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DATA FOR THE CORE IDENTIFICATION OF RESEARCH AND TEST REACTORS AT JAERI

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For analysing core performance of a reactor, information of geometry and materials of the reactor are required. These data on research and test reactors were edited with the same formula as one which was developed to construct the integrated experimental data bank at JAERI. In this formula, a reactor is assumed to be composed of elements. For identifying position and materials of each element, geometrical figures and data tables are prepared to the reactors, JRR-2, JRR-4 and JMTR. This report will supply whole information to be required for performing nuclear calculation on the above reactors.

Keywords: Core Identification, Research and Test Reactor, JRR-2, JRR-4, JMTR, Nuclear Calculation, Geometrical Data, Reactor Core.

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JAERI－M 9175

原研の研究炉および試験炉の炉心同程のためのデータ

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（1980年10月25日受理）

原子炉の炉心特性を解析するためには，原子炉の幾何形状と材料に関する情報が必要である。研究炉および試験炉に関するこれ等のデータを，原研の積分実験データバンクを作成するために開発したものと同一方式で編集した。この方式では，原子炉は要素から構成されると仮定されている。各要素の配置およびその構成材質を表わすための幾何形状図とデータ表がJRR－2，JRR－4およびJMTRに対して用意されている。この報告書は，上記原子炉の核計算を行なうために必要な全ての情報を提供する。

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1. Introduction

There are three research reactors and one test reactor in JAERI, that is, JRR-2, JRR-3, JRR-4 and JMTR. For analysing core performance of a reactor, informations on geometry and materials of the reactor are required. These geometrical and material data on a reactor have been managed independently according to the way of each reactor section. However, it is desirable to manage these data with the same formula, because computer control on these data has become familiar. These data on research and test reactors were edited with the same formula as one which was developed to construct the integrated experimental data bank at JAERI. In this formula, a reactor is assumed to be composed of elements. For identifying position and materials of each element, geometrical figures and data tables are prepared. In the next chapter 2 to 4, outline of the reactors, JRR-2, JRR-4 and JMTR, which are treated in this report, are shown to give the global information on the reactors. In chapter 5, geometrical figures and data tables of each reactor are described to identify the reactor core. This is the whole information to be required for performing nuclear calculation on the reactors.

2. Outline of JRR-2

2.1 Purpose of the Reactor

The JRR-2 was constructed in Tokai-Mura, Ibaraki-Ken in 1960, as the second research reactor in JAERI. The JRR-2 is a research reactor moderated and cooled by heavy water, with MTR-type 93 % enriched uranium fuel elements. It is designed to produce a maximum thermal neutron flux of about 2×10^{14} n/cm^{2}sec at the core center at the power level of 10 MW.

The reactor has been successfully operated and utilized for 17 years since the initial critical test, except the scheduled reactor shutdown term for its modification in 1974 and 1975.

The reactor has been used for various experiments such as solid state physics, material irradiation, reactor fuel irradiation and radio-isotope production. In such mode of utilization, the reactor has been served as the facility for common use by the people coming from universities, companies and institutions. Recently, they are engaged in about 50 of subjects.

Current use of JRR-2, including program in the near future, is described below:

A. Solid State Physics

a. JAERI neutron scattering studies of materials (HT-2, 10, 14)
b. JAERI neutron diffraction studies with topographic camera (HT-11)
c. Neutron scattering studies by the institute for solid state physics, Univ. of Tokyo, with neutron scattering instrument No. 2 (HT-6)
d. Neutron scattering studies by the institute for solid state physics, Univ. of Tokyo, with neutron scattering instrument No.1 (HT-8)
e. Neutron scattering studies of materials (HT-1)
f. Program of another neutron beam facility

Neutron beam facilities and in-pile irradiation facilities are listed in Table 2.1 and 2.2.

Table 2.1 Neutron beam facilities in JRR-2

Horizontal experiment hole No.	Facility name	Study theme	Thermal flux required	Fast flux required	Typical time required
HT - 1 (4")	TUNS (Univ. of Tohoku)	Neutron scattering studies of spin-dynamics in magnetic materials, lattice dynamics of invaralloy, soft phonons in relation to the electron-lattice interaction.	about 1×10^{14} nv	As low as possible	7—40 days
HT - 2 ($7\frac{1}{2}$")	DMNS (JAERI)	Inelastic neutron scattering studies of lattice dynamics and structural phase transitions. Small angle neutron scattering of the precipitation in alloys.	"	"	"
HT - 6 (4")	PANSI (Univ. of Tokyo)	Pseudo-randomly modulated polarized neutron is used together with a dynamical proton polarization technique to study the behavior of protons in organic substances. Also the behavior of magnetic electrons at the active site of bioenzymes is studied by means of the polarized neutron technique.	"	"	"
HT - 8 (4")	ISSP-NDI (Univ. of Tokyo)	Neutron scattering studies of low dimensional magnetic system, non-equilibrium system and inelastic scattering studies of solution.	"	"	"
HT - 10 (6")	CTNS (JAERI)	Inelastic neutron scattering studies of lattice and spin dynamics. Neutron diffraction studies of magnetic structure and crystal structure of uranium compounds.	"	"	"
HT - 11 ($7\frac{1}{2}$")	N-TOPO (JAERI)	Neutron topographic studies of charged-particles irradiated materials.	"	"	"
HT - 14 (12")	PTNS-I (JAERI)	Neutron time-of-flight measurements of scattering function of paramagnetics and adsorbed gas.	"	"	"

Table 2.2 Summary of in-pile irradiation facilities in JRR-2

Facility		Position	Size	Neutron fluxes ($n/cm^2 \cdot sec$) at 10 MW		Special features
				Thermal	Fast	
Hollow fuel experiment	6A	Core region	40 mmϕ	1.4×10^{14}	8×10^{13}	Available services: Temperature observation; Temperature control by mixed gas control system; Temperature control by electric heater; Creeping is planned
	6B	Core region	40 mmϕ	1.1×10^{14}	6×10^{13}	
	6C	Core region	40 mmϕ	8×10^{13}	4×10^{13}	
	6D	Core region	40 mmϕ	8×10^{13}	4×10^{13}	
Vertical holes	VT-1	Core center	88 mmϕ	2×10^{14}	2.5×10^{13}	
	VT-2	D_2O reflector region	50 mmϕ	6×10^{13}	2×10^{11}	On-power loading system is used
	VT-4,5,7,8	D_2O reflector	88 mmϕ	3×10^{13}	1.5×10^{11}	
	VT-9	D_2O reflector region	88 mmϕ	3×10^{13}	1.3×10^{11}	
	VT-10~12	Core region	50 mmϕ	1.3×10^{14}	7×10^{12}	Instrumentation is planned
Pneumatic tubes	2"	D_2O reflector region	2"ϕ	8×10^{13}	2.5×10^{12}	Instrumented capsules are available
	1"	D_2O reflector region	1"ϕ	2×10^{13}	5×10^{10}	

* Horizontal experiment facilities (refer to Table 3 and Fig.3)

2.2 Performance and Construction

2.2.1 General Description

General description including specific dimensions, core physics parameters and other technical details are as follows:

(1) General

Reactor type	Tank type with highly enriched uranium (93%) fuel, moderated and cooled by heavy water
Thermal power	10 MW
Purposes	Commonly used for solid state physics, isotope production, material irradiation test, fundamental research and others

(2) Core Dimensions: 850 mm (diameter) × 600 mm (height)

(3) Grid Arrangement: 863.6 mm (diameter) × 44.5 mm (thickness) aluminum alloy (See Fig.2)

(4) In-Core Physics Parameters

Neutron flux (max.)	Thermal; 2×10^{14} n/cm^{2}sec	
	Fast (>180 KeV); 7×10^{13} n/cm^{2}sec	
Reactivity balance	Max. built in (cold clean)	15.5% Δk/k
	To compensate for	
	Temperature	1 %
	Xe	4 %
	Irradiation experiments	3 %
	Burn up	6 %
	Operation	1.5%
Critical mass	Approximately 2.3 Kg U-235	

(5) In-Core Reflector: Heavy water

(6) Thermal Hydraulics Parameters

Cooling system	Coolant	D_2O
	Coolant mass flow	1350 m^3/hr
	Temperature (core outlet)	63°C max.
	Pressure (at main pump outlet)	3 kg/cm^{2}G
Heat flux and temp.	Max.	60 W/cm^2
	Average	35 W/cm^2
	Fuel plate temperature (max.)	100°C

(7) Control

Control rods	5 shim-safety cylindrical rods & 1 regulation rod cladded by Cd Total worth (approximately 35 %Δk/k)
Scram mechanism	Gravity fall
Burnable poison	None
Other control	D_2O dump 0.7 %Δk/k

(8) Mechanical Design

D_2O tank	Type 2S Al cylinder of 152 cm ID × 193 cm H with 1.27cm wall thickness
Thermal shield light-water tank	Diameter 243 cm
Shielding	Sides; 191 cm barytes concrete Bottom; 78 cm barytes concrete Top; 10 cm lead, boron and shot iron concrete in lower plug (93.5 cm) and shot iron concrete in upper plug (117 cm)
Containment	Cylinder with domed head of 25 m D × 18.2 m H with 30 cm thick concrete wall Working pressure; approx. 10 mm Aq below atmosphere

(9) Supporting Facilities

Spent fuel pond	Max. 120 elements stored
Fresh fuel storage	Max. 99 elements stored
Refueling cask	1
Fresh fuel loading cask	1
30 tons crane	1

2.2.2 Description of Fuel

The JRR-2 reactor core consists of 24 fuel elements. Four of them are called cylindrical type fuel elements which serve as in-core irradiation facilities, and the others are MTR type fuel elements which serves

as driver fuels.

(1) Fuel Element Design

A. MTR type fuel element (See Fig.2.1(a))

Inner plate (15 plates)	Meat; U-Al alloy with 23 w/o uranium content Thickness 0.51 mm Length 600 mm Enrichment; 93% U-235 Cladding; Al rolled 0.38 mm thickness
Outer plate (2 plates)	Meat; U-Al alloy with 8 w/o uranium content Thickness 0.51 mm Length 600 mm Enrichment; 93% U-235 Cladding; Al rolled 0.765 mm thickness
U-235 content	195g

B. Cylindrical type fuel element (See Fig.2.1(b))

Plate design (15 plates)	Meat; U-Al alloy with 22 w/o uranium content Thickness 0.51 mm Length 600 mm Enrichment; 93% U-235 Cladding; Al rolled 0.38 mm thickness
U-235 content	195g

(2) Fabrication Method

A. MTR type fuel element

Fuel plates are fabricated by the picture frame method. Seventeen curved fuel plates are assembled in parallel with approximately 3 mm windages by means of the roll-swage method.

B. Cylindrical type fuel element

Fuel plates are fabricated by the picture frame method. Three fuel plates form a cylinder by support combs and the fuel element consists of 5 concentric cylinders with 3 mm windages by the roll-swage method.

2.2.3 Operation Mode

The JRR-2 is operated continuously for two weeks by three-shift system and then it is shut down for one week for necessary works.

Operating loading	Average	3.9 Kg U-235
	Maximum	4.8 Kg U-235
Operating schedule	13 cycle operations/year 1 cycle: 3 weeks, 2 weeks for high power operation and 1 week for refueling, maintenance & special operation	
Refueling schedule	2-4 elements/cycle or 48 elements/year	
Fuel burn-up range	Maximum	30%

2.2.4 Fuel Inventory

The JRR-2 fuel inventory (93% U-235) considered necessary to assure continuous reactor operation is as follows:

New fuel in-process	48 el. × 0.21 Kg = 10.1 Kg U/y
New fuel on-hand	Min. 24 el. × 0.21 Kg = 5.1 Kg U
Fuel in-core	24 el. × 0.21 Kg = 5.1 Kg U

The above amount of U depends on the operating mode described in 4. and the following conditions:

(1)	Fuel source	U.S.A.
(2)	Procurement lead time U-metal acquisition	approximately 3~4 years approximately 2~3 years including the lead time for metal conversion at NUKEM in W. Germany
	Fabrication	approximately 0.7~1 year
(3)	Disposition of spent fuel Reprocessing plan	80 elements/1.5~2 years at Savannah River plant
(4)	Reprocessing contract	JAERI made a contract for ERDA U.S.A. in 1977
(5)	Storage arrangements	Spent fuel pond at JRR-2 facility for max. 120 elements

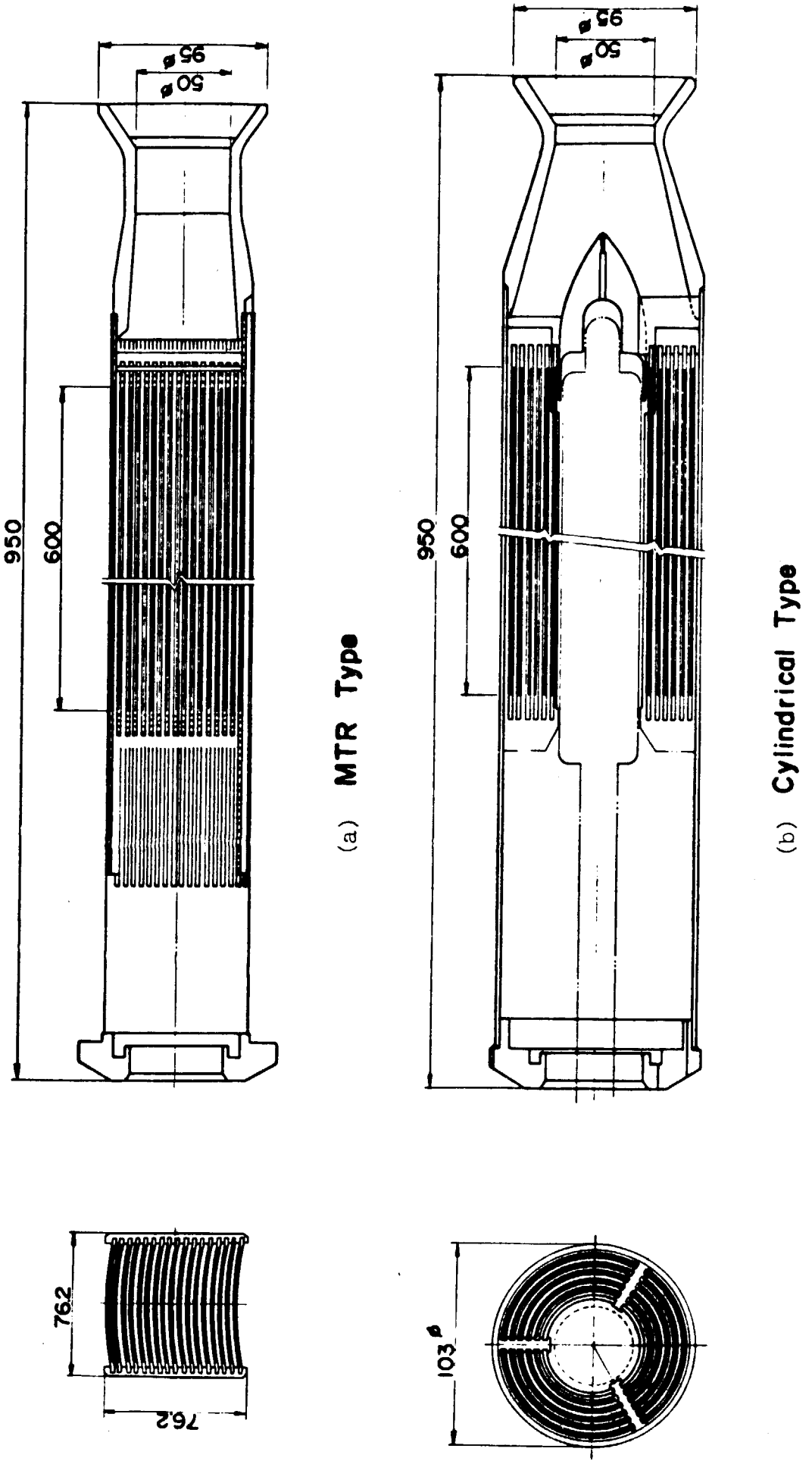


Fig. 2.1 JRR-2 fuel element

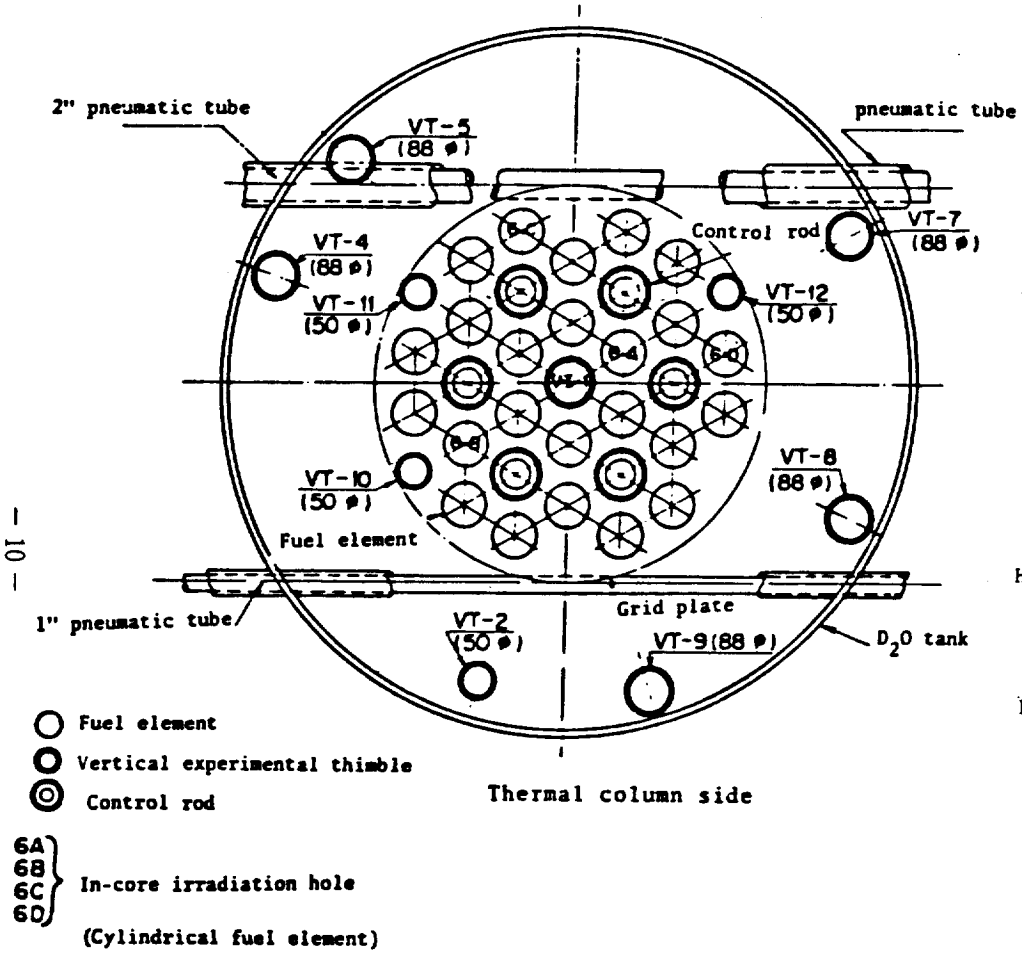


Fig. 2.2 JRR-2 core configuration radial pattern

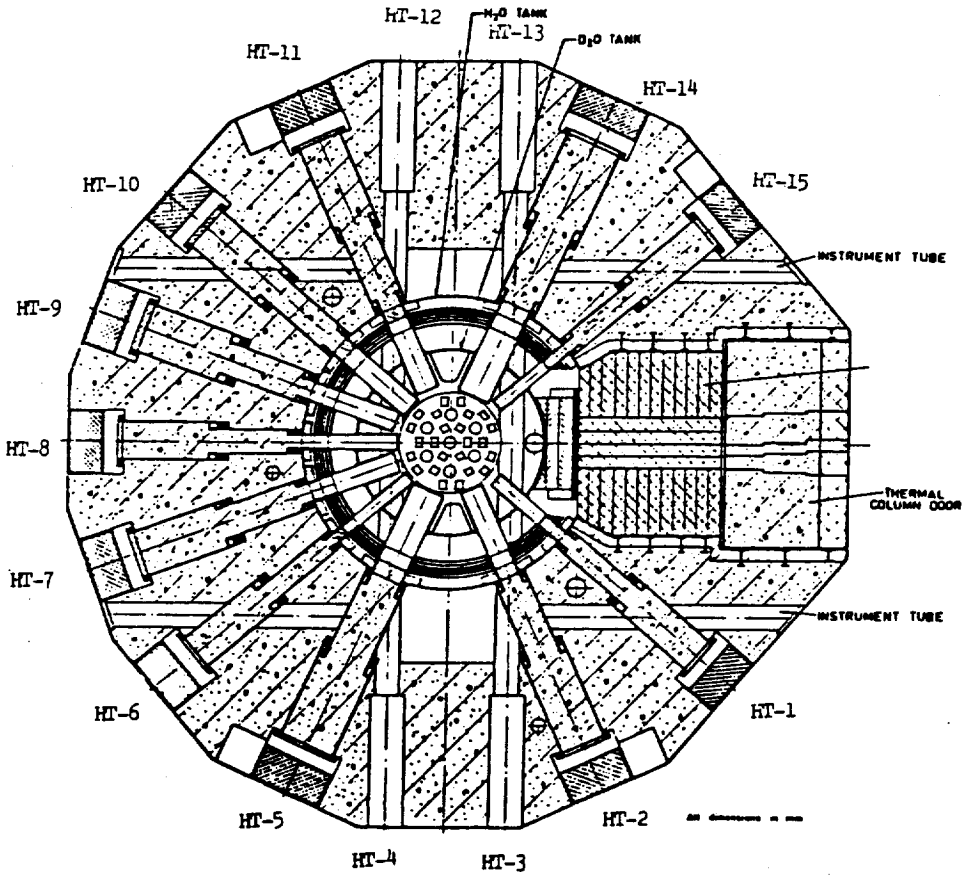


Fig. 2.3 Horizontal cross section of JRR-2

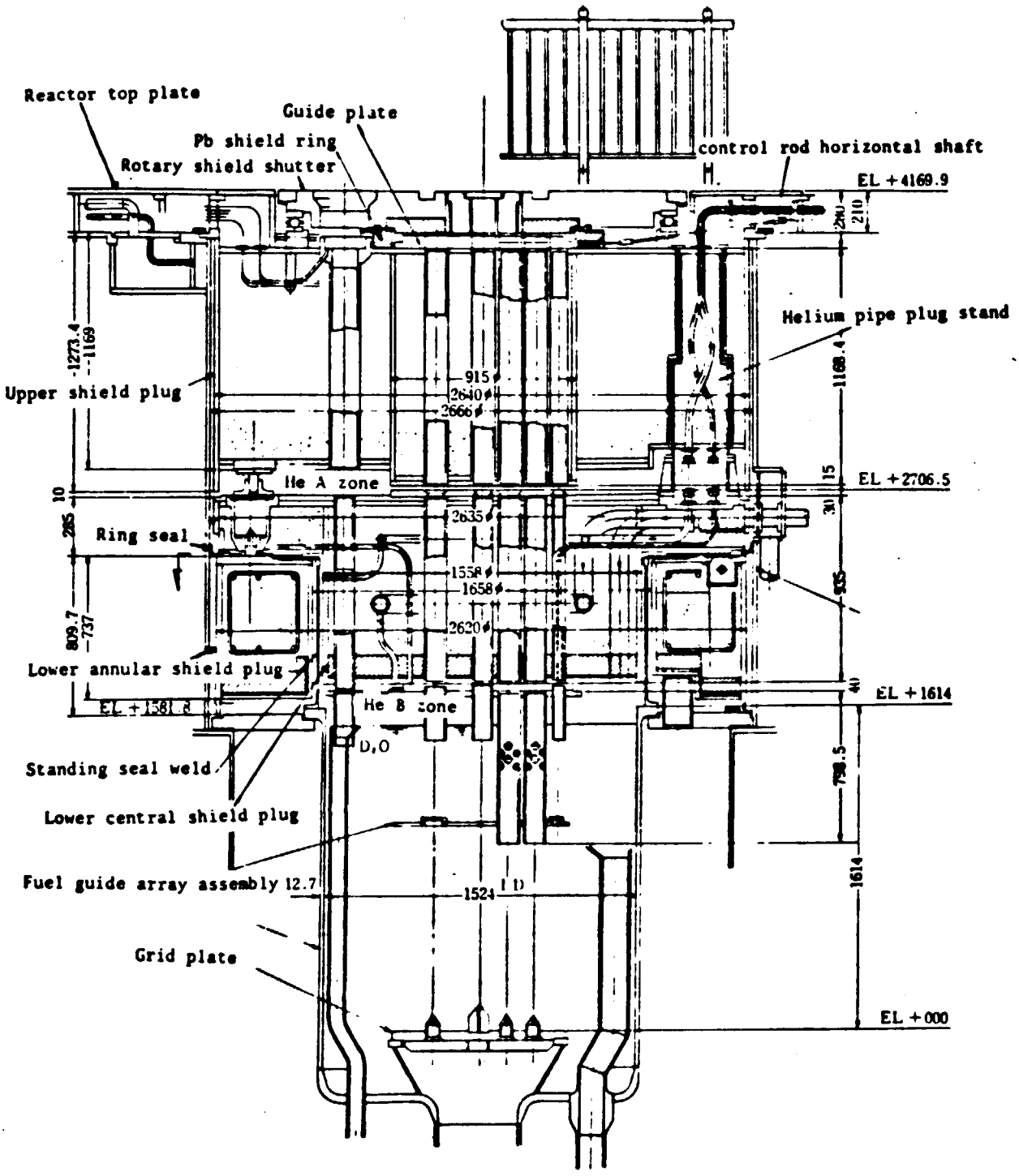


Fig. 2.4 Vertical cross section of JRR-2

3. Outline of JRR-4

3.1 Purpose of the reactor

JRR-4 is swimming pool type reacter. This reacter was built for study of shielding "Nuclear power ship MUTU" at 1965. Since then, we have been operated this reactor at 2500 kW but succeeded on power up from 2.5 MW to 3.5 MW at 1976. Fuel is ETR type, plate type and enrich is 93 %.

First shielding experiment for "Nuclear power ship MUTU" was taken at 1966 - 1967 and second experiment was taken at 1976. This reactor has been using material irradiation, general experiment and training of reacter operators. Now, this reactor is used common utilization irradiation for University and research institution of Japan from 1974. So recently, this reactor contribute largely toward the university and the research institution.

Current use of the JRR-4 including program in the near future, is described below:

(1) Shielding studies for nuclear powered ship
(2) Isotope production
(3) Neutron activation analysis
(4) Training of reacter operators
(5) Production of neutron transmutation doped silicon
(6) In-pile materials testing loop (LHTL)
(7) Miscellaneous experiments
  i) Neutron detector development for advanced power reactors
  ii) Neutron radiography experiments for fuel development
  iii) Release behavior chemical forms of tritium and iodine from irradiated uranium compounds
  iv) Studies of irradiation behaviors in lithium oxide.

JRR-4 experimental facilities are listed in Table 3.1.

Table 3.1 JRR-4 experimental facility

Facility	No.	Size	Thermal flux at 3.5 MW ($n/cm^2 \cdot sec$)	Application
Pool (No.1, No.2)	2	No.1 7×7×10.3 m No.2 7×9×10.3 m	Core tank wall max. 1×10^{11}	Shielding experiment
Lid Tank (Thermal column)	1	(1.1×1.1×2)	max. 1.4×10^{8} top of column	Neutron Radiography Neutron scattering study Detector characteristic test
Irradiation Pipe (in core)				
S Pipe	1	60 ϕ	max. 5.8×10^{13}	Isotope Production Material irradiation test
T Pipe	1	72 ϕ	8.8×10^{13}	
D Pipe	1	74 ϕ	3.1×10^{13}	Transmutation Doping of Silicon
L Pipe	1	118 ϕ	1.5×10^{13}	
Pneumatic tube	1	30 ϕ	4.6×10^{13}	Short life nuclide study
*F Pipe	1	68 ϕ	1×10^{14}	Isotope Production Material irradiation test
Dry shielding test facility	1	beam hole 68 ϕ		Dry shielding test

* F-Pipe ----- F-Pipe is removable

3.2 Performance and Construction

3.2.1 General Description

General description including specific dimensions, core physics parameters and other technical details are as follows;

(1) General

Reactor type	;	Swimming pool type highly enriched uranium(93%) Fuel used, light water moderated and cooled.
Thermal power	;	3.5 MW
Purposes	;	(1) Shielding studies for nuclear ship (2) Isotope production (3) General experiment (4) Training of reactor operators
(2) Core dimensions	;	647 × 667 × 600 mm
(3) Core arrangement	;	(:See Fig. 3.1)
(4) In-Core physics parameters		
Neutron flux	;	Thermal 3.5×10^{13} n/cm^2•sec Fast 8.7×10^{13} n/cm^2•sec
Reactivity balance	;	(1) Temperature 0.6 %Δk/k (2) Xe, Sm 3.35 " (3) Burn up 1.35 " (4) Experimental sample 1.8 " (5) Xenon override 0.7 " (6) Operation 0.2 " Total 8.0 %Δk/k
Critical mass	;	Approx. 1.99 kg U-235
(5) Reflector	;	Graphite

(6) Thermal hydraulics parameters

Cooling system	; Coolant	Light water
	Primary flow rate	7 m^3/min
	Secondary flow rate	7.2 m^3/min
	Temperature (core outlet)	60°C
Heat flux and temperature	; Maximum	33 W/cm^2
	Fuel plate temperature	Max. 113°C

(7) Controls

Control rods	; 4 shim-safety rods, 1 regulating rods, and 2 back up safety rods. Boron-stainless steel plate type.	
	Total worth	15 %Δk/k
Burnable poison	; None	

(8) Mechanical design

Core tank	Upper part	150×1.5×816 cm
	Lower part	80×75.0×279 cm
Pool	No.1	700×700×1030 cm (hight)
	No.2	900×700×1030 cm (hight)
		(water depth 980 cm)
	Shielding	
Core bridge	Light water,	825 cm
Experimental bridge	Light water,	825 cm
Control room	Concrete,	40 cm
1st floor of reactor room	Light water,	460 cm
	Concrete,	145 cm
Dry shielding experimental ruum	Light water,	120 cm
	Heavy concrete,	40 cm

(9) Supporting facility

Pool No.1, No.2	2
Experimental bridge	1
Fresh fuel storage	1 (max. 60 elements storecl)

3.2.2 Description of fuel

(1) design

Fuel type	U-Al alloy (19 /)
	ETR type
Enrichment	93% U-Al
Fuel meat size	0.5mm x 68mm x 600mm
Cladding	o.38mm,Alminum
Side plate	4.8mm (thickness)
	Alminum
Water gap	4.1mm
Dimensions of plates	plate
and element	inner···630mm x 74.5mm x 1.26mm
	outer···734mm x 74.5mm x 1.26mm
	element···80mm x 80mm x 1025mm
Plates / element	15
U-235 / element	166g

(2) Method of fablication

1) It uses U-Al alloy as fuel core.

2) U-Al alloy is covered with al plate by the picture flame method.

3) Fuel element is fabricated by the roll-swage method.

3.2.3 Operation Mode

Operating loading	. Average 3.1 KgU-235
	Maximum 4.15KgU-235
Operating schedule	Dayly operation
	1cycle.1week···Tuesday to Friday
Refueling schedule	5 elements / year
Element rotation pattern	out-in pattern
Fuel burn up range	Maximum 20 %

3.2.4 Fuel Inventory

(1)Fuel source U.S.A

(2) Procurement lead time	Application for budget approval based on long procurement plan for JRR-4 fuel is made in each fiscal year. The period from application to approval is about one year.
Fablication	the fablication time is about six mounth.
(3) Disposion of spent fuel	
Reprocessing plan	25 elements/5years at Savannah river plant
Recently reprocessing	25 elements shipped at May.1978
(4) reprocessing contracts	JAERI make a contract for ERDA USA at 1977.
(5) Storage arrangements	Pool at JRR-4 Maximum 90 elements stored.

