

A study on the effect of PWR debris-filtering devices on filtering efficiency

493

3 Solidworks

가

가

가

A

가

B

90%

, B

A

, B

가 가

가 가

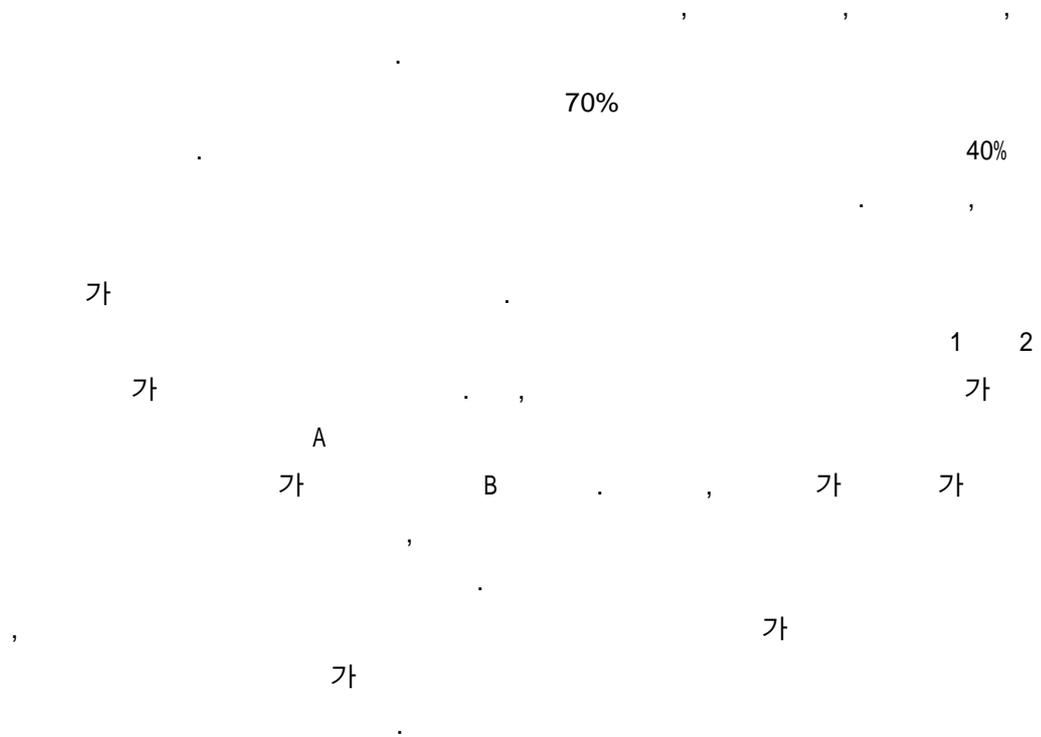
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Abstract

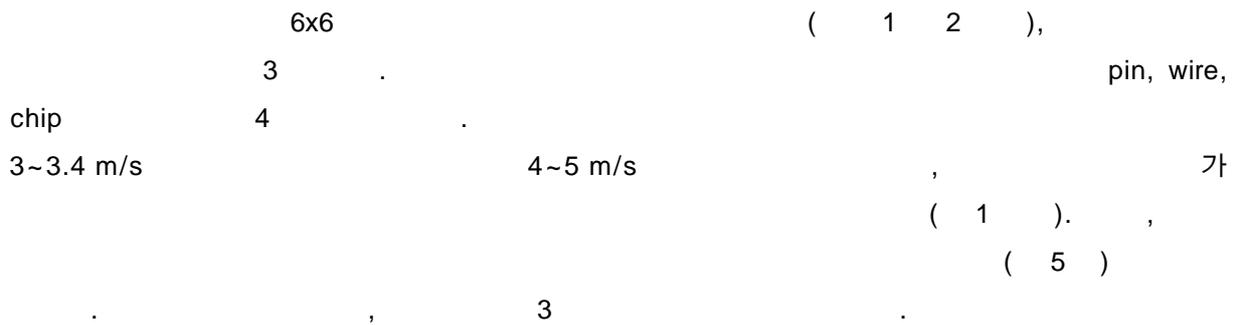
The debris-filtering efficiency tests for debris-filtering devices used in the domestic PWRs, which are located at the bottom of PWR fuel assembly, were performed. The effect of debris flow paths on the debris-filtering efficiency were evaluated with the use of the 3-D Solidworks code model and the debris-filtering efficiency test results. Based on the debris-filtering efficiency and fabrication cost of the debris-filtering devices, a development guideline for an optimized debris-filtering device is proposed. In this study, two types of debris-filtering device were taken into account. The first type (A type) has a short debris-filtering grid closely attached to a small-hole bottom nozzle, while the second type (B type) a tall debris-filtering and rod-supporting grid located above a large-hole bottom nozzle. According to the debris-filtering tests results, both types of debris-filtering devices showed debris-filtering efficiency of greater than 90%. However, the type B generated better filtering efficiency especially for wire-type debris since its flow channels between a fuel rod and a grid cell is narrower and its debris-filtering dimple size is longer than those of the type A. In addition, the fuel fabrication cost for the type B is

