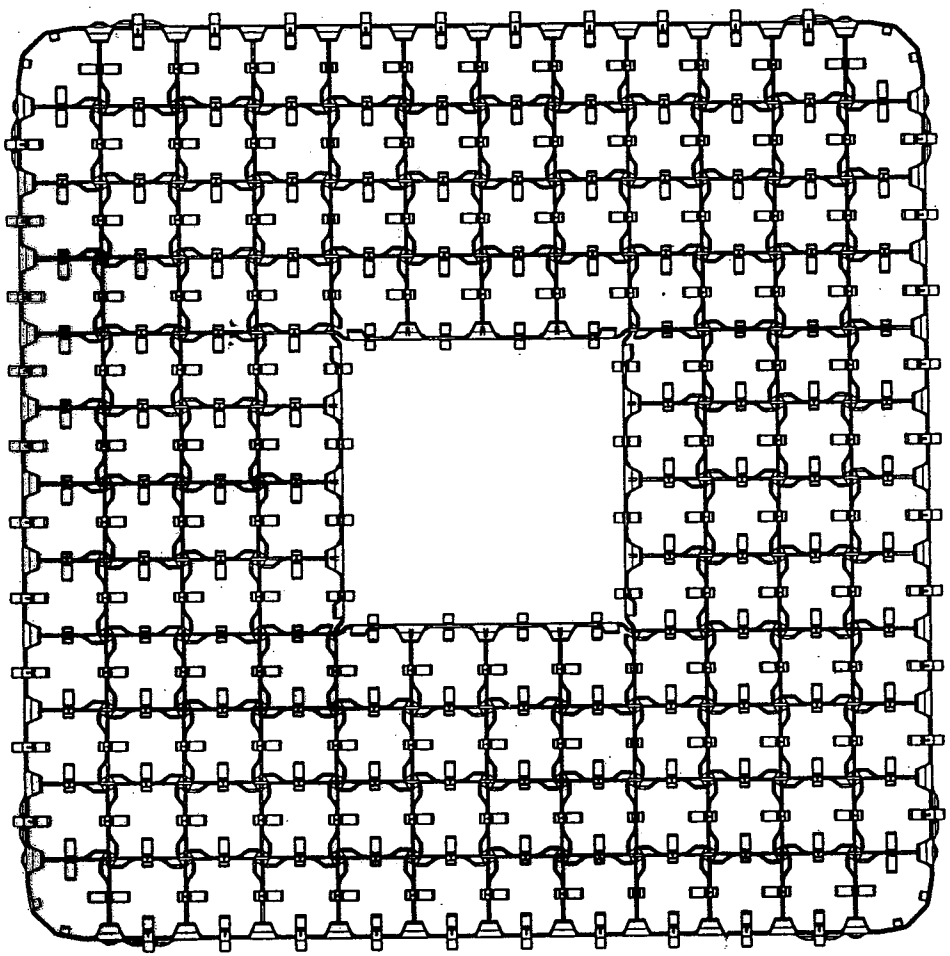
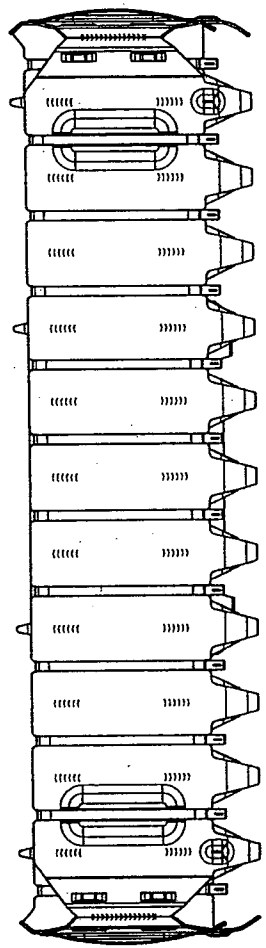
FRAMATOME ANP

