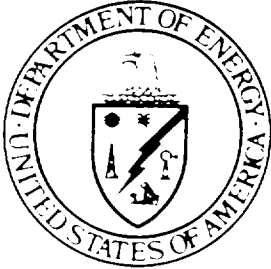


Office of Civilian Radioactive Waste Management



**CHARACTERISTICS OF SPENT FUEL,
HIGH-LEVEL WASTE, AND OTHER
RADIOACTIVE WASTES WHICH MAY
REQUIRE LONG-TERM ISOLATION**

**Appendix 2A. Physical Descriptions of
LWR Fuel Assemblies**

DECEMBER 1987

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

APPENDIX 2A

PHYSICAL DESCRIPTIONS OF LWR FUEL ASSEMBLIES

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INTRODUCTION

This appendix includes a four-page Physical Description report for each assembly type identified from the current data. Where available, a drawing of an assembly follows the appropriate Physical Description report. If no drawing is available for an assembly, a cross-reference to a similar assembly is provided if possible.

For Advanced Nuclear Fuels, Babcock & Wilcox, Combustion Engineering, and Westinghouse assemblies, information was obtained via subcontracts with these fuel vendors. Data for some assembly types are not available. For such assemblies, the information shown in this report was obtained from the open literature and by inference from reload fuels made by other vendors. Efforts to obtain additional information are continuing.

Individual Physical Description reports can be generated interactively through the menu-driven LWR Assemblies Data Base system. These reports can be viewed on the screen or directed to a printer. Special reports and compilations of specific data items can be produced on request. Examples of such special reports are shown on the pages 2A-9 through 2A-16.

Comments and requests are welcome. Please contact:

K. J. Notz
Oak Ridge National Laboratory
P. O. Box X
Oak Ridge, Tennessee 37831
(615) 574-6632 or FTS-624-6632

2A-7

EXAMPLES OF
SPECIAL REPORTS

CURRENTLY LISTED ASSEMBLIES

PRESSURIZED WATER REACTOR ASSEMBLIES

<u>Assembly Manufacturer</u>	<u>Array Size</u>	<u>Version</u>
Babcock & Wilcox	14 X 14	
Babcock & Wilcox	15 X 15	Mark B
Babcock & Wilcox	15 X 15	St.Stl.
Babcock & Wilcox	15 X 15	Mark BZ
Babcock & Wilcox	17 X 17	Mark C
Combustion Engineering	14 X 14	Std
Combustion Engineering	14 X 14	Ft.Cal.
Combustion Engineering	15 X 15	Palis.
Combustion Engineering	16 X 16	Onofre
Combustion Engineering	16 X 16	Lucie 2
Combustion Engineering	16 X 16	ANO2
Combustion Engineering	16 X 16	SYS80
Combustion Engineering	15 X 16	Yankee
Exxon / ANF	14 X 14	WE
Exxon / ANF	14 X 14	CE
Exxon / ANF	14 X 14	TOP ROD
Exxon / ANF	15 X 15	WE
Exxon / ANF	15 X 15	CE
Exxon / ANF	15 X 16	WE
Exxon / ANF	17 X 17	WE
Westinghouse	13 X 13	
Westinghouse	14 X 14	Std/ZCA
Westinghouse	14 X 14	OFA
Westinghouse	14 X 14	Std/ZCB
Westinghouse	14 X 14	Std/SC
Westinghouse	14 X 14	Model C
Westinghouse	15 X 15	Std/ZC
Westinghouse	15 X 15	OFA
Westinghouse	15 X 15	Std/SC
Westinghouse	15 X 16	
Westinghouse	17 X 17	Std
Westinghouse	17 X 17	OFA
Westinghouse	17 X 17	Vant 5
Westinghouse	17 X 17	XLR

CURRENTLY LISTED ASSEMBLIES

BOILING WATER REACTOR ASSEMBLIES

<u>Assembly Manufacturer</u>	<u>Array Size</u>	<u>Version</u>
Allis Chalmers	10 X 10	
Exxon / ANF	6 X 6	GE
Exxon / ANF	6 X 6	HUM.BAY
Exxon / ANF	7 X 7	GE
Exxon / ANF	8 X 8	JP-3
Exxon / ANF	8 X 8	JP-4,5
Exxon / ANF	9 X 9	JP-3
Exxon / ANF	9 X 9	JP-4,5
Exxon / ANF	9 X 9	BRP
Exxon / ANF	10 X 10	AC
Exxon / ANF	11 X 11	GE
Exxon / ANF	14 X 14	Ft. Cal
General Electric	6 X 6	DRES-1
General Electric	6 X 6	HUM.BAY
General Electric	7 X 7	/2,3:V1
General Electric	7 X 7	/2,3:V2
General Electric	7 X 7	/4,5
General Electric	7 X 7	HUM.BAY
General Electric	8 X 8	/2,3
General Electric	8 X 8	/4,5:V1
General Electric	8 X 8	/4,5:V2
General Electric	9 X 9	BRP
General Electric	11 X 11	BRP
Westinghouse	8 X 8	QUAD+

ASSEMBLY PHYSICAL DIMENSIONS

PRESSURIZED WATER REACTOR ASSEMBLIES

<u>Assembly Manufacturer</u>	<u>Array Size</u>	<u>Version</u>	<u>Assembly Length (inches)</u>	<u>Assembly Width (inches)</u>
Babcock & Wilcox	14 X 14			
Babcock & Wilcox	15 X 15	Mark B	165.625	8.536
Babcock & Wilcox	15 X 15	St.Stl.	137.06	8.466
Babcock & Wilcox	15 X 15	Mark BZ	165.625	8.536
Babcock & Wilcox	17 X 17	Mark C	165.71875	8.536
Combustion Engineering	14 X 14	Std	157.00	8.10
Combustion Engineering	14 X 14	Ft.Cal.	146	8.1
Combustion Engineering	15 X 15	Palis.	147.5	8.2
Combustion Engineering	16 X 16	Onofre	176.803	8.1
Combustion Engineering	16 X 16	Lucie 2	158.129	8.1
Combustion Engineering	16 X 16	ANO2	176.803	8.1
Combustion Engineering	16 X 16	SYS80	178.250	8.1
Combustion Engineering	15 X 16	Yankee	111.785	7.6
Exxon / ANF	14 X 14	WE	160.13	7.763
Exxon / ANF	14 X 14	CE	157.24	8.110
Exxon / ANF	14 X 14	TOP ROD	160.13	7.763
Exxon / ANF	15 X 15	WE	159.7	8.426
Exxon / ANF	15 X 15	CE	148.852	8.250
Exxon / ANF	15 X 16	WE	111.775	7.614
Exxon / ANF	17 X 17	WE	159.71	8.426
Westinghouse	13 X 13			
Westinghouse	14 X 14	Std/ZCA	159.71	7.76
Westinghouse	14 X 14	OFA	159.71	7.76
Westinghouse	14 X 14	Std/ZCB	159.71	7.76
Westinghouse	14 X 14	Std/SC	137.06	7.76
Westinghouse	14 X 14	Model C	157.238	8.03
Westinghouse	15 X 15	Std/ZC	159.71	8.434
Westinghouse	15 X 15	OFA	159.765	8.424
Westinghouse	15 X 15	Std/SC	137.06	8.42
Westinghouse	15 X 16			
Westinghouse	17 X 17	Std	159.765	8.434
Westinghouse	17 X 17	OFA	159.765	8.434
Westinghouse	17 X 17	Vant 5	160.1	8.426
Westinghouse	17 X 17	XLR	199	8.43

ASSEMBLY PHYSICAL DIMENSIONS

BOILING WATER REACTOR ASSEMBLIES

<u>Assembly Manufacturer</u>	<u>Array Size</u>	<u>Version</u>	<u>Assembly Length (inches)</u>	<u>Assembly Width (inches)</u>
Allis Chalmers	10 X 10			
Exxon / ANF	6 X 6	GE	134.32	4.275
Exxon / ANF	6 X 6	HUM.BAY	95	
Exxon / ANF	7 X 7	GE	171.25	5.247
Exxon / ANF	8 X 8	JP-3	171.29	5.251
Exxon / ANF	8 X 8	JP-4,5	176.05	5.251
Exxon / ANF	9 X 9	JP-3	171.29	5.251
Exxon / ANF	9 X 9	JP-4,5	176.058	5.251
Exxon / ANF	9 X 9	BRP	82	6.5
Exxon / ANF	10 X 10	AC	102.45	5.614
Exxon / ANF	11 X 11	GE	83.970	6.515
Exxon / ANF	14 X 14	Ft.Cal	147	
General Electric	6 X 6	DRES-1	135	4
General Electric	6 X 6	HUM.BAY	95	4
General Electric	7 X 7	/2,3:V1	171	5.518
General Electric	7 X 7	/2,3:V2	171	5.518
General Electric	7 X 7	/4,5	176	5.518
General Electric	7 X 7	HUM.BAY	95	4
General Electric	8 X 8	/2,3	171	5.518
General Electric	8 X 8	/4,5:V1	176	5.518
General Electric	8 X 8	/4,5:V2	176	5.518
General Electric	9 X 9	BRP	82	6.5
General Electric	11 X 11	BRP	82	6.5
Westinghouse	8 X 8	QUAD+	175.5	5.50

ASSEMBLY WEIGHT CHARACTERISTICS
PRESSURIZED WATER REACTOR ASSEMBLIES

<u>Assembly Manufacturer</u>	<u>Array Size</u>	<u>Version</u>	<u>Assembly Weight (pounds)</u>	<u>Metric Tons Initial Heavy Metal</u>
Babcock & Wilcox	14 X 14			
Babcock & Wilcox	15 X 15	Mark B	1515.0	0.46363
Babcock & Wilcox	15 X 15	St.Stl.	1255.0	0.40946
Babcock & Wilcox	15 X 15	Mark BZ	1515.0	0.46363
Babcock & Wilcox	17 X 17	Mark C	1505.0	0.45619
Combustion Engineering	14 X 14	Std	1270.0	0.38600
Combustion Engineering	14 X 14	Ft.Cal.	1220.0	0.37600
Combustion Engineering	15 X 15	Palis.	1360.0	0.41300
Combustion Engineering	16 X 16	Onofre	1430.0	0.42600
Combustion Engineering	16 X 16	Lucie 2	1300.0	0.39000
Combustion Engineering	16 X 16	ANO2	1430.0	0.42600
Combustion Engineering	16 X 16	SYS80	1430.0	0.42600
Combustion Engineering	15 X 16	Yankee	720	0.231
Exxon / ANF	14 X 14	WE	1271.2	0.37900
Exxon / ANF	14 X 14	CE	1292.2	0.38099
Exxon / ANF	14 X 14	TOP ROD	1215.0	0.36497
Exxon / ANF	15 X 15	WE	1432.8	0.43197
Exxon / ANF	15 X 15	CE	1338.6	0.40069
Exxon / ANF	15 X 16	WE	796.6	0.23554
Exxon / ANF	17 X 17	WE	1348.0	0.40113
Westinghouse	13 X 13			
Westinghouse	14 X 14	Std/ZCA	1242-1302	0.389-0.407
Westinghouse	14 X 14	OFA	1096-1177	0.336-0.358
Westinghouse	14 X 14	Std/ZCB	1242-1302	0.389-0.407
Westinghouse	14 X 14	Std/SC	1233-1247	0.37300
Westinghouse	14 X 14	Model C	1283.0	0.39700
Westinghouse	15 X 15	Std/ZC	1449-1472	0.4563-0.4690
Westinghouse	15 X 15	OFA	1448-1459	0.46270
Westinghouse	15 X 15	Std/SC	1392-1421	0.413-0.422
Westinghouse	15 X 16			
Westinghouse	17 X 17	Std	1482.0	0.46360
Westinghouse	17 X 17	OFA	1373.0	0.42600
Westinghouse	17 X 17	Vant 5	1365.0	0.42302
Westinghouse	17 X 17	XLR		

ASSEMBLY WEIGHT CHARACTERISTICS
BOILING WATER REACTOR ASSEMBLIES

<u>Assembly Manufacturer</u>	<u>Array Size</u>	<u>Version</u>	<u>Assembly Weight (pounds)</u>	<u>Metric Tons Initial Heavy Metal</u>
Allis Chalmers	10 X 10			
Exxon / ANF	6 X 6	GE	328.4	0.09466
Exxon / ANF	6 X 6	HUM.BAY		
Exxon / ANF	7 X 7	GE	619.1	0.18377
Exxon / ANF	8 X 8	JP-3	562.3	0.17425
Exxon / ANF	8 X 8	JP-4,5	587.8	0.17679
Exxon / ANF	9 X 9	JP-3	556.9	0.16771
Exxon / ANF	9 X 9	JP-4,5	575.3	0.17298
Exxon / ANF	9 X 9	BRP		
Exxon / ANF	10 X 10	AC	376.6	0.10824
Exxon / ANF	11 X 11	GE	457.3	0.13165
Exxon / ANF	14 X 14	Ft.Cal		0.162
General Electric	6 X 6	DRES-1		0.107
General Electric	6 X 6	HUM.BAY		0.77
General Electric	7 X 7	/2,3:V1		
General Electric	7 X 7	/2,3:V2		
General Electric	7 X 7	/4,5		
General Electric	7 X 7	HUM.BAY		0.77
General Electric	8 X 8	/2,3		
General Electric	8 X 8	/4,5:V1		
General Electric	8 X 8	/4,5:V2		
General Electric	9 X 9	BRP		0.138
General Electric	11 X 11	BRP		
Westinghouse	8 X 8	QUAD+	600.0	

ASSEMBLY FUEL ROD CHARACTERISTICS
PRESSURIZED WATER REACTOR ASSEMBLIES

Assembly Manufacturer	Array Size	Version	Rod Diameter (inches)	Clad Material
Babcock & Wilcox	14 X 14			
Babcock & Wilcox	15 X 15	Mark B	0.430	Zircaloy-4
Babcock & Wilcox	15 X 15	St.Stl.	0.422	Stainless Steel 304
Babcock & Wilcox	15 X 15	Mark BZ	0.430	Zircaloy-4
Babcock & Wilcox	17 X 17	Mark C	0.379	Zircaloy-4
Combustion Engineering	14 X 14	Std	0.440	Zircaloy-4
Combustion Engineering	14 X 14	Ft.Cal.	0.440	Zircaloy-4
Combustion Engineering	15 X 15	Palis.	0.418	Zircaloy-4
Combustion Engineering	16 X 16	Onofre	0.382	Zircaloy-4
Combustion Engineering	16 X 16	Lucie 2	0.382	Zircaloy-4
Combustion Engineering	16 X 16	ANO2	0.382	Zircaloy-4
Combustion Engineering	16 X 16	SYS80	0.382	Zircaloy-4
Combustion Engineering	15 X 16	Yankee		Zircaloy-4
Exxon / ANF	14 X 14	WE	0.424	Zircaloy-4
Exxon / ANF	14 X 14	CE	0.440	Zircaloy-4
Exxon / ANF	14 X 14	TOP ROD	0.417	Zircaloy-4
Exxon / ANF	15 X 15	WE	0.424	Zircaloy-4
Exxon / ANF	15 X 15	CE	0.417	Zircaloy-4
Exxon / ANF	15 X 16	WE	0.365	Zircaloy-4
Exxon / ANF	17 X 17	WE	0.360	Zircaloy-4
Westinghouse	13 X 13			
Westinghouse	14 X 14	Std/ZCA	0.422	Zircaloy-4
Westinghouse	14 X 14	OFA	0.400	Zircaloy-4
Westinghouse	14 X 14	Std/ZCB	0.422	Zircaloy-4
Westinghouse	14 X 14	Std/SC	0.422	Stainless Steel 304
Westinghouse	14 X 14	Model C	0.440	Zircaloy-4
Westinghouse	15 X 15	Std/ZC	0.422	Zircaloy-4
Westinghouse	15 X 15	OFA	0.422	Zircaloy-4
Westinghouse	15 X 15	Std/SC	0.422	Stainless Steel 304
Westinghouse	15 X 16			
Westinghouse	17 X 17	Std	0.374	Zircaloy-4
Westinghouse	17 X 17	OFA	0.360	Zircaloy-4
Westinghouse	17 X 17	Vant 5	0.36	Zircaloy-4
Westinghouse	17 X 17	XLR	0.374	Zircaloy-4

ASSEMBLY FUEL ROD CHARACTERISTICS
PRESSURIZED WATER REACTOR ASSEMBLIES

Assembly Manufacturer	Array Size	Version	Rod Diameter (inches)	Clad Material
Allis Chalmers	10 X 10		0.396	Stainless Steel 348H
Exxon / ANF	6 X 6	GE	0.5645	Zircaloy-2
Exxon / ANF	6 X 6	HUM.BAY		
Exxon / ANF	7 X 7	GE	0.570	Zircaloy-2
Exxon / ANF	8 X 8	JP-3	0.484	Zircaloy-2
Exxon / ANF	8 X 8	JP-4,5	0.484	Zircaloy-2
Exxon / ANF	9 X 9	JP-3	0.424	Zircaloy-2
Exxon / ANF	9 X 9	JP-4,5	0.424	Zircaloy-2
Exxon / ANF	9 X 9	BRP	0.5625	Zircaloy-2
Exxon / ANF	10 X 10	AC	0.394	Stainless Steel 348H
Exxon / ANF	11 X 11	GE	0.449	Zircaloy-2
Exxon / ANF	14 X 14	Ft.Cal		
General Electric	6 X 6	DRES-1	0.562	Zircaloy-2
General Electric	6 X 6	HUM.BAY	0.563	
General Electric	7 X 7	/2,3:V1	0.570	Zircaloy-2
General Electric	7 X 7	/2,3:V2	0.563	Zircaloy-2
General Electric	7 X 7	/4,5	0.563	Zircaloy-2
General Electric	7 X 7	HUM.BAY	0.486	
General Electric	8 X 8	/2,3	0.48	Zircaloy-2
General Electric	8 X 8	/4,5:V1	0.49	Zircaloy-2
General Electric	8 X 8	/4,5:V2	0.49	
General Electric	9 X 9	BRP	0.5625	Zircaloy-2
General Electric	11 X 11	BRP	0.449	
Westinghouse	8 X 8	QUAD+	0.458	Zircaloy-2

2A-17

LISTING OF
PHYSICAL DESCRIPTION REPORTS

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Allis Chalmers 10 X 10 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches).....
Assembly Length (inches).....
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.565

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Allis Chalmers 10 X 10 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Materia Fractio
T. TIE PLATE	1	0.0000	TOP	St.Steel 304	1.00000
B. TIE PLATE	1	0.0000	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Allis Chalmers 10 X 10 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	100
Typical Number of Fueled Rods per Assembly.....	100
Rod Diameter (inches).....	0.396
Rod Length (inches).....	
Active Length (inches).....	
Weight per Rod (lbs).....	
Clad Material.....	St.Steel 348H
Clad Thickness (inches).....	0.020
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	0.003
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	0.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Allis Chalmers 10 X 10 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.350
Fuel Pellet Length (inches).....	1.050
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	
Plenum Spring Weight per Assembly (lbs).....	
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	

Comments:

Length of fuel pellets varies from 0.35 to 1.05 inches.

2A-23

No drawing available for an Allis Chalmers 10 X 10.
For a drawing of a similar assembly, see page 2A-155.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Babcock & Wilcox 14 X 14 PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches).....
Assembly Length (inches).....
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches).....

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

All of these assemblies were used in Con. Edison's Indian Point-1
Reactor and have been reprocessed at West Valley.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Babcock & Wilcox 14 X 14 PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Babcock & Wilcox 14 X 14 PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	
Fuel Rod Positions per Assembly.....	
Typical Number of Fueled Rods per Assembly.....	
Rod Diameter (inches).....	
Rod Length (inches).....	
Active Length (inches).....	
Weight per Rod (lbs).....	
Clad Material.....	
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	0.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Babcock & Wilcox 14 X 14 PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-29

No drawing available for a Babcock & Wilcox 14 X 14.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Babcock & Wilcox 15 X 15 Mark B PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1971
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	3764
Assembly Width (inches).....	8.536
Assembly Length (inches).....	165.625
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.568
Total Assembly Weight (lbs).....	1515.0
Weight of Heavy Metal (lbs).....	1022.12
Metric Tons Initial Heavy Metal (metric tons).....	0.46363
Enrichment Range (% U235).....	2.0-4.0
Average Design Burnup (MWd/MTIHM).....	35000
Maximum Design Burnup (MWd/MTIHM).....	50200
Linear Heat Rating (KW/foot).....	6.30
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	3
for Mechanical Disassembly in Air.....	5
for Underwater Cosolidation.....	3
for Underwater Rod Replacement.....	5

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Babcock & Wilcox 15 X 15 Mark B PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
TOP NOZZLE	1	7.4800	TOP	St.Steel CF3M	1.00000
BOTTOM NOZZLE	1	8.1600	BOTTOM	St.Steel CF3M	1.00000
GUIDE TUBES	16	8.0000	IN CORE	Zircaloy-4	1.00000
INSTRUMENT TUBE	1	0.6400	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	1.0400	GAS PLENUM	Inconel-718	1.00000
SPACER-BOTTOM	1	1.3000	BOTTOM	Inconel-718	1.00000
SPACER-INCORE	6	4.9000	IN CORE	Inconel-718	1.00000
SPRING RETAINER	1	0.9100	TOP	St.Steel CF3M	1.00000
HOLDDOWN SPRING	1	1.8000	TOP	Inconel-718	1.00000
UPPER END PLUG	2	0.0600	TOP	St.Steel 304	1.00000
UPPER NUT	16	0.5100	TOP	St.Steel 304L	1.00000
LOWER NUT	16	0.1500	BOTTOM	St.Steel 304	1.00000
GRID SUPPORTS	7	0.6400	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

02-32958F

11-55248F

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Babcock & Wilcox 15 X 15 Mark B PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	225
Typical Number of Fueled Rods per Assembly.....	208
Rod Diameter (inches).....	0.430
Rod Length (inches).....	153.68
Active Length (inches).....	141.8
Weight per Rod (lbs).....	7.00
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0265
Clad Final Conditioning.....	SRA
Fuel-Clad Gap (inches).....	0.0042
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	415
Nitrogen Content of Fill Gas (percent).....	3.0

PHYSICAL DESCRIPTION REPORT

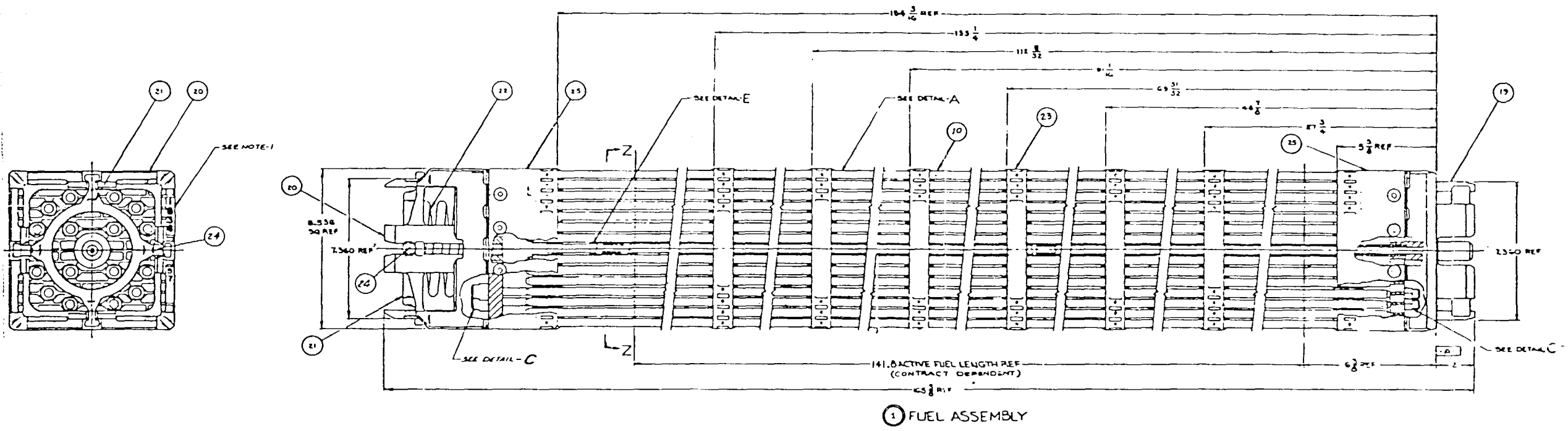
PAGE: 4

Babcock & Wilcox 15 X 15 Mark B PWR

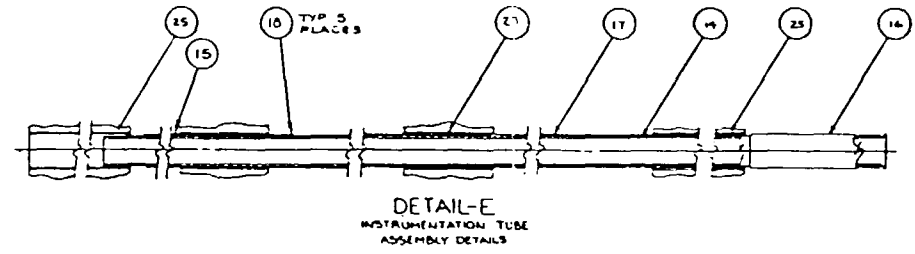
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3686
Fuel Pellet Length (inches).....	0.435
Fuel Pellet Weight per Rod (lbs).....	5.58
Open Porosity (percent).....	< 1%
Grain Size (microns).....	10-14
Fuel Density (% theoretical).....	95
O/U Ratio.....	2-2.02:1
Smear Density(gr/cm3).....	9.75
Spacer Pellet Material.....	Zircaloy-4
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.042
Plenum Length (inches).....	11.720
Plenum Volume (cubic inches).....	1.308

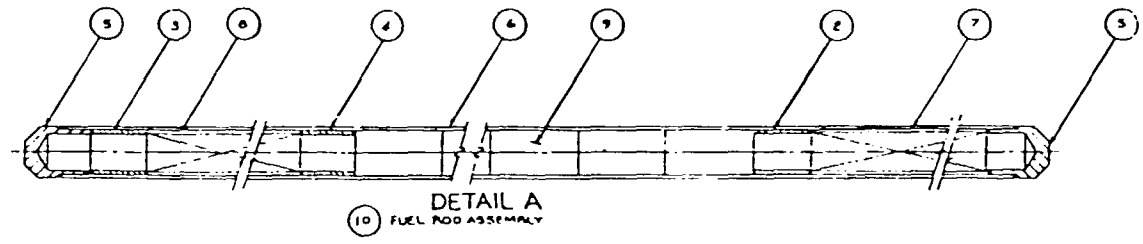
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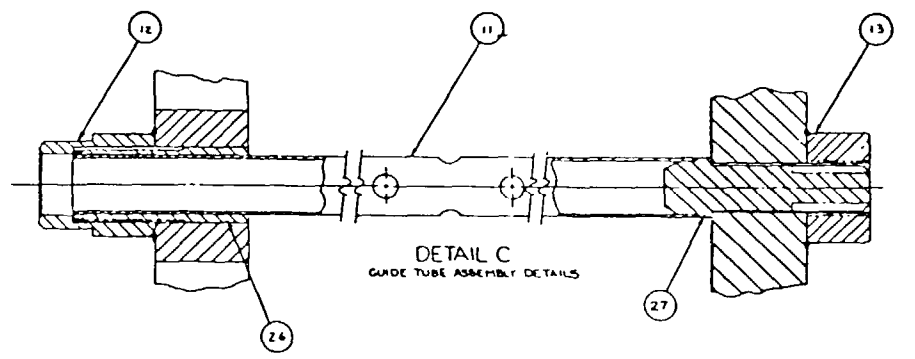
1 FUEL ASSEMBLY



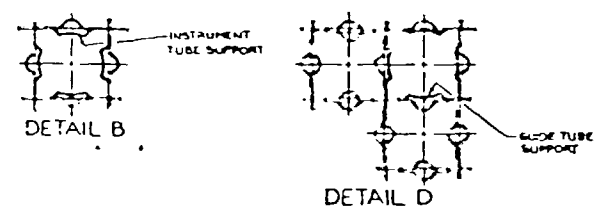
DETAIL E
INSTRUMENTATION TUBE
ASSEMBLY DETAILS



DETAIL A
FUEL ROD ASSEMBLY

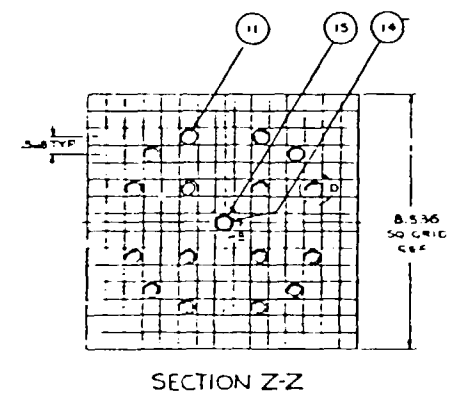


DETAIL C
GUIDE TUBE ASSEMBLY DETAILS



DETAIL B

DETAIL D



SECTION Z-Z

BILL OF MATERIAL		
QTY	DESCRIPTION	MATERIAL
1	FUEL ASSEMBLY	
2	20 LOWER SPA CER	ZIRC-4
3	200 UPPER SPACER	ZIRC-4
4	15 VARIABLE SPACER	ZIRC-4
5	46 END CAP	ZIRC-4
6	20 FUEL ROD CLADDING	ZIRC-4
7	20 LOWER SPRING	304 SST
8	20 UPPER SPRING	304 SST
9	FUEL PELLET	UO ₂
10	FUEL ROD	
11	6 GUIDE TUBE	ZIRC-4
12	6 UPPER NUT	304 SST
13	6 LOWER NUT	304 SST
14	1 INSTRUMENTATION TUBE	ZIRC-4
15	1 SPACER SLEEVE "A"	ZIRC-4
16	1 RETAINER SLEEVE	ZIRC-4
17	1 SPACER SLEEVE "C"	ZIRC-4
18	3 SPACER SLEEVE "B"	ZIRC-4
19	1 LOWER END FITTING ASSY	CPVMSBT
20	1 UPPER END FITTING ASSY	CPVMSBT
21	1 HOLD DOWN SPRING RETAINER	304 SST
22	1 HOLD DOWN SPRING	304 SST
23	6 INTERMEDIATE SPACER GRD ASSY	304 SST
24	2 UPPER END FITTING PLUG	304 SST
25	2 END SPACER BRD ASSY	ZIRC-4
26	16 UPPER SLEEVE	ZIRC-4
27	16 LOWER PLUG	ZIRC-4

NOTES:
 1. THE NUMBER SHOWN IS FOR ILLUSTRATION ONLY. THE FINAL IDENTIFICATION NUMBERS SHALL BE IN ACCORDANCE WITH THE PURCHASE ORDER OR OTHER DOCUMENT WHICH IS OFFICIALLY USED FOR PROCUREMENT OF THE PARTS SHOWN ON THIS DRAWING.
 2. APPROXIMATE WEIGHT IN AIR: 1515 LBS.
 3. DIMENSIONS ARE IN INCHES.

DATE: 11-10-84 DRAWN BY: [Signature] CHECKED BY: [Signature] DESIGNED BY: [Signature] CUST. ORDER NO. [Blank] QUANTITY: [Blank]	FUEL ASSEMBLY MARK - B4	THE WORK ON THIS DRAWING IS THE PROPERTY OF B&W LYNCHBURG VA. IT IS TO BE USED ONLY FOR THE PURPOSES SPECIFIED IN THE PURCHASE ORDER OR OTHER DOCUMENT WHICH IS OFFICIALLY USED FOR PROCUREMENT OF THE PARTS SHOWN ON THIS DRAWING.
		11552-8 F 0

11-10-84

MICROFILMED BY
 B&W LYNCHBURG VA

F-1 E O C 2 3 4 5 6 7 8 9 10 11 12

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Babcock & Wilcox 15 X 15 St.Stl. PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1976
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	368
Assembly Width (inches).....	8.466
Assembly Length (inches).....	137.06
with Control Rod Inserted.....	
including Holddown Device, etc.....	137.625
Rod Pitch (inches).....	0.563
Total Assembly Weight (lbs).....	1255.0
Weight of Heavy Metal (lbs).....	902.70
Metric Tons Initial Heavy Metal (metric tons).....	0.40946
Enrichment Range (% U235).....	4.0
Average Design Burnup (MWd/MTIHM).....	33000
Maximum Design Burnup (MWd/MTIHM).....	39000
Linear Heat Rating (KW/foot).....	5.57
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	3
for Mechanical Disassembly in Air.....	5
for Underwater Cosolidation.....	3
for Underwater Rod Replacement.....	5

Comments:

Manufactured only for Conn. Yankee's Haddam Neck Reactor.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Babcock & Wilcox 15 X 15 St.Stl. PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	20	7.2600	IN CORE	St.Steel 304	1.00000
INSTRUMENT TUBE	1	0.3500	IN CORE	St.Steel 304	1.00000
TOP NOZZLE	1	9.4800	TOP	St.Steel CF3M	1.00000
BOTTOM NOZZLE	1	6.3000	BOTTOM	St.Steel 304L	1.00000
SPACER-INCORE	6	3.8000	IN CORE	Inconel-718	1.00000
HOLDDOWN SPRING	4	0.3300	TOP	Inconel-718	1.00000
SPACER-PLENUM	1	0.6400	GAS PLENUM	Inconel-718	1.00000
LOWER NUT	20	0.0800	BOTTOM	St.Steel 304	1.00000
UPPER NUT	20	0.1300	TOP	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

02-1001177F

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Babcock & Wilcox 15 X 15 St.Stl. PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	225
Typical Number of Fueled Rods per Assembly.....	204
Rod Diameter (inches).....	0.422
Rod Length (inches).....	126.68
Active Length (inches).....	120.5
Weight per Rod (lbs).....	5.90
Clad Material.....	St.Steel 304
Clad Thickness (inches).....	0.0165
Clad Final Conditioning.....	SRA
Fuel-Clad Gap (inches).....	.00325
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	40
Nitrogen Content of Fill Gas (percent).....	3.0

PHYSICAL DESCRIPTION REPORT

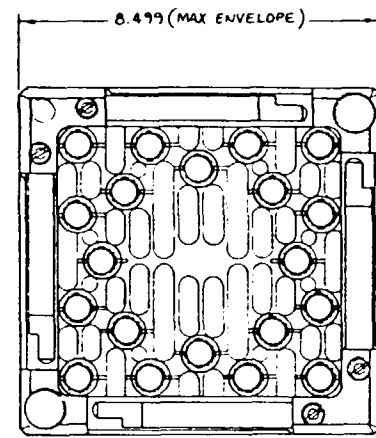
PAGE: 4

Babcock & Wilcox 15 X 15 St.Stl. PWR

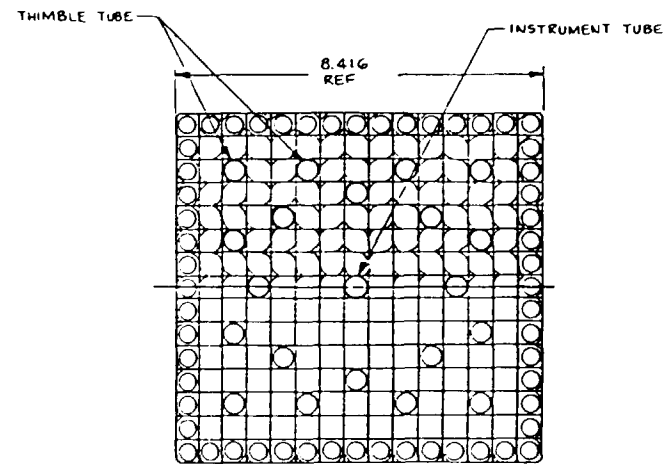
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3825
Fuel Pellet Length (inches).....	0.458
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	< 1%
Grain Size (microns).....	10-14
Fuel Density (% theoretical).....	95
O/U Ratio.....	2-2.02:1
Smear Density(gr/cm ³).....	9.75
Spacer Pellet Material.....	Zircaloy-4
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.035
Plenum Length (inches).....	4.810
Plenum Volume (cubic inches).....	0.570

Comments:

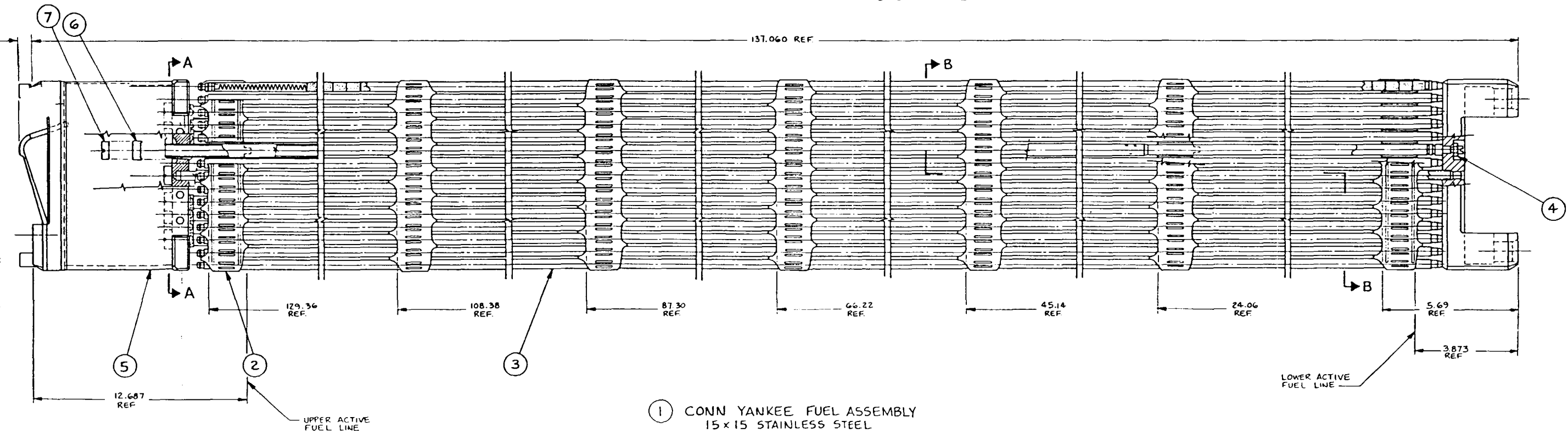


SECTION A-A
TOP VIEW



SECTION B-B

BILL OF MATERIALS						
1	1	1001177	001	F	FUEL ASSEMBLY	
2	1	1001210	001	F	SKELETON STRUCTURE	
3	204	1001190	001	C	FUEL ROD ASSEMBLY	
4	20	1001221	001	C	LOCK NUT	
5	1	1006316	001	F	TOP NOZZLE	
6	20	1001219	001	C	LOCKING CUP	
7	20	1001220	001	C	RING NUT	



① CONN YANKEE FUEL ASSEMBLY
15x15 STAINLESS STEEL

DESIGNED BY: <i>SHOLES/FARMER/Connell</i> CHECKED BY: DRAWN BY: <i>Sholes/Farmers</i> DATE: <i>9-24-66</i> CONTRACT NO:	FUEL ASSEMBLY INFORMATION DRAWING	PREPARED BY: <i>SHOLES</i> CHECKED BY: DATE: <i>9-24-66</i> DRAWING NO: 1165405 REV: E O
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PHYSICAL DESCRIPTION REPORT

PAGE: 1

Babcock & Wilcox 15 X 15 Mark BZ PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1984
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	3764
Assembly Width (inches).....	8.536
Assembly Length (inches).....	165.625
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.568
Total Assembly Weight (lbs).....	1515.0
Weight of Heavy Metal (lbs).....	1022.12
Metric Tons Initial Heavy Metal (metric tons).....	0.46363
Enrichment Range (% U235).....	2.0-4.0
Average Design Burnup (MWd/MTIHM).....	35000
Maximum Design Burnup (MWd/MTIHM).....	50200
Linear Heat Rating (KW/foot).....	6.30
Difficulty Indexes (0-not required, 1-simple,..,6-impossible)	
for Cutting.....	3
for Mechanical Disassembly in Air.....	5
for Underwater Cosolidation.....	3
for Underwater Rod Replacement.....	5

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Babcock & Wilcox 15 X 15 Mark BZ PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
TOP NOZZLE	1	7.4800	TOP	St.Steel CF3M	1.00000
BOTTOM NOZZLE	1	8.1600	BOTTOM	St.Steel CF3M	1.00000
GUIDE TUBES	16	8.0000	IN CORE	Zircaloy-4	1.00000
INSTRUMENT TUBE	1	0.6400	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	1.0400	GAS PLENUM	Inconel-718	1.00000
SPACER-BOTTOM	1	1.3000	BOTTOM	Inconel-718	1.00000
SPACER-INCORE	6	4.9000	IN CORE	Zircaloy-4	1.00000
SPRING RETAINER	1	0.9100	TOP	St.Steel CF3M	1.00000
HOLDDOWN SPRING	1	1.8000	TOP	Inconel-718	1.00000
UPPER END PLUG	2	0.0600	TOP	St.Steel 304	1.00000
UPPER NUT	15	0.5100	TOP	St.Steel 304L	1.00000
LOWER NUT	16	0.1500	BOTTOM	St.Steel 304	1.00000
GRID SUPPORTS	7	0.6400	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

02-32958F

11-55248F

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Babcock & Wilcox 15 X 15 Mark BZ PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	225
Typical Number of Fueled Rods per Assembly.....	208
Rod Diameter (inches).....	0.430
Rod Length (inches).....	153.68
Active Length (inches).....	141.8
Weight per Rod (lbs).....	7.00
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0265
Clad Final Conditioning.....	SRA
Fuel-Clad Gap (inches).....	0.0042
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	415
Nitrogen Content of Fill Gas (percent).....	3.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Babcock & Wilcox 15 X 15 Mark BZ PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3686
Fuel Pellet Length (inches).....	0.435
Fuel Pellet Weight per Rod (lbs).....	5.58
Open Porosity (percent).....	< 1%
Grain Size (microns).....	10-14
Fuel Density (% theoretical).....	95
O/U Ratio.....	2-2.02:1
Smear Density(gr/cm ³).....	9.75
Spacer Pellet Material.....	Zircaloy-4
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St. Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.042
Plenum Length (inches).....	11.720
Plenum Volume (cubic inches).....	1.308

Comments:

2A-47

No drawing available for a Babcock & Wilcox 15 X 15 Mark BZ.