evaluated to be relatively low because the fabrication cost of the large-hole bottom nozzle is relatively cheap and the lowest bottom grid is not necessary as well.

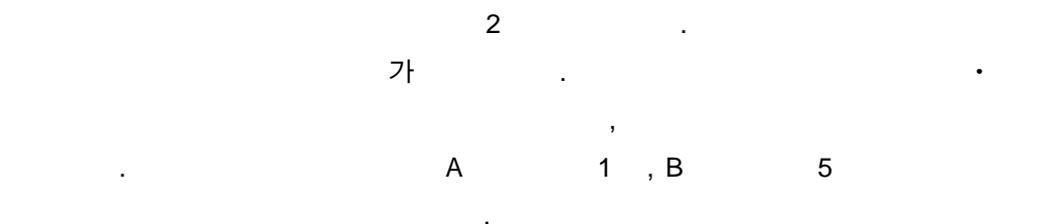
1.



2.



3.



A B 91% 96% A
 B
 , A B 가 , 1
 B / / 3
 4

4. 3 가

3 Solidworks
 (6), 3 7 8
 가 가

4.1

■ wire pin 가 , 가 가
 가
 ■ , 가

4.2

■ , /
 (9, 10). , /
 가
 8 , /
 B A 가 A
 ■ , 가 가
 9 A , 가

가 B
 (11).

5. 가

A B
A 가
B , B 가 가 가
, B A
가 .

6.

가 3
가 ,
B 가 , A 가
가 .

1.

		(m ³ /hr)	(m/sec)	
A	18 90	29	3.0	5
B	18 90	27	3.4	5

2.

	A (3)			
	Level1	Level2	Level3	Level4
Long wire 5 EA	15	0	0	0
Middle wire 5 EA	8	2	4	0
Short wire 5 EA	8	7	0	0
Long twist wire 5 EA	12	1	2	0
Middle twist wire 5 EA	11	4	0	0
Short twist wire 5 EA	4	7	4	0
Thick pin 5 EA	14	0	1	0
Mid pin 5 EA	10	2	3	0
Thin pin 5 EA	10	4	1	0
Large lathe chip 5 EA	15	0	0	0
Middle lathe chip 5 EA	11	4	0	0
Small lathe chip 5 EA	5	9	1	0
Large lathe coil chip 5 EA	15	0	0	0
Middle lathe coil chip 5 EA	3	11	1	0
Small lathe coil chip 5 EA	3	11	1	0
Long lathe coil chip 5 EA	14	1	0	0
Middle lathe coil chip 5 EA	2	10	3	0
Short lathe coil chip 5 EA	0	13	2	0
(270 EA)	160	86	23	0
(/ *100%)	59%	32%	9%	0%
(A B)	91%			

