



Reactor Vessel and Internals

Section 3.1

Learning Objectives:

1. State the purposes of the following major reactor vessel and core components:
 - a. Internals support ledge
 - b. Neutron shield pad assembly
 - c. Secondary support assembly
 - d. Internals packages
 - e. Neutron sources
 - f. Burnable poisons
 - g. Thimble plug assemblies
 - h. Irradiation specimens

Learning Objectives (cont.):

2. Describe the flow path of reactor coolant from the inlet nozzles to the outlet nozzles of the reactor vessel.
3. List the core bypass flow paths.
4. Describe the physical arrangement of the following assemblies including the purposes of the component parts listed:
 - a. Fuel assembly
 1. fuel rods
 2. spring clip grid assembly
 3. guide thimbles
 4. top and bottom nozzles

Learning Objectives (cont.):

4. Describe the physical arrangement of the following assemblies including the purposes of the component parts listed:
 - b. Control rod assembly
 1. rodlets
 2. spider
 3. hub
 4. drive shaft
 - c. Rod Drive Mechanism
 1. magnetic coils
 2. gripper latches
 3. pressure boundary

Learning Objectives (cont.):

5. Describe the reactor vessel head seal arrangement.
6. Describe how the reactor vessel is supported.

Figure 3.1-1

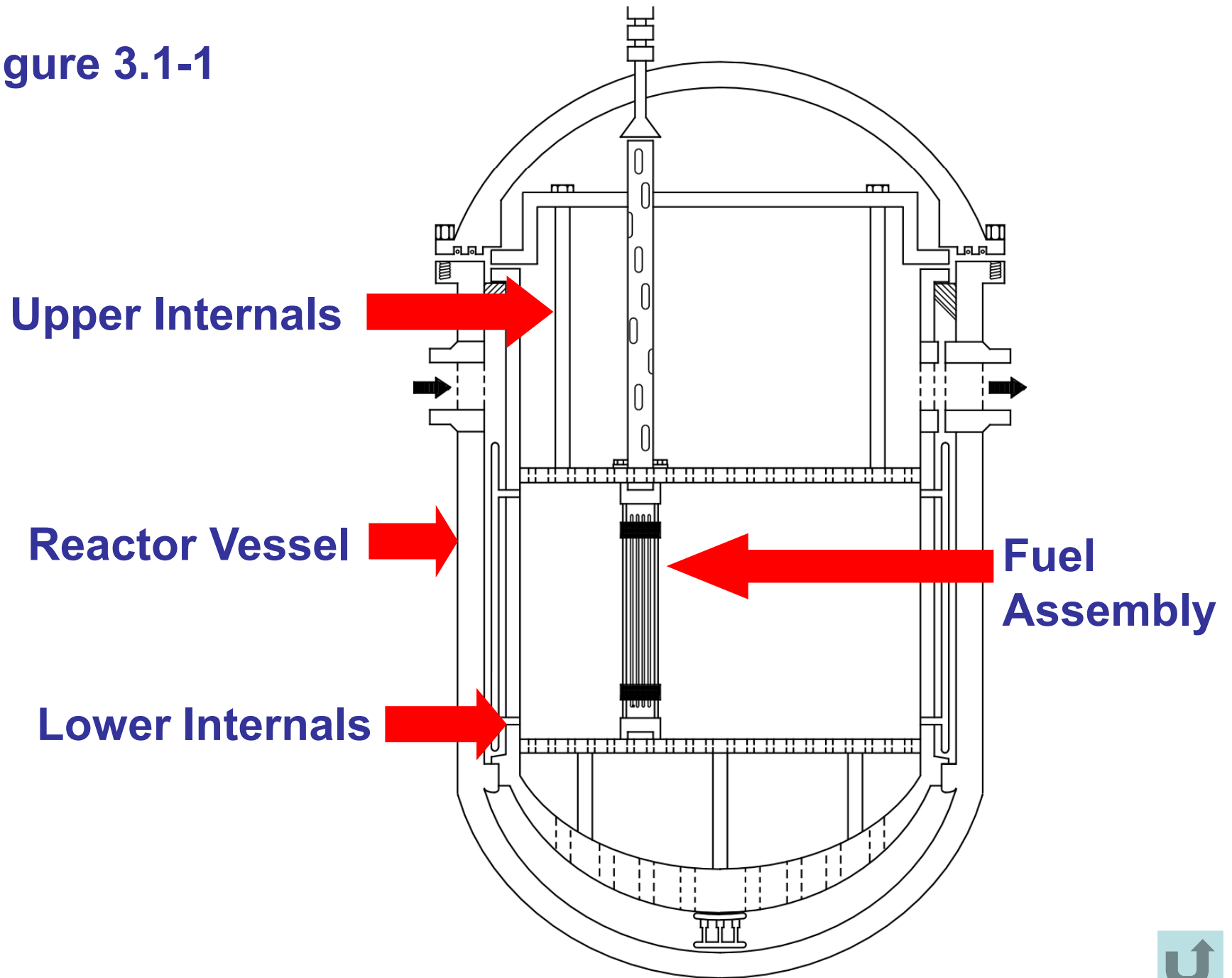


Figure 3.1-6

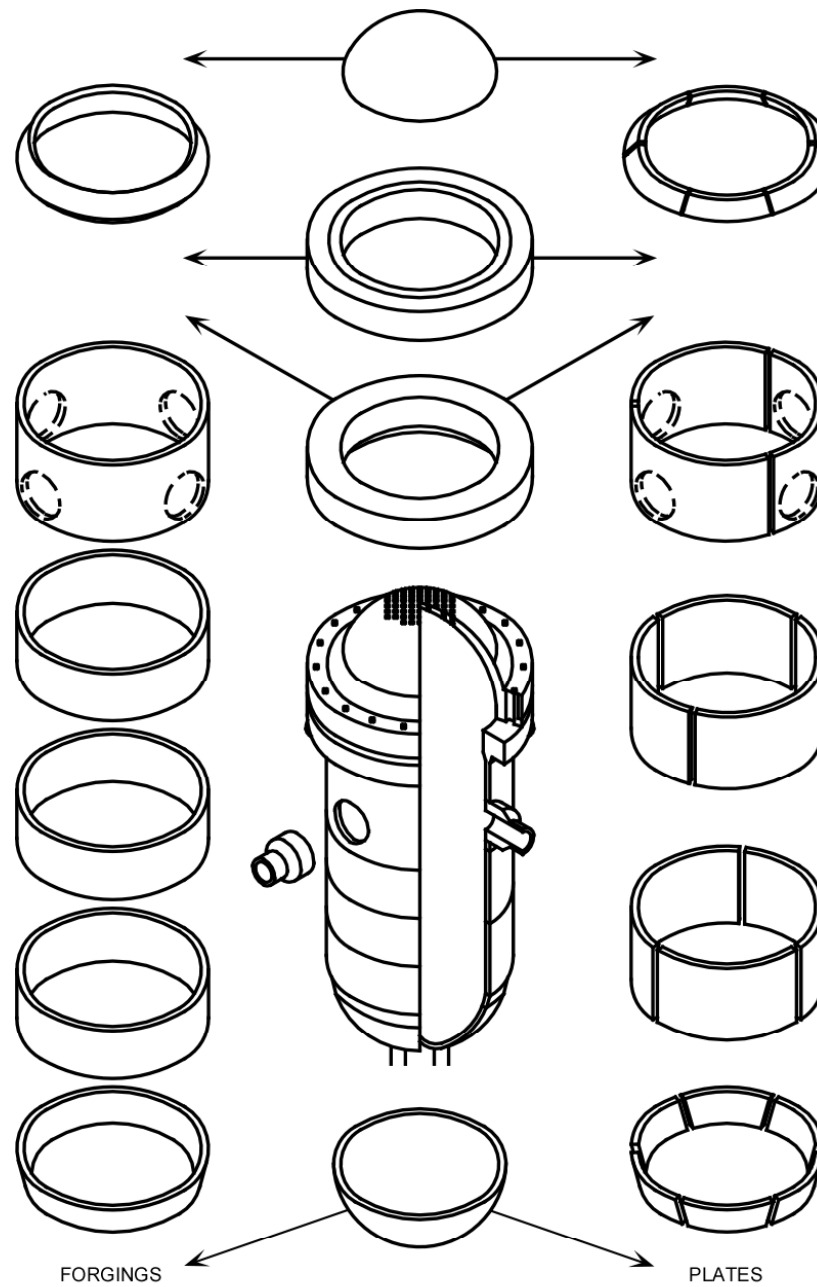


Figure 3.1-9

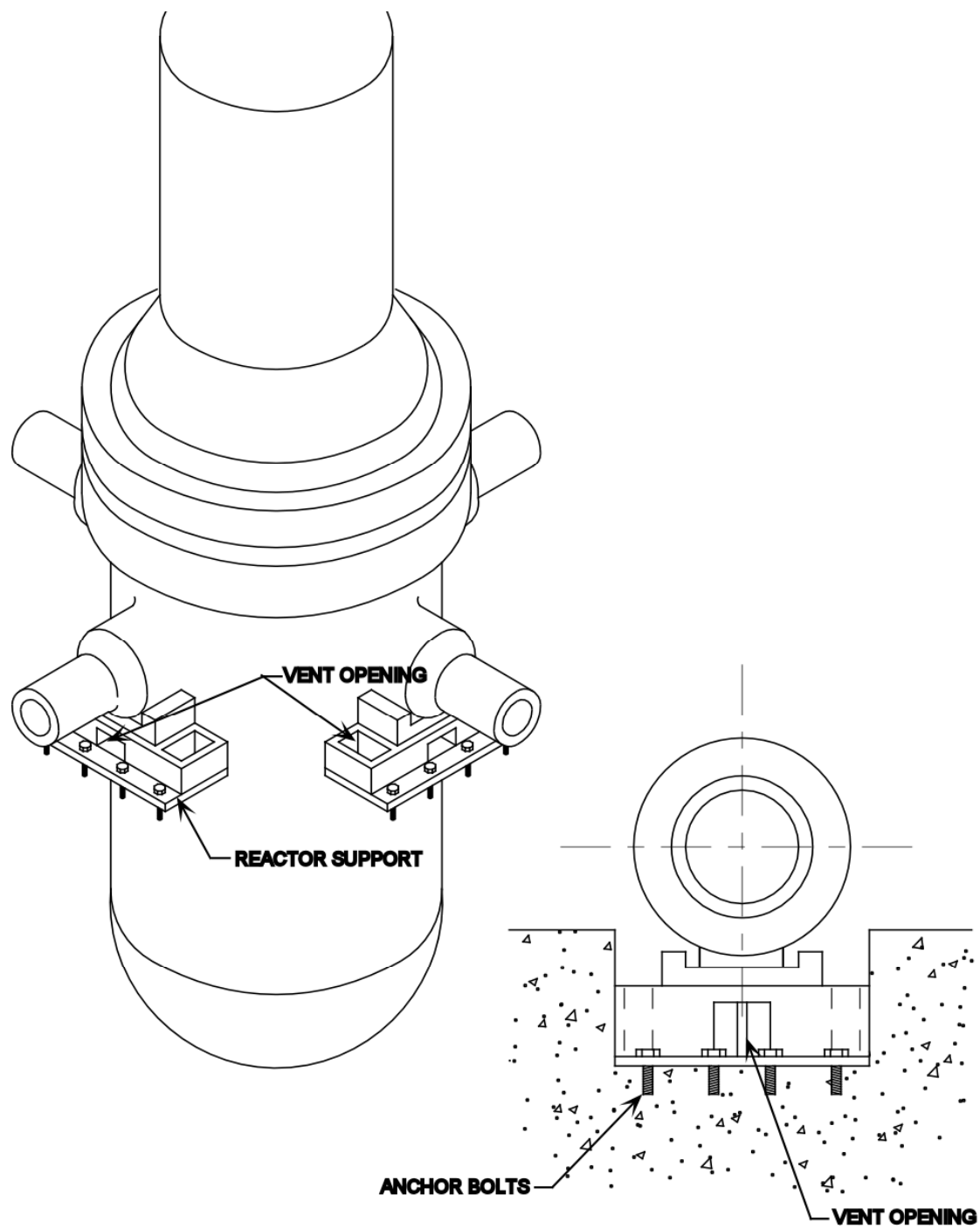
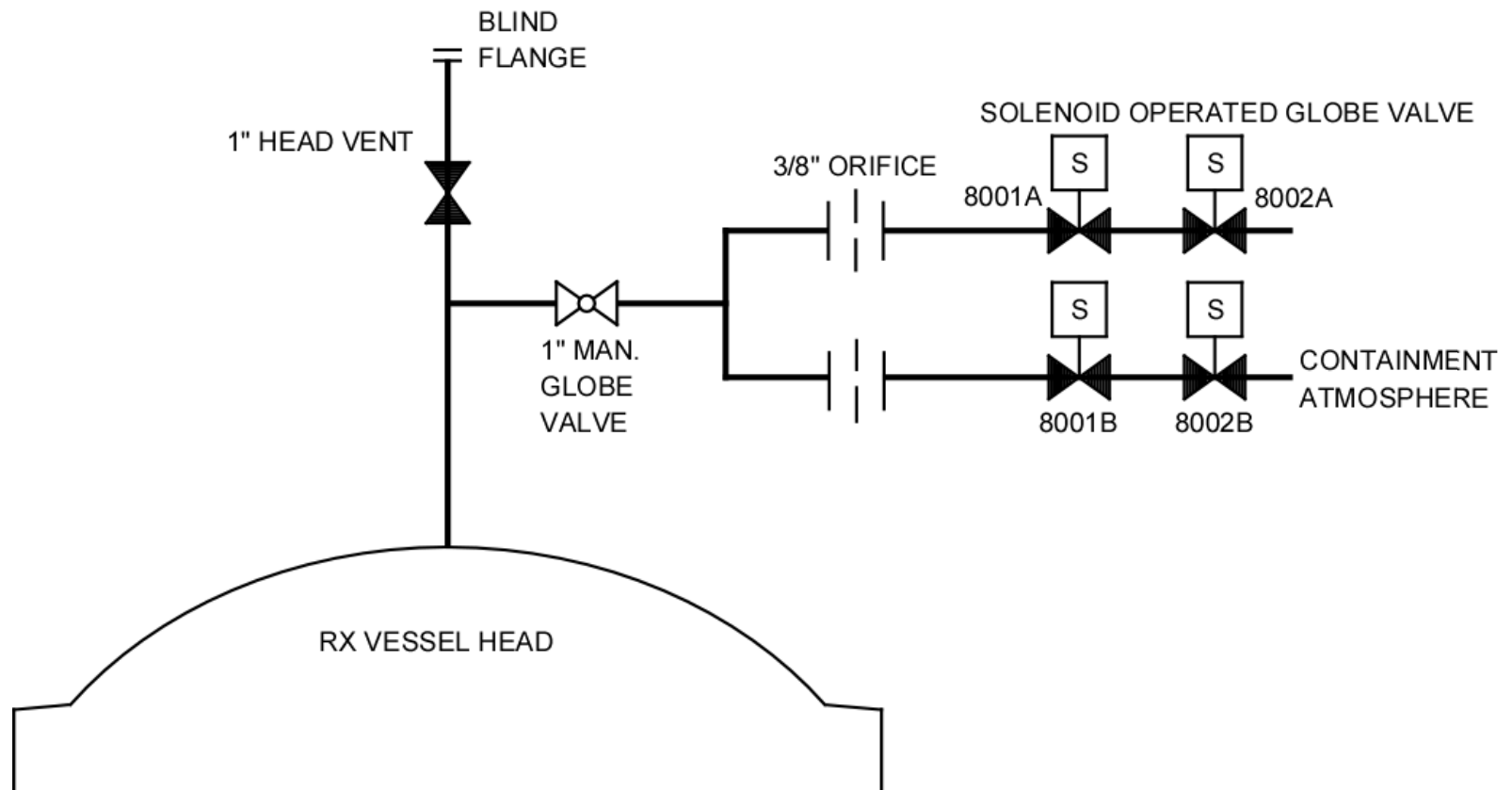