For a drawing of a similar assembly, see page 2A-35.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Babcock & Wilcox 17 X 17 Mark C PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1976
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	410
Assembly Width (inches).....	8.536
Assembly Length (inches).....	165.71875
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.502
Total Assembly Weight (lbs).....	1505.0
Weight of Heavy Metal (lbs).....	1005.70
Metric Tons Initial Heavy Metal (metric tons).....	0.45619
Enrichment Range (% U235).....	2.0-4.0
Average Design Burnup (MWd/MTIHM).....	35000
Maximum Design Burnup (MWd/MTIHM).....	35000
Linear Heat Rating (KW/foot).....	5.83
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	3
for Mechanical Disassembly in Air.....	5
for Underwater Cosolidation.....	3
for Underwater Rod Replacement.....	5

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Babcock & Wilcox 17 X 17 Mark C PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	24	10.9000	IN CORE	Zircaloy-4	1.00000
INSTRUMENT TUBE	1	0.3200	IN CORE	Zircaloy-4	1.00000
TOP NOZZLE	1	11.6000	TOP	St.Steel CF3M	1.00000
BOTTOM NOZZLE	1	5.1300	BOTTOM	St.Steel CF3M	1.00000
SPACER-PLENUM	1	1.3000	GAS PLENUM	Inconel-718	1.00000
SPACER-BOTTOM	1	1.3000	BOTTOM	Inconel-718	1.00000
SPACER-INCORE	6	4.2700	IN CORE	Inconel-718	1.00000
RETAINER ID	0	2.0700	TOP	St.Steel CF3M	1.00000
HOLDDOWN SPRING	4	3.5900	TOP	Inconel X-750	1.00000
GRID SUPPORTS	7	0.5400	IN CORE	Zircaloy-4	1.00000
UPPER NUT	24	0.8700	TOP	St.Steel 304	1.00000
LOWER NUT	24	0.4400	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

02-35319F

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Babcock & Wilcox 17 X 17 Mark C PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	289
Typical Number of Fueled Rods per Assembly.....	264
Rod Diameter (inches).....	0.379
Rod Length (inches).....	152.688
Active Length (inches).....	143.0
Weight per Rod (lbs).....	4.90
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0240
Clad Final Conditioning.....	SRA
Fuel-Clad Gap (inches).....	0.0039
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	435
Nitrogen Content of Fill Gas (percent).....	3.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

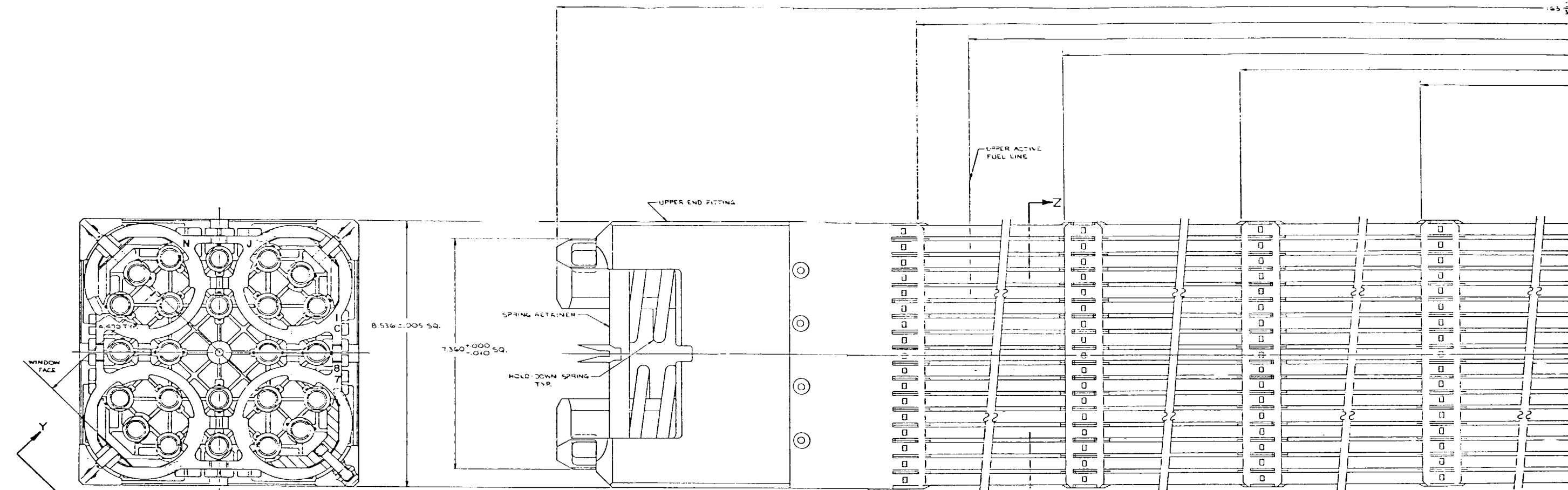
Babcock & Wilcox 17 X 17 Mark C PWR

FUEL ROD DESCRIPTION TABLE continued

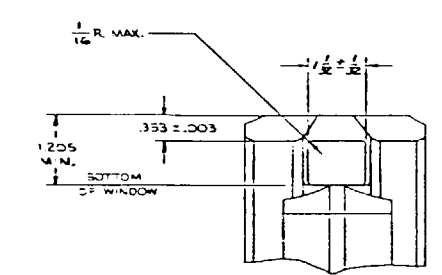
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3232
Fuel Pellet Length (inches).....	0.375
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	< 1%
Grain Size (microns).....	10-14
Fuel Density (% theoretical).....	95
O/U Ratio.....	2-2.02:1
Smear Density(gr/cm ³).....	9.72
Spacer Pellet Material.....	Zircaloy-4
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St. Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.026
Plenum Length (inches).....	9.520
Plenum Volume (cubic inches).....	0.819

Comments:

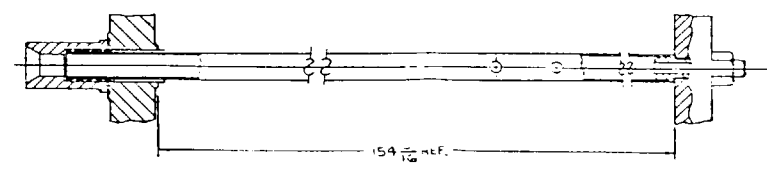
22 21 20 19 18 17 16 15 14 13 12 11



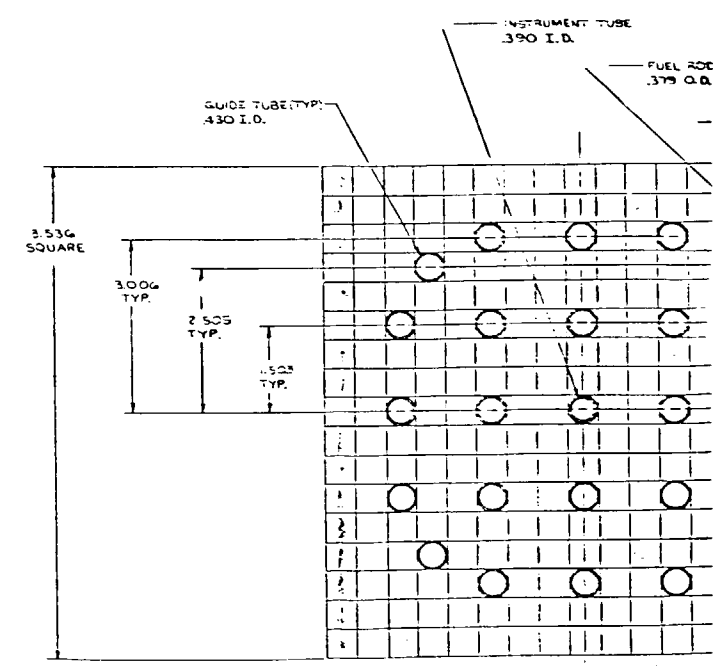
MARK-C FUEL ASSEMBLY RELOAD INFORMATION



VIEW Y-Y
HANDLING WINDOW (TYP)



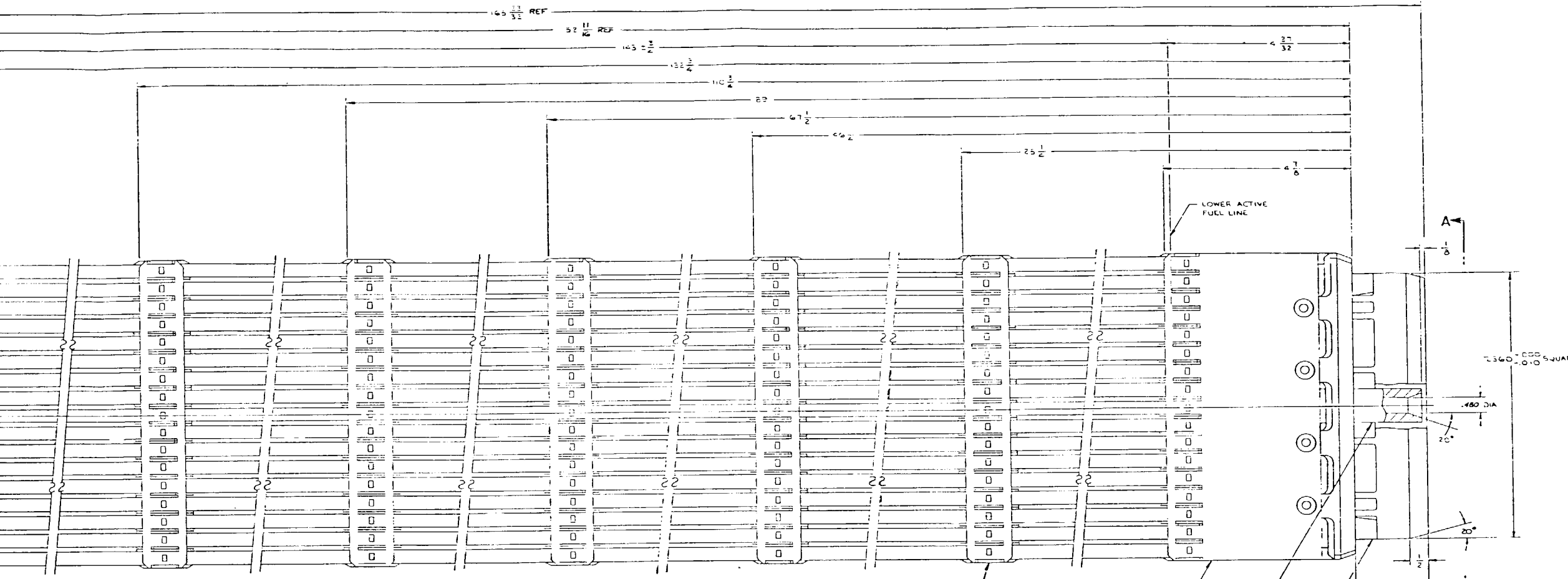
GUIDE TUBE ASSEMBLY DETAILS



SECTION Z-Z

22 21 20 19 18 17 16 15 14 13 12 11

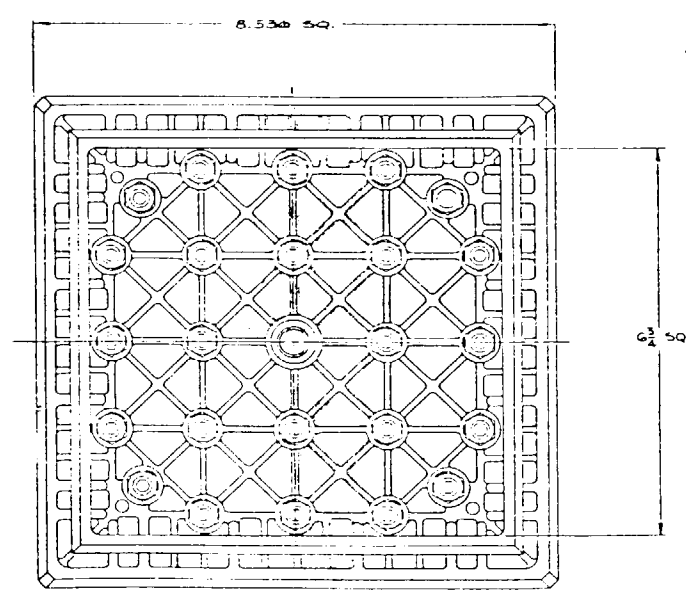
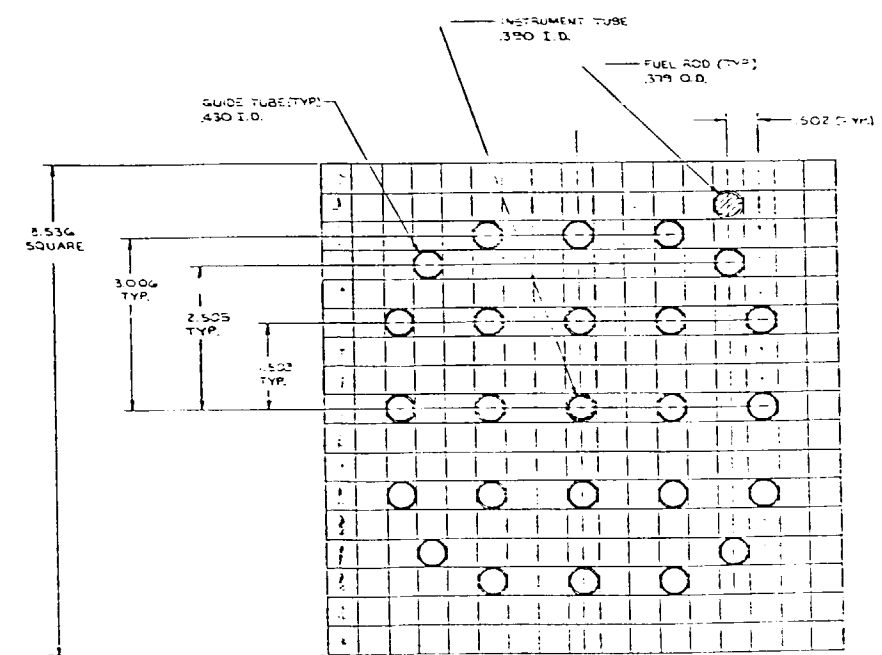
NO.	DESCRIPTION	DATE	BY	CHKD.
1	ADDED VIEW A-A, UPDATED DIMS	2-5-78	BT	BT
2	CHANGED REFERENCE PLANE OF SPACER GRID LOCATION FROM TOP OF LOWER END GRID TO PRIMARY SCALING SURFACE; CHANGED .450 DIA. TO .480 DIA. (C-4); CHANGED .625 DIA. TO .532 DIA. (C-1); CHANGED .625 DIA. TO .532 DIA. (C-2); CHANGED .625 DIA. TO .532 DIA. (C-3); CHANGED .625 DIA. TO .532 DIA. (C-4); CHANGED .625 DIA. TO .532 DIA. (C-5); CHANGED .625 DIA. TO .532 DIA. (C-6); CHANGED .625 DIA. TO .532 DIA. (C-7); CHANGED .625 DIA. TO .532 DIA. (C-8); CHANGED .625 DIA. TO .532 DIA. (C-9); CHANGED .625 DIA. TO .532 DIA. (C-10); CHANGED .625 DIA. TO .532 DIA. (C-11); CHANGED .625 DIA. TO .532 DIA. (C-12)	7-1-78	BT	BT
3	ADDED NOTE 1, CHANGES MADE TO REV 02 AND ENTERED IN DLRV BLOCK CHANGES WERE: 1.560 DIA. TO 1.560 DIA. (C-1); 1.560 DIA. TO 1.560 DIA. (C-2); 1.560 DIA. TO 1.560 DIA. (C-3); 1.560 DIA. TO 1.560 DIA. (C-4); 1.560 DIA. TO 1.560 DIA. (C-5); 1.560 DIA. TO 1.560 DIA. (C-6); 1.560 DIA. TO 1.560 DIA. (C-7); 1.560 DIA. TO 1.560 DIA. (C-8); 1.560 DIA. TO 1.560 DIA. (C-9); 1.560 DIA. TO 1.560 DIA. (C-10); 1.560 DIA. TO 1.560 DIA. (C-11); 1.560 DIA. TO 1.560 DIA. (C-12)	2-8-78	BT	BT



ITEM	QUANTITY	MAJOR MAT'L	WEIGHT - LBS.
UPPER END FITTING ASSY	1	CFM S.S.	33.1
LOWER END FITTING	1	CFM S.S.	11.3
END GRID	2	INCONEL TIB	2.9
SPACER GRID	6	INCONEL TIB	1.6
FUEL ROD	264	ZIRC-4 /UO ₂	4.3
GUIDE TUBE	24	ZIRC-4	1.0
INSTRUMENT TUBE	1	ZIRC-4	.7

NOTES
 1 THIS INFORMATION DRAWING IS NOT A DESIGN DOCUMENT. THIS DRAWING SHOULD NOT BE USED FOR DESIGNING OF COMPONENTS WHICH INTERFACE WITH OR WILL BE USED IN CONNECTION WITH THE FUEL ASSEMBLY SHOWN ON THIS DRAWING.

MARK-C FUEL ASSEMBLY RELOAD INFORMATION DRAWING



VIEW A-A

SECTION Z-Z

<p>10-11-78</p> <p>BT</p> <p>BT</p>	<p>The Babcock & Wilcox Company</p> <p>Power Generation Group</p> <p>MARK-C FUEL ASSEMBLY RELOAD INFORMATION DRAWING</p> <p>NONE</p>
-------------------------------------	--

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Combustion Engineering 14 X 14 Std PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1971
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	2858
Assembly Width (inches).....	8.10
Assembly Length (inches).....	157.00
with Control Rod Inserted.....	168
including Holddown Device, etc.....	157
Rod Pitch (inches).....	0.580
Total Assembly Weight (lbs).....	1270.0
Weight of Heavy Metal (lbs):.....	850.00
Metric Tons Initial Heavy Metal (metric tons).....	0.38600
Enrichment Range (% U235).....	2.75-4.05
Average Design Burnup (MWd/MTIHM).....	45000
Maximum Design Burnup (MWd/MTIHM).....	52000
Linear Heat Rating (KW/foot).....	6.30
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	3

Comments:

Typ.12 nonfueled burnable poison rods; 2.1 lbs. of Al203-B4C/rod

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Combustion Engineering 14 X 14 Std PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	5	11.8000	IN CORE	Zircaloy-4	1.00000
SPACER-LOWER	1	1.3600	IN CORE	Inconel 625	1.00000
SPACER-INCORE	7	4.7600	IN CORE	Zircaloy-4	1.00000
BOTTOM NOZZLE	1	5.0000	BOTTOM	St.Steel 304	1.00000
LOCKING POSTS	5	2.6300	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	5	1.1000	TOP	CE Ni Alloy	1.00000
FLOW PLATE	1	1.4500	TOP	St.Steel 304	1.00000
HOLDDOWN PLATE	1	1.0000	TOP	St.Steel 304	1.00000
SPACER-PLENUM	1	0.6800	GAS PLENUM	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

E-19367-161-001
E-4468-701-101
E-4468-701-201
E-STD-161-001

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Combustion Engineering 14 X 14 Std PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	176
Typical Number of Fueled Rods per Assembly.....	164
Rod Diameter (inches).....	0.440
Rod Length (inches).....	147
Active Length (inches).....	137
Weight per Rod (lbs).....	6.90
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.028
Clad Final Conditioning.....	HT, SRA
Fuel-Clad Gap (inches).....	.00375
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	300-450
Nitrogen Content of Fill Gas (PPM).....	4.0-5.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Combustion Engineering 14 X 14 Std PWR

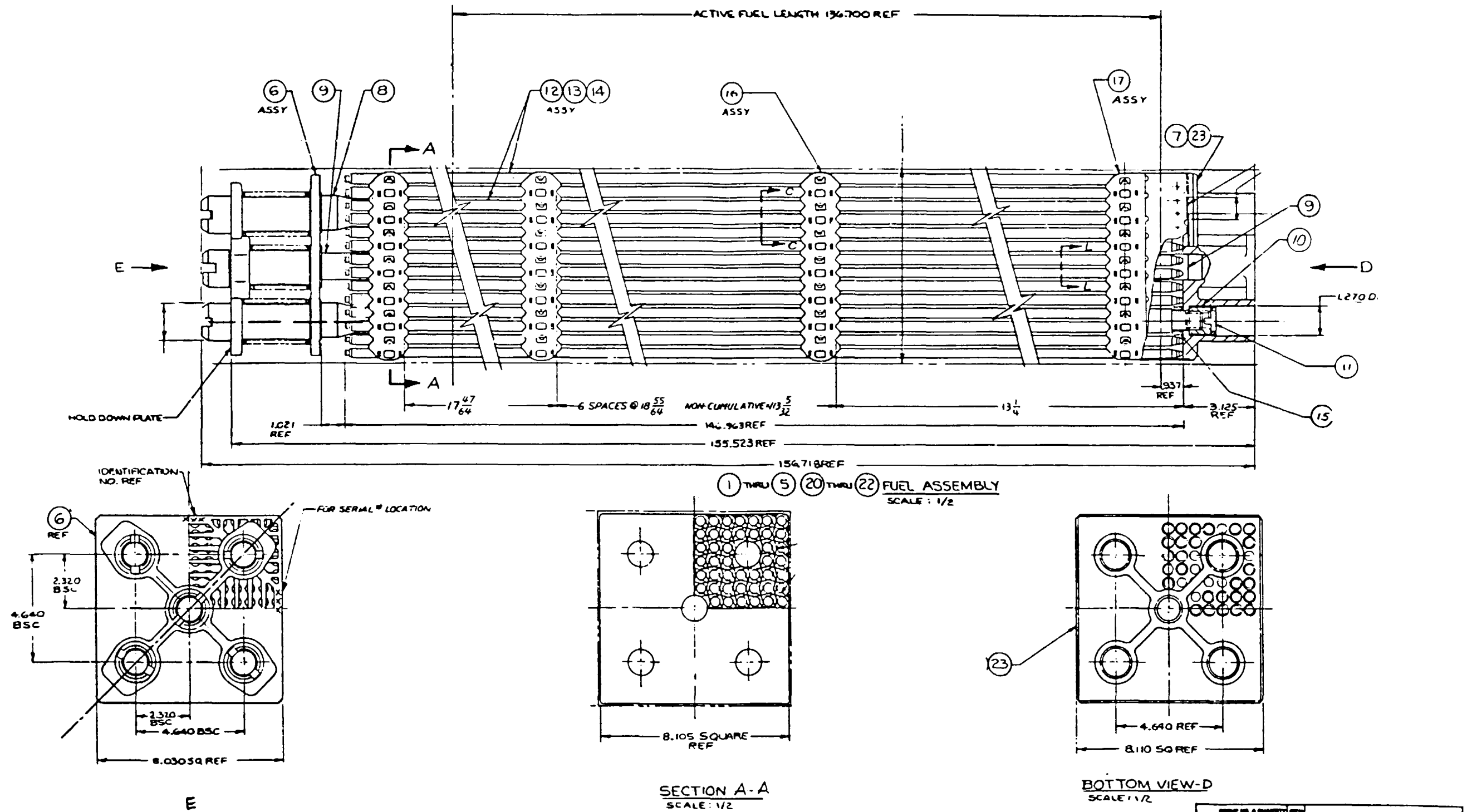
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3765
Fuel Pellet Length (inches).....	0.450
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	> 5
Fuel Density (% theoretical).....	94-95
O/U Ratio.....	2.00-2.02
Smear Density(lb/in ³).....	0.358
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.100
Plenum Length (inches).....	8.375
Plenum Volume (cubic inches).....	

Comments:

Prototypes with fuel pellet and fuel rod clad variants have been used at Calvert Cliffs.

FIGURE 1-4
FUEL ASSEMBLY DRAWING
 CALVERT CLIFFS UNITS 1 AND 2 MILLSTONE UNIT 2
 MAINE YANKEE ST. LUCIE UNIT 1



① THRU ⑤ ②⑦ THRU ②② FUEL ASSEMBLY
 SCALE: 1/2

SECTION A-A
 SCALE: 1/2

BOTTOM VIEW-D
 SCALE: 1/2

GROUP NO. & QUANTITY	NO.	NAME
9 4 3 2 1	1	FUEL ASSY
	2	FUEL ASSY
	3	FUEL ASSY
	4	FUEL ASSY
	5	FUEL ASSY
1 1 1 1 1 1 1 1	6	UPPER END FITTING ASSY
	7	LOWER END FITTING
4 4 4 4 4 4 4 4	8	GLIDE TUBE ASSY
1 1 1 1 1 1 1 1	9	CENTER GUIDE TUBE

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Combustion Engineering 14 X 14 Ft. Cal. PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1971
Final Year of Manufacture.....	1978
Total Number Fabricated to Date.....	291
Assembly Width (inches).....	8.1
Assembly Length (inches).....	146
with Control Rod Inserted.....	157
including Holddown Device, etc.....	148.833
Rod Pitch (inches).....	0.580
Total Assembly Weight (lbs).....	1220.0
Weight of Heavy Metal (lbs).....	830.00
Metric Tons Initial Heavy Metal (metric tons).....	0.37600
Enrichment Range (% U235).....	1.39-3.80
Average Design Burnup (MWd/MTIHM).....	45000
Maximum Design Burnup (MWd/MTIHM).....	52000
Linear Heat Rating (KW/foot).....	6
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	3

Comments:

This assembly type used in the Ft. Calhoun reactor only.
Typ.8 nonfueled burnable poison rods; 2.0 lbs. of Al2O3-B4C/rod.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Combustion Engineering 14 X 14 Ft. Cal. PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	5	11.3000	IN CORE	Zircaloy-4	1.00000
SPACER-LOWER	1	1.3600	IN CORE	Inconel 625	1.00000
SPACER-INCORE	7	4.7600	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	0.6800	GAS PLENUM	Zircaloy-4	1.00000
LOCKING POSTS	5	3.6000	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	1	0.4500	TOP	CE Ni Alloy	1.00000
FLOW PLATE	1	1.3600	TOP	St.Steel 304	1.00000
HOLDDOWN PLATE	1	0.9100	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	3.1800	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

E-20466-701-201

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Combustion Engineering 14 X 14 Ft. Cal. PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	176
Typical Number of Fueled Rods per Assembly.....	168
Rod Diameter (inches).....	0.440
Rod Length (inches).....	137
Active Length (inches).....	128
Weight per Rod (lbs).....	6.50
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.028
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0038
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	300-450
Nitrogen Content of Fill Gas (PPM).....	4.0-5.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

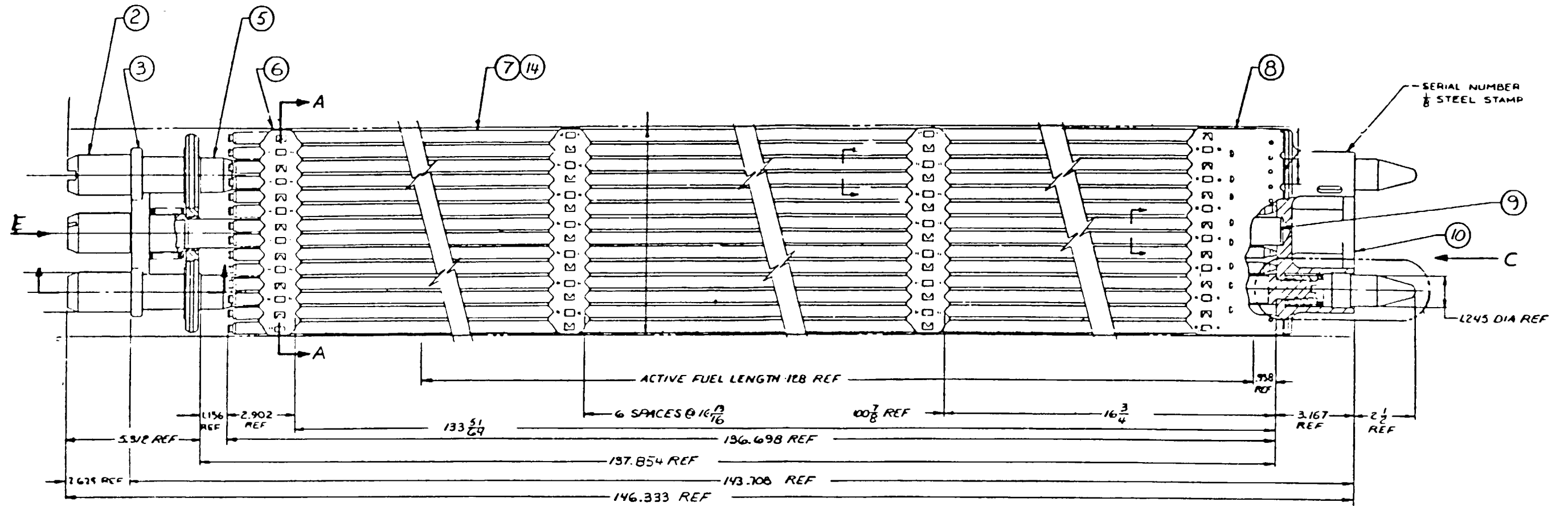
Combustion Engineering 14 X 14 Ft. Cal. PWR

FUEL ROD DESCRIPTION TABLE continued

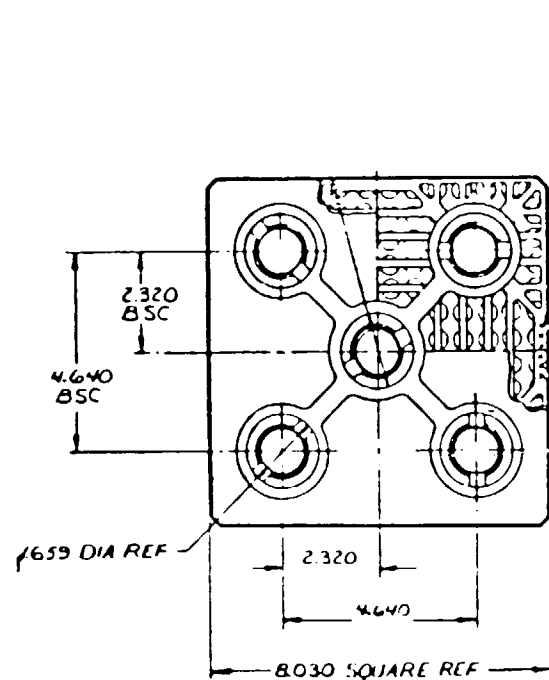
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3765
Fuel Pellet Length (inches).....	0.450
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	>5
Fuel Density (% theoretical).....	94-95%
O/U Ratio.....	2.00-2.02
Smear Density(lb/in ³).....	0.335
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St. Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.100
Plenum Length (inches).....	7.010
Plenum Volume (cubic inches).....	

Comments:

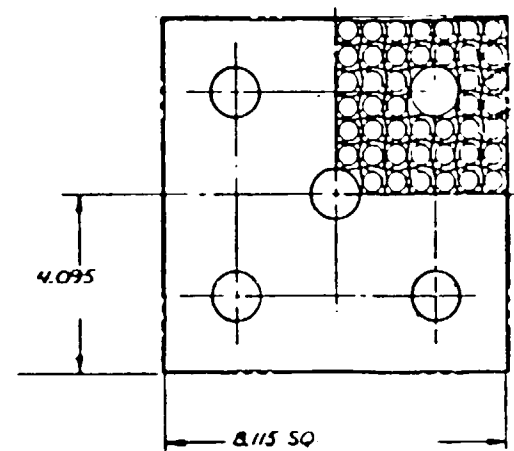
FIGURE 1-2
FUEL ASSEMBLY DRAWING
FT. CALHOUN STATION 1



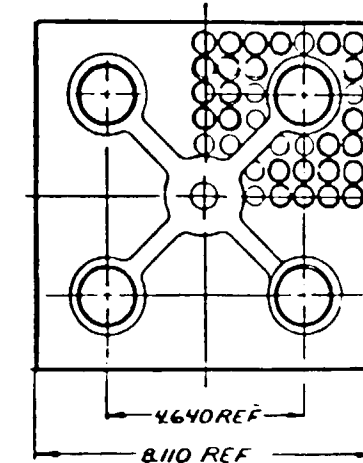
① ⑬ FUEL BUNDLE ASSEMBLY
SCALE: HALF SIZE



VIEW E
SCALE: HALF SIZE



SECTION A-A
SCALE: HALF SIZE



VIEW C
SCALE: HALF SIZE

NO	DESCRIPTION
1	FUEL BUNDLE ASSY
2	ADST
3	UPPER END FITTING ASSY
5	GUIDE TUBE ASSEMBLY
6	SPACER (GRID) ASSEMBLY
7	FUEL ROD ASSEMBLY
8	NUT/EL SPACER GRID
9	CENTER GUIDE TUBE
10	LOWER END FITTING
13	FUEL BUND. ASSY
14	FUEL ROD ASSY

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Combustion Engineering 15 X 15 Palis. PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1969
Final Year of Manufacture.....	1975
Total Number Fabricated to Date.....	275
Assembly Width (inches).....	8.2
Assembly Length (inches).....	147.5
with Control Rod Inserted.....	
including Holddown Device, etc.....	149.125
Rod Pitch (inches).....	0.550
Total Assembly Weight (lbs).....	1360.0
Weight of Heavy Metal (lbs).....	910.00
Metric Tons Initial Heavy Metal (metric tons).....	0.41300
Enrichment Range (% U235).....	2.4-2.9
Average Design Burnup (MWd/MTIHM).....	45000
Maximum Design Burnup (MWd/MTIHM).....	52000
Linear Heat Rating (KW/foot).....	5.3
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	2
for Mechanical Disassembly in Air.....	2
for Underwater Cosolidation.....	2
for Underwater Rod Replacement.....	4

Comments:

This assembly type was used in the Palisades Reactor only.
Typ.12 nonfueled burnable poison rods; 1.8 lbs. of Al²⁰³-B4C/rod

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Combustion Engineering 15 X 15 Palis. PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	8	6.4500	IN CORE	Zircaloy-4	1.00000
GUIDE BARS	8	21.3000	IN CORE	Zircaloy-4	1.00000
BOTTOM NOZZLE	1	5.4000	BOTTOM	St.Steel 304	1.00000
TOP NOZZLE	1	4.5000	TOP	St.Steel 304	1.00000
SPACER-LOWER	1	0.8200	IN CORE	Inconel 625	1.00000
INSTRUMENT TUBE	1	0.4500	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	0.8100	GAS PLENUM	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

2966E2712
2966E3025
2966E3031
2966E3139

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Combustion Engineering 15 X 15 Palis. PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	216
Typical Number of Fueled Rods per Assembly.....	204
Rod Diameter (inches).....	0.418
Rod Length (inches).....	140.00
Active Length (inches).....	132
Weight per Rod (lbs).....	5.80
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.026
Clad Final Conditioning.....	HT, SRA
Fuel-Clad Gap (inches).....	0.004
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	300-450
Nitrogen Content of Fill Gas (PPM).....	4.0-5.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

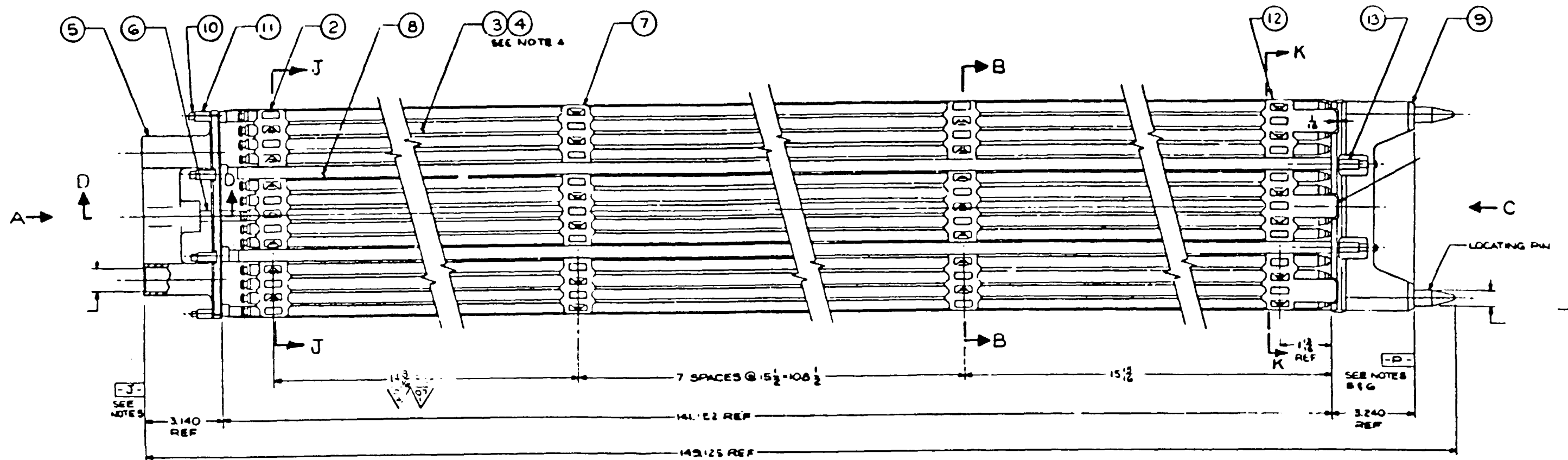
Combustion Engineering 15 X 15 Palis. PWR

FUEL ROD DESCRIPTION TABLE continued

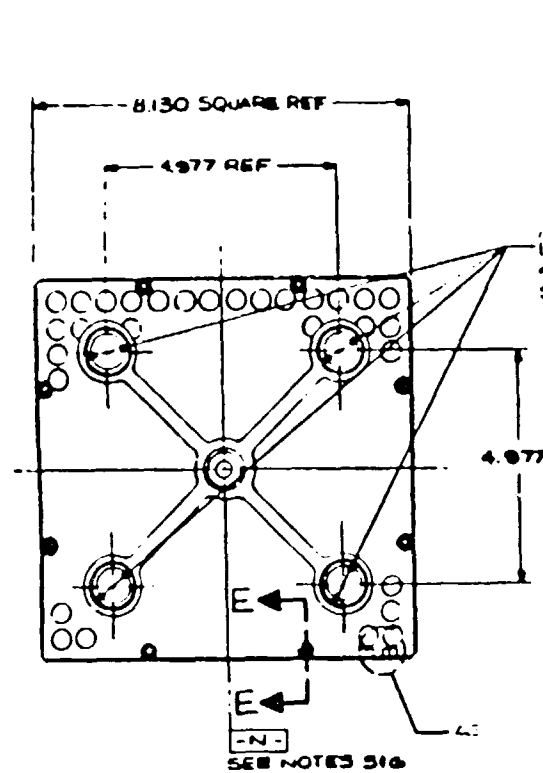
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3580
Fuel Pellet Length (inches).....	0.430
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	> 5
Fuel Density (% theoretical).....	94-95%
O/U Ratio.....	2.00-2.02
Smear Density(lb/in ³).....	0.356
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.050
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	

Comments:

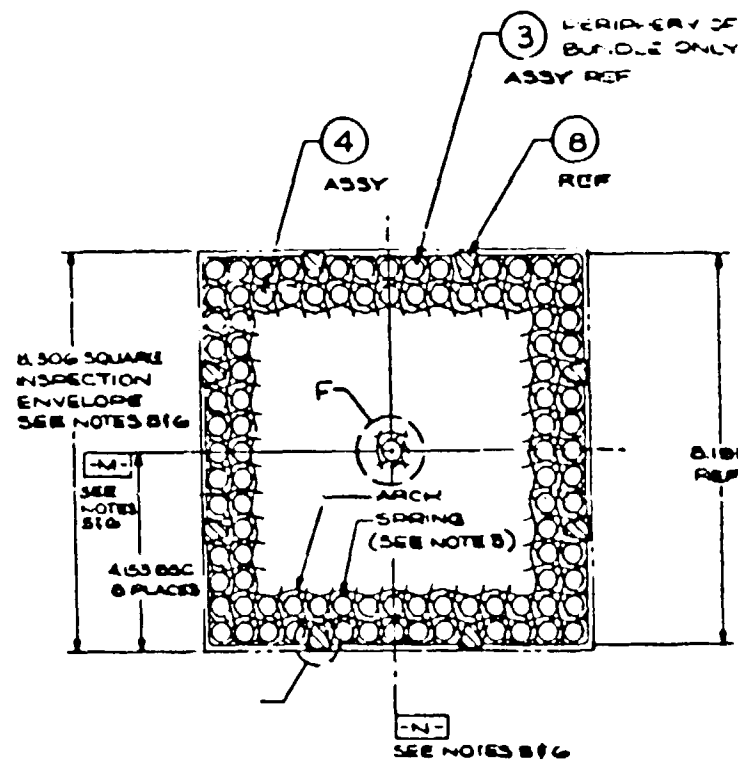
FIGURE 1-1
FUEL ASSEMBLY DRAWING
PALISADES