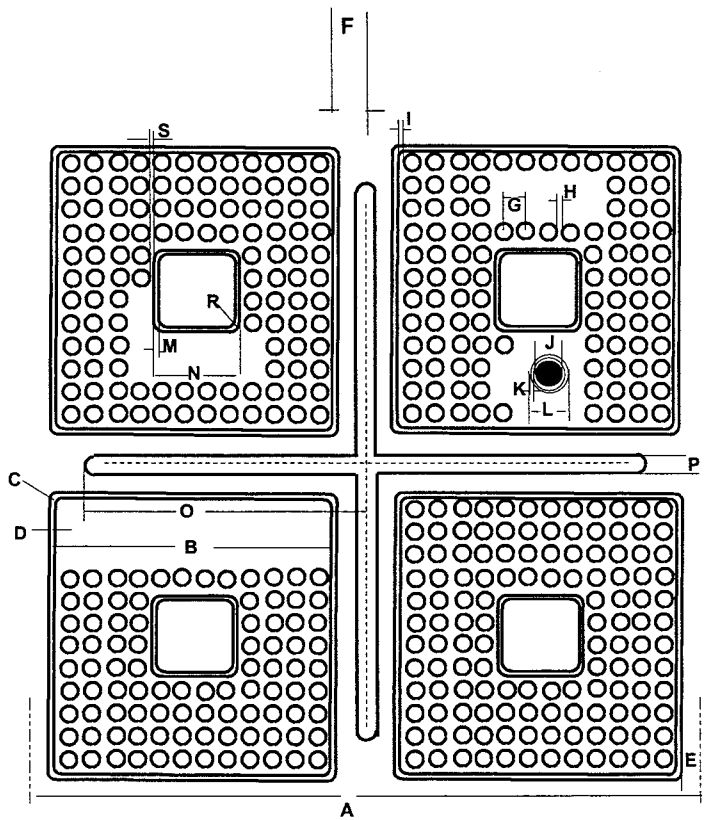
Preliminary Thermal Hydraulic Test Program for SWR 1000 ATRIUM 12 Fuel Assembly

Spacer of ATRIUM 12 Fuel Assembly

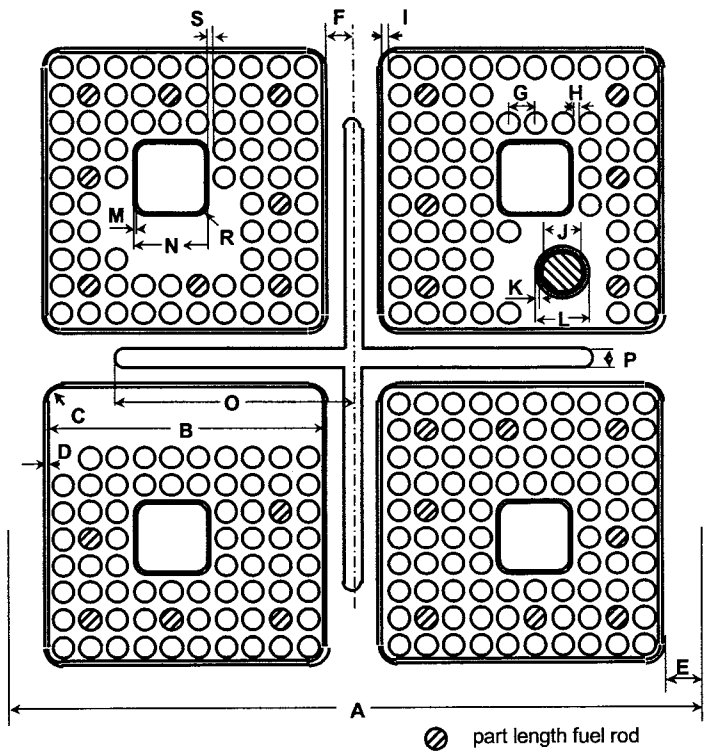




Core Cell Geometry of SWR-1000 Compared to Conventional BWR



SWR 1000



Conventional BWR

Core Cell Geometry of SWR-1000 Compared to Conventional BWR

> *Fuel rod diameter, cladding thickness, pellet diameter, fuel rod pitch*	*equal*
> *Fuel channel side length*	*+ 16%*
> *„Central" water channel*	*4x4 compared to 3x3 ;*
> *Control rod pitch*	*+ 19%*
> *Control rod span*	*+20%*

SWR 1000 ATRIUM 12 Fuel Assembly

Preliminary Thermal Hydraulic Design

> *Pressure Drop Performance*

- Loss Coefficients derived from ATRIUM 10A/B Loss Coefficients

> *Critical Power Performance*

-Modification of XL10A1 (Critical Power Correlation of ATRIUM 10A/B) due to expected Critical Power of ATRIUM 12 determined by Subchannel Analysis (RINGS)

> *Determination of Additive Constants*

Verification by KATHY Loop Measurements

ATRIUM 12 Fuel Assembly Test Bundle

> *Original ATRIUM 12 FA geometry for critical power and pressure drop tests*

- *same rod diameter*
- *same rod pitch*
- *same water channel geometry*
- *same inner width of FA-Channel*
- *same spacer and spacer pitch*