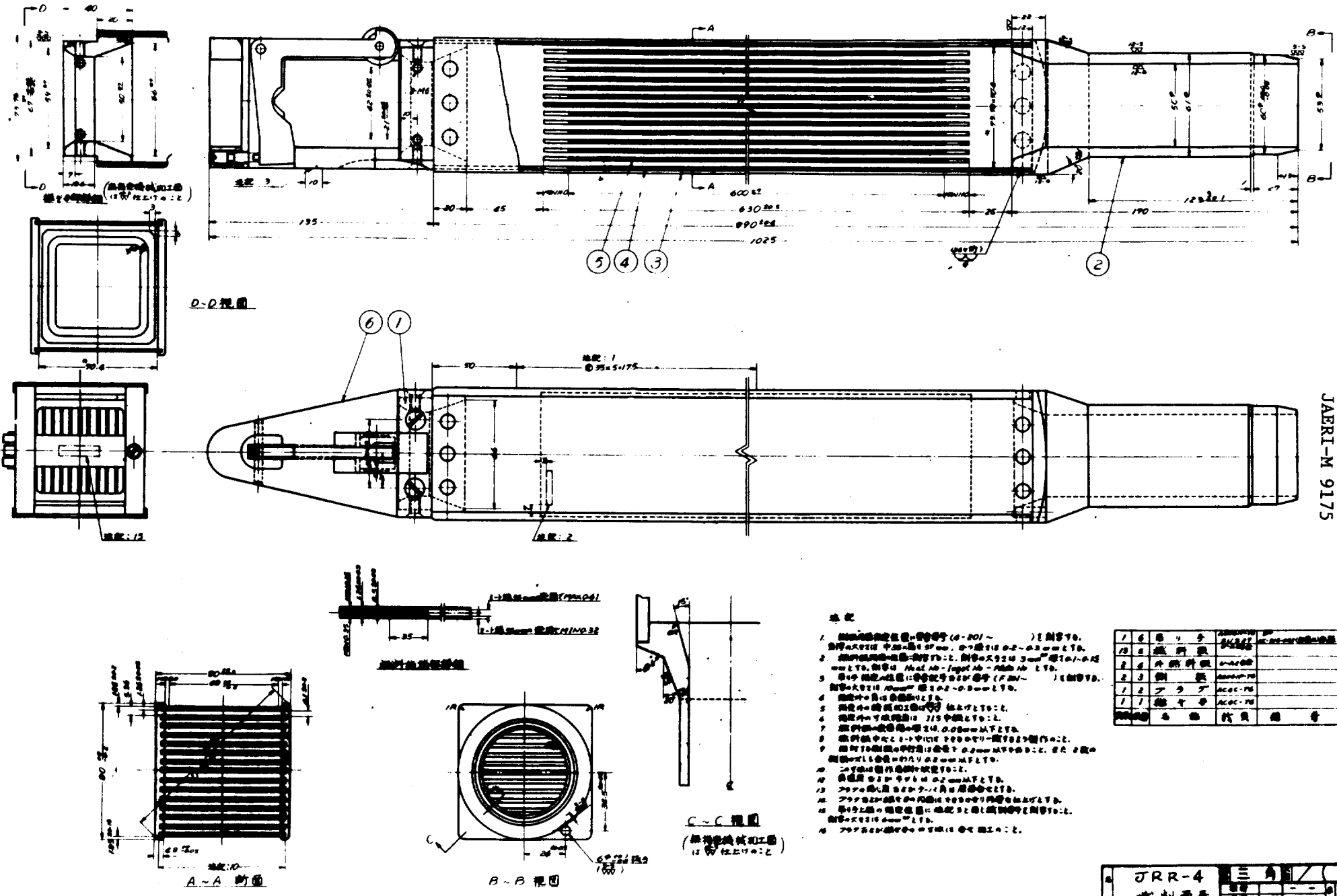
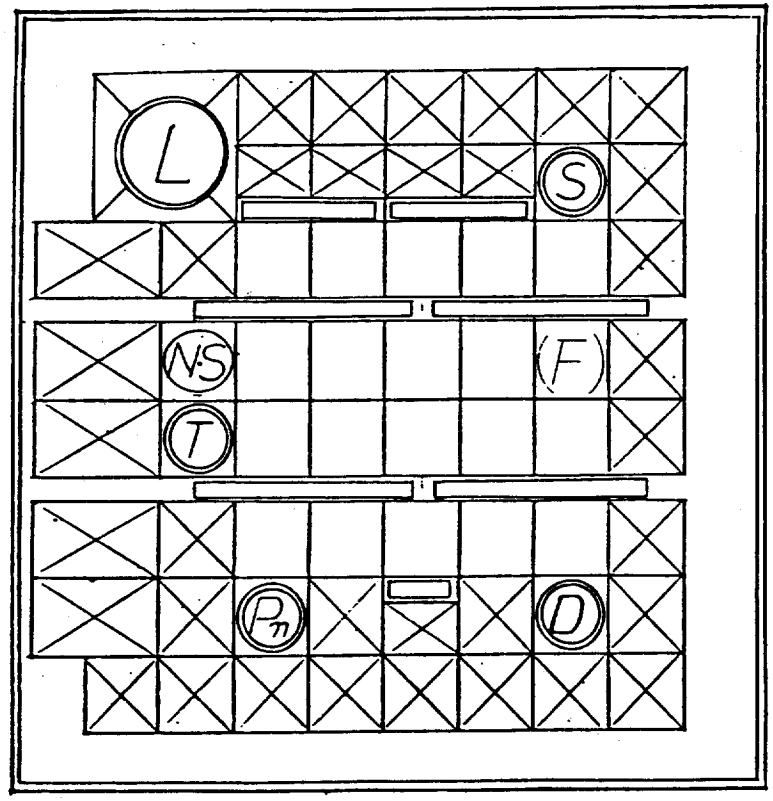


Fig. 3.1 JRR-4 Fuel Element



□ ----Fuel
⊠ ----Reflector
▭ ---Control Brade
L ----L-Pipe
S ----S-Pipe
T ----T-Pipe
D ----D-Pipe
Pn----Pneumatic Tube
N.S---Neutron Souce
F ----F-Pipe (removable pipe)

Fig. 3.2 JRR-4 Irradiation Pipe Arrangement

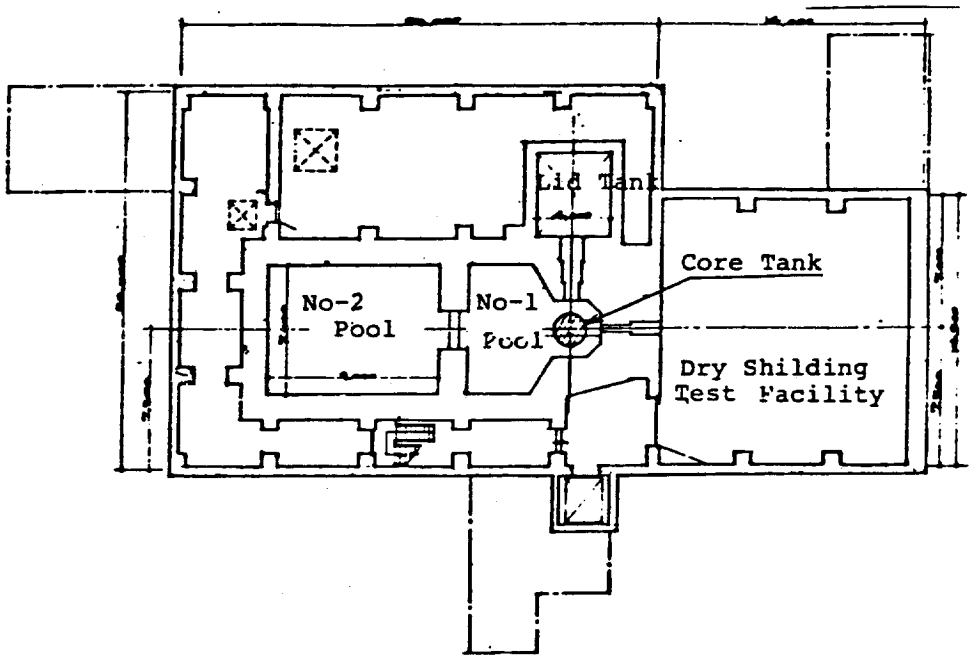


Fig. 3.3 JRR-4 Experimental Facilities

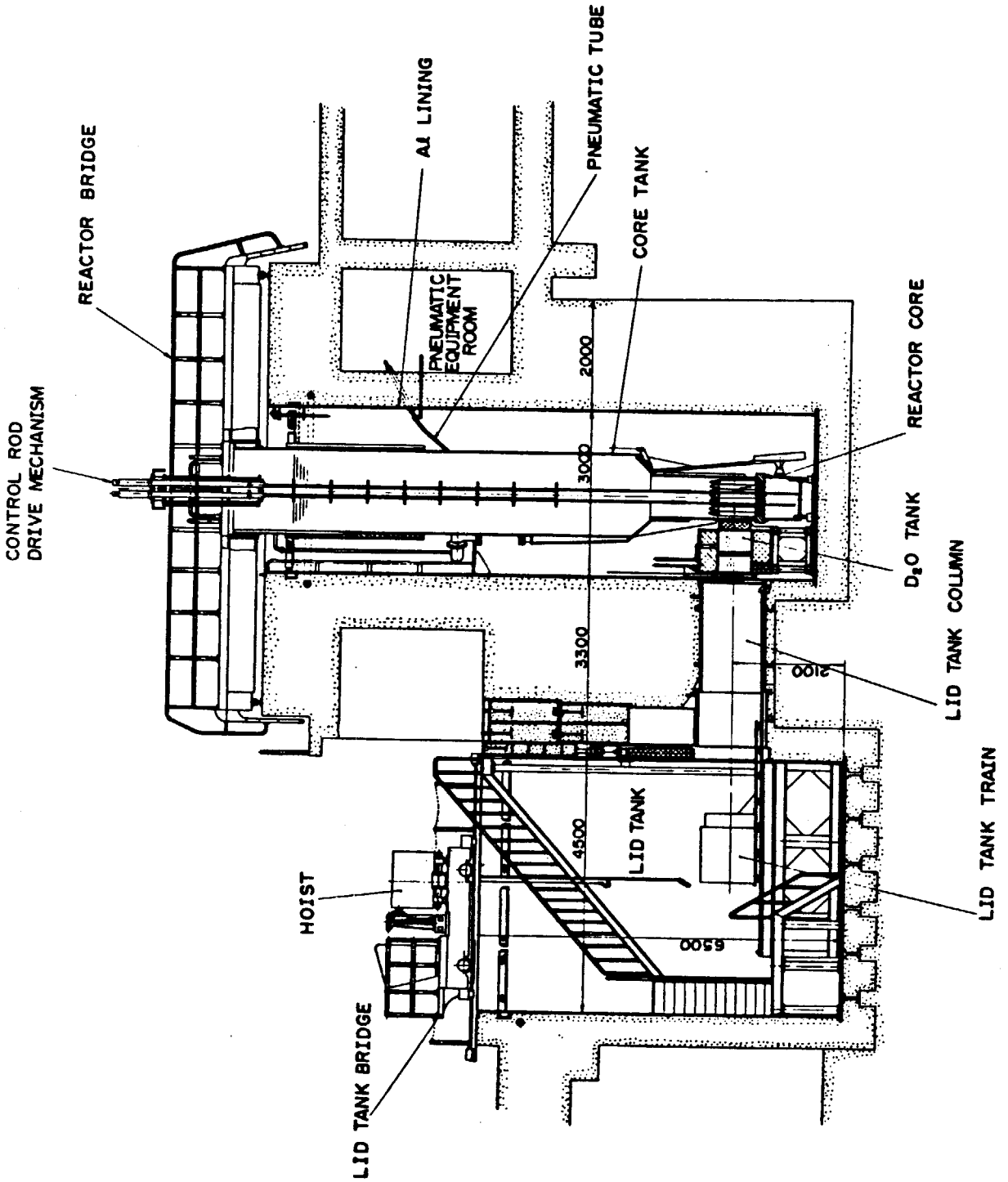


Fig. 3.4 JRR-4 Reactor Vertical Section

4. Outline of JMTR

4.1 Purpose of the Reactor

The JMTR is a multi-purpose tank type material testing reactor, consisting of modified ETR type fuel elements of 93 % enriched uranium, and light water moderator and coolant, operated at 50 MW. The JMTR achieved criticality in March 1968 and has been operated steadily for irradiation experiments. The integrated power reached 32,260 MWD by February 1978.

As only one material testing reactor in Japan, JMTR irradiation experiments are served for basic study, RI production and so on. The JMTR irradiation experiments are classified as follows;

a. Safety research on light water reactors
b. R and D on very high temperature gas reactor
c. Material test for fast breeder experiment reactor and advanced thermal reactor
d. Research on reactor materials
e. R and D on fusion reactor materials
f. Basic research on material science
g. RI production.

4.2 Performance and Construction

4.2.1 General Description

General description including specific dimensions, core physics parameters and other technical details is as follows:

(1) General (see Fig.4.1)

Reactor type	Tank type with highly enriched uranium (93%), moderated and cooled by light water
Thermal power	50 MW
Purpose	Material irradiation experiment, radio-isotope production, fundamental research and others

(2) Core Dimensions

540* mm × 386* mm × 750 mm
(effective height)
(* currently operating core)

(3) Grid Arrangement (see Fig.4.2)

Grid plate	Thickness	220 mm
	Diameter	1720 mm
	Material	Stainless steel
Perforations	For fuel or reflector elements	166
	For control rods	11
	For loops	15

(Perforation for the control rods and the loops can be attached with the adapter for fuel or reflector elements.)

(4) In-Core Physics Parameters

Neutron flux (max.)	Thermal	4×10^{14} n/cm^2·sec
	Fast (>1 MeV)	4×10^{14} n/cm^2·sec
Reactivity balance	Excess reactivity	10.2 %Δk/k (limit ≤15)
	Xe and Sm	4.1 %Δk/k
	Temperature	0.3 %Δk/k
	Burn-up	5.3 %Δk/k
	Operation	0.5 %Δk/k
Temperature coefficient		-3×10^{-4} Δk/k/°C
Void coefficient		-2×10^{-3} Δk/k/% void

Neutron lifetime	7×10^{-5} sec
Effective delayed neutron fraction	0.0076

(5) In-Core Reflector

Reflector element	Materials	Berylium or aluminum
	Dimension	76.7 mm square × 878 mm
	(Each element contains a center piece of 40 mmϕ, 36 mmϕ or 30 mmϕ which can be removed so as to insert irradiation capsule)	

(6) Thermal Hydraulics Parameters

Cooling system	Coolant	Light water
	Flow rate	6000 m^3/hr
	fuel region	3700 m^3/hr
	reflector region	2300 m^3/hr
	Velocity in coolant channel	10 m/sec
	Coolant temperature	
	inlet	47 °C (max.)
	outlet	56 °C
	Pressure at inlet	14 $Kg/cm^2 \cdot G$
	Pressure difference	3.3 $Kg/cm^2 \cdot G$
Power density and temp.	Average	492 KW/l
	Max.	621 KW/l
	Fuel plate temp.	205 °C (max.)
Heat transfer area	Total fuel element	42.35 m^2
	per fuel element	1.76 m^2

(7) Control

Control rods	Consisting of absorber, fuel follower and shock section	
	Number of safety-regulating rods	2
	Number of shim rods	3
	Absorber	
	Material	Hafnium
	Dimension	63.5 mm square × 800 mm
	Shut-down margine	K_{eff} = 0.81 (limit ≦0.9)
	One stuck rod margine	$K_{eff} < 1$
	Scram mechanism	Gravity fall
Burnable poison	None	
Back-up scram	Boracic acid	

(8) Mechanical Design

Pressure vessel	Overall height		9500 mm
	Diameter		2600 mm
	Material		Stainless steel
	Number of rig nozzles		30
	Number of spent fuel shoots		1
Inner tank	Dimension		1600 mm × 1560 mm
	Wall thickness		20 mm
	Material		Stainless steel
Reactor pool	Diameter		6000 mm
	Depth		13400 mm
	(Filled with water for cooling and shielding)		
Shielding	Radial	Water	1.5 m
		Concrete	2.5 m
	Vertical	Water	10 m
		Stainless steel	7.5 m

(9) Supporting Facilities

New fuel storage building: Max. 288 elements stored

Canal

Width	3 m
Depth	6.2 m
Length	50 m

(Linking reactor pool with hot laboratory)

Spent fuel cutting pool: Max. 300 elements stored

Critical facility (JMTRC)

Thermal power	100 W
Core compositions	Similar to JMTR
Functions	Securing the operation of JMTR and arranging the core configuration to perform accurate irradiations in JMTR.

4.2.2 Description of Fuel

(1) Fuel Element (see Fig.4.3)

A. Standard fuel element (Modified ETR-type)

Plate:

Meat;

U-Al alloy of 21.5 w/o enriched U	
U-235 content	14.68 g
Thickness	0.51 mm

	Width	61.6 mm
	Length	750 mm
Enrichment;	93% U-235	
Cladding;	Al rolled 0.38 mm thick	
Thickness;	1.27 mm	
Length;	778 mm	

Element:

Number of fuel plates;	19
Side plate;	Al
Outer dimensions;	77.04 mm square at pad portion
Length;	1,200 mm

B. Fuel follower (Connected with control rod)

Plate:

Meat;	U-Al alloy of 21.5 w/o enriched U	
	U-235 content	12.19 g
	Thickness	0.51 mm
	Width	49.7 mm
	Length	750 mm
Enrichment;	93% U-235	
Cladding;	Al rolled 0.38 mm thick	
Thickness;	1.27 mm	
Length;	769 mm	

Follower element

Number of fuel plates;	16
Side plate;	Al
Outer dimensions;	63.64 mm square
Length;	890 mm

(2) Method of Fuel Fabrication

The outline of fabrication procedure for JMTR fuel elements (standard fuel and fuel follower) is as follows:

1) It uses U-Al alloy as fuel core

2) U-Al alloy is covered with Al plate by the picture flame method

3) Fuel element is fabricated by the roll-swage method.

4.2.3 Operating Mode

Operating loading	Approximately 6.6 Kg U-235
Operating schedule	Usually 5 operation cycles/year One operation cycle; Two weeks for high power operation, three days for refueling works and two

more weeks for high power operation.

Refueling schedule — Refueling works are performed twice in an operation cycle. The first refueling is performed before the operation cycle. Then 8 standard fuel elements and 5 fuel followers are exchanged for new fuel elements. The second refueling work is performed in the middle of operation cycle, and 12 standard fuel elements are exchanged for new fuel elements.

Fuel burn-up range — Maximum 40 %.

4.2.4 Fuel Inventory

Fuel inventory considered necessary to assure the continuity of reactor operation:

<table>
<tr><td>New fuel in-process</td><td>93% U-235 enriched ,35.2Kg U
125 elements/year
100×300^{g-u} (Std)*/y
+25×209^{g-u} (Flw)**/y = 35.2Kg U/y</td></tr>
<tr><td>New fuel on-hand</td><td>93% U-235 enriched ,14.1Kg U
40×300^{g-u} (Std)+10×209^{g-u}(Flw)
= 14.1Kg U</td></tr>
<tr><td>Fuel in-core</td><td>91% U-235(Ave.) enriched 7.2Kg U
<table>
<tr><td colspan="3">Former core</td><td colspan="2">Latter core</td></tr>
<tr><td rowspan="3">Std</td><td>New</td><td>8×300g</td><td colspan="2">12×300g</td></tr>
<tr><td>Old(1)</td><td>12×273g</td><td colspan="2">8×273g</td></tr>
<tr><td>Old(2)</td><td>2×247g</td><td colspan="2">2×247g</td></tr>
<tr><td>Flw</td><td>New</td><td>5×210g</td><td>Old</td><td>5×190g</td></tr>
<tr><td colspan="3">Total 7.2Kg</td><td colspan="2">7.2Kg</td></tr>
</table></td></tr>
<tr><td>Spent fuel currently in storage
Estimated quantity

Estimated percent of U-235</td><td>73.8Kg U (312 fuel elements on May 1st, 1978)
89.2 %</td></tr>
</table>

* Std ; Standard fuel element

** Flw ; Fuel follower

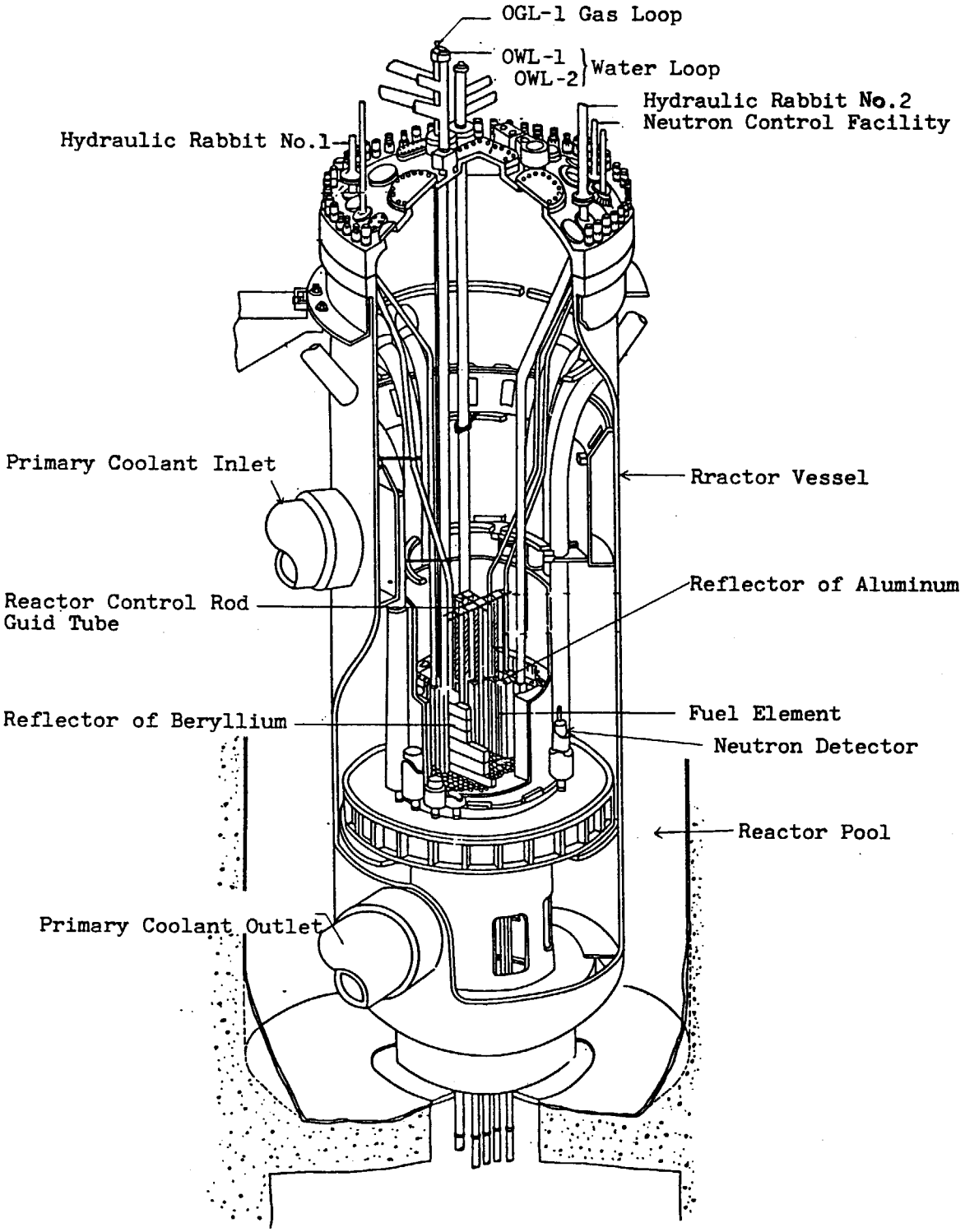
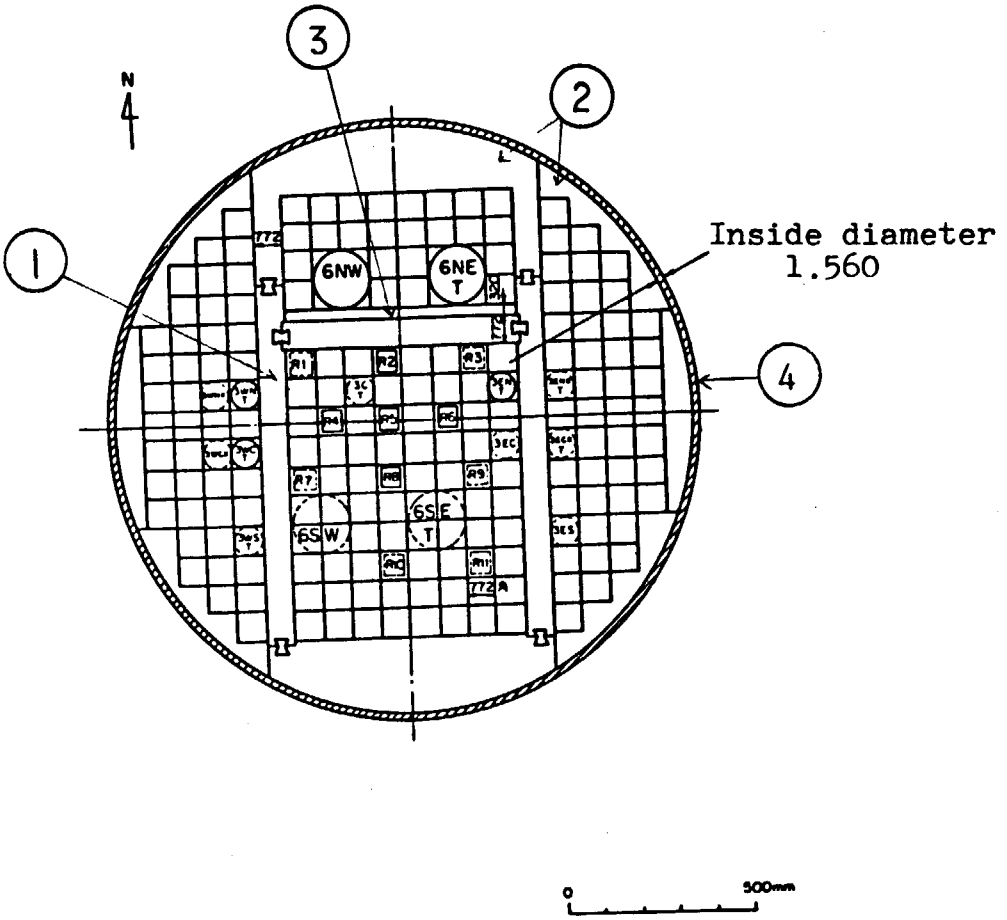


Fig. 4.1 JMTR Reactor Vessel



Cell (77.2 mm square)

Position of control rods

Position of loops (T is a through loop)

1 H shape beryllium partition wall

2 Aluminum frame

3 Gamma shield

4 Inner tank

Fig. 4.2 JMTR grid arrangement

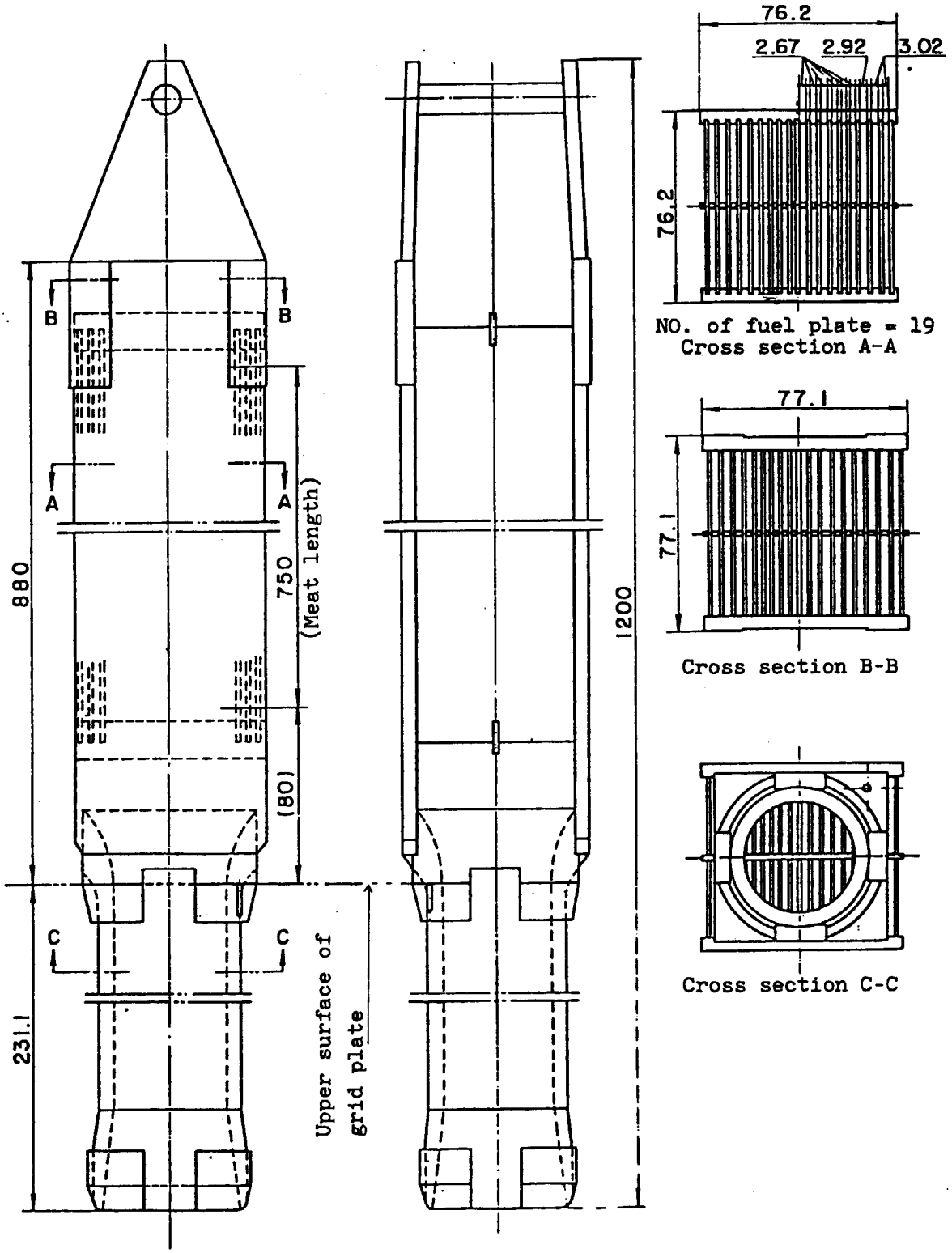


Fig. 4.3 JMTR Fuel Element

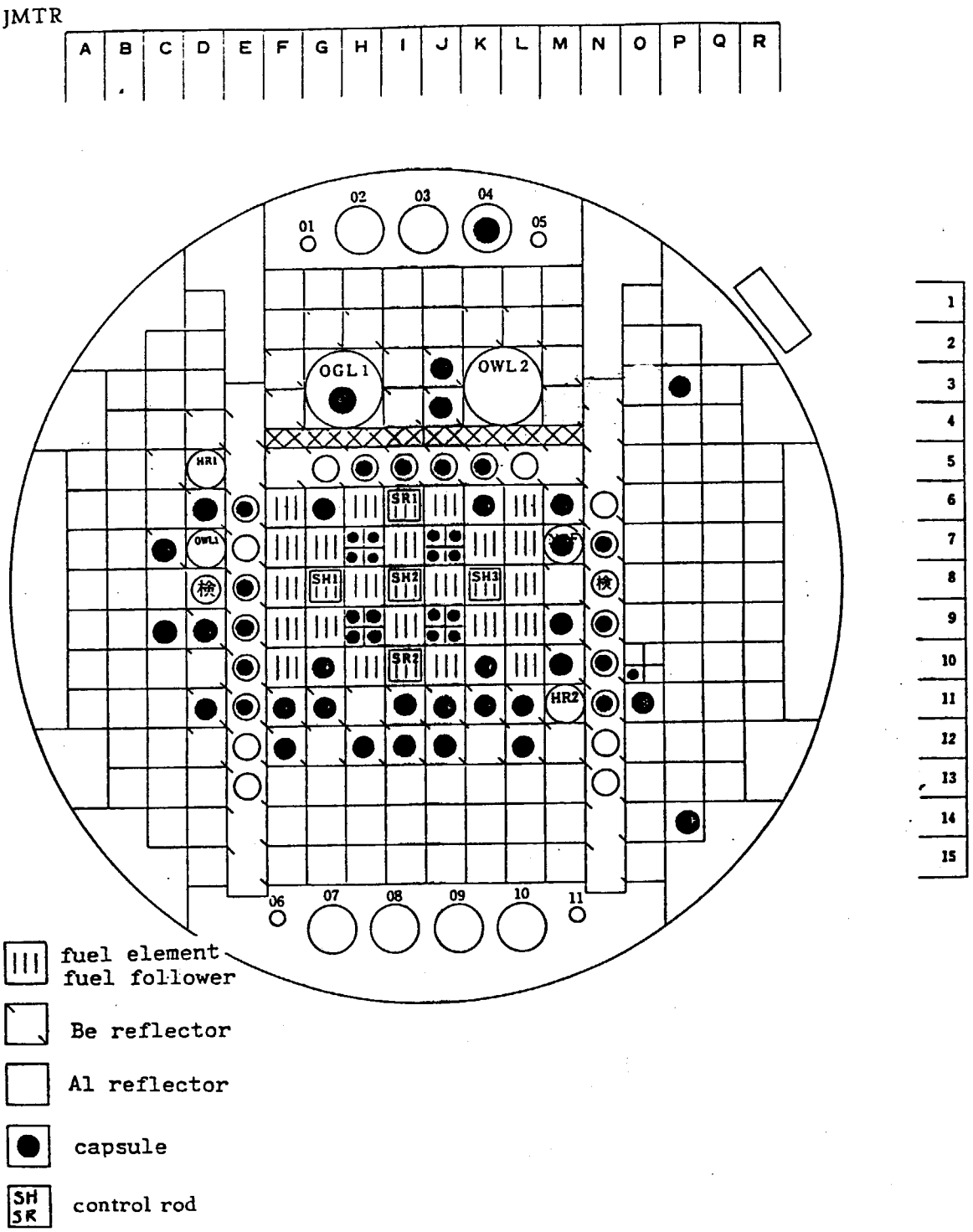


Fig. 4.4 Present JMTR core configuration

5. Reactor Core Identification

5.1 Definition and usage of the data prepared for reactor core identification

Definition of the data for reactor core identification is described below, and flow diagram for using the data is shown in Fig. 5.1.