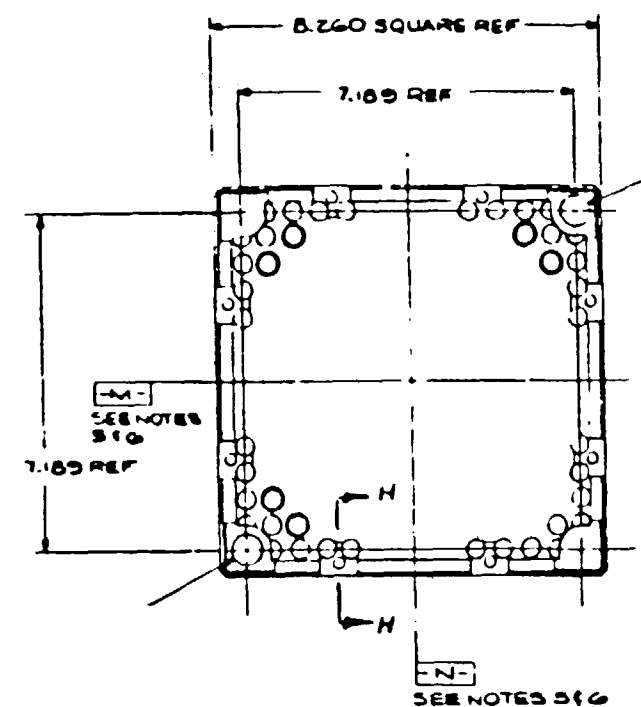
① FUEL BUNDLE ASSY



VIEW A



SECTION B-B



VIEW C

GROUP NO. & QUANTITY	QTY	REF	NAME
8 3 4 3 2 1			
	X	1	FUEL BUNDLE ASSY
	1	2	UPPER SPACER GRID
	48	3	FUEL ROD ASSY
	48	4	FUEL ROD ASSY
	1	5	UPPER END FITTING
	1	6	INSTRUMENT TUBE ASSY
	8	7	SPACER GRID
	8	8	GUIDE ROD
	1	9	LOWER END FITTING
	8	10	UPPER NUT
	8	11	LOCKING DEVICE
	1	12	LOWER SPACER GRID
	3	3	VERTICAL

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Combustion Engineering 16 X 16 Onofre PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1981
Final Year of Manufacture.....	SINP
Total Number Fabricated to Date.....	744
Assembly Width (inches).....	8.1
Assembly Length (inches).....	176.803
with Control Rod Inserted.....	187
including Holddown Device, etc.....	176.803
Rod Pitch (inches).....	0.506
Total Assembly Weight (lbs).....	1430.0
Weight of Heavy Metal (lbs).....	940.00
Metric Tons Initial Heavy Metal (metric tons).....	0.42600
Enrichment Range (% U235).....	2.78-4.05
Average Design Burnup (MWd/MTIHM).....	45000
Maximum Design Burnup (MWd/MTIHM).....	52000
Linear Heat Rating (KW/foot).....	5.5
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	3

Comments:

Typ. 12 nonfueled burnable poison rods; 1.7 lbs. of Al203-B4C/rod

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Combustion Engineering 16 X 16 Onofre PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	5	10.9000	IN CORE	Zircaloy-4	1.00000
HOLDDOWN SPRING	5	4.5000	TOP	CE Ni Alloy	1.00000
SPACER-INCORE	9	7.3500	IN CORE	Zircaloy-4	1.00000
SPACER-LOWER	1	1.3600	IN CORE	Inconel 625	1.00000
LOCKING POSTS	5	7.3000	TOP	St.Steel 304	1.00000
FLOW PLATE	1	3.2000	TOP	St.Steel 304	1.00000
HOLDDOWN PLATE	1	1.8000	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	5.4000	BOTTOM	St.Steel 304	1.00000
SPACER-PLENUM	1	0.8200	GAS PLENUM	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

E-1370-161-101

E-1570-711-101

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Combustion Engineering 16 X 16 Onofre PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	236
Typical Number of Fueled Rods per Assembly.....	224
Rod Diameter (inches).....	0.382
Rod Length (inches).....	161
Active Length (inches).....	150
Weight per Rod (lbs).....	5.70
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.025
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0035
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	300-450
Nitrogen Content of Fill Gas (PPM).....	4.0-5.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

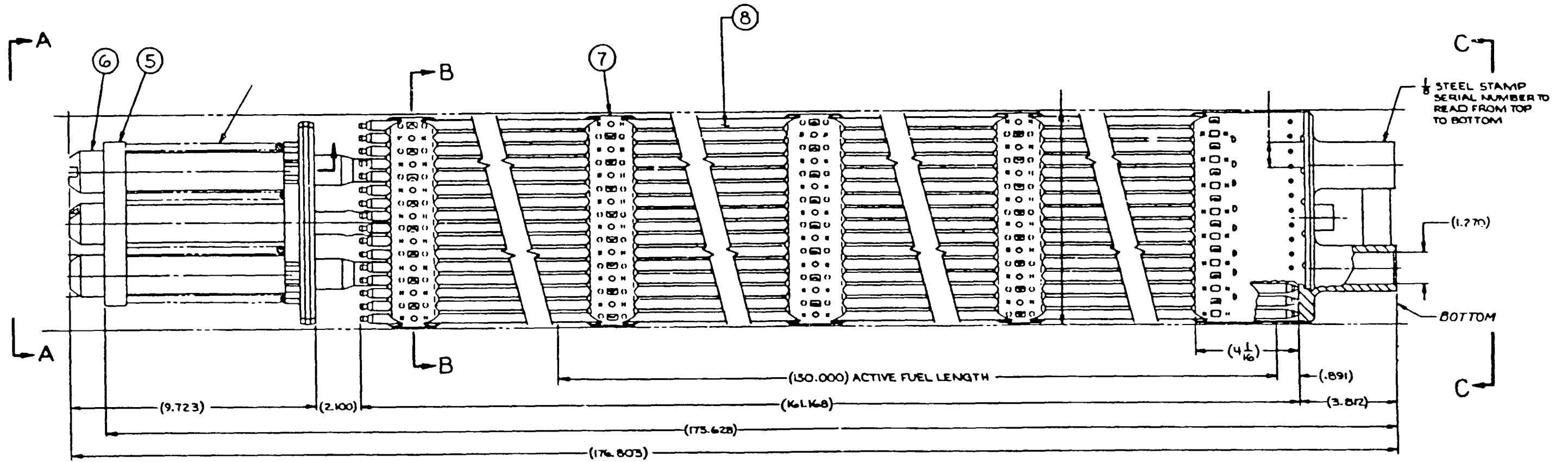
Combustion Engineering 16 X 16 Onofre PWR

FUEL ROD DESCRIPTION TABLE continued

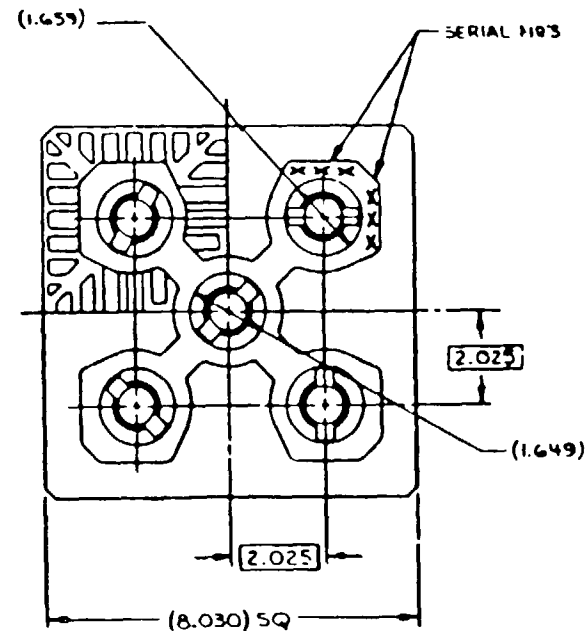
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.325
Fuel Pellet Length (inches).....	0.390
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	> 5
Fuel Density (% theoretical).....	94-95
O/U Ratio.....	2.00-2.02
Smear Density(lb/in ³).....	0.357
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.100
Plenum Length (inches).....	9.527
Plenum Volume (cubic inches).....	

Comments:

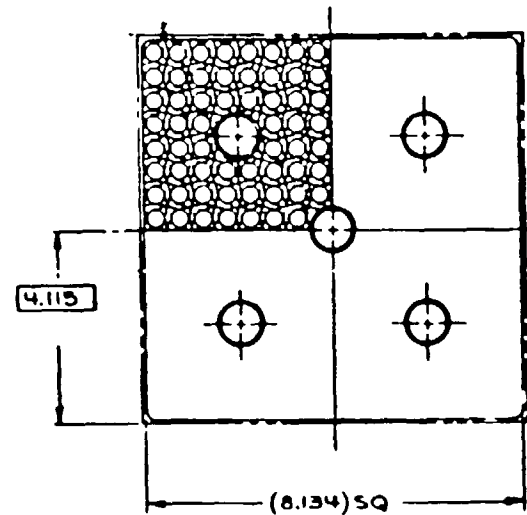
FIGURE 1-9
FUEL ASSEMBLY DRAWING
SAN ONOFRE UNITS 2 AND 3



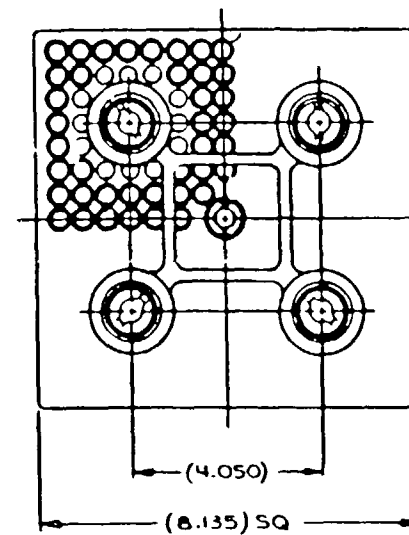
①②③④ FUEL BUNDLE ASSY
SCALE: 1/2



VIEW A-A
SCALE: 1/2



SECTION B-B
SCALE: 1/2



VIEW C-C
SCALE: 1/2

ITEM NO. & QUANTITY	ITEM NO.	NAME
8 5 4 3 2 1	1	FUEL BUNDLE ASSY
	2	FUEL BUNDLE ASSY
	3	FUEL BUNDLE ASSY
	4	FUEL BUNDLE ASSY
	5	UPPER END FITTING ASSY
	6	OUTER POST
	7	FUEL BUNDLE BRIDGAGE ASSY
	8	FUEL ROD ASSY

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Combustion Engineering 16 X 16 Lucie 2 PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1973
Final Year of Manufacture.....	SINP
Total Number Fabricated to Date.....	389
Assembly Width (inches).....	8.1
Assembly Length (inches).....	158.129
with Control Rod Inserted.....	169
including Holddown Device, etc.....	158.129
Rod Pitch (inches).....	0.506
Total Assembly Weight (lbs).....	1300.0
Weight of Heavy Metal (lbs).....	860.00
Metric Tons Initial Heavy Metal (metric tons).....	0.39000
Enrichment Range (% U235).....	
Average Design Burnup (MWd/MTIHM).....	45000
Maximum Design Burnup (MWd/MTIHM).....	52000
Linear Heat Rating (KW/foot).....	5.0
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	3

Comments:

Typ. 12 nonfueled burnable poison rods; 2.0 lbs. of Al203-B4C/rod

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Combustion Engineering 16 X 16 Lucie 2 PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-PLENUM	1	0.8100	GAS PLENUM	Zircaloy-4	1.00000
SPACER-INCORE	8	6.4500	IN CORE	Zircaloy-4	1.00000
SPACER-LOWER	1	1.3600	IN CORE	Inconel 625	1.00000
LOCKING POSTS	5	5.0000	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	5	1.8000	TOP	CE Ni Alloy	1.00000
FLOW PLATE	1	2.7000	TOP	St.Steel 304	1.00000
HOLDDOWN PLATE	1	1.8000	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	5.4000	BOTTOM	St.Steel 304	1.00000
GUIDE TUBES	5	9.5000	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

E-13172-161-101

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Combustion Engineering 16 X 16 Lucie 2 PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	236
Typical Number of Fueled Rods per Assembly.....	224
Rod Diameter (inches).....	0.382
Rod Length (inches).....	146.499
Active Length (inches).....	136.7
Weight per Rod (lbs).....	5.20
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.025
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0035
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	300-450
Nitrogen Content of Fill Gas (PPM).....	4.0-5.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

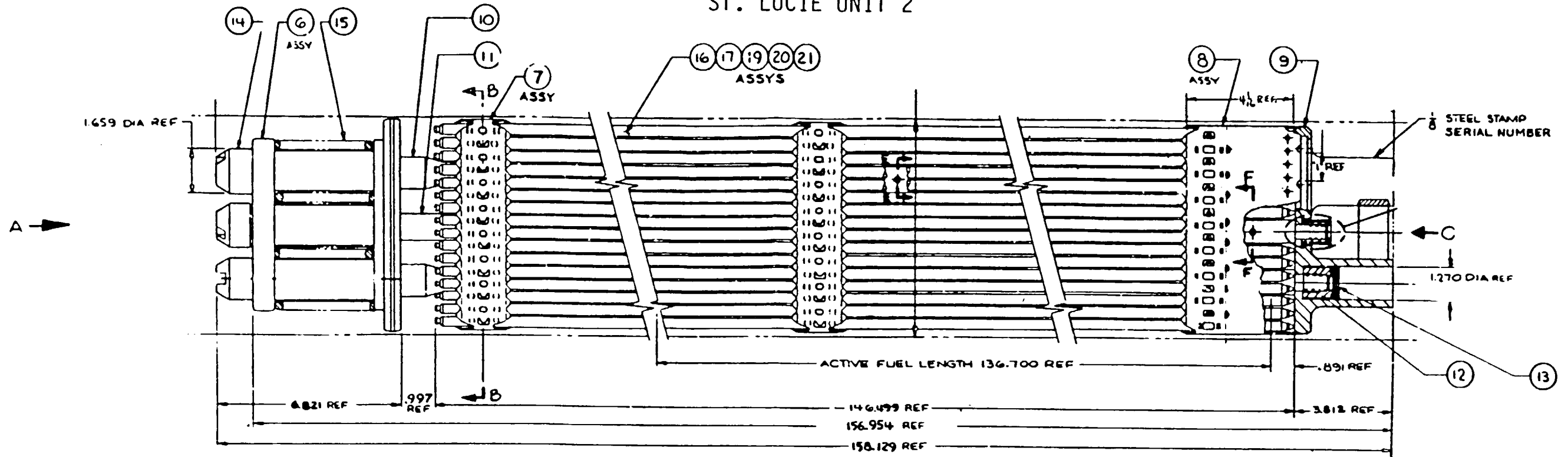
Combustion Engineering 16 X 16 Lucie 2 PWR

FUEL ROD DESCRIPTION TABLE continued

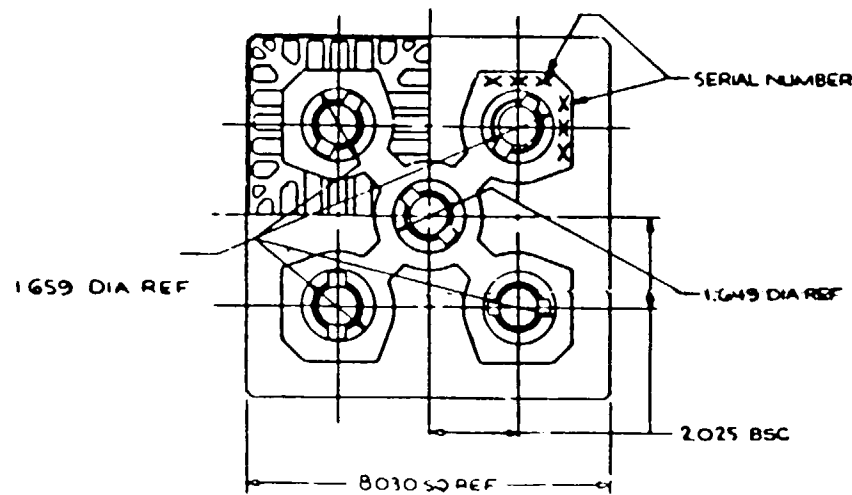
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.325
Fuel Pellet Length (inches).....	0.390
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	>5
Fuel Density (% theoretical).....	94-95%
O/U Ratio.....	2.00-2.02
Smear Density(lb/in ³).....	0.356
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.100
Plenum Length (inches).....	8.158
Plenum Volume (cubic inches).....	

Comments:

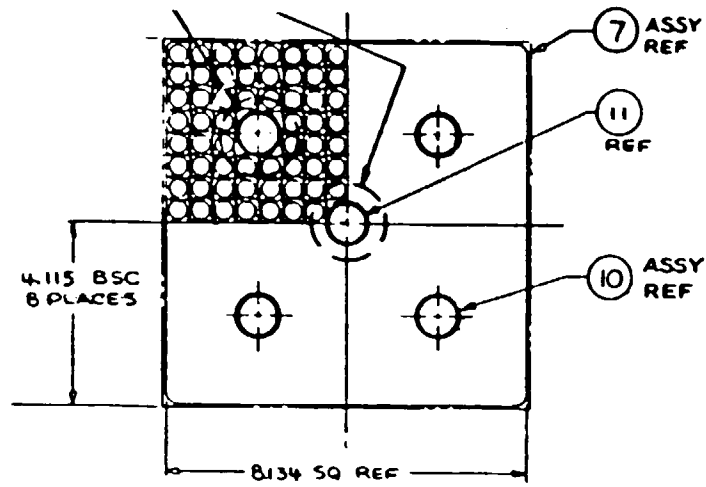
FIGURE 1-6
FUEL ASSEMBLY DRAWING
ST. LUCIE UNIT 2



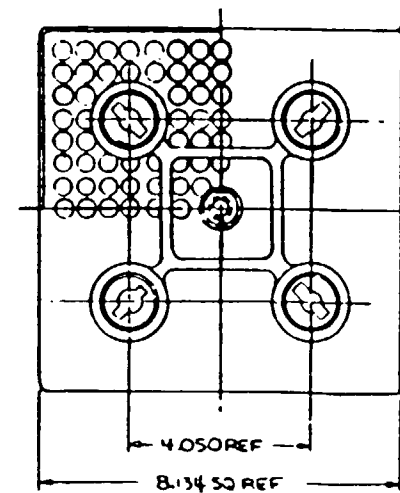
(1)(2)(3)(4)(5) FUEL BUNDLE ASSY
SCALE: 1/2



TOP VIEW A
SCALE: 1/2



SECTION B-B
SCALE: 1/2



BOTTOM VIEW C
SCALE: 1/2

GROUP NO. & QUANTITY	ITEM NO.	NAME
6 8 4 3 2 1	1	FUEL BUNDLE ASSY
	2	FUEL BUNDLE ASSY
	3	FUEL BUNDLE ASSY
	4	FUEL BUNDLE ASSY
	5	FUEL BUNDLE ASSY
1 1 1 1 1 1	6	UPPER END FITTING
9 9 9 9 9	7	SPACER GRID ASSY MID-1
1 1 1 1 1 1	8	INCONEL SPACER GRID ASSY
1 1 1 1 1 1	9	LOWER END FITTING
4 4 4 4 4 4	10	GUIDE TUBE ASSY
1 1 1 1 1 1	11	CENTER GUIDE TUBE
4 4 4 4 4 4	12	LOWER NUT
4 4 4 4 4 4	13	LOCKING DISK
4 4 4 4 4 4	14	OUTER POST
4 4 4 4 4 4	15	SPRING
16 12	16	POISON ROD ASSY
	17	POISON ROD ASSY
	18	FUEL ROD ASSY
	19	FUEL ROD ASSY
20 12 114	20	FUEL ROD ASSY
	21	FUEL ROD ASSY

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Combustion Engineering 16 X 16 ANO2 PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1977
Final Year of Manufacture.....	SINP
Total Number Fabricated to Date.....	774
Assembly Width (inches).....	8.1
Assembly Length (inches).....	176.803
with Control Rod Inserted.....	189
including Holddown Device, etc.....	176.803
Rod Pitch (inches).....	0.506
Total Assembly Weight (lbs).....	1430.0
Weight of Heavy Metal (lbs).....	940.00
Metric Tons Initial Heavy Metal (metric tons).....	0.42600
Enrichment Range (% U235).....	2.90-4.05
Average Design Burnup (MWd/MTIHM).....	45000
Maximum Design Burnup (MWd/MTIHM).....	52000
Linear Heat Rating (KW/foot).....	5.5
Difficulty Indexes (0-not required, 1-simple,..,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	3

Comments:

Typ. 4 nonfueled burnable poison rods; 1.7 lbs. of Al203-B4C rod.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Combustion Engineering 16 X 16 ANO2 PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-PLENUM	1	0.8200	GAS PLENUM	Zircaloy-4	1.00000
SPACER-INCORE	10	8.2000	IN CORE	Zircaloy-4	1.00000
SPACER-LOWER	1	1.3600	IN CORE	Inconel 625	1.00000
LOCKING POSTS	5	7.3000	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	5	1.1000	TOP	CE Ni Alloy	1.00000
FLOW PLATE	1	3.2000	TOP	St.Steel 304	1.00000
HOLDDOWN PLATE	1	1.8000	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	5.4000	BOTTOM	St.Steel 304	1.00000
GUIDE TUBES	5	10.9000	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

E-9270-161-111
 E-6370-161-101
 E-9475-711-101
 E-9475-711-201
 E-9475-711-301
 E-9475-711-401

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Combustion Engineering 16 X 16 ANO2 PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	236
Typical Number of Fueled Rods per Assembly.....	232
Rod Diameter (inches).....	0.382
Rod Length (inches).....	161
Active Length (inches).....	150
Weight per Rod (lbs).....	5.70
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.025
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0035
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	300-450
Nitrogen Content of Fill Gas (PPM).....	4.0-5.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Combustion Engineering 16 X 16 ANO2 PWR

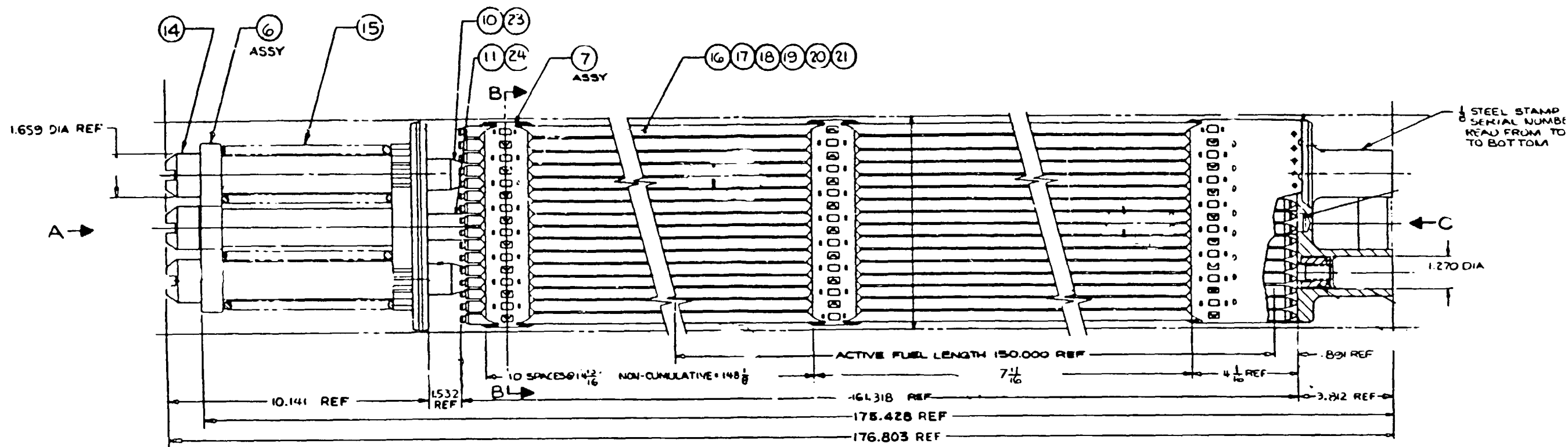
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.0325
Fuel Pellet Length (inches).....	0.390
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	>5
Fuel Density (% theoretical).....	94-95%
O/U Ratio.....	2.00-2.02
Smear Density(lb/in3).....	0.357
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.100
Plenum Length (inches).....	9.527
Plenum Volume (cubic inches).....	

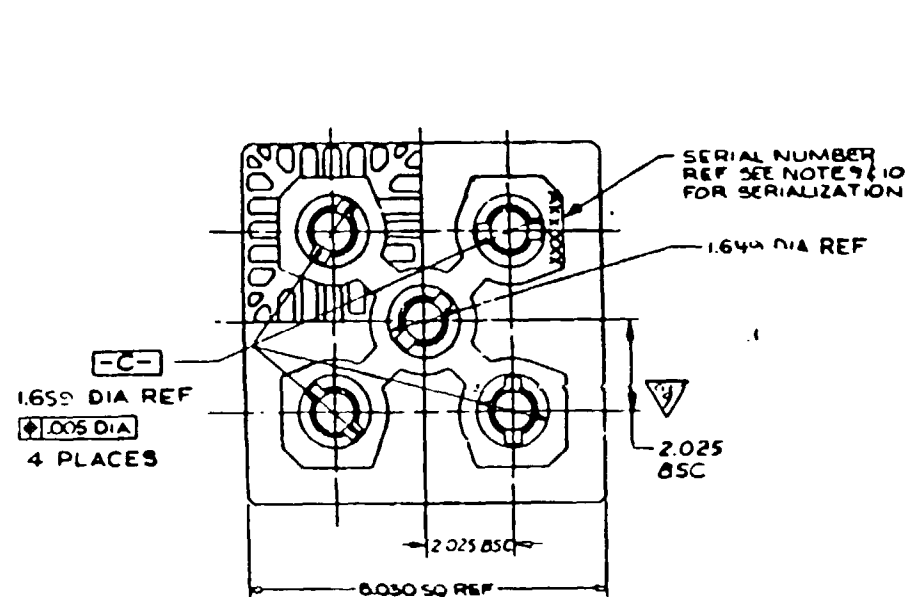
Comments:

Prototypes with fuel pellet and fuel clad variants have been used at ANO2.

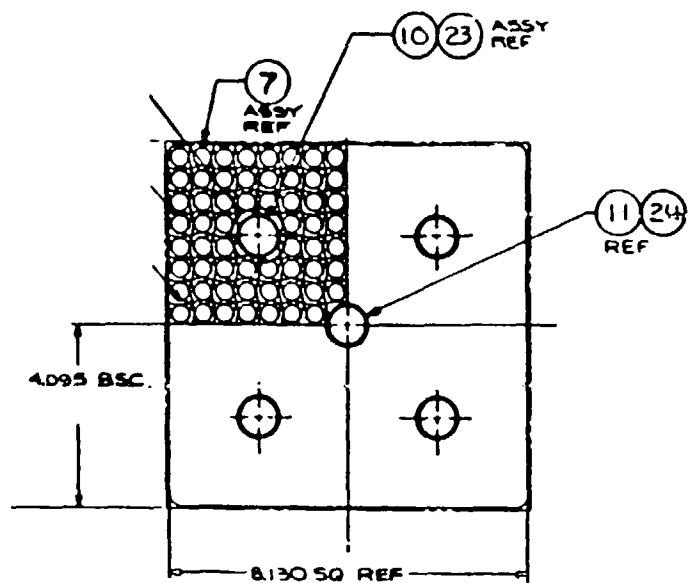
FIGURE 1-8
 FUEL ASSEMBLY DRAWING
 ARKANSAS NUCLEAR ONE - UNIT 2
 WATERFORD UNIT 3



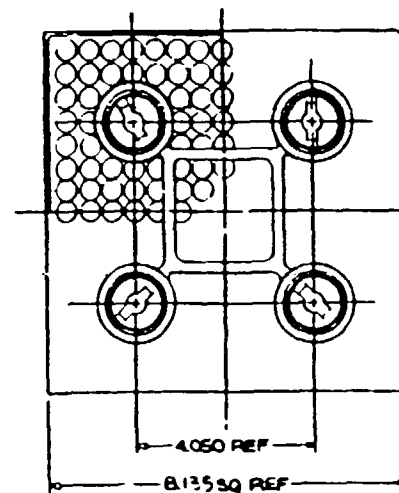
1 2 3 4 5 22 FUEL BUNDLE ASSY
 SCALE: HALF SIZE



TOP VIEW A
 SCALE: HALF SIZE



SECTION B-B
 SCALE: HALF SIZE



BOTTOM VIEW C
 SCALE: HALF SIZE

GROUP NO. & QUANTITY	REF. NO.	NAME
6 3 4 3 2 1		
	1	FUEL BUNDLE ASSY
	2	FUEL BUNDLE ASSY
	3	FUEL BUNDLE ASSY
	4	FUEL BUNDLE ASSY
	5	FUEL BUNDLE ASSY
11 11 11 11 11	6	UPPER END FITTING A
11 11 11 11 11	7	SPACER GRID ASSY
11 11 11 11 11		
4 4 4 4 4	8	GUIDE TUBE ASSY
1 1 1 1 1	11	CENTER GUIDE TUBE
4 4 4 4 4		
4 4 4 4 4		
4 4 4 4 4	14	WREN FUST
4 4 4 4 4	15	SPRING
4 4 4 4 4	16	POISON ROD ASSY
2	17	POISON ROD ASSY
2	18	POISON ROD ASSY
24	19	FUEL ROD ASSY
24	20	FUEL ROD ASSY
24 24 24	21	FUEL ROD ASSY
	22	FUEL BUNDLE ASSY
4	23	GUIDE TUBE ASSY
1	24	CENTER GUIDE TUBE
4 4 4 4 4		

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Combustion Engineering 16 X 16 SYS80 PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1983
Final Year of Manufacture.....	SINP
Total Number Fabricated to Date.....	444
Assembly Width (inches).....	8.1
Assembly Length (inches).....	178.250
with Control Rod Inserted.....	193
including Holddown Device, etc.....	178.250
Rod Pitch (inches).....	0.506
Total Assembly Weight (lbs).....	1430.0
Weight of Heavy Metal (lbs).....	940.00
Metric Tons Initial Heavy Metal (metric tons).....	0.42600
Enrichment Range (% U235).....	
Average Design Burnup (MWd/MTIHM).....	45000
Maximum Design Burnup (MWd/MTIHM).....	52000
Linear Heat Rating (KW/foot).....	5.5
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	3

Comments:

Typ. 16 nonfueled burnable poison rods; 1.7 lbs. of Al2O3-B4C/
rod.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Combustion Engineering 16 X 16 SYS80 PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-PLENUM	1	0.8200	GAS PLENUM	Zircaloy-4	1.00000
SPACER-INCORE	9	7.3500	IN CORE	Zircaloy-4	1.00000
SPACER-LOWER	1	1.3600	IN CORE	Inconel 625	1.00000
LOCKING POSTS	4	5.9000	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	4	4.5000	TOP	CE Ni Alloy	1.00000
FLOW PLATE	1	3.2000	TOP	St.Steel 304	1.00000
HOLDDOWN PLATE	1	2.3000	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	7.3000	BOTTOM	St.Steel 304	1.00000
GUIDE TUBES	5	11.3000	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Combustion Engineering 16 X 16 SYS80 PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	231
Typical Number of Fueled Rods per Assembly.....	220
Rod Diameter (inches).....	0.382
Rod Length (inches).....	161
Active Length (inches).....	150
Weight per Rod (lbs).....	5.70
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.025
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0035
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	300-450
Nitrogen Content of Fill Gas (PPM).....	4.0-5.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

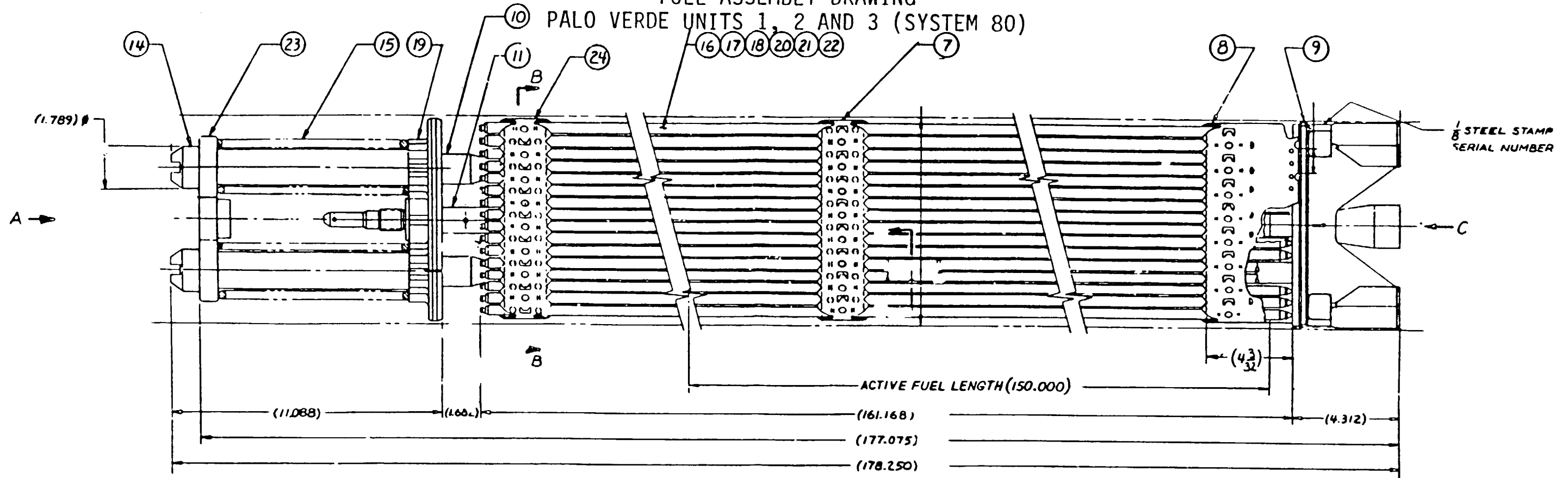
Combustion Engineering 16 X 16 SYS80 PWR

FUEL ROD DESCRIPTION TABLE continued

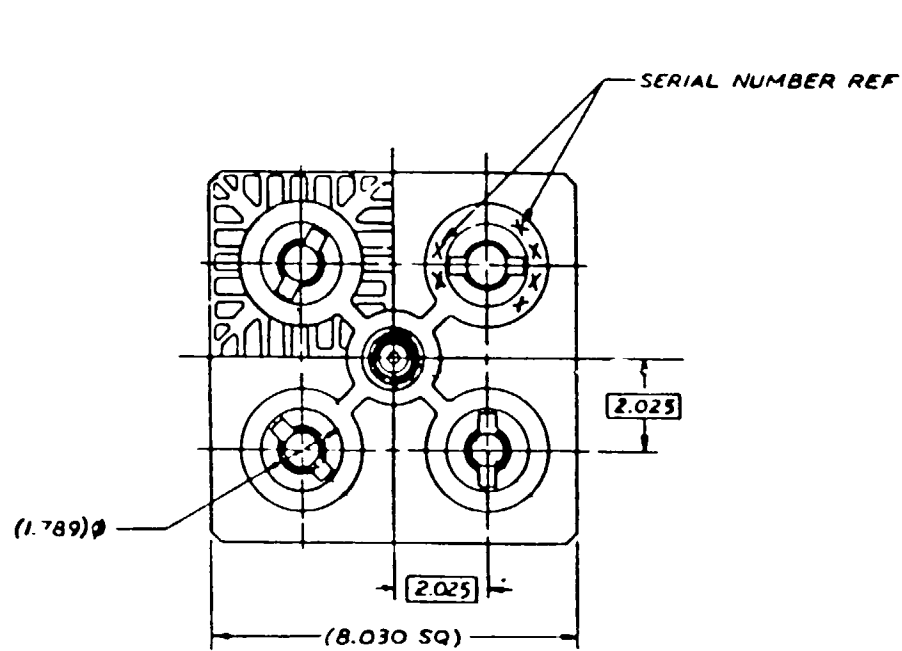
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.325
Fuel Pellet Length (inches).....	0.390
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	>5
Fuel Density (% theoretical).....	94-95%
O/U Ratio.....	2.00-2.02
Smear Density(lb/in ³).....	0.357
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.100
Plenum Length (inches).....	9.527
Plenum Volume (cubic inches).....	

Comments:

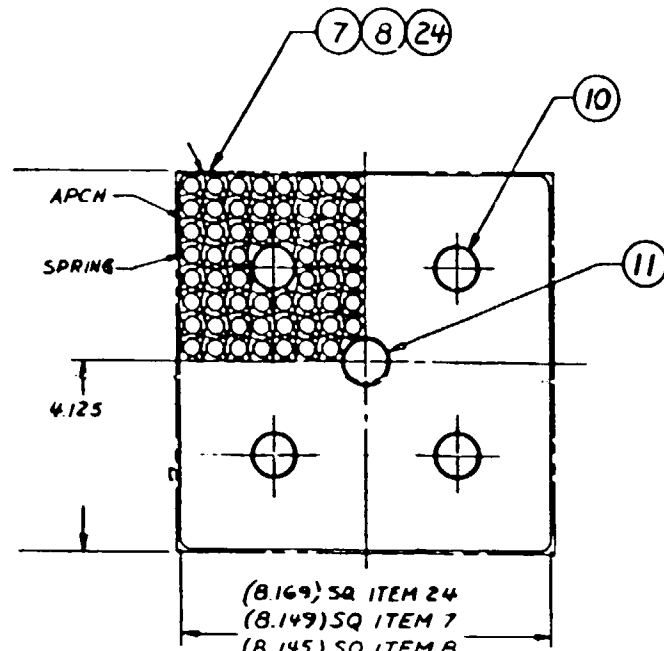
FIGURE 1-10
FUEL ASSEMBLY DRAWING



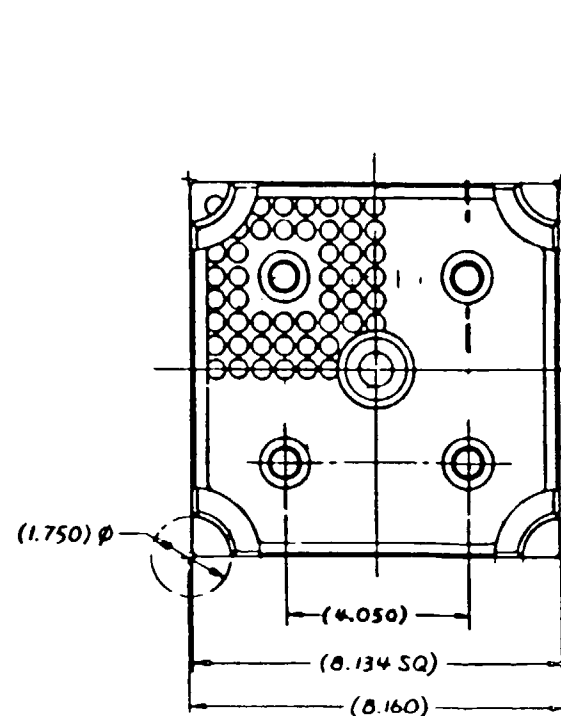
①②③④⑥ FUEL BUNDLE ASSY
SCALE: HALF SIZE



TOP VIEW A



SECTION B-B



GROUP NO. & QUANTITY	ITEM NO.	NAME				
6	5	4	3	2	1	
					X	1 FUEL BUNDLE ASSY A/C
				X		2 FUEL BUNDLE ASSY B1
			X			3 FUEL BUNDLE ASSY B2
			X			4 FUEL BUNDLE ASSY C1
						5
X						6 FUEL BUNDLE ASSY C2
9	9	9	9	9		7 MID H ZIRC SPACER GRID ASSY
1	1	1	1	1		8 INCONEL SPACER GRID ASSY
1	1	1	1	1		9 LOWER END FITTING ASSY
4	4	4	4	4		10 GUIDE TUBE ASSY
1	1	1	1	1		11 CENTER GUIDETUBE
4	4	4	4	4		12 LOWER NUT
4	4	4	4	4		13 LOCKING DISC
4	4	4	4	4		14 OUTER POST
4	4	4	4	4		15 SPRING
				16		16 POISON ROD ASSY B1
				16		17 POISON ROD ASSY B2
				16		18 POISON ROD ASSY C1
1	1	1	1	1		19 FLOW PLATE ASSY
		12	12	24		20 FUEL ROD ASSY
12	12	24	24			21 FUEL ROD ASSY
24	24					22 FUEL ROD ASSY
1	1	1	1	1		23 HOLD DOWN PLATE
1	1	1	1	1		24 UPPER MID H ZIRC SPACER GRID ASSY

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Combustion Engineering 15 X 16 Yankee PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1985
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	40
Assembly Width (inches).....	7.6
Assembly Length (inches).....	111.785
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.472
Total Assembly Weight (lbs).....	720
Weight of Heavy Metal (lbs).....	510
Metric Tons Initial Heavy Metal (metric tons).....	0.231
Enrichment Range (% U235).....	3.0-4.0
Average Design Burnup (MWd/MTIHM).....	27000
Maximum Design Burnup (MWd/MTIHM).....	38000
Linear Heat Rating (KW/foot).....	4.4
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	2
for Mechanical Disassembly in Air.....	2
for Underwater Cosolidation.....	2
for Underwater Rod Replacement.....	4

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Combustion Engineering 15 X 16 Yankee PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-PLENUM	1	0.6400	GAS PLENUM	Zircaloy-4	1.00000
SPACER-INCORE	4	2.5000	IN CORE	Zircaloy-4	1.00000
SPACER-LOWER	1	0.9100	IN CORE	Inconel 625	1.00000
GUIDE BARS	8	13.2000	IN CORE	Zircaloy-4	1.00000
INSTRUMENT TUBE	1	0.4500	IN CORE	Zircaloy-4	1.00000
TOP NOZZLE	1	8.2000	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	9.1000	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

E-17182-713-101

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Combustion Engineering 15 X 16 Yankee PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	231
Typical Number of Fueled Rods per Assembly.....	231
Rod Diameter (inches).....	
Rod Length (inches).....	95
Active Length (inches).....	91
Weight per Rod (lbs).....	2.8
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.026
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0033
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	300-450
Nitrogen Content of Fill Gas (PPM).....	4-5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

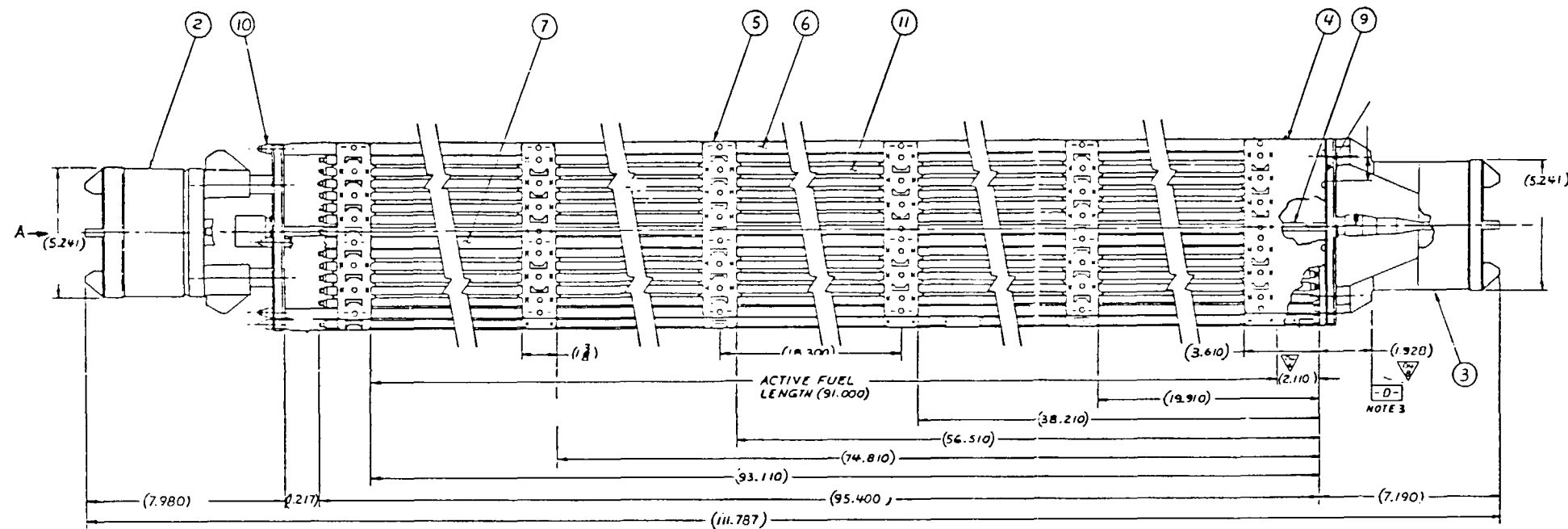
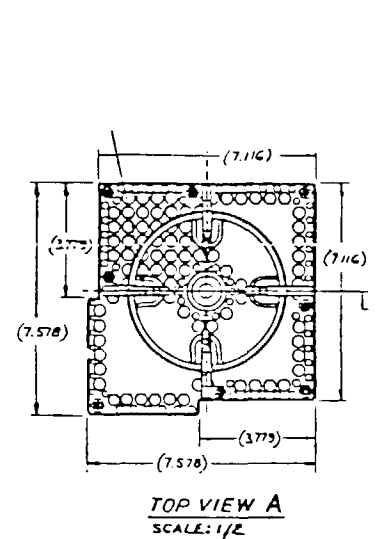
Combustion Engineering 15 X 16 Yankee PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3105
Fuel Pellet Length (inches).....	0.372
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	>5
Fuel Density (% theoretical).....	94-95%
O/U Ratio.....	2.00-2.02
Smear Density(lb/in ³).....	0.324
Spacer Pellet Material.....	St.Steel 304
Spacer Pellet Length (inches).....	1.490
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.05
Plenum Length (inches).....	1.55
Plenum Volume (cubic inches).....	