Figure 3.1-8



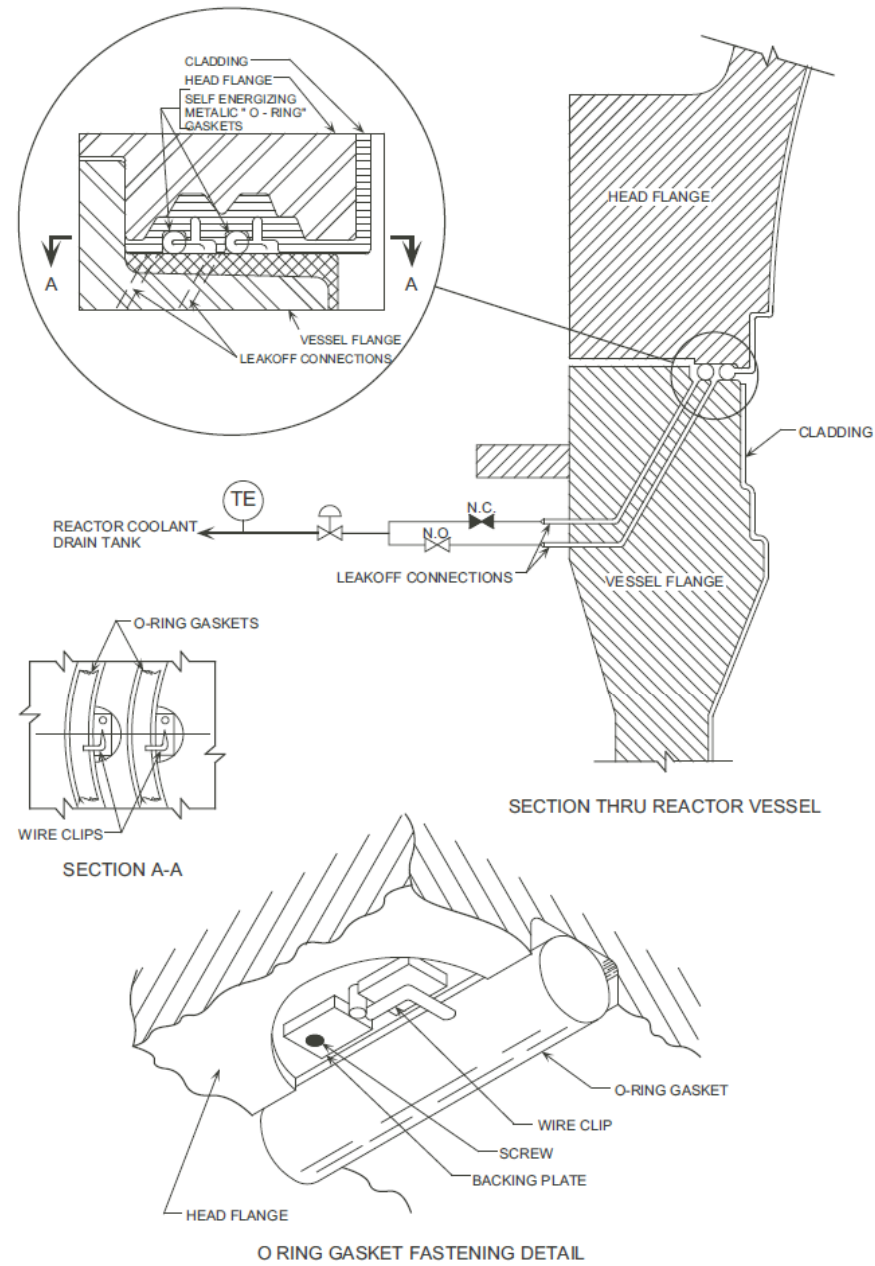
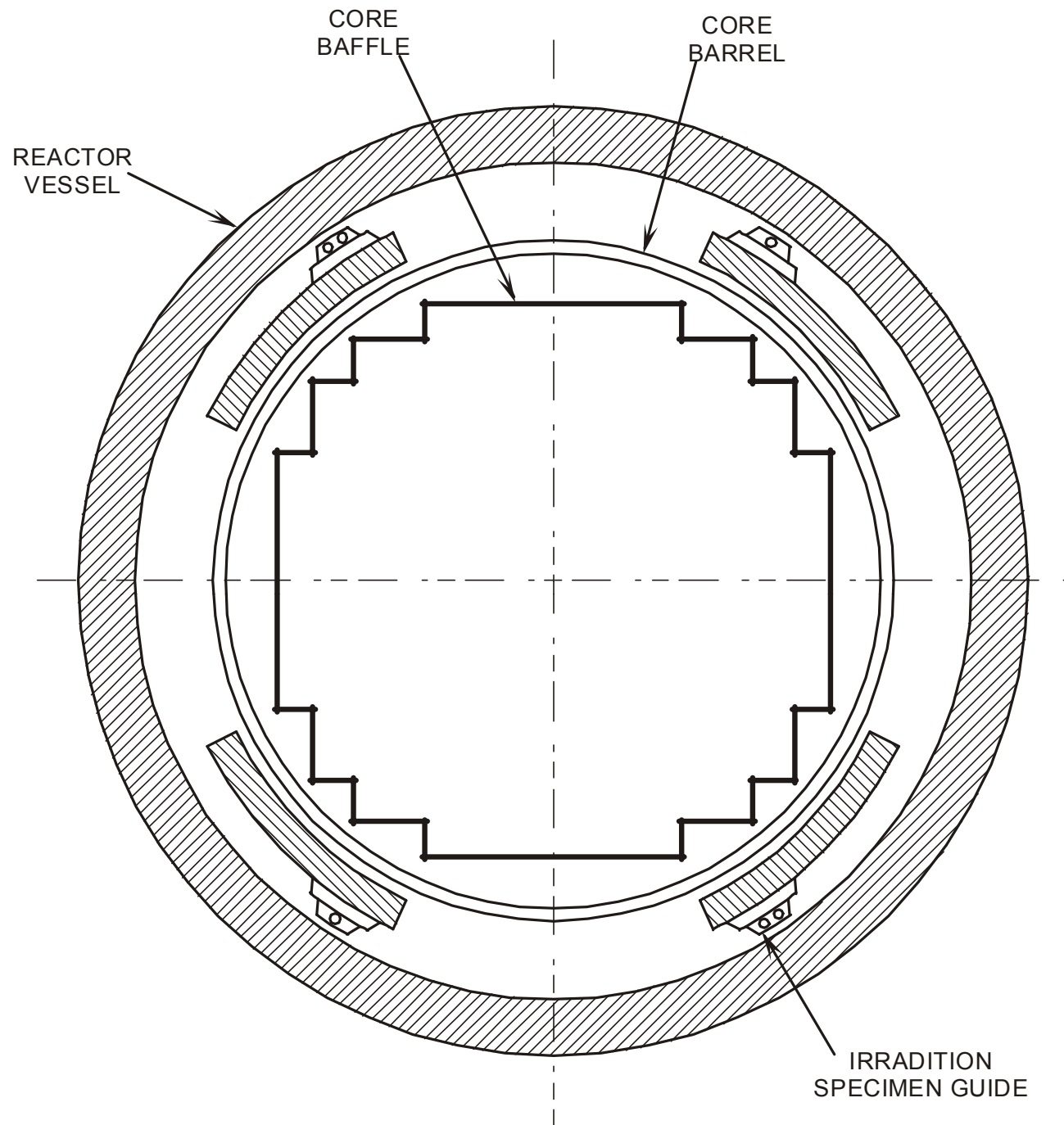