CORE

A reactor is assumed to be composed of elements. For identifying positions and materials of each element, following data are prepared.

i)	CORE ID Table	:	assign CORE FIG NO., CORE GEOM Table No. and CORE MAT Table NO. to each reactor.
ii)	CORE FIG	:	assign location number to each region in a core
iii)	CORE GEOM Table	:	assign dimension to each region in a core
iv)	CORE MAT Table	:	assign element number to each location in a core

ELEMENT

A element is expressed with figure, material number and dimension of each region in an element. For identifying construction of an element, following data are prepared.

i)	ELM ID Table	:	assign ELM FIG NO., ELM GEOM Table No. and ELM MAT Table NO. to each element.
ii)	ELM FIG	:	assign material region number to each region in an element
iii)	ELM GEOM Table	:	assign dimension to each region in an element
iv)	ELM MAT Table	:	assign material number to each material region number

SUB-ELEMENT

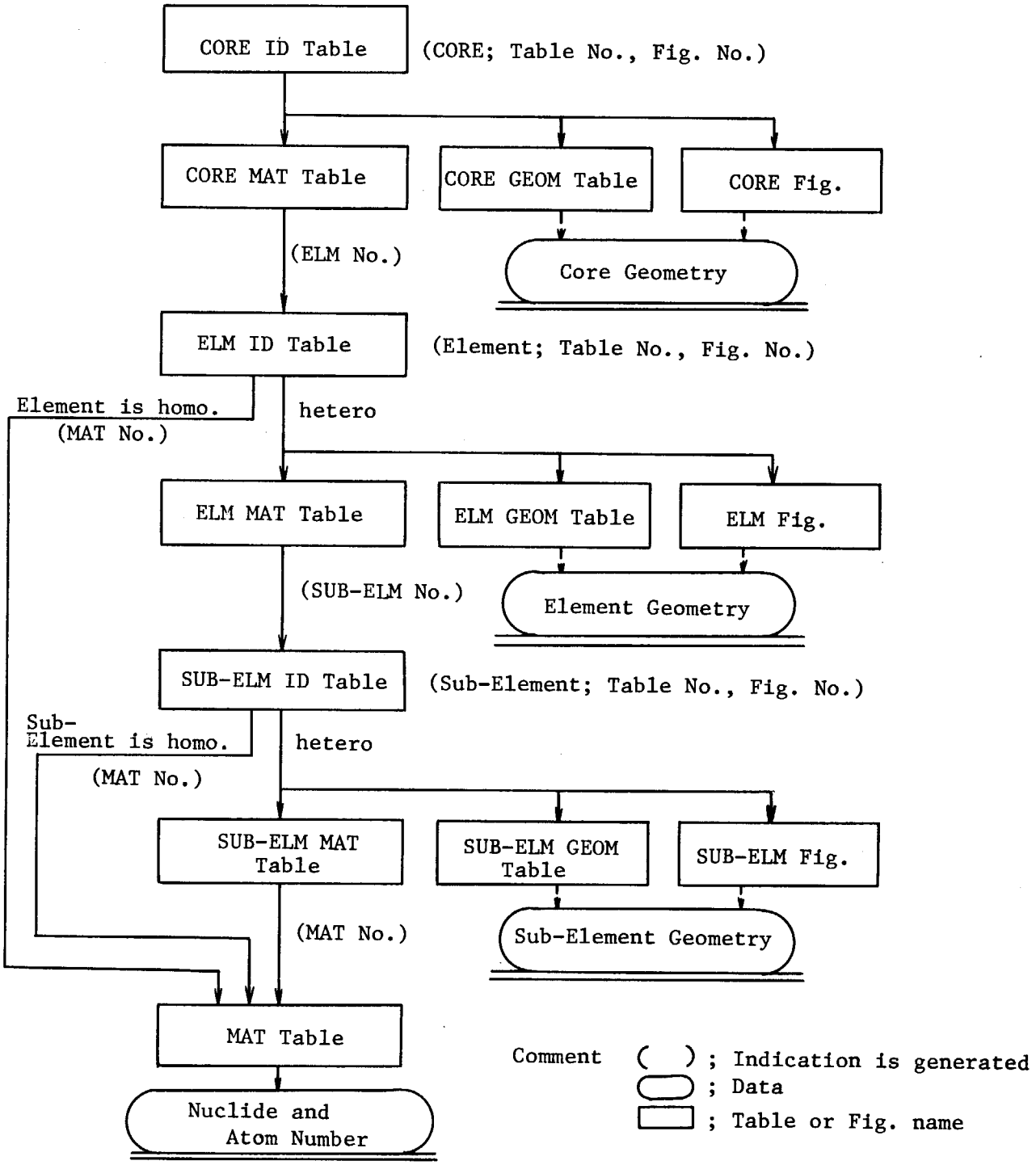
To complex element, sub-elements are prepared. For identifying construction of a sub-element, following data are prepared.

i)	SUB-ELM ID Table	:	assign SUB-ELM FIG NO., SUB-ELM GEOM Table NO. and SUB-ELM MAT Table NO. to each sub-elements
ii)	SUB-ELM FIG	:	assign material region number to each region in a sub-element
iii)	SUB-ELM GEOM Table	:	assign dimension to each region in a sub-element
iv)	SUB-ELM MAT Table	:	assign material number to each material region number

MATERIAL

To each material, MAT NO. is assigned and to each MAT NO., atomic number densities of each nuclide contained in the material are prepared.

Fig. 5.1 Reactor Core Identification System Flow



5.2 Core identification table and figure

5.2.1 JRR-2 core identification

I. Core

Core Identification Table

Core FIG

Core GEOM Table

Core MAT Table

II. Element

Elements Identification Table

ELM FIG

ELM GEOM Table

ELM MAT Table

III. Sub-element

Sub-elements Identification Table

SUB-ELM FIG

SUB-ELM GEOM Table

SUB-ELM MAT Table

IV. Material

Material Table

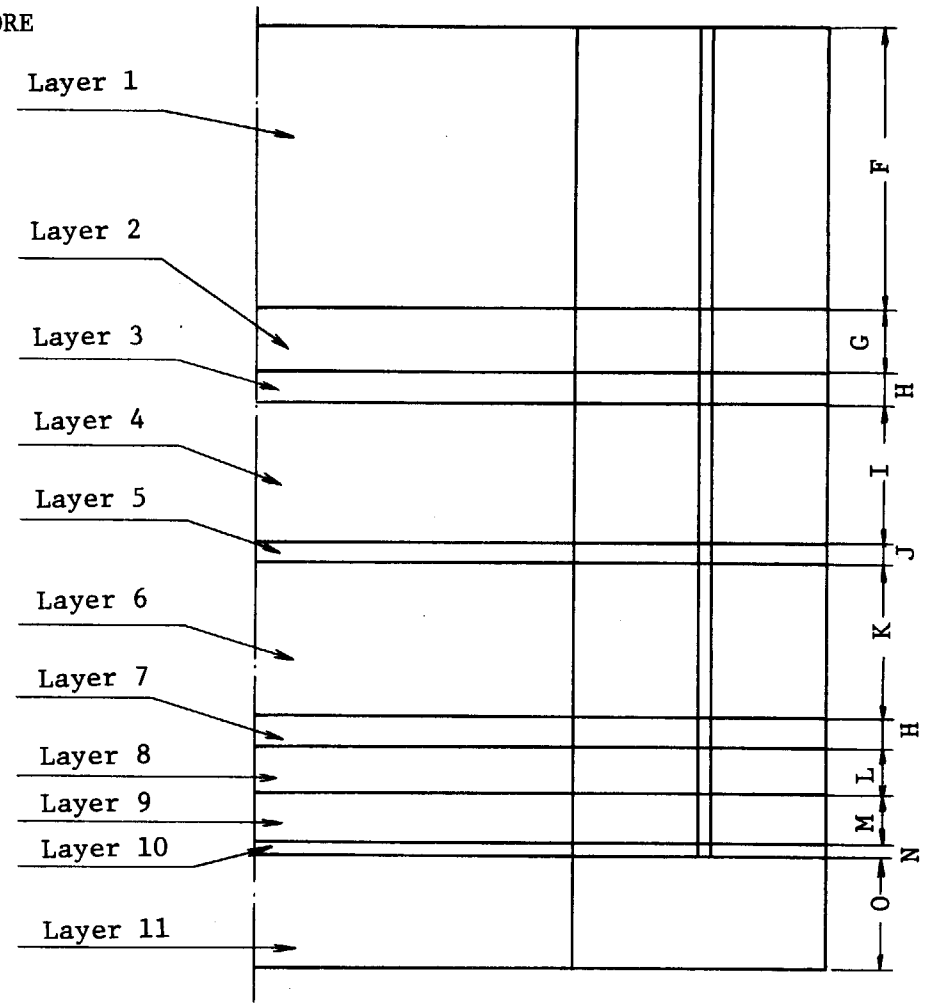
I. CORE

CORE Identification Table ; JRR-2

Core Z Fig. NO.	Core Z GEOM Table NO.
1	1

Layer NO.	Core X-Y Fig. NO.	Core X-Y GEOM Table NO.	Core MAT Table NO.
1	1	1	1
2	1	1	2
3	1	1	3
4	1	1	4
5	1	1	5
6	1	1	6
7	1	1	7
8	1	1	8
9	1	1	9
10	1	1	10
11	1	1	11

I. CORE

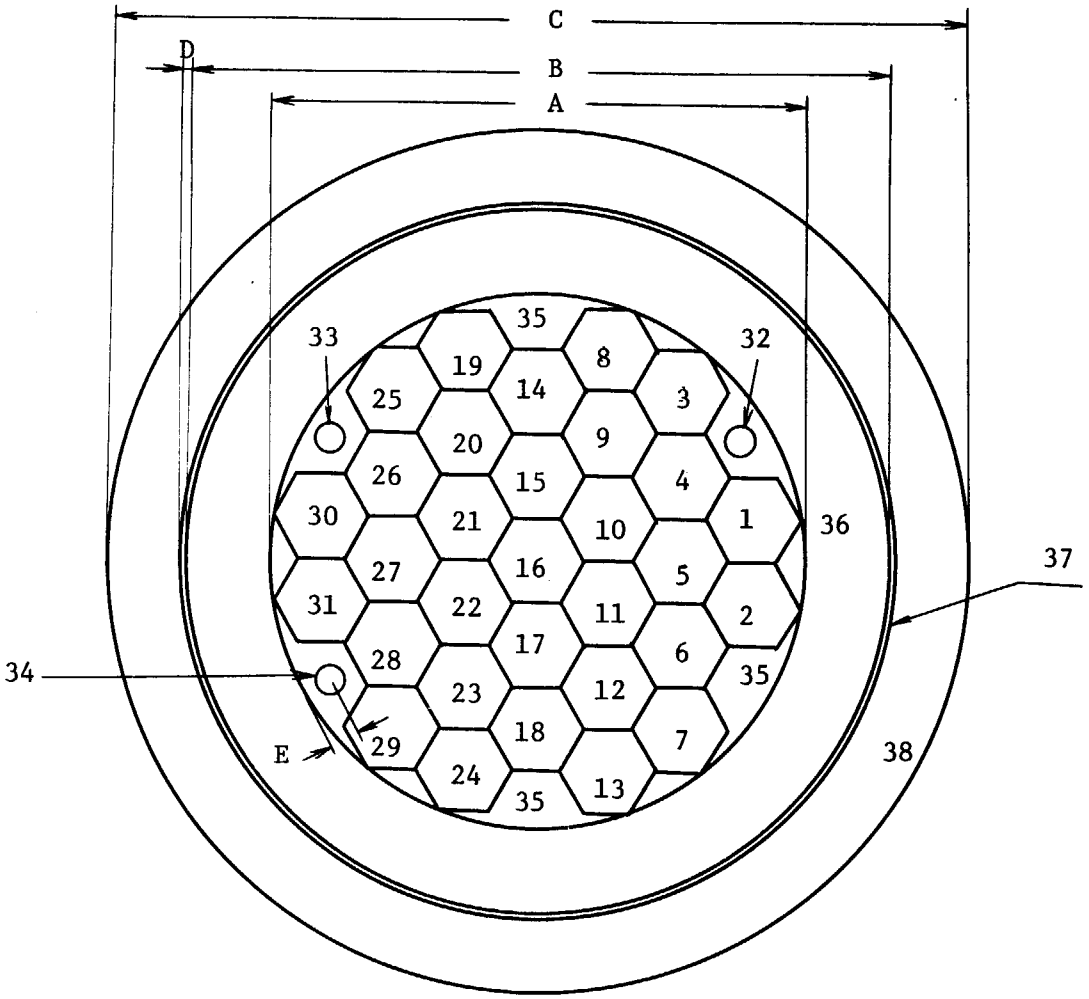


CORE Z Fig. 1

CORE Z GEOM Table 1

	DIM cm
F	61.99
G	13.4
H	1.25
I	60-CRL
J	5.0
K	CRL-60
L	14.66
M	29.62
N	3.18
O	37.93

* If DIM is negative, DIM must be set to zero.
CRL is an abbreviation of control rod length.



CORE X-Y Fig. 1

CORE X-Y GEOM Table 1

	DIM cm
A	85.2
B	152.4
C	190.6
D	1.27
E	4.1

CORE MAT Table 1

REGION NO.	ELM NO.
1	ELM 9
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	"
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	"
27	"
28	"
29	"
30	"
31	"
32	ELM 15
33	"
34	"
35	101
36	105
37	100
38	109

CORE MAT Table 2

REGION NO.	ELM NO.
1	ELM 10
2	"
3	"
4	"
5	5
6	10
7	"
8	"
9	5
10	10
11	10
12	5
13	10
14	"
15	"
16	"
17	"
18	"
19	"
20	5
21	10
22	10
23	5
24	10
25	"
26	"
27	5
28	10
29	"
30	"
31	"
32	16
33	"
34	"
35	" 102
36	105
37	100
38	109

CORE MAT Table 3

REGION NO.	ELM NO.
1	ELM 4
2	2
3	"
4	"
5	5
6	2
7	"
8	"
9	5
10	4
11	2
12	5
13	2
14	"
15	"
16	6
17	2
18	"
19	4
20	5
21	2
22	"
23	5
24	2
25	"
26	"
27	5
28	4
29	2
30	"
31	"
32	14
33	"
34	"
35	113
36	105
37	100
38	109

CORE MAT Table 4

REGION NO.	ELM NO.
1	ELM 3
2	1
3	"
4	"
5	5
6	1
7	"
8	"
9	5
10	3
11	1
12	5
13	1
14	"
15	"
16	6
17	1
18	"
19	3
20	5
21	1
22	"
23	5
24	1
25	"
26	"
27	5
28	3
29	1
30	"
31	"
32	14
33	"
34	"
35	113
36	106
37	100
38	110

CORE MAT Table 5

REGION NO.	ELM NO.
1	ELM 3
2	1
3	"
4	"
5	7
6	1
7	"
8	"
9	7
10	3
11	1
12	7
13	1
14	"
15	"
16	6
17	1
18	"
19	3
20	7
21	1
22	"
23	7
24	1
25	"
26	"
27	7
28	3
29	1
30	"
31	"
32	14
33	"
34	"
35	113
36	106
37	100
38	110

CORE MAT Table 6

REGION NO.	ELM NO.
1	ELM 3
2	1
3	"
4	"
5	8
6	1
7	"
8	"
9	8
10	3
11	"
12	8
13	1
14	"
15	"
16	6
17	1
18	"
19	3
20	8
21	1
22	"
23	8
24	1
25	"
26	"
27	8
28	3
29	1
30	"
31	"
32	14
33	"
34	"
35	113
36	106
37	100
38	110

CORE MAT Table 7

REGION NO.	ELM NO.
1	ELM 4
2	"
3	"
4	"
5	8
6	2
7	"
8	"
9	8
10	4
11	"
12	8
13	2
14	"
15	"
16	6
17	2
18	"
19	4
20	8
21	2
22	"
23	8
24	2
25	"
26	"
27	8
28	4
29	2
30	"
31	"
32	14
33	"
34	"
35	113
36	107
37	100
38	111

CORE MAT Table 8

REGION NO.	ELM NO.
1	ELM 11
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	"
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	"
27	"
28	"
29	"
30	"
31	"
32	17
33	"
34	"
35	103
36	107
37	100
38	111

CORE MAT Table 9

REGION NO.	ELM NO.
1	ELM 12
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	"
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	"
27	"
28	"
29	"
30	"
31	"
32	18
33	"
34	"
35	104
36	107
37	100
38	111

CORE MAT Table 10

REGION NO.	ELM NO.
1	ELM 20
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	"
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	"
27	"
28	"
29	"
30	"
31	"
32	21
33	"
34	"
35	100
36	"
37	"
38	111

CORE MAT Table 11

REGION NO.	ELM NO.
1	ELM 13
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	"
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	"
27	"
28	"
29	"
30	"
31	"
32	19
33	"
34	"
35	108
36	112
37	"
38	"

II. Element

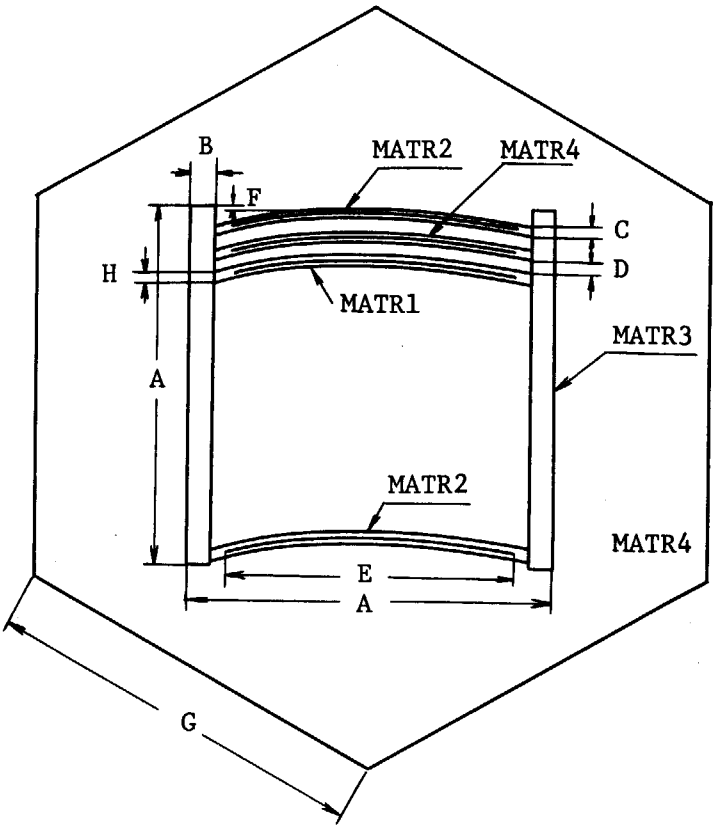
Elements Identification Table

ELM NO.	ELM FIG. NO.	ELM FEOM Table No.	ELM MAT Table No.	Comments
1	1	1	1	MTR Type Fuel Cell
2	1	1	2	"
3	2	2	3	Cylinder Type Fuel Cell
4	2	2	4	"
5	3	3	5	Control Rod
6	4	4	6	Irradiation Tube
7	4	5	7	Control Rod
8	5	6	8	Reflector D_2O+Al
9	5	6	9	"
10	5	6	10	"
11	5	6	11	"
12	5	6	12	"
13	5	6	13	"
14	6	7	14	"
15	6	7	15	"
16	6	7	16	"
17	6	7	17	"
18	6	7	18	"
19	6	7	19	"
20	5	6	20	Al
21	6	7	21	Al

ELM NO.	MAT NO.	Comments
100	501	Al
101	502	Upper Ref. D_2O+Al
102	503	"
103	504	Lower Ref. D_2O+Al
104	505	"
105	506	Upper Ref. D_2O+Al
106	507	Side Ref. D_2O+Al
107	508	Lower Ref. D_2O+Al
108	509	Lower Ref. D_2O+H_2O+Al
109	510	Upper Ref. H_2O+Al
110	511	Side Ref. H_2O+Al
111	512	Lower Ref. H_2O+Al
112	513	Lower Ref. D_2O+H_2O+Al
113	301	Moderator D_2O

ELM-GEOM Table 1

	DIM cm
A	7.62
B	0.52
C	0.204(×2)
D	0.297
E	6.10
F	0.02
G	7.699
H	0.127(×15)



ELM Fig. 1 (ELM 1, 2)

ELM-MAT Table 1

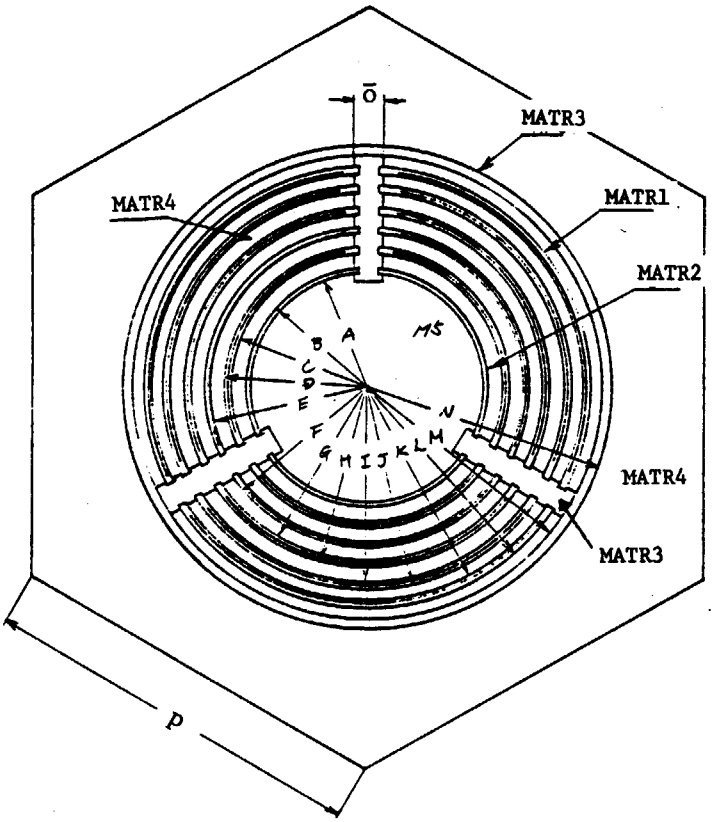
Region No.	Material No.	Comments
MATR1	SUB-ELM 1	U-Al
MATR2	SUB-ELM 2	U-Al
MATR3	501	Al
MATR4	301	D_2O

ELM-MAT Table 2

Region No.	Material No.	Comments
MATR1	201	Al
MATR2	201	Al
MATR3	501	Al
MATR4	301	D_2O

ELM-GEOM Table 2

	DIM cm
A	4.858
B	5.112
C	5.712
D	5.966
E	6.566
F	6.82
G	7.42
H	7.674
I	8.274
J	8.528
K	9.128
L	9.382
M	9.9
N	10.3
O	0.6
P	7.699



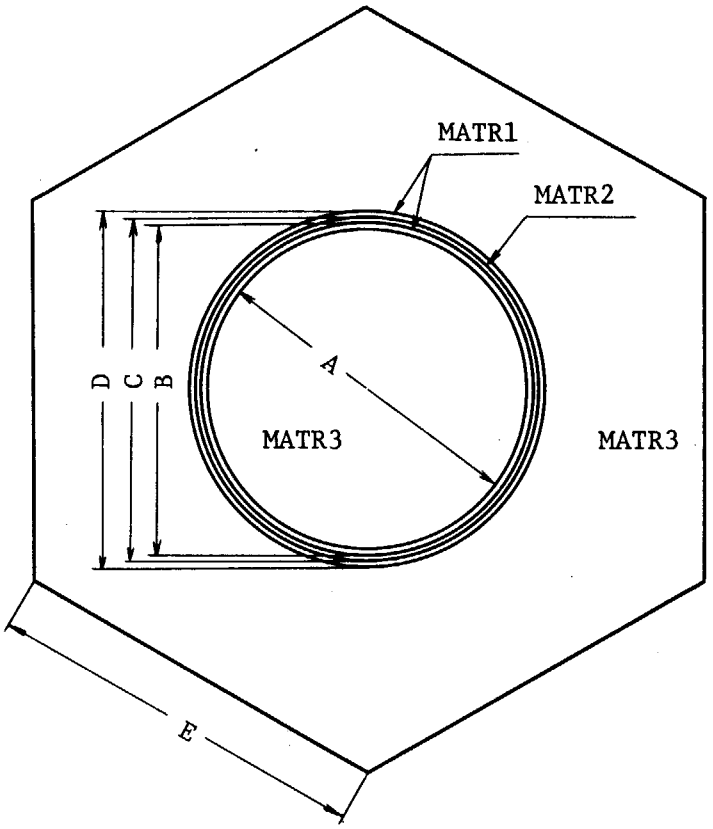
ELM Fig. 2 (ELM 3, 4)

ELM-MAT Table 3

Region No.	Material No.	Comments
MATR1	SUB-ELM 4	U-Al
MATR2	SUB-ELM 5	Al
MATR3	501	Al
MATR4	301	D_2O

ELM-MAT Table 4

Region No.	Material No.	Comments
MATR1	SUB-ELM 5	Al
MATR2	SUB-ELM 5	Al
MATR3	501	Al
MATR4	301	D_2O



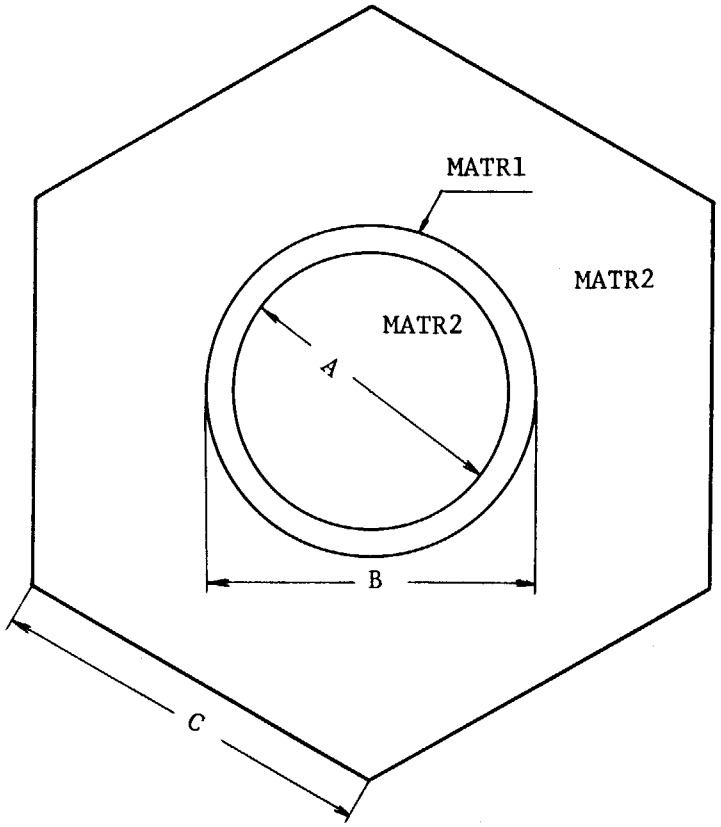
ELM Fig. 3 (ELM 5)

ELM-MAT Table 3

	DIM cm
A	6.7
B	7.0
C	7.3
D	7.6
E	7.699

ELM-MAT Table 5

Region No.	Material No.	Comments
MATR1	602	SUS 304
MATR2	601	Cd
MATR3	301	D_2O



ELM Fig. 4 (ELM 6, 7)

ELM-GEOM Table 4

	DIM cm
A	8.8
B	9.6
C	7.699

ELM-GEOM Table 5

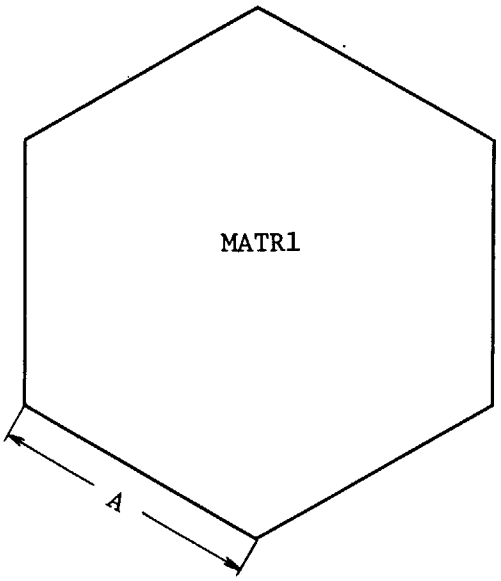
	DIM cm
A	5.8
B	6.7
C	7.699

ELM-MAT Table 6

Region No.	Material No.	Comments
MATR1	501	Al
MATR2	301	D_2O

ELM-MAT Table 7

Region No.	Material No.	Comments
MATR1	602	SUS 304
MATR2	301	D_2O



ELM Fig. 5 (ELM 8 ∿ 13, 20)

ELM-GEOM Table 6

	DIM cm
A	7.699

ELM-MAT Table 8

Region No.	Material No.	Comments
MATR1	301	D_2O

ELM-MAT Table 9

Region No.	Material No.	Comments
MATR1	502	Reflector D_2O+Al

ELM-MAT Table 10

Region No.	Material No.	Comments
MATR1	503	Reflector D_2O+Al

ELM-MAT Table 11

Region No.	Material No.	Comments
MATR1	504	Reflector D_2O+Al

ELM-MAT Table 12

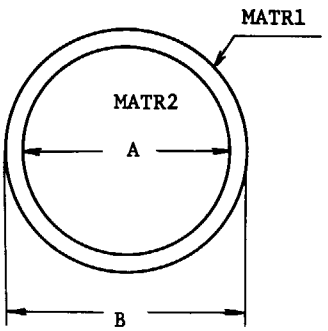
Region No.	Material No.	Comments
MATR1	505	Reflector D_2O+Al

ELM-MAT Table 13

Region No.	Material No.	Comments
MATR1	509	Reflector D_2O+H_2O+Al

ELM-MAT Table 14

Region No.	Material No.	Comments
MATR1	501	Al
MATR2	301	D_2O



ELM-GEOM Table 7

	DIM cm
A	5.0
B	5.7

ELM Fig. 6 (ELM 14 ∿ 19, 21)

ELM-MAT Table 15

Region No.	Material No.	Comments
MATR1	502	D_2O+Al
MATR2	502	"

ELM-MAT Table 16

Region No.	Material No.	Comments
MATR1	503	D_2O+Al
MATR2	503	"

ELM-MAT Table 17

Region No.	Material No.	Comments
MATR1	504	D_2O+Al
MATR2	504	"

ELM-MAT Table 18

Region No.	Material No.	Comments
MATR1	505	D_2O+Al
MATR2	505	"

ELM-MAT Table 19

Region No.	Material No.	Comments
MATR1	509	D_2O+H_2O+Al
MATR2	509	"

ELM-MAT Table 20

Region No.	Material No.	Comments
MATR1	501	Al

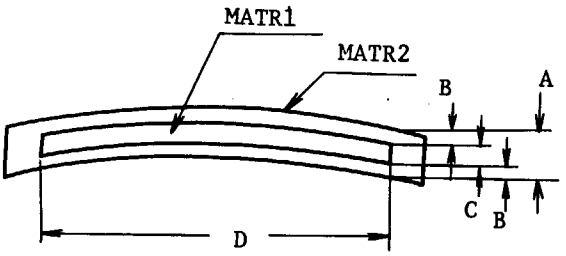
ELM-MAT Table 21

Region No.	Material No.	Comments
MATR1	501	Al
MATR2	501	Al

III. Sub-element

Sub-elements Identification Table

SUB-ELM NO.	SUB-ELM FIG.NO.	SUB-ELM GEOM Table NO.	SUB-ELM MAT Table NO.	Comments
1	1	1	1	MTR Tupe Fuel Inner
2	1	2	2	MTR Type Fuel Outer
3	1	1	3	MTR Type Al
4	2	3	4	Cylinder Type Fuel
5	2	3	5	Cylinder Type Al



SUB-ELM Fig. 1 (SUB-ELM 1, 2, 3)

SUB-ELM-GEOM Table 1

	DIM cm
A	0.127
B	0.038
C	0.051
D	6.10

SUB-ELM-GEOM Table 2

	DIM cm
A	0.204
B	0.0765
C	0.051
D	6.10

SUB-ELM-MAT Table 1

Region No.	Material No.	Comments
MATR1	101	U-Al
MATR2	201	Al

(93% Enr. 20 w/o U-Al MTR Type Inner Plate)