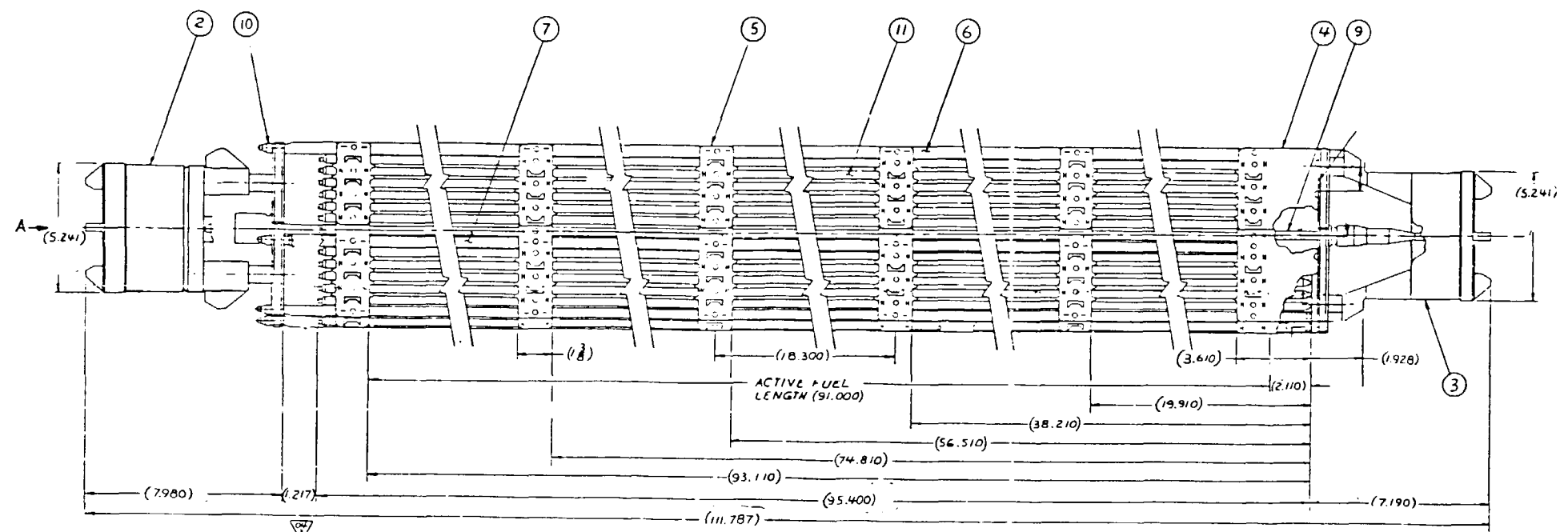
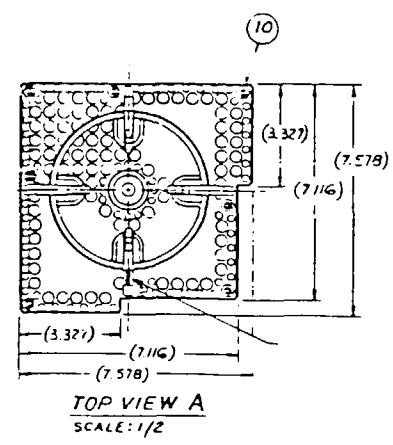
Comments:

FIGURE 1-1
FUEL ASSEMBLY DRAWING
YANKEE ROWE



① FUEL BUNDLE ASSEMBLY (TYPE A)
SCALE: 1/2

GROUP NO.	QUANTITY	NAME
1	1	FUEL BUNDLE ASSY TYPE A
2	1	UPPER END FITTING ASSY
3	1	LOWER END FITTING ASSY
4	1	UNCOMEL SPACER GRID ASSY
5	1	ZIRC SPACER GRID ASSY
6	1	CORNER GUIDE BAR ASSY
7	1	SIDE GUIDE BAR ASSY
8	1	BI SCREW
9	1	INSTRUMENT TUBE
10	1	UPPER NUT
11	1	FUEL ROD ASSY



① FUEL BUNDLE ASSEMBLY (TYPE B)
SCALE: 1/2

GROUP NO.	QUANTITY	NAME
1	1	FUEL BUNDLE ASSY TYPE B
2	1	UPPER END FITTING ASSY
3	1	LOWER END FITTING ASSY
4	1	UNCOMEL SPACER GRID ASSY
5	1	ZIRC SPACER GRID ASSY
6	1	CORNER GUIDE BAR ASSY
7	1	SIDE GUIDE BAR ASSY
8	1	BI SCREW
9	1	INSTRUMENT TUBE
10	1	UPPER NUT
11	1	FUEL ROD ASSY

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 6 X 6 GE BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 4.275

Assembly Length (inches)..... 134.32
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.694

Total Assembly Weight (lbs)..... 328.4

Weight of Heavy Metal (lbs)..... 2208.69

Metric Tons Initial Heavy Metal (metric tons)..... 0.09466

Enrichment Range (% U235)..... 1.65-2.52

Average Design Burnup (MWd/MTIHM)..... 21000

Maximum Design Burnup (MWd/MTIHM)..... 22700

Linear Heat Rating (KW/foot)..... 4.79

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)

for Cutting..... 0

for Mechanical Disassembly in Air..... 1

for Underwater Cosolidation..... 0

for Underwater Rod Replacement..... 1

Comments:

This assembly is manufactured for older GE reactors (Humboldt Bay, Dresden 1)

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 6 X 6 GE BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
T. TIE PLATE	1	1.5500	TOP	St.Steel-ANF	1.00000
B. TIE PLATE	1	5.7300	BOTTOM	St.Steel-ANF	1.00000
SPACER-INCORE	5	1.1100	IN CORE	Zircaloy-4	0.84000
				Inconel-718	0.16000
COMP. SPRINGS	36	0.1100	TOP	Inconel X-750	1.00000
INERT ROD	1	0.9400	IN CORE	Zircaloy-2	1.00000

Drawing Numbers Associated With Assembly:

XF-NF-SK-302,012

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 6 X 6 GE BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	36
Typical Number of Fueled Rods per Assembly.....	35
Rod Diameter (inches).....	0.5645
Rod Length (inches).....	116.65
Active Length (inches).....	108.25
Weight per Rod (lbs).....	8.71-8.86
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	0.036-0.046
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	0
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Exxon / ANF 6 X.6 GE BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	93.5
O/U Ratio.....	2.00-2.02
Smear Density(%).....	91.7
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.059
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	0.706-0.784

Comments:

PHYSICAL DESCRIPTION REPORT

Exxon / ANF 6 X 6 HUM.BAY BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches).....
Assembly Length (inches)..... 95
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches).....

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

Complete data not yet available.

2A-110

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 6 X 6 HUM.BAY BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

Exxon / ANF 6 X 6 HUM.BAY BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	36
Typical Number of Fueled Rods per Assembly.....	36
Rod Diameter (inches).....	
Rod Length (inches).....	
Active Length (inches).....	
Weight per Rod (lbs).....	
Clad Material.....	
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Exxon / ANF 6 X 6 HUM.BAY BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-113

No drawing available for an Exxon / ANF 6 X 6 HUM.BAY.
For a drawing of a similar assembly, see page 2A-107.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 7 X 7 GE BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1971
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	
Assembly Width (inches).....	5.247
Assembly Length (inches).....	171.25
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.738
Total Assembly Weight (lbs).....	619.1
Weight of Heavy Metal (lbs).....	405.14
Metric Tons Initial Heavy Metal (metric tons).....	0.18377
Enrichment Range (% U235).....	1.59-1.87
Average Design Burnup (MWd/MTIHM).....	23600
Maximum Design Burnup (MWd/MTIHM).....	27900
Linear Heat Rating (KW/foot).....	5.98
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	1

Comments:

This assembly manufactured as a reload for General Electric BWRs.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 7 X 7 GE BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
T. TIE PLATE	1	3.3100	TOP	St.Steel-ANF	1.00000
B. TIE PLATE	1	4.2200	BOTTOM	St.Steel-ANF	1.00000
SPACER-INCORE	7	2.0400	IN CORE	Zircaloy-4	0.84000
				Inconel-718	0.16000
COMP. SPRINGS	49	0.2100	TOP	Inconel X-750	1.00000
INERT ROD	1	3.7940	IN CORE	Zircaloy-2	0.99900
				Inconel X-750	0.00100

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,011

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 7 X 7 GE BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	49
Typical Number of Fueled Rods per Assembly.....	48
Rod Diameter (inches).....	0.570
Rod Length (inches).....	158.15
Active Length (inches).....	144
Weight per Rod (lbs).....	12.19-12.41
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	0.036-0.046
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	0.02
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	0
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

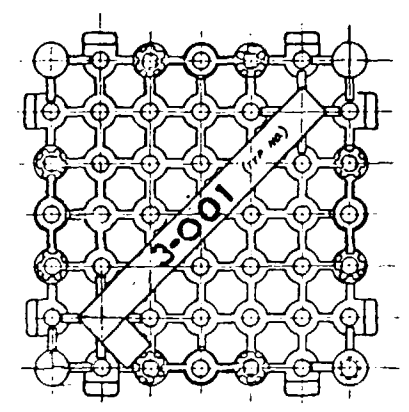
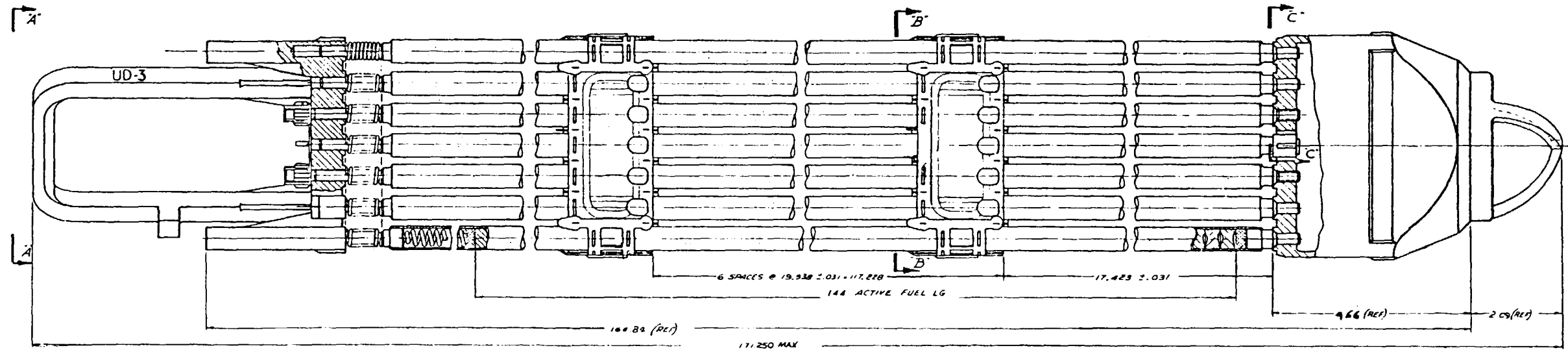
Exxon / ANF 7 X 7 GE BWR

FUEL ROD DESCRIPTION TABLE continued

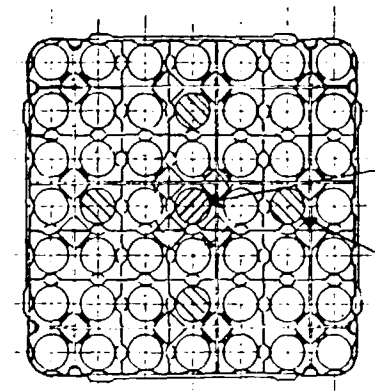
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.49
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	95%
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.7
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.130
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	1.461-1.624

Comments:

Max of 4 fueled burnable poison rods; typ. 44.75 GMS gadolinia/
rod.

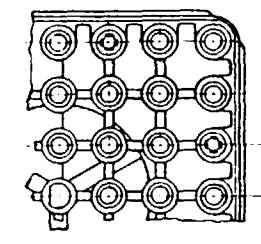


VIEW A-A



SECTION B-B

INERT ROD ASSEMBLY
NA ROD ASSEMBLY



SECTION C-C
(FUEL RODS REMOVED)

EXXON NUCLEAR COMPANY, INC.

FUEL BUNDLE ASSEMBLY

APPROVED	REVISIONS	REFERENCE DRAWINGS

XN- SK-302,011 1/1/0

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 8 X 8 JP-3 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1974
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	
Assembly Width (inches).....	5.251
Assembly Length (inches).....	171.29
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.641
Total Assembly Weight (lbs).....	562.3
Weight of Heavy Metal (lbs).....	384.15
Metric Tons Initial Heavy Metal (metric tons).....	0.17425
Enrichment Range (% U235).....	1.35-3.76
Average Design Burnup (MWd/MTIHM).....	31500
Maximum Design Burnup (MWd/MTIHM).....	35000
Linear Heat Rating (KW/foot).....	4.58
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	1

Comments:

This assembly manufactured as a reload for General Electric BWRs.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 8 X 8 JP-3 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	7	1.6600	IN CORE	Zircaloy-4	0.87000
				Inconel-718	0.13000
COMP. SPRINGS	64	0.1600	TOP	Inconel X-750	1.00000
T. TIE PLATE	1	1.5300	TOP	St.Steel-ANF	1.00000
B. TIE PLATE	1	3.9400	BOTTOM	St.Steel-ANF	1.00000
SP. CAPTURE ROD	1	0.8500	IN CORE	Zircaloy-2	1.00000

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,001

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 8 X 8 JP-3 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	64
Typical Number of Fueled Rods per Assembly.....	63
Rod Diameter (inches).....	0.484
Rod Length (inches).....	158.665
Active Length (inches).....	145.24
Weight per Rod (lbs).....	8.95
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	0.36
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	.005
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	45
Nitrogen Content of Fill Gas (percent).....	2.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

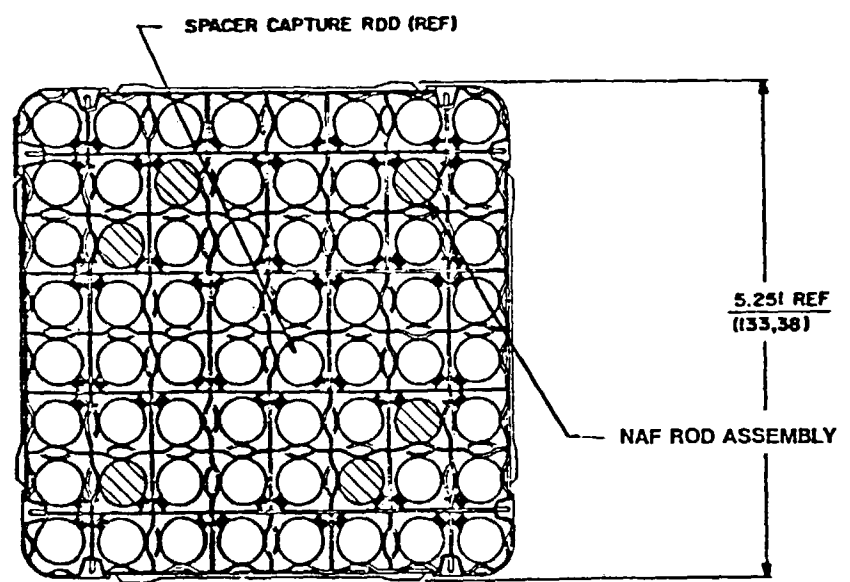
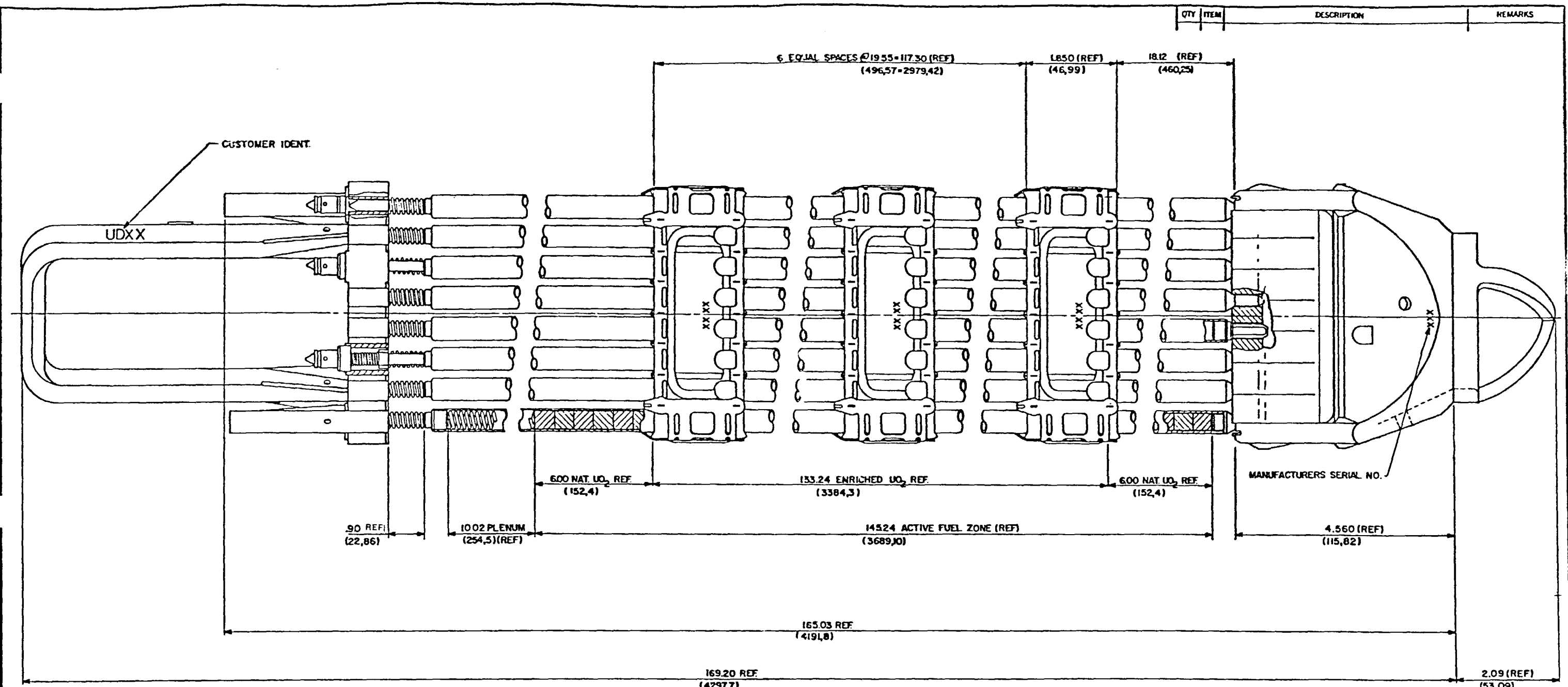
Exxon / ANF 8 X 8 JP-3 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.4195
Fuel Pellet Length (inches).....	.320
Fuel Pellet Weight per Rod (lbs).....	7.0
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94.5
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.7
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.100
Plenum Length (inches).....	10.020
Plenum Volume (cubic inches).....	1.090

Comments:

Max of 6 fueled burnable poison rods; typ. 99.38 GMS gadolinia/
rod. 6" UO2 blanket on each end included in active length.



QTY	ITEM	DESCRIPTION	REMARKS
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APPROVED	REV	REVISIONS
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DESIGNER CHECKED BY APPROVED BY DATE	EXXON NUCLEAR COMPANY INC. <small>BAYLAND TRANSPORT GROUP</small> FUEL BUNDLE ASSEMBLY
SCALE: NONE	DRAWING NO.: XN-NF-SK-302,001 SHEET NO.: 110

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 8 X 8 JP-4,5 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.251

Assembly Length (inches)..... 176.05
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.641

Total Assembly Weight (lbs)..... 587.8

Weight of Heavy Metal (lbs)..... 389.75

Metric Tons Initial Heavy Metal (metric tons)..... 0.17679

Enrichment Range (% U235)..... 1.50-4.25

Average Design Burnup (MWd/MTIHM)..... 31500

Maximum Design Burnup (MWd/MTIHM)..... 35000

Linear Heat Rating (KW/foot)..... 5.61

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)

for Cutting..... 0

for Mechanical Disassembly in Air..... 1

for Underwater Cosolidation..... 0

for Underwater Rod Replacement..... 1

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 8 X 8 JP-4,5 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
COMP. SPRINGS	64	0.1600	TOP	Inconel X-750	1.00000
T. TIE PLATE	1	1.5300	TOP	St.Steel-ANF	1.00000
SPACER-INCORE	7	1.6600	IN CORE	Zircaloy-4	0.87000
				Inconel-718	0.13000
B. TIE PLATE	1	3.9400	BOTTOM	St.Steel-ANF	1.00000
INERT ROD	1	0.8700	IN CORE	Zircaloy-2	1.00000
SP. CAPTURE ROD	1	0.8700	IN CORE	Zircaloy-2	1.00000

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,002

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 8 X 8 JP-4,5 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	64
Typical Number of Fueled Rods per Assembly.....	62
Rod Diameter (inches).....	0.484
Rod Length (inches).....	163.424
Active Length (inches).....	150.000
Weight per Rod (lbs).....	9.15
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	0.036
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	30.0
Nitrogen Content of Fill Gas (percent).....	2.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

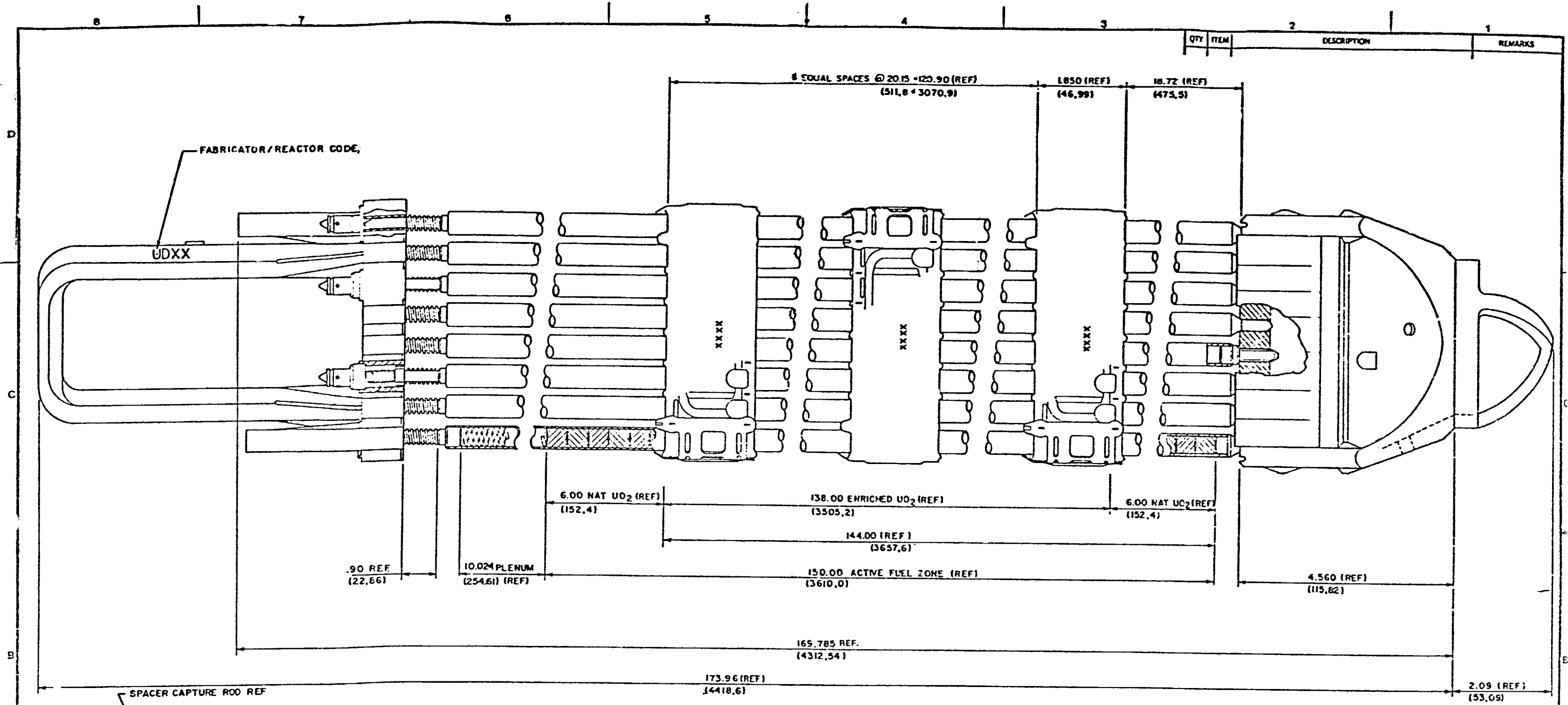
Exxon / ANF 8 X 8 JP-4,5 BWR

FUEL ROD DESCRIPTION TABLE continued

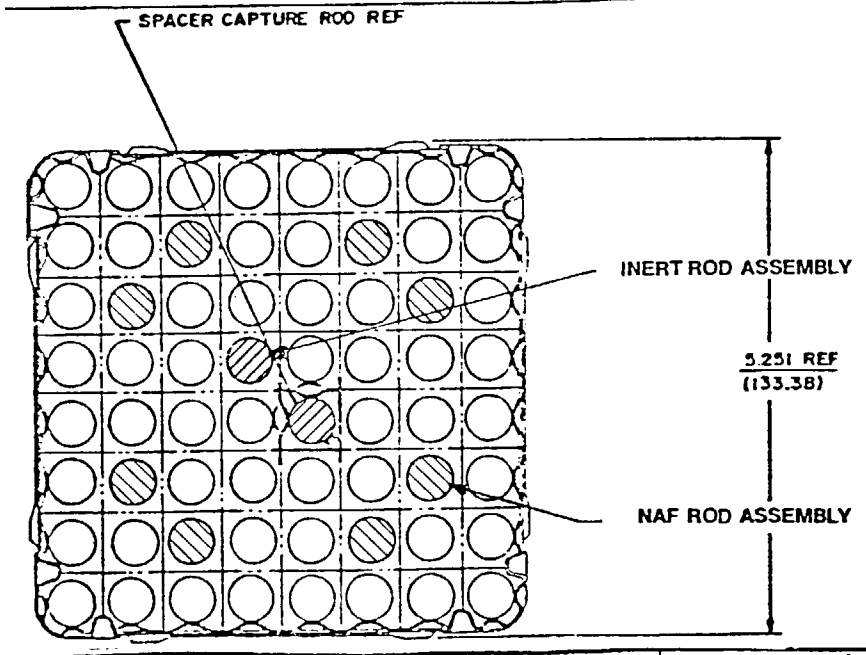
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94.5
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.7
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.100
Plenum Length (inches).....	10.024
Plenum Volume (cubic inches).....	1.090

Comments:

Max of 8 fueled burnable poison rods; typ. 68.75 GMS gadolinia/
rod.



QTY	ITEM	DESCRIPTION	REMARKS
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APPROVED	REV	REVISIONS
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APPROVED	
DESIGNED BY	
CHECKED BY	
DRAWN BY	
DATE	
SCALE	NONE
EXXON NUCLEAR COMPANY, INC. <small>PLAZA AND WASHINGTON BLVD.</small>	
FUEL BUNDLE ASSEMBLY	
XN-NF- SK-302-002 110	

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 9 X 9 JP-3 BWR
 OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1981
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	
Assembly Width (inches).....	5.251
Assembly Length (inches).....	171.29
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.572
Total Assembly Weight (lbs).....	556.9
Weight of Heavy Metal (lbs).....	369.74
Metric Tons Initial Heavy Metal (metric tons).....	0.16771
Enrichment Range (% U235).....	1.50-4.34
Average Design Burnup (MWd/MTIHM).....	36000
Maximum Design Burnup (MWd/MTIHM).....	40000
Linear Heat Rating (KW/foot).....	3.65
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	1

Comments:

This assembly is manufactured as a reload only.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 9 X 9 JP-3 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
COMP. SPRINGS	81	0.3300	TOP	Inconel X-750	1.00000
SPACER-INCORE	7	1.5300	IN CORE	Zircaloy-4	0.84000
				Inconel-718	0.16000
T. TIE PLATE	1	1.6700	TOP	St.Steel-ANF	1.00000
B. TIE PLATE	1	4.5300	BOTTOM	St.Steel-ANF	1.00000
INERT ROD	1	0.6100	IN CORE	Zircaloy-2	1.00000
SP. CAPTURE ROD	1	0.6200	IN CORE	Zircaloy-2	1.00000

Drawing Numbers Associated With Assembly:

XN-NF-SK-301,992

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 9 X 9 JP-3 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	81
Typical Number of Fueled Rods per Assembly.....	79
Rod Diameter (inches).....	0.424
Rod Length (inches).....	159.07
Active Length (inches).....	145.24
Weight per Rod (lbs).....	6.79
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	0.030
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	.00375
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	60.0
Nitrogen Content of Fill Gas (percent).....	2.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Exxon / ANF 9 X 9 JP-3 BWR

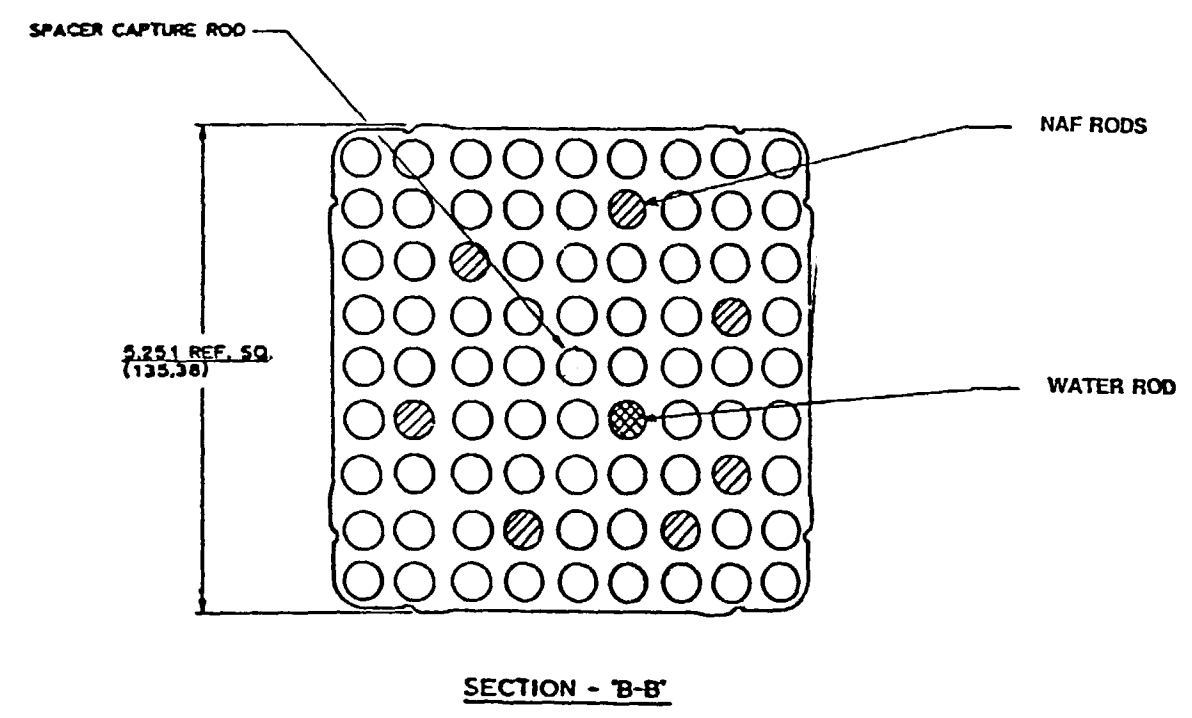
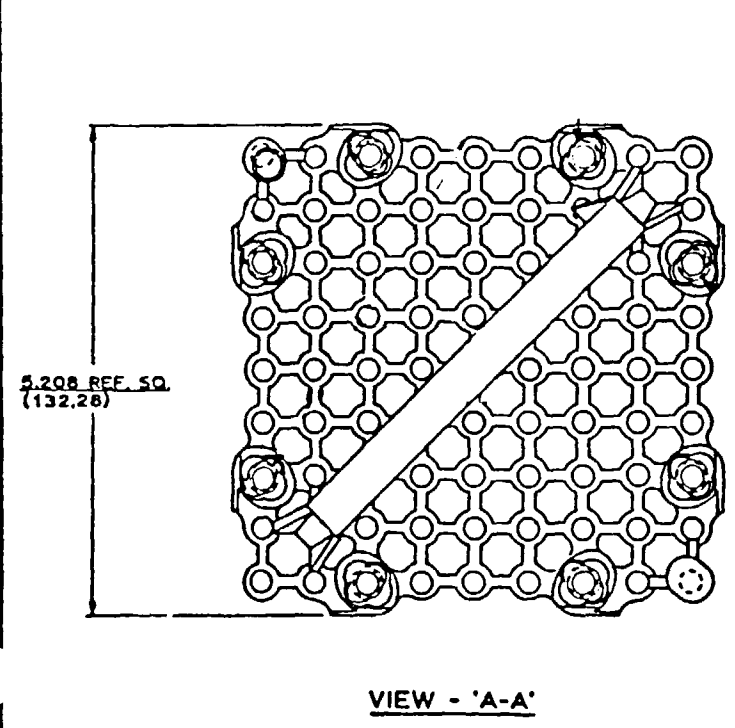
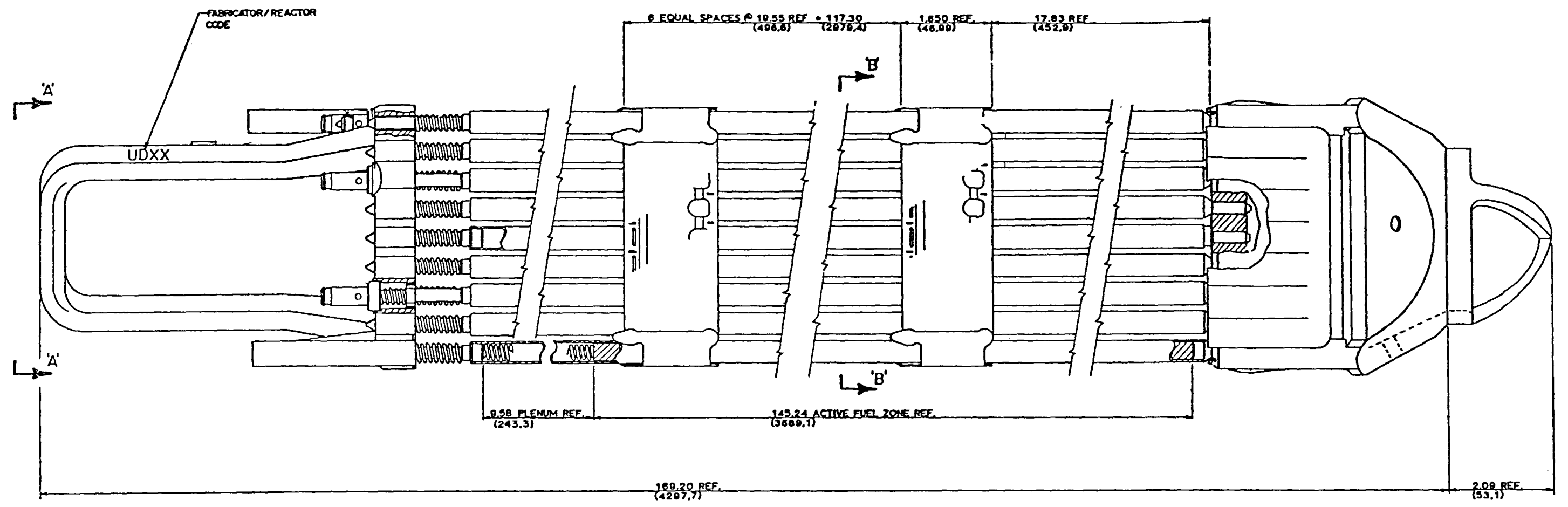
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.3565
Fuel Pellet Length (inches).....	0.410
Fuel Pellet Weight per Rod (lbs).....	5.7
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94.5
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.7
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.047
Plenum Length (inches).....	9.580
Plenum Volume (cubic inches).....	0.785

Comments:

Max of 8 fueled burnable poison rods; typ. 77.08 GMS gadolinia/
rod.

