

Attachment II to JPN-94-060

Atrium 10A Fuel Bundle Design Description Report  
for

New York Power Authority

James A. FitzPatrick Nuclear Power Plant

Reload 11/Cycle 12

(Non-Proprietary Version)

## James A. Fitzpatrick ATRIUM-10A Design Description

The ATRIUM-10A fuel assembly consists of a lower tie plate and upper tie plate, 91 fuel rods, spacer grids, a central water channel, and miscellaneous assembly hardware. The structural members of the fuel assembly include the tie plates, spacer grids, water channel and connecting hardware. The ATRIUM-10A has a 10x10 fuel rod array with a total of 91 fuel rods. A central, square water channel occupies the equivalent of nine fuel rod positions in the array.

The fuel rods are fabricated with cladding which has an internal zirconium liner. of the 91 fuel rods are part-length fuel rods which have a length of approximately of a full-length rod. The spacer grids are of the ULTRAFLOW™\* configuration.

Table 1 summarizes the features of the fuel assembly. Figure 1 shows the fuel assembly design features. Figure 2 presents the axial zoning scheme for the assembly U235 enrichment and Figures 3, 4, 5 and 6 show the individual pin enrichments for each nuclear lattice type.

All of the design features of the James A. FitzPatrick ATRIUM-10A LFAs have been under irradiation on reload or lead assemblies at other reactors.

There are three design features on the James A. FitzPatrick LFAs which have not previously appeared on SFC fuel assemblies irradiated in the U.S.; these are:

- 10x10 fuel rod lattice configuration
- Partial length fuel rods
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10x10 fuel rod lattice configuration: The ATRIUM-10A has a 10x10 fuel rod array with a total of 91 fuel rods. A central, square water channel occupies the equivalent of nine fuel rod positions in the array. The 10x10 array allows for operation at lower average linear heat generation rates, and thus results in less fission gas release, as compared to 8x8 and 9x9 lattice arrays.

Partial length fuel rods: of the 91 fuel rods are part-length fuel rods which have a length of approximately of a full-length rod. The partial length rods reduce the total and two-phase pressure drop in the ATRIUM-10A assembly, thus improving the stability performance.

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\*ULTRAFLOW is a trademark of Siemens.

Table 1

## Fuel Assembly Characteristics

<u>Characteristic</u>	<u>Material</u>	<u>Value</u>
Fuel Assembly		
Array		
Number of fuel rods		
Full-length rods		
Part-length rods		
Number of inert rods		
Overall length, inches (mm)		
Number of spacers		
Fuel rod pitch, inch (mm)		
Fuel rod to fuel rod spacing, inch (mm)		
Spacer Grid		
Envelope, inch (mm)		
Height, inch (mm)		
Water Channel		
Outside dimension, inch (mm)		
Channel wall thickness, inch (mm)		
Channel length, inch (mm)		
Lower Tie Plate		
Envelope, inch (mm)		
Height, inch (mm)		
Seal spring thickness, inch (mm)		
Upper Tie Plate		
Envelope, inch (mm)		
Height, inch (mm)		
Upper Tie Plate Locking Hardware		
Bayonet bolt		

Table 1

## Fuel Assembly Characteristics (Continued)

<u>Characteristic</u>	<u>Material</u>	<u>Value</u>
Fuel Rod Cladding		
Cladding outside diameter, inch (mm)		
Cladding inside diameter, inch (mm)		
Overall length (from lower tie plate), inch (mm)		
Full-length rod		
Part-length rod		
Fuel column		
Pellet outside diameter, inch (mm)		
Active length, inch (mm)		
Full-length rod		
Part-length rod		
Lower natural enrichment length, inch (mm)		
Full-length rod		
Part-length rod		
Upper natural enrichment length, inch (mm)		
Full-length rod		
Part-length rod		
Percent theoretical density		
Fill gas pressure, psia (kPa)		
Plenum spring		
Fuel Channel		
Inside dimension, inch (mm)		
Wall thickness (variable), inch (mm)		
Corners		
Mid-wall at bottom		
Mid-wall at top		
Inside corner radius, inch (mm)		
Overall length, inch (mm)		