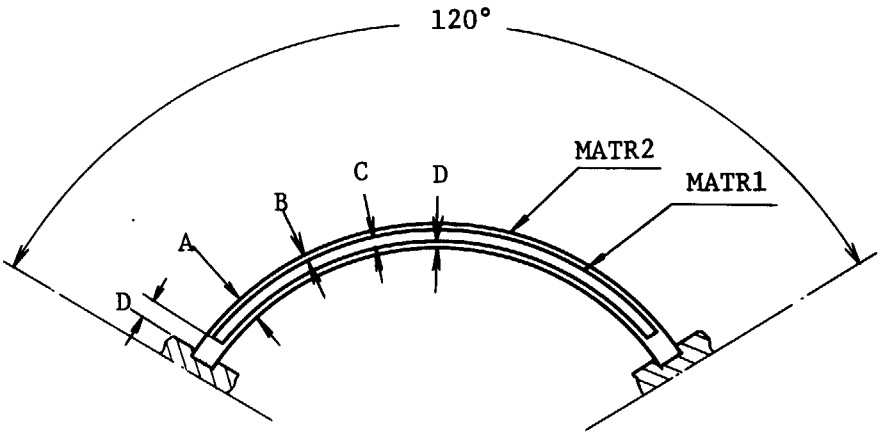
SUB-ELM-MAT Table 1

Region No.	Material No.	Comments
MATR1	102	U-Al
MATR2	201	Al

(93% Enr. 8 w/o U-Al MTR Type Outer Plate)

SUB-ELM-MAT Table 3

Region No.	Material No.	Comments
MATR1	201	Al
MATR2	201	Al



SUB-ELM Fig. 2 (SUB-ELM 4, 5)

SUB-ELM-GEOM Table 3 (Cylinder Type)

	DIM cm
A	0.127
B	0.038
C	0.051
D	0.3

SUB-ELM-MAT Table 4

Region No.	Material No.	Comments
MATR1	103	U-Al
MATR2	201	Al

IV. Material

Material Table

Fuel

ATOM / MAT NO.	U-235	U-238	Al	Comments
101	1.7131×10^{-3}	1.2731×10^{-4}	5.7161×10^{-2}	93% Enrich 20 w/o U-Al Alloy MTR Type Fuel, Inner
102	5.3532×10^{-4}	3.9787×10^{-5}	5.9487×10^{-2}	93% Enrich 20 w/o U-Al Alloy MTR Type Fuel, Outer
103	1.6259×10^{-3}	1.2083×10^{-4}	5.7307×10^{-2}	93% Enrich 20 w/o U-Al Alloy Cylinder Type Fuel

Crad

ATOM / MAT NO.	Al
201	6.0037×10^{-2}

ATOM / MAT NO.	D	H	O
301	6.3970×10^{-2}	2.5028×10^{-3}	3.3236×10^{-2}

Structure

MAT NO. \ ATOM	D	H	O	Al	C	Fe	Ni	Cr
501				6.0037×10^{-2}				
502	5.8142×10^{-2}	2.2748×10^{-3}	3.0208×10^{-2}	5.4694×10^{-3}				
503	6.1938×10^{-2}	2.4233×10^{-3}	3.2180×10^{-2}	1.9071×10^{-3}				
504	5.8293×10^{-2}	2.2381×10^{-3}	3.0265×10^{-2}	5.5849×10^{-3}				
505	4.2090×10^{-2}	1.6468×10^{-3}	2.1868×10^{-2}	2.0303×10^{-2}		2.6537×10^{-4}	7.1214×10^{-5}	2.8864×10^{-5}
506	6.1647×10^{-2}	2.6903×10^{-3}	3.2169×10^{-3}	5.8943×10^{-4}				
507	4.9570×10^{-2}	3.9258×10^{-3}	2.6748×10^{-2}	3.1462×10^{-3}				
508	5.8068×10^{-2}	2.4862×10^{-3}	3.0277×10^{-2}	1.9539×10^{-3}				
509	1.3789×10^{-2}	4.2098×10^{-2}	2.7944×10^{-2}	4.3032×10^{-3}	8.2837×10^{-3}			
510	9.8965×10^{-4}	6.6410×10^{-2}	3.3700×10^{-2}	5.0275×10^{-6}				
511	$8.8564\ 10^{-4}$	5.9430×10^{-2}	3.0158×10^{-2}	5.1446×10^{-4}				
512	9.8187×10^{-4}	6.5887×10^{-2}	3.3435×10^{-2}	1.3014×10^{-4}				
513	2.1257×10^{-2}	3.2886×10^{-2}	2.7072×10^{-2}	5.1301×10^{-3}	8.5194×10^{-3}			

Poison

MAT NO. \ ATOM	Cd	Fe	Ni	Cr
601	4.6286×10^{-2}			
602		5.8901×10^{-2}	7.7997×10^{-3}	1.7603×10^{-2}

5.2.2 JRR-4 Core Identification

I. Core

Core Identification Table
Core FIG
Core GEOM Table
Core MAT Table

II. Element

Elements Identification Table
ELM FIG
ELM GEOM Table
ELM MAT Table

III. Sub-element

Sub-elements Identification
SUB-ELM FIG
SUB-ELM GEOM Table
SUB-ELM MAT Table

IV. Material

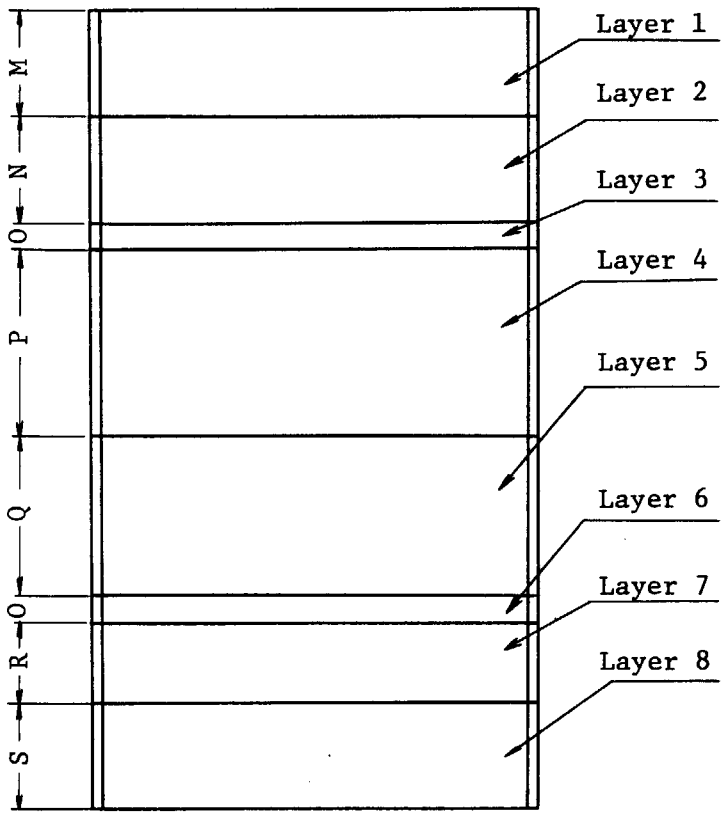
Material Table

I. CORE

CORE Identification Table; JRR-4

Core Z Fig. NO.	Core Z GEOM Table NO.
1	1

Layer NO.	Core X-Y Fig. NO.	Core X-Y GEOM Table NO.	Core MAT Table NO.
1	1	1	1
2	1	1	2
3	1	1	3
4	1	1	4
5	1	1	5
6	1	1	6
7	1	1	7
8	1	1	8

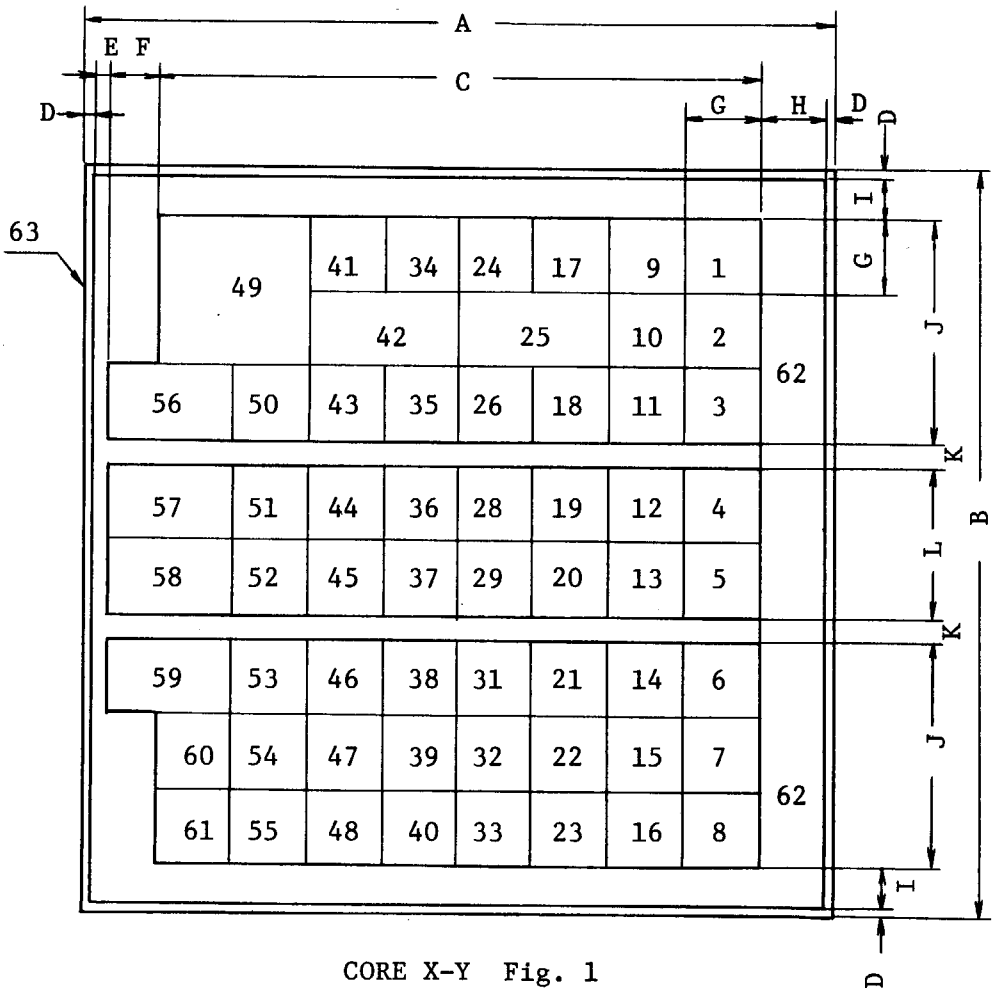


CORE Z Fig. 1

CORE Z GEOM Table 1

	DIM cm
M	30.0
N	20.0
O	1.5
P	60-C.R.L
Q	C.R.L
R	5.7126
S	13.787

C.R.L; Control Rod Level



CORE X-Y Fig. 1

CORE X-Y GEOM Table 1

	DIM cm
A	82.5
B	77.5
C	64.5
D	1.5
E	0.35
F	7.0
G	8.1
H	7.35
I	3.85
J	24.3
K	1.0
L	16.2

Core MAT Table 1

Region NO.	Element NO.
1	ELM 16
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	"
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	"
27	3
28	16
29	"
30	3
31	16
32	"

Region NO.	Element NO.
33	ELM 16
34	"
35	"
36	"
37	"
38	"
39	"
40	"
41	"
42	13
43	16
44	"
45	"
46	"
47	"
48	"
49	18
50	16
51	"
52	"
53	"
54	"
55	"
56	17
57	"
58	"
59	"
60	16
61	"
62	101
63	102

Core MAT Table 2

Region NO.	Element No.
1	ELM 21
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	29
11	19
12	"
13	"
14	"
15	29
16	21
17	"
18	19
19	"
20	"
21	"
22	21
23	"
24	"
25	11
26	19
27	3
28	19
29	"
30	3
31	7
32	21

Region NO.	Element NO.
33	ELM 21
34	"
35	19
36	"
37	"
38	"
39	21
40	"
41	"
42	11
43	19
44	"
45	"
46	"
47	29
48	21
49	30
50	21
51	"
52	29
53	21
54	"
55	"
56	22
57	"
58	"
59	"
60	21
61	"
62	101
63	102

Core MAT Table 3

Region NO.	Element NO.
1	ELM 14
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	29
11	2
12	"
13	"
14	"
15	29
16	14
17	"
18	2
19	"
20	"
21	"
22	14
23	"
24	"
25	9
26	2
27	3
28	2
29	"
30	3
31	2
32	5

Region NO.	Element NO.
33	ELM 14
34	"
35	2
36	"
37	"
38	"
39	14
40	"
41	"
42	9
43	2
44	"
45	"
46	"
47	29
48	14
49	30
50	14
51	"
62	29
53	14
54	"
55	"
56	15
57	"
58	"
59	"
60	14
61	"
62	101
63	102

Core MAT Table 4

Region NO.	Element NO.
1	ELM 14
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	29
11	1
12	"
13	"
14	"
15	29
16	14
17	"
18	1
19	"
20	"
21	"
22	14
23	"
24	"
25	9
26	1
27	3
28	1
29	"
30	3
31	1
32	5

Region NO.	Element NO.
33	ELM 14
34	"
35	1
36	"
37	"
38	"
39	14
40	"
41	"
42	9
43	1
44	"
45	"
46	"
47	29
48	14
49	30
50	14
51	"
52	29
53	14
54	"
55	"
56	15
57	"
58	"
59	"
60	14
61	"
62	101
63	102

Core MAT Table 5

Region NO.	Element NO.
1	ELM 14
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	29
11	1
12	"
13	"
14	"
15	29
16	14
17	"
18	1
19	"
20	"
21	"
22	14
23	"
24	"
25	10
26	1
27	4
28	1
29	"
30	4
31	1
32	6

Region NO.	Element NO.
33	ELM 14
34	"
35	1
36	"
37	"
38	"
39	14
40	"
41	"
42	10
43	1
44	"
45	"
46	"
47	29
48	14
49	30
50	14
51	"
52	29
53	14
54	"
55	"
56	15
57	"
58	"
59	"
60	14
61	"
62	101
63	102

Core MAT Table 6

Region NO.	Element NO.
1	ELM 14
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	29
11	2
12	"
13	"
14	"
15	29
16	14
17	"
18	2
19	"
20	"
21	"
22	14
23	"
24	"
25	10
26	2
27	4
28	2
29	"
30	4
31	2
32	6

Region NO.	Element NO.
33	ELM 14
34	"
35	2
36	"
37	"
38	"
39	14
40	"
41	"
42	10
43	2
44	"
45	"
46	"
47	29
48	14
49	30
50	14
51	"
52	29
53	14
54	"
55	"
56	15
57	"
58	"
59	"
60	14
61	"
62	101
63	102

Core MAT Table 7

Region NO.	Element NO.
1	ELM 23
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	29
11	20
12	"
13	"
14	"
15	29
16	23
17	"
18	20
19	"
20	"
21	"
22	23
23	"
24	"
25	12
]6	20
27	4
28	20
29	"
30	4
31	20
32	8

Region NO.	Element NO.
33	ELM 23
34	"
45	20
36	"
37	"
38	"
39	23
40	"
41	"
42	12
43	20
44	"
45	"
46	"
47	29
48	23
49	30
50	23
51	"
52	29
53	23
54	"
55	"
56	24
57	"
58	"
59	"
60	23
61	"
62	101
63	102

Core MAT Table 8

Region NO.	Element NO.
1	ELM 27
2	"
3	"
4	"
5	"
6	"
7	"
8	"
9	"
10	"
11	25
12	"
13	"
14	"
15	27
16	"
17	"
18	25
19	"
20	"
21	"
22	27
23	"
24	"
25	31
26	25
27	4
28	25
29	"
30	4
31	25
32	27

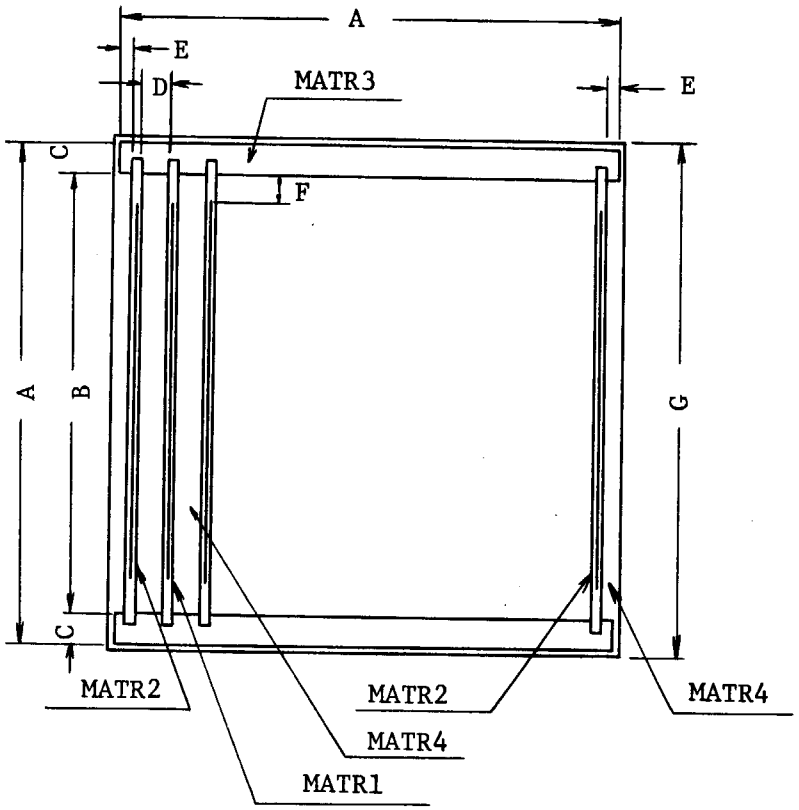
Region NO.	Element NO.
33	ELM 27
34	"
35	25
36	"
37	"
38	"
39	27
40	"
41	"
42	31
43	25
44	"
45	"
46	"
47	27
48	"
49	26
50	27
51	"
52	"
53	"
54	"
55	"
56	28
57	"
58	"
59	"
60	27
61	"
62	101
63	102

Elements Identification Table

ELM NO.	ELM FIG NO.	ELM GEOM Table NO.	ELM MAT Table NO.	Comments
1	1	1	1	A Type Fuel
1'	1	1	1'	B Type Fuel
2	1	1	2	Al
3	2	2	3	Control Rod
4	2	2	4	"
5	3	3	5	Regulating Rod Reflector
6	3	3	5	"
7	3	3	7	"
8	3	3	8	"
9	4	4	9	Back Up Rod Reflector
10	4	4	6	"
11	4	4	10	"
12	4	4	11	"
13	4	4	12	"
14	5	5	13	Reflector
15	5	6	13	"
16	5	5	14	"
17	5	6	14	"
18	5	7	14	"
19	5	5	15	"
20	5	5	16	"
21	5	5	17	"
22	5	6	17	"
23	5	5	18	"
24	5	6	18	"
25	5	5	19	"
26	5	7	20	"
27	5	5	20	"
28	5	6	20	"
29	5	5	21	Reflector
30	5	7	21	"
31	4	4	22	Safety Rod Reflector

ELM NO.	MAT NO.	Comments
101	301	Moderator
102	501	Al

II. Element



ELM-Fig. 1 (ELM 1, 1', 2)

ELM-GEOM Table 1

	DIM cm
A	8.0
B	7.04
C	0.48
D	0.41
E	0.185
F	0.12
G	8.1

ELM-MAT Table 1 (B Type)

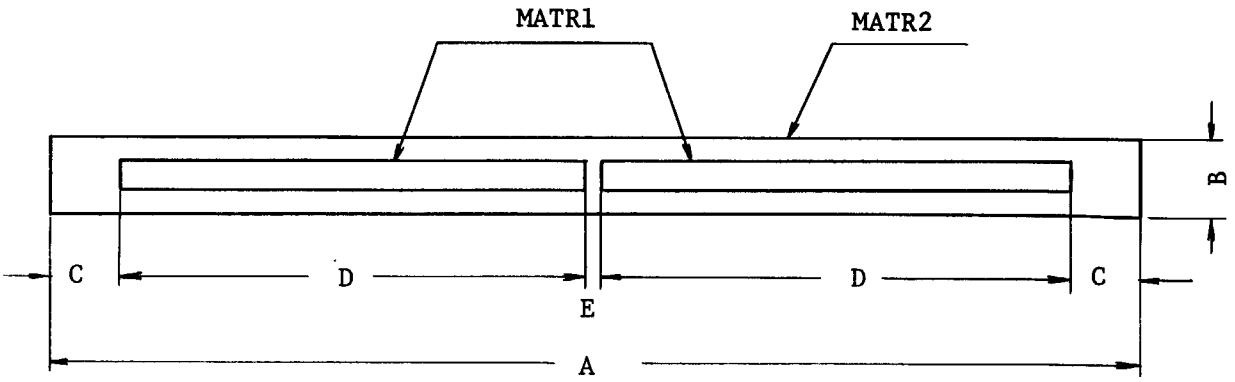
Region NO.	Material NO.	Comments
MATR1	SUB-ELM 1	U-Al (20 w/o)
MATR2	SUB-ELM 2	U-Al (8 w/o)
MATR3	501	Al
MATR4	301	H_2O

ELM-MAT Table 1' (A Type)

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 1'	19 w/o
MATR3	SUB-ELM 1"	"
MATR3	501	
MATR4	301	

ELM-MAT Table 2

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 3	Al
MATR2	SUB-ELM 3	Al
MATR3	501	Al
MATR4	301	H_2O



ELM Fig. 2 (ELM 3, 4)

ELM-GEOM Table 2

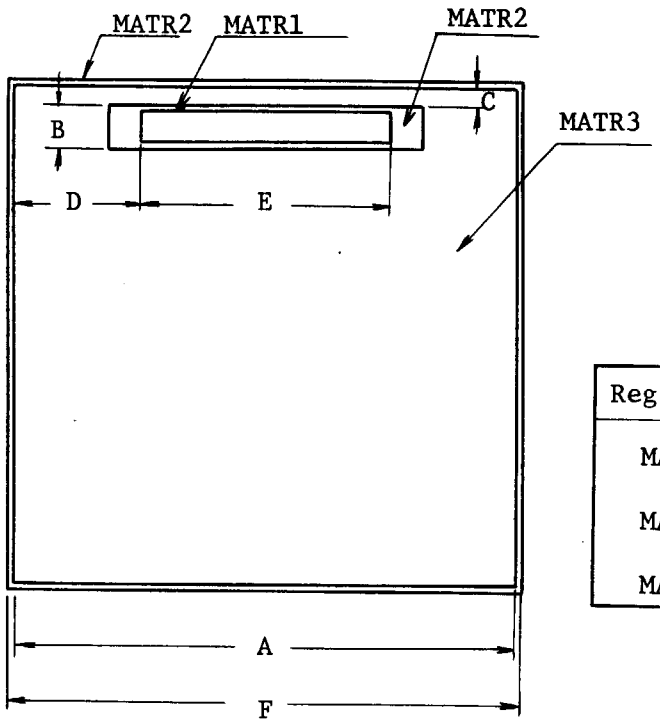
	DIM cm
A	56.7
B	1.0
C	4.45
D	23.5
E	0.8

ELM-MAT Table 3

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 4	B-steel
MATR2	301	H_2O

ELM-MAT Table 4

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	301	H_2O



ELM-Fig. 3 (ELM 5 ∿ 8)

ELM-GEOM Table 3

	DIM cm
A	8.0
B	0.7
C	0.3
D	2.0
E	4.0
F	8.1

ELM-MAT Table 5

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 5	B-steel
MATR2	401	H_2O
MATR3	401	Graphite

ELM-MAT Table 6

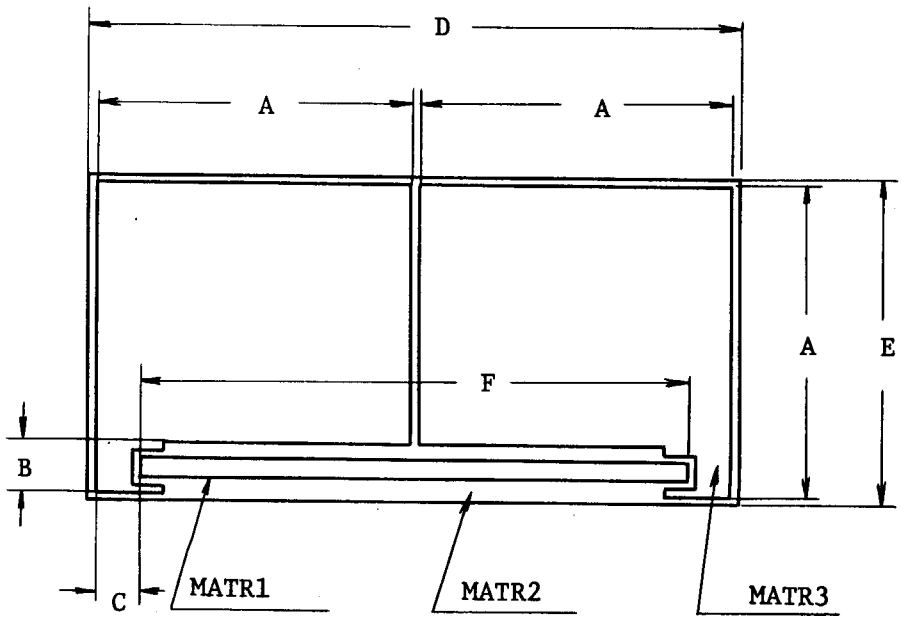
Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	301	H_2O
MATR3	401	Graphite

ELM-MAT Table 7

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 5	B-steel
MATR2	505	SUS Al H_2O
MATR3	505	"

ELM-MAT Table 8

Region NO.	Material NO.	Comments
MATR1	506	H_2O, Al
MATR2	506	"
MATR3	506	"



ELM-Fig. 4 (ELM 8 ∿ 13, 31)

ELM-GEOM Table 4

	DIM cm
A	8.0
B	1.3
C	1.05
D	16.2
E	8.1
F	14.0

ELM-MAT Table 9

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 6	Bron-Steel
MATR2	401	H_2O
MATR3	401	Graphite

ELM-MAT Table 10

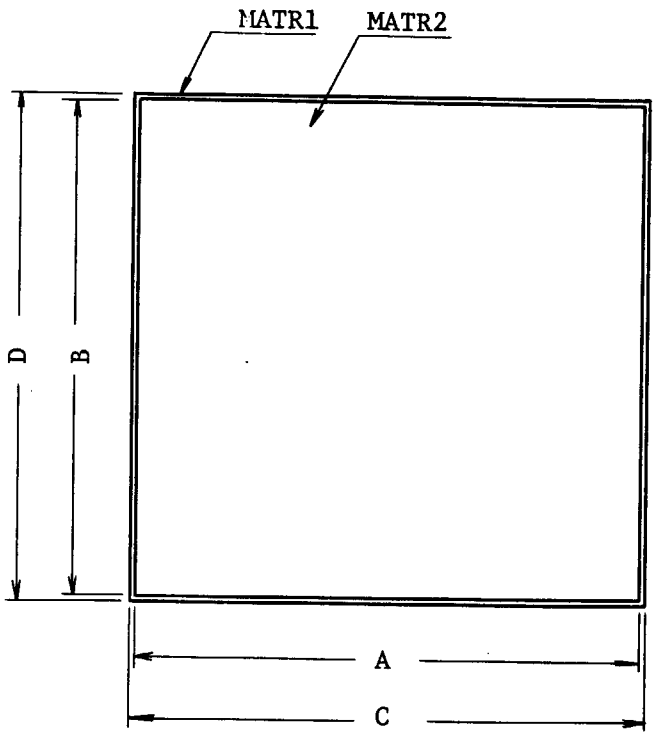
Region NO.	Material NO.	Comments
MATR1	SUB-ELM 6	Bron-Steel
MATR2	505	SUS,Al,H_2O
MATR3	505	"

ELM-MAT Table 11

Region NO.	Material NO.	Comments
MATR1	506	Al, H_2O
MATR2	506	"
MATR3	506	"

ELM-MAT Table 12

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	301	H_2O
MATR3	301	H_2O



ELM-GEOM Table 5

	DIM cm
A	8.0
B	8.0
C	8.1
D	8.1

ELM-Fig. 5 (ELM 14 ∿ 30)

ELM-GEOM Table 6

	DIM cm
A	15.0
B	8.0
C	15.0
D	8.1

ELM-GEOM Table 7

	DIM cm
A	16.0
B	16.0
C	16.2
D	16.2

ELM-MAT Table 13

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	401	Graphite

ELM-MAT TAble 14

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	301	H_2O

ELM-MAT Table 15

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	503	SUS,Al,H_2O

ELM-MAT Table 16

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	504	Al, H_2O

ELM-MAT Table 17

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	505	SUS,Al,H_2O

ELM-MAT Table 18

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	Al, H_2O

ELM-MAT Table 19

Region NO.	Material NO.	Comments
MATR1	507	Al, H_2O
MATR2	507	"

ELM-MAT TAble 20

Region NO.	Material NO.	Comments
MATR1	508	Al, H_2O
MATR2	508	"

ELM-MAT Table 21

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	502	Irra. Pipe

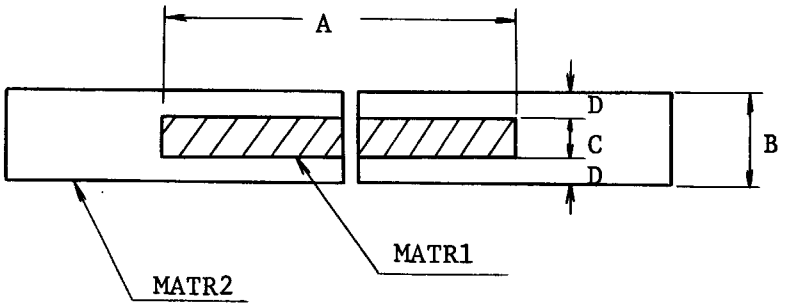
ELM-MAT Table 22

Region NO.	Material NO.	Comments
MATR1	508	Al, H_2O
MATR2	508	"
MATR3	508	"

III. Sub-element

Sub-elements Identification Table

SUB-ELM NO.	SUB-ELM Fig. NO.	SUB-ELM GEOM Table NO.	SUB-ELM-MAT Table NO.	Comments
1	1	1	1	93% Enr. 20 w/o U-Al
1'	1	1	1'	93% Enr. 19 w/o U-Al
2	1	1	2	93% Enr. 8 w/o U-Al
3	1	1	3	Fuel Cell Al
4	2	2	4	Bron-Steel Shim Rod
5	3	3	5	Bron-Steel Regulating Rod
6	4	4	6	Bron-Steel Safety Rod



SUB-ELM-Fig. 1 (SUB-ELM 1, 2, 3)

SUB-ELM-GEOM Table 1

	DIM cm
A	6.8
B	0.126
C	0.05
D	0.038

SUB-ELM-MAT Table 1 (B Type)

Region NO.	Material NO.	Comments
MATR1	101	U-Al
MATR2	201	Al

SUB-ELM-MAT Table 1' (A Type)

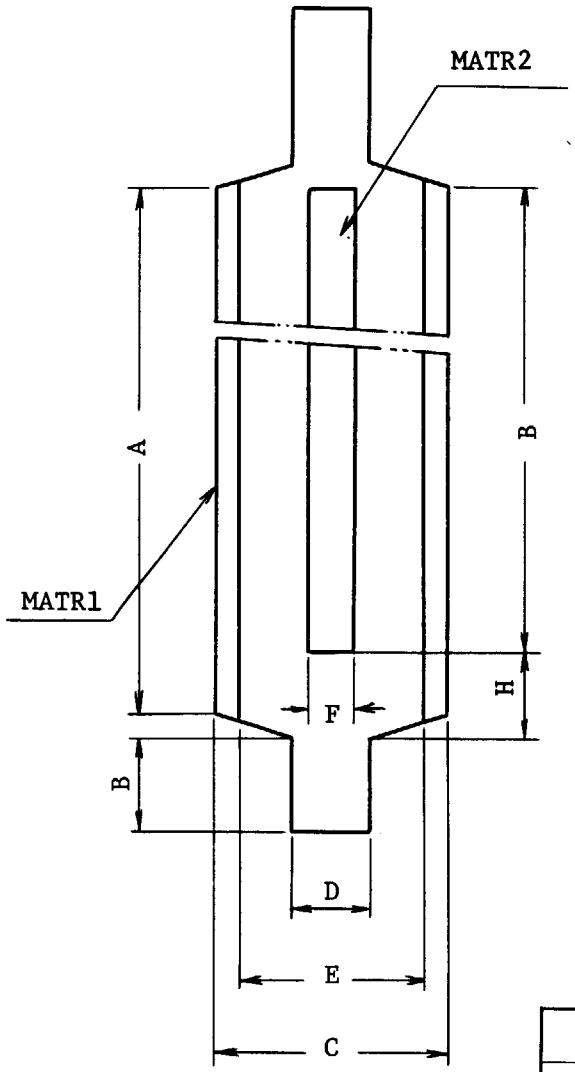
Region NO.	Material NO.	Comments
MATR1	103	U-Al
MATR2	201	Al

SUB-ELM-MAT Table 2 (B Type side)