Figure 3.1-7 Reactor Vessel Seal

Fig 3.1-3



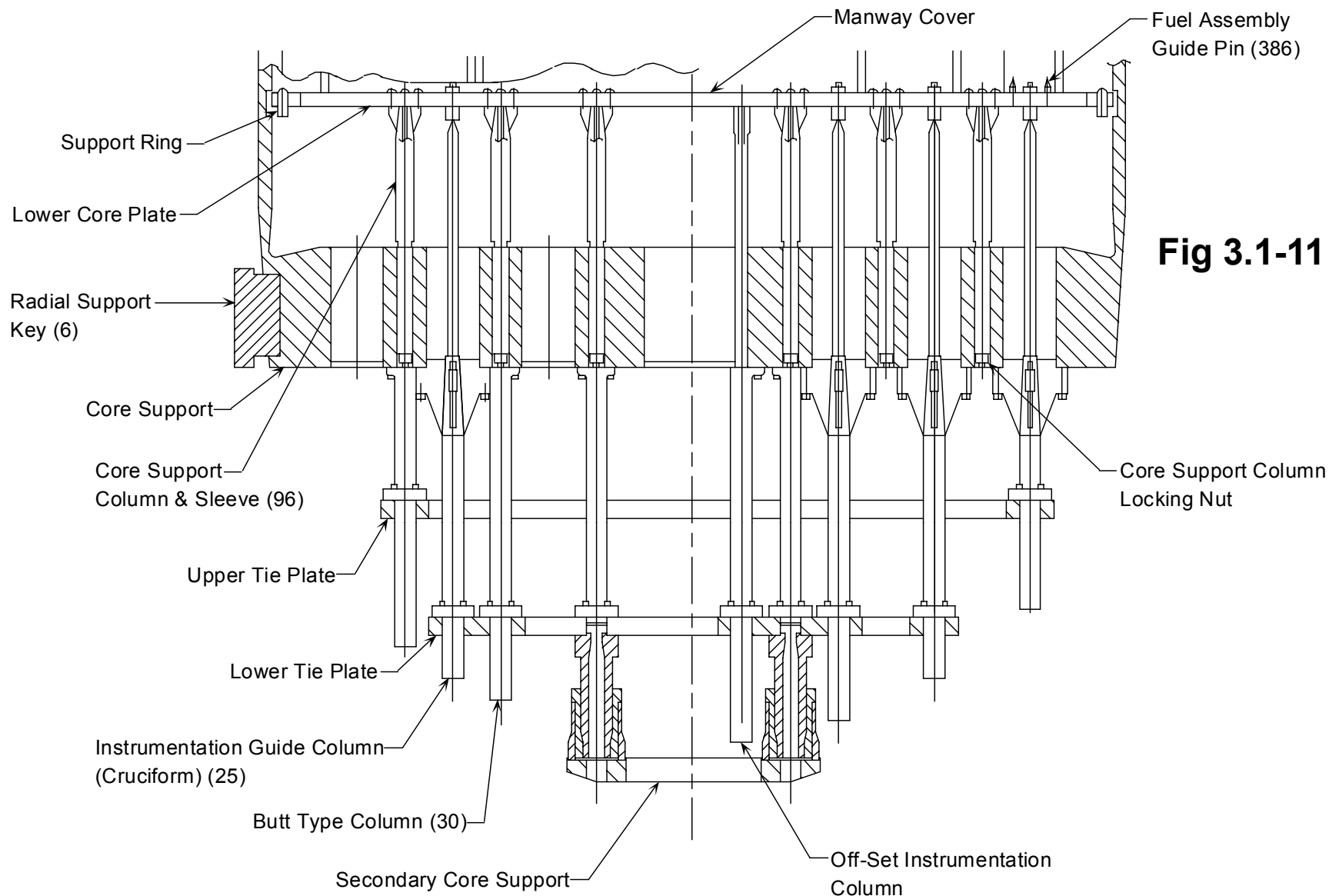


Fig 3.1-12
Upper Internals

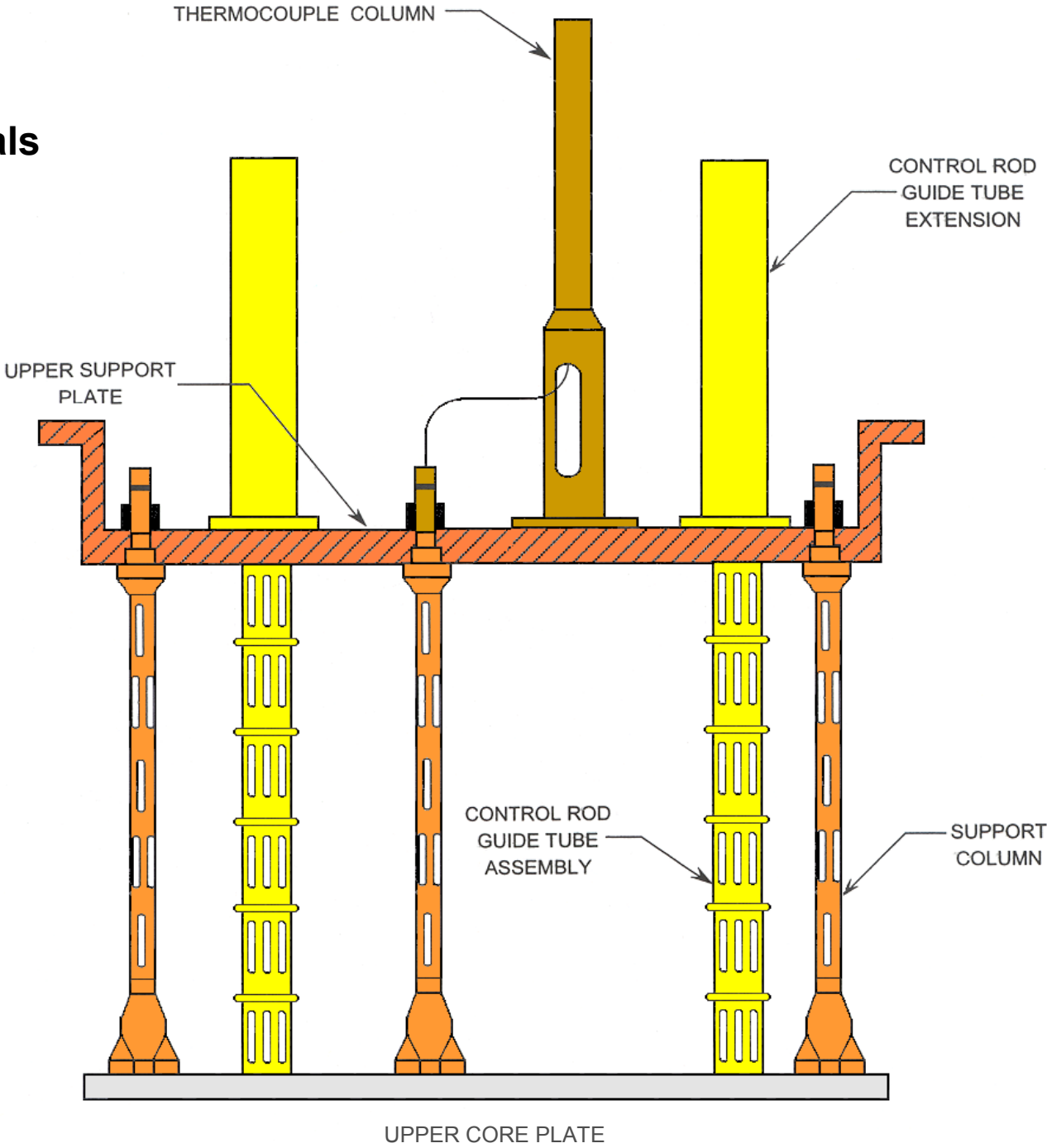


Figure 3.1-15
In-Core
Instrumentation
Support

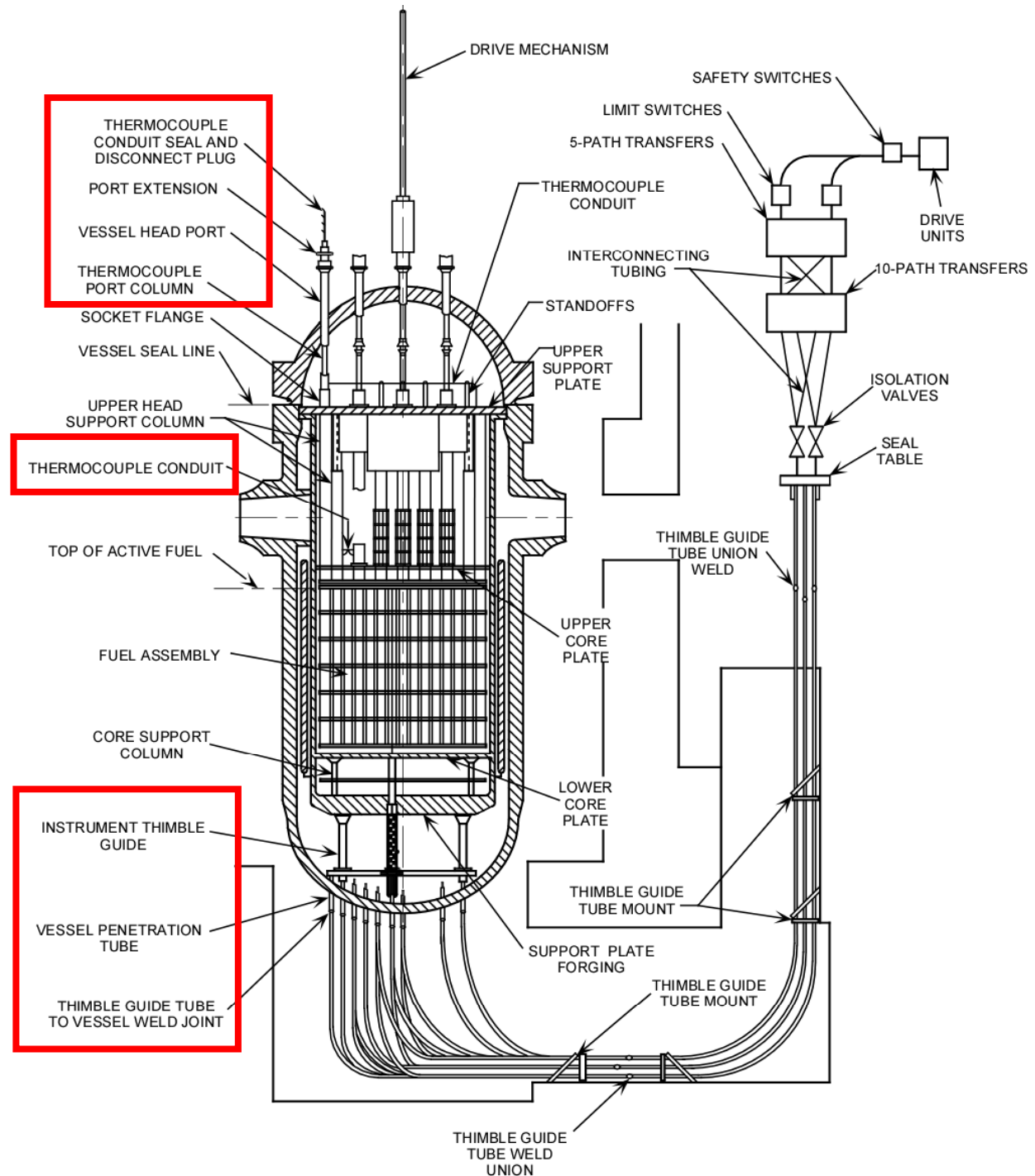


Fig 3.1-1

Internals Review

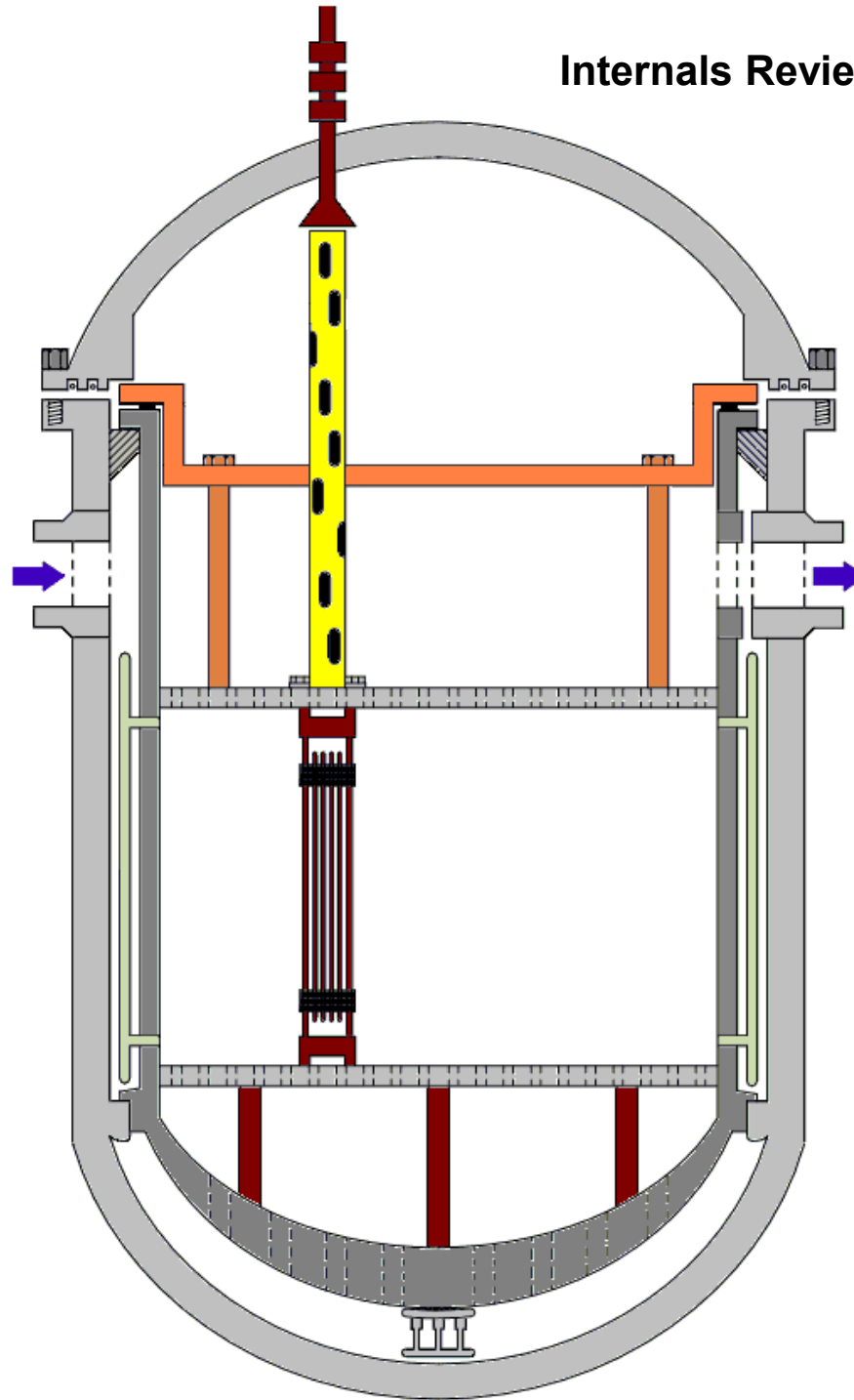
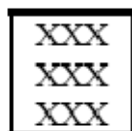


Figure 3.1-5 Core Loading

	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A
1					N02 K-05	L13 K-15 Cy 12	N19 E-04	R33	N23 J-06	N29 K-11	N08 L-04				
2			N14 D-14	R17	R14	R30	R32	N04 J-10	R07	R25	R18	R35	N18 M-14		
3		N06 B-12	D38R K-10	R37	M17 N-05	M45 G-15	L11 A-06 Cy 12	P06 G-12	M14 L-03	M48 F-15	M20 K-15	R43	F11 F-10	N13 P-12	
4		R16	R38	P28 J-12	P18 H-12	P17 D-10	Q18 E-02	P38 G-14	Q26 L-02	P34 M-10	P08 J-05	P07 M-07	R41	R10	
5	N12 M-11	R12	M19 A-10	P21 L-09	Q04 N-03	Q17 C-04	P04 G-09	P40 J-14	P19 L-11	Q21 N-04	Q01 C-03	P09 M-08	M07 E-03	R20	N15 F-06
6	N32 E-10	R28	M43 A-06	P27 F-12	Q11 M-13	F04R H-09	Q27 K-14	F07R H-10	Q07 F-14	F56R J-08	Q24 D-13	P11 K-12	M26 R-09	R29	L12 R-06 Cy 12
7	N22 K-09	R09	M15 N-11	Q20 P-11	P13 E-11	Q08 B-06	P29 G-05	N34 H-14	P25 E-09	Q15 P-06	P20 J-09	Q23 B-11	L23 F-15 Cy 12	R24	N24 D-11
8	R04	N25 F-09	P35 D-07	P42 B-07	P41 B-09	F18R F-08	N36 B-08	D12 H-13 Cy 4	N33 P-08	F05R K-08	P37 P-07	P39 P-09	P16 M-09	N21 K-07	R03
9	N11 M-05	R36	L09 K-01 Cy 12	Q28 P-05	P03 G-07	Q22 B-10	P33 L-07	N-35 H-02	P02 J-11	Q14 P-10	P24 L-05	Q19 B-05	M36 C-05	R21	N26 F-07
10	L20 A-10 Cy 12	R01	M47 A-07	P23 F-04	Q09 M-03	F03R G-08	Q13 K-02	F02R H-06	Q06 F-02	F21 H-07	Q10 D-03	P15 K-04	M18 R-10	R27	N27 I-06
11	N20 L-10	R15	M05 L-13	P01 D-08	Q03 N-13	Q05 C-12	P22 E-05	P44 G-02	P05 J-07	Q12 N-12	Q02 C-13	P32 E-07	M38 R-06	R08	N09 D-05
12		R11	R40	P26 D-09	P30 G-11	P36 D-06	Q16 E-14	P43 J-02	Q25 L-14	P12 M-06	P14 H-04	P10 G-04	R39	R19	
		N10 B-04	F30 F-06	R44	M30 F-01	M32 K-01	M46 E-13	P31 J-04	L30 R-10 Cy 12	M04 J-01	M24 C-11	R42	F19R K-06	N05 P-04	
			N16 D-02	R05	R23	R26	R02	N28 G-06	R22	R13	R31	R06	N07 M-02		
					N03 E-12	N31 F-05	N30 G-10	R34	N17 L-12	L01 F-01 Cy 12	N01 F-11				