QTY	ITEM	DESCRIPTION	REMARKS
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DESIGN	MECH & MAT'LBS DESIGN	EXXON NUCLEAR COMPANY, INC. RICHLAND WASHINGTON, DC 20181
COMPONENT CODE		
DESIGN CODE		FUEL BUNDLE ASSEMBLY
RESPONSIBLE DESIGNER		
DRAWN BY		
CHECKED BY		
SCALE	NONE	EXXON NF - SK-301,992
APPROVED	REV	REVISIONS

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 9 X 9 JP-4,5 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.251

Assembly Length (inches)..... 176.058
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.572

Total Assembly Weight (lbs)..... 575.3

Weight of Heavy Metal (lbs)..... 381.35

Metric Tons Initial Heavy Metal (metric tons)..... 0.17298

Enrichment Range (% U235)..... 1.45-4.68

Average Design Burnup (MWd/MTIHM)..... 36000

Maximum Design Burnup (MWd/MTIHM)..... 40000

Linear Heat Rating (KW/foot)..... 4.36

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)

for Cutting..... 0

for Mechanical Disassembly in Air..... 1

for Underwater Cosolidation..... 0

for Underwater Rod Replacement..... 1

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 9 X 9 JP-4,5 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
COMP. SPRINGS	81	0.3400	TOP	Inconel X-750	1.00000
T. TIE PLATE	1	1.6100	TOP	St.Steel-ANF	1.00000
B. TIE PLATE	1	4.5300	BOTTOM	St.Steel-ANF	1.00000
SPACER-INCORE	7	1.5400	IN CORE	Zircaloy-4	0.84000
				Inconel-718	0.16000
INERT ROD	1	0.6500	IN CORE	Zircaloy-2	1.00000
SP. CAPTURE ROD	1	0.6500	IN CORE	Zircaloy-2	1.00000

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,000

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 9 X 9 JP-4,5 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	81
Typical Number of Fueled Rods per Assembly.....	79
Rod Diameter (inches).....	0.424
Rod Length (inches).....	163.84
Active Length (inches).....	150.00
Weight per Rod (lbs).....	7.01
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	0.03
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	60.0
Nitrogen Content of Fill Gas (percent).....	2.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

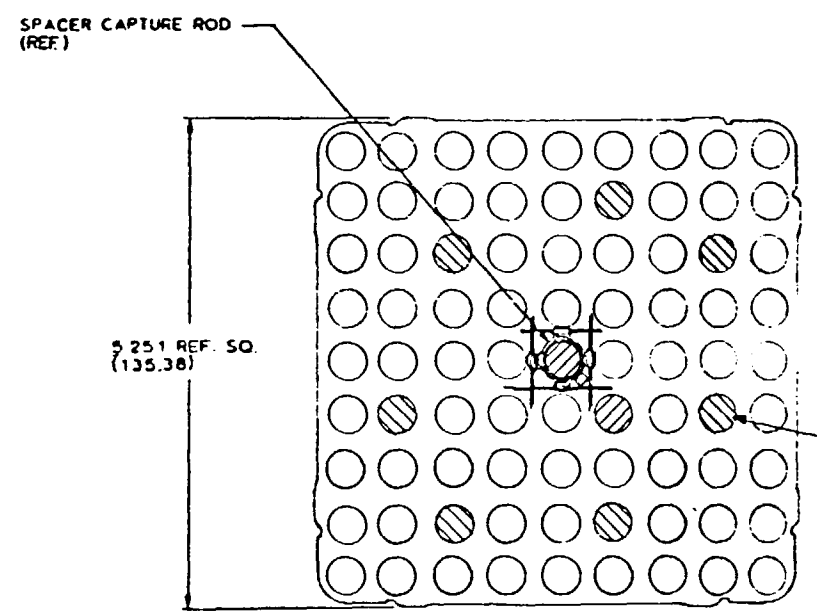
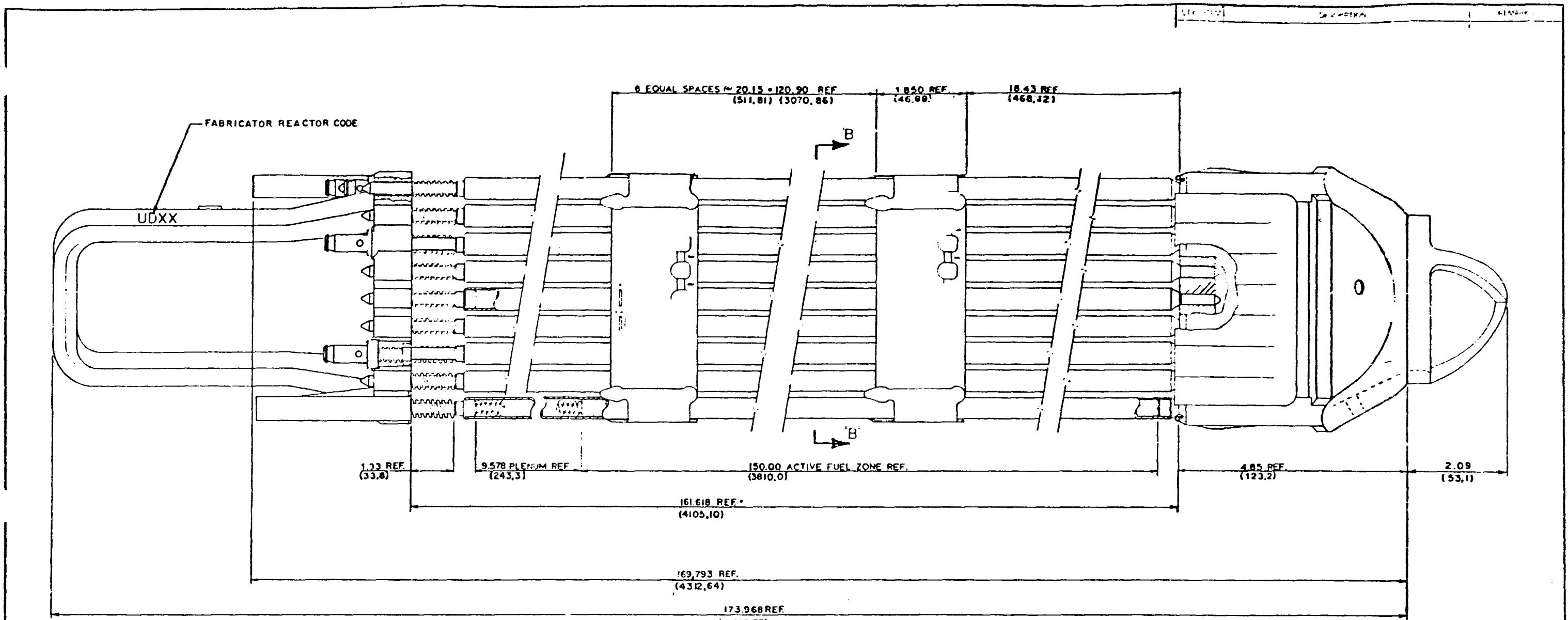
Exxon / ANF 9 X 9 JP-4,5 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94.5
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.7
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.047
Plenum Length (inches).....	9.578
Plenum Volume (cubic inches).....	0.785

Comments:

Max of 7 fueled burnable poison rods; typ. 95.04 GMS gadolinia/
rod.



DESIGNATION	
DATE	
BY	
CHKD	
APP'D	
REV	
REASON	
NONE	
EXXON NUCLEAR COMPANY, INC. BURLINGAME, CALIF. 94010	
9 x 9 FUEL BUNDLE ASSEMBLY	
XN-NF- SK-302,000	

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 9 X 9 BRP BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 6.5

Assembly Length (inches)..... 82
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.707

Total Assembly Weight (lbs).....

Weight of Heavy Metal (lbs).....

Metric Tons Initial Heavy Metal (metric tons).....

Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....

Maximum Design Burnup (MWd/MTIHM).....

Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
for Cutting.....
for Mechanical Disassembly in Air.....
for Underwater Cosolidation.....
for Underwater Rod Replacement.....

Comments:

Complete data not yet available.

2A-146

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 9 X 9 BRP BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 9 X 9 BRP BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	81
Typical Number of Fueled Rods per Assembly.....	
Rod Diameter (inches).....	0.5625
Rod Length (inches).....	
Active Length (inches).....	68
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

Exxon / ANF 9 X 9 BRP BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-149

No drawing available for an Exxon / ANF 9 X 9 BRP.
For a drawing of a similar assembly, see page 2A-161.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 10 X 10 AC BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.614

Assembly Length (inches)..... 102.45
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.557

Total Assembly Weight (lbs)..... 376.6

Weight of Heavy Metal (lbs)..... 238.63

Metric Tons Initial Heavy Metal (metric tons)..... 0.10824

Enrichment Range (% U235)..... 3.12-4.05

Average Design Burnup (MWd/MTIHM)..... 15000

Maximum Design Burnup (MWd/MTIHM)..... 16000

Linear Heat Rating (KW/foot)..... 4.30

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)

for Cutting..... 0

for Mechanical Disassembly in Air..... 1

for Underwater Cosolidation..... 0

for Underwater Rod Replacement..... 1

Comments:

This assembly manufactured as a reload for the Allis Chalmers
reactor LaCrosse.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 10 X 10 AC BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
COMP. SPRINGS	100	0.1100	TOP	Inconel X-750	1.00000
T. TIE PLATE	1	1.2400	TOP	St.Steel-ANF	1.00000
B. TIE PLATE	1	10.4600	BOTTOM	St.Steel-ANF	1.00000
SPACER-INCORE	3	0.6100	IN CORE	St.Steel-ANF	0.82000
				Zircaloy-4	0.18000
INERT ROD	3	3.3000	IN CORE	St.Steel-ANF	0.98000
				Inconel X-750	0.02000
SP. CAPTURE ROD	1	1.1070	IN CORE	St.Steel-ANF	0.99400
				Inconel X-750	0.00600

Drawing Numbers Associated With Assembly:

XN-XF-SK-302,005

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 10 X 10 AC BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	100
Typical Number of Fueled Rods per Assembly.....	96
Rod Diameter (inches).....	0.394
Rod Length (inches).....	89.98
Active Length (inches).....	83.00
Weight per Rod (lbs).....	3.53
Clad Material.....	St.Steel 348H
Clad Thickness (inches).....	0.022
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	0
Nitrogen Content of Fill Gas (percent).....	2.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

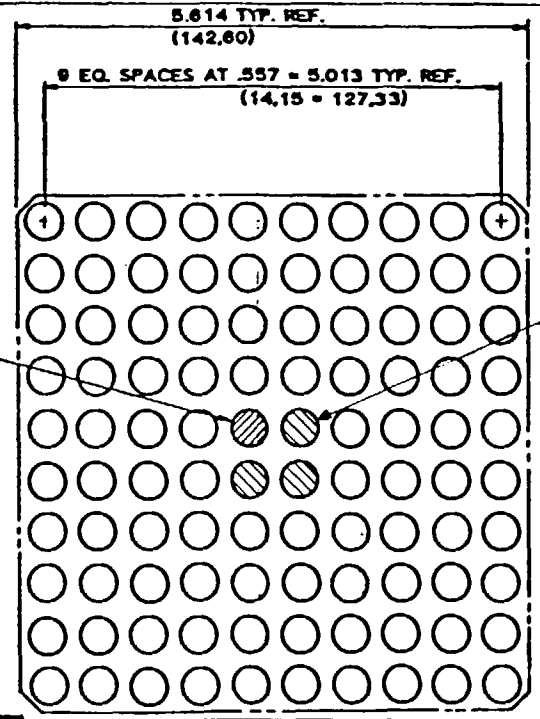
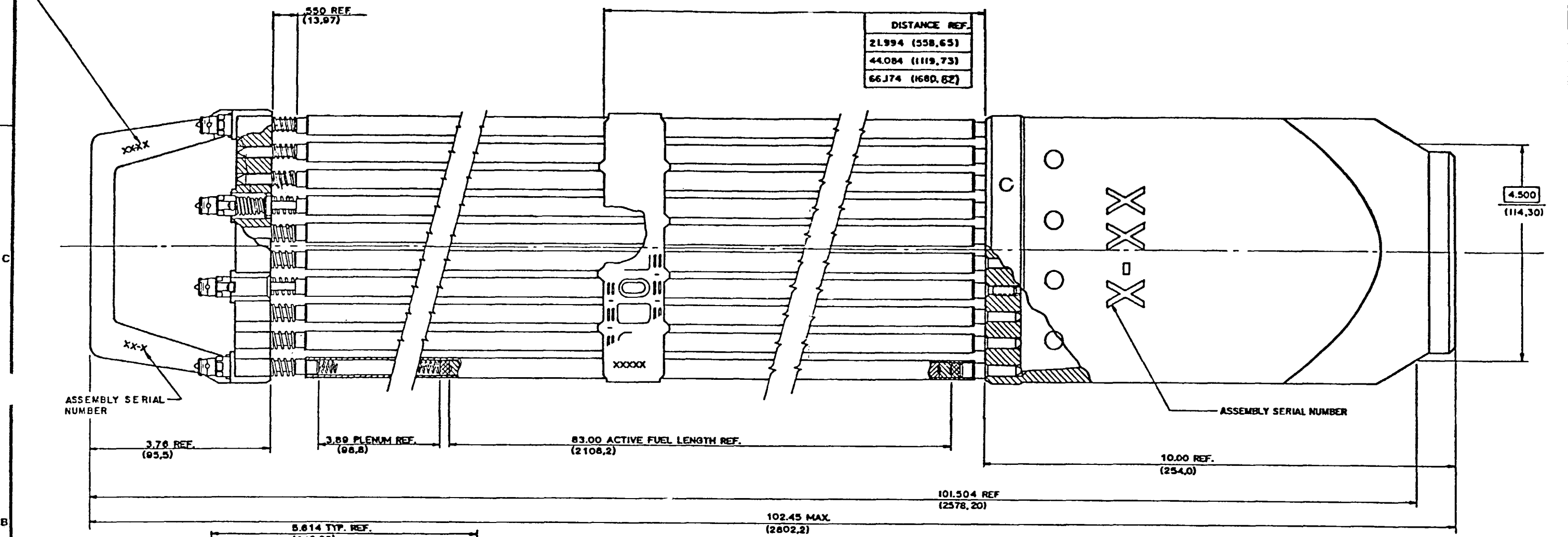
Exxon / ANF 10 X 10 AC BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94%
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.015
Plenum Length (inches).....	3.890
Plenum Volume (cubic inches).....	0.322
Comments:	

QTY	ITEM	DESCRIPTION	REMARKS
-----	------	-------------	---------

FABRICATOR / REACTOR IDENT. NUMBER



APPROVED	
APPROVED	
PROJECT ENGR.	
COMPONENT ENGR.	
DESIGNED BY	
DRAWN BY	DATE
SCALE	NONE
EXXON NUCLEAR COMPANY, INC. <small>RICHLAND WASHINGTON, D.C.</small>	
FUEL BUNDLE ASSEMBLY	
DRAWING NO. XN-NF-SK-302,005	(REV) (DATE) (REV) 1 1 0

APPROVED	REV	REVISIONS
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PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 11 X 11 GE BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	
Assembly Width (inches).....	6.515
Assembly Length (inches).....	83.970
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.577
Total Assembly Weight (lbs).....	457.3
Weight of Heavy Metal (lbs).....	290.24
Metric Tons Initial Heavy Metal (metric tons).....	0.13165
Enrichment Range (% U235).....	1.80-4.18
Average Design Burnup (MWd/MTIHM).....	23900
Maximum Design Burnup (MWd/MTIHM).....	36300
Linear Heat Rating (KW/foot).....	4.19
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	1

Comments:

This assembly is manufactured as a reload for General Electric's Big Rock reactor.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 11 X 11 GE BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
COMP. SPRINGS	121	0.5800	TOP	Inconel X-750	1.00000
T. TIE PLATE	1	2.5500	TOP	St.Steel-ANF	1.00000
B. TIE PLATE	1	1.9400	BOTTOM	St.Steel-ANF	1.00000
SPACER-INCORE	3	1.4100	IN CORE	Zircaloy-4	0.77000
				Inconel-718	0.23000
INERT ROD	3	3.6510	IN CORE	Zircaloy-2	0.99400
				Inconel X-750	0.00600
SP. CAPTURE ROD	1	0.4000	IN CORE	Zircaloy-2	1.00000

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,013

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 11 X 11 GE BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	121
Typical Number of Fueled Rods per Assembly.....	117
Rod Diameter (inches).....	0.449
Rod Length (inches).....	78.601
Active Length (inches).....	70.00
Weight per Rod (lbs).....	3.70
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	0.034
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	30.0
Nitrogen Content of Fill Gas (percent).....	2.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Exxon / ANF 11 X 11 GE BWR

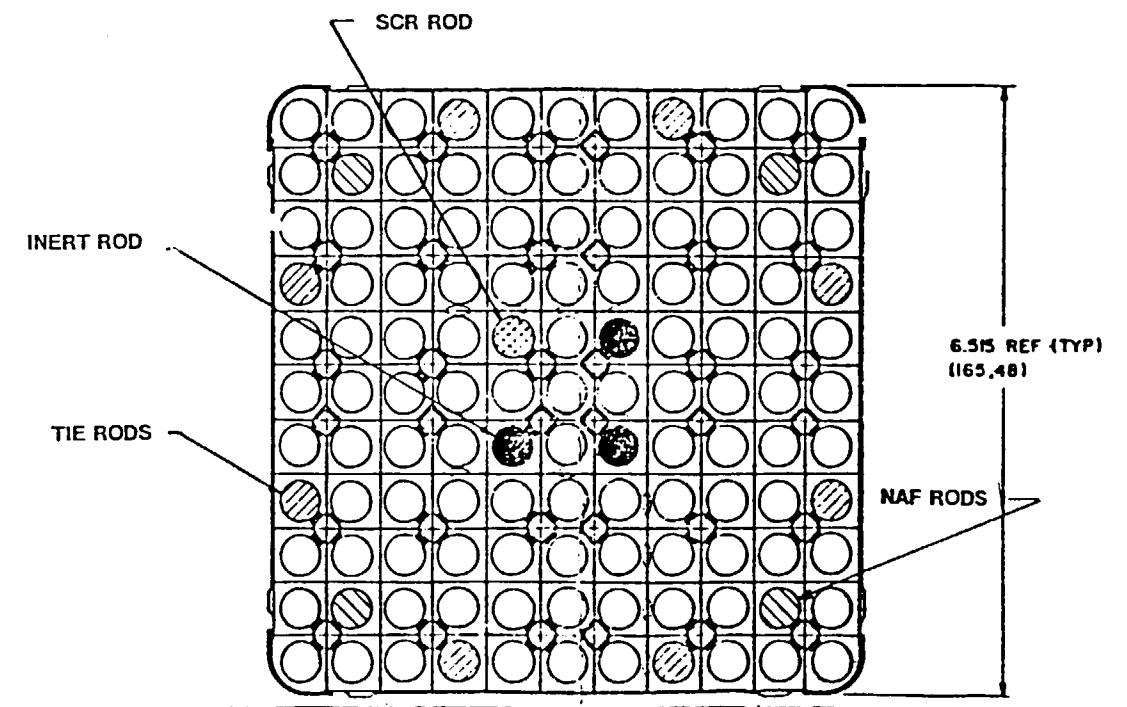
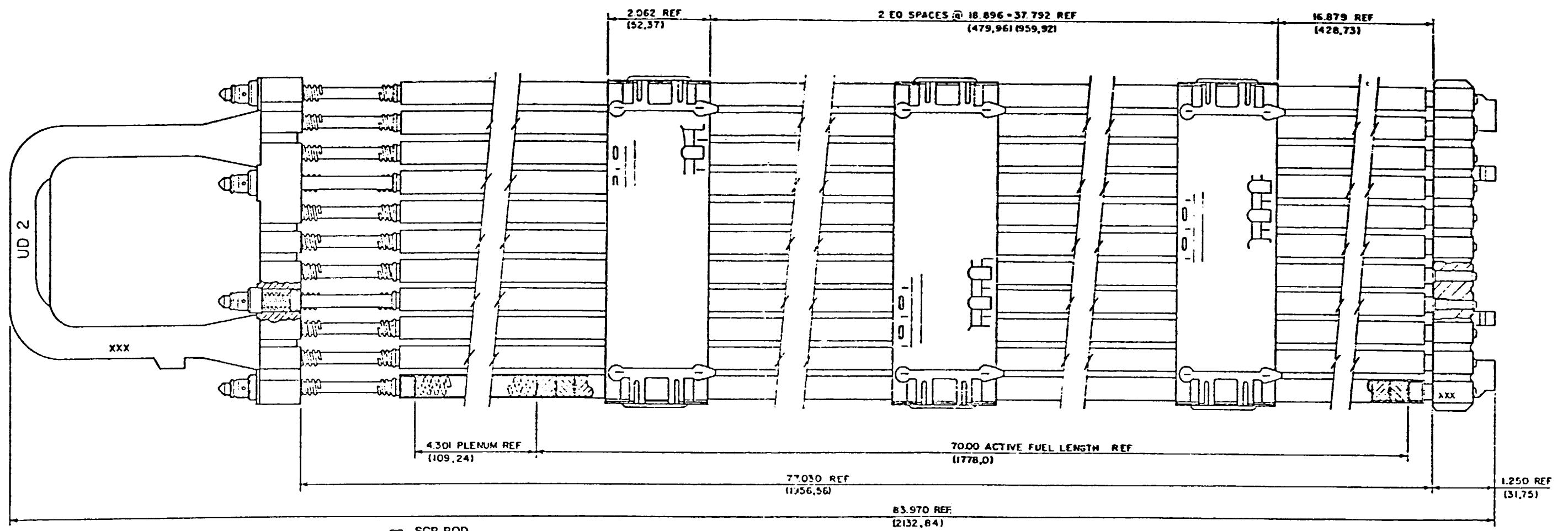
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94%
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.014
Plenum Length (inches).....	4.301
Plenum Volume (cubic inches).....	0.440

Comments:

Max of 4 fueled burnable poison rods; typ. 19.35 GMS gadolinia/
rod.

QTY	ITEM	DESCRIPTION	REMARKS
-----	------	-------------	---------



APPROVED	REV	REVISIONS

DESIGN	
COMMITTEE	
DESIGN	
DESIGNER	
DATE	
APPROVED	
DATE	
REV	
DESCRIPTION	EXXON NUCLEAR COMPANY, INC. A CHLORO-CORPORATION COMPANY
TITLE	FUEL ASSEMBLY
PROJECT NO.	XN-NF - SK-302,013
REV	1 1 0

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 14 X 14 WE PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 7.763

Assembly Length (inches)..... 160.13
with Control Rod Inserted.....
including Holddown Device, etc..... 161.33

Rod Pitch (inches)..... 0.556

Total Assembly Weight (lbs)..... 1271.2

Weight of Heavy Metal (lbs)..... 835.54

Metric Tons Initial Heavy Metal (metric tons)..... 0.37900

Enrichment Range (% U235)..... 3.45

Average Design Burnup (MWd/MTIHM)..... 34500

Maximum Design Burnup (MWd/MTIHM)..... 43900

Linear Heat Rating (KW/foot)..... 6.44

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)

for Cutting..... 0

for Mechanical Disassembly in Air..... 1

for Underwater Cosolidation..... 0

for Underwater Rod Replacement..... 1

Comments:

This assembly manufactured as a reload for Westinghouse 14 X 14 assemblies.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 14 X 14 WE PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	16	6.5700	IN CORE	Zircaloy-4	1.00000
INSTRUMENT TUBE	1	0.5300	IN CORE	Zircaloy-4	1.00000
TOP NOZZLE	1	8.5700	TOP	St.Steel-ANF	1.00000
HOLDDOWN SPRING	4	0.6900	TOP	Inconel-718	1.00000
SPACER-PLENUM	1	0.7400	GAS PLENUM	Zircaloy-4	0.93000
				Inconel-718	0.07000
SPACER-VANED	6	4.4600	IN CORE	Zircaloy-4	0.93000
				Inconel-718	0.07000
SPACER-NONVANED	2	1.4800	IN CORE	Zircaloy-4	0.93000
				Inconel-718	0.07000
BOTTOM NOZZLE	1	4.7600	BOTTOM	St.Steel-ANF	1.00000
GUIDE TUBE HDWR	1	0.5600	TOP	Inconel-718	0.14000
				Zircaloy-4	0.86000

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,004

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 14 X 14 WE PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	196
Typical Number of Fueled Rods per Assembly.....	179
Rod Diameter (inches).....	0.424
Rod Length (inches).....	149.10
Active Length (inches).....	142.00
Weight per Rod (lbs).....	6.72
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.03
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	290
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Exxon / ANF 14 X 14 WE PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.3505
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.043
Plenum Length (inches).....	5.900
Plenum Volume (cubic inches).....	0.469

Comments:

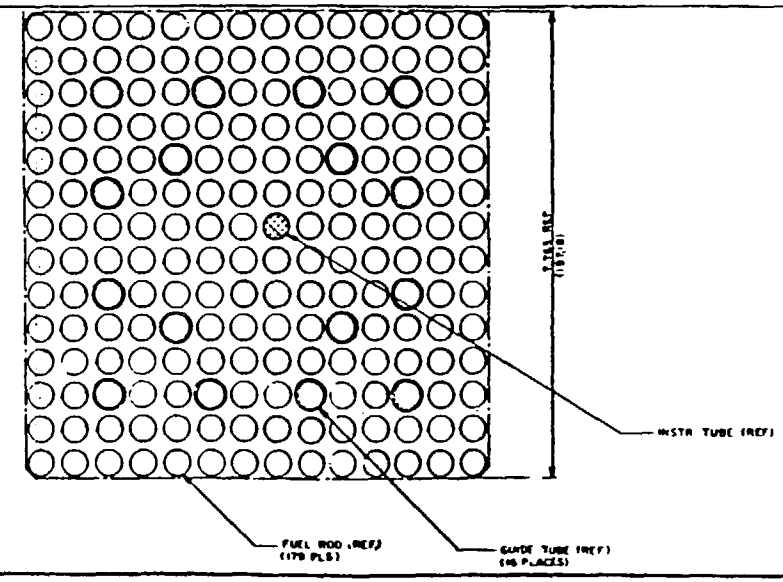
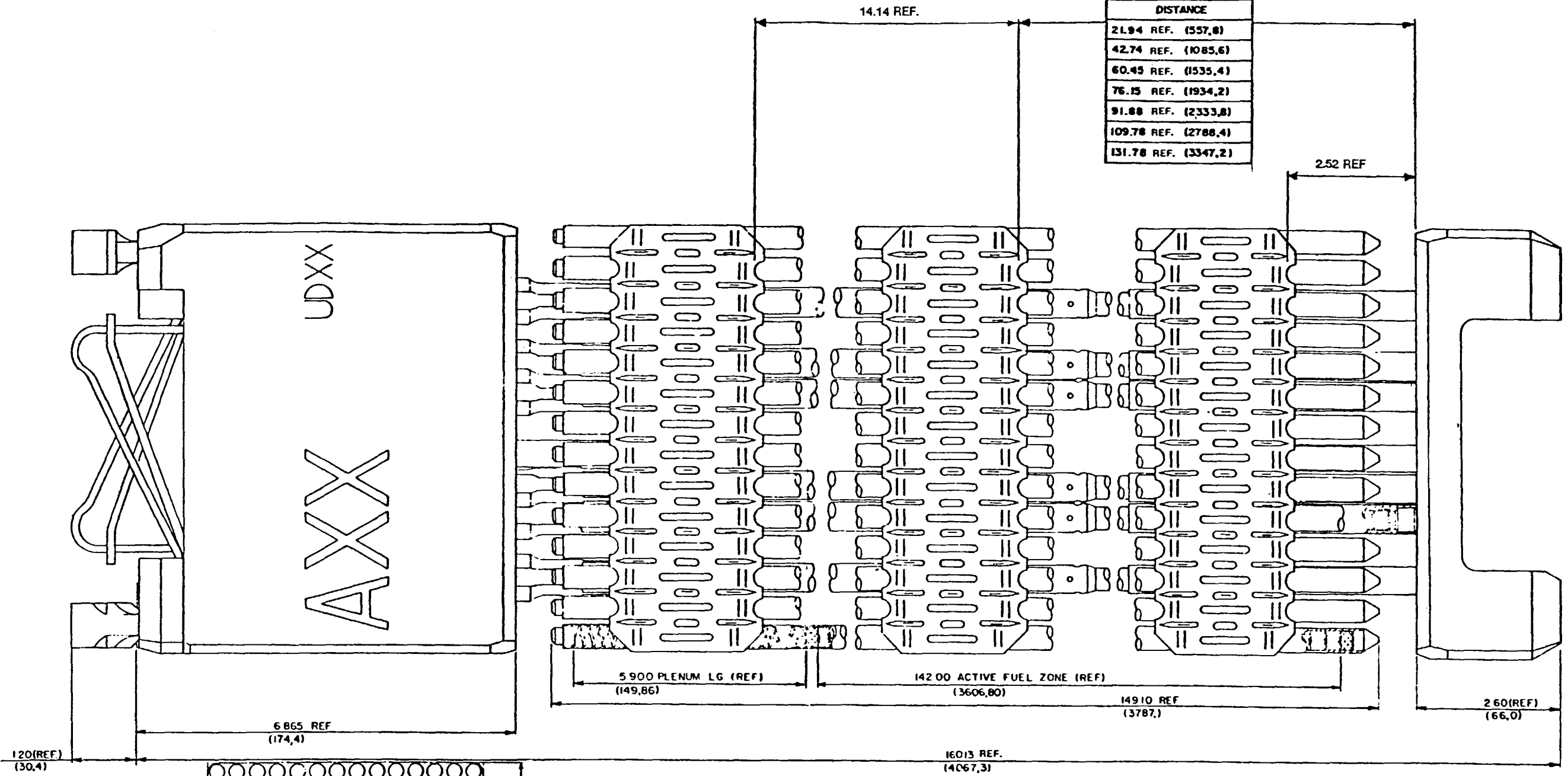


EXHIBIT NO.				
PREPARED BY				
DESIGNED BY				
CHECKED BY				
DATE				
SCALE	NONE			
EXXON NUCLEAR COMPANY, Inc. <small>PICHLAND WASHINGTON 99312</small>				
FUEL BUNDLE ASSEMBLY				
<small>DRAWING NO.</small> XN-NF - SK-302,004	<small>REV.</small> <table border="1"> <tr> <td>1</td> <td>1</td> <td>0</td> </tr> </table>	1	1	0
1	1	0		

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 14 X 14 CE PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	
Assembly Width (inches).....	8.110
Assembly Length (inches).....	157.24
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.580
Total Assembly Weight (lbs).....	1292.2
Weight of Heavy Metal (lbs).....	839.93
Metric Tons Initial Heavy Metal (metric tons).....	0.38099
Enrichment Range (% U235).....	2.70-3.67
Average Design Burnup (MWd/MTIHM).....	40000
Maximum Design Burnup (MWd/MTIHM).....	44500
Linear Heat Rating (KW/foot).....	6.21
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	1

Comments:

This assembly manufactured as a reload for CE PWR reactors.
Max of 4 nonfueled burnable poison rods; Typ. 652.0 GMS B4C/rod

2A-170

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 14 X 14 CE PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	5	9.8200	IN CORE	Zircaloy-4	1.00000
BOTTOM NOZZLE	1	6.0800	BOTTOM	St.Steel-ANF	1.00000
TOP NOZZLE	1	7.3100	TOP	St.Steel-ANF	1.00000
SPACER-INCORE	8	4.9400	IN CORE	Inconel-718	0.11500
				Zircaloy-4	0.88500
HOLDDOWN SPRING	5	1.4100	TOP	Inconel X-750	1.00000
GUIDE TUBE HDWR	1	3.1200	TOP	Zircaloy-4	0.09300
				Inconel X-750	0.90700
SPACER-PLENUM	1	0.6200	GAS PLENUM	Zircaloy-4	0.89000
				Inconel-718	0.11000

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,006

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 14 X 14 CE PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	176
Typical Number of Fueled Rods per Assembly.....	176
Rod Diameter (inches).....	0.440
Rod Length (inches).....	146.484
Active Length (inches).....	134.06
Weight per Rod (lbs).....	6.90
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.031
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	0.0040
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	375
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Exxon / ANF 14 X 14 CE PWR

FUEL ROD DESCRIPTION TABLE continued

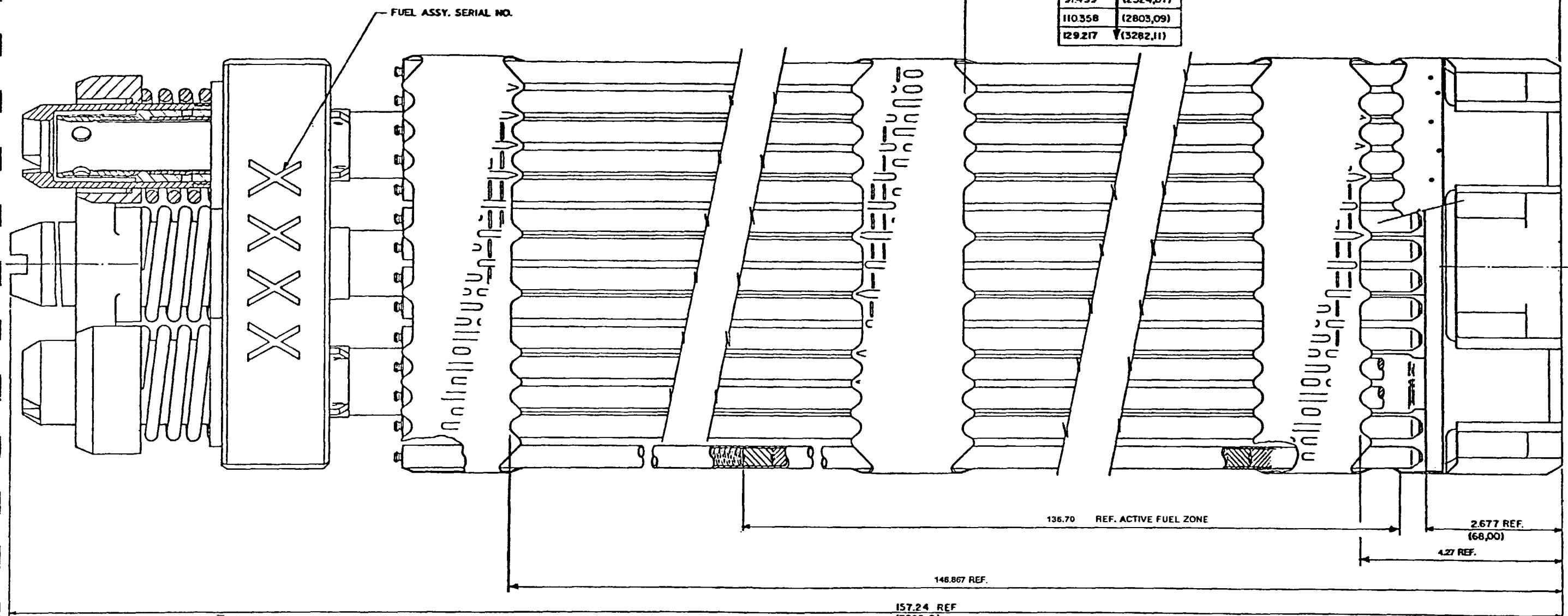
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.370
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.051
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	0.844

Comments:

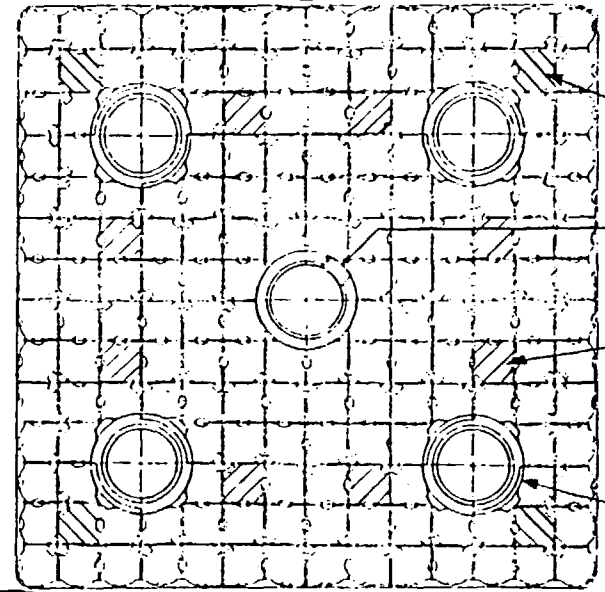
Max of 8 fueled burnable poison rods; typ. 80.72 GMS gadolinia/
rod.

DISTANCE	
16.310	REF. (414,27)
34.922	(887,02)
53.781	(1366,04)
72.640	(1845,06)
91.499	(2324,07)
110.358	(2803,09)
129.217	(3282,11)

QTY	REV	DESCRIPTION	REMARKS



157.24 REF.
(3993,9)



NA ROD ASSEMBLY
ORIENTATION NOTCH
NAF ROD ASSEMBLY
GUIDE TUBE ASSEMBLY

APPROVED	REV	REVISIONS

<small>DESIGNED BY</small> <small>DESIGNED DATE</small> <small>DESIGNED BY</small> <small>CHECKED BY</small> <small>DATE</small>	EXXON NUCLEAR COMPANY, INC. <small>BAYLOR WASHINGTON 98122</small> FUEL BUNDLE ASSEMBLY <small>EXXON-NF-SK-302,006</small>
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PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 14 X 14 TOP ROD PWR
 OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 7.763

Assembly Length (inches)..... 160.13
 with Control Rod Inserted.....
 including Holddown Device, etc..... 161.30

Rod Pitch (inches)..... 0.556

Total Assembly Weight (lbs)..... 1215.0

Weight of Heavy Metal (lbs)..... 804.61

Metric Tons Initial Heavy Metal (metric tons)..... 0.36497

Enrichment Range (% U235)..... 2.90-3.82

Average Design Burnup (MWd/MTIHM)..... 36900

Maximum Design Burnup (MWd/MTIHM)..... 43100

Linear Heat Rating (KW/foot)..... 6.35

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)

 for Cutting..... 0

 for Mechanical Disassembly in Air..... 1

 for Underwater Cosolidation..... 0

 for Underwater Rod Replacement..... 1

Comments:

This assembly manufactured as a reload for Westinghouse PWRs
 (Prairie Island).

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 14 X 14 TOP ROD PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
HOLDDOWN SPRING	4	0.5500	TOP	Inconel-718	1.00000
TOP NOZZLE	1	5.6100	TOP	St.Steel-ANF	1.00000
GUIDE TUBE HDWR	1	0.4200	TOP	Inconel X-750	0.24000
				Zircaloy-4	0.76000
SPACER-PLENUM	1	0.7400	GAS PLENUM	Zircaloy-4	0.93000
				Inconel-718	0.07000
GUIDE TUBES	16	7.4800	IN CORE	Zircaloy-4	1.00000
SPACER-VANED	3	2.2400	IN CORE	Zircaloy-4	0.93000
				Inconel-718	0.07000
SPACER-NONVANED	3	2.2200	IN CORE	Zircaloy-4	0.93000
				Inconel-718	0.07000
BOTTOM NOZZLE	1	4.7600	BOTTOM	St.Steel-ANF	1.00000
INSTRUMENT TUBE	1	0.5300	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

XN-NF-SK-301,994

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 14 X 14 TOP ROD PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	196
Typical Number of Fueled Rods per Assembly.....	179
Rod Diameter (inches).....	0.417
Rod Length (inches).....	152.00
Active Length (inches).....	144.00
Weight per Rod (lbs).....	6.48
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0295
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	305
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

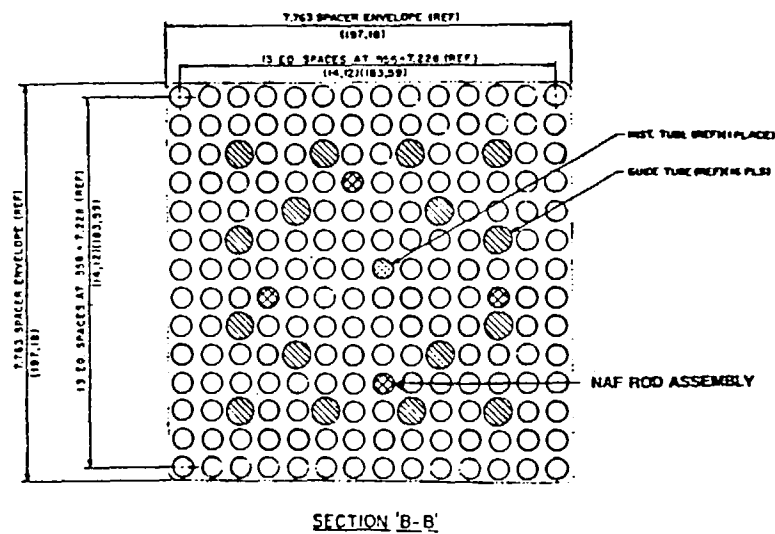
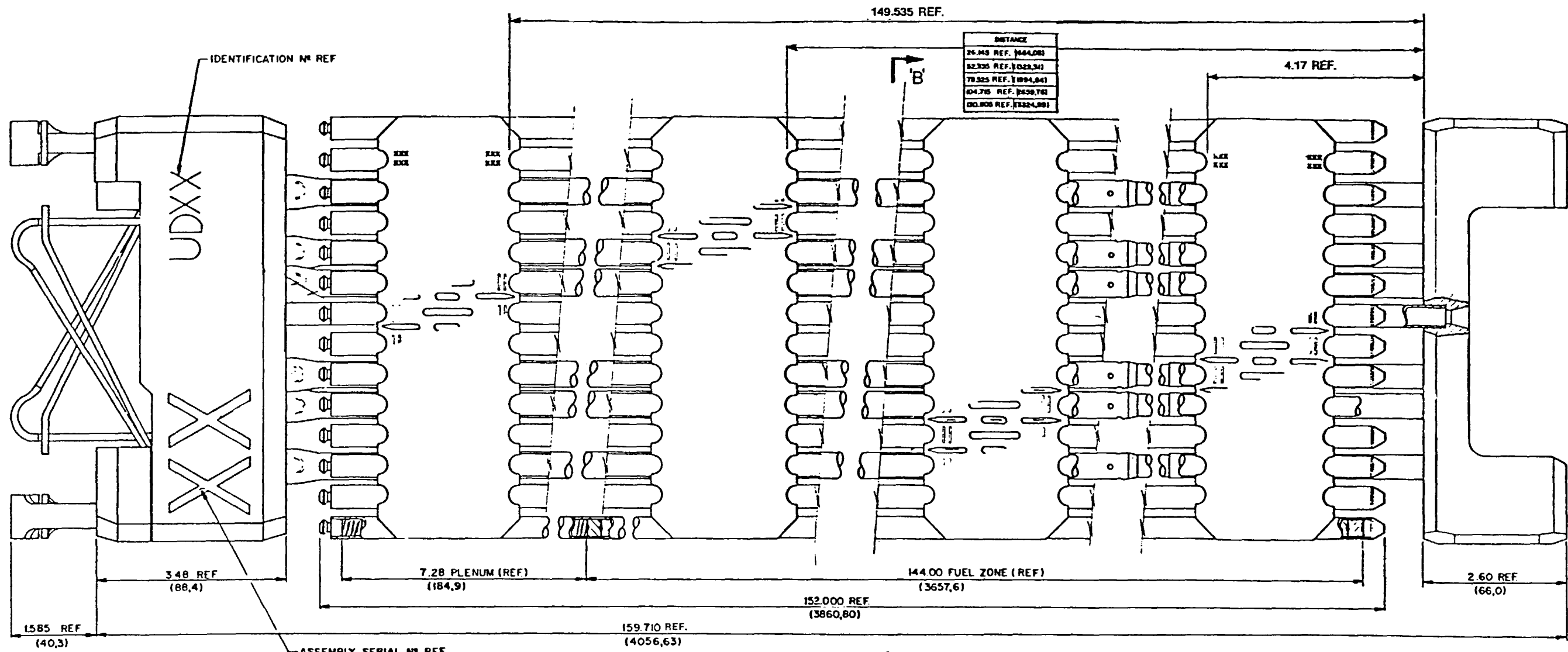
Exxon / ANF 14 X 14 TOP ROD PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94.0
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.066
Plenum Length (inches).....	7.280
Plenum Volume (cubic inches).....	0.510

Comments:

Max of 4 fueled burnable poison rods; typ. 83.77 GMS gadolinia/
rod.



