma_1 = 0.02120 \text{ cm}^{-1}$	$D_2 = 0.211 \text{ cm}$

Graphite

$$\begin{aligned}
 L^2 &= 1700 \text{ cm}^2 \\
 \tau &= 385 \text{ cm}^2 \\
 D_1 &= 1.14 \text{ cm} \\
 D_2 &= 0.916 \text{ cm} \\
 \Sigma_a &= 0.00539 \text{ cm}^{-1}
 \end{aligned}$$

H₂O

$$\begin{aligned}
 L^2 &= 7.510 \text{ cm}^2 \\
 \tau &= 31.8 \text{ cm}^2 \\
 D_1 &= 1.20 \text{ cm} \\
 D_2 &= 0.1435 \text{ cm} \\
 \Sigma_a &= 0.01910 \text{ cm}^{-1}
 \end{aligned}$$

The constants τ_f , D_1 and Σ_1 for the core have been corrected by iterating between τ_f and B^2 . Hence the constants listed above are slightly different from those given in the text.

ADDENDUM

The method of obtaining two-group constants for the Argonaut can be briefly described as follows. Deutsch's three-group constants are reduced to two groups by taking into account leakage effects for an "equivalent bare reactor." In the slab configuration the definition of the equivalent bare reactor is the standard one; for the annular or more complicated configuration by "equivalent bare reactor" is meant a bare homogeneous cylindrical reactor, with the same material constants as the core of the Argonaut, of just critical dimensions and no internal thermal column. It is also required that for the "equivalent bare reactor" the same criticality solution is obtained by two-group theory as by three group theory. The reason for this stress on three-group theory is the fact that a convolution of two diffusion kernels gives a better representation of the experimental slowing-down density in water than does the single diffusion kernel of two-group theory. Four groups would be even better.

The constants obtained by this method for the slab configuration are given on page 87. Given below are the constants obtained for the annular configuration assuming a homogenized core and using the 1959 World consistent set of cross sections.

Core

$W_{\text{U}}^{25} = 4.0 \text{ kg}$	$D_1 = 1.315 \text{ cm}$
$T_{\text{M}} = 20^\circ\text{C}$	$\Sigma_1 = 0.022364 \text{ cm}^{-1}$
$V_{\text{C}} = 87.003 \text{ liters}$	$\Sigma_{\text{a}} = 0.014701 + 0.016226 W_{\text{U}}^{25} \text{ cm}^{-1}$
$\tau_1 = 36.38 \text{ cm}^2$	$\nu\Sigma_{\text{f}} = 0.033223 W_{\text{U}}^{25} \text{ cm}^{-1}$
$\tau_2 = 16.19 \text{ cm}^2$	$\nu = 2.43$
$\tau_{\text{f}} = 58.8 \text{ cm}^2$	$L^2 = 2.657 \text{ cm}^2$
$B_{\text{M}}^2 = 0.010513 \text{ cm}^{-2}$	$D_2 = 0.212 \text{ cm}$

Graphite

$\tau = 385 \text{ cm}^2$
$D_1 = 1.14 \text{ cm}$
$D_2 = 0.916 \text{ cm}$
$\Sigma_1 = 0.002961 \text{ cm}^{-1}$
$\Sigma_{\text{a}} = 0.000539 \text{ cm}^{-1}$

H₂O

$\tau = 31.8 \text{ cm}^2$
$D_1 = 1.20 \text{ cm}$
$D_2 = 0.142 \text{ cm}$
$\Sigma_1 = 0.0374 \text{ cm}^{-1}$
$\Sigma_{\text{a}} = 0.0195 \text{ cm}^{-1}$

Concrete	Outside Graphite Reflector ($\frac{2}{3}$ concrete, $\frac{1}{6}$ graphite, $\frac{1}{6}$ H ₂ O)
$\tau = 205 \text{ cm}^2$	$\tau = 140 \text{ cm}^2$
$D_1 = 1.51 \text{ cm}$	$D_1 = 1.37 \text{ cm}$
$D_2 = 0.707 \text{ cm}$	$D_2 = 0.439 \text{ cm}$
$\Sigma_1 = 0.00737 \text{ cm}^{-1}$	$\Sigma_1 = 0.00979 \text{ cm}^{-1}$
$\Sigma_a = 0.00736 \text{ cm}^{-1}$	$\Sigma_a = 0.00822 \text{ cm}^{-1}$

These constants give $\lambda = \nu/\nu^* = 1.0202$ (PDQ #290042) for the annular configuration loaded with 4.0 kg U²³⁵. It is felt that the negative effects of the Al tanks, control plate voids, and BF₃ counters would reduce this to 1.003. The experimental critical mass is 3.99 kg.

A simple proportionality relation has been developed between the critical mass $W_{U^{25}}$ and certain core constants which works quite well in intercomparing the critical mass of different Argonaut configurations. The one configuration for which accurate results are not obtained is the three-slab loading. It is felt that the angular flux distribution may play a more important part in this case than it does for the other configurations.

The relation used is

$$W_{U^{25}} \sim V_C + X^2 M^2 \sum_i (A_i/t_i)$$

where V_C is the core volume, M the core migration length, X is a constant ($2.405 \leq X \leq \pi$) (the exact value is a linear function of the fraction of annulus which contains core material), A_i the area associated with one of the reactor faces, and t_i the core thickness (perpendicular to A_i) of equivalent outside-bare reactor using a reflector savings of 15 cm.

The area associated with a reactor face is defined as the area of that face unless it is on the boundary of the internal thermal column. In the latter case the face area is multiplied by an appropriate weighting factor which is defined on the right circular cylinder enclosing the internal thermal column. It is the ratio of that part of the area of this cylinder not identical to the core boundary area to the total area of the cylinder. This gives an area which may be called an "equivalent leakage area."

A still simpler correlation which gives a very good result is

$$W_{U^{25}} \sim \sum_i A_i$$

This would seem to be correct if:

- 1) The reflector savings is large in comparison to the reactor core thickness.
- 2) X^2M^2 is the same for all configurations.
- 3) The core volume varies in the same way as does

$$X^2M^2 \sum_i (A_i/t_i) \quad .$$

None of these requirements are met very well.

Configuration	$C_1 \left(V_C + X^2M^2 \sum_i A_i/t_i \right)$	$C_2 \left(\sum_i A_i \right)$	$W_{U^{235}} \text{ experimental}$
One-slab	2.07	2.03	2.0 kg
Two-slab	3.45	3.72	3.5 kg
Three-slab	3.59	3.85	4.3 kg
Annular	4.00	4.00	4.0 kg

Note added in proof:

The same correlation when applied to the Juggernaut, which is similar to the annular Argonaut configuration except it has an internal thermal column diameter of 18 inches, gives 3.00 by the first correlation, 2.97 by the second. A PDQ calculation using constants evaluated by the same method as described in this report gives a critical mass of 3.0 kg.

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