Region NO.	Material NO.	Comments
MATR1	102	U-Al
MATR2	201	Al

SUB-ELM-MAT Table 3

Region NO.	Material NO.	Comments
MATR1	201	Al
MATR2	201	Al

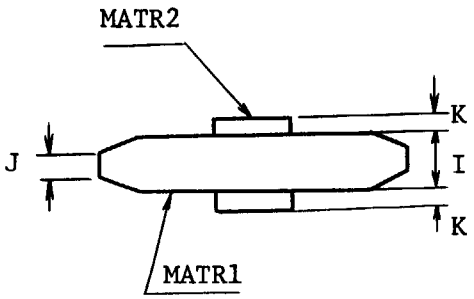


SUB-ELM-GEOM Table 2

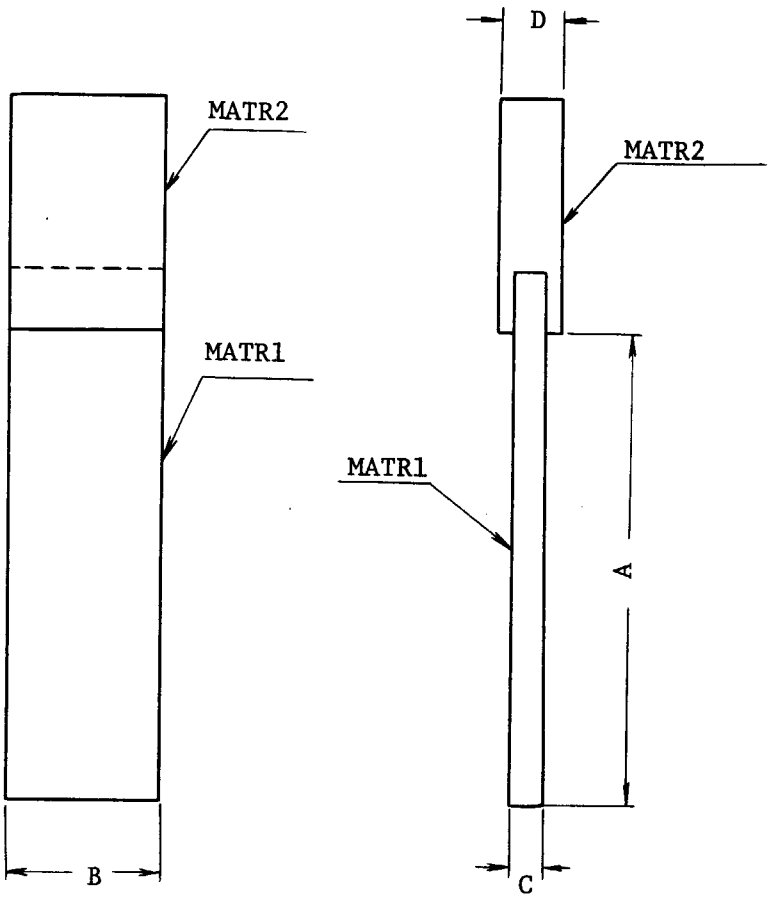
	DIM cm
A	83.5
B	80.0
C	23.5
D	8.0
E	18.5
F	4.5
G	8.0
H	5.0
I	0.5
J	0.3
K	0.2

SUB-ELM-MAT Table 4

Region NO.	Material NO.	Comments
MATR1	601	Bron Steel
MATR2	602	SUS 304



SUB-ELM Fig. 2 (SUB-ELM 4)

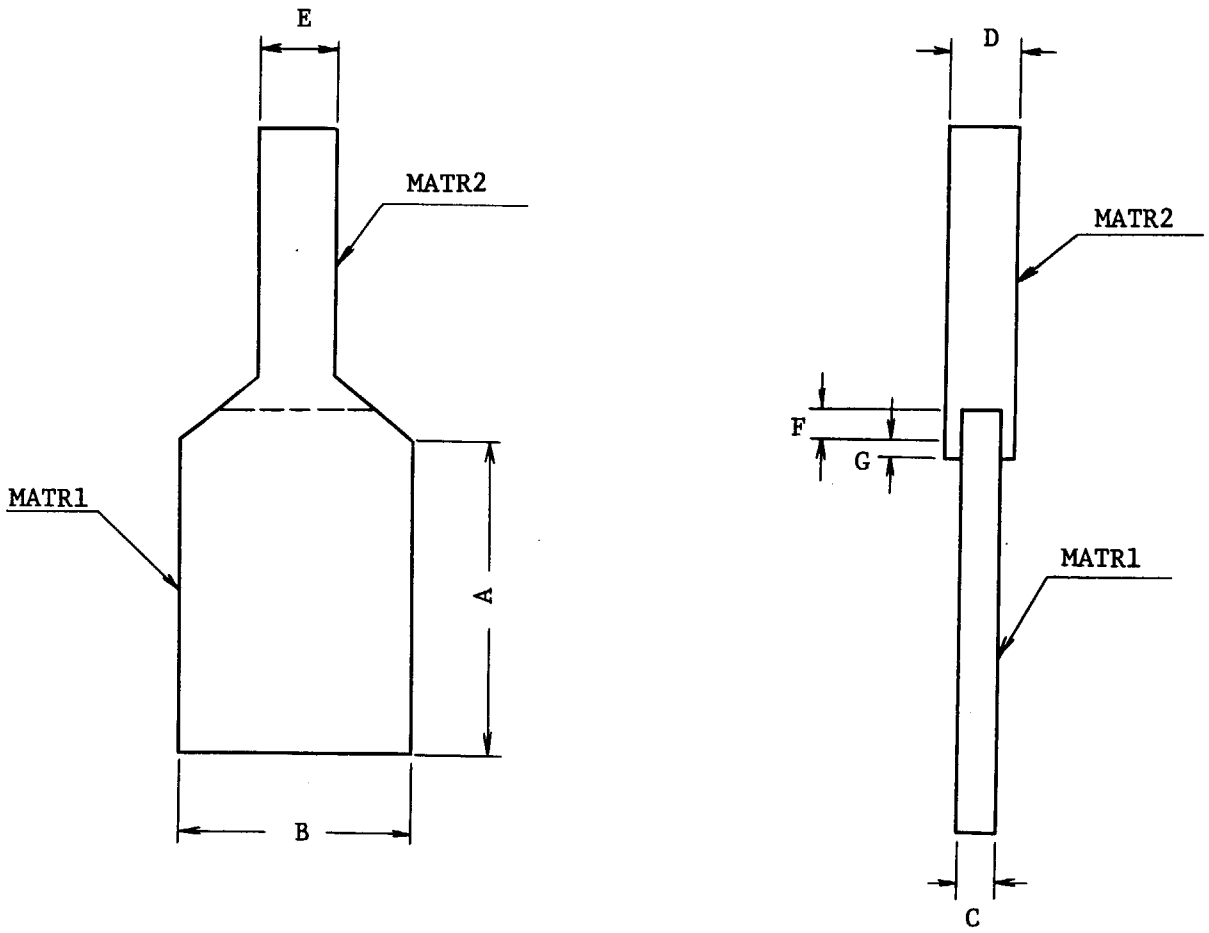


SUB-ELM-Fig. 3 (SUB-ELM 5)

SUB-ELM-GEOM Table 3

	DIM cm
A	100
B	4.0
C	0.5
D	0.8

cf SUB-ELM MAT Table 4



SUB-ELM-Fig. 4 (SUB-ELM 6)

SUB-ELM-GEOM Table 4

	DIM cm
A	100
B	14.0
C	0.5
D	1.2
E	4.5
F	4.75
G	2.0

cf SUB-ELM-MAT Table 4

IV. Materials

Material Table

Fuel

ATOM / MAT NO.	U-235	U-238	Al	Comments
101	1.4898×10^{-3}	1.1076×10^{-4}	5.4451×10^{-2}	93%, Type B
102	7.4238×10^{-4}	5.5172×10^{-5}	2.7133×10^{-2}	93%, Type B, Side Fuel
103	1.3902×10^{-3}	1.0331×10^{-4}	5.0808×10^{-2}	93%, Type A

Clad

ATOM / MAT NO.	Al
201	6.0047×10^{-2}

Moderator

ATOM / MAT NO.	H	O
301	6.6746×10^{-2}	3.3373×10^{-2}

Reflector

ATOM / MAT NO.	C	Al	H	O
401	9.4169×10^{-2}	8.4565×10^{-3}	1.6379×10^{-3}	8.1894×10^{-4}

Structure

ATOM / MAT NO.	Al	H	O
501	6.0047×10^{-2}		
502	1.9212×10^{-2}	4.5391×10^{-2}	2.2695×10^{-2}

Structure

MAT NO. \ ATOM	H	O	Al	C	Si	Mn	Ni	Cr	Fe
503	5.0223×10^{-2}	2.5111×10^{-2}	1.3825×10^{-2}	1.5598×10^{-6}	8.6734×10^{-6}	2.8115×10^{-5}	1.4907×10^{-4}	2.7383×10^{-4}	1.0023×10^{-3}
504	4.4857×10^{-2}	2.2429×10^{-2}	1.9692×10^{-2}						
505	3.0037×10^{-2}	1.5169×10^{-2}	1.3069×10^{-2}	3.5042×10^{-2}	8.6734×10^{-6}	2.8115×10^{-5}	1.4907×10^{-4}	2.7383×10^{-4}	1.0023×10^{-3}
506	4.3014×10^{-3}	2.1507×10^{-3}	2.8383×10^{-2}	5.2225×10^{-2}					
507	2.3108×10^{-2}	1.1554×10^{-2}	3.9258×10^{-2}						
508	3.1330×10^{-3}	1.5665×10^{-3}	5.7228×10^{-2}						

Piston

MAT NO. \ ATOM	B-10	B-11	C	Si	Ni	Mn	Cr	Fe
601	4.5570×10^{-4}	1.8002×10^{-3}	8.8818×10^{-5}	4.9389×10^{-4}	8.4886×10^{-3}	1.6009×10^{-3}	1.5593×10^{-2}	5.7071×10^{-2}
602			9.0262×10^{-5}	5.0192×10^{-4}	8.6266×10^{-3}	1.6269×10^{-3}	1.5846×10^{-2}	5.7999×10^{-2}

5.2.3 JMTR Core Identification

I. Core

Core Identification Table
Core Fig.
Core GEOM Table
Core MAT Table

II. Element

Elements Identification Table
ELM Fig.
ELM GEOM Table
ELM MAT Table

III. Sub-element

Sub-elements Identification
SUB-ELM Fig.
SUB-ELM GEOM Table
SUB-ELM MAT Table

IV. Material

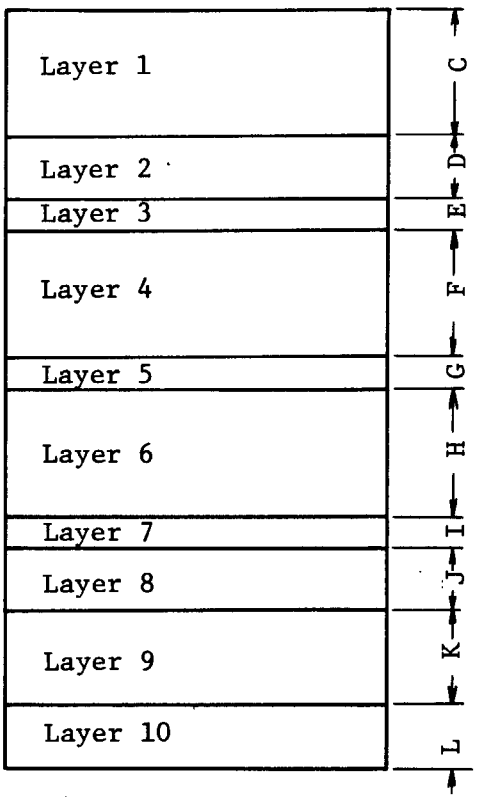
Material Table

I. CORE

Core Identification Table ; JMTR

Core Z Fig. NO.	Core Z GEOM Table NO.
1	1

Layer NO.	Core X-Y Fig. NO.	Core X-Y GEOM Table NO.	Core MAT Table NO.
1	1	1	1
2	1	1	2
3	1	1	3
4	1	1	4
5	1	1	5
6	1	1	6
7	1	1	7
8	1	1	8
9	1	1	9
10	1	1	10



CORE Z Fig. 1

CORE Z GEOM Table 1

	DIM cm
C	30.0
D	5.0
E	0.95
F	75.9-5.0-FfL
G	5.0
H	F.f.L
I	0.95
J	8.0
K	22.0
L	10.0

F.f.L ; Fuel follower Level

184	184	197	185	185	185	186	186	186	186	186	186	186	186	187	187	187	190	190
184	184	197	185	185	185	186	186	186	186	186	186	186	186	187	187	187	190	190
184	184	197	185	185	185	37	50	62	80	92	110	121	131	187	187	187	190	190
184	184	197	1	15	189/26	38	51	63	81	93			132	188				
184	184	197	2	16	27	39	52	64	82	94	111		133	143	154	168	190	190
184	184	197	3	17	28	40								144	155	169	190	190
184	184	197	4	18	29	41	53	65	83	95	112	122	134	145	156	170	190	190
184	184	197	5	19	30	42	54	66	84	96	113	123	135	146	157	171	190	190
184	184	197	9/8 6/7	20	31	43	55	70/69 67/68	85	100/99 97/98	114	124	136	147	158	172	190	190
184	184	197	10	21	32	44	56	71	86	101	115	125	137	148	162/161 159/160	173	190	190
184	184	197	11	22	33	45	57	75/74 72/73	87	105/104 102/103	116	126	138	149	163	174	190	190
184	184	197	12	23	34	46	58	76	88	106	117	127	139	150	200/199 164/164	175	190	190
184	184	197	13	24	35	47	59	77	89	107	118	128	140	151	165	176	190	190
184	184	197	14	25	36	48	60	78	90	108	119	129	141	152	166	177	190	190
184	184	197	183	183	192	49	61	79	91	109	120	130	142	153	167	178	190	190
184	184	197	183	183	192	181	181	181	181	181	181	181	181	191	193	195	190	190
184	184	197	183	183	192	181	181	181	181	181	181	181	181	180	179	179	190	190
184	184	197	183	183	196	196	196	196	196	196	196	196	196	196	179	179	190	190

B

A

CORE X-Y Fig. 1

CORE X-Y GEOM Table 1

	DIM cm
A	7.72
B	7.72

CORE MAT Table 1

Region NO.	ELM NO.
1	ELM 54
2	"
3	"
4	"
5	"
6	56
7	"
8	"
9	"
10	54
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	55
27	54
28	"
29	"
30	"
31	"
32	"
33	"
34	"

Region NO.	ELM NO.
35	ELM 54
36	"
37	"
38	"
39	"
40	64
41	54
42	"
43	"
44	"
45	"
46	"
47	"
48	"
49	"
50	"
51	"
62	"
53	"
54	"
55	"
56	"
57	"
58	"
59	"
60	"
61	"
62	"
63	"
64	"
65	"
66	"
67	56
68	"

Region NO.	ELM NO.
69	ELM 56
70	"
71	54
72	56
73	"
74	"
75	"
76	54
77	"
78	"
79	"
80	"
81	"
82	"
83	"
84	"
85	"
86	"
87	"
88	"
89	"
90	"
91	"
92	"
93	"
94	"
95	"
96	"
97	56
98	"
99	"
100	"
101	54
102	56

CORE MAT Table 1 (continued)

Region NO.	ELM NO.
103	ELM 56
104	"
105	"
106	54
107	"
108	"
109	"
110	"
111	57
112	54
113	"
114	"
115	"
116	"
117	"
118	"
119	"
120	"
121	"
122	"
123	"
124	"
125	"
126	"
127	"
128	"
129	"
130	"
131	"
132	"
133	"
134	"
135	"

Region NO.	ELM NO.
136	ELM 54
137	"
138	"
139	"
140	"
141	"
142	"
143	55
144	54
145	"
146	"
147	"
148	"
149	"
150	"
151	"
152	"
153	"
154	"
155	"
156	"
157	"
158	"
159	56
160	"
161	"
162	"
163	54
164	56
165	54
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 54
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	"
179	"
180	"
181	"
182	"
183	"
184	"
185	"
186	"
187	"
188	55
189	"
190	54
191	"
192	"
193	
194	
195	
196	54
197	"
198	
199	56
200	"

CORE MAT Table 2

Region NO.	ELM NO.
1	ELM 36
2	"
3	37
4	36
5	"
6	13
7	16
8	38
9	"
10	36
11	"
12	"
13	"
14	"
15	"
16	37
17	19
18	37
19	7
20	36
21	20
22	37
23	"
24	"
25	36
26	51
27	50
28	49
29	9
30	34
31	33
32	44
33	32
34	43

Region NO.	ELM NO.
35	ELM 10
36	43
37	36
38	"
39	37
40	46
41	45
42	6
43	58
44	"
45	"
46	"
47	37
48	"
49	46
50	"
51	"
52	37
53	45
54	23
55	58
56	6
57	58
58	21
59	25
60	37
61	36
62	"
63	"
64	37
65	31
66	58
67	24
68	"

Region NO.	ELM NO.
69	ELM 14
70	15
71	58
72	40
73	24
74	12
75	24
76	58
77	37
78	"
79	8
80	36
81	"
82	37
83	31
84	6
85	58
86	6
87	58
88	6
89	17
90	37
91	36
92	37
93	"
84	"
95	45
96	58
97	38
98	24
99	11
100	27
101	58
102	24

CORE MAT Table 2 (continued)

Region NO.	ELM NO.
103	ELM 35
104	18
105	40
106	58
107	37
108	"
109	36
110	37
111	22
112	45
113	41
114	58
115	6
116	58
117	41
118	26
119	37
120	36
121	37
122	28
123	58
124	"
125	"
126	"
127	6
128	37
129	"
130	36
131	"
132	37
133	"
134	45
135	37

Region NO.	ELM NO.
136	ELM 39
137	37
138	42
139	37
140	30
141	37
142	36
143	51
144	50
145	48
146	9
147	44
148	9
149	44
150	9
151	43
152	"
153	"
154	36
155	37
156	"
157	"
158	29
159	52
160	"
161	"
162	"
163	36
164	52
165	36
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 36
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	"
179	"
180	47
181	36
182	47
183	36
184	"
185	"
186	"
187	"
188	53
189	"
190	36
191	47
192	"
193	
194	
195	
196	36
197	"
198	
199	52
200	"

CORE MAT Table 3

Region NO.	ELM NO.
1	ELM 36
2	"
3	37
4	36
5	"
6	13
7	16
8	38
9	"
10	46
11	"
12	"
13	"
14	"
15	"
16	37
17	19
18	37
19	7
20	36
21	20
22	37
23	"
24	"
25	36
26	51
27	50
28	49
29	9
30	34
31	33
32	44
33	32
34	43

Region NO.	ELM NO.
35	ELM 10
36	43
37	36
38	"
39	37
40	46
41	45
42	6
43	3
44	"
45	"
46	"
47	37
48	"
49	36
50	"
51	"
52	37
54	45
54	23
55	3
56	6
57	3
58	21
59	25
60	37
61	36
62	"
63	"
64	37
65	31
66	3
67	24
68	"

Region NO.	ELM NO.
69	ELM 14
70	15
71	3
72	40
73	24
74	12
75	24
76	3
77	37
78	"
79	8
80	36
81	"
82	37
83	31
84	6
85	3
86	6
87	3
88	6
89	17
90	37
91	36
92	37
93	"
94	"
95	45
96	3
97	38
98	24
99	"
100	27
101	3
102	24

CORE MAT Table 3 (continued)

Region NO.	ELM NO.
103	ELM
104	18
105	40
106	3
107	37
108	"
109	36
110	37
111	22
112	45
113	41
114	3
115	6
116	3
117	41
118	26
119	37
120	36
121	37
122	28
123	3
124	"
125	"
126	"
127	6
128	37
129	"
130	36
131	"
132	37
133	"
134	45
135	37

Region NO.	ELM NO.
136	ELM 39
137	37
138	42
139	37
140	30
141	37
142	36
143	51
144	50
145	48
146	9
147	44
148	9
149	44
150	9
151	43
152	"
153	"
154	36
155	37
156	"
157	"
158	29
159	52
160	"
161	"
162	"
163	36
164	52
165	36
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 36
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	"
179	"
180	47
181	36
182	47
183	36
184	"
185	"
186	"
187	"
188	53
189	"
190	36
191	47
192	"
193	
194	
195	
196	36
197	"
198	
199	52
200	"

CORE MAT Table 4

Region NO.	ELM NO.
1	ELM 36
2	"
3	37
4	36
5	"
6	13
7	16
8	38
9	"
10	36
11	"
12	"
13	"
14	"
15	"
16	37
17	19
18	37
19	7
20	36
21	20
22	37
23	"
24	"
25	36
26	51
27	50
28	49
29	9
30	34
31	33
32	44
33	32
34	43

Region NO.	ELM NO.
35	ELM 10
36	43
37	46
38	"
39	37
40	46
41	45
42	6
43	1
44	2
45	1
46	"
47	37
48	"
49	36
50	"
51	"
52	37
53	45
54	23
55	2
56	6
57	2
58	21
59	25
60	37
61	36
62	"
63	"
64	37
65	31
66	2
67	24
68	"

Region NO.	ELM NO.
69	ELM 14
70	15
71	1
72	40
73	24
74	12
75	24
76	2
77	37
78	"
79	8
80	36
81	"
82	37
83	31
84	6
85	2
86	6
87	2
88	6
89	17
90	37
91	36
92	37
93	"
94	"
95	45
96	2
97	38
98	24
99	11
100	27
101	1
102	24

CORE MAT Table 4 (continued)

Region NO.	ELM NO.
103	ELM 35
104	18
105	40
106	2
107	37
108	"
109	36
110	37
111	22
112	45
113	41
114	2
115	6
116	2
117	41
118	26
119	37
120	36
121	37
122	28
123	1
124	"
125	2
126	1
127	6
128	37
129	"
130	36
131	"
132	37
133	"
134	45
135	37

Region NO.	ELM NO.
136	ELM 39
137	37
138	42
139	37
140	30
141	37
142	36
143	51
144	50
145	48
146	9
147	44
148	9
149	44
150	9
151	43
152	"
153	"
154	36
155	37
156	"
157	"
158	29
159	52
160	"
161	"
162	"
163	36
164	52
165	36
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 36
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	"
179	"
180	47
181	36
182	47
183	36
184	"
185	"
186	"
187	"
188	53
189	"
190	36
191	47
192	"
193	
194	
195	
196	36
197	"
198	
199	52
200	"

CORE MAT Table 5

Region NO.	ELM NO.
1	ELM 36
2	"
3	37
4	36
5	"
6	13
7	16
8	38
9	"
10	36
11	"
12	"
13	"
14	"
15	"
16	37
17	19
18	37
19	7
20	36
21	20
22	37
23	"
24	"
25	36
26	51
27	50
28	49
29	9
30	34
31	33
32	44
33	32
34	43

Region NO.	ELM NO.
35	ELM 10
36	43
37	36
38	"
39	37
40	46
41	45
42	64
43	1
44	2
45	1
46	"
47	37
48	"
49	37
50	"
51	"
52	37
53	45
54	23
55	2
56	64
57	2
58	21
59	25
60	37
61	36
62	"
63	"
64	37
65	31
66	2
67	24
68	"

Region NO.	ELM NO.
69	ELM 14
70	15
71	1
72	40
73	24
74	12
75	24
76	2
77	37
78	"
79	8
80	36
81	"
82	37
83	31
84	64
85	2
86	64
87	2
88	64
89	17
90	37
91	36
92	37
93	"
94	"
95	45
96	2
97	38
98	24
99	11
100	27
101	1
102	24

CORE MAT Table 5 (continued)

Region NO.	ELM NO.
103	ELM 35
104	18
105	40
106	2
107	37
108	"
109	36
110	37
111	22
112	45
113	41
114	2
115	64
116	2
117	41
118	26
119	37
120	36
121	37
122	28
123	1
124	"
125	2
126	1
127	64
128	37
129	"
130	36
131	"
132	37
133	"
134	45
135	37

Region NO.	ELM NO.
136	ELM 39
137	37
138	42
139	37
140	30
141	37
142	36
143	51
144	50
145	48
146	9
147	44
148	9
149	44
150	9
151	43
152	"
153	"
154	36
155	37
156	"
157	"
158	29
159	52
160	"
161	"
162	"
163	36
164	52
165	36
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 36
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	36
179	"
180	47
181	36
182	47
183	36
184	"
185	"
186	"
187	"
188	53
189	"
190	36
191	47
192	"
193	
194	
195	
196	36
197	"
198	
199	52
200	"

CORE MAT Table 6

Region NO.	ELM NO.
1	ELM 36
2	"
3	37
4	36
5	"
6	13
7	16
8	38
9	"
10	36
11	"
12	"
13	"
14	"
15	"
16	37
17	19
18	37
19	7
20	36
21	20
22	37
23	"
24	"
25	46
26	51
27	50
28	49
29	9
30	34
31	33
32	44
33	32
34	43

Region NO.	ELM NO.
35	ELM 10
36	43
37	36
38	"
39	37
40	46
41	45
42	4
43	1
44	2
45	1
46	"
47	37
48	:
49	36
50	"
51	"
52	37
53	45
54	23
55	2
56	4
57	2
58	21
59	25
60	37
61	36
62	"
63	"
64	37
65	31
66	2
67	24
68	"

Region NO.	ELM NO.
69	ELM 14
70	15
71	1
72	40
73	24
74	12
75	24
76	2
77	37
78	"
79	8
80	36
81	"
82	37
83	31
84	4
85	2
86	4
87	2
88	4
89	17
90	37
91	36
92	37
93	"
94	"
95	45
96	2
97	38
98	24
99	11
100	27
101	1
102	24

CORE MAT Table 6 (continued)

Region NO.	ELM NO.
103	ELM 35
104	18
105	40
106	2
107	37
108	"
109	36
110	37
111	22
112	45
113	41
114	2
115	4
116	2
117	41
118	26
119	37
120	36
121	37
122	28
123	1
124	"
125	2
126	1
127	4
128	37
129	"
130	36
131	"
132	37
133	"
134	45
135	37

Region NO.	ELM NO.
136	ELM 39
137	37
138	42
139	37
140	30
141	37
142	36
143	51
144	50
145	48
146	9
147	44
148	9
149	44
150	9
151	43
152	"
153	"
154	36
155	37
156	"
157	"
158	29
159	52
160	"
161	"
162	"
163	36
164	52
165	36
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 36
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	36
179	"
180	47
181	36
182	47
183	36
184	"
185	"
186	"
187	"
188	53
189	"
190	36
191	47
192	"
193	
194	
195	
196	36
197	"
198	
199	52
200	"

CORE MAT Table 7

Region NO.	ELM NO.
1	ELM 36
2	"
3	37
4	36
5	"
6	13
7	16
8	38
9	"
10	36
11	"
12	"
13	"
14	"
15	"
16	37
17	19
18	37
19	7
20	36
21	20
22	37
23	"
24	"
25	36
26	51
27	50
28	49
29	9
30	34
31	33
32	44
33	32
34	43

Region NO.	ELM NO.
35	ELM 10
36	43
37	36
38	"
39	37
40	46
41	45
42	4
43	3
44	"
45	"
36	"
47	37
48	"
49	36
50	"
51	"
52	37
53	45
54	23
55	3
56	4
57	3
58	21
59	25
60	37
61	36
62	"
63	"
64	37
65	31
66	3
67	24
68	"

Region NO.	ELM NO.
69	ELM 14
70	15
71	3
72	40
73	24
74	12
75	24
76	3
77	37
78	"
79	8
80	36
81	"
82	37
83	31
84	4
85	3
86	4
87	3
88	4
89	17
90	37
91	36
92	37
93	"
94	"
95	45
96	3
97	38
98	24
99	11
100	27
101	3
102	24

CORE MAT Table 7 (continued)

Region NO.	ELM NO.
103	ELM 35
104	18
105	40
106	3
107	37
108	"
109	36
110	37
111	22
112	45
113	41
114	3
115	4
116	3
117	41
118	26
119	37
120	36
121	37
122	28
123	3
124	"
125	"
126	"
127	4
128	37
129	"
130	36
131	"
132	37
133	"
134	45
135	37

Region NO.	ELM NO.
136	ELM 39
137	37
138	42
139	37
140	30
141	37
142	36
143	51
144	50
145	48
146	9
147	44
148	9
149	44
150	9
151	43
152	"
153	"
154	36
155	37
156	"
157	"
158	29
159	52
160	"
161	"
162	"
163	36
164	52
165	36
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 36
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	36
179	"
180	47
181	36
182	47
183	36
184	"
185	"
186	"
187	"
188	53
189	"
190	36
191	47
192	"
193	
194	
195	
196	36
197	"
198	
199	52
200	"

CORE MAT Table 8

Region NO.	ELM NO.
1	ELM 36
2	"
3	37
4	36
5	"
6	13
7	16
8	38
9	"
10	36
11	"
12	"
13	"
14	"
15	"
16	37
17	19
18	37
19	7
20	36
21	20
22	37
23	"
24	"
25	36
26	51
27	50
28	49
29	9
30	34
31	33
32	44
33	32
34	43

Region NO.	ELM NO.
35	ELM 10
36	43
37	36
38	"
39	37
40	46
41	45
42	4
43	58
44	"
45	"
46	"
47	37
48	"
49	36
50	"
51	"
52	37
53	45
54	23
55	58
56	4
57	58
58	21
59	25
60	37
61	36
62	"
63	"
64	37
65	31
66	58
67	24
68	"

Region NO.	ELM NO.
69	ELM 14
70	15
71	58
72	40
73	24
74	12
75	24
76	58
77	37
78	"
79	8
80	36
81	"
82	37
83	31
84	4
85	58
86	4
87	58
88	4
89	17
90	37
91	36
92	37
93	"
94	"
95	45
96	58
97	38
98	24
99	11
100	27
101	58
102	24

CORE MAT Table 8 (continued)

Region NO.	ELM NO.
103	ELM 35
104	18
105	40
106	58
107	37
108	"
109	36
110	37
111	22
112	45
113	41
114	58
115	4
116	58
117	41
118	26
119	37
120	36
121	37
122	28
123	58
124	"
125	"
126	"
127	4
128	37
129	"
130	36
131	"
132	37
133	"
134	45
135	37

Region NO.	ELM NO.
136	ELM 39
137	37
138	42
139	37
140	30
141	37
142	36
143	51
144	50
145	48
146	9
147	44
148	9
149	44
150	9
151	43
152	"
153	"
154	36
155	37
156	"
157	"
158	29
159	52
160	"
161	"
162	"
163	36
164	52
165	36
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 36
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	36
179	"
180	47
181	36
182	47
183	36
184	"
185	"
186	"
187	"
188	53
189	"
190	36
191	47
192	"
193	
194	
195	
196	36
197	"
198	
199	52
200	"

CORE MAT Table 9

Region NO.	ELM NO.
1	ELM 59
2	"
3	"
4	"
5	"
6	61
7	"
8	"
9	"
10	59
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	60
27	59
28	"
29	"
30	"
31	"
32	"
33	"
34	"

Region NO.	ELM NO.
35	ELM 59
36	"
37	"
38	"
39	"
40	65
41	59
42	"
43	"
44	"
45	"
46	"
47	"
48	"
49	"
50	"
51	"
52	"
53	"
54	"
55	"
56	"
57	"
58	"
59	"
60	"
61	"
62	"
63	"
64	"
65	"
66	"
67	61
68	"

Region NO.	ELM NO.
69	ELM 61
70	"
71	59
72	61
73	"
74	"
75	"
76	59
77	"
78	"
79	"
80	"
81	"
82	"
83	"
84	"
85	"
86	"
87	"
88	"
89	"
90	"
91	"
92	"
93	"
94	"
95	"
96	"
97	61
98	"
99	"
100	"
101	59
102	61

CORE MAT Table 9

Region NO.	ELM NO.
103	ELM 61
104	"
105	"
106	59
107	"
108	"
109	"
110	"
111	62
112	59
113	"
114	"
115	"
116	"
117	"
118	"
119	"
120	"
121	"
122	"
123	"
124	"
125	"
126	"
127	"
128	"
129	"
130	"
131	"
132	"
133	"
134	"
135	"

Region NO.	ELM NO.
136	ELM 59
137	"
138	"
139	"
140	"
141	"
142	"
143	60
144	59
145	"
146	"
147	"
148	"
149	"
150	"
151	"
152	"
153	"
154	"
155	"
156	"
157	"
158	"
159	61
160	"
161	"
162	"
163	59
164	61
165	59
166	"
167	"
168	"

Region NO.	ELM NO.
169	ELM 59
170	"
171	"
172	"
173	"
174	"
175	"
176	"
177	"
178	"
179	"
180	"
181	"
182	"
183	"
184	"
185	"
186	"
187	"
188	60
189	"
190	59
191	"
192	"
193	
194	
195	
196	59
197	"
198	
199	61
200	"

CORE MAT Table 10

Region NO.	ELM NO.
1	ELM 54
2	"
3	"
4	"
5	"
6	56
7	"
8	"
9	"
10	54
11	"
12	"
13	"
14	"
15	"
16	"
17	"
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	55
27	54
28	"
29	"
30	"
31	"
32	"
33	"
34	"