ASSEMBLY

B'

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 14 X 14 Ft. Cal BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches).....

Assembly Length (inches)..... 147
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches).....

Total Assembly Weight (lbs).....

Weight of Heavy Metal (lbs)..... 357

Metric Tons Initial Heavy Metal (metric tons)..... 0.162

Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....

Maximum Design Burnup (MWd/MTIHM).....

Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,..,6-impossible)
for Cutting.....
for Mechanical Disassembly in Air.....
for Underwater Cosolidation.....
for Underwater Rod Replacement.....

Comments:
Complete data not yet available.

2A-182

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 14 X 14 Ft.Cal BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 14 X 14 Ft. Cal BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	176
Typical Number of Fueled Rods per Assembly.....	
Rod Diameter (inches).....	
Rod Length (inches).....	
Active Length (inches).....	
Weight per Rod (lbs).....	
Clad Material.....	
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

Exxon / ANF 14 X 14 Ft. Cal BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-185

No drawing available for an Exxon / ANF 14 X 14 Ft.Cal.

For a drawing of a similar assembly, see page 2A-173.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 15 X 15 WE PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	
Assembly Width (inches).....	8.426
Assembly Length (inches).....	159.7
with Control Rod Inserted.....	
including Holddown Device, etc.....	161.30
Rod Pitch (inches).....	0.563
Total Assembly Weight (lbs).....	1432.8
Weight of Heavy Metal (lbs).....	952.32
Metric Tons Initial Heavy Metal (metric tons).....	0.43197
Enrichment Range (% U235).....	
Average Design Burnup (MWd/MTIHM).....	25100
Maximum Design Burnup (MWd/MTIHM).....	47700
Linear Heat Rating (KW/foot).....	5.98
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	1

Comments:

This assembly manufactured as a reload for Westinghouse 15 X 15 Assemblies.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 15 X 15 WE PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	20	9.0700	IN CORE	Zircaloy-4	1.00000
HOLDDOWN SPRING	4	0.5500	TOP	Inconel-718	1.00000
TOP NOZZLE	1	6.1100	TOP	St.Steel-ANF	1.00000
GUIDE TUBE HDWR	1	0.3400	TOP	Zircaloy-4	0.62000
				Inconel X-750	0.38000
SPACER-PLENUM	1	0.7000	GAS PLENUM	Zircaloy-4	0.93000
				Inconel-718	0.07000
SPACER-VANED	5	3.6600	IN CORE	Zircaloy-4	0.93000
				Inconel-718	0.07000
SPACER-NONVANED	1	0.7000	IN CORE	Zircaloy-4	0.93000
				Inconel-718	0.07000
BOTTOM NOZZLE	1	5.6800	BOTTOM	St.Steel-ANF	1.00000
INSTRUMENT TUBE	1	0.4500	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

XN-XF-SK-301,996

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 15 X 15 WE PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	225
Typical Number of Fueled Rods per Assembly.....	204
Rod Diameter (inches).....	0.424
Rod Length (inches).....	152.065
Active Length (inches).....	144.00
Weight per Rod (lbs).....	6.72
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.030
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	.00375
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	290
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Exxon / ANF 15 X 15 WE PWR

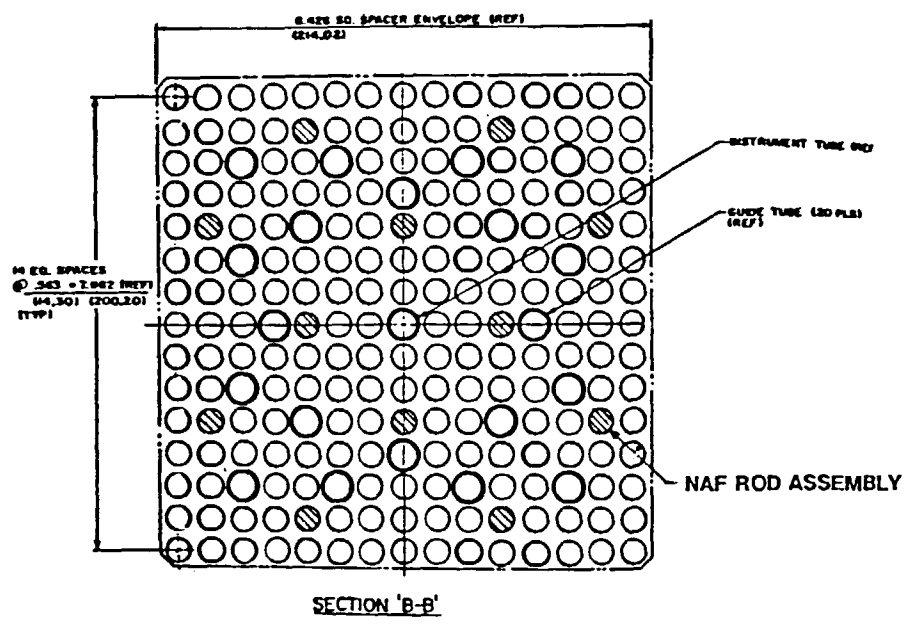
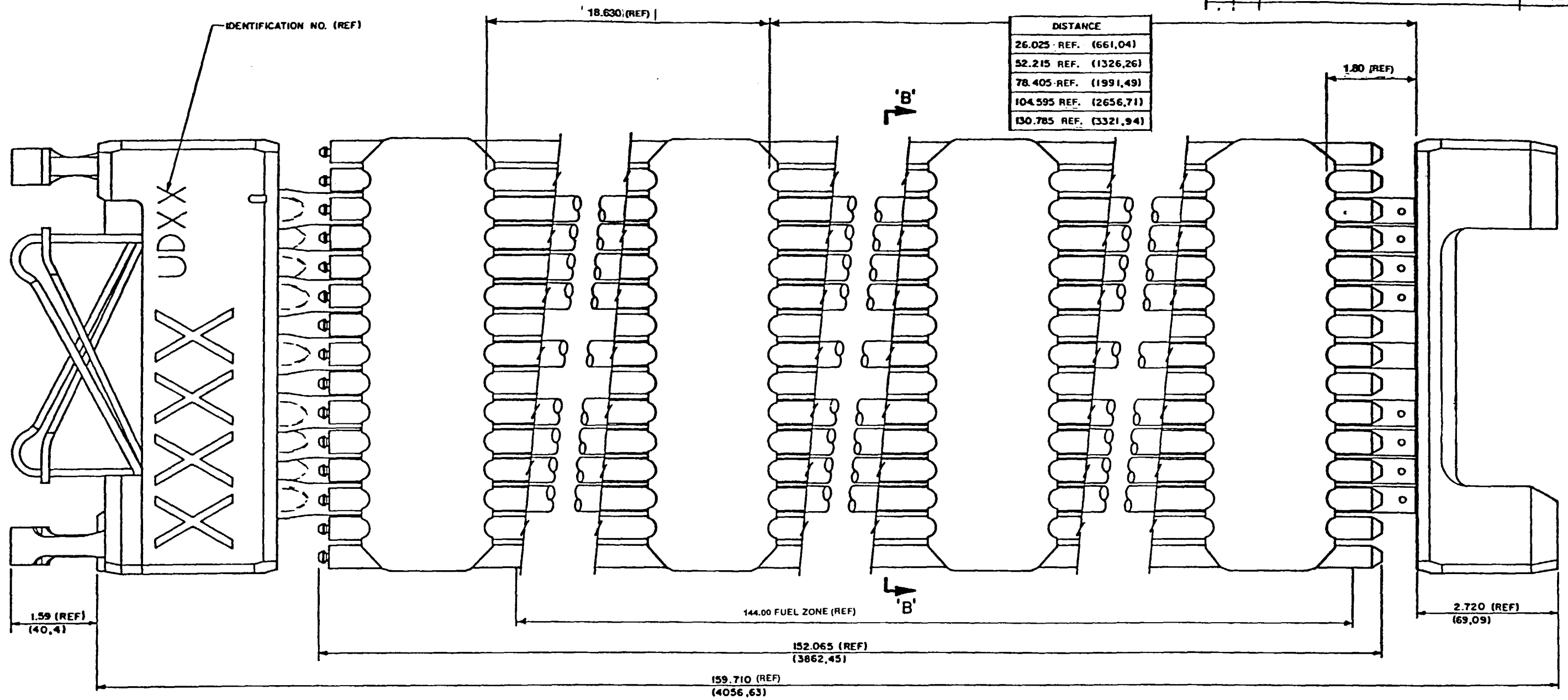
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.3565
Fuel Pellet Length (inches).....	0.273
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.039
Plenum Length (inches).....	6.800
Plenum Volume (cubic inches).....	0.569

Comments:

Max of 12 fueled burnable poison rods; typ. 78.95 GMS gadolinia/
rod.

QTY	ITEM	DESCRIPTION	REMARKS
-----	------	-------------	---------



DESIGNED BY	EXXON NUCLEAR COMPANY, INC. ROCKLAND MASSACHUSETTS						
DESIGNED DATE							
DESIGNED BY							
DESIGNED DATE							
SCALE							
APPROVED	REV	REVISIONS	NONE	XN-NF- SK-301,996	1	1	0

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 15 X 15 CE PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	
Assembly Width (inches).....	8.250
Assembly Length (inches).....	148.852
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.550
Total Assembly Weight (lbs).....	1338.6
Weight of Heavy Metal (lbs).....	883.36
Metric Tons Initial Heavy Metal (metric tons).....	0.40069
Enrichment Range (% U235).....	2.47-3.38
Average Design Burnup (MWd/MTIHM).....	27500
Maximum Design Burnup (MWd/MTIHM).....	36600
Linear Heat Rating (KW/foot).....	5.23
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0
for Mechanical Disassembly in Air.....	1
for Underwater Cosolidation.....	0
for Underwater Rod Replacement.....	1

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 15 X 15 CE PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
TOP NOZZLE	1	4.3700	TOP	St.Steel-ANF	1.00000
BOTTOM NOZZLE	1	4.7700	BOTTOM	St.Steel-ANF	1.00000
GUIDE BARS	8	16.6800	IN CORE	Zircaloy-4	1.00000
SPACER-INCORE	9	4.3300	IN CORE	Inconel-718	0.21000
				Zircaloy-4	0.79000
SPACER-PLENUM	1	0.4800	GAS PLENUM	Inconel-718	0.21000
				Zircaloy-4	0.79000
INSTRUMENT TUBE	1	0.5500	IN CORE	Zircaloy-4	1.00000
GUIDE TUBE HDWR	1	0.2200	TOP	Zircaloy-4	0.64000
				Inconel X-750	0.36000

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,010

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 15 X 15 CE PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	225
Typical Number of Fueled Rods per Assembly.....	216
Rod Diameter (inches).....	0.417
Rod Length (inches).....	139.423
Active Length (inches).....	131.80
Weight per Rod (lbs).....	5.88
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.030
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	306
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

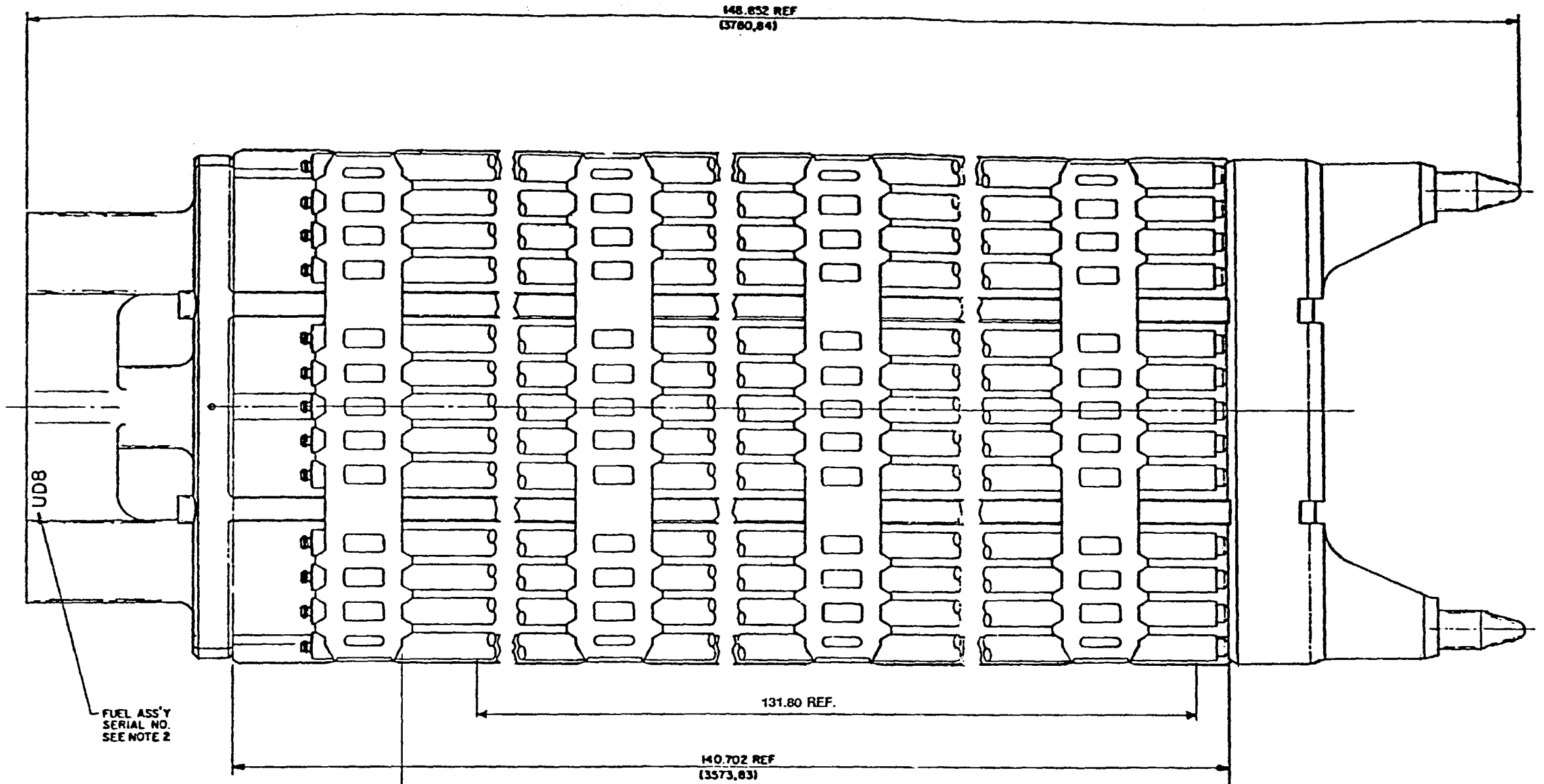
Exxon / ANF 15 X 15 CE PWR

FUEL ROD DESCRIPTION TABLE continued

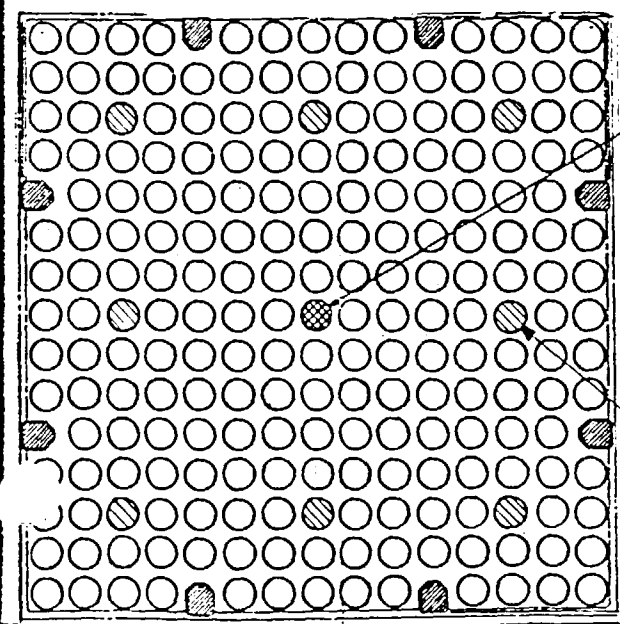
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94.0
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.034
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	0.556

Comments:

Max of 8 fueled burnable poison rods; typ. 83.82 GMS gadolinia/
rod.



SPACER DISTANCE
1.550 REF.
15.347 REF.
30.847 REF.
46.347 REF.
61.847 REF.
77.347 REF.
92.847 REF.
108.347 REF.
123.847 REF.
137.952 REF.



DESIGN & QUALITY DESIGN	
MANAGEMENT GROUP	
DESIGN GROUP	EXXON NUCLEAR COMPANY, Inc. RICHMOND WASHINGTON BASE
APPROVALS	
DESIGNED BY	
CHECKED BY	FUEL BUNDLE ASSEMBLY
DATE	
SCALE	
APPROVED	REV
REVISIONS	
NONE	
XN-NF- SK-302,010	1 1 0

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 15 X 16 WE PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 7.614

Assembly Length (inches)..... 111.775
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.472

Total Assembly Weight (lbs)..... 796.6

Weight of Heavy Metal (lbs)..... 519.27

Metric Tons Initial Heavy Metal (metric tons)..... 0.23554

Enrichment Range (% U235)..... 3.50

Average Design Burnup (MWd/MTIHM)..... 27900

Maximum Design Burnup (MWd/MTIHM)..... 33700

Linear Heat Rating (KW/foot)..... 4.51

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)

 for Cutting..... 0

 for Mechanical Disassembly in Air..... 1

 for Underwater Cosolidation..... 0

 for Underwater Rod Replacement..... 1

Comments:

This assembly manufactured for Yankee Rowe. This assembly not described by West.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 15 X 16 WE PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
HOLDDOWN SPRING	4	2.1600	TOP	Inconel X-750	1.00000
TOP NOZZLE	1	6.0000	TOP	St.Steel-ANF	1.00000
GUIDE TUBE HDWR	1	0.0760	TOP	St.Steel-ANF	0.79000
				Inconel X-750	0.21000
SPACER-PLENUM	1	0.6000	GAS PLENUM	Inconel-718	0.15000
				Zircaloy-4	0.85000
GUIDE BARS	8	13.1000	IN CORE	Zircaloy-4	1.00000
SPACER-INCORE	5	2.9800	IN CORE	Zircaloy-4	0.86000
				Inconel-718	0.14000
BOTTOM NOZZLE	1	5.1800	BOTTOM	St.Steel-ANF	1.00000
INSTRUMENT TUBE	1	0.2600	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

XN-NF-SK-302,014

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 15 X 16 WE PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	240
Typical Number of Fueled Rods per Assembly.....	231
Rod Diameter (inches).....	0.365
Rod Length (inches).....	95.340
Active Length (inches).....	91.00
Weight per Rod (lbs).....	3.15
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.024
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	250
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

PAGE: 4

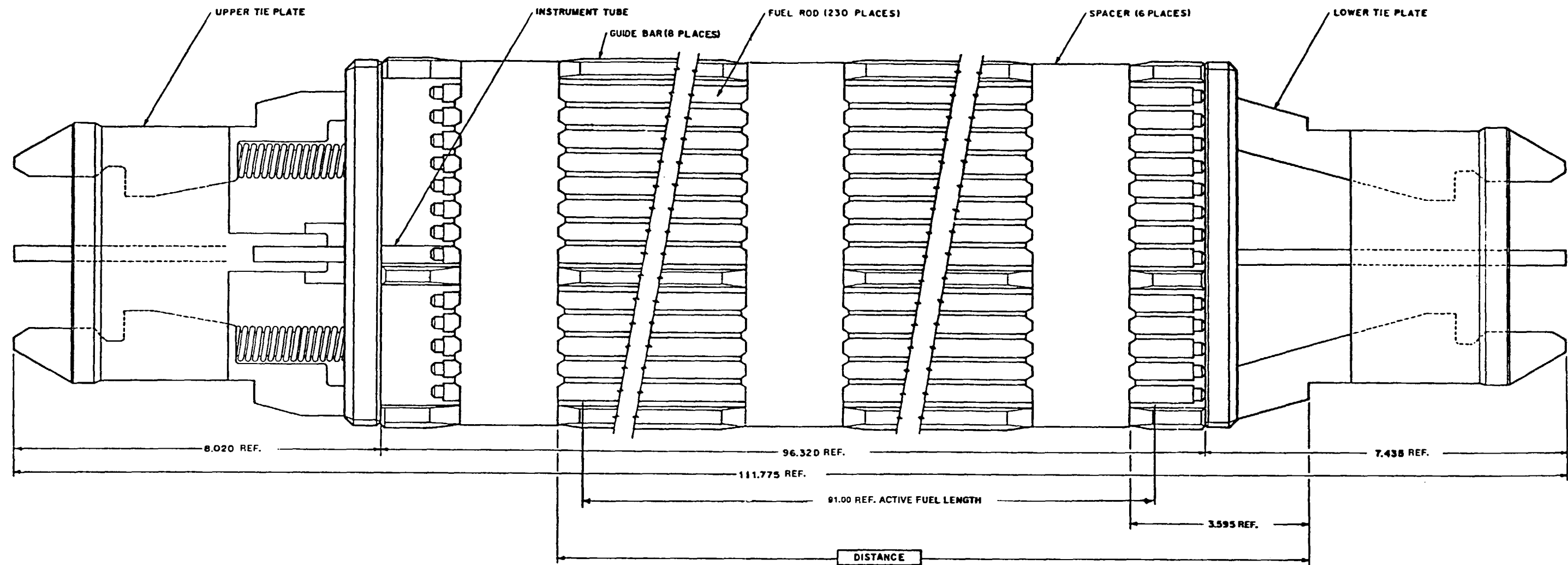
Exxon / ANF 15 X 16 WE PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94.0
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	St.Steel-ANF
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.009
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	0.206

Comments:

QTY	ITEM	DESCRIPTION	REMARKS
-----	------	-------------	---------



DISTANCE
21.895 REF.
40.195 REF.
59.495 REF.
76.795 REF.
95.095 REF.

DESIGN	EXXON NUCLEAR COMPANY, Inc.
COMPONENT	RICHLAND WASHINGTON 99352
DESIGN CODE	FUEL ASSEMBLY
RESPONSIBLE ENGINEER	
CHECKED BY	
DATE	
REVISED BY	
DATE	
SCALE	NONE
PROJECT NO.	SK-302,014
REV	1 2 0

APPROVED	REV	REVISIONS

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Exxon / ANF 17 X 17 WE PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 8.426

Assembly Length (inches)..... 159.71
with Control Rod Inserted.....
including Holddown Device, etc..... 161.37

Rod Pitch (inches)..... 0.496

Total Assembly Weight (lbs)..... 1348.0

Weight of Heavy Metal (lbs)..... 884.33

Metric Tons Initial Heavy Metal (metric tons)..... 0.40113

Enrichment Range (% U235)..... 3.83

Average Design Burnup (MWd/MTIHM)..... 36600

Maximum Design Burnup (MWd/MTIHM)..... 38000

Linear Heat Rating (KW/foot)..... 5.58

Difficulty Indexes (0-not required, 1-simple,..,6-impossible)

for Cutting..... 0

for Mechanical Disassembly in Air..... 1

for Underwater Cosolidation..... 0

for Underwater Rod Replacement..... 1

Comments:

This assembly manufactured as a reload for Westinghouse reactors.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Exxon / ANF 17 X 17 WE PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
GUIDE TUBES	24	11.3000	IN CORE	Zircaloy-4	1.00000
HOLDDOWN SPRING	4	0.9800	TOP	Inconel-718	1.00000
TOP NOZZLE	1	6.1800	TOP	St.Steel-ANF	1.00000
BOTTOM NOZZLE	1	5.7500	BOTTOM	St.Steel-ANF	1.00000
GUIDE TUBE HDWR	1	1.0700	TOP	Zircaloy-4	0.85000
				Inconel X-750	0.15000
SPACER-PLENUM	1	1.1200	GAS PLENUM	Zircaloy-4	0.86000
				Inconel-718	0.14000
SPACER-VANED	6	6.7200	IN CORE	Zircaloy-4	0.86000
				Inconel-718	0.14000
SPACER-NONVANED	1	1.1200	IN CORE	Zircaloy-4	0.86000
				Inconel-718	0.14000
INSTRUMENT TUBE	1	0.3800	IN CORE	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

XN-NF-SK-301,995

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Exxon / ANF 17 X 17 WE PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	289
Typical Number of Fueled Rods per Assembly.....	264
Rod Diameter (inches).....	0.360
Rod Length (inches).....	152.00
Active Length (inches).....	144.00
Weight per Rod (lbs).....	4.81
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.025
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	290
Nitrogen Content of Fill Gas (percent).....	0.5

PHYSICAL DESCRIPTION REPORT

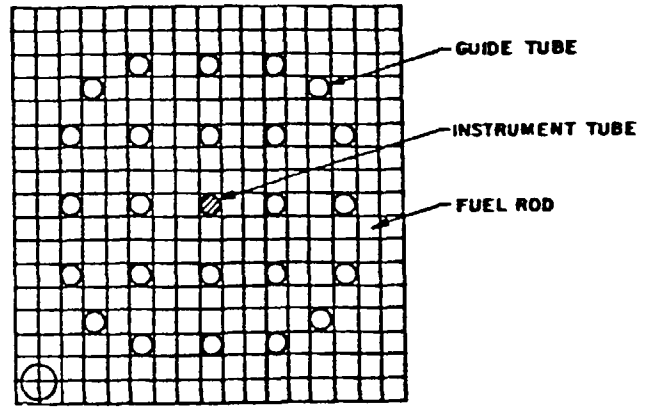
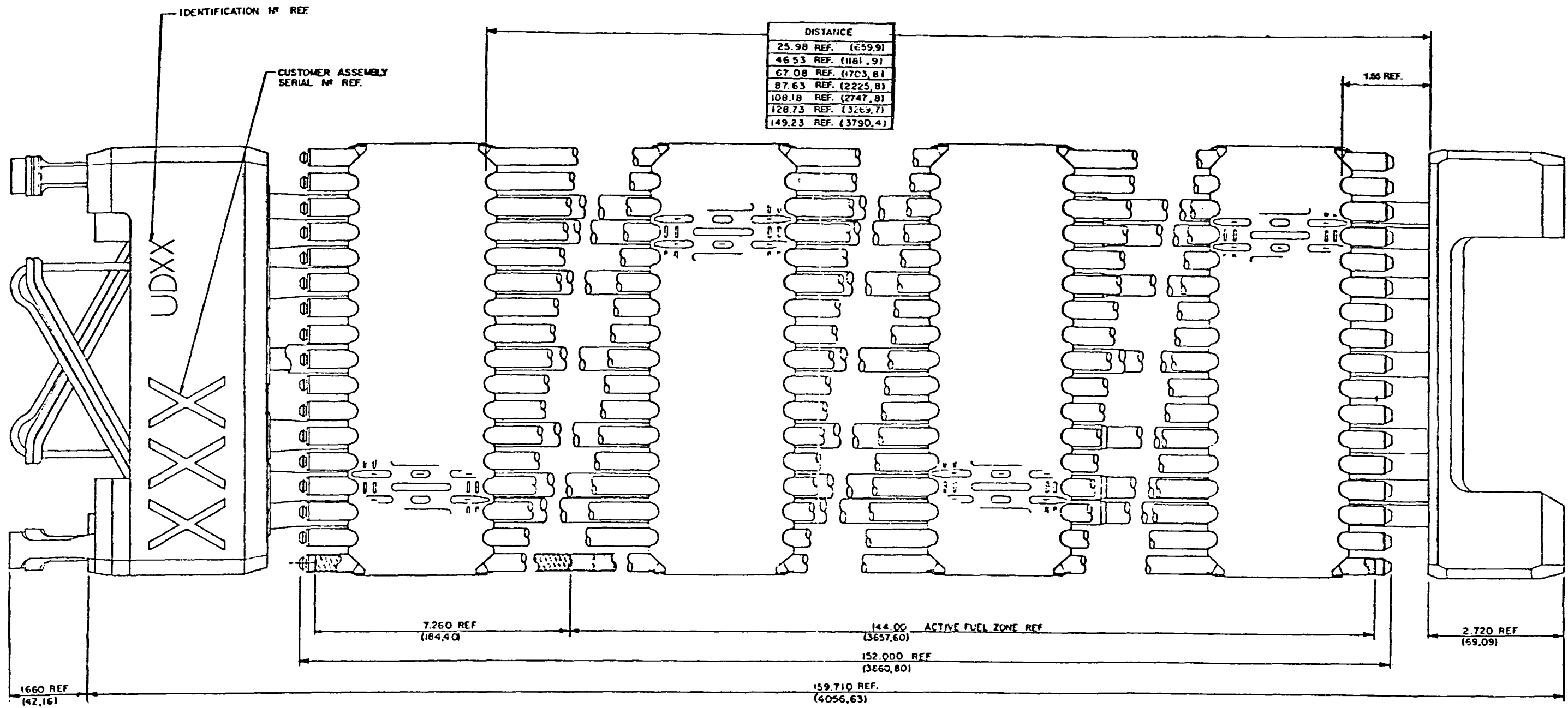
PAGE: 4

Exxon / ANF 17 X 17 WE PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.303
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	PROP.
Grain Size (microns).....	PROP.
Fuel Density (% theoretical).....	94
O/U Ratio.....	2.00-2.02
Smear Density(%).....	92.2
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	Inconel X-750
Plenum Spring Weight per Assembly (lbs).....	0.025
Plenum Length (inches).....	7.260
Plenum Volume (cubic inches).....	0.462

Comments:



EXXON NUCLEAR COMPANY, INC. NEW BRUNSWICK, NEW JERSEY
FUEL BUNDLE ASSEMBLY
XN-NF-SK-301,995

APPROVED: [Signature] ELEMENT

NONE

1110

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 6 X 6 DRES-1 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 4
Assembly Length (inches)..... 135
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.710

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs)..... 236
Metric Tons Initial Heavy Metal (metric tons)..... 0.107
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,..,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:
 Complete data not yet available.

2A-212

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 6 X 6 DRES-1 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 6 X 6 DRES-1 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	36
Typical Number of Fueled Rods per Assembly.....	36
Rod Diameter (inches).....	0.562
Rod Length (inches).....	117
Active Length (inches).....	104
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

General Electric 6 X 6 DRES-1 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-215

No drawing available for an General Electric 6 X 6 DRES-1.

For a drawing of a similar assembly, see page 2A-107.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 6 X 6 HUM.BAY BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 4
Assembly Length (inches)..... 95
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches).....

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs)..... 170
Metric Tons Initial Heavy Metal (metric tons)..... 0.77
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:
 Complete data not yet available.

2A-218

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 6 X 6 HUM.BAY BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 6 X 6 HUM.BAY BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	36
Typical Number of Fueled Rods per Assembly.....	36
Rod Diameter (inches).....	0.563
Rod Length (inches).....	
Active Length (inches).....	79
Weight per Rod (lbs).....	
Clad Material.....	
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

General Electric 6 X 6 HUM.BAY BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-221

No drawing available for an General Electric 6 X 6 HUM.BAY.

For a drawing of a similar assembly, see page 2A-107.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 7 X 7 /2,3:V1 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.518
Assembly Length (inches)..... 171
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.738

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,..,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

Complete data not yet available.

2A-224

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 7 X 7 /2,3:V1 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 7 X 7 /2,3:V1 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	49
Typical Number of Fueled Rods per Assembly.....	49
Rod Diameter (inches).....	0.570
Rod Length (inches).....	
Active Length (inches).....	144
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

General Electric 7 X 7 /2,3:V1 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	
Fuel Density (% theoretical).....	
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	
Plenum Spring Weight per Assembly (lbs).....	
Plenum Length (inches).....	11.24
Plenum Volume (cubic inches).....	
Comments:	

2A-227

No drawing available for an General Electric 7 X 7 /2,3:V1.

For a drawing of a similar assembly, see page 2A-119.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 7 X 7 /2,3:V2 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.518

Assembly Length (inches)..... 171
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.738

Total Assembly Weight (lbs).....

Weight of Heavy Metal (lbs).....

Metric Tons Initial Heavy Metal (metric tons).....

Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....

Maximum Design Burnup (MWd/MTIHM).....

Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
for Cutting.....
for Mechanical Disassembly in Air.....
for Underwater Cosolidation.....
for Underwater Rod Replacement.....

Comments:

Complete data not yet available.

2A-230

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 7 X 7 /2,3:V2 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 7 X 7 /2,3:V2 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	49
Typical Number of Fueled Rods per Assembly.....	49
Rod Diameter (inches).....	0.563
Rod Length (inches).....	
Active Length (inches).....	144
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

General Electric 7 X 7 /2,3:V2 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....

Fuel Pellet Shape.....

Fuel Pellet Diameter (inches).....

Fuel Pellet Length (inches).....

Fuel Pellet Weight per Rod (lbs).....

Open Porosity (percent).....

Grain Size (microns).....

Fuel Density (% theoretical).....

O/U Ratio.....

Smear Density.....

Spacer Pellet Material.....

Spacer Pellet Length (inches).....

Plenum Spring Material.....

Plenum Spring Weight per Assembly (lbs).....

Plenum Length (inches)..... 16

Plenum Volume (cubic inches).....

Comments:

2A-233

No drawing available for an General Electric 7 X 7 /2,3:V2.

For a drawing of a similar assembly, see page 2A-119.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 7 X 7 /4,5 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.518
Assembly Length (inches)..... 176
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.738

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:
 Complete data not yet available.

2A-236

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 7 X 7 /4,5 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 7 X 7 /4,5 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	49
Typical Number of Fueled Rods per Assembly.....	49
Rod Diameter (inches).....	0.563
Rod Length (inches).....	
Active Length (inches).....	144-146
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

General Electric 7 X 7 /4,5 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	
Fuel Density (% theoretical).....	
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	
Plenum Spring Weight per Assembly (lbs).....	
Plenum Length (inches).....	14-16
Plenum Volume (cubic inches).....	
Comments:	

2A-239

No drawing available for an General Electric 7 X 7 /4,5.

For a drawing of a similar assembly, see page 2A-131.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 7 X 7 HUM.BAY BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 4

Assembly Length (inches)..... 95
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.636

Total Assembly Weight (lbs).....

Weight of Heavy Metal (lbs)..... 170

Metric Tons Initial Heavy Metal (metric tons)..... 0.77

Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....

Maximum Design Burnup (MWd/MTIHM).....

Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
for Cutting.....
for Mechanical Disassembly in Air.....
for Underwater Cosolidation.....
for Underwater Rod Replacement.....

Comments:

Complete data not yet available.

2A-242

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 7 X 7 HUM.BAY BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 7 X 7 HUM.BAY BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	49
Typical Number of Fueled Rods per Assembly.....	49
Rod Diameter (inches).....	0.486
Rod Length (inches).....	
Active Length (inches).....	79
Weight per Rod (lbs).....	
Clad Material.....	
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

General Electric 7 X 7 HUM.BAY BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-245

No drawing available for a General Electric 7 X 7 HUM.BAY.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 8 X 8 /2,3 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.518
Assembly Length (inches)..... 171
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.640

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:
 Complete data not yet available.

2A-248

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 8 X 8 /2,3 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 8 X 8 /2,3 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	
Fuel Rod Positions per Assembly.....	
Typical Number of Fueled Rods per Assembly.....	
Rod Diameter (inches).....	0.48
Rod Length (inches).....	
Active Length (inches).....	144
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

General Electric 8 X 8 /2,3 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	
Fuel Density (% theoretical).....	
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	
Plenum Spring Weight per Assembly (lbs).....	
Plenum Length (inches).....	11.24
Plenum Volume (cubic inches).....	
Comments:	

2A-251

No drawing available for an General Electric 8 X 8 /2,3.
For a drawing of a similar assembly, see page 2A-125.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 8 X 8 /4,5:V1 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.518
Assembly Length (inches)..... 176
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.640

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

Complete data not yet available.

2A-254

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 8 X 8 /4,5:V1 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 8 X 8 /4,5:V1 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	64
Typical Number of Fueled Rods per Assembly.....	63
Rod Diameter (inches).....	0.49
Rod Length (inches).....	
Active Length (inches).....	144-146
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

PAGE: 4

General Electric 8 X 8 /4,5:V1 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	
Fuel Density (% theoretical).....	
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	
Plenum Spring Weight per Assembly (lbs).....	
Plenum Length (inches).....	14-16
Plenum Volume (cubic inches).....	

Comments:

1 Water Rod per assembly.

2A-257

No drawing available for an General Electric 8 X 8 /4,5:V1.

For a drawing of a similar assembly, see page 2A-131.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 8 X 8 /4,5:V2 BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.518

Assembly Length (inches)..... 176
with Control Rod Inserted.....
including Holddown Device, etc.....

Rod Pitch (inches)..... 0.640

Total Assembly Weight (lbs).....

Weight of Heavy Metal (lbs).....

Metric Tons Initial Heavy Metal (metric tons).....

Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....

Maximum Design Burnup (MWd/MTIHM).....

Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,..,6-impossible)
for Cutting.....
for Mechanical Disassembly in Air.....
for Underwater Cosolidation.....
for Underwater Rod Replacement.....

Comments:

Complete data not yet available.

2A-260

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 8 X 8 /4,5:V2 BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

General Electric 8 X 8 /4,5:V2 BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	64
Typical Number of Fueled Rods per Assembly.....	62
Rod Diameter (inches).....	0.49
Rod Length (inches).....	
Active Length (inches).....	144-146
Weight per Rod (lbs).....	
Clad Material.....	
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

General Electric 8 X 8 /4,5:V2 BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....

Fuel Pellet Shape.....

Fuel Pellet Diameter (inches).....

Fuel Pellet Length (inches).....

Fuel Pellet Weight per Rod (lbs).....

Open Porosity (percent).....

Grain Size (microns).....

Fuel Density (% theoretical).....

O/U Ratio.....

Smear Density.....

Spacer Pellet Material.....

Spacer Pellet Length (inches).....

Plenum Spring Material.....

Plenum Spring Weight per Assembly (lbs).....

Plenum Length (inches)..... 14-16

Plenum Volume (cubic inches).....

Comments:

2 Water Rods per assembly.

2A-263

No drawing available for an General Electric 8 X 8 /4,5:V2.

For a drawing of a similar assembly, see page 2A-131.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 9 X 9 BRP BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 6.5
Assembly Length (inches)..... 82
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.707

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs)..... 305
Metric Tons Initial Heavy Metal (metric tons)..... 0.138
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,..,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:
 Complete data not yet available.

2A-266

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 9 X 9 BRP BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 9 X 9 BRP BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	81
Typical Number of Fueled Rods per Assembly.....	81
Rod Diameter (inches).....	0.5625
Rod Length (inches).....	
Active Length (inches).....	70
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

PHYSICAL DESCRIPTION REPORT

General Electric 9 X 9 BRP BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....

Comments:

2A-269

No drawing available for an General Electric 9 X 9 BRP.

For a drawing of a similar assembly, see page 2A-161.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

General Electric 11 X 11 BRP BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 6.5
Assembly Length (inches)..... 82
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.577

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (Mwd/MTIHM).....
Maximum Design Burnup (Mwd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,..,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:
 Complete data not yet available.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

General Electric 11 X 11 BRP BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

General Electric 11 X 11 BRP BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	111
Typical Number of Fueled Rods per Assembly.....	111
Rod Diameter (inches).....	0.449
Rod Length (inches).....	
Active Length (inches).....	70
Weight per Rod (lbs).....	
Clad Material.....	
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

General Electric 11 X 11 BRP BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-275

No drawing available for an General Electric 11 X 11 BRP.

For a drawing of a similar assembly, see page 2A-161.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 8 X 8 QUAD+ BWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 5.50
Assembly Length (inches)..... 175.5
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.609

Total Assembly Weight (lbs)..... 600.0
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 8 X 8 QUAD+ BWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
T. TIE PLATE	4	0.0000	TOP	St.Steel 304	1.00000
B. TIE PLATE	4	0.0000	BOTTOM	St.Steel 304	1.00000
SPACER-INCORE	24	0.0000	IN CORE	Zircaloy-4	1.00000
SPACER SPRING	0	0.0000	IN CORE	Zircaloy-4	1.00000
COMP. SPRINGS	0	0.0000	TOP	Inconel	1.00000
BOTTOM NOZZLE	1	0.0000	BOTTOM	St.Steel 304	1.00000
WATER CROSS	1	0.0000	IN CORE	Zircaloy-4	1.00000
OUTSIDE CHANNEL	1	0.0000	IN CORE	Zircaloy-4	1.00000
SUPPORT SCREWS	12	0.0000	BOTTOM	Inconel	1.00000
TOP NOZZLE	1	0.0000	TOP	St.Steel 304	1.00000
ATTACHMENT STUD	4	0.0000	TOP	Zircaloy-4	1.00000

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 8 X 8 QUAD+ BWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	64
Typical Number of Fueled Rods per Assembly.....	64
Rod Diameter (inches).....	0.458
Rod Length (inches).....	160.6
Active Length (inches).....	150
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-2
Clad Thickness (inches).....	0.029
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0435
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	0.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

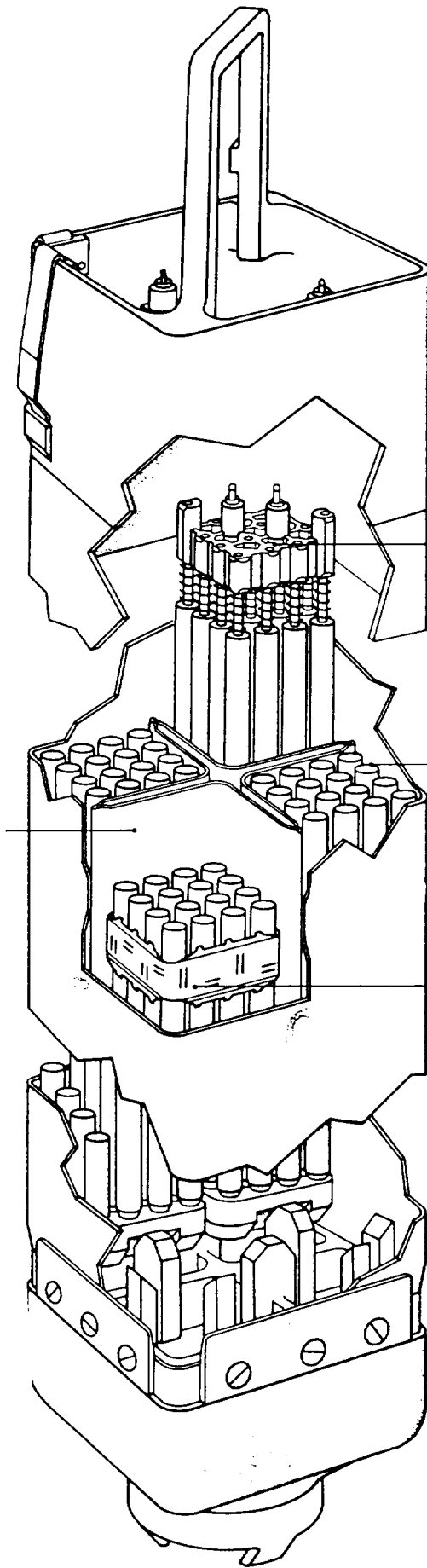
Westinghouse 8 X 8 QUAD+ BWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.3913
Fuel Pellet Length (inches).....	0.470
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	
Plenum Length (inches).....	10.0
Plenum Volume (cubic inches).....	1.201

Comments:

Typ. 6-10 fueled burnable poison rods; no info on gms of gadolinia per rod.