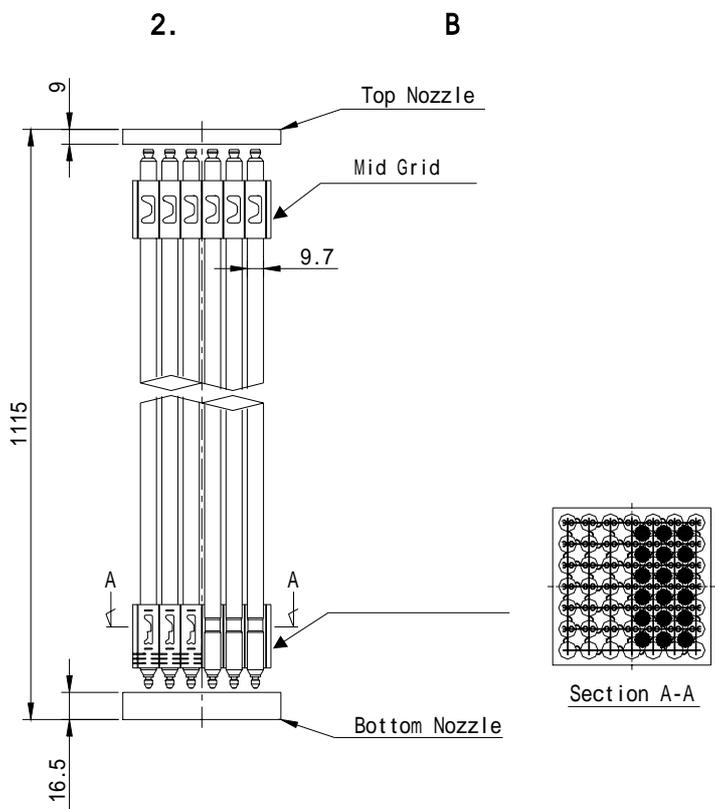
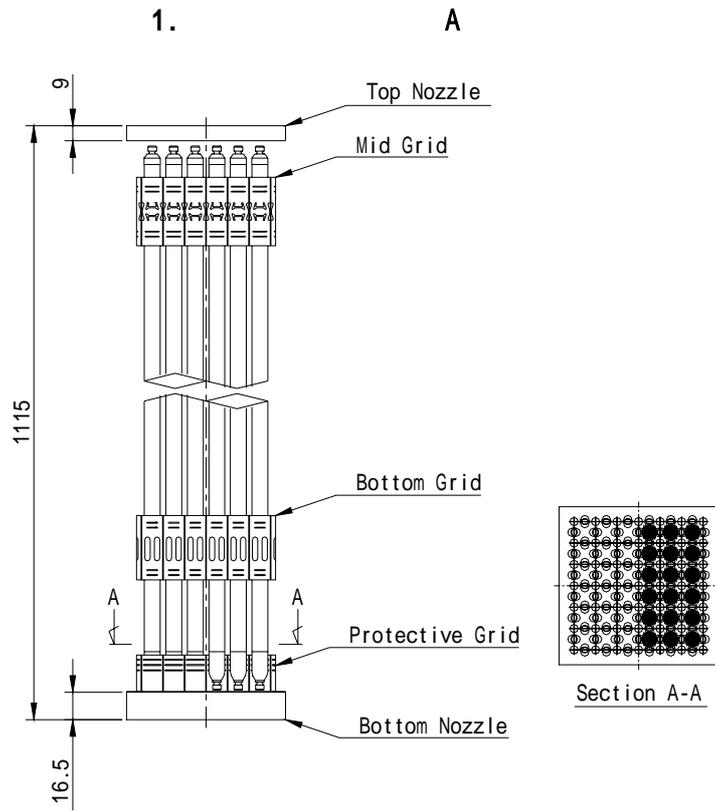
	B (3)			
	Level1	Level2	Level3	Level4
Long wire 5 EA	9	5	1	0
Middle wire 5 EA	4	9	2	0
Short wire 5 EA	1	13	0	0
Long twist wire 5 EA	9	6	0	0
Middle twist wire 5 EA	4	11	0	0
Short twist wire 5 EA	1	14	0	0
Thick pin 5 EA	8	7	0	0
Mid pin 5 EA	7	7	1	0
Thin pin 5 EA	5	10	0	0
Large lathe chip 5 EA	1	14	0	0
Middle lathe chip 5 EA	3	12	0	0
Small lathe chip 5 EA	1	13	0	0
Large lathe coil chip 5 EA	5	10	0	0
Middle lathe coil chip 5 EA	5	9	0	0
Small lathe coil chip 5 EA	1	11	0	0
Long lathe coil chip 5 EA	4	11	0	0
Middle lathe coil chip 5 EA	0	15	0	0
Short lathe coil chip 5 EA	3	12	0	0
(270 EA)	71	189	4	0
(/ *100%)	26%	70%	1%	0%
(A B)	96%			