Assembly Identity
Position in Previous Cycle
Discharge Cycle of Reinserts

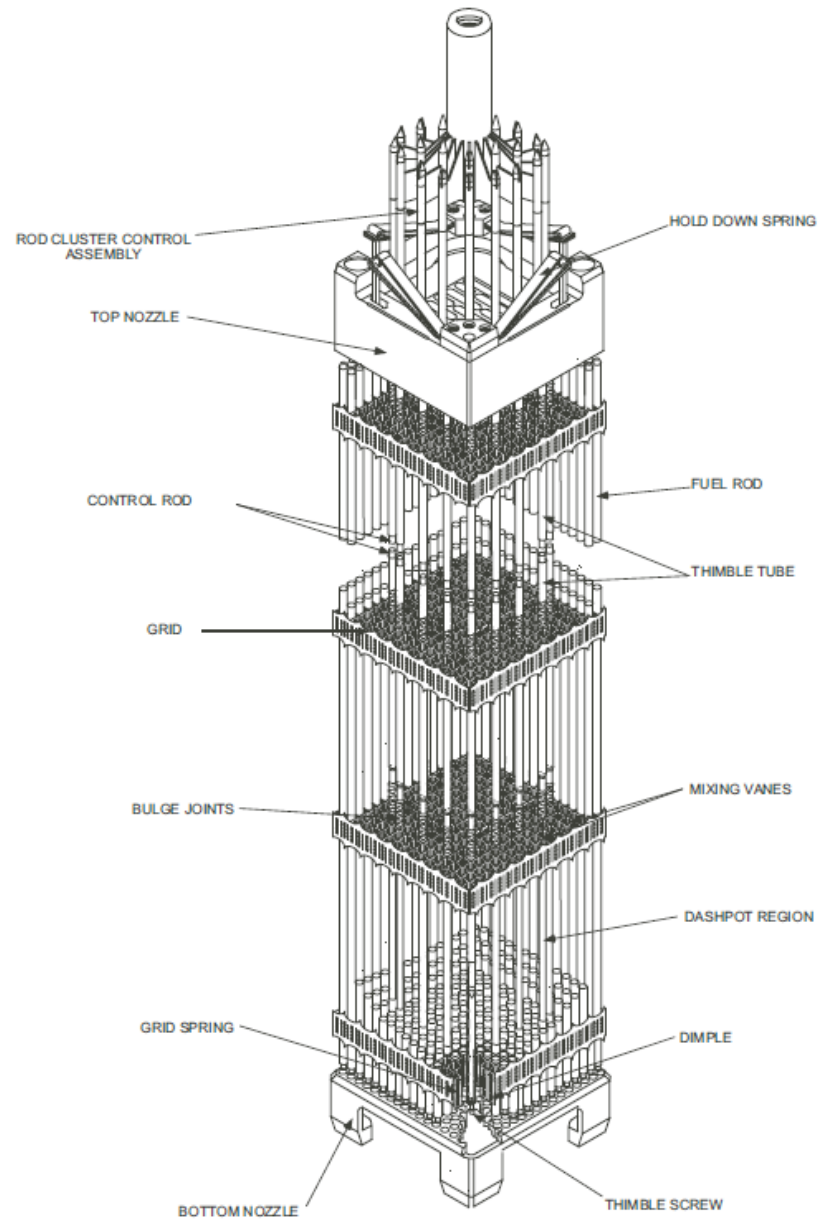
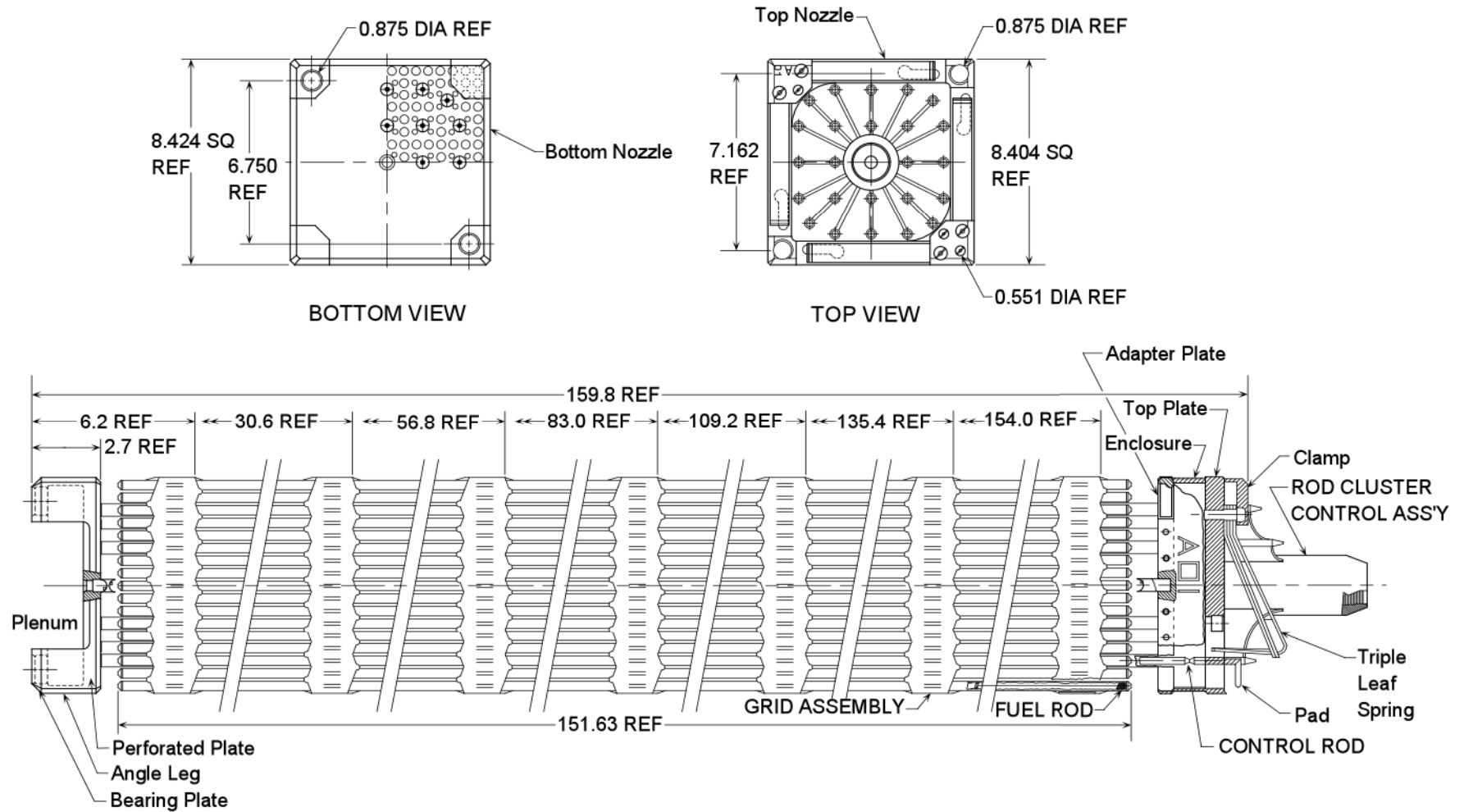


Figure 3.1-16 Fuel Assembly and RCCA Cutaway

Fig 3.1-18



NOTE: ALL DIMENSIONS ARE IN INCHES.