Region NO.	ELM NO.
35	ELM 54
36	"
37	"
38	"
39	"
40	64
41	54
42	"
43	"
44	"
45	"
46	"
47	"
48	"
49	"
50	"
51	"
52	"
53	"
54	"
55	"
56	"
57	"
58	"
59	"
60	"
61	"
62	"
63	"
64	"
65	"
66	"
67	56
68	"

Region NO.	ELM NO.
69	ELM 56
70	"
71	54
72	56
73	"
74	"
75	"
76	54
77	"
78	"
79	"
80	"
81	"
82	"
83	"
84	"
85	"
86	"
87	"
88	"
89	"
90	"
91	"
92	"
93	"
94	"
95	"
96	"
97	56
98	"
99	"
100	"
101	54
102	56

CORE MAT Table 10 (continued)

Region NO.	ELM NO.
103	ELM 56
104	"
105	"
106	53
107	"
108	"
109	"
110	"
111	57
112	54
113	"
114	"
115	"
116	"
117	"
118	"
119	"
120	"
121	"
122	"
123	"
124	"
125	"
126	"
127	"
128	"
129	"
130	"
131	"
132	"
133	"
134	"
135	"

Region NO.	ELM NO.
136	ELM 54
137	"
138	"
139	"
140	"
141	"
142	"
143	55
144	54
145	"
146	"
147	"
148	"
149	"
150	"
151	"
152	"
153	"
154	"
155	"
156	"
157	"
158	"
159	56
160	"
161	"
162	"
163	54
164	56
165	54
166	"
167	"
168	"

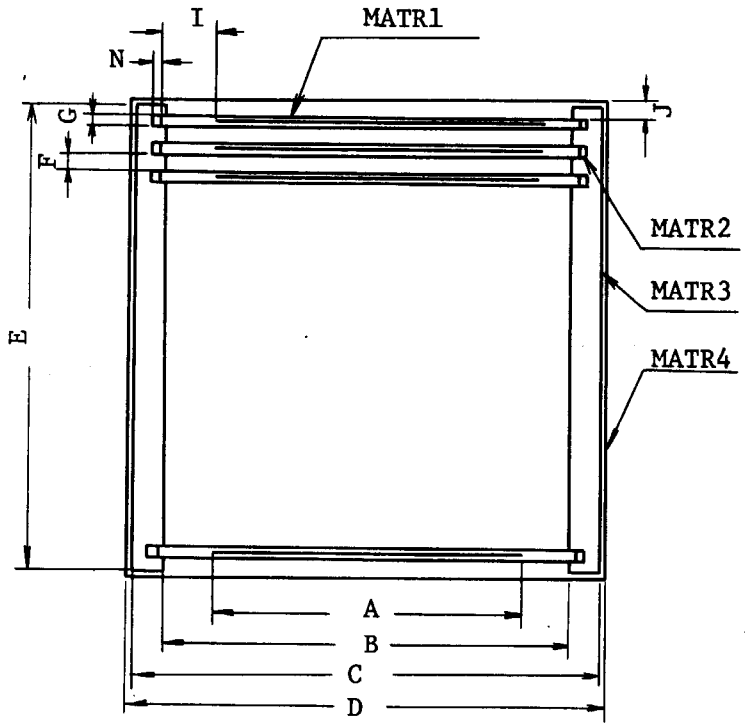
Region NO.	ELM NO.
169	ELM 54
170	"
171	"
172	"
173	"
174	"
175	
176	
177	
178	54
179	"
180	"
181	"
182	"
183	"
184	"
185	"
186	"
187	"
188	55
189	"
190	54
191	"
192	"
193	
194	
195	
196	54
197	"
198	
199	56
200	"

II. Element

Elements Identification Table

ELM NO.	ELM Fig. NO.	ELM GEOM Table NO.	ELM MAT Table NO.	Comments
1	1	1	1	Standard Fuel A
2	1	1	2	Standard Fuel B
3	1	1	3	Al
4	2	2	4	Fuel Follower
5	2	2	5	Al
6	3	4	6	Control Element Hf
7	4	4	7	Irradiation Element
8	5	5	8	↓
9	6	6	9	
10	6	7	10	
11	7	8	11	
12	7	9	12	
13	7	10	13	
14	7	11	11	
15	7	12	14	
16	7	13	15	
17	7	14	16	
18	7	15	17	
19	7	16	18	
20	7	17	19	
21	7	17	20	
22	7	18	21	
23	8	19	22	
24	8	20	23	
25	8	21	24	
26	9	22	25	
27	9	23	26	
28	10	24	27	
29	11	25	28	
30	11	26	29	

ELM NO.	ELM Fig. NO.	ELM GEOM Table NO.	ELM MAT Table NO.	Comments
31	12	27	30	Irradiation Element
32	12	28	31	↓
33	12	29	32	
34	12	30	33	
35	13	31	34	
36	13	32	35	
37	13	32	36	
38	13	33	35	
39	14	34	37	
40	14	35	38	
41	14	36	39	
42	14	37	40	
43	15	38	41	
44	15	39	42	
45	15	40	43	
46	16	41	44	
47	16	42	45	
48	16	42	46	
49	16	42	47	
50	16	42	48	
51	16	43	48	
52	16	44	49	
53	16	43	49	
54	16	42	50	
55	16	43	50	
56	16	44	50	
57	16	45	50	
58	16	42	51	
59	16	42	52	
60	16	43	52	
61	16	44	52	
62	16	45	52	
63	16	42	53	
64	16	46	50	
65	16	46	52	



ELM-GEOM Table 1

	DIM cm
A	5.95
B	6.66
C	7.62
D	7.72
E	7.62
F	0.2794
G	0.127(×19)
H	0.139
I	0.355
J	0.2794

ELM-Fig. 1 (ELM 1 ∿ 3)

ELM-MAT Table 1

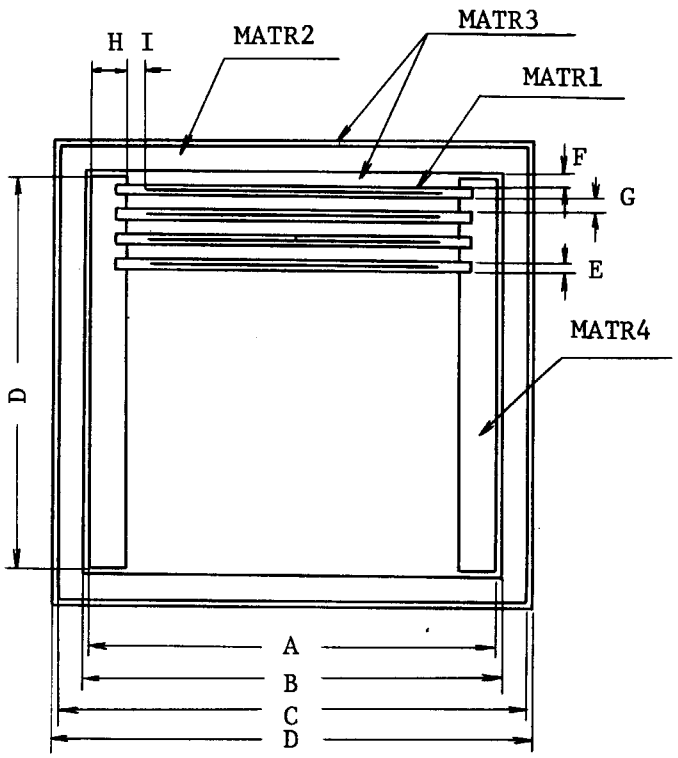
Region NO.	Material NO.	Comments
MATR1	SUB-ELM 2	U-Al
MATR2	301	H_2O
MATR3	510	Al
MATR4	301	H_2O

ELM-MAT Table 2

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 2	U-Al
MATR2	301	H_2O
MATR3	510	Al
MATR4	301	H_2O

ELM-MAT Table 3

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 3	Al
MATR2	301	H_2O
MATR3	510	Al
MATR4	301	H_2O



ELM-GEOM Table 2

	DIM cm
A	6.364
B	6.60
C	7.45
D	6.364
E	0.127(×16)
F	0.212
G	0.1295
H	0.425
I	0.322
J	7.72

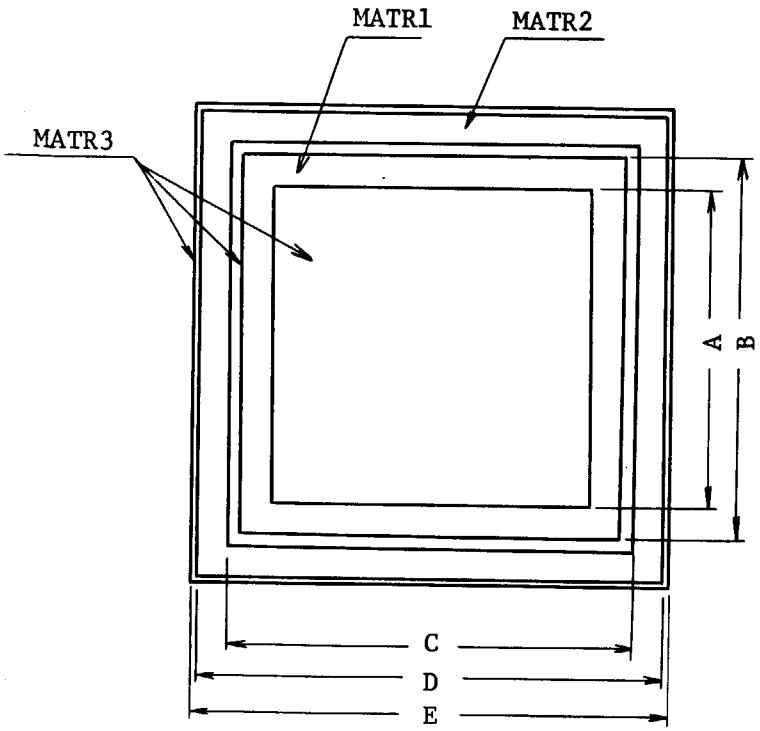
ELM-Fig. 2 (ELM 4, 5)

ELM-MAT Table 4

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 4	U-Al
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al

ELM-MAT Table 5

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 5	Al
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al



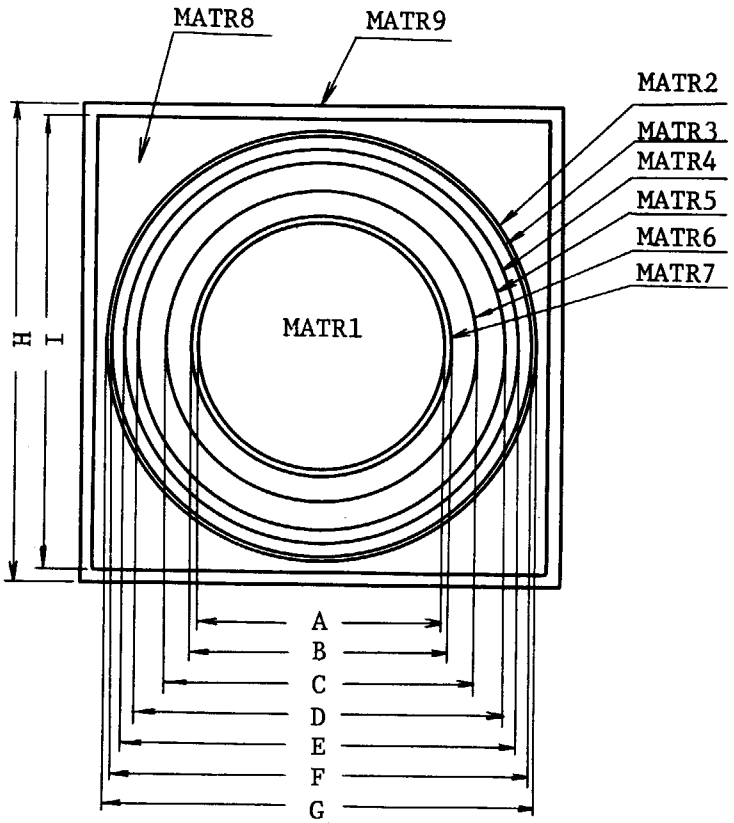
ELM-Fig. 3 (ELM 6)

ELM-GEOM Table 3

	DIM cm
A	5.3
B	6.3
C	6.6
D	7.45
E	7.72

ELM-MAT Table 6

Region NO.	Material NO.	Comments
MATR1	601	Hf
MATR2	602	Al
MATR3	301	H_2O



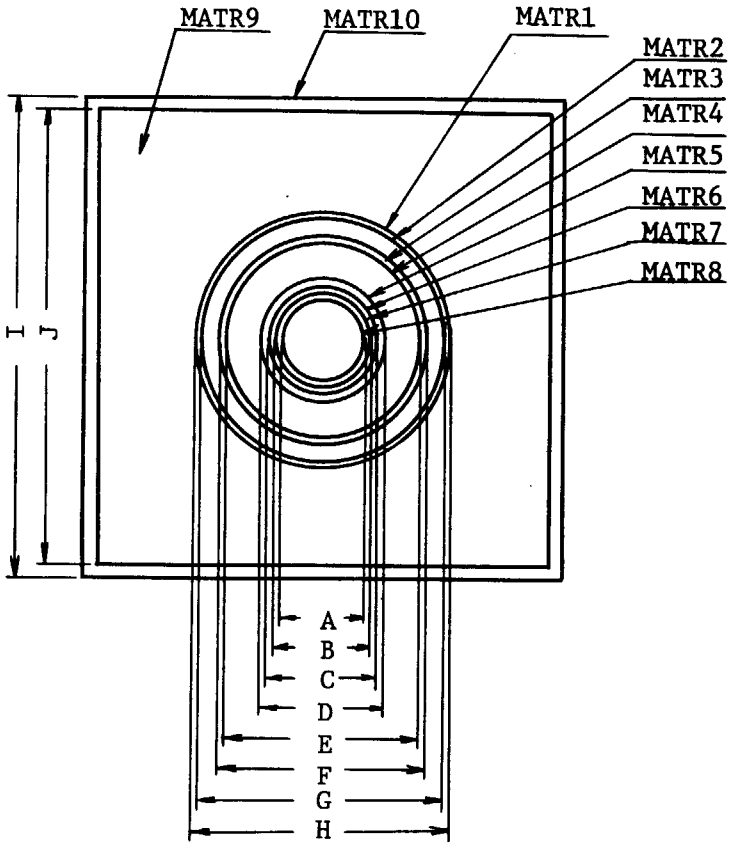
ELM Fig. 4 (ELM 7)

ELM-GEOM Table 4

	DIM cm
A	3.97
B	4.27
C	5.02
D	6.02
E	6.42
F	6.90
G	7.0
H	7.72
I	7.62

ELM-MAT Table 7

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 6	UO_2
MATR2	301	H_2O
MATR3	506	304SS
MATR4	528	Gap
MATR5	519	347SS
MATR6	301	H_2O
MATR7	506	304SS
MATR8	401	Al
MATR9	301	H_2O



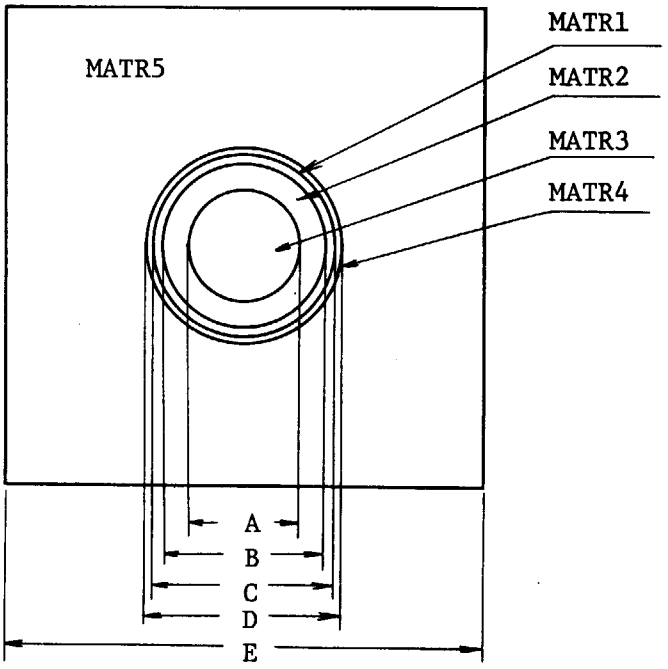
ELM Fig. 5 (ELM 8)

ELM-GEOM Table 5

	DIM cm
A	1.48
B	1.509
C	1.681
D	1.941
E	3.192
F	3.452
G	4.0
H	4.20
I	7.72
J	7.55

ELM-MAT Table 8

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	517	NaK
MATR4	510	Al
MATR5	517	NaK
MATR6	518	Zry-2
MATR7	528	Gap
MATR8	106	UO_2
MATR9	401	Al
MATR10	301	H_2O



ELM Fig. 6 (ELM 9, 10)

ELM-GEOM Table 6

	DIM cm
A	1.8
B	2.6
C	2.9
D	3.2
E	7.72

ELM-GEOM Table 7

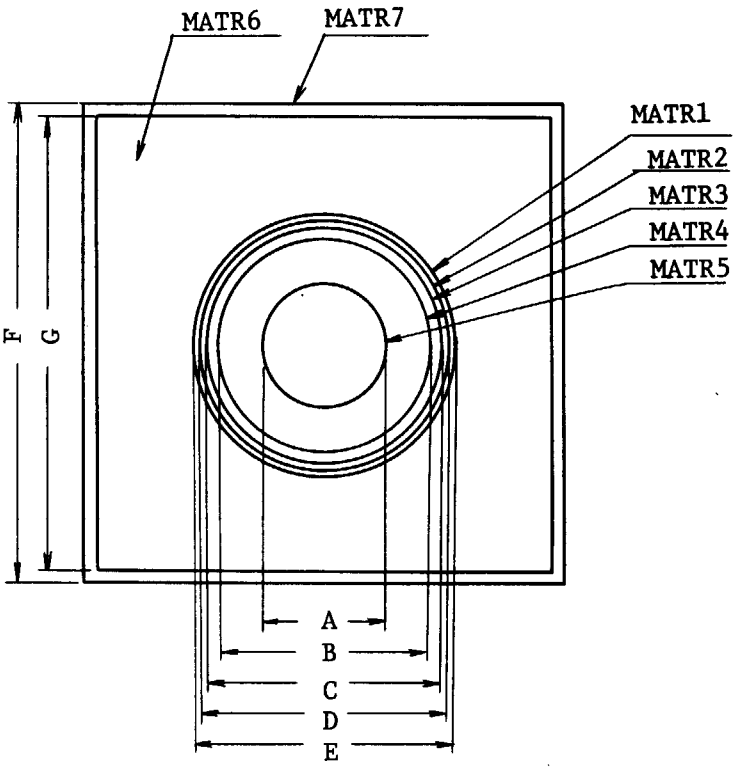
	DIM cm
A	2.56
B	2.62
C	2.92
D	3.2
E	7.72

ELM-MAT Table 9

Region NO.	Material NO.	Comments
MATR1	506	304SS
MATR2	510	Al
MATR3	511	Al+N
MATR4	301	H_2O
MATR5	403	Be+H_2O

ELM-MAT Table 10

Region NO.	Material NO.	Comments
MATR1	510	Al
MATR2	301	H_2O
MATR3	501	Ni
MATR4	301	H_2O
MATR5	403	Be-H_2O



ELM Fig. 7 (ELM 11 ∿ 22)

ELM-GEOM Table 8

	DIM cm
A	1.6
B	2.5
C	2.7
D	3.0
E	3.2
F	3.86
G	3.725

ELM-GEOM Table 9

	DIM cm
A	0.76
B	2.5
C	2.7
D	3.0
E	3.2
F	3.86
G	3.725

ELM-GEOM Table 10

	DIM cm
A	1.8
B	2.5
C	2.9
D	3.14
E	3.2
F	3.86
G	3.725

ELM-GEOM Table 11

	DIM cm
A	1.35
B	2.5
C	2.7
D	3.0
E	3.2
F	3.86
G	3.725

ELM-GEOM Table 12

	DIM cm
A	1.45
B	2.5
C	2.7
D	3.0
E	3.2
F	3.86
G	3.725

ELM-GEOM Table 13

	DIM cm
A	0.68
B	2.5
C	2.7
D	3.0
E	3.2
F	3.86
G	3.725

ELM-GEOM Table 14

	DUN cm
A	2.08
B	3.4
C	3.98
D	4.1
E	4.2
F	7.72
G	7.45

ELM-GEOM Table 15

	DIM cm
A	0.63
B	2.55
C	2.65
D	3.04
E	3.2
F	3.86
G	3.725

ELM-GEOM Table 16

	DIM cm
A	3.67
B	4.27
C	5.7
D	6.3
E	6.6
F	7.72
G	7.55

ELM-GEOM Table 17

	DIM cm
A	0.86
B	2.12
C	3.7
D	4.0
E	4.2
F	7.72
G	7.45

ELM-GEOM Table 18

	DIM cm
A	11.78
B	12.74
C	13.64
D	14.5
E	14.7
F	15.44
G	15.3

ELM-MAT Table 11

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	510	Al
MATR5	505	Fe
MATR6	401	Al
MATR7	301	H_2O

ELM-MAT Table 12

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al
MATR5	512	Al+Nb
MATR6	401	Al
MATR7	301	H_2O

ELM-MAT Table 13

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al
MATR5	513	Al+Cu
MATR6	401	Al
MATR7	301	H_2O

ELM-MAT Table 14

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al
MATR5	514	Al+Fe+Nb
MATR6	401	Al
MATR7	301	H_2O

ELM-MAT Table 15

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al
MATR5	515	Fe+Al
MATR6	401	Al
MATR7	301	H_2O

ELM-MAT Table 16

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al
MATR5	524	TeO
MATR6	402	Be
MATR7	301	H_2O

ELM-MAT Table 17

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	510	Al
MATR5	520	316SS
MATR6	401	Al
MATR7	301	H_2O

ELM-MAT Table 18

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	506	304SS
MATR5	301	H_2O
MATR6	401	Al
MATR7	301	H_2O

ELM-MAT Table 19

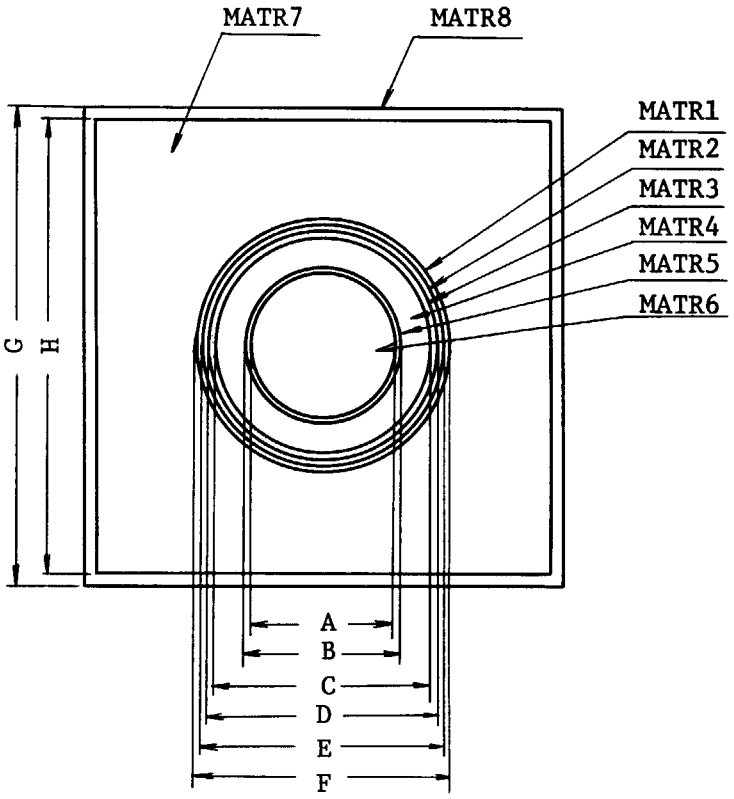
Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	510	Al
MATR4	530	Graphite
MATR5	529	C+Co
MATR6	402	Be
MATR7	301	H_2O

ELM-MAT Table 20

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	510	Al
MATR4	530	Graphite
MATR5	529	C+Co
MATR6	401	Al
MATR7	301	H_2O

ELM-MAT Table 21

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	533	SUS32
MATR3	528	He
MATR4	533	SUS32
MATR5	301	H_2O
MATR6	510	Al
MATR7	301	H_2O



ELM Fig. 8 (ELM 23 ∿ 25)

ELM-GEOM Table 19

	DIM cm
A	2.55
B	2.62
C	3.65
D	3.7
E	4.0
F	4.2
G	7.72
H	7.45

ELM-GEOM Table 20

	DIM cm
A	1.30
B	1.82
C	2.56
D	2.65
E	3.0
F	3.2
G	3.86
H	3.725

ELM-GEOM Table 21

	DIM cm
A	1.86
B	3.2
C	3.54
D	3.6
E	4.0
F	4.2
G	7.72
H	7.45

ELM-MAT Table 22

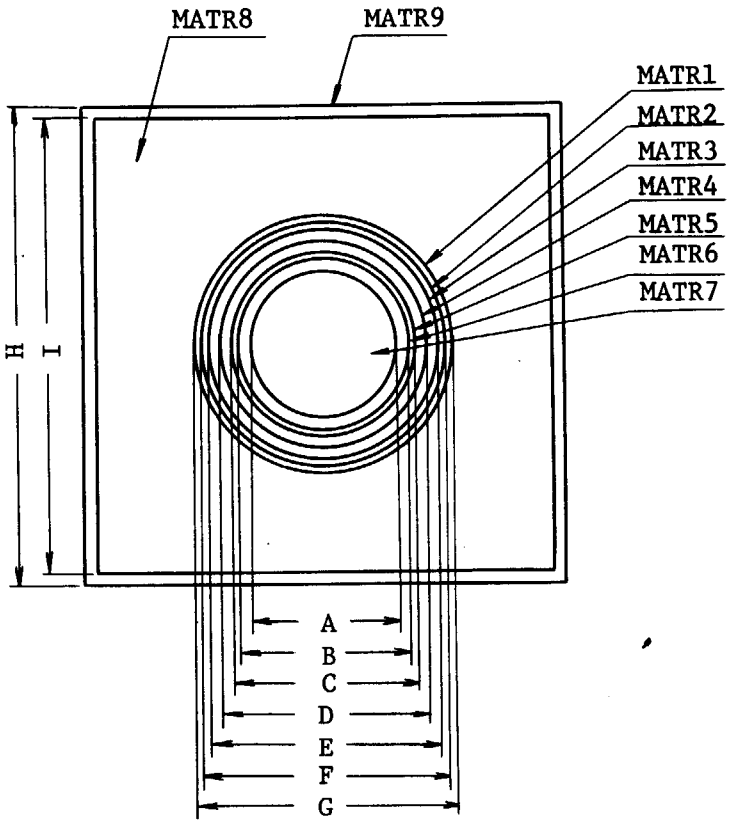
Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	528	He
MATR4	506	304SS
MATR5	528	He
MATR6	525	Graphite
MATR7	401	Al
MATR8	301	H_2O

ELM-MAT Table 23

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	506	Al+304SS
MATR5	301	H_2O
MATR6	521	316SS+H_2O
MATR7	401	Al
MATR8	301	H_2O

ELM-MAT Table 24

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	528	He
MATR4	506	304SS
MATR5	505	Fe
MATR6	507	304SS+Fe
MATR7	401	Al
MATR8	301	H_2O



ELM Fig. 9 (ELM 26, 27)

ELM-GEOM Table 22

	DIM cm
A	2.5
B	2.8
C	2.9
D	3.5
E	3.86
F	4.1
G	4.2
H	7.72
I	7.42

ELM-GEOM Table 23

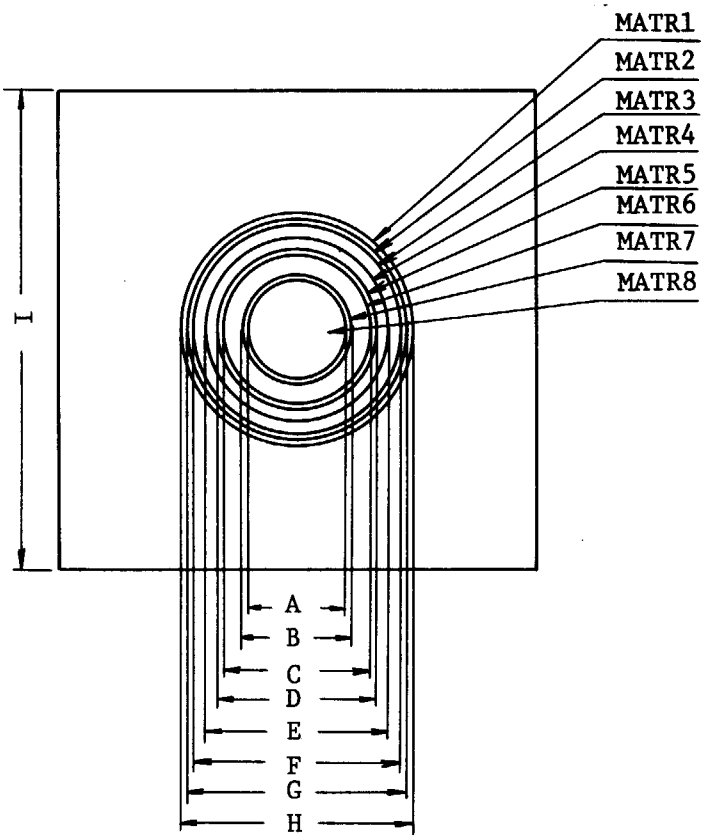
	DIM cm
A	1.128
B	1.492
C	1.538
D	2.46
E	2.66
F	3.0
G	3.2
H	3.86
I	3.725

ELM-MAT Table 25

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al
MATR5	528	He
MATR6	510	Al
MATR7	503	Ir
MATR8	402	Be
MATR9	301	H_2O

ELM-MAT Table 26

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	534	Fe+Al
MATR5	506	304SS
MATR6	301	H_2O
MATR7	506	304SS
MATR8	401	Al
MATR9	301	H_2O



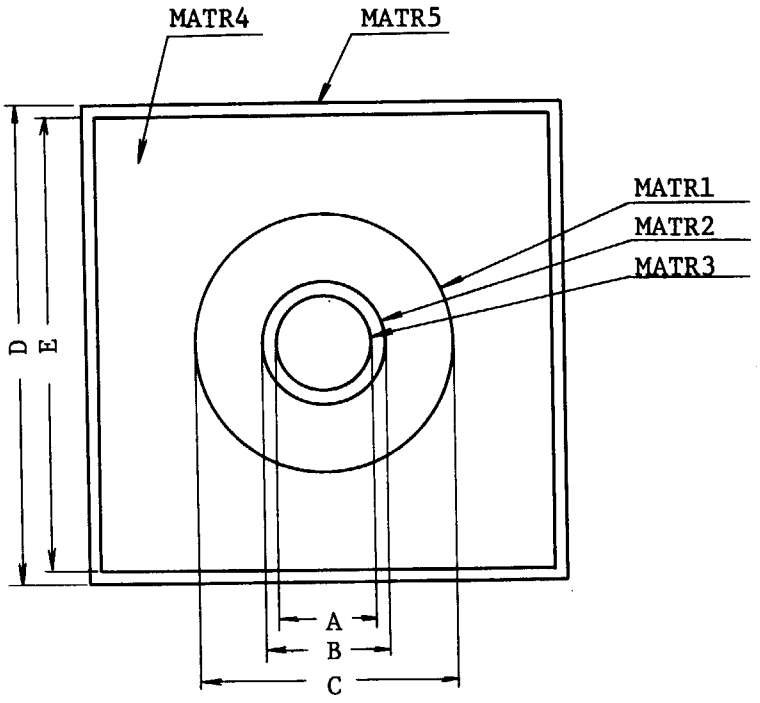
ELM Fig. 10 (ELM 28)

ELM-GEOM Table 24

	DIM cm
A	1.6
B	1.65
C	2.46
D	2.50
E	2.90
F	3.37
G	3.52
H	3.8
I	7.72

ELM-MAT Table 27

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al
MATR5	528	He
MATR6	510	Al
MATR7	528	He
MATR8	502	Sb
MATR9	403	Be+H_2O



ELM Fig. 11 (ELM 29, 30)