Source:
Westinghouse
Electric Co.
Information
Brochure

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 13 X 13 PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches).....
Assembly Length (inches).....
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches).....

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

THIS ASSEMBLY USED AT INDIAN PT. 1.

2A-284

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 13 X 13 PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

Westinghouse 13 X 13 PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....
Fuel Rod Positions per Assembly.....
Typical Number of Fueled Rods per Assembly.....
Rod Diameter (inches).....
Rod Length (inches).....
Active Length (inches).....
Weight per Rod (lbs).....
Clad Material.....
Clad Thickness (inches).....
Clad Final Conditioning.....
Fuel-Clad Gap (inches).....
Fill Gas Used.....
Initial Gas Pressure (psig).....
Nitrogen Content of Fill Gas (percent).....

Westinghouse 13 X 13 PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-287

No drawing available for a Westinghouse 13 X 13.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 14 X 14 Std/ZCA PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1969
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	4000
Assembly Width (inches).....	7.76
Assembly Length (inches).....	159.71
with Control Rod Inserted.....	164.670
including Holddown Device, etc.....	161.3
Rod Pitch (inches).....	0.556
Total Assembly Weight (lbs).....	1242-1302
Weight of Heavy Metal (lbs).....	858-897
Metric Tons Initial Heavy Metal (metric tons).....	0.389-0.407
Enrichment Range (% U235).....	2.2-3.4
Average Design Burnup (MWd/MTIHM).....	33000
Maximum Design Burnup (MWd/MTIHM).....	50000
Linear Heat Rating (KW/foot).....	6.20
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0-3
for Mechanical Disassembly in Air.....	3
for Underwater Cosolidation.....	0-3
for Underwater Rod Replacement.....	3

Comments:

Westinghouse 14 X 14 Std/ZC with SS304 Guide Tubes.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 14 X 14 Std/ZCA PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	6	5.3700	IN CORE	Inconel-718	1.00000
GUIDE TUBES	17	8.1200	IN CORE	St.Steel 304	1.00000
SPACER-PLENUM	1	0.6800	GAS PLENUM	Inconel-718	0.90000
				West. Braze	0.10000
TOP NOZZLE	1	9.3800	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	8	0.5080	TOP	Inconel-718	1.00000
BOTTOM NOZZLE	1	7.8930	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

1224E94

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 14 X 14 Std/ZCA PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	196
Typical Number of Fueled Rods per Assembly.....	179
Rod Diameter (inches).....	0.422
Rod Length (inches).....	148.55-152.40
Active Length (inches).....	141.20-145.20
Weight per Rod (lbs).....	6.63-6.68
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0225
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0048-0.0065
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	0 - 460
Nitrogen Content of Fill Gas (percent).....	4-78

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 14 X 14 Std/ZCA PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3640-0.3674
Fuel Pellet Length (inches).....	0.300-0.675
Fuel Pellet Weight per Rod (lbs).....	5.63
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	91-95
O/U Ratio.....	
Smear Density(gr/cm3).....	9.97
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.050-0.070
Plenum Length (inches).....	6.990
Plenum Volume (cubic inches).....	1.720

Comments:

2A-293

No drawing available for a Westinghouse 14 X 14 Std/ZCA.

For a drawing of a similar assembly, see page 2A-305.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 14 X 14 OFA PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1984
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	30
Assembly Width (inches).....	7.76
Assembly Length (inches).....	159.71
with Control Rod Inserted.....	164.670
including Holddown Device, etc.....	161.51
Rod Pitch (inches).....	0.556
Total Assembly Weight (lbs).....	1096-1177
Weight of Heavy Metal (lbs).....	741-790
Metric Tons Initial Heavy Metal (metric tons).....	0.336-0.358
Enrichment Range (% U235).....	0.71-5.00
Average Design Burnup (MWd/MTIHM).....	40000
Maximum Design Burnup (MWd/MTIHM).....	
Linear Heat Rating (KW/foot).....	
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0-3
for Mechanical Disassembly in Air.....	3
for Underwater Cosolidation.....	0-3
for Underwater Rod Replacement.....	3

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 14 X 14 OFA PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	5	9.2080	IN CORE	Zircaloy-4	1.00000
GUIDE TUBES	17	8.5600	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	0.9500	GAS PLENUM	Inconel-718	1.00000
TOP NOZZLE	1	6.2820	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	4	0.7440	TOP	Inconel-718	1.00000
BOTTOM NOZZLE	1	5.4430	BOTTOM	St.Steel 304	1.00000
SPACER-LOWER	1	0.8620	IN CORE	Inconel-718	1.00000

Drawing Numbers Associated With Assembly:

1762E99

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 14 X 14 OFA PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	196
Typical Number of Fueled Rods per Assembly.....	179
Rod Diameter (inches).....	0.400
Rod Length (inches).....	148.61-151.85
Active Length (inches).....	135.20-144.00
Weight per Rod (lbs).....	5.82-6.14
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0243
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0035
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	250 - 350
Nitrogen Content of Fill Gas (percent).....	4.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 14 X 14 OFA PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3444
Fuel Pellet Length (inches).....	0.283-0.565
Fuel Pellet Weight per Rod (lbs).....	4.99
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density(gr/cm ³).....	9.97
Spacer Pellet Material.....	Nat. UO ₂
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	St. Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.03-0.04
Plenum Length (inches).....	7.158
Plenum Volume (cubic inches).....	1.260

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 14 X 14 Std/ZCB PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 7.76

Assembly Length (inches)..... 159.71
with Control Rod Inserted..... 164.670
including Holddown Device, etc..... 161.3

Rod Pitch (inches)..... 0.556

Total Assembly Weight (lbs)..... 1242-1302

Weight of Heavy Metal (lbs)..... 858-897

Metric Tons Initial Heavy Metal (metric tons)..... 0.389-0.407

Enrichment Range (% U235)..... 2.2-3.4

Average Design Burnup (MWd/MTIHM)..... 33000

Maximum Design Burnup (MWd/MTIHM).....

Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,..,6-impossible)
for Cutting..... 0-3
for Mechanical Disassembly in Air..... 3
for Underwater Cosolidation..... 0-3
for Underwater Rod Replacement..... 3

Comments:

Westinghouse 14 X 14 Std/ZC with Zircaloy-4 Guide Tubes.

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 14 X 14 Std/ZCB PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

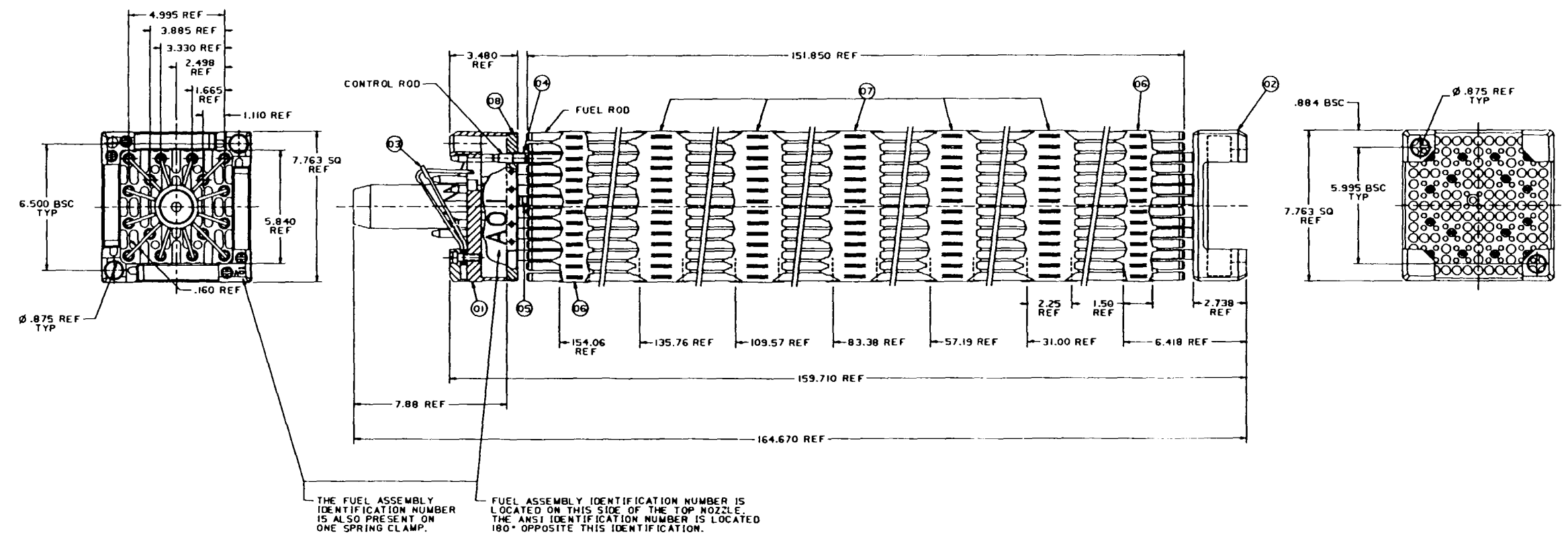
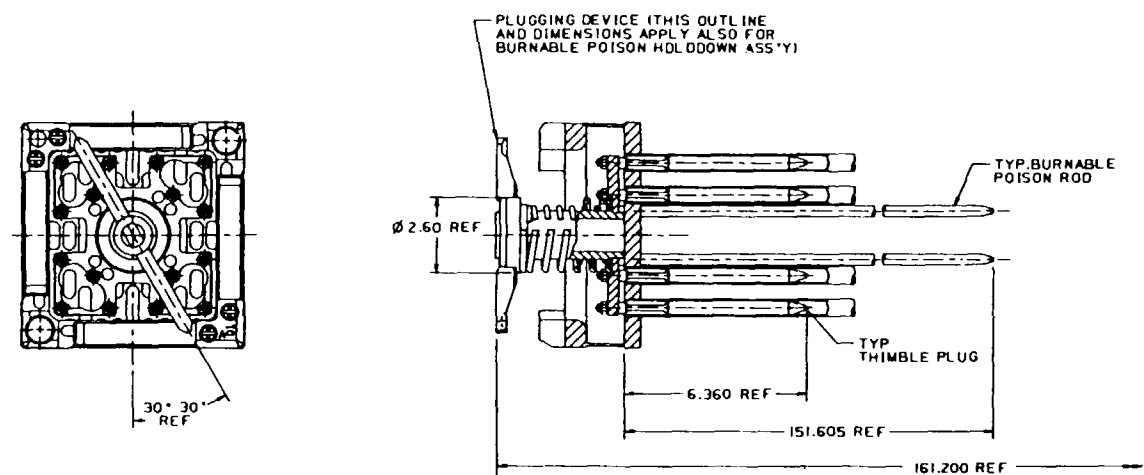
Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	6	5.3700	IN CORE	Inconel-718	1.00000
GUIDE TUBES	17	7.9800	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	0.6800	GAS PLENUM	Inconel-718	0.90000
				West. Braze	0.10000
TOP NOZZLE	1	9.3800	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	8	0.5080	TOP	Inconel-718	1.00000
BOTTOM NOZZLE	1	7.8930	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

1224E94

B.O.L. OF MATERIAL				
QTY	REV	PART NAME	ISSUE REFERENCE INFORMATION	DATE
1	01	TOP NOZZLE	304 SST	
1	02	BOTTOM NOZZLE	304 SST	
4	03	SPALING SKI	ZIRCALOY-4	
16	04	GUIDE THIMBLE	ZIRCALOY-4	
1	05	INSTR. TUBE	ZIRCALOY-4	
2	06	GRID ASSEMBLY	ZIRCALOY-4	
5	07	GRID ASSEMBLY	ZIRCALOY-4	
1	08	ADAPTOR PLATE	304 SST	
	09			
	10			

NOTES:
1. DIMENSIONS SHOWN ARE PRIOR TO IRRADIATION.



REV	DATE	BY	CHKD	DESCRIPTION
1				
2				

INTERACTIVE GRAPHICS
D:\FAQ\EV\1762E99.XXX.02.XXX.0108

EST. WEIGHT OF FUEL ASSEMBLY
EST. WEIGHT OF FUEL ASSEMBLY
EST. WEIGHT OF FUEL ASSEMBLY AND CONTROL ROD ASSEMBLY
EST. WEIGHT OF FUEL ASSEMBLY AND CONTROL ROD ASSEMBLY

D. SEELEY

SPIN/CFACD

1762E99

14 X 14 OPTIMIZED
FUEL ASSEMBLY OUTLINE

1762E99

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 14 X 14 Std/ZCB PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	196
Typical Number of Fueled Rods per Assembly.....	179
Rod Diameter (inches).....	0.422
Rod Length (inches).....	148.55-152.40
Active Length (inches).....	141.20-145.20
Weight per Rod (lbs).....	6.63-6.68
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0225
Clad Final Conditioning.....	HT, SRA
Fuel-Clad Gap (inches).....	0.0048-0.0065
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	0 - 460
Nitrogen Content of Fill Gas (percent).....	4-78

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 14 X 14 Std/ZCB PWR

FUEL ROD DESCRIPTION TABLE continued

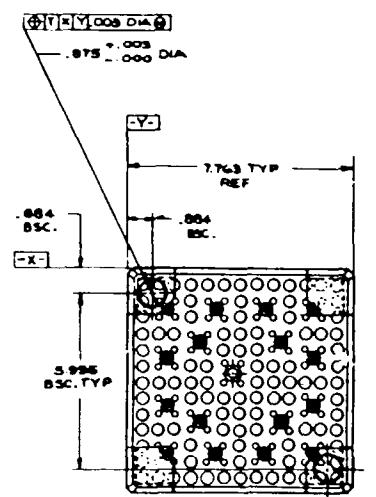
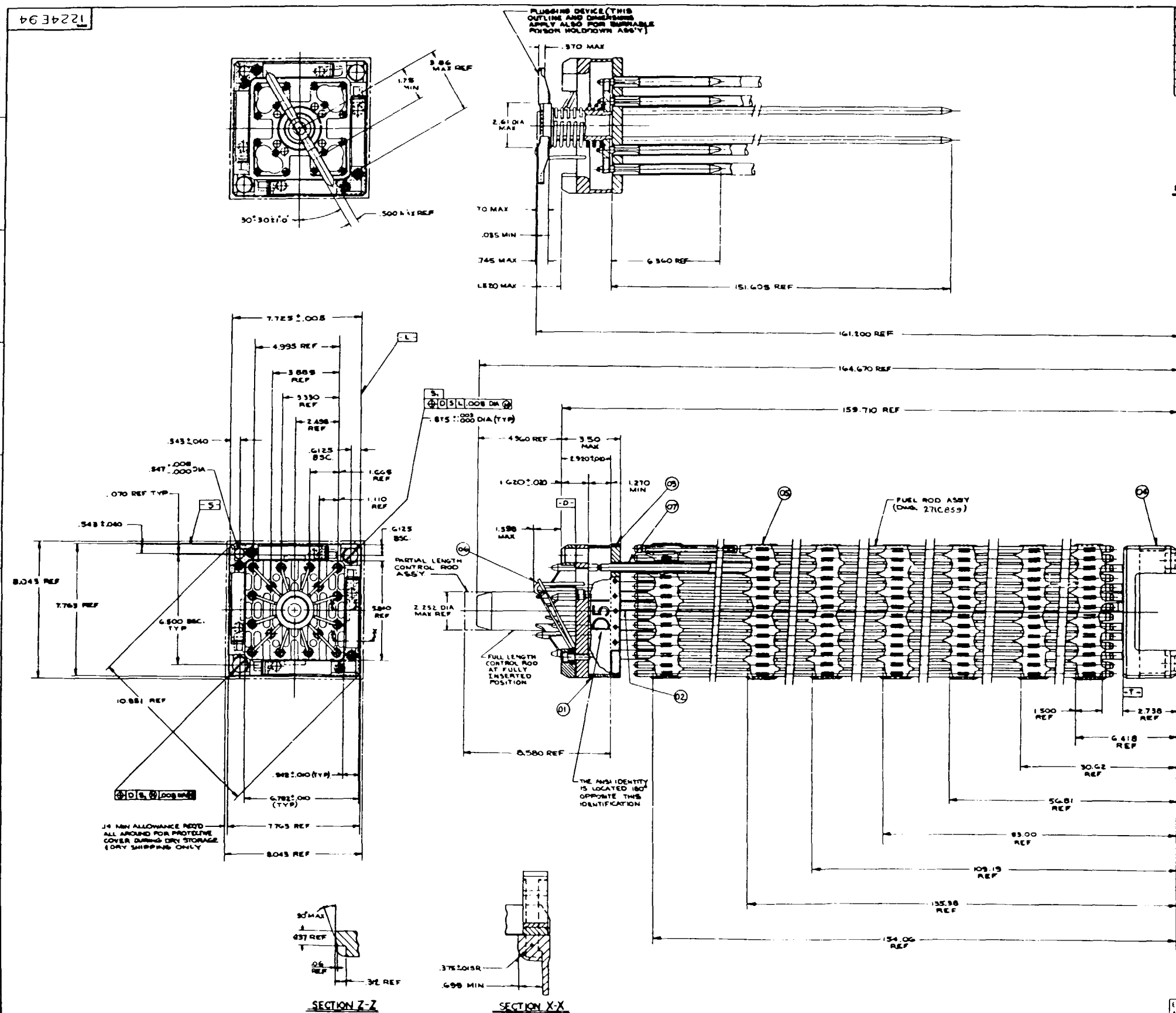
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3640-0.3674
Fuel Pellet Length (inches).....	0.300-0.675
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	91-95
O/U Ratio.....	
Smear Density(gr/cm ³).....	9.97
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.050-0.07
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	1.720

Comments:

1224E94

BILL OF MATERIAL				
ITEM NO.	DESCRIPTION	QUANTITY	REMARKS	REVISION
01	TOP NOZZLE	1	304 SST	1
02	INSTRUMENT TUBE	1	ZIRCALOY-4	1
03	ADAPTOR PLATE	1	304 SST	1
04	BOTTOM NOZZLE	1	304 SST	1
05	ORIO	1	INCONEL 718	1
06	LEAF SPRING	8	INCONEL 718	1
07	GUGE THIMBLE	16	ZIRCALOY-4	16

NOTES:
1. DIMENSIONS SHOWN ARE PRIOR TO IRRADIATION



NO. 1224E94	REV. 1	DATE 10/10/64
DESIGNED BY	10/10/64	
CHECKED BY		
APPROVED BY		

EST. WT. OF MATERIALS IN FUEL ASSEMBLY ONLY

EST. WT. OF FUEL ASSEMBLY AND CONTROL ROD ASSEMBLY

EST. WT. OF FUEL ASSEMBLY

STAINLESS STEEL
ZIRCALOY
URANIUM DIOXIDE
INCONEL

Westinghouse Electric Corporation
14 X 14 STANDARD
FUEL ASSEMBLY OUTLINE

1224E94

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 14 X 14 Std/SC PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	
Assembly Width (inches).....	7.76
Assembly Length (inches).....	137.06
with Control Rod Inserted.....	138.5
including Holddown Device, etc.....	137.63
Rod Pitch (inches).....	0.556
Total Assembly Weight (lbs).....	1233-1247
Weight of Heavy Metal (lbs).....	822.00
Metric Tons Initial Heavy Metal (metric tons).....	0.37300
Enrichment Range (% U235).....	2.8-4.36
Average Design Burnup (MWd/MTIHM).....	30000
Maximum Design Burnup (MWd/MTIHM).....	
Linear Heat Rating (KW/foot).....	
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0-3
for Mechanical Disassembly in Air.....	3
for Underwater Cosolidation.....	0-3
for Underwater Rod Replacement.....	3

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 14 X 14 Std/SC PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	6	3.4800	IN CORE	Inconel-718	1.00000
GUIDE TUBES	16	7.1850	IN CORE	St.Steel 304	1.00000
SPACER-PLENUM	1	0.6710	GAS PLENUM	Inconel-718	1.00000
TOP NOZZLE	1	9.2100	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	2	0.4100	TOP	Inconel-718	1.00000
BOTTOM NOZZLE	1	7.8900	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

1097E36

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 14 X 14 Std/SC PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	196
Typical Number of Fueled Rods per Assembly.....	180
Rod Diameter (inches).....	0.422
Rod Length (inches).....	126.13-126.68
Active Length (inches).....	120.00
Weight per Rod (lbs).....	6.55-6.57
Clad Material.....	St.Steel 304
Clad Thickness (inches).....	0.0165
Clad Final Conditioning.....	A/CR
Fuel-Clad Gap (inches).....	0.0027
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	0 - 300
Nitrogen Content of Fill Gas (percent).....	4-78

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 14 X 14 Std/SC PWR

FUEL ROD DESCRIPTION TABLE continued

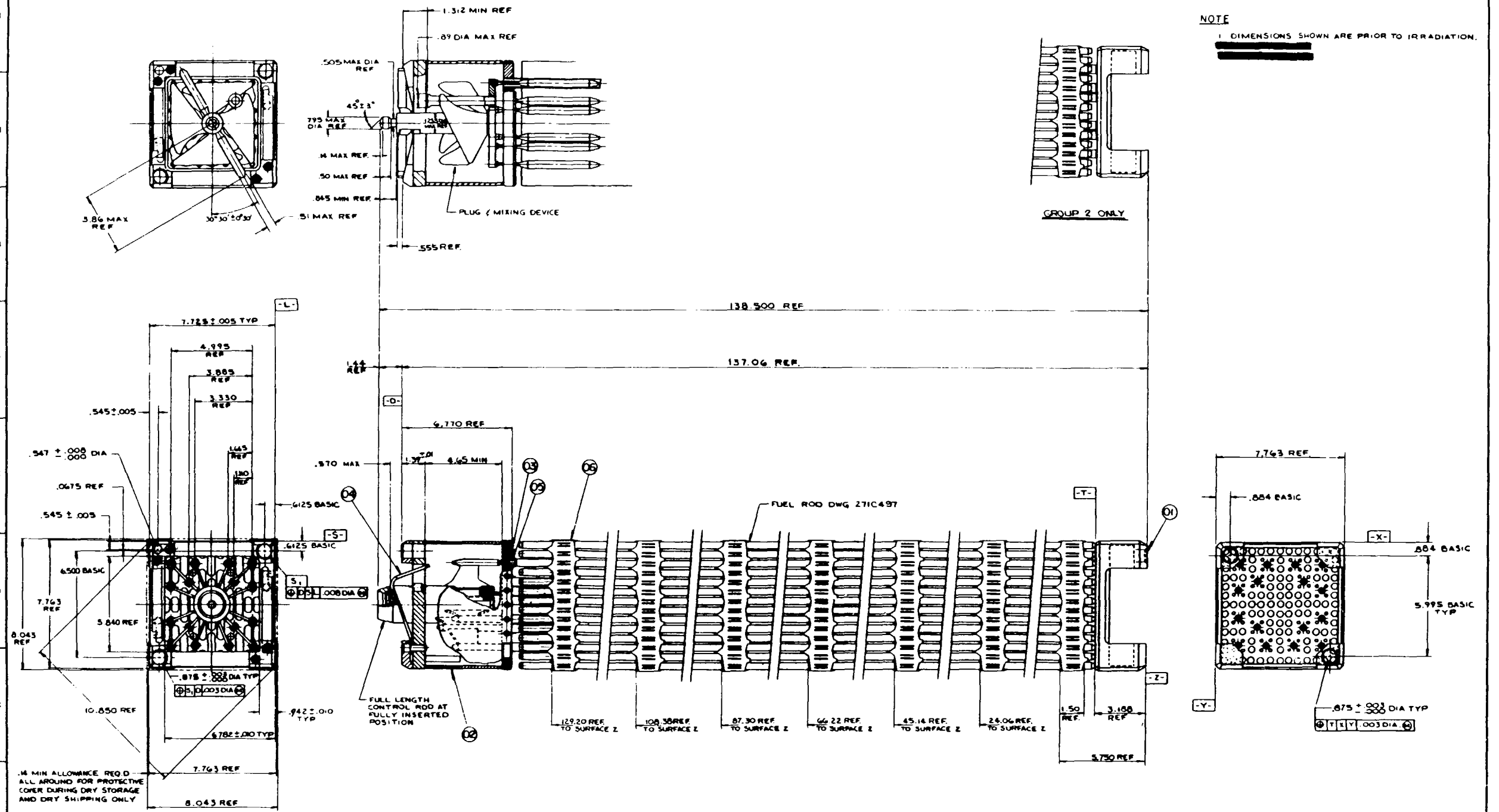
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3835
Fuel Pellet Length (inches).....	0.300-0.675
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	93-95
O/U Ratio.....	
Smear Density(gr/cm ³).....	10.1
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.025-0.042
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	1.06-1.22

Comments:

1097E36

BILL OF MATERIALS				
ITEM NO.	DESCRIPTION	QTY	UNIT	REMARKS
1	BOTTOM NOZZLE	1	304 SST	
2	TOP NOZZLE	1	304 SST	
3	ADAPTOR PLATE	1	304 SST	
4	LEAF SPRING	2	INCONEL-718	
5	GUIDE THIMBLE	16	304 SST	
6	GRID	7	INCONEL-718	

NOTE
 1. DIMENSIONS SHOWN ARE PRIOR TO IRRADIATION.



EST. WGT. OF MATERIALS IN FUEL ASSEMBLY		
	GR 1	GR 2
STAINLESS STEEL		
CARBON STEEL		
INCONEL		
URANIUM DIOXIDE		
TOTAL LBS.		

EST. WGT. OF FUEL ASSEMBLY & CONTROL ROD ASSEMBLY		
	GR 1	GR 2
TOTAL LBS.		

REVISIONS
 1. ASSEMBLY
 2. ASSEMBLY
 3. ASSEMBLY
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 99. ASSEMBLY
 100. ASSEMBLY

14X14 STANDARD FUEL ASSY OUTLINE (55T FUEL TUBES)
 1097E36

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 14 X 14 Model C PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture..... 1980
Final Year of Manufacture..... SINP
Total Number Fabricated to Date..... 343

Assembly Width (inches)..... 8.03
Assembly Length (inches)..... 157.238
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.580

Total Assembly Weight (lbs)..... 1283.0
Weight of Heavy Metal (lbs)..... 876.00
Metric Tons Initial Heavy Metal (metric tons)..... 0.39700
Enrichment Range (% U235)..... 2.6-3.3

Average Design Burnup (MWd/MTIHM)..... 33000
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting..... 0-3
 for Mechanical Disassembly in Air..... 3
 for Underwater Cosolidation..... 0-3
 for Underwater Rod Replacement..... 3

Comments:

2A-314

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 14 X 14 Model C PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	8	6.7590	IN CORE	Inconel-718	1.00000
GRID SLEEVES	8	0.6580	IN CORE	St.Steel 304	1.00000
GUIDE TUBES	5	10.9500	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	0.7700	GAS PLENUM	Inconel-718	1.00000
TOP NOZZLE	1	8.3460	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	5	1.2000	TOP	Inconel-718	1.00000
BOTTOM NOZZLE	1	5.4400	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

1766E73

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 14 X 14 Model C PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	176
Typical Number of Fueled Rods per Assembly.....	176
Rod Diameter (inches).....	0.440
Rod Length (inches).....	146.44
Active Length (inches).....	136.70
Weight per Rod (lbs).....	6.86
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0260
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0038
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	275 - 400
Nitrogen Content of Fill Gas (percent).....	4.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 14 X 14 Model C PWR

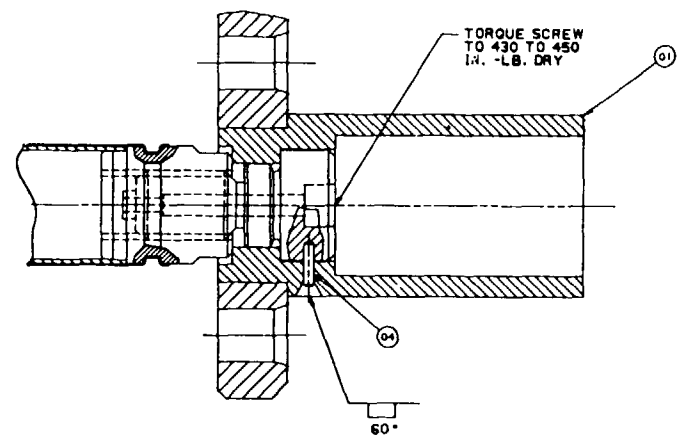
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3805
Fuel Pellet Length (inches).....	0.600
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density(gr/cm3).....	9.71
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.039
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	1.600

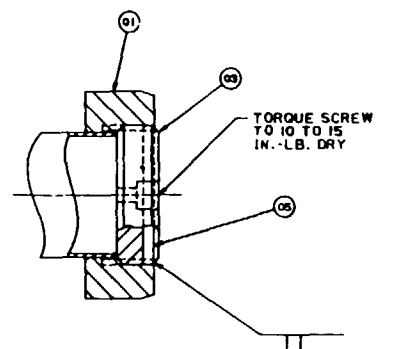
Comments:

QTY		PART NAME		MATERIAL	
1	01	ASSEMBLY	SKELETON		1766E73
1	02	ASSEMBLY	FUEL ROD		
1	03	SCREEN			
4	04	PIN			
1	05	PIN			

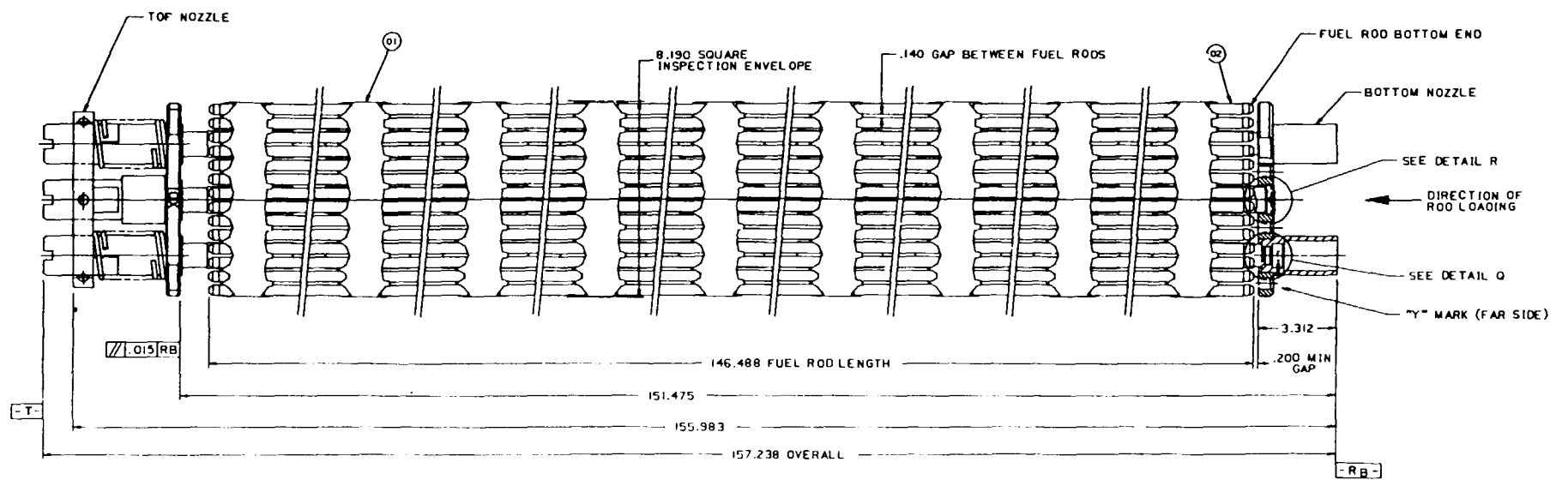
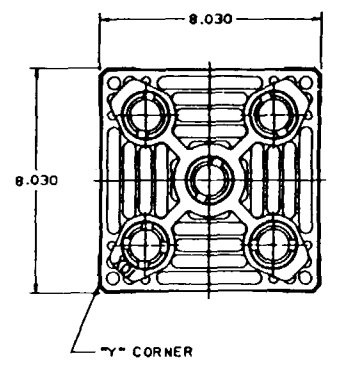
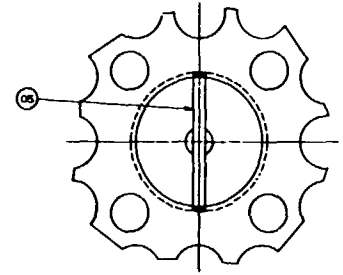
- NOTES:
- THE STRAIGHTNESS SHALL BE DETERMINED FROM AN ENVELOPE INSPECTION WHILE THE FUEL ASSEMBLY STANDS VERTICALLY ON PLANE $-RB-$ UNDER THE FOLLOWING CONDITIONS:
 - THE FUEL ASSEMBLY TOP AND BOTTOM NOZZLES ARE CENTERED IN THE ENVELOPE WITHIN .001.
 - THE INSPECTION ENVELOPE IS SQUARE IN CROSS SECTION.
 - THE TOP AND BASE OF THE ENVELOPE ARE PERPENDICULAR TO THE AXIS OF THE ENVELOPE.
 - A FULL HEIGHT TRAVERSE OF THE ASSEMBLY SHALL BE MADE AND ALL COMPONENTS MUST BE WITHIN THE BOUNDS OF THE ENVELOPE.
 - THE FUEL ASSEMBLY MUST NOT BE LIFTED FROM THE HORIZONTAL TO THE VERTICAL POSITION WITHOUT BEING SUPPORTED AT EACH GRID AND NOZZLE LOCATION BY A CONTINUOUS RIGID FIXTURE.
 - ITEM 03 AND 04 TO BE LOCKED IN PLACE AFTER ROD LOADING.
 - ALL DIMENSIONS ARE NOMINAL UNLESS OTHERWISE SPECIFIED.



DETAIL Q
SCALE 2:1



DETAIL R
SCALE 2:1



1	1766E73	1
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TOLERANCE & MACHINE NOTES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
FRACTIONS SHALL BE TO NEAREST 1/1000
DECIMALS SHALL BE TO NEAREST .0005
ANGLES TO NEAREST 5 MINUTES
SURFACE FINISH SHALL BE AS SHOWN
UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE NOMINAL UNLESS OTHERWISE SPECIFIED

INTERACTIVE GRAPHICS
OF A01104.1766E73 XXX.01.XXX.07.1984

SEE PRODUCT SPECIFICATION NFP 31032 FOR SUPPLEMENTAL PRODUCT INFORMATION

Westinghouse Electric Corporation
14x14 MODEL "C" FUEL ASSEMBLY OUTLINE

1766E73

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 15 X 15 Std/ZC PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1967
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	5200
Assembly Width (inches).....	8.434
Assembly Length (inches).....	159.71
with Control Rod Inserted.....	164
including Holddown Device, etc.....	161.51
Rod Pitch (inches).....	0.563
Total Assembly Weight (lbs).....	1449-1472
Weight of Heavy Metal (lbs).....	1006-1034
Metric Tons Initial Heavy Metal (metric tons).....	0.4563-0.4690
Enrichment Range (% U235).....	1.85-3.8
Average Design Burnup (MWd/MTIHM).....	36000
Maximum Design Burnup (MWd/MTIHM).....	50000
Linear Heat Rating (KW/foot).....	6.70
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0-3
for Mechanical Disassembly in Air.....	3
for Underwater Cosolidation.....	0-3
for Underwater Rod Replacement.....	3

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 15 X 15 Std/ZC PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	6	6.8000	IN CORE	Inconel-718	1.00000
GUIDE TUBES	21	9.3900	IN CORE	Zircaloy-4	1.00000
GRID SLEEVES	7	1.2500	IN CORE	St.Steel 304	1.00000
SPACER-PLENUM	1	0.8160	GAS PLENUM	Inconel-718	0.90000
				West. Braze	0.10000
GRID SLEEVE	1	0.2500	GAS PLENUM	St.Steel 304	1.00000
TOP NOZZLE	1	10.7000	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	4	1.1400	TOP	Inconel-718	1.00000
BOTTOM NOZZLE	1	5.4400	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

1598E32

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 15 X 15 Std/ZC PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	225
Typical Number of Fueled Rods per Assembly.....	204
Rod Diameter (inches).....	0.422
Rod Length (inches).....	148.59-151.88
Active Length (inches).....	142.00-144.00
Weight per Rod (lbs).....	6.77-6.85
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0242
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0038
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	0 - 475
Nitrogen Content of Fill Gas (percent).....	4-78

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 15 X 15 Std/ZC PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3659
Fuel Pellet Length (inches).....	0.300-0.675
Fuel Pellet Weight per Rod (lbs).....	5.52
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density(gr/cm ³).....	10.07
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	St. Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.038-0.044
Plenum Length (inches).....	8.200
Plenum Volume (cubic inches).....	1.250

Comments:

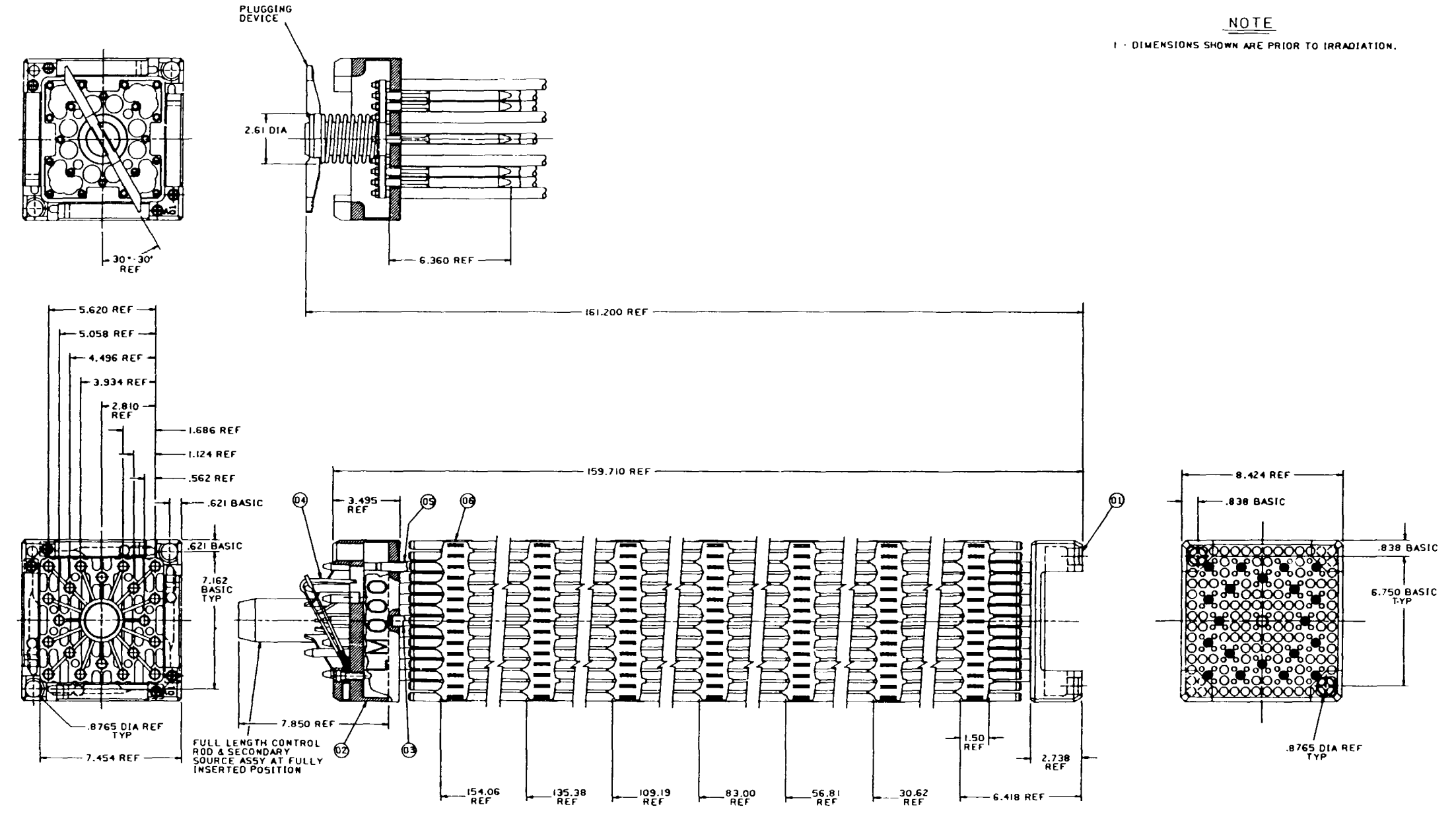
8 7 6 5 4 3 2 1

BILL OF MATERIAL			
ITEM NO	PART NAME	QUANTITY	REVISION
01	NOZZLE (BOTTOM)	1	SEE NOTE A
02	NOZZLE (TOP)	1	SEE NOTE A
03	TUBE (INSTRUMENTATION)	1	SEE NOTE B
04	SPRING SET (LEAF)	4	SEE NOTE C
05	TUBE (GUIDE THIMBLE)	20	SEE NOTE B
06	GRID	7	SEE NOTE C

NOTE "A" - 304 SST
 "B" - ZIRCALOY-4
 "C" - INCONEL-718

NOTE

1 - DIMENSIONS SHOWN ARE PRIOR TO IRRADIATION.