Fig 3.1-20

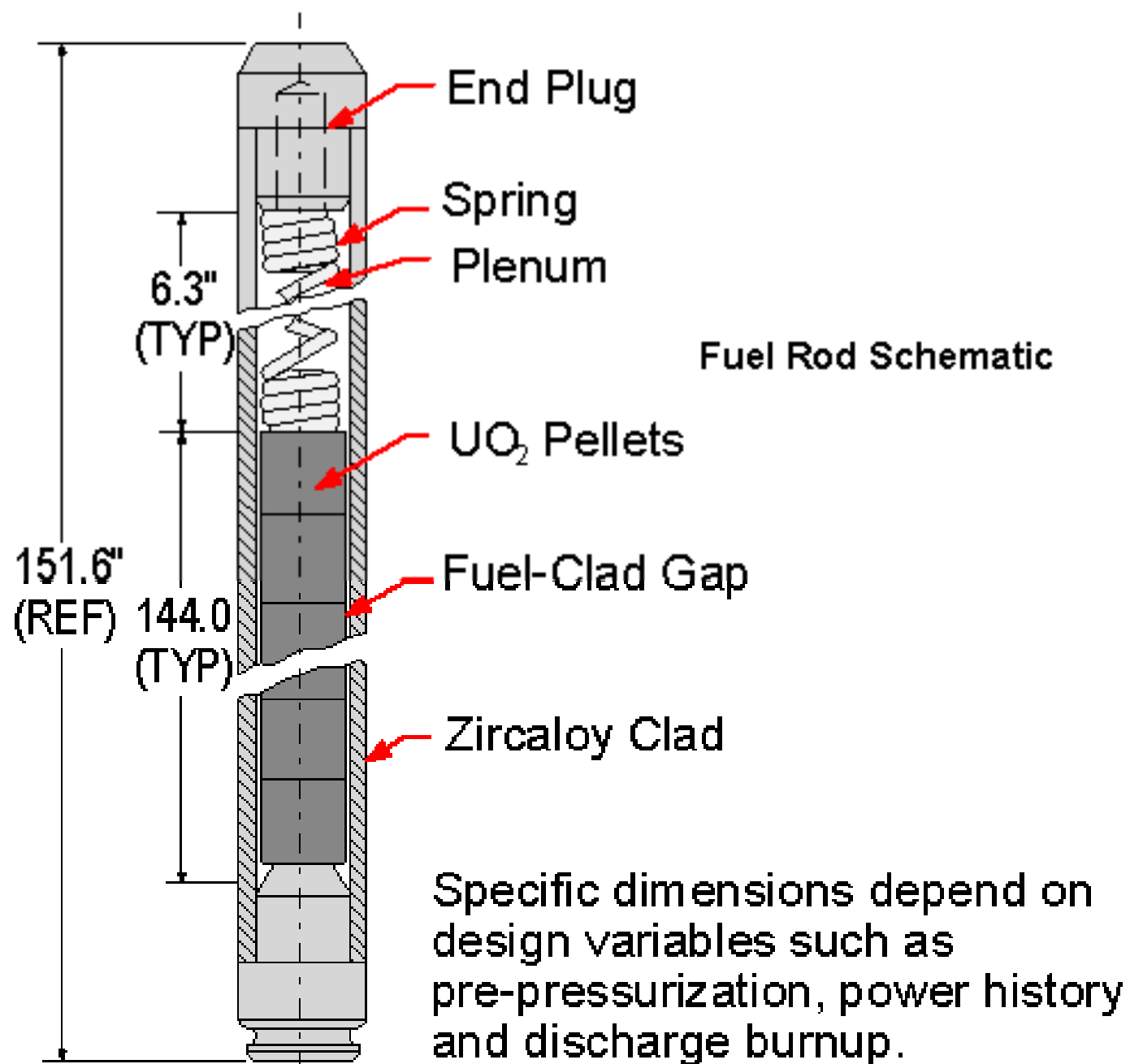


Fig 3.1-21

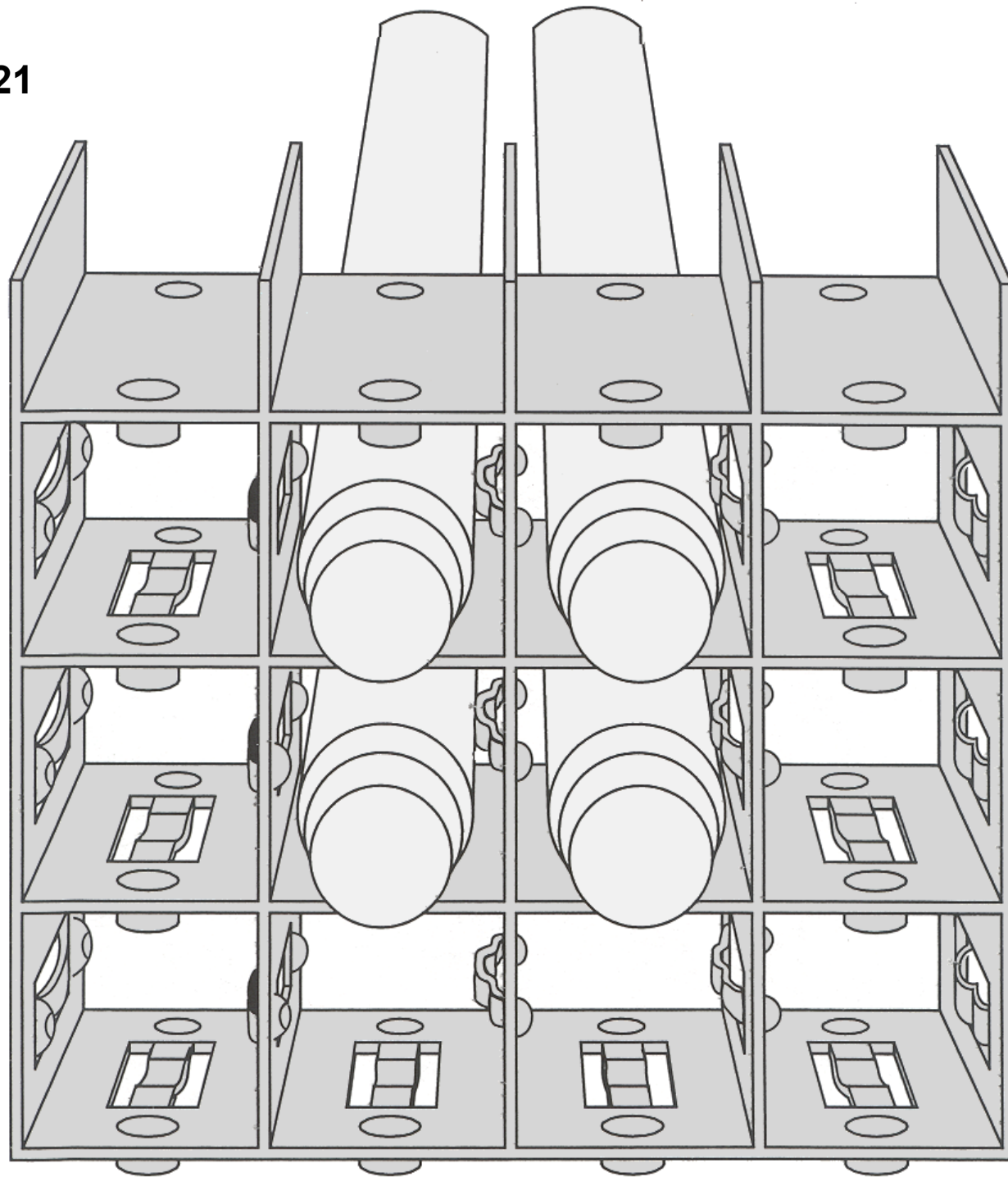


Fig 3.1-22
Spring Grid Clip
Assembly

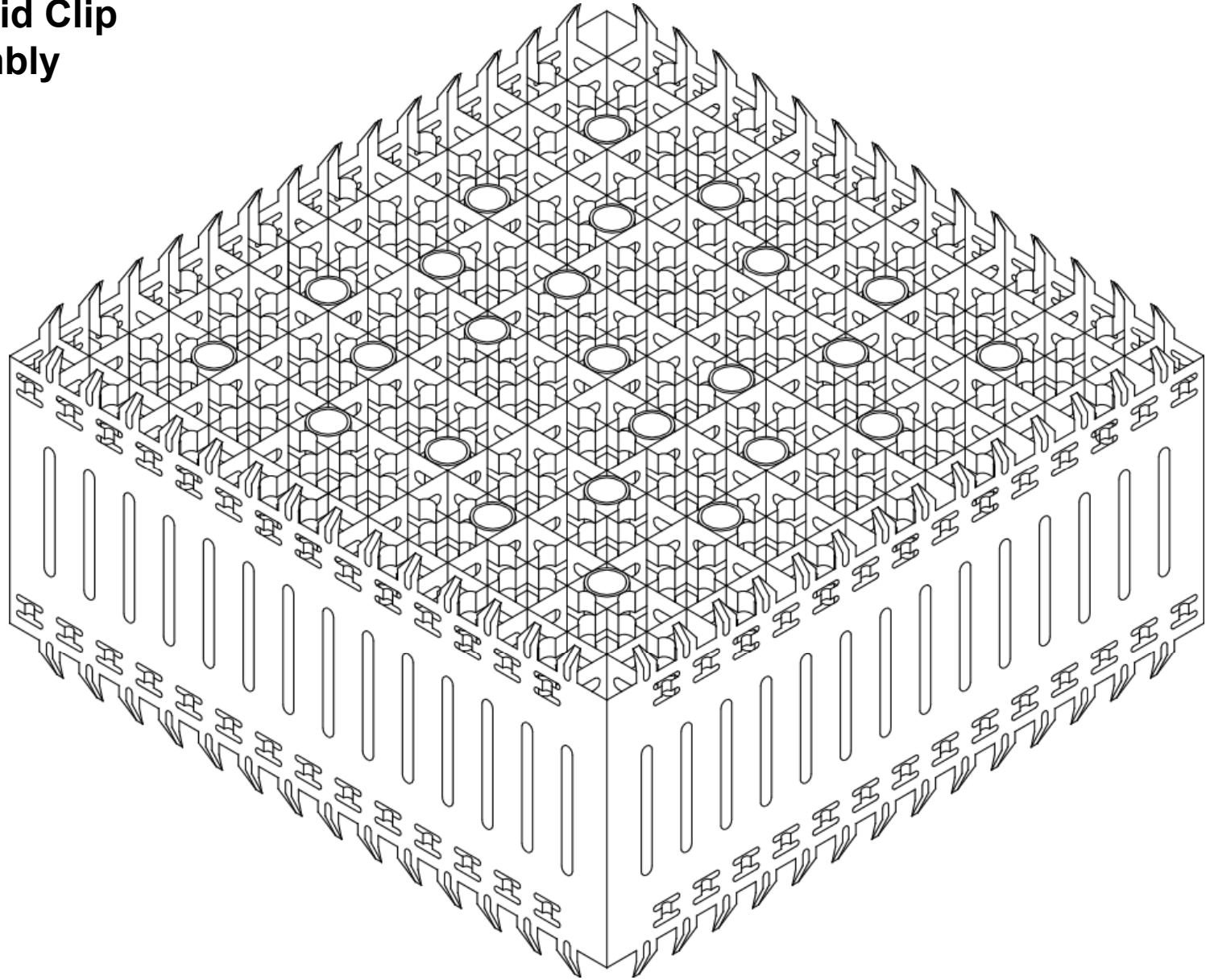
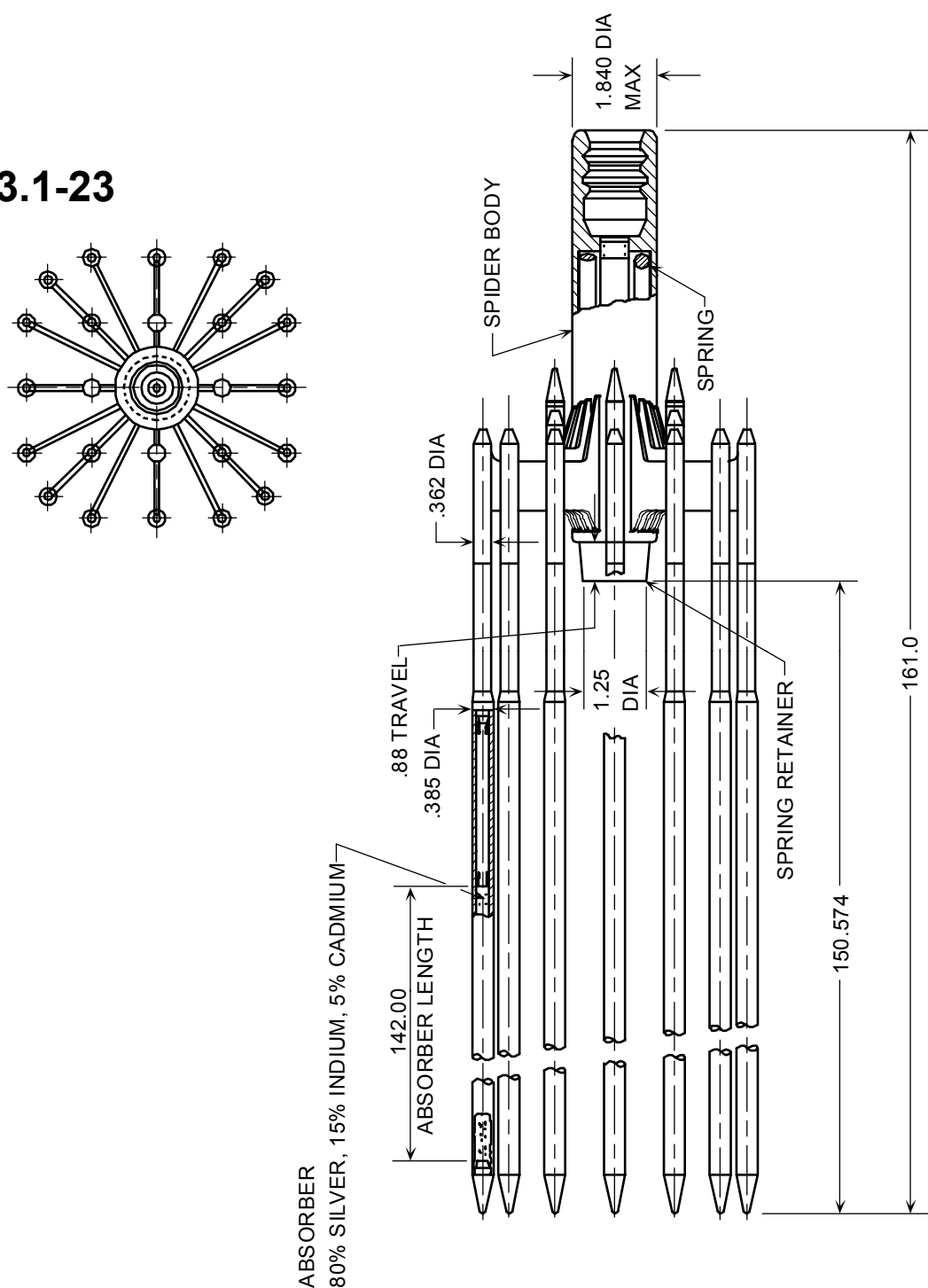


Fig 3.1-23



NOTE: ALL DIMENSIONS ARE IN INCHES.