ELM-GEOM Table 25

	DIM cm
A	1.7
B	2.0
C	4.2
D	7.72
E	7.45

ELM-GEOM Table 26

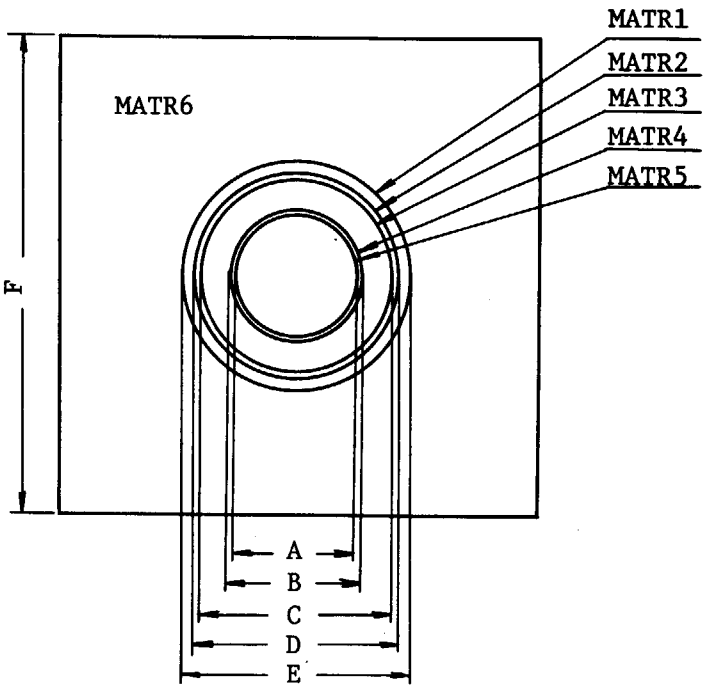
	DIM cm
A	2.0
B	4.0
C	4.2
D	7.72
E	7.45

ELM-MAT Table 28

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	401	Al
MATR5	301	H_2O

ELM-MAT Table 29

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	508	304SS+Gap 2
MATR3	509	304SS+Gap 1
MATR4	402	Be
MATR5	301	H_2O



ELM Fig. 12 (ELM 31 ∿ 34)

ELM-GEOM Table 28

	DIM cm
A	1.61
B	2.53
C	2.63
D	2.88
E	3.2
F	7.72

ELM-GEOM Table 29

	DIM cm
A	1.20
B	2.06
C	2.64
D	3.14
E	3.2
F	7.72

ELM-GEOM Table 27

	DIM cm
A	2.02
B	2.2
C	3.32
D	3.5
E	3.8
F	7.72

ELM-GEOM Table 30

	DIM cm
A	0.86
B	2.02
C	2.6
D	2.9
E	3.2
F	7.72

ELM-MAT Table 30

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	510	Al
MATR4	506	304SS
MATR5	504	Zr
MATR6	402	Be

ELM-MAT Table 31

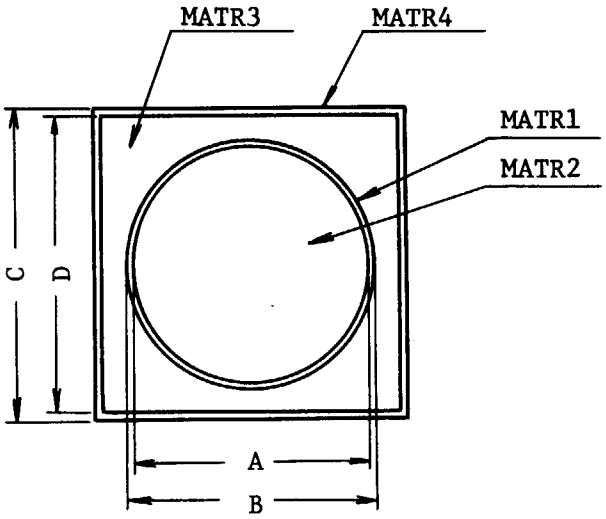
Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	528	He
MATR4	506	304SS
MATR5	528	He
MATR6	402	Be

ELM-MAT Table 32

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	506	304SS
MATR5	522	MgO
MATR6	402	Be

ELM-MAT Table 33

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	510	Al
MATR4	525	Graphite
MATR5	532	C+Co
MATR6	403	Be+H_2O



ELM Fig. 13 (ELM 35 ∿ 38)

ELM-GEOM Table 31

	DIM cm
A	2.91
B	3.2
C	3.86
D	3.725

ELM-GEOM Table 32

	DIM cm
A	4.0
B	4.2
C	7.72
D	7.55

ELM-GEOM Table 33

	DIM cm
A	3.0
B	3.2
C	3.86
D	3.725

ELM-MAT Table 34

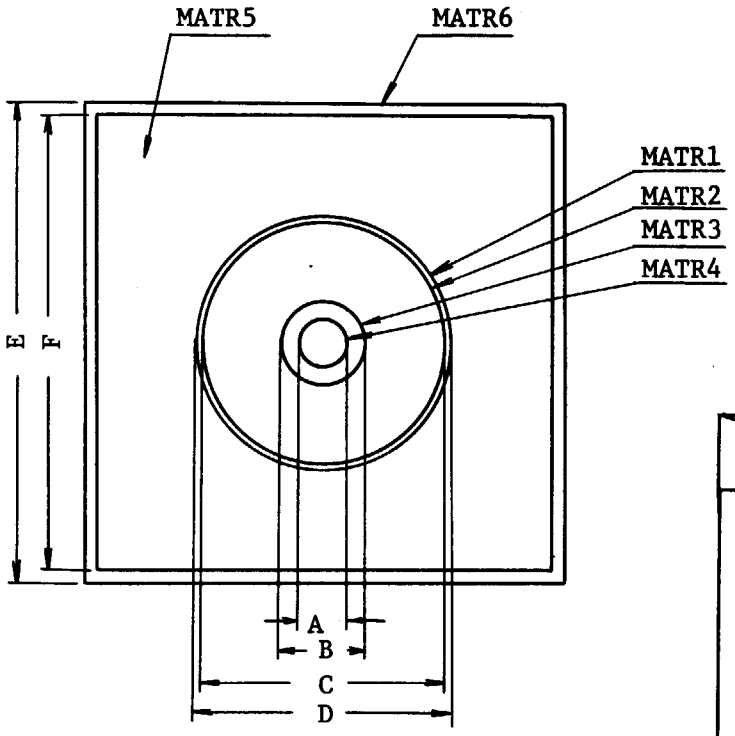
Region NO.	Material NO.	Comments
MATR1	527	H_2O+Al
MATR2	526	Zr+MIX
MATR3	401	Al
MATR4	301	H_2O

ELM-MAT Table 35

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	401	Al
MATR4	301	H_2O

ELM-MAT Table 36

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	402	Be
MATR3	402	Be
MATR4	301	H_2O



ELM Fig. 12 (ELM 39 ∿ 42)

ELM-GEOM Table 34

	DIM cm
A	0.7
B	1.4
C	4.0
D	4.2
E	7.72
F	7.45

ELM-GEOM Table 35

	DIM cm
A	2.55
B	2.9
C	3.12
D	3.2
E	3.86
F	3.725

ELM-GEOM Table 36

	DIM cm
A	2.46
B	3.7
C	4.0
D	4.2
E	7.72
F	7.45

ELM-GEOM Table 37

	DIM cm
A	3.4
B	3.86
C	4.1
D	4.2
E	7.72
F	7.45

ELM-MAT Table 37

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	523	Fe+Gap
MATR4	510	Al
MATR5	402	Be
MATR6	301	H_2O

ELM-MAT Table 38

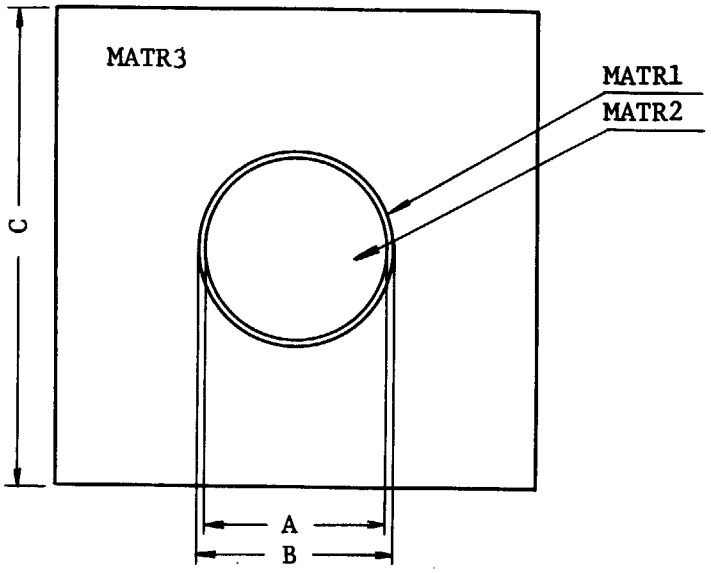
Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	536	304SS+MIX
MATR5	401	Al
MATR6	301	H_2O

ELM-MAT Table 39

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	506	304SS
MATR3	301	H_2O
MATR4	518	Zr
MATR5	401	Al
MATR6	301	H_2O

ELM-MAT Table 40

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	510	Al
MATR3	301	H_2O
MATR4	510	Al
MATR5	402	Be
MATR6	301	H_2O



ELM Fig. 15 (ELM 43 ∿)

ELM-GEOM Table 38

	DIM cm
A	3.0
B	4.2
C	7.72

ELM-GEOM Table 39

	DIM cm
A	2.9
B	3.2
C	7.72

ELM-GEOM Table 40

	DIM cm
A	3.6
B	3.8
C	7.72

ELM-MAT Table 41

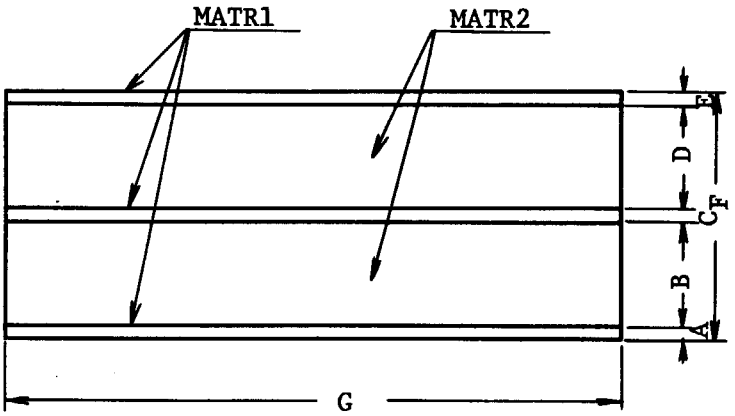
Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	402	Be
MATR3	403	Be+H_2O

ELM-MAT Table 42

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	401	Al
MATR3	403	Be+H_2O

ELM-MAT Table 43

Region NO.	Material NO.	Comments
MATR1	401	H_2O
MATR2	402	Be
MATR3	408	Be+H_2O



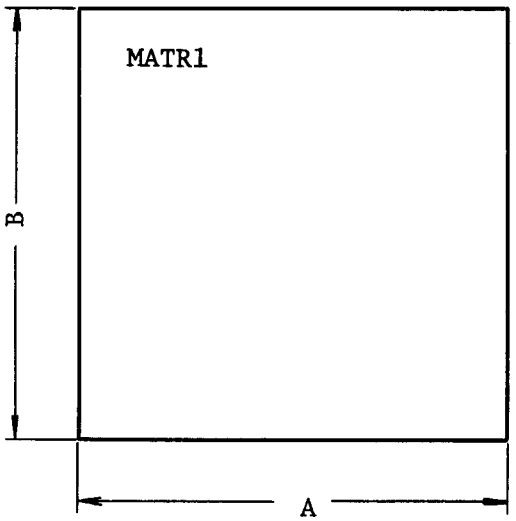
ELM Fig. 16 (ELM 46)

ELM-GEOM Table 41

	DIM cm
A	0.18
B	1.65
C	0.2
D	1.65
E	0.18
F	3.86
G	61.76

ELM-MAT Table 44

Region NO.	Material NO.	Comments
MATR1	504	Zr
MATR2	301	H_2O



ELM Fig. 16 (ELM 46 ∿ 65)

ELM-GEOM Table 42

	DIM cm
A	7.72
B	7.72

ELM-GEOM Table 43

	DIM cm
A	7.72
B	3.86

ELM-GEOM Table 44

	DIM cm
A	3.86
B	3.86

ELM-GEOM Table 45

	DIM cm
A	15.44
B	15.44

ELM-GEOM Table 46

	DIM cm
A	61.76
B	3.86

ELM-MAT Table 45

Region NO.	Material NO.	Comments
MATR1	405	Be+H_2O

ELM-MAT Table 46

Region NO.	Material NO.	Comments
MATR	406	Al+Be+H_2O

ELM-MAT Table 47

Region NO.	Material NO.	Comments
MATR1	407	Al+Be+H_2O

ELM-MAT Table 48

Region NO.	Material NO.	Comments
MATR1	404	Be+H_2O

ELM-MAT Table 49

Region NO.	Material NO.	Comments
MATR1	409	Al+H_2O

ELM-MAT Table 50

Region NO.	Material NO.	Comments
MATR1	301	H_2O

ELM-MAT Table 51

Region NO.	Material NO.	Comments
MATR1	535	Al+H_2O

ELM-MAT Table 52

Region NO.	Material NO.	Comments
MATR1	537	

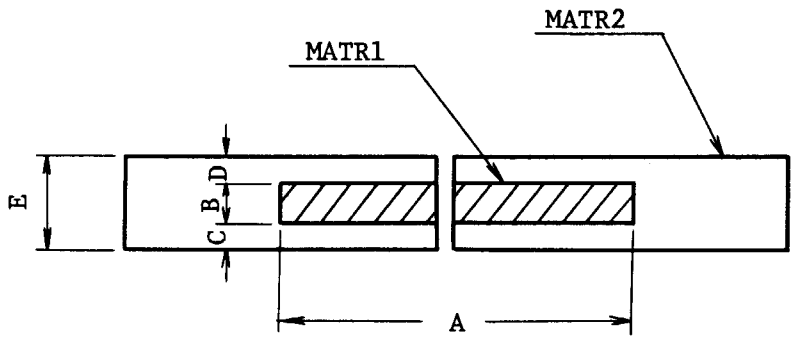
ELM-MAT Table 53

Region NO.	Material NO.	Comments
MATR1	538	

III. Sub-element

Sub-elements Identification Table

SUB-ELM NO.	SUB-ELM Fig. NO.	SUB-ELM GEOM Table NO.	SUB-ELM MAT Table NO.	Comments
1	1	1	1	Standard Fuel A
2	1	1	2	Standard Fuel B
3	1	1	4	Al
4	1	2	3	Fuel Follower
5	1	2	4	Al
6	2	3	5	69L-5P (UO_2)



SUB-ELM Fig. 1

SUB-ELM-GEOM Table 1

	DIM cm
A	5.95
B	0.05
C	0.0385
D	0.0385
E	0.127

SUB-ELM-GEOM Table 1

	DIM cm
A	4.76
B	0.05
C	0.0385
D	0.0385
E	0.127

SUB-ELM-MAT Table 1

Region NO.	Material NO.	Comments	
MATR1	101	U-Al	Standard Fuel A
MATR2	201	Al	

SUB-ELM-MAT Table 2

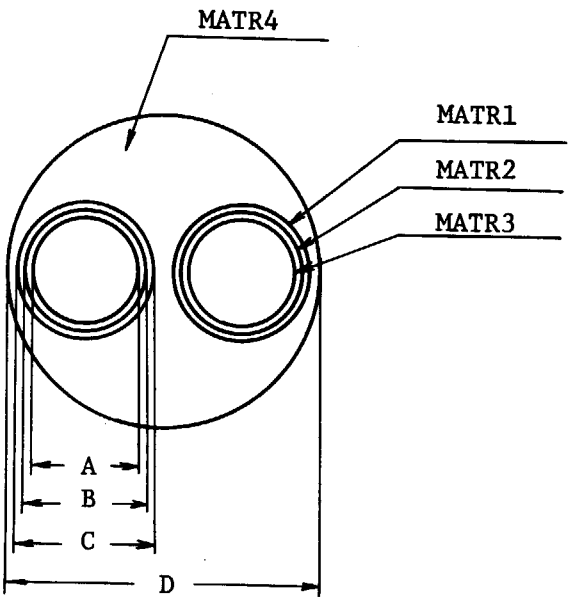
Region NO.	Material NO.	Comments	
MATR1	102	U-Al	Standard Fuel B
MATR2	201	Al	

SUB-ELM-MAT Table 3

Region NO.	Material NO.	Comments	
MATR1	103	U-Al	Fuel Follower
MATR2	201	Al	

SUB-ELM-MAT Table 4

Region NO.	Material NO.	Comments
MATR1	201	Al
MATR	@)L	Al



SUB-ELM Fig. 2

SUB-ELM-GEOM Table 3

	DIM cm
A	1.48
B	1.509
C	1.681
D	3.97

SUB-ELM-MAT Table 5

Region NO.	Material NO.	Comments	
MATR1	105	UO_2	69L-5P
MATR2	528	Gap	
MATR3	202	Zry-2	
MATR4	301	H_2O	

IV. Material

Material

ATOM MAT NO.	U-235	U-238	Al	O	Comments
101	1.6811×10^{-3}	1.2495×10^{-4}	5.7050×10^{-2}		Standard Fuel A
102	1.4279×10^{-3}	1.0612×10^{-4}	5.7462×10^{-2}		Standard Fuel B
103	1.7653×10^{-3}	1.3120×10^{-4}	5.6917×10^{-2}		Fuel Follower
104	5.6444×10^{-4}	2.2664×10^{-2}		4.6456×10^{-2}	69L-5P
105	3.5556×10^{-4}	2.2870×10^{-2}		4.6462×10^{-2}	68F-5P

Crad

ATOM MAT NO.	Al	Zr
201	6.0299×10^{-2}	
202		4.2523×10^{-2}

Moderater

ATOM MAT NO.	H	O
301	6.5946×10^{-2}	3.2973×10^{-2}

Reflector

ATOM MAT NO.	Al	Be	H	O
401	6.0299×10^{-2}			
402		1.2287×10^{-1}		
403		1.1517×10^{-1}	4.1334×10^{-3}	2.0667×10^{-3}
404		1.1719×10^{-1}	3.0500×10^{-3}	1.5250×10^{-3}
405		1.1360×10^{-1}	4.9772×10^{-3}	2.4886×10^{-3}
406	6.4641×10^{-3}	1.0279×10^{-1}	3.7106×10^{-3}	1.8553×10^{-3}
407	2.8099×10^{-3}	1.1023×10^{-1}	3.7104×10^{-3}	1.8552×10^{-3}
408		1.1464×10^{-1}	4.4158×10^{-3}	2.2079×10^{-3}
409	5.6368×10^{-2}		4.2997×10^{-3}	2.1498×10^{3}

Structure

ATOM / MAT NO.	Ni	Sb	Ir	Zr
501	9.1304×10^{-2}			
502		3.3076×10^{-2}		
503			7.0222×10^{-2}	
504				4.2523×10^{-2}

ATOM / MAT NO.	Fe	Ni	Cr
505	8.4767×10^{-2}		
506	5.8901×10^{-2}	7.7997×10^{-3}	1.7603×10^{-2}
507	7.3709×10^{-2}	3.3222×10^{-3}	7.4979×10^{-2}
508	5.5743×10^{-2}	7.3815×10^{-3}	1.6659×10^{-2}
509	3.7493×10^{-3}	4.9648×10^{-4}	1.1205×10^{3}

ATOM / MAT NO.	Al	N	Nb	Cu	Fe
510	6.0299×10^{-2}				
511	4.3415×10^{-2}	1.6884×10^{-2}			
512	4.8239×10^{-2}		1.0890×10^{-2}		
513	2.8642×10^{-2}			4.4468×10^{-2}	
514	2.6435×10^{-2}		1.2911×10^{-2}		1.8649×10^{-2}
515	3.0149×10^{-2}				4.2384×10^{-2}

ATOM / MAT NO.	Zr	Na	K
516	1.194×10^{-2}	9.128×10^{-3}	4.218×10^{-2}
517		1.269×10^{-2}	5.864×10^{-3}
518	4.2523×10^{-2}		

ATOM / MAT NO.	Fe	Ni	Cr	Mn	Mo
519	5.8125×10^{-2}	9.0312×10^{-2}	1.6677×10^{-2}	1.7544×10^{-3}	
520	5.7620×10^{-2}	9.6023×10^{-2}	1.5356×10^{-2}		1.2241×10^{-3}

ATOM / MAT NO.	Fe	Ni	Cr	Mo	H	O
521	4.4599×10^{-2}	7.4323×10^{-3}	1.1886×10^{-2}	9.4746×10^{-4}	1.4903×10^{-2}	7.4515×10^{-3}

ATOM / MAT NO.	Fe	Mg	Te	O
522		5.3497×10^{-2}		5.3497×10^{-2}
523	9.2497×10^{-3}			1.0×10^{-6}
524			2.3535×10^{-2}	1.0561×10^{-5}

ATOM / MAT NO.	C	H	O	Al	Zr
525	9.0847×10^{-2}				
526		3.7142×10^{-2}	1.8571×10^{-2}	1.8178×10^{-2}	5.7552×10^{-3}
527		$1\ 6498\times10^{-2}$	8.2492×10^{-3}	4.5213×10^{-2}	
528			1.0×10^{-6}		

ATOM / MAT NO.	^{59}Co	C	Fe	Ni	Cr
529	1.6307×10^{-2}	6.5533×10^{-2}			
530		8.0232×10^{-2}			
531			5.8901×10^{-2}	7.7997×10^{-3}	1.7603×10^{-2}
532	2.9668×10^{-2}	5.3491×10^{-2}			
533			5.5526×10^{-2}	1.0646×10^{-2}	1.4388×10^{-2}

ATOM / MAT NO.	Fe	Al	H	O
534	4.0920×10^{-4}	5.9660×10^{-2}		
535		1.2060×10^{-2}	5.3398×10^{-2}	2.6699×10^{-2}

ATOM / MAT NO.	Al	H	O	Fe	Cr	Ni
536	2.986×10^{-2}	1.5965×10^{-2}	7.9825×10^{-3}	2.185×10^{-2}	6.530×10^{-3}	2.8933×10^{-3}
537	8.8284×10^{-3}	2.5696×10^{-2}	1.2848×10^{-2}	2.7602×10^{-2}	8.2491×10^{-3}	3.6551×10^{-3}

ATOM / MAT NO.	Fe	Ni	Cr	Al	H
538	1.1403×10^{-2}	1.510×10^{-3}	3.4079×10^{-3}	2.1599×10^{-2}	2.9557×10^{-2}

ATOM / MAT NO.	O	B-10	B-11
538	1.4778×10^{-2}	1.9826×10^{-4}	1.9607×10^{-5}

Poison

ATOM / MAT NO.	Hf	Al
601	4.4854×10^{-2}	
602		6.0299×10^{-2}

5.2.4 JMTRC Core Identification

I. Core

- Core Identification Table
- Core Fig.
- Core GEOM Table
- Core MAT Table

II. Element

- Elements Identification Table
- ELM Fig.
- ELM GEOM Table
- ELM MAT Table

III. Sub-element

- Sub-elements Identification Table
- SUB-ELM Fig.
- SUB-ELM GEOM Table
- SUB-ELM MAT Table

IV. Material

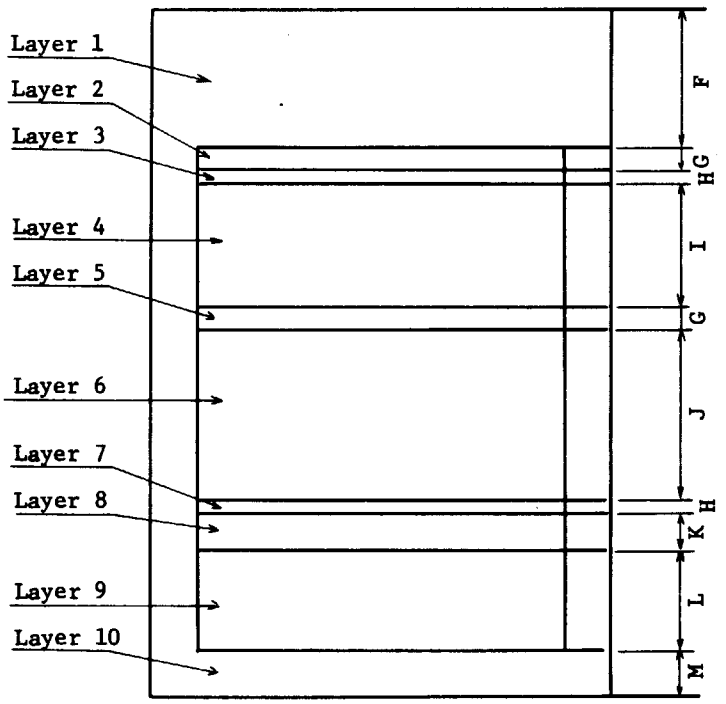
- Material Table

I. Core

Core Identification Table : JMTR C

Core Z Fig. NO.	Core Z GEOM Table NO.
1	1

Layer NO.	Core X-Y Fig. NO.	Core X-Y GEOM Table NO.	Core MAT Table NO.
1	1	1	1
2	1	1	2
3	1	1	3
4	1	1	4
5	1	1	5
6	1	1	6
7	1	1	7
8	1	1	8
9	1	1	9
10	1	1	10

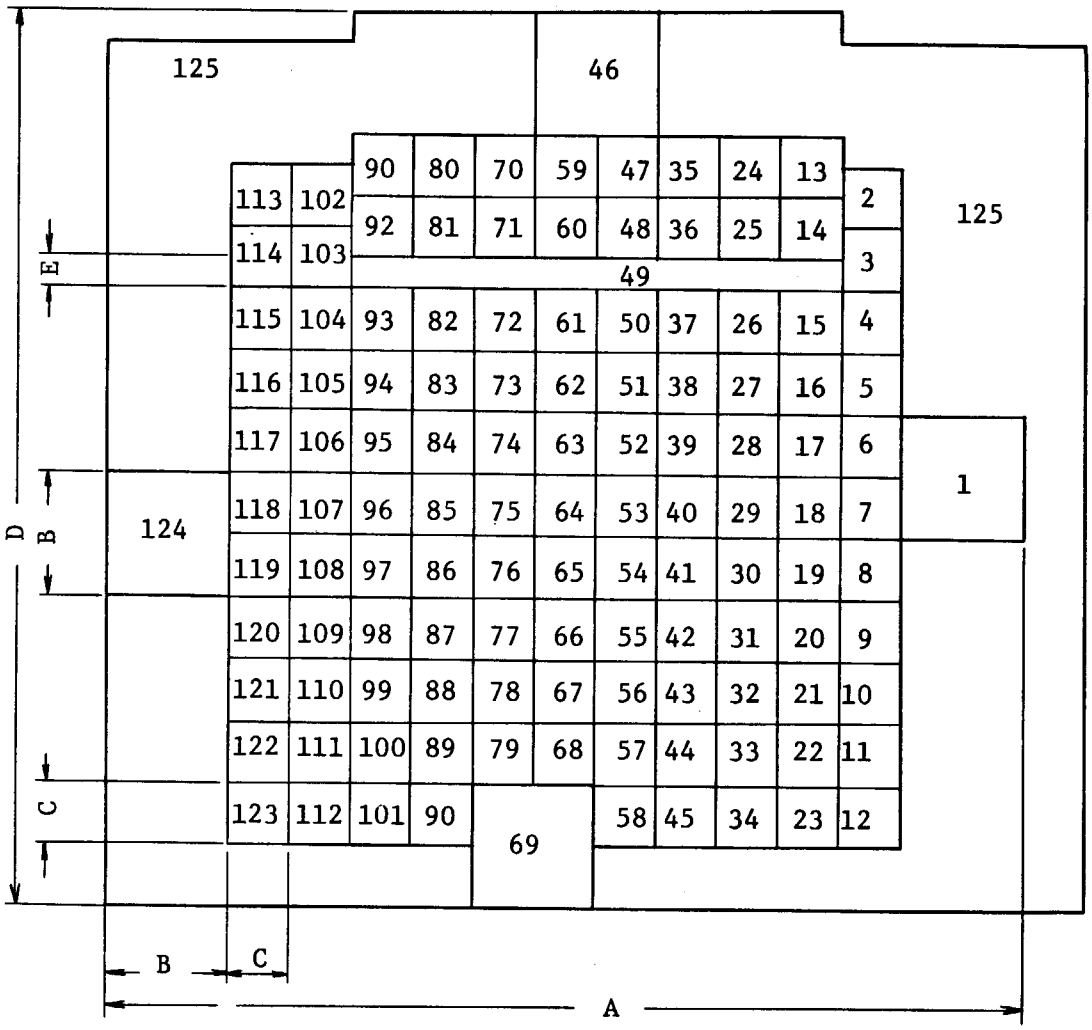


CORE Z Fig. 1

	DIM cm
F	30.0
G	5.0
H	0.95
I	75.9-5.0-F.f.L
J	F.f.L
K	8.0
L	22.0
M	10.0

F.f.L; Fuel follower Level

If DIM(I) is negative, set DIM(I) = 0



CORE X-Y Fig. 1

CORE GEOM Table 1

	DIM cm
A	115.8
B	15.44
C	7.72
D	111.28
E	3.2

CORE MAT Table 1

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 25	33	ELM 23	65	ELM 23	97	ELM 23
2	23	34	"	66	"	98	"
3	"	35	"	67	"	99	"
4	"	36	"	68	"	100	"
5	"	37	"	69	25	101	"
6	"	38	"	70	23	102	"
7	"	39	"	71	"	103	"
8	"	40	"	72	"	104	"
9	"	41	"	73	"	105	"
10	"	42	"	74	"	106	"
11	"	43	"	75	"	107	"
12	"	44	"	76	"	108	"
13	"	45	"	77	"	109	"
14	"	46	25	78	"	110	"
15	"	47	23	79	"	111	"
16	"	48	"	80	"	112	"
17	"	49	18	81	"	113	"
18	"	50	23	82	"	114	"
19	"	51	"	83	"	115	"
20	"	52	"	84	"	116	"
21	"	53	"	85	"	117	"
22	"	54	"	86	"	118	"
23	"	55	"	87	"	119	"
24	"	56	"	88	"	120	"
25	"	57	"	89	"	121	"
26	"	58	"	90	"	122	"
27	"	59	"	91	"	123	"
28	"	60	"	92	"	124	25
29	"	61	"	93	"	125	100
30	"	62	"	94	"		
31	"	63	"	95	"		
32	23	64	23	96	23		

CORE MAT Table 2

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 16	33	ELM 6	65	ELM 20	97	ELM 7
2	8	34	"	66	5	98	6
3	6	35	7	67	13	99	9
4	"	36	6	68	9	100	6
5	7	37	"	69	16	101	"
6	6	38	10	70	6	102	"
7	9	39	"	71	"	103	12
8	6	40	5	72	11	104	6
9	"	41	10	73	10	105	"
10	"	42	"	74	20	106	"
11	"	43	6	75	"	107	8
12	8	44	"	76	"	108	6
13	7	45	7	77	10	109	"
14	12	46	16	78	15	110	"
15	6	47	7	79	6	111	12
16	"	48	6	80	"	112	7
17	"	49	17	81	"	113	8
18	9	50	13	82	"	114	6
19	6	51	10	83	10	115	"
20	"	52	20	84	"	116	"
21	"	53	"	85	5	117	7
22	12	54	"	86	10	118	12
23	8	55	10	87	"	119	7
24	7	56	15	88	6	120	6
25	6	57	6	89	7	121	"
26	12	58	"	90	"	122	"
27	6	59	12	91	6	123	8
28	7	60	9	92	"	124	16
29	13	61	13	93	9	125	100
30	7	62	5	94	6		
31	6	63	20	95	7		
32	9	64	14	96	13		

CORE MAT Table 3

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 16	33	ELM 6	65	ELM 4	97	ELM 7
2	8	34	"	66	5	98	6
3	6	35	7	67	13	99	9
4	"	36	6	68	9	100	6
5	7	37	"	69	16	101	"
6	6	38	10	70	6	102	"
7	9	39	"	71	"	103	12
8	6	40	5	72	11	104	6
9	"	41	10	73	10	105	"
10	"	42	"	74	4	106	"
11	"	43	6	75	"	107	8
12	8	44	"	76	"	108	6
13	7	45	7	77	10	109	"
14	12	46	16	78	15	110	"
15	6	47	7	79	6	111	12
16	"	48	6	80	"	112	7
17	"	49	17	81	"	113	8
18	9	50	13	82	"	114	6
19	6	51	10	83	10	115	"
20	"	52	4	84	"	116	"
21	"	53	"	85	5	117	7
22	12	54	"	86	10	118	12
23	8	55	10	87	"	119	7
24	7	56	15	88	6	120	6
25	6	57	6	89	7	121	"
26	12	58	"	90	"	122	"
27	6	59	12	91	6	123	8
28	7	60	9	92	"	124	16
29	13	61	13	93	9	125	100
30	7	62	5	94	6		
31	6	63	4	95	7		
32	9	64	14	96	13		

CORE MAT Table 4

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 16	33	ELM 6	65	ELM 3	97	ELM 7
2	8	34	"	66	5	98	6
3	6	35	7	67	13	99	9
4	"	36	6	68	9	100	6
5	7	37	"	69	16	101	"
6	6	38	10	70	6	102	"
7	9	39	"	71	"	103	12
8	6	40	5	72	11	104	6
9	"	41	10	73	10	105	"
10	"	42	"	74	3	106	"
11	"	43	6	75		107	8
12	8	44	"	76		108	6
13	7	45	7	77	10	109	"
14	12	46	16	78	15	110	"
15	6	47	7	79	6	111	12
16	"	48	6	80	"	112	7
17	"	49	17	81	"	113	8
18	9	50	13	82	"	114	6
19	6	51	10	83	10	115	"
20	"	52	3	84	"	116	"
21	"	53	"	85	5	117	7
22	12	54	"	86	10	118	12
23	8	55	10	87	"	119	7
24	7	56	15	88	6	120	6
25	6	57	6	89	7	121	"
26	12	58	"	90	"	122	"
27	6	59	12	91	6	123	8
28	7	60	9	92	"	124	16
29	13	61	13	93	9	125	100
30	7	62	5	94	6		
31	6	63	3	95	7		
32	9	64	14	96	13		