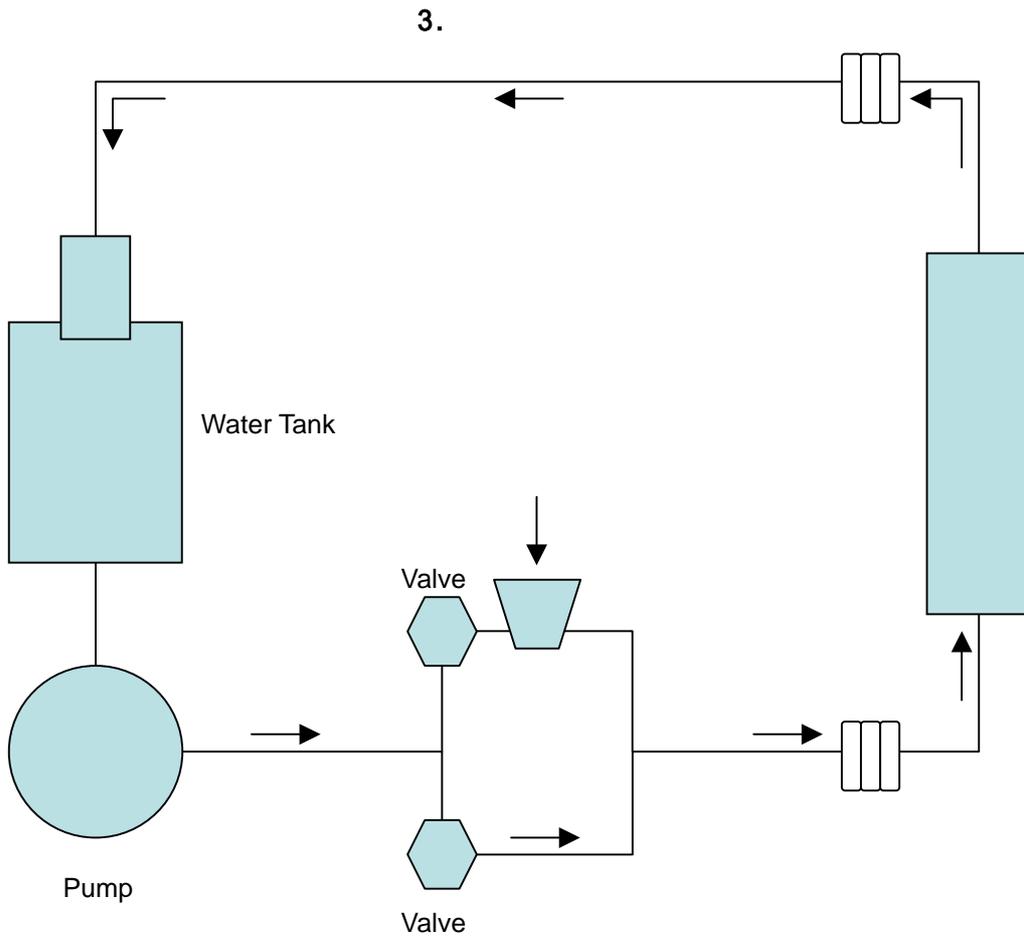
) Level1 :

Level2 :