Fig 3.1-24

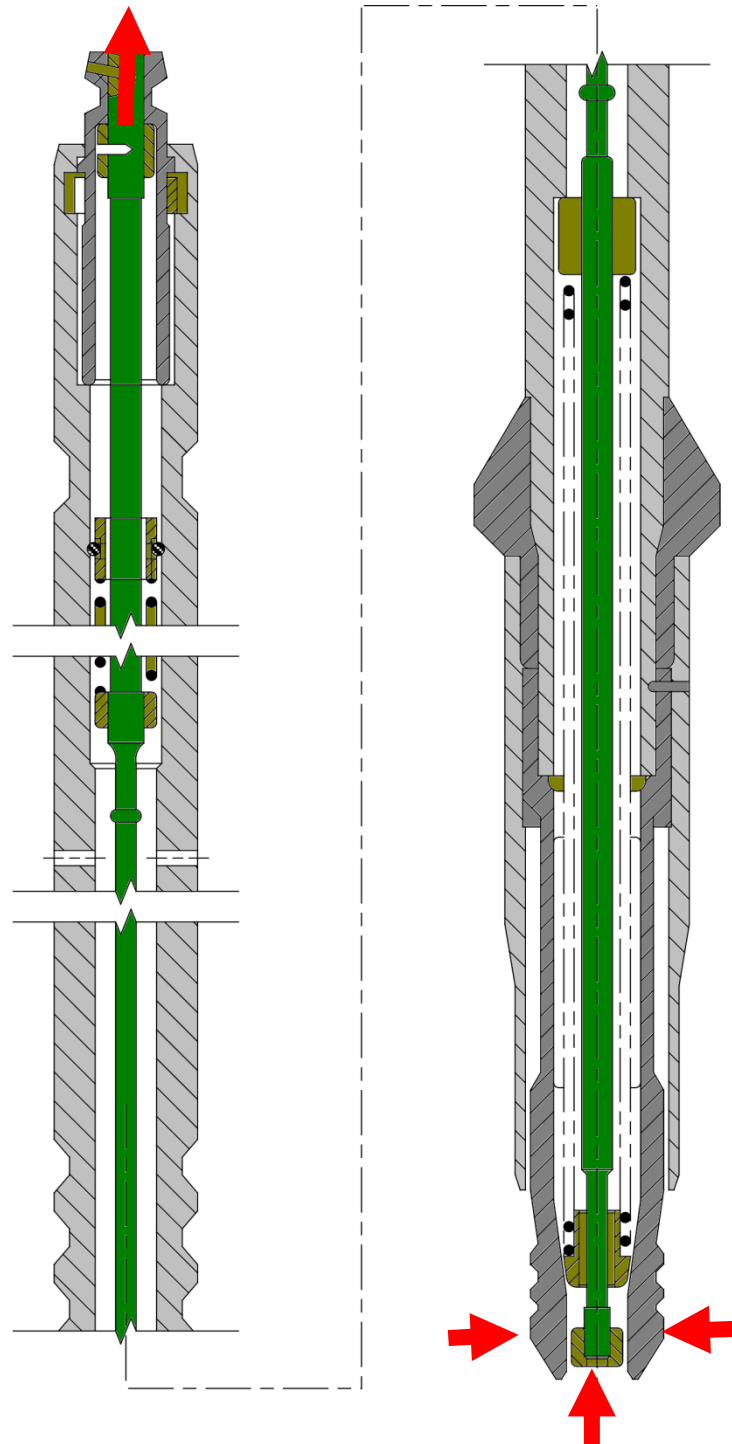


Fig 3.1-25

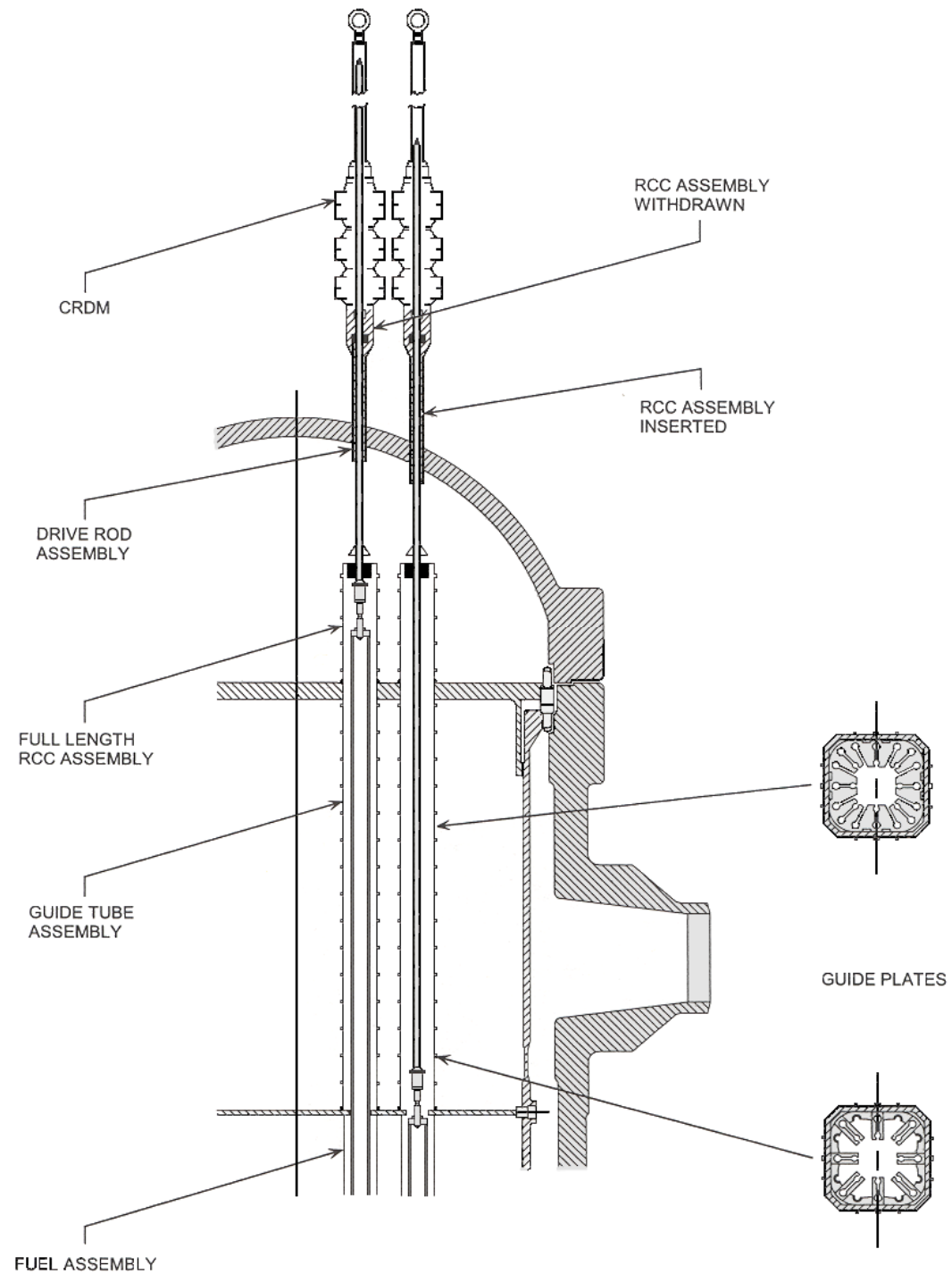


Fig 3.1-32

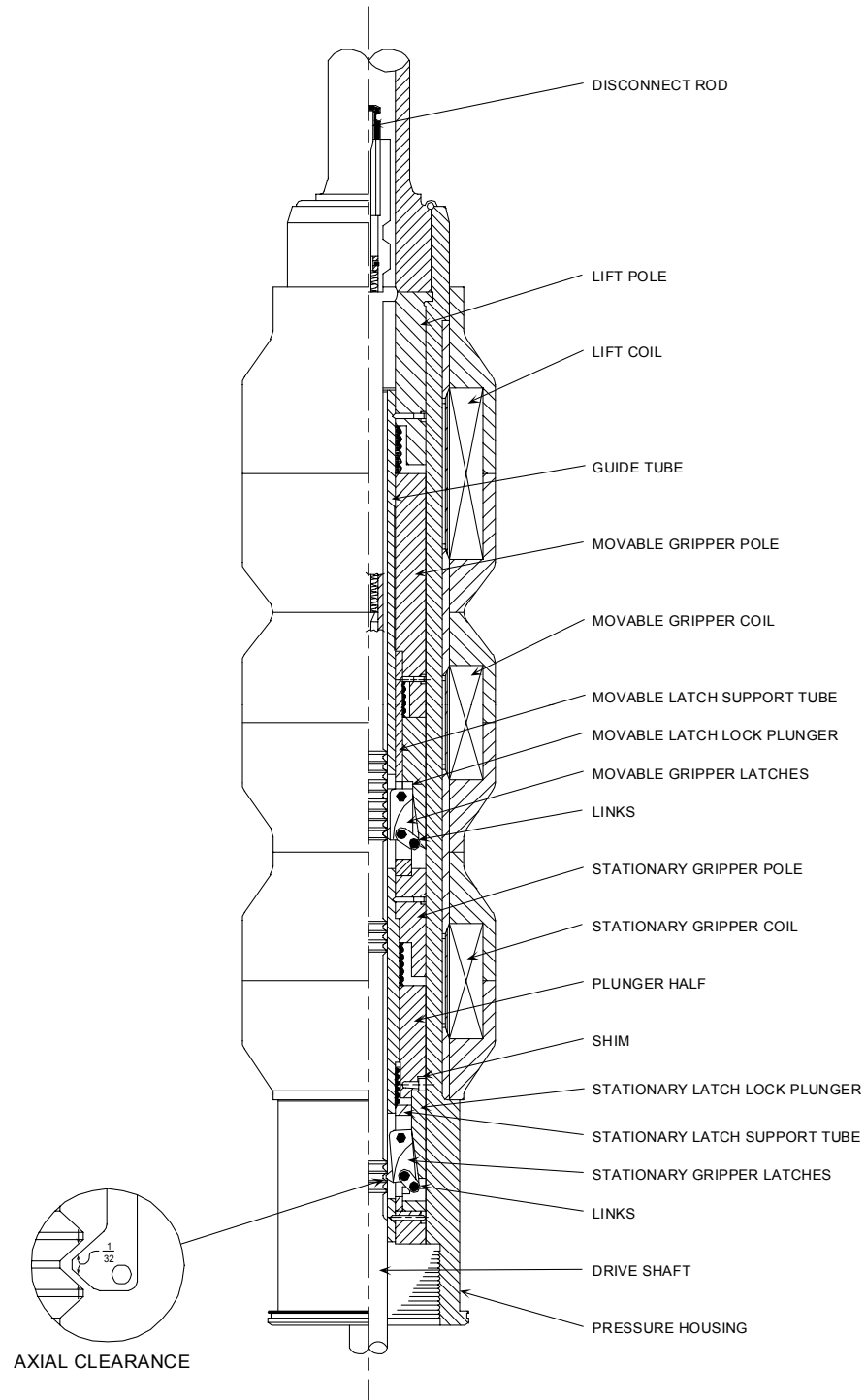
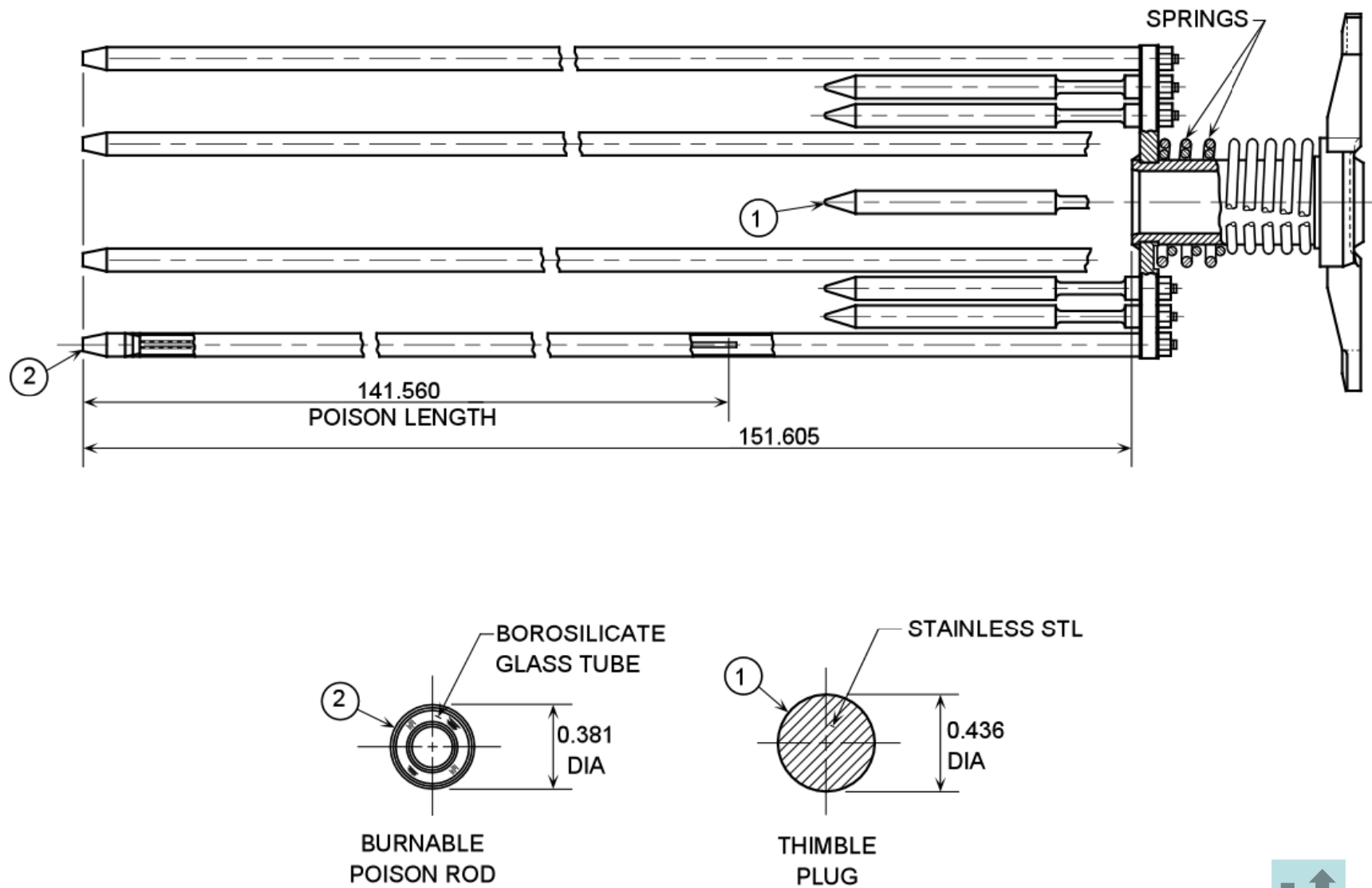


Fig. 3.1-26
Burnable Poison Rod



NOTE: ALL DIMENSIONS ARE IN INCHES.