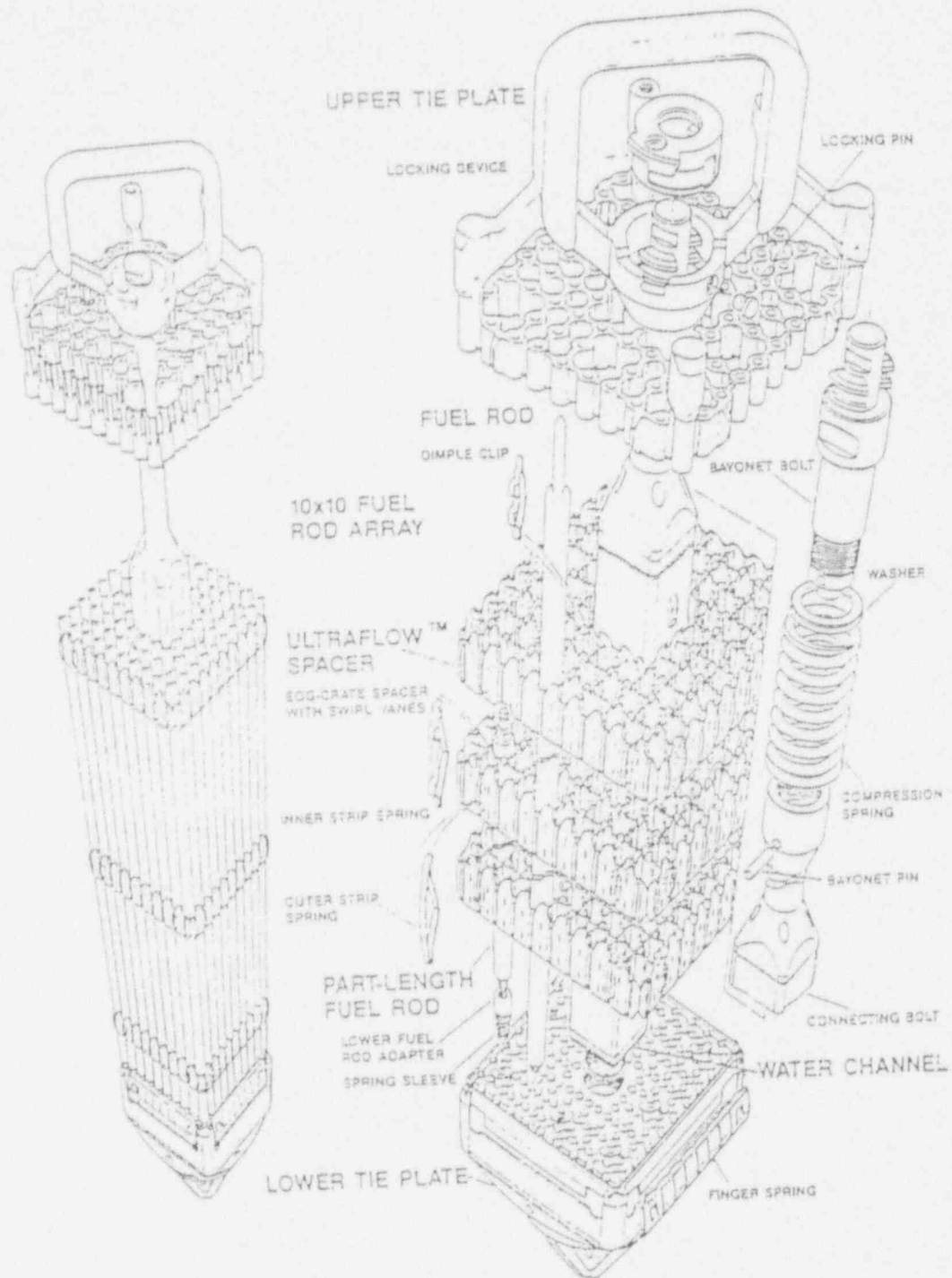


Figure 1  
ATRIUM™ 10A Fuel Assembly for Boiling Water Reactors



Figure 3

James A. FitzPatrick ATRIUM-10A BOT Lattice Enrichment Distribution

Figure 4

James A. FitzPatrick ATRIUM-10A DOM Lattice Enrichment Distribution



Figure 5

James A. FitzPatrick ATRIUM-10A SDM Lattice Enrichment Distribution

Figure 6

James A. FitzPatrick ATRIUM-10A TOP Lattice Enrichment Distribution