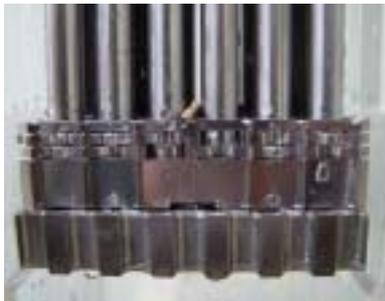
Level3 :

Level4 : Level3 ()





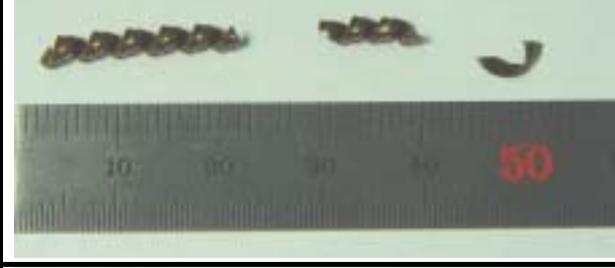
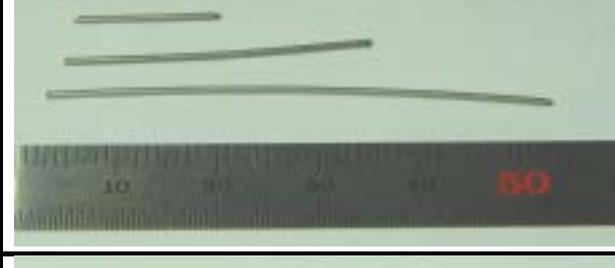
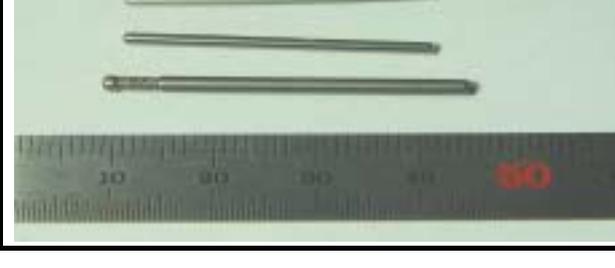
A



B

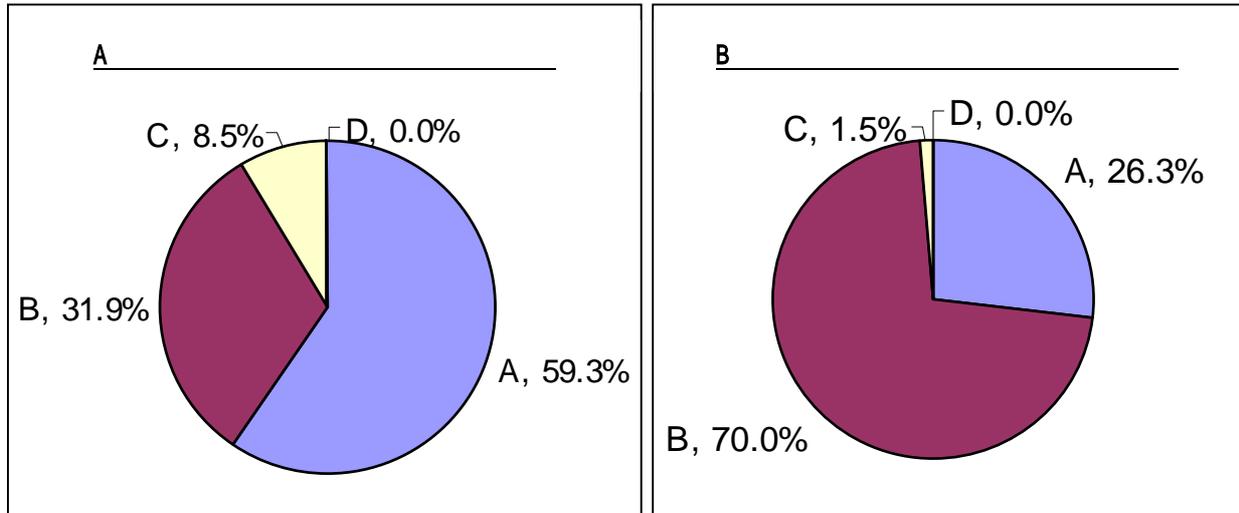


4.