Fig. 3.1-27
Burnable Poison Rod

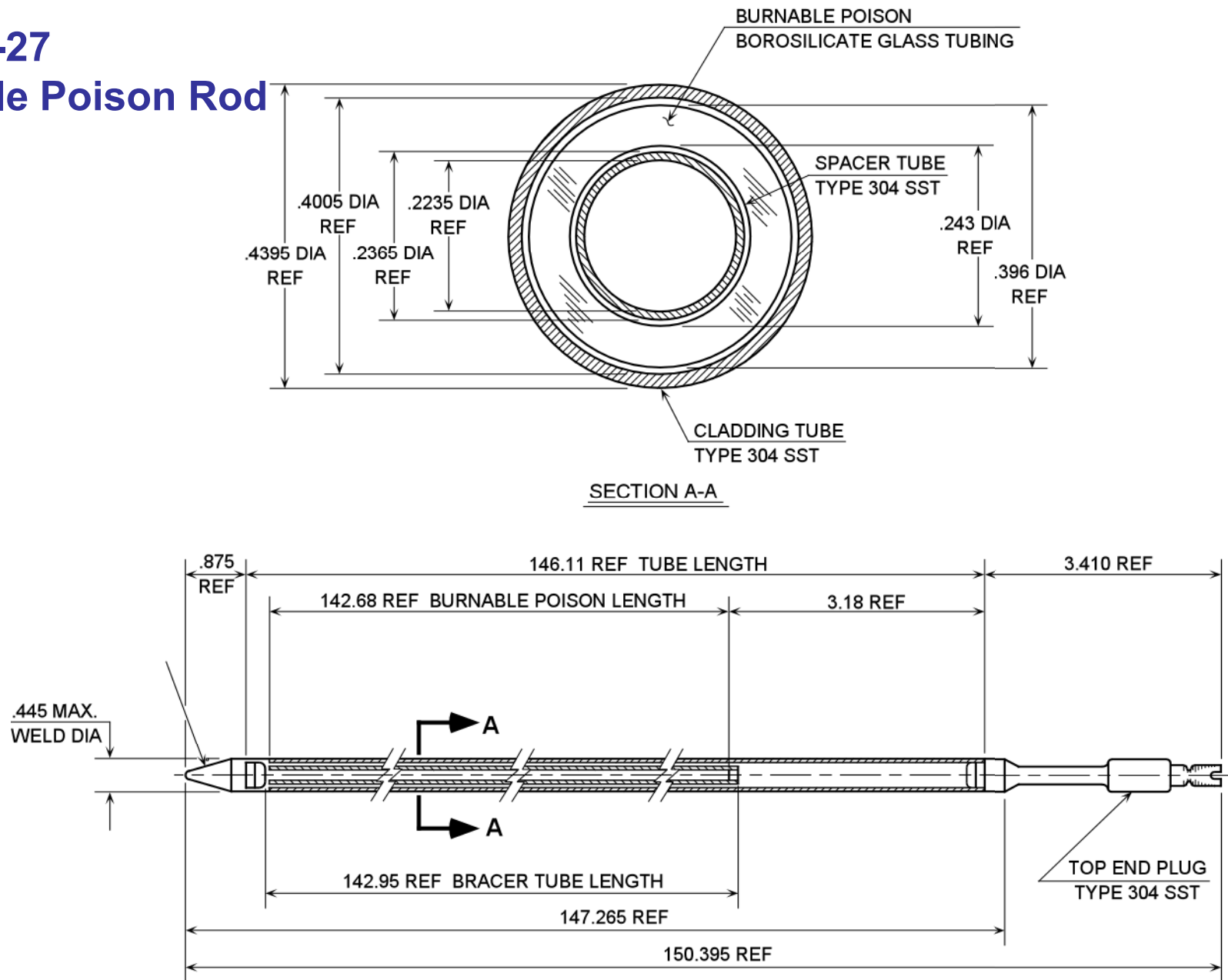


Fig. 3.1-28
Burnable Poison Rod
(WABA)

3rd Possible Burnable
Poison: IFBA
(Coating on fuel pellets;
Not pictured)

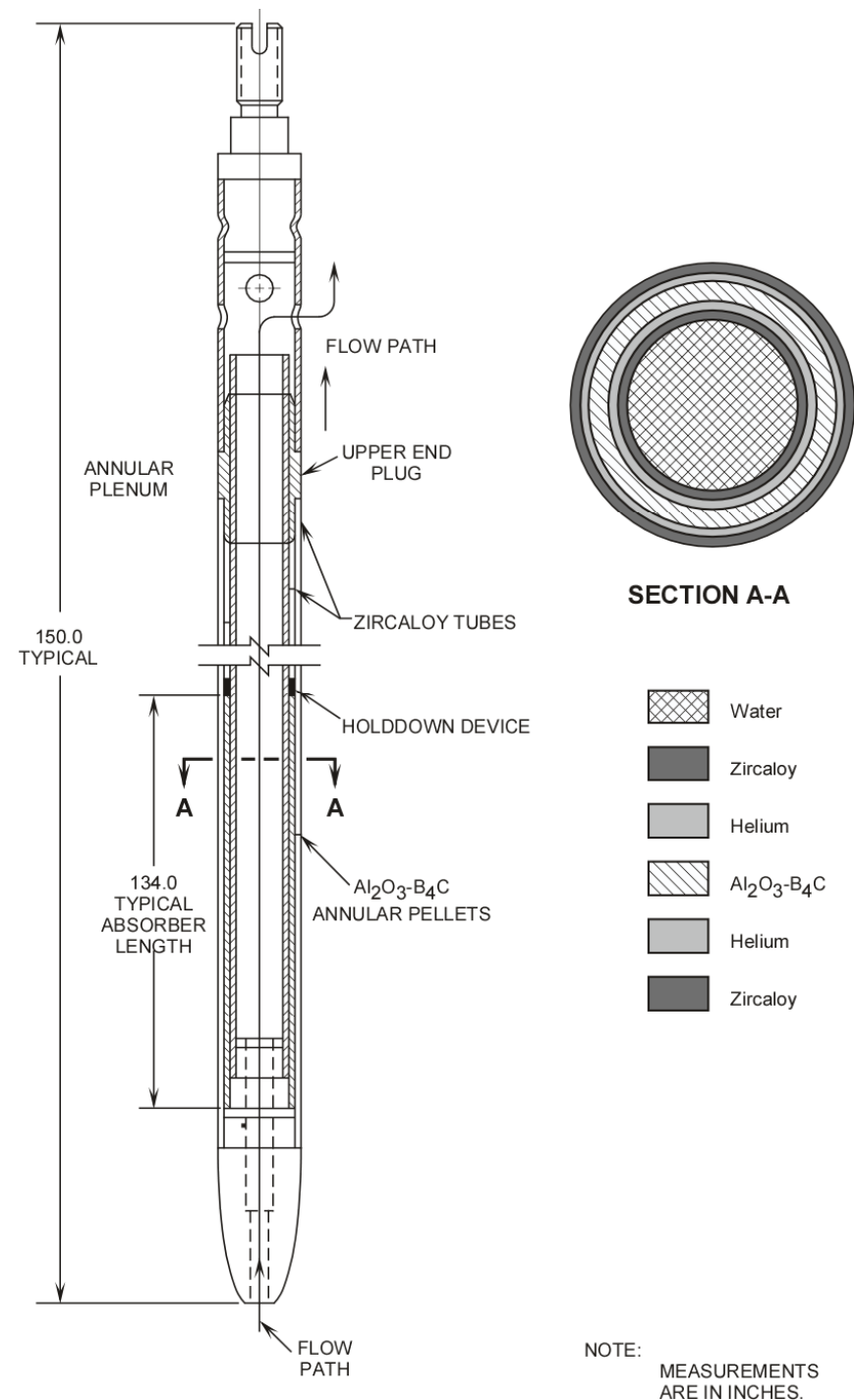
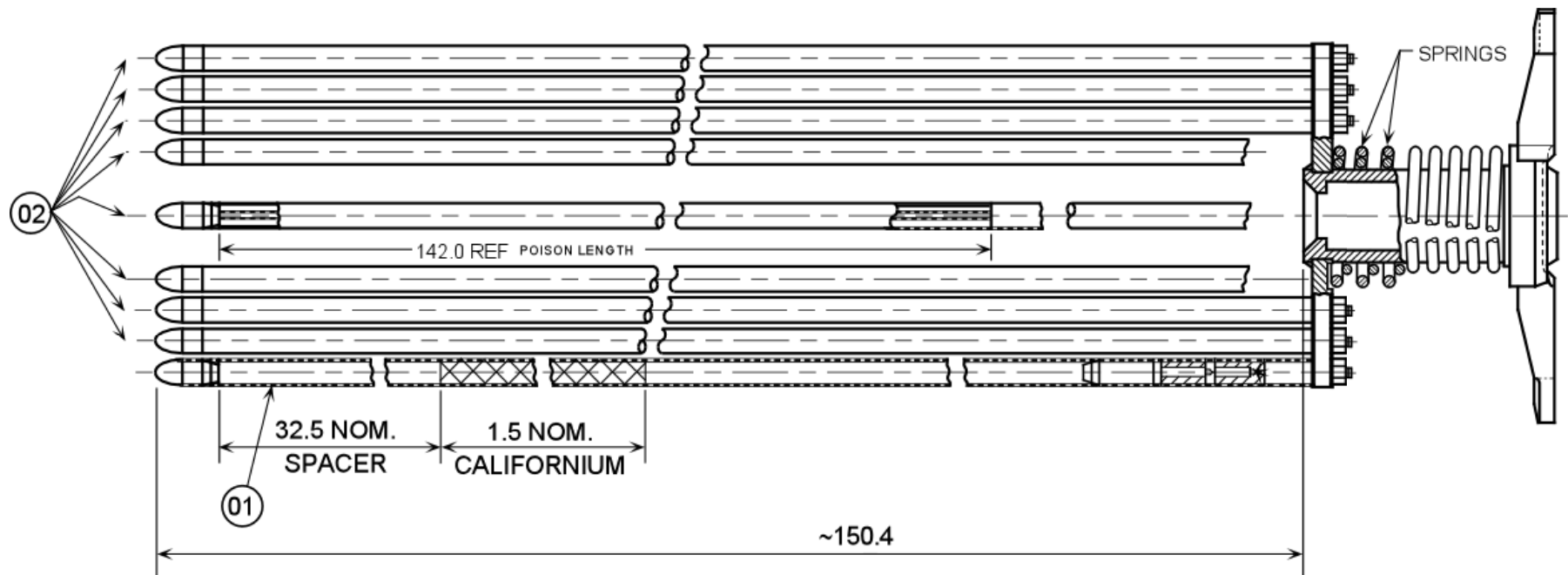
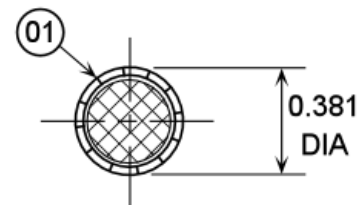