CORE MAT Table 5

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 16	33	ELM 6	65	ELM 3	97	ELM 7
2	8	34	"	66	21	98	6
3	6	35	7	67	13	99	9
4	"	36	6	68	9	100	6
5	7	37	"	69	16	101	"
6	6	38	10	70	6	102	"
7	9	39	"	71	"	103	12
8	6	40	21	72	"	104	6
9	"	41	10	73	10	105	"
10	"	42	"	74	3	106	"
11	"	43	6	75	"	107	8
12	8	44	"	76	"	108	6
13	7	45	7	77	10	109	"
14	12	46	16	78	15	110	"
15	6	47	7	79	6	111	12
16	"	48	6	80	"	112	7
17	"	49	17	81	"	113	8
18	9	50	13	82	"	114	6
19	6	51	10	83	10	115	"
20	"	52	3	84	"	116	"
21	"	53	"	85	21	117	7
22	12	54	"	86	10	118	12
23	8	55	10	87	"	119	7
24	7	56	15	88	6	120	6
25	6	57	6	89	7	121	"
26	12	58	"	90	"	122	"
27	6	59	12	91	6	123	8
28	7	60	9	92	"	124	16
29	13	61	13	93	9	125	100
30	7	62	21	94	6		
31	6	63	3	95	7		
32	9	64	14	96	13		

CORE MAT Table 6

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 16	33	ELM 6	65	ELM 3	97	ELM 7
2	8	34	"	66	1	98	6
3	6	35	7	67	13	99	9
4	"	36	6	68	9	100	6
5	7	37	"	69	16	101	"
6	6	38	10	70	6	102	"
7	9	39	"	71	"	103	12
8	6	40	1	72	11	104	6
9	"	41	10	73	10	105	"
10	"	42	"	74	3	106	"
11	"	43	6	75	"	107	8
12	8	44	"	76	"	108	6
13	7	45	7	77	10	109	"
14	12	46	16	78	15	110	"
15	6	47	7	79	6	111	12
16	"	48	6	80	"	112	7
17	"	49	17	81	"	113	8
18	9	50	13	82	"	114	6
19	6	51	10	83	10	115	"
20	"	52	3	84	"	116	"
21	"	53	"	85	7	117	7
22	12	54	"	86	10	118	12
23	8	55	10	87	"	119	7
24	7	56	15	88	6	120	6
25	6	57	6	89	7	121	"
26	12	58	"	90	"	122	"
27	6	59	12	91	6	123	8
28	7	60	9	92	"	124	16
29	13	61	13	93	9	125	100
30	7	62	1	94	6		
31	6	63	3	95	7		
32	9	64	14	96	13		

CORE MAT Table 7

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 16	33	ELM 6	65	ELM 4	97	ELM 7
2	8	34	"	66	1	98	6
3	6	35	7	67	13	99	9
4	"	36	6	68	9	100	6
5	7	37	"	69	16	101	"
6	6	38	10	70	6	102	"
7	9	39	"	71	"	103	12
8	6	40	1	72	11	104	6
9	"	41	10	73	10	105	"
10	"	42	"	74	4	106	"
11	"	43	6	75	"	107	8
12	8	44	"	76	"	108	6
13	7	45	7	77	10	109	"
14	12	46	16	78	15	110	"
15	6	47	7	79	6	111	12
16	"	48	6	80	"	112	7
17	"	49	17	81	"	113	8
18	9	50	13	82	"	114	6
19	6	51	10	83	10	115	"
20	"	52	4	84	"	116	"
21	"	53	"	85	1	117	7
22	12	54	"	86	10	118	12
23	8	55	10	87	"	119	7
24	7	56	15	88	6	120	6
25	6	57	6	89	7	121	"
26	12	58	"	90	"	122	"
27	6	59	12	91	6	123	8
28	7	60	9	92	"	124	16
29	13	61	13	93	9	125	100
30	7	62	1	94	6		
31	6	63	4	95	7		
32	9	64	14	96	13		

CORE MAT Table 8

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 16	33	ELM 6	65	ELM 20	97	ELM 7
2	8	34	"	66	1	98	6
3	6	35	7	67	13	99	9
4	"	36	6	68	9	100	6
5	7	37	"	69	16	101	"
6	6	38	10	70	6	102	"
7	9	39	"	71	"	103	12
8	6	40	1	72	11	104	6
9	"	41	10	73	10	105	"
10	"	42	"	74	20	106	"
11	"	43	6	75	"	107	8
12	8	44	"	76	"	108	6
13	7	45	7	77	10	109	"
14	12	46	16	78	15	110	"
15	6	47	7	79	6	111	12
16	"	48	6	80	"	112	7
17	"	49	17	81	"	113	8
18	9	50	13	82	"	114	6
19	6	51	10	83	10	115	"
20	"	52	20	84	"	116	"
21	"	53	"	85	1	117	7
22	12	54	"	86	10	118	12
23	8	55	10	87	"	119	7
24	7	56	15	88	6	120	6
25	6	57	6	89	7	121	"
26	12	58	"	90	"	122	"
27	6	59	12	91	6	123	8
28	7	60	9	92	"	124	16
29	13	61	13	93	9	125	100
30	7	62	1	94	6		
31	6	63	20	95	7		
32	9	64	14	96	13		

CORE MAT Table 9

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 24	33	ELM 22	65	ELM 22	97	ELM 22
2	22	34	"	66	1	98	"
3	"	35	"	67	22	99	"
4	"	36	"	68	"	100	"
5	"	37	"	69	24	101	"
6	"	38	"	70	22	102	"
7	"	39	"	71	"	103	"
8	"	40	1	72	"	104	"
9	"	41	22	73	"	105	"
10	"	42	"	74	"	106	"
11	"	43	"	75	"	107	"
12	"	44	"	76	"	108	"
13	"	45	"	77	"	109	"
14	"	46	24	78	"	110	"
15	"	47	22	79	"	111	"
16	"	48	"	80	"	112	"
17	"	49	19	81	"	113	"
18	"	50	22	82	"	114	"
19	"	51	"	83	"	115	"
20	"	52	"	84	"	116	"
21	"	53	"	85	1	117	"
22	"	54	"	86	22	118	"
23	"	55	"	87	"	119	"
24	"	56	"	88	"	120	"
25	"	57	"	89	"	121	"
26	"	58	"	90	"	122	"
27	"	59	"	91	"	123	"
28	"	60	"	92	"	124	24
29	"	61	"	93	"	125	100
30	"	62	1	94	"		
31	"	63	22	95	"		
32	22	64	"	96	22		

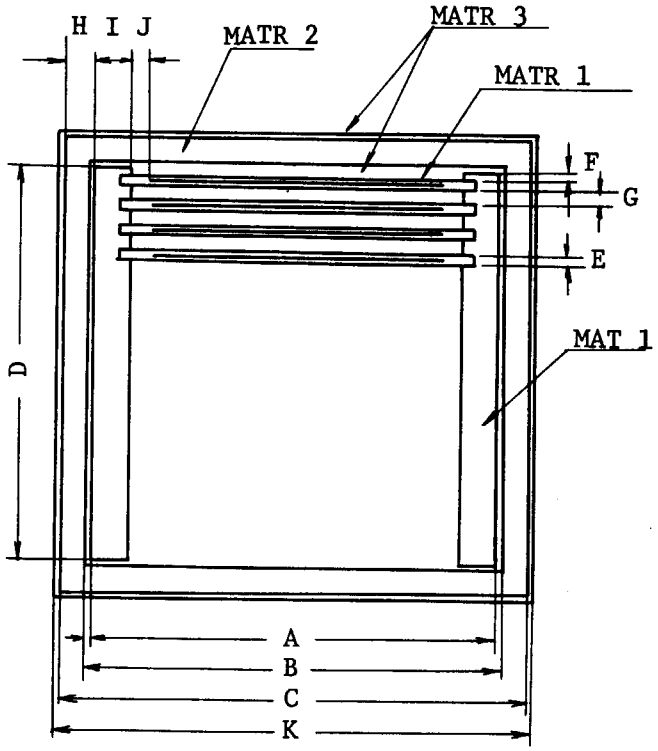
CORE MAT Table 10

Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.	Region NO.	ELM NO.
1	ELM 25	33	ELM 23	65	ELM 23	97	ELM 23
2	23	34	"	66	"	98	"
3	"	35	"	67	"	99	"
4	"	36	"	68	"	100	"
5	"	37	"	69	25	101	"
6	"	38	"	70	23	102	"
7	"	39	"	71	"	103	"
8	"	40	"	72	"	104	"
9	"	41	"	73	"	105	"
10	"	42	"	74	"	106	"
11	"	43	"	75	"	107	"
12	"	44	"	76	"	108	"
13	"	45	"	77	"	109	"
14	"	36	25	78	"	110	"
15	"	47	23	79	"	111	"
16	"	48	"	80	"	112	"
17	"	49	18	81	"	113	"
18	"	50	23	82	"	114	"
19	"	51	"	83	"	115	"
20	"	52	"	84	"	116	"
21	"	53	"	85	"	117	"
22	"	54	"	86	"	118	"
23	"	55	"	87	"	119	"
24	"	56	"	88	"	120	"
25	"	57	"	89	"	121	"
26	"	58	"	90	"	122	"
27	"	59	"	91	"	123	"
28	"	60	"	92	"	124	25
29	"	61	"	93	"	125	100
30	"	62	"	94	"		
31	"	63	"	95	"		
32	23	64	23	96	23		

II. Element

Elements Identification Table

ELM NO.	ELM Fig. NO.	ELM GEOM Table NO.	ELM NAT Table NO.	Comments
1	1	1	1	Fuel U-Al
2	1	1	2	Fuel Al
3	2	2	3	Fuel U-Al
4	2	2	4	Fuel Al
5	3	3	5	Irradiation Element Al
6	4	4	6	Irradiation Element Al
7	4	5	6	Irradiation Element Al
8	5	6	6	Irradiation Element Al
9	5	7	6	Irradiation Element Al
10	5	8	7	Irradiation Element Be
11	5	7	7	Irradiation Element Be
12	6	9	6	Irradiation Element Al
13	6	9	7	Irradiation Element Be
14	7	10	8	Irradiation Element SUS Al
15	8	11	7	Irradiation Element Be
16	9	12	9	CIC Element Al
17	10	13	10	
18	10	13	11	
19	10	13	12	
20	11	14	13	H_2O+Al
21	11	14	14	
22	11	14	15	Grid Plate
23	11	14	16	H_2O
24	11	15	15	Grid Plate
25	11	15	16	H_2O
ELM NO.	——	——	MAT NO.	———
100	——	——	301	Moderator H_2O



ELM-Fig. 1 (ELM 1,2)

ELM-GEOM Table 1

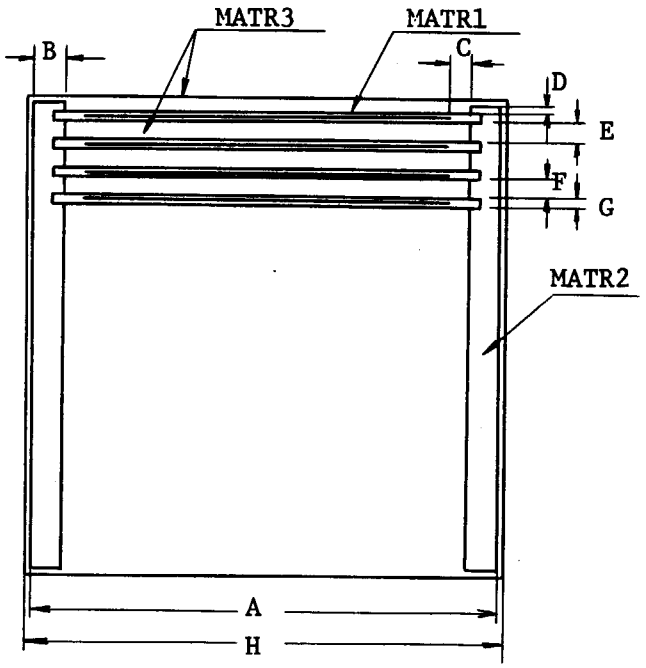
	DIM cm
A	6.37
B	6.62
C	7.62
D	6.37
E	0.127×16
F	0.224×2
G	0.259×15
H	0.5
I	0.625
J	0.2475
K	7.72

ELM-MAT Table 1

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 1	U-Al
MATR2	501	Al
MATR3	301	H_2O

ELM-MAT Table 2

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 2	Al
MATR2	501	Al
MATR3	301	Al



ELM Fig. 2 (ELM 3, 4)

ELM-GEOM Table 2

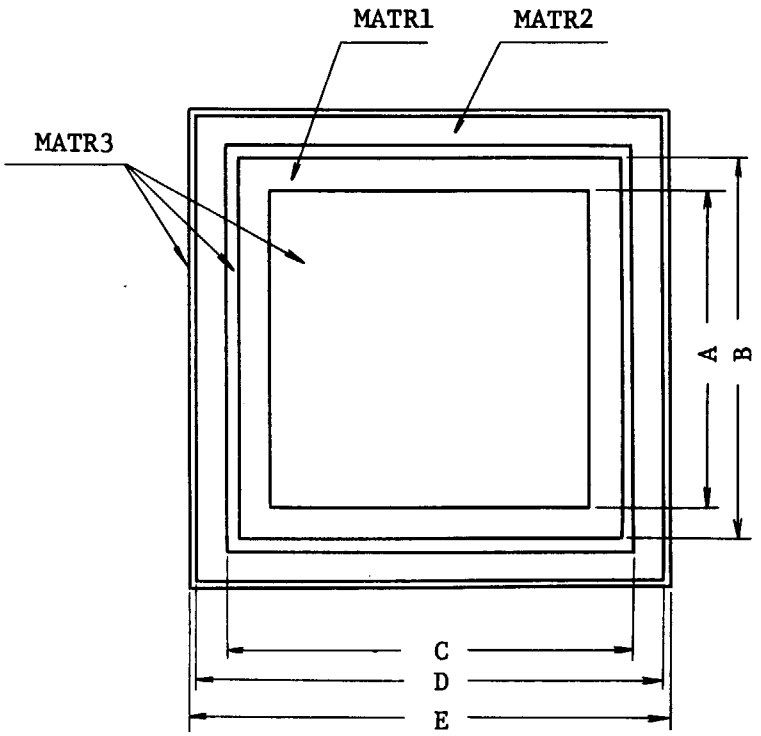
	DIM cm
A	7.62
B	0.5
C	0.29
D	0.1055×2
E	0.302×2
F	0.292×14
G	0.127×19
H	7.72

ELM-MAT Table 3

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 3	U-Al
MATR2	501	Al
MATR3	301	H_2O

ELM-MAT Table 4

Region NO.	Material NO.	Comments
MATR1	SUB-ELM 4	Al
MATR2	501	Al
MATR3	301	H_2O



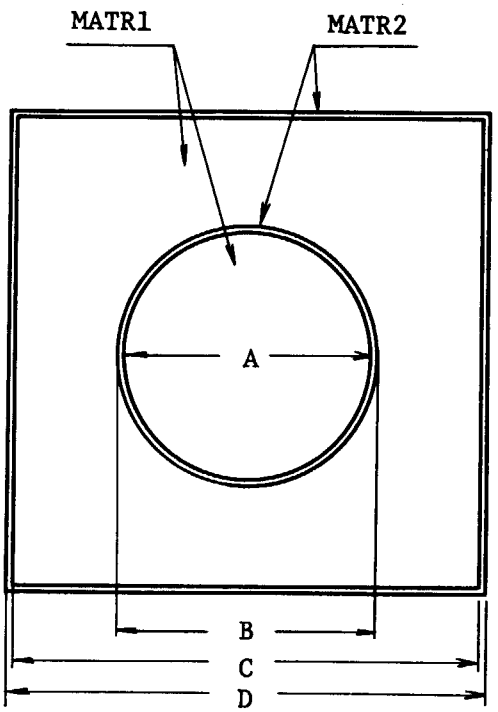
ELM Fig. 3 (ELM 5)

ELM-GEOM Table 3

	DIM cm
A	5.31
B	6.31
C	6.77
D	7.62
E	7.72

ELM-MAT Table 5

Region NO.	Material NO.	Comments
MATR1	601	
MATR2	501	Al
MATR3	301	H_2O



ELM Fig. 5 (ELM 8 ∿ 11)

ELM-GEOM Table 6

	DIM cm
A	4.0
B	4.2
C	7.55
D	7.72

ELM-GEOM Table 7

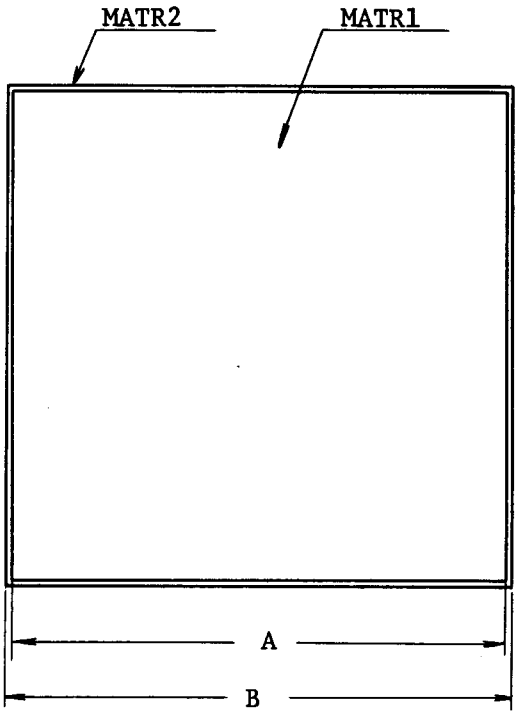
	DIM cm
A	4.0
B	4.2
C	7.62
D	7.72

ELM-GEOM Table 8

	DIM cm
A	4.0
B	4.2
C	7.45
D	7.72

ELM-MAT Table 7

Region NO.	Material NO.	Comments
MATR1	401	Be
MATR2	301	H_2O



ELM Fig. 4 (ELM 6, 7)

ELM-GEOM Table 4

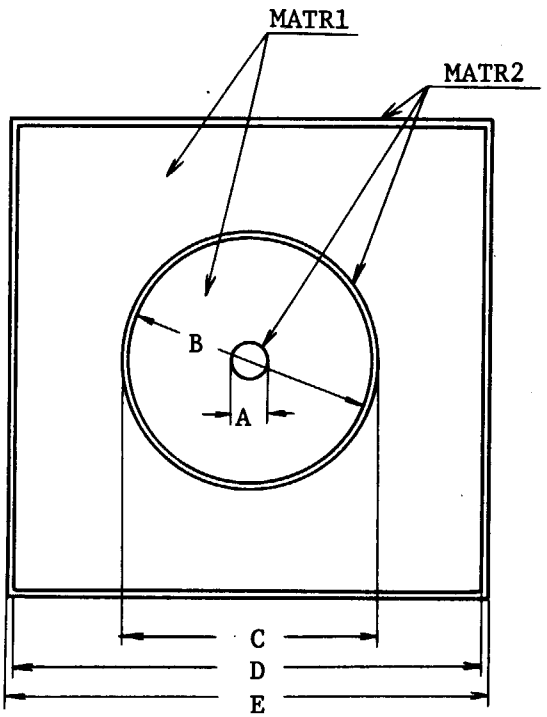
	DIM cm
A	7.55
B	7.72

ELM-GEOM Table 5

	DIM cm
A	7.62
B	7.72

ELM-MAT Table 6

Region NO.	Material NO.	Comments
MATR1	403	Al
MATR2	301	H_2O



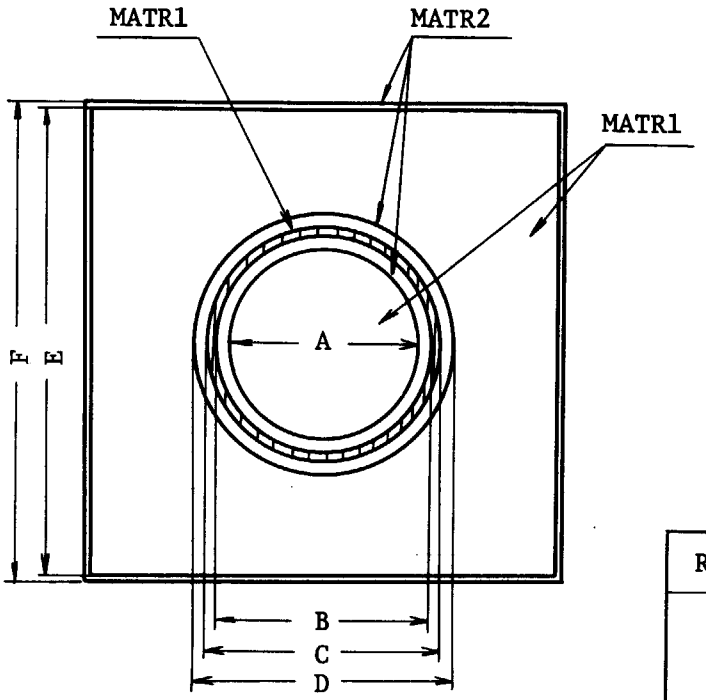
ELM Fig. 6 (ELM 12, 13)

ELM-GEOM Table 9

	DIM cm
A	0.73
B	4.0
C	4.2
D	7.62
E	7.72

cf ELM MAT Table 6

cf ELM MAT Table 7



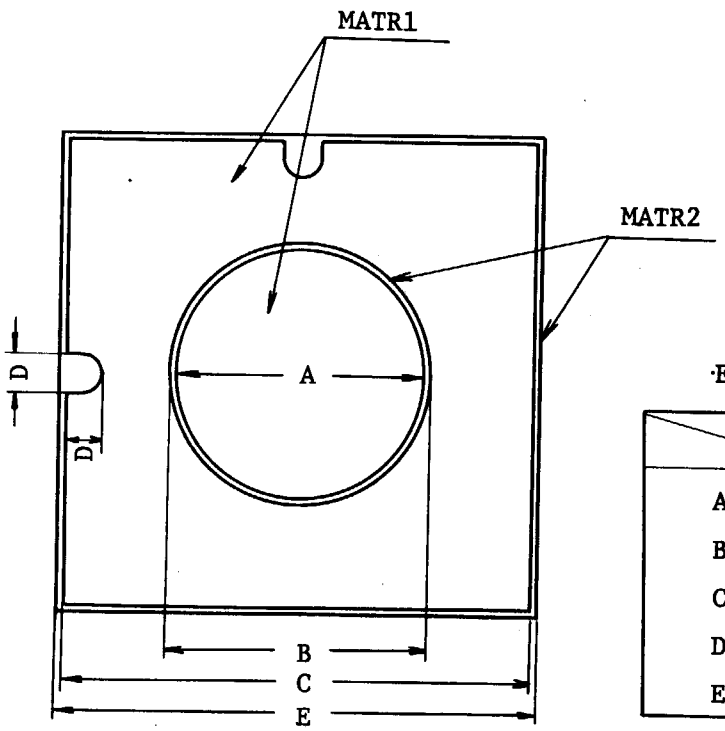
ELM Fig. 7 (ELM 14)

ELM-GEOM Table 10

	DIM cm
A	3.1
B	3.5
C	3.8
D	4.2
E	7.62
F	7.72

ELM-MAT Table 8

Region NO.	Material NO.	Comments
MATR1	501	Al
MATR2	503	SUS 304
MATR3	301	H_2O

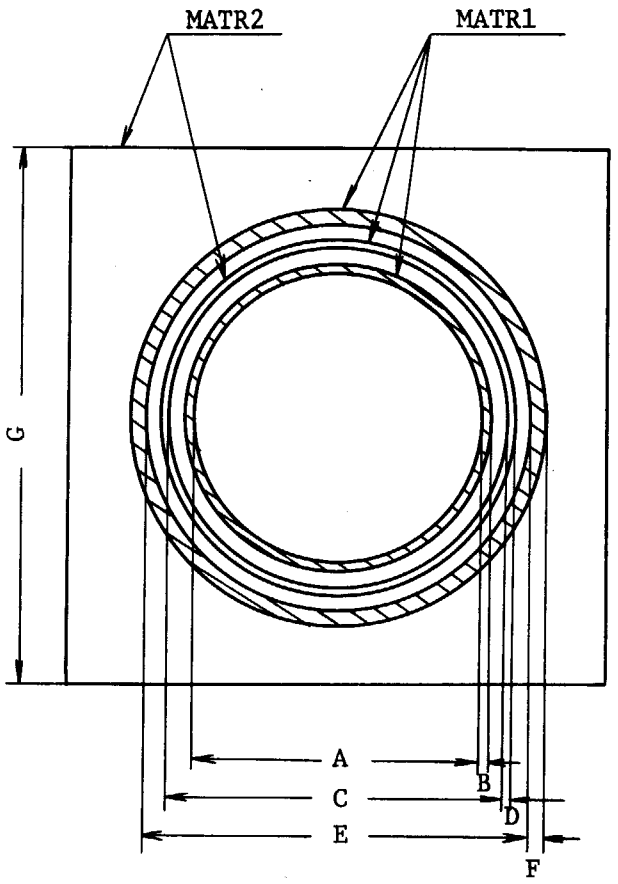


ELM Fig. 8 (ELM 15)

ELM-GEOM Table 11

	DIM cm
A	4.0
B	4.2
C	7.62
D	0.65
E	7.72

cf ELM MAT Table 7



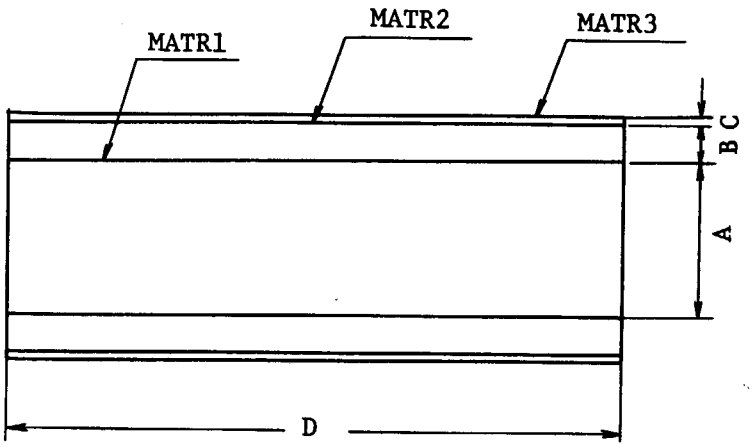
ELM Fig. 9 (ELM 16)

ELM-GEOM Table 12

	DIM cm
A	7.55
B	0.2
C	8.6
D	0.2
E	9.5
F	0.5
G	15.44

ELM-MAT Table 9

Region NO.	Material NO.	Comments
MATR1	501	Al
MATR2	301	H_2O
		CIC
		Air



ELM Fig. 10 (ELM 17, 18, 19)

ELM-GEOM Table 13

	DIM cm
A	2.0
B	0.5
C	0.1
D	61.76

ELM-MAT Table 10

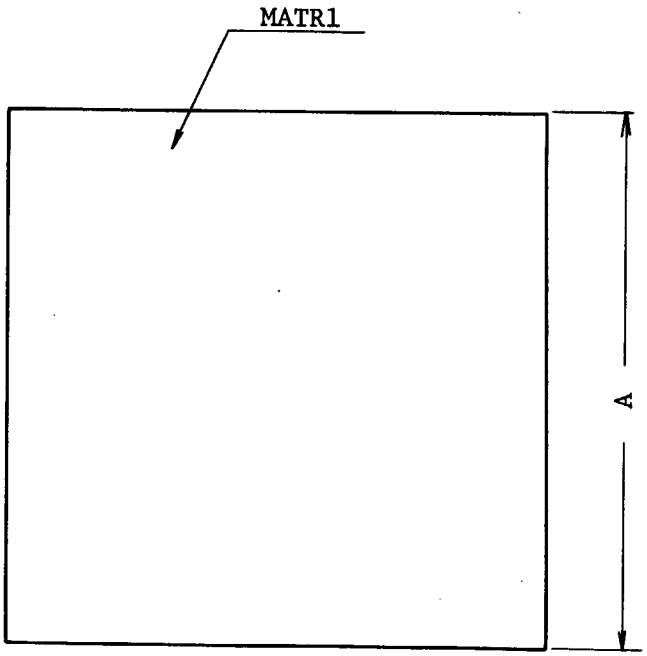
Region NO.	Material NO.	Comments
MATR1	402	Pb
MATR2	201	Al
MATR3	301	H_2O

ELM-MAT Table 11

Region NO.	Material NO.	Comments
MATR1	301	H_2O
MATR2	301	H_2O
MATR3	301	H_2O

ELM-MAT Table 12

Region NO.	Material NO.	Comments
MATR1	504	
MATR2	504	
MATR3	504	



ELM-GEOM Table 14

	DIM cm
A	7.72

ELM-GEOM Table 15

	DIM cm
A	15.44

ELM Fig. 11 (ELM 20 ∿ 25)

ELM-MAT Table 13

Region NO.	Material NO.	Comments
MATR1	502	H_2O+Al

ELM-MAT Table 14

Region NO.	Material NO.	Comments
MATR1	504	

ELM-MAT Table 15

Region NO.	Material NO.	Comments
MATR1	505	Grid Plate

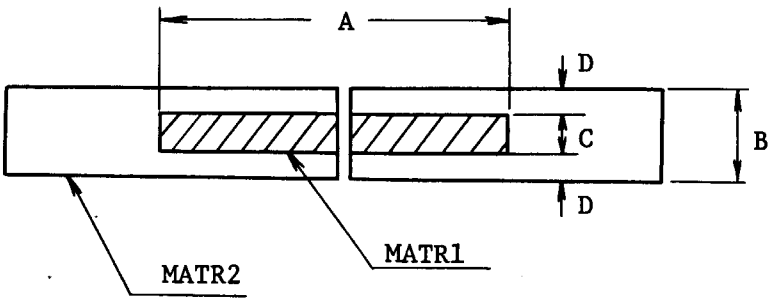
ELM-MAT Table 16

Region NO.	Material NO.	Comments
MATR1	301	H_2O

III. Sub-element

Sub-elements Identification Table

SUB-ELM NO.	SUB-ELM Fig. NO.	SUB-ELM GEOM Table NO.	SUB-ELM MAT Table NO.	Comments
1	1	1	1	Fuel U-Al
2	1	1	3	Fuel Al
3	1	2	2	Fuel U-Al
4	1	2	3	Fuel Al



SUB-ELM Fig. 1

SUB-ELM-GEOM Table 1

	DIM cm
A	4.875
B	0.127
C	0.050
D	0.0385

SUB-ELM-GEOM Table 2

	DIM cm
A	6.04
B	0.127
C	0.050
D	0.0385

SUB-ELM-MAT Table 1

Region NO.	Material NO.	Comments
MATR1	101	U-Al FC
MATR2	201	Al

SUB-ELM-MAT Table 2

Region NO.	Material NO.	Comments
MATR1	102	U-Al FF
MATR2	201	Al

SUB-ELM-MAT Table 3

Region NO.	Material NO.	Comments
MATR1	201	Al
MATR2	201	Al

IV. Material

Material Table

Fuel

ATOM / MAT NO.	U-235	U-238	Al	Comments
101	1.712×10^{-3}	1.877×10^{-4}	5.759×10^{-2}	93%, FF,
102	1.162×10^{-3}	1.274×10^{-4}	5.850×10^{-2}	93%, FC,

Crad

ATOM / MAT NO.	Al
201	6.0299×10^{-2}

Moderator

ATOM / MAT NO.	H	O
301	6.6747×10^{-2}	3.3373×10^{-2}

Reflector

ATOM / MAT NO.	Be	Pb	Al
401	1.2287×10^{-1}		
402		3.2847×10^{-2}	6.0299 10
403			5.0299×10^{-2}

Structure

ATOM / MAT NO.	Al	H	O	Fe	Ni	Cr
501	6.0299×10^{-2}					
502	1.2060×10^{-2}	5.3398×10^{-2}	2.6699×10^{-2}			
503				5.8901×10^{-2}	7.7997×10^{-3}	1.7603×10^{-2}
504	2.285×10^{-2}	3.177×10^{-2}	1.589×10^{-2}	8.541×10^{-3}	1.131×10^{-3}	2.552×10^{-3}
505	8.8284×10^{-3}	2.5696×10^{-2}	1.2848×10^{-2}	2.7602×10^{-2}	3.6551×10^{-3}	8.2491×10^{-3}

Poison

ATOM / MAT NO.	Fe	Ni	Cr	^{10}B	^{11}B
601	5.7959×10^{-2}	7.6749×10^{-3}	1.7321×10^{-2}	1.5074×10^{-3}	4.9183×10^{-3}

Acknowledgement

This work is performed under the auspices of the Project on Reduced Enrichment Fuel of JAERI.