	(: mm)	
	Large Lathe chip	7.5x15x3
	Mid Lathe chip	7x8x3
	Small Lathe chip	2.5x5x2
	Large Lathe coil chip	Ø8x15
	Mid Lathe coil chip	Ø3.8x15
	Small Lathe coil chip	Ø1.9x15
	Long Lathe coil chip	Ø3.5x18
	Middle Lathe coil chip	Ø3.5x10
	Short Lathe coil chip	Ø3.5x5
	Short twist wire	Ø1.7x15
	Middle twist wire	Ø1.7x26
	Long twist wire	Ø1.7x58
	Short wire	Ø1.3x15
	Middle wire	Ø1.3x28
	Long wire	Ø1.3x50
	Thin pin	Ø1.3x30
	Mid pin	Ø2.0x32
	Thick pin	Ø2.6x36

5. A B

(3)



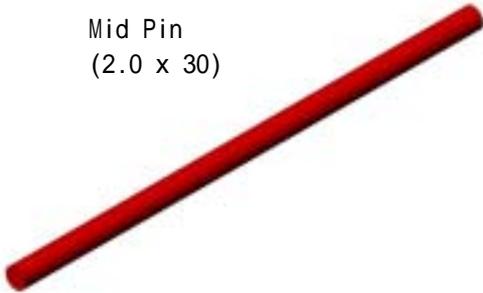
) A : , B : , C : , D :

6.

3

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Mid Pin
(2.0 x 30)



Short Twist Wire
(1.7 x 15)



Thick Pin
(2.6 x 30)



Small Lathe Coil Chip
(3.5 x 5)

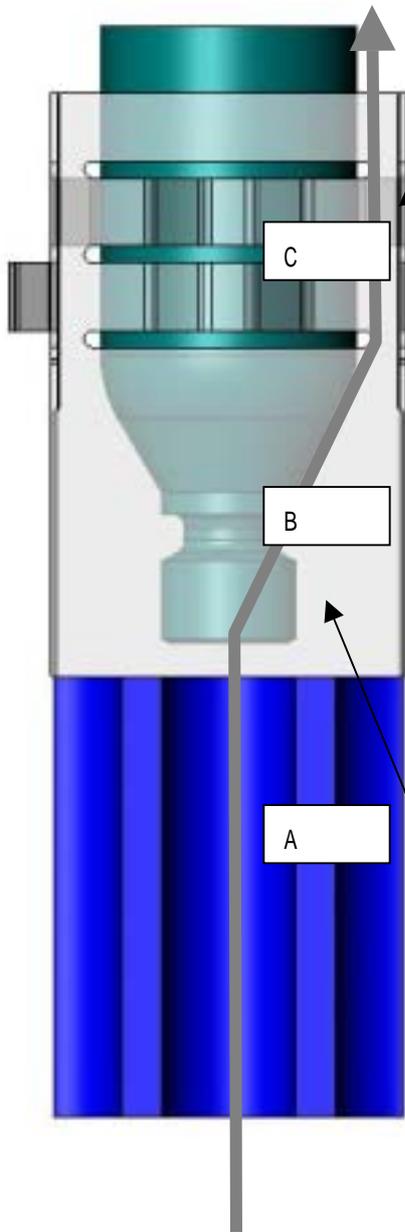


Mid Lathe Coil Chip
(3.5 x 15)