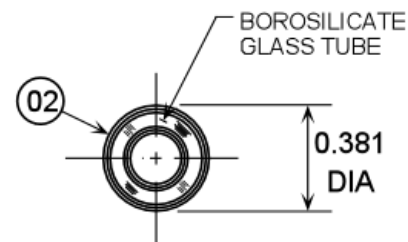
Fig. 3.1-29
Primary Source Assembly



NOTE: ALL DIMENSIONS ARE IN INCHES

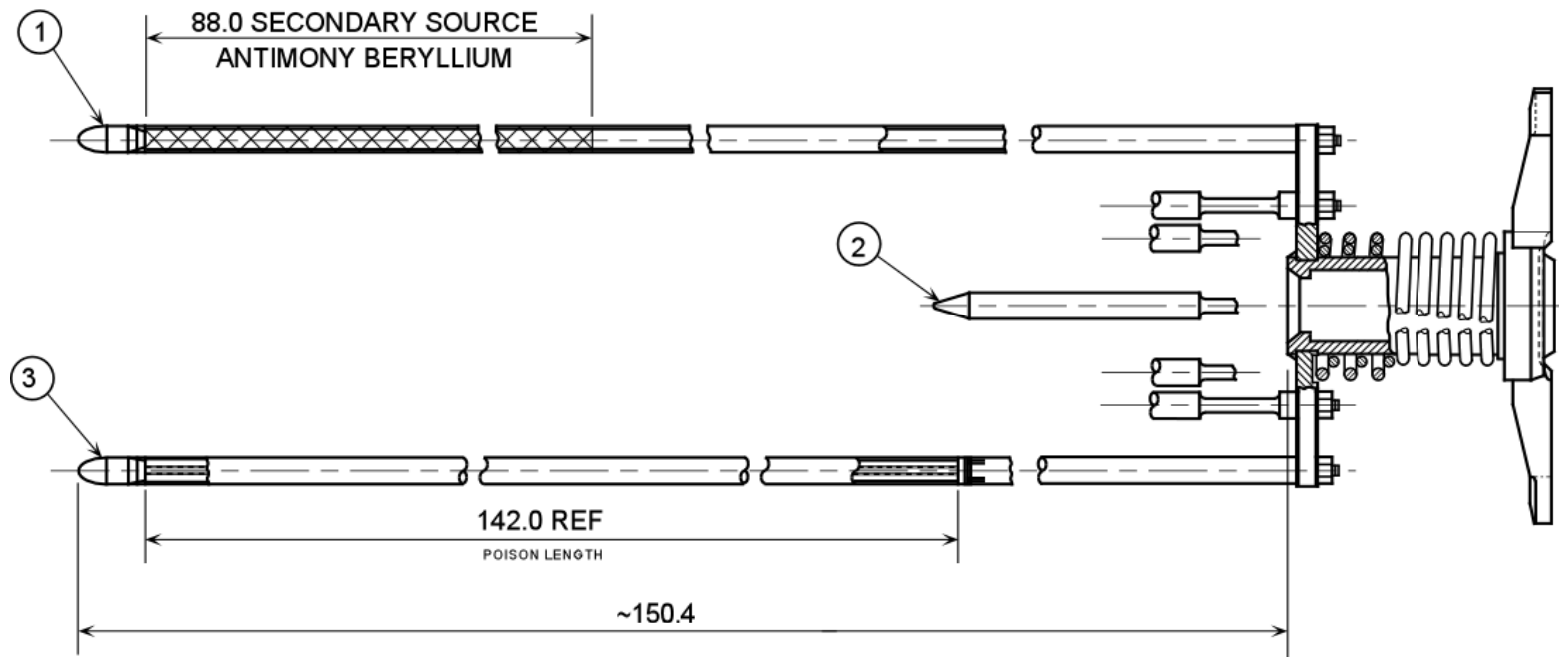


PRIMARY SOURCE

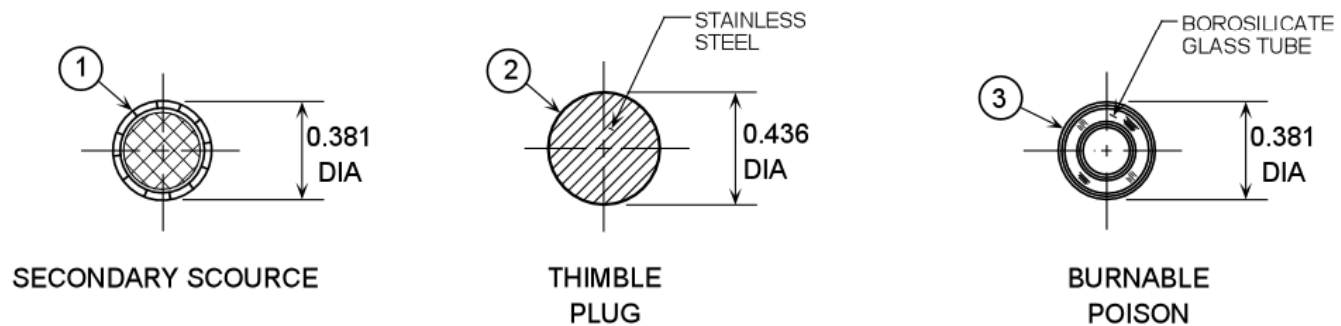


BURNABLE POISON

Fig. 3.1-30 Secondary Source Assembly



NOTE: ALL DIMENSIONS ARE IN INCHES



Secondary Source Neutron Generation

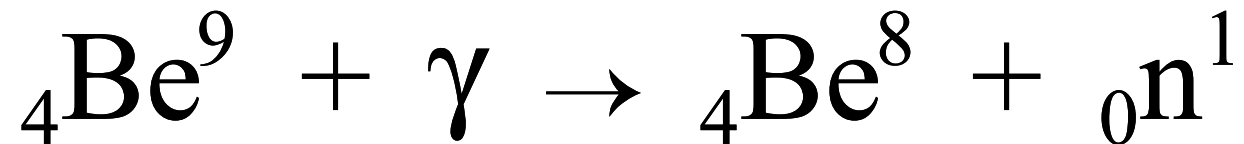
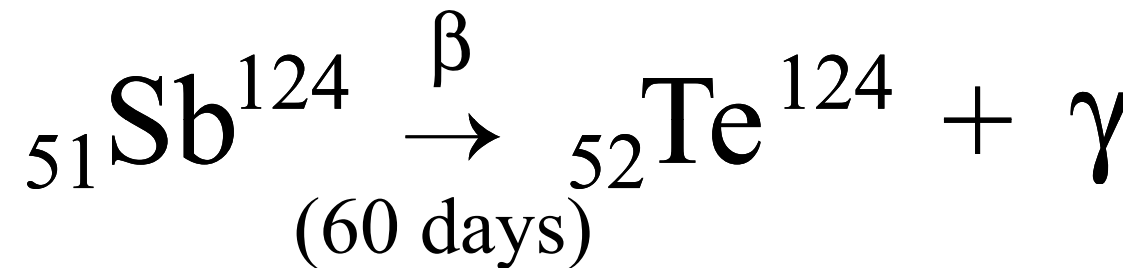
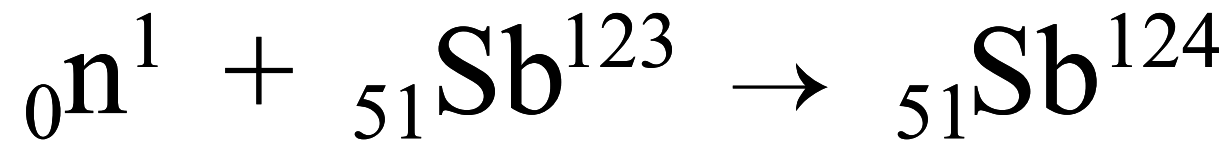
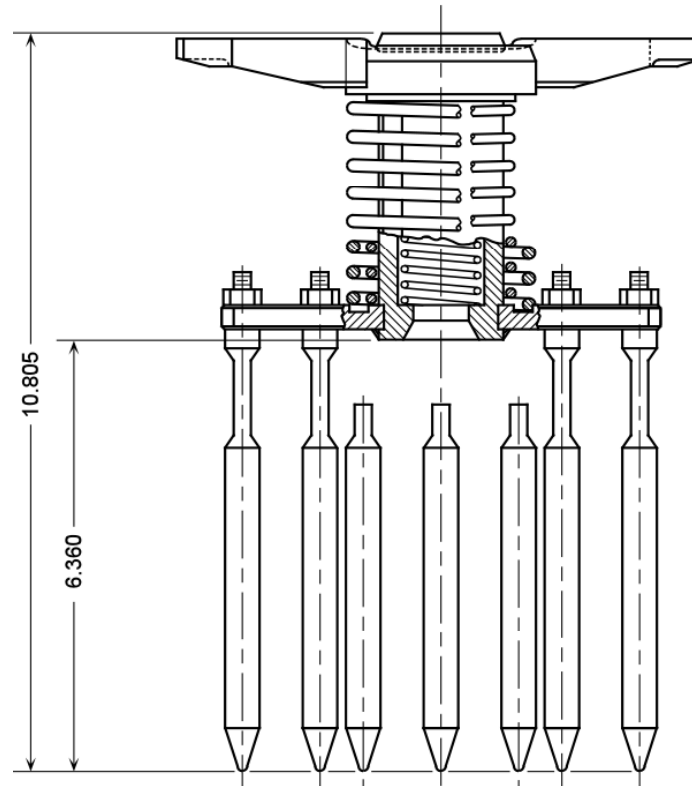
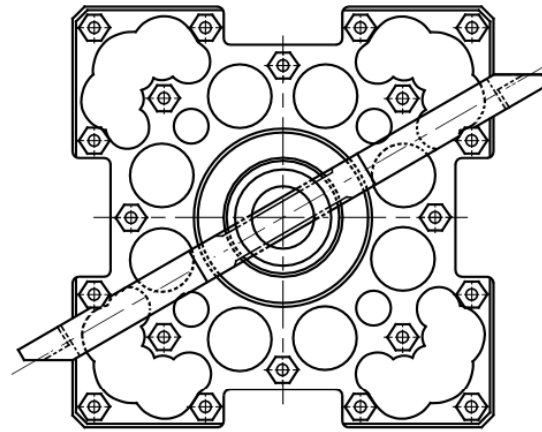


Fig. 3.1-31
Thimble Plug Assembly



NOTE: ALL DIMENSIONS ARE IN INCHES.



Fig. 3.1-2

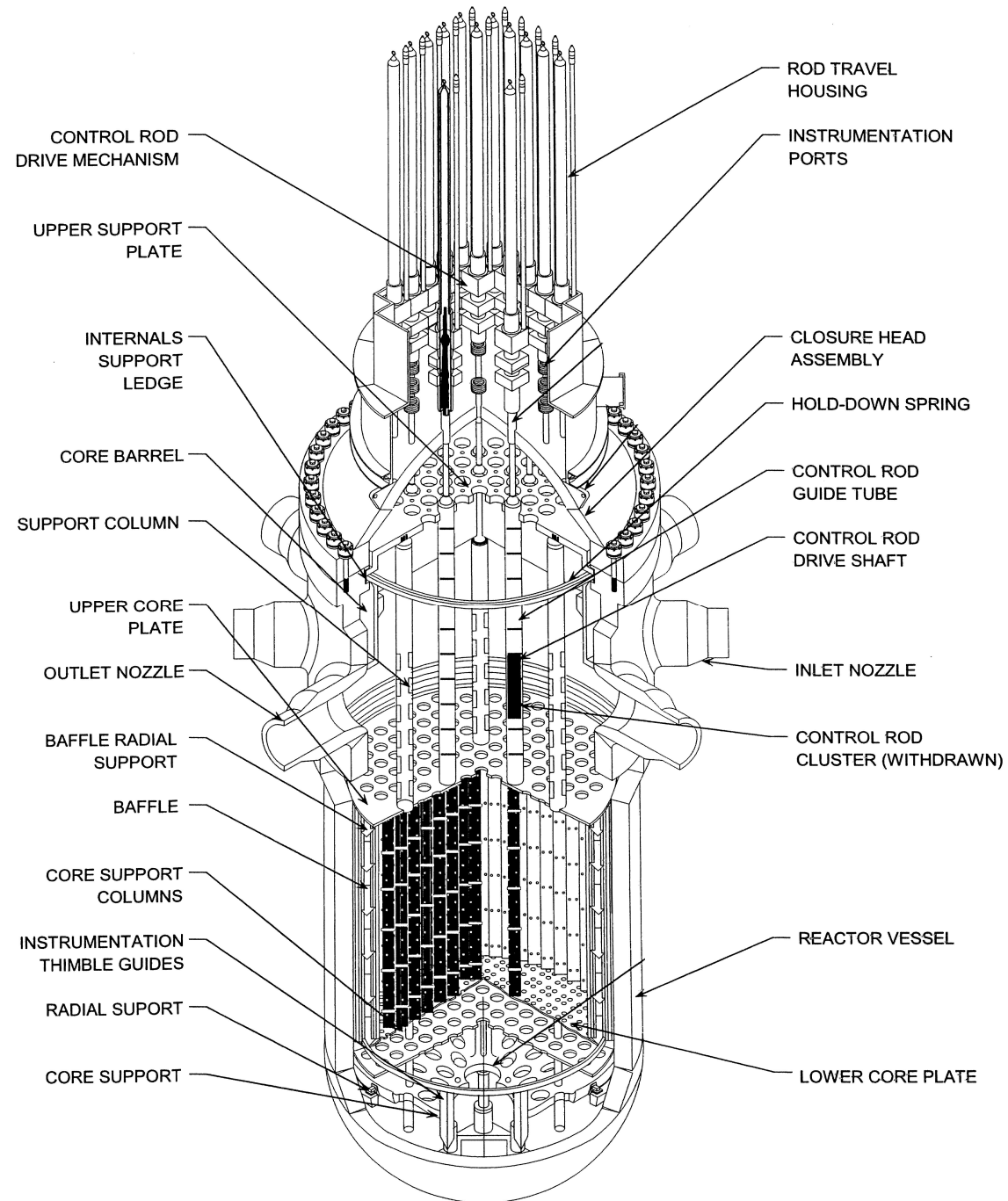
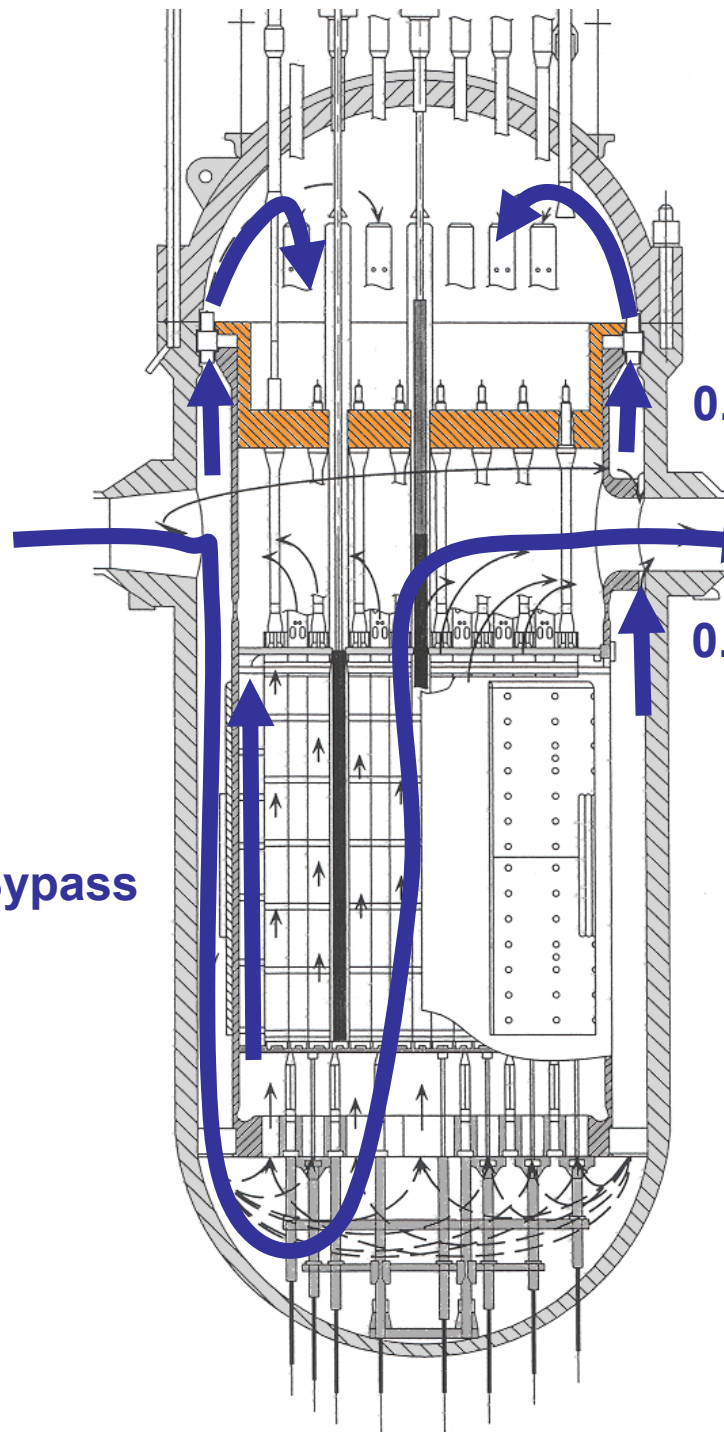


Fig 3.1-34

1.84% Baffle Bypass



Vessel Flow paths

0.13% Upper Head Bypass

93.5% Core Cooling

0.68% Nozzle Bypass

**Remaining 3.85% is RCCA
guide thimble bypass flow**