REVISION
 103951
 CORR. 30
 ECR-10390
 15X15 STANDARD FUEL ASSEMBLY ROD
 WERE NOT ON
 SEELEY DB-28-91
 10/21/77
 10/21/77
 10/21/77

INTERACTIVE GRAPHICS
 15X15 STANDARD FUEL ASSEMBLY OUTLINE
 1598E32
 M. BARTLEY
 S. F. FALAM
 R. D. THUMAS
 J. M. LUONICZAN
 T. H. HADLEY

8 7 6 5 4 3 2 1

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 15 X 15 OFA PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1983
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	400
Assembly Width (inches).....	8.424
Assembly Length (inches).....	159.765
with Control Rod Inserted.....	
including Holddown Device, etc.....	161.565
Rod Pitch (inches).....	0.563
Total Assembly Weight (lbs).....	1448-1459
Weight of Heavy Metal (lbs).....	1020
Metric Tons Initial Heavy Metal (metric tons).....	0.46270
Enrichment Range (% U235).....	3.2-3.6
Average Design Burnup (MWd/MTIHM).....	38000
Maximum Design Burnup (MWd/MTIHM).....	50000
Linear Heat Rating (KW/foot).....	6.70
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0-3
for Mechanical Disassembly in Air.....	3
for Underwater Cosolidation.....	0-3
for Underwater Rod Replacement.....	3

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 15 X 15 OFA PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-LOWER	1	1.0300	IN CORE	Inconel-718	1.00000
SPACER-INCORE	5	7.9600	IN CORE	Zircaloy-4	1.00000
GUIDE TUBES	21	9.3900	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	0.9070	GAS PLENUM	Inconel-718	0.90000
				West. Braze	0.10000
TOP NOZZLE	1	6.8900	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	4	0.9600	TOP	Inconel-718	1.00000
BOTTOM NOZZLE	1	5.4400	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

1607E93

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 15 X 15 OFA PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	225
Typical Number of Fueled Rods per Assembly.....	204
Rod Diameter (inches).....	0.422
Rod Length (inches).....	151.85
Active Length (inches).....	144.00
Weight per Rod (lbs).....	6.75-6.80
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0242
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0038
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	275 - 350
Nitrogen Content of Fill Gas (percent).....	4.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 15 X 15 OFA PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3659
Fuel Pellet Length (inches).....	0.300-0.675
Fuel Pellet Weight per Rod (lbs).....	5.73
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density(gr/cm ³).....	9.99
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.02-0.03
Plenum Length (inches).....	8.200
Plenum Volume (cubic inches).....	1.350

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 15 X 15 Std/SC PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....

Final Year of Manufacture.....

Total Number Fabricated to Date.....

Assembly Width (inches)..... 8.42

Assembly Length (inches)..... 137.06
with Control Rod Inserted..... 138.52
including Holddown Device, etc..... 137.64

Rod Pitch (inches)..... 0.563

Total Assembly Weight (lbs)..... 1392-1421

Weight of Heavy Metal (lbs)..... 912-930

Metric Tons Initial Heavy Metal (metric tons)..... 0.413-0.422

Enrichment Range (% U235)..... 4.0

Average Design Burnup (MWd/MTIHM)..... 31000

Maximum Design Burnup (MWd/MTIHM).....

Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
for Cutting..... 0-3
for Mechanical Disassembly in Air..... 3
for Underwater Cosolidation..... 0-3
for Underwater Rod Replacement..... 3

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 15 X 15 Std/SC PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	6	5.1980	IN CORE	Inconel-718	1.00000
GUIDE TUBES	21	7.2600	IN CORE	St.Steel 304	1.00000
SPACER-PLENUM	1	0.8660	GAS PLENUM	Inconel-718	0.90000
				West. Braze	0.10000
TOP NOZZLE	1	10.7000	TOP	St.Steel 304	1.00000
HOLDDOWN SPRING	4	0.5400	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	8.8500	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

114E134

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 15 X 15 Std/SC PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	225
Typical Number of Fueled Rods per Assembly.....	204
Rod Diameter (inches).....	0.422
Rod Length (inches).....	126.52-126.72
Active Length (inches).....	120.00-122.00
Weight per Rod (lbs).....	6.44-6.57
Clad Material.....	St.Steel 304
Clad Thickness (inches).....	0.0165
Clad Final Conditioning.....	A/CR
Fuel-Clad Gap (inches).....	0.0025
Fill Gas Used.....	AIR
Initial Gas Pressure (psig).....	0
Nitrogen Content of Fill Gas (percent).....	78.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 15 X 15 Std/SC PWR

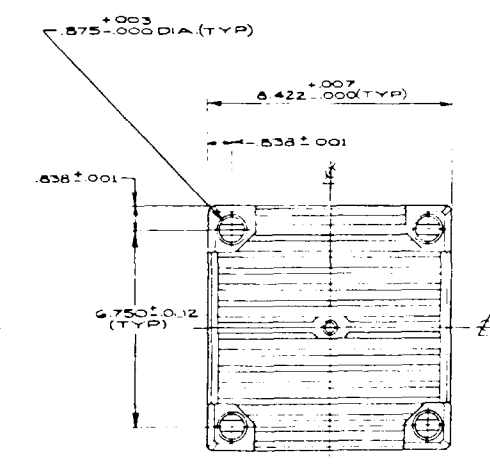
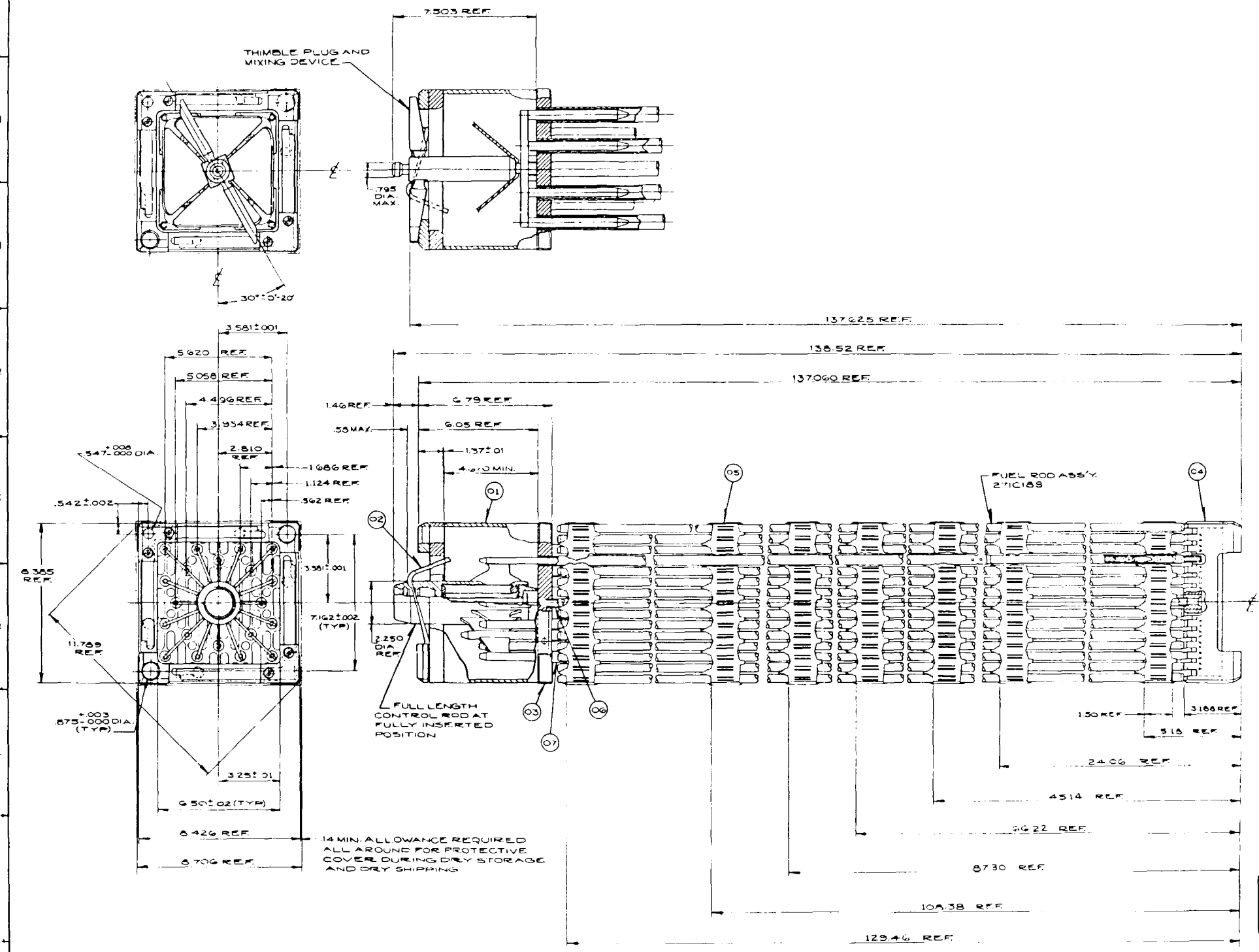
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3895
Fuel Pellet Length (inches).....	0.675
Fuel Pellet Weight per Rod (lbs).....	5.25
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	93
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	Alum. Oxide
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	Carbon Steel
Plenum Spring Weight per Assembly (lbs).....	0.025
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	0.950
Comments:	

114E134

BILL OF MATERIAL					
ITEM	DESCRIPTION	QTY	UNIT	EST. WT.	REMARKS
1	TOP NOZZLE	1	PC	304 SST	
2	LEAF SPRING	4	PC	304 SST	
3	ADAPTOR PLATE	1	PC	304 SST	
4	BOTTOM NOZZLE	1	PC	304 SST	
5	SPRING CLIP GRID	7	PC	INCONEL 718	
6	INSTRUMENTATION TUBE	1	PC	304 SST	
7	GUIDE THIMBLE	1	PC	304 SST	

NOTE:
1. DIMENSIONS SHOWN ARE PRIOR TO IRRADIATION.



EST. WT. OF FUEL ASSEMBLY AND CONTROL ROD [REDACTED]
EST. WT. OF FUEL ASSEMBLY [REDACTED]

EST. WT. OF MATERIALS IN FUEL ASSEMBLY ONLY
STAINLESS STEEL [REDACTED]
CARBON STEEL [REDACTED]
INCONEL [REDACTED]
URANIUM DIOXIDE [REDACTED]
TOTAL [REDACTED]

114E134

Westinghouse Electric Corporation

15x15 STANDARD FUEL ASSEMBLY OUTLINE (5ST FUEL TUBES)

114E134

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 15 X 16 PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches).....
Assembly Length (inches).....
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches).....

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

This assembly used at Yankee Rowe. It is a non-square array.
For similar assemblies, see CE 15x16 & Exxon 15x16 Yankee Rowe.

2A-338

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 15 X 16 PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

Westinghouse 15 X 16 PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	
Fuel Rod Positions per Assembly.....	240
Typical Number of Fueled Rods per Assembly.....	
Rod Diameter (inches).....	
Rod Length (inches).....	
Active Length (inches).....	
Weight per Rod (lbs).....	
Clad Material.....	
Clad Thickness (inches).....	
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	

Westinghouse 15 X 16 PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....
Fuel Pellet Shape.....
Fuel Pellet Diameter (inches).....
Fuel Pellet Length (inches).....
Fuel Pellet Weight per Rod (lbs).....
Open Porosity (percent).....
Grain Size (microns).....
Fuel Density (% theoretical).....
O/U Ratio.....
Smear Density.....
Spacer Pellet Material.....
Spacer Pellet Length (inches).....
Plenum Spring Material.....
Plenum Spring Weight per Assembly (lbs).....
Plenum Length (inches).....
Plenum Volume (cubic inches).....
Comments:

2A-341

No drawing available for an Westinghouse 15 X 16.
For a drawing of a similar assembly, see page 2A-203.

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 17 X 17 Std PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1975
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	6006
Assembly Width (inches).....	8.434
Assembly Length (inches).....	159.765
with Control Rod Inserted.....	167.220
including Holddown Device, etc.....	161.556
Rod Pitch (inches).....	0.496
Total Assembly Weight (lbs).....	1482.0
Weight of Heavy Metal (lbs).....	1022.00
Metric Tons Initial Heavy Metal (metric tons).....	0.46360
Enrichment Range (% U235).....	1.6-3.8
Average Design Burnup (MWd/MTIHM).....	38000
Maximum Design Burnup (MWd/MTIHM).....	50000
Linear Heat Rating (KW/foot).....	5.44
Difficulty Indexes (0-not required, 1-simple,..,6-impossible)	
for Cutting.....	0-3
for Mechanical Disassembly in Air.....	3
for Underwater Cosolidation.....	0-3
for Underwater Rod Replacement.....	3

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 17 X 17 Std PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-INCORE	6	4.9000	IN CORE	Inconel-718	1.00000
GUIDE TUBES	25	9.5260	IN CORE	Zircaloy-4	1.00000
GRID SLEEVES	6	0.5400	IN CORE	St.Steel 304	1.00000
SPACER-PLENUM	1	0.7930	GAS PLENUM	Inconel-718	0.90000
				West. Braze	0.10000
GRID SLEEVE	1	0.0910	GAS PLENUM	St.Steel 304	1.00000
HOLDDOWN SPRING	4	0.9600	TOP	Inconel-718	1.00000
TOP NOZZLE	1	6.8900	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	5.9000	BOTTOM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

1465F30

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 17 X 17 Std PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	289
Typical Number of Fueled Rods per Assembly.....	264
Rod Diameter (inches).....	0.374
Rod Length (inches).....	151.560-151.635
Active Length (inches).....	144.00
Weight per Rod (lbs).....	5.37
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0225
Clad Final Conditioning.....	HT, SRA
Fuel-Clad Gap (inches).....	.00325
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	275 - 500
Nitrogen Content of Fill Gas (percent).....	4.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 17 X 17 Std PWR

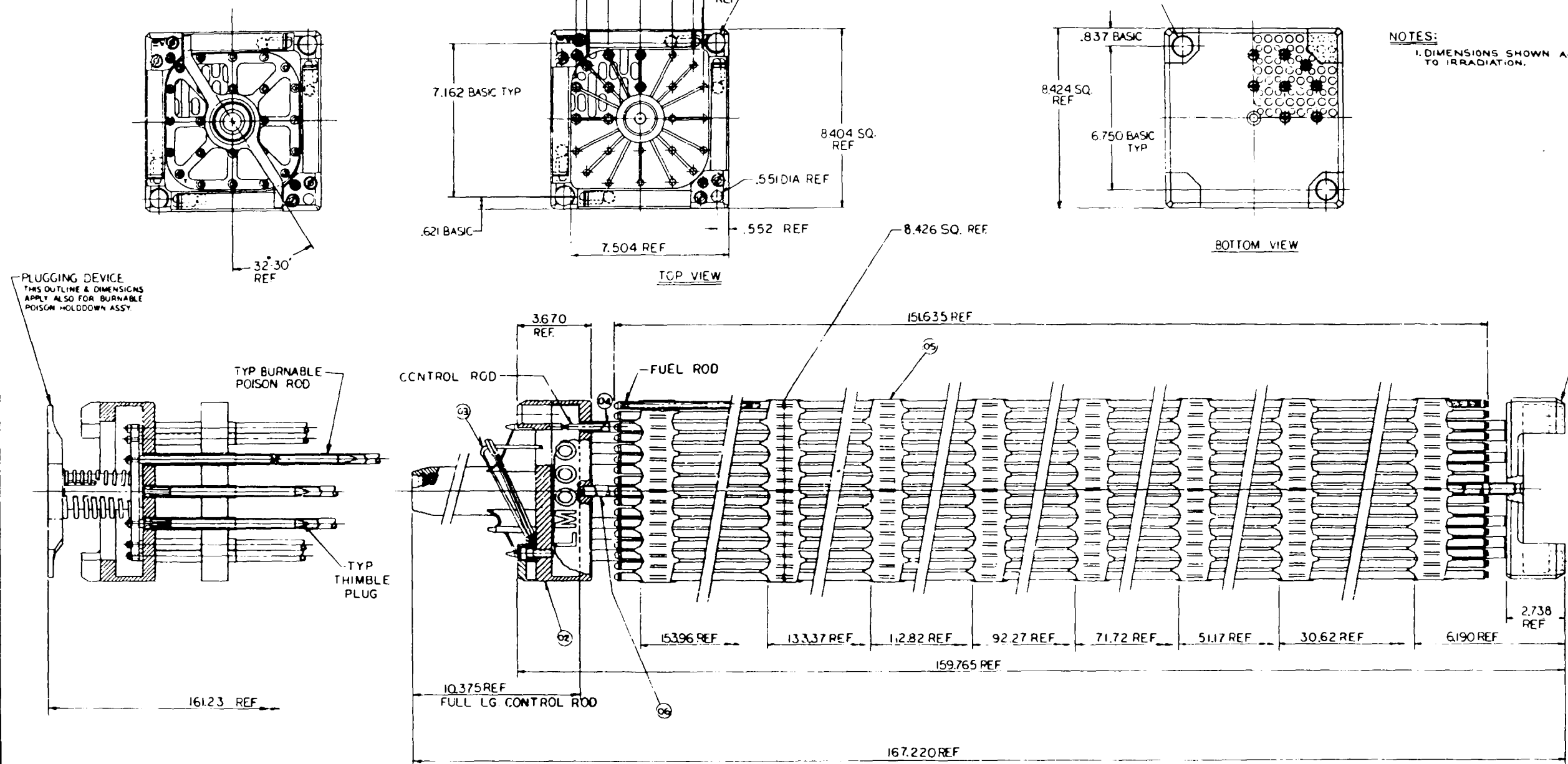
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3225
Fuel Pellet Length (inches).....	0.530
Fuel Pellet Weight per Rod (lbs).....	4.37
Open Porosity (percent).....	0-3
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density(gr/cm ³).....	9.99
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.020-0.037
Plenum Length (inches).....	6.300
Plenum Volume (cubic inches).....	1.05-1.25

Comments:

1465F30

BILL OF MATERIAL			
ITEM NO.	DESCRIPTION	MATERIAL SPECIFICATION	QTY
01	BOTTOM NOZZLE	304 S5T	1
02	TOP NOZZLE	304 S5T	1
03	NOZZLE SPRING SET	INCONEL-718	4
04	GUIDE THIMBLE	ZIRCALOY-4	24
05	GRID ASSEMBLY	INCONEL-718	8
06	INSTRUMENTATION TUBE	ZIRCALOY-4	1



REVISIONS

NO.	DATE	DESCRIPTION
1	10/15/68	ISSUED FOR FABRICATION
2	11/10/68	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
3	12/15/68	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
4	01/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
5	02/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
6	03/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
7	04/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
8	05/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
9	06/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
10	07/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
11	08/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
12	09/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET
13	10/15/69	REVISED TO REFLECT CHANGES TO THE NOZZLE SPRING SET

WESTINGHOUSE Electric Corporation
 17x17 STANDARD FUEL ASSEMBLY OUTLINE
 1465F30
 SCALE: N.T.S.
 DATE: 10/15/68
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 17 X 17 OFA PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1983
Final Year of Manufacture.....	SINP
Total Number Fabricated to Date.....	1417
Assembly Width (inches).....	8.434
Assembly Length (inches).....	159.765
with Control Rod Inserted.....	167.22
including Holddown Device, etc.....	161.57
Rod Pitch (inches).....	0.496
Total Assembly Weight (lbs).....	1373.0
Weight of Heavy Metal (lbs).....	939.00
Metric Tons Initial Heavy Metal (metric tons).....	0.42600
Enrichment Range (% U235).....	1.6-3.8
Average Design Burnup (MWd/MTIHM).....	38000
Maximum Design Burnup (MWd/MTIHM).....	
Linear Heat Rating (KW/foot).....	5.44
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	0-3
for Mechanical Disassembly in Air.....	3
for Underwater Cosolidation.....	0-3
for Underwater Rod Replacement.....	3

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 17 X 17 OFA PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-LOWER	1	0.9250	IN CORE	Inconel-718	1.00000
SPACER-INCORE	5	7.0220	IN CORE	Zircaloy-4	1.00000
GUIDE TUBES	24	9.5300	IN CORE	Zircaloy-4	1.00000
SPACER-PLENUM	1	0.8850	GAS PLENUM	Inconel-718	0.90000
				West. Braze	0.10000
TOP NOZZLE	1	6.8900	TOP	St.Steel 304	1.00000
BOTTOM NOZZLE	1	5.8970	BOTTOM	St.Steel 304	1.00000
HOLDDOWN SPRING	4	0.9600	TOP	Inconel-718	1.00000
B. GRID SLEEVE	1	0.0910	IN CORE	St.Steel 304	1.00000
GRID SLEEVE	1	0.0910	GAS PLENUM	St.Steel 304	1.00000

Drawing Numbers Associated With Assembly:

1465F89

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 17 X 17 OFA PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	289
Typical Number of Fueled Rods per Assembly.....	264
Rod Diameter (inches).....	0.360
Rod Length (inches).....	151.560-151.635
Active Length (inches).....	144.00
Weight per Rod (lbs).....	4.94
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0225
Clad Final Conditioning.....	HT,SRA
Fuel-Clad Gap (inches).....	0.0031
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	275 - 350
Nitrogen Content of Fill Gas (percent).....	4.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 17 X 17 OFA PWR

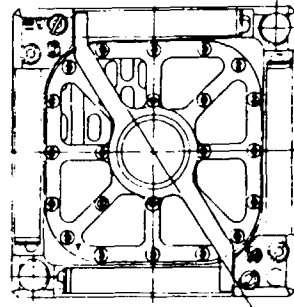
FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	Dished, Chamfered
Fuel Pellet Diameter (inches).....	0.3088
Fuel Pellet Length (inches).....	0.507
Fuel Pellet Weight per Rod (lbs).....	4.01
Open Porosity (percent).....	0-3%
Grain Size (microns).....	8-20
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density(gr/cm3).....	9.99
Spacer Pellet Material.....	N/A
Spacer Pellet Length (inches).....	N/A
Plenum Spring Material.....	St.Steel 302
Plenum Spring Weight per Assembly (lbs).....	0.020-0.030
Plenum Length (inches).....	6.900
Plenum Volume (cubic inches).....	1.05-1.35

Comments:

1465F89

BILL OF MATERIAL			
QTY	DESCRIPTION	MATERIAL SPECIFICATION	UNIT
1	1 BOTTOM NOZZLE	304 SST	1
1	1 TOP NOZZLE	304 SST	1
4	4 NOZZLE SPRING	INCONEL-718	4
24	24 GUIDE THIMBLE	ZIRCALOY-4	24
2	2 GRID ASSEMBLY	INCONEL-718	2
1	1 INSTRUMENTATION TUBE	ZIRCALOY-4	1
6	6 GRID ASSEMBLY	ZIRCALOY-4	6



PLUGGING DEVICE
THIS OUTLINE & DIMENSIONS
APPLY ALSO FOR BURNABLE
PCISCN HOLDDOWN ASST

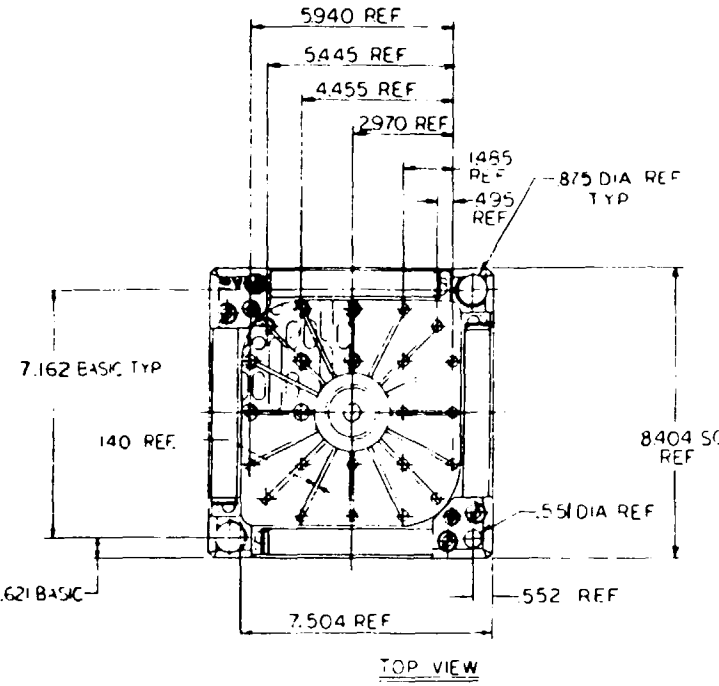
32.30 REF

TYP BURNABLE
PCISCN ROD

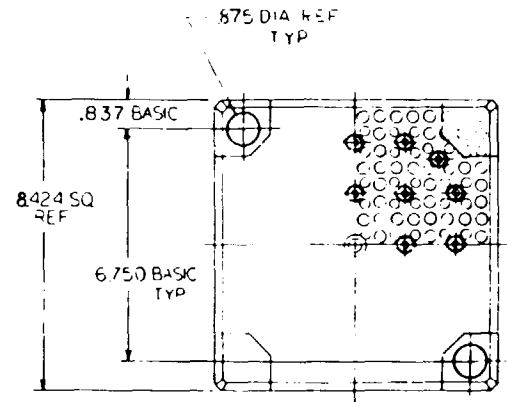
TYP THIMBLE
PLUG

7.942 REF

161.23 REF

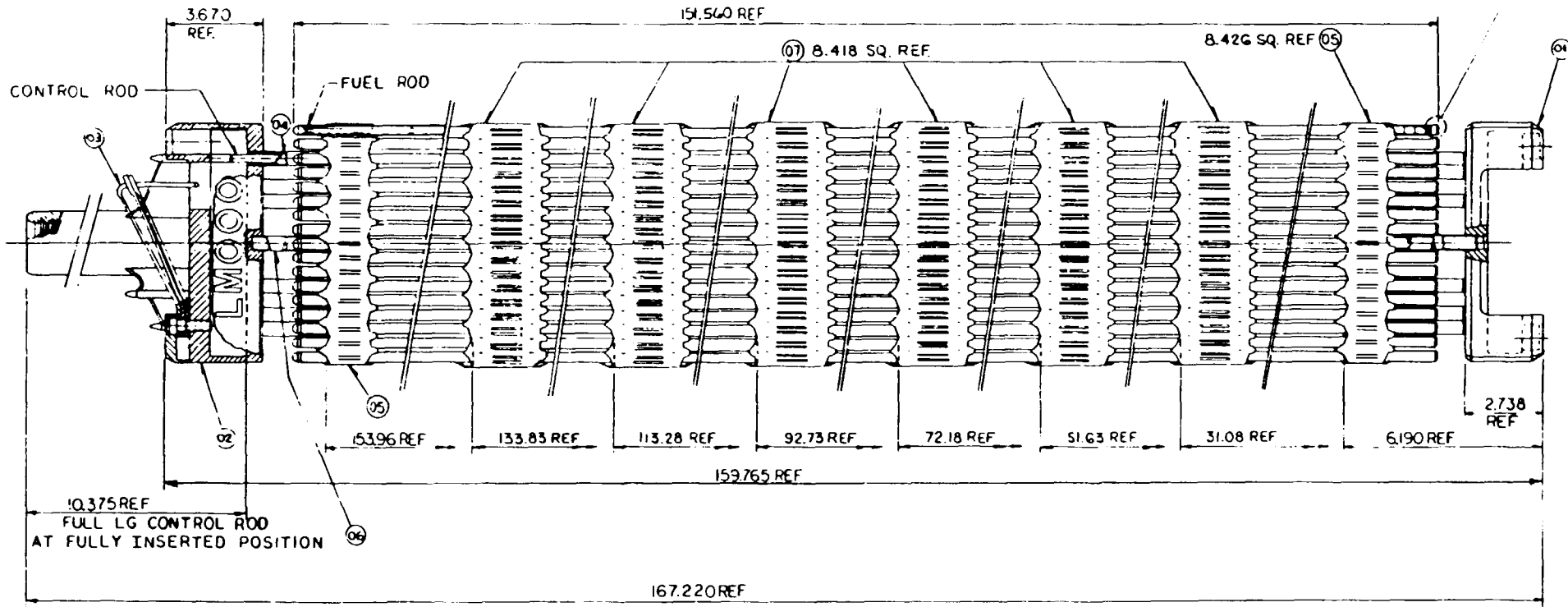


TOP VIEW



BOTTOM VIEW

NOTES:
1. DIMENSIONS SHOWN ARE PRIOR
TO IRRADIATION.



ESTIMATED WEIGHT OF
FUEL ASSEMBLY:

Westinghouse Electric Corporation
17217 OPTIMIZED
FUEL ASSEMBLY OUTLINE

1465F89

DATE: 12/20/00
BY: 9132/JS

13 12 11 10 9 8 7 6 5 4 3 2 1

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 17 X 17 Vant 5 PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....	1987
Final Year of Manufacture.....	
Total Number Fabricated to Date.....	0
Assembly Width (inches).....	8.426
Assembly Length (inches).....	160.1
with Control Rod Inserted.....	
including Holddown Device, etc.....	
Rod Pitch (inches).....	0.496
Total Assembly Weight (lbs).....	1365.0
Weight of Heavy Metal (lbs).....	932.61
Metric Tons Initial Heavy Metal (metric tons).....	0.42302
Enrichment Range (% U235).....	
Average Design Burnup (MWd/MTIHM).....	
Maximum Design Burnup (MWd/MTIHM).....	
Linear Heat Rating (KW/foot).....	
Difficulty Indexes (0-not required, 1-simple,...,6-impossible)	
for Cutting.....	
for Mechanical Disassembly in Air.....	X
for Underwater Cosolidation.....	
for Underwater Rod Replacement.....	X

Comments:

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 17 X 17 Vant 5 PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
SPACER-LOWER	1	0.0000	IN CORE	Inconel-718	1.00000
SPACER-INCORE	6	0.0000	IN CORE	Zircaloy-4	1.00000
INT. FLOW MIXER	3	0.0000	IN CORE	Zircaloy-4	1.00000
GUIDE TUBES	24	0.0000	IN CORE	Zircaloy-4	1.00000
INSTRUMENT TUBE	1	0.0000	IN CORE	Zircaloy-4	1.00000
TOP NOZZLE	1	0.0000	TOP	St.Steel	1.00000
BOTTOM NOZZLE	1	0.0000	BOTTOM	St.Steel	1.00000
HOLDDOWN SPRING	4	0.0000	TOP	Inconel	1.00000
SPACER-PLENUM	1	0.0000	GAS PLENUM	Inconel	1.00000

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 17 X 17 Vant 5 PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	289
Typical Number of Fueled Rods per Assembly.....	264
Rod Diameter (inches).....	0.36
Rod Length (inches).....	152.3
Active Length (inches).....	144
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0225
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	0.00325
Fill Gas Used.....	He
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	0.0

PHYSICAL DESCRIPTION REPORT

PAGE: 4

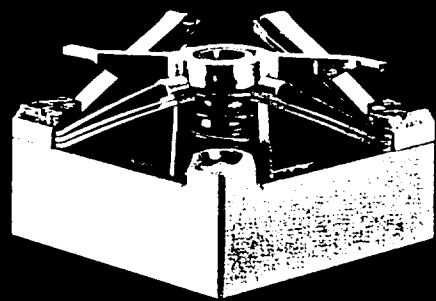
Westinghouse 17 X 17 Vant 5 PWR

FUEL ROD DESCRIPTION TABLE continued

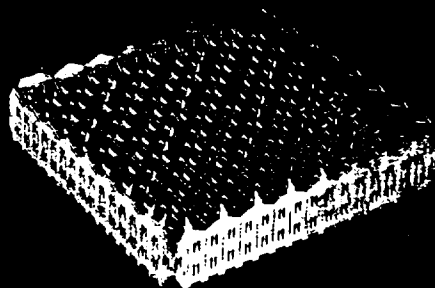
Fuel Pellet Material.....	Uranium Oxide
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.3088
Fuel Pellet Length (inches).....	0.51
Fuel Pellet Weight per Rod (lbs).....	4.01
Open Porosity (percent).....	
Grain Size (microns).....	
Fuel Density (% theoretical).....	95
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	
Plenum Spring Weight per Assembly (lbs).....	
Plenum Length (inches).....	7.405
Plenum Volume (cubic inches).....	0.577

Comments:

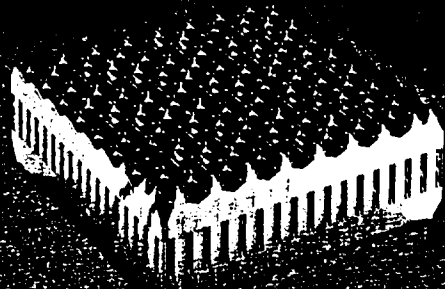
Plenum length is taken from working length of plenum spring.



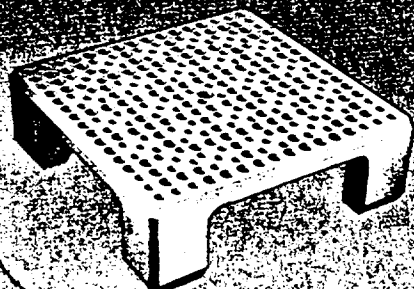
Top Nozzle



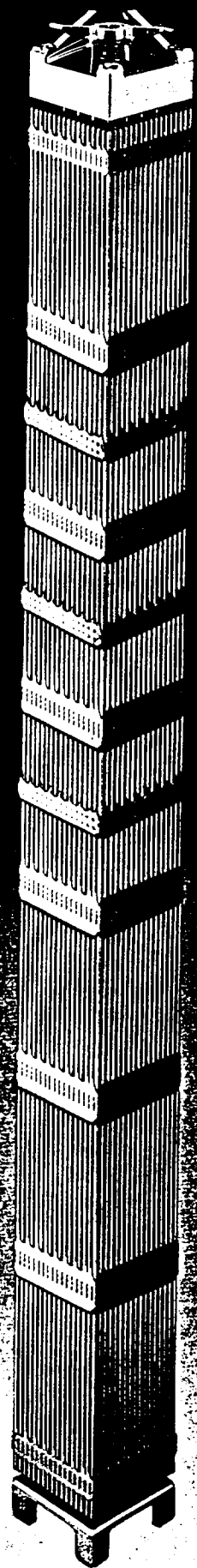
Intermediate Flow Mixer



Zircaloy Grid



Bottom Nozzle



Source:
Westinghouse
Electric Co.
Information
Brochure

PHYSICAL DESCRIPTION REPORT

PAGE: 1

Westinghouse 17 X 17 XLR PWR
OVERALL ASSEMBLY CHARACTERISTICS

Initial Year of Manufacture.....
Final Year of Manufacture.....
Total Number Fabricated to Date.....

Assembly Width (inches)..... 8.43
Assembly Length (inches)..... 199
 with Control Rod Inserted.....
 including Holddown Device, etc.....
Rod Pitch (inches)..... 0.496

Total Assembly Weight (lbs).....
Weight of Heavy Metal (lbs).....
Metric Tons Initial Heavy Metal (metric tons).....
Enrichment Range (% U235).....

Average Design Burnup (MWd/MTIHM).....
Maximum Design Burnup (MWd/MTIHM).....
Linear Heat Rating (KW/foot).....

Difficulty Indexes (0-not required, 1-simple,...,6-impossible)
 for Cutting.....
 for Mechanical Disassembly in Air.....
 for Underwater Cosolidation.....
 for Underwater Rod Replacement.....

Comments:

This assembly type manufactured for South Texas Plant 1 & 2 only.

2A-362

PHYSICAL DESCRIPTION REPORT

PAGE: 2

Westinghouse 17 X 17 XLR PWR

FUEL ASSEMBLY HARDWARE PARTS AND MATERIALS

Part Name	Parts/ Assembly	Weight(kg)/ Assembly	Zone	Material Name	Material Fraction
-----------	--------------------	-------------------------	------	------------------	----------------------

Drawing Numbers Associated With Assembly:

PHYSICAL DESCRIPTION REPORT

PAGE: 3

Westinghouse 17 X 17 XLR PWR

FUEL ROD DESCRIPTION TABLE

Type of Rod.....	Fuel Rod
Fuel Rod Positions per Assembly.....	289
Typical Number of Fueled Rods per Assembly.....	
Rod Diameter (inches).....	0.374
Rod Length (inches).....	176.642
Active Length (inches).....	
Weight per Rod (lbs).....	
Clad Material.....	Zircaloy-4
Clad Thickness (inches).....	0.0225
Clad Final Conditioning.....	
Fuel-Clad Gap (inches).....	0.0035
Fill Gas Used.....	
Initial Gas Pressure (psig).....	
Nitrogen Content of Fill Gas (percent).....	0.0

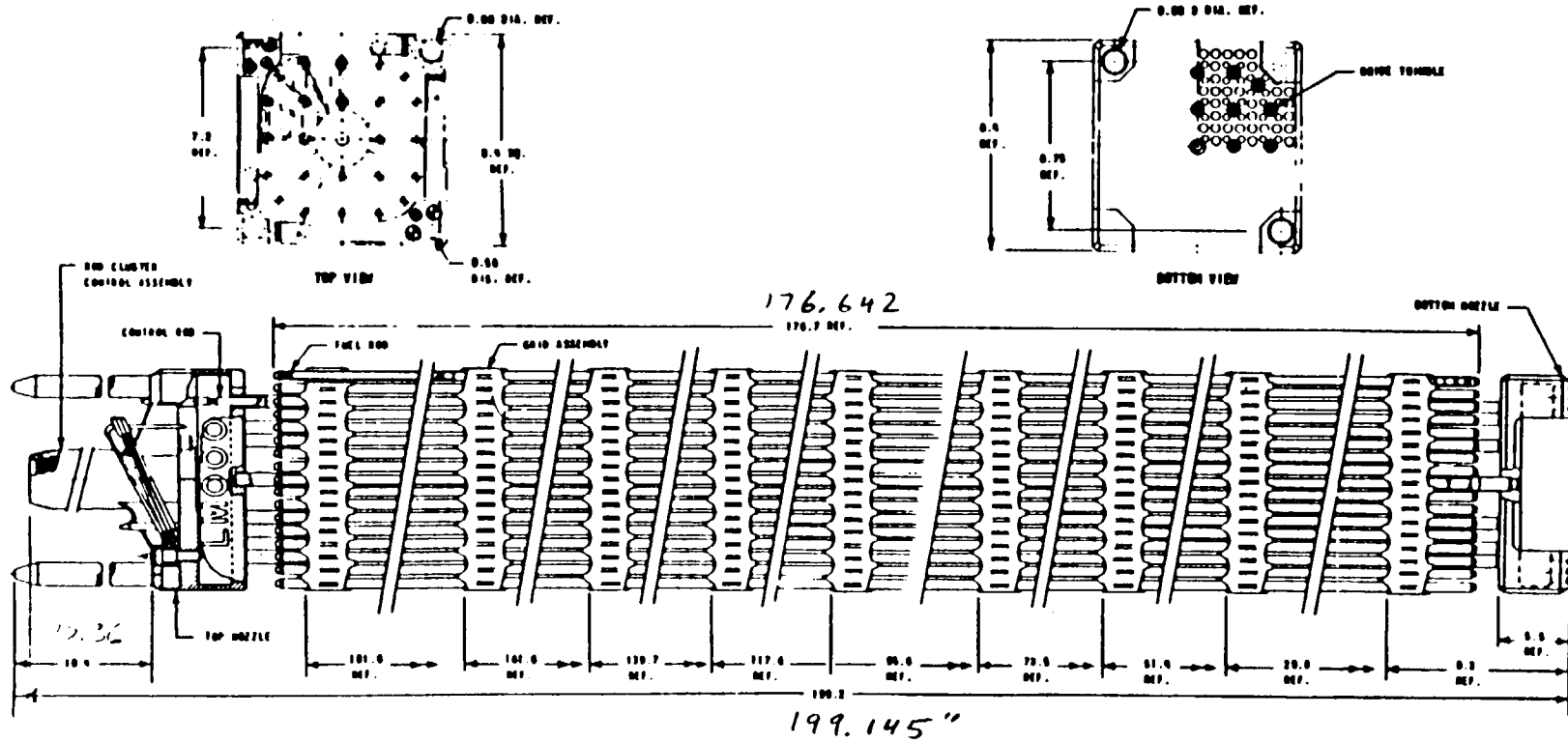
PHYSICAL DESCRIPTION REPORT

PAGE: 4

Westinghouse 17 X 17 XLR PWR

FUEL ROD DESCRIPTION TABLE continued

Fuel Pellet Material.....	
Fuel Pellet Shape.....	
Fuel Pellet Diameter (inches).....	0.322
Fuel Pellet Length (inches).....	
Fuel Pellet Weight per Rod (lbs).....	
Open Porosity (percent).....	
Grain Size (microns).....	
Fuel Density (% theoretical).....	
O/U Ratio.....	
Smear Density.....	
Spacer Pellet Material.....	
Spacer Pellet Length (inches).....	
Plenum Spring Material.....	
Plenum Spring Weight per Assembly (lbs).....	
Plenum Length (inches).....	
Plenum Volume (cubic inches).....	
Comments:	



199.145"

LENGTH WITH CRD W/O GUIDEPINS 195.715"

**SOUTH TEXAS PROJECT
UNITS 1 & 2**

Fuel Assembly Outline 17 x 17
(Conceptual)
Figure 4.2.2. 14 FT XTR