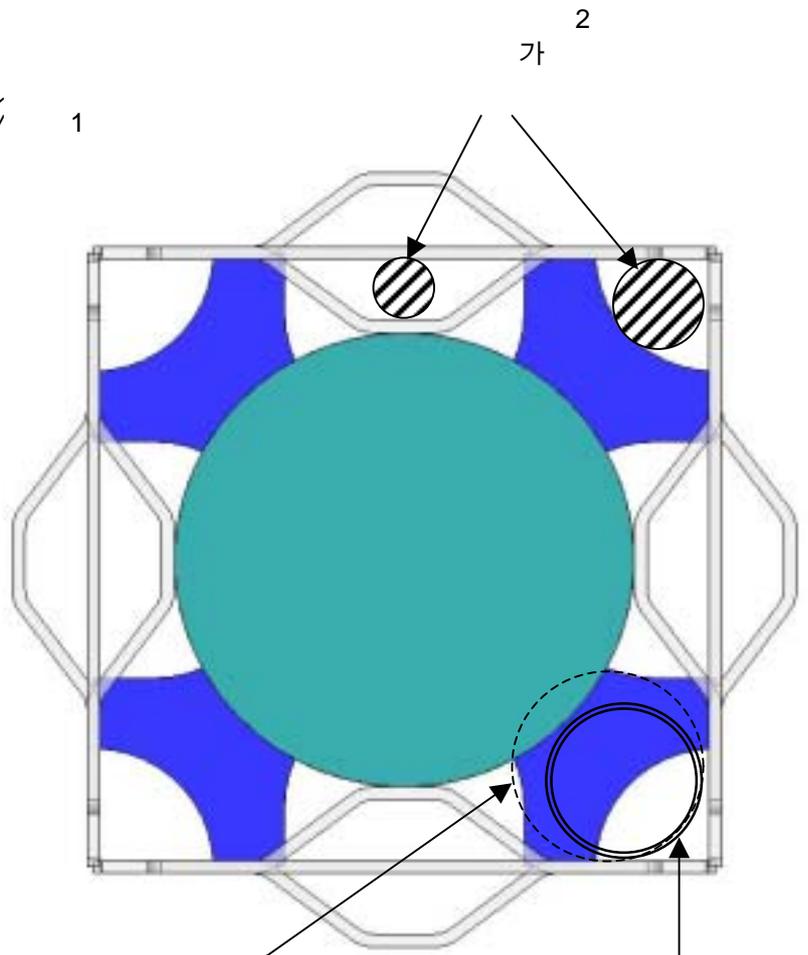


7. A

3



가
C

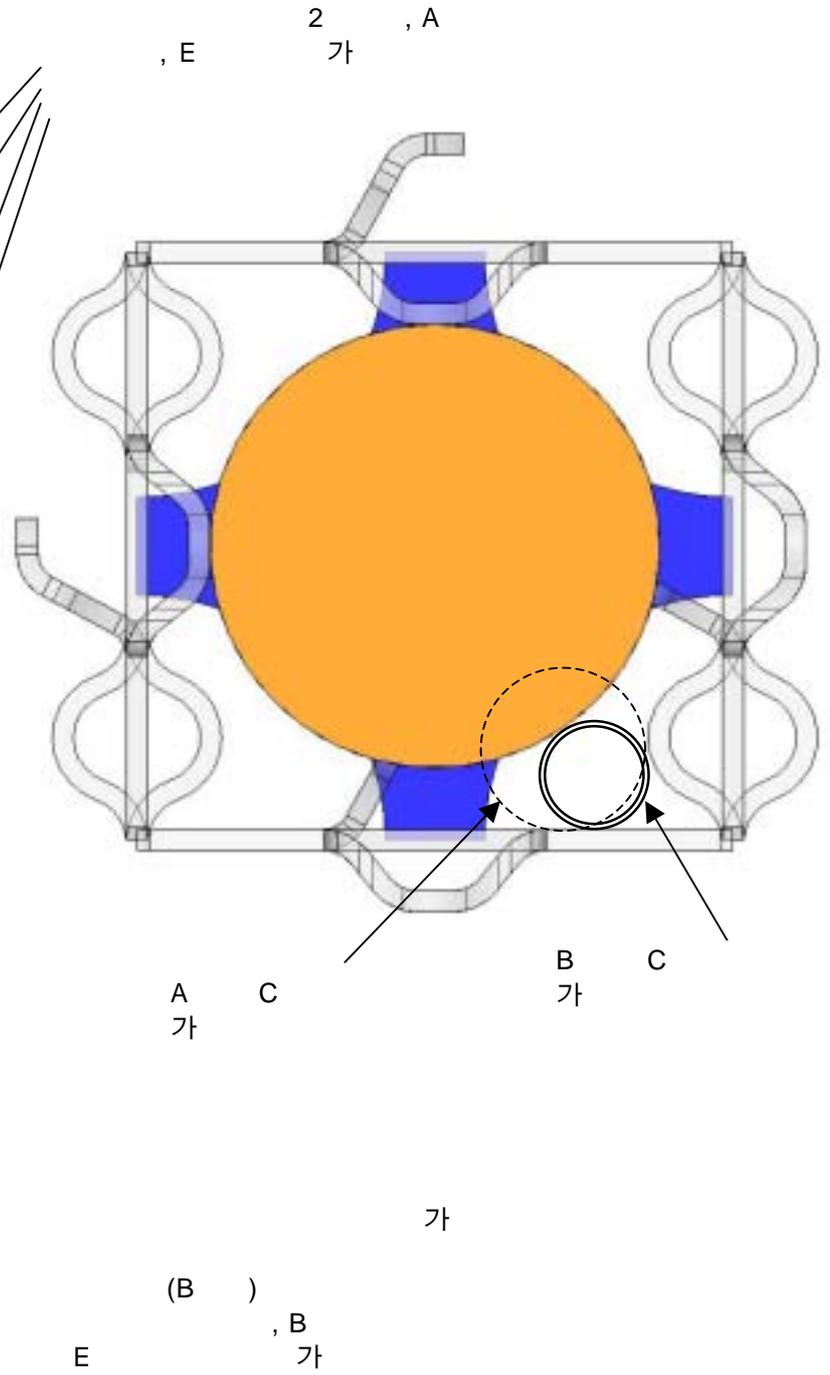