Axial power distribution for pelimanary tests: *chopped cosine*

ATRIUM 12 Fuel Assembly Test Program

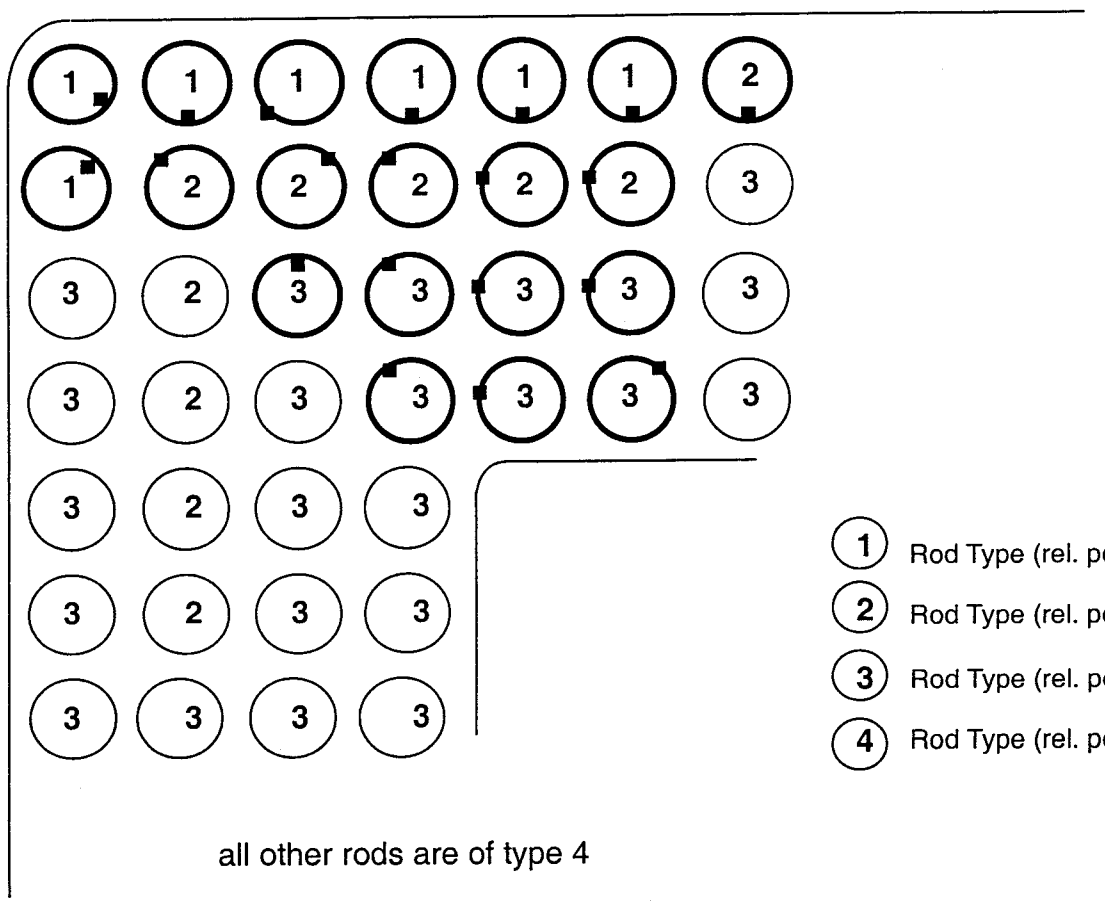
> **Critical Power Measurement as a Function of**

- *Fuel Assembly Flow (according to power flow map)*
- *Core inlet subcooling*
- *Pressure*
- *Radial Power Distribution (4 Peaking Patterns for preliminary tests)*

> **Measurement of Pressure Drop (single and two phase) as a Function of**

- *Fuel Assembly Flow*
- *Bundle Power*

Peaking Pattern STS-85.1 with Cosine Shaped Axial Power Profile



all other rods are of type 4

1 Rod Type (rel. power 1.2)

2 Rod Type (rel. power 1.1)

3 Rod Type (rel. power 1.0)

4 Rod Type (rel. power 0.9))

SWR 1000 ATRIUM 12 Fuel Assembly

Determination of Thermal Hydraulic Performance

> ***Critical Power***

> *Establish preliminary critical power correlation (XL-Type) based on test results*

> *Derive K-Factors (R-Factors) for critical power correlation*

> *Determine additive constants*

> ***Pressure Drop***

> *Determine spacer loss coefficient based on test results*