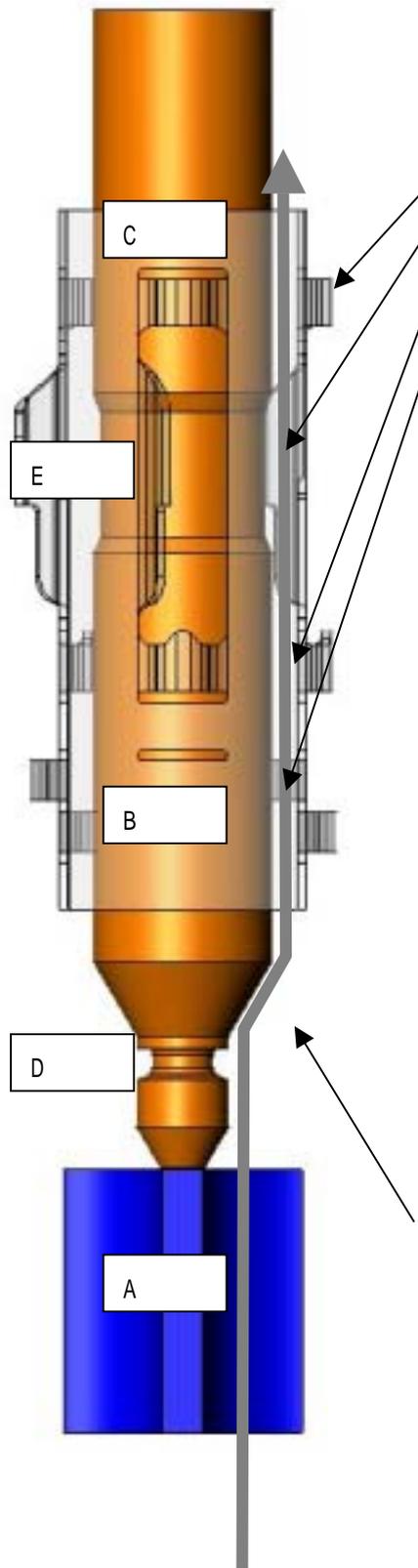


A (A) 가 A 가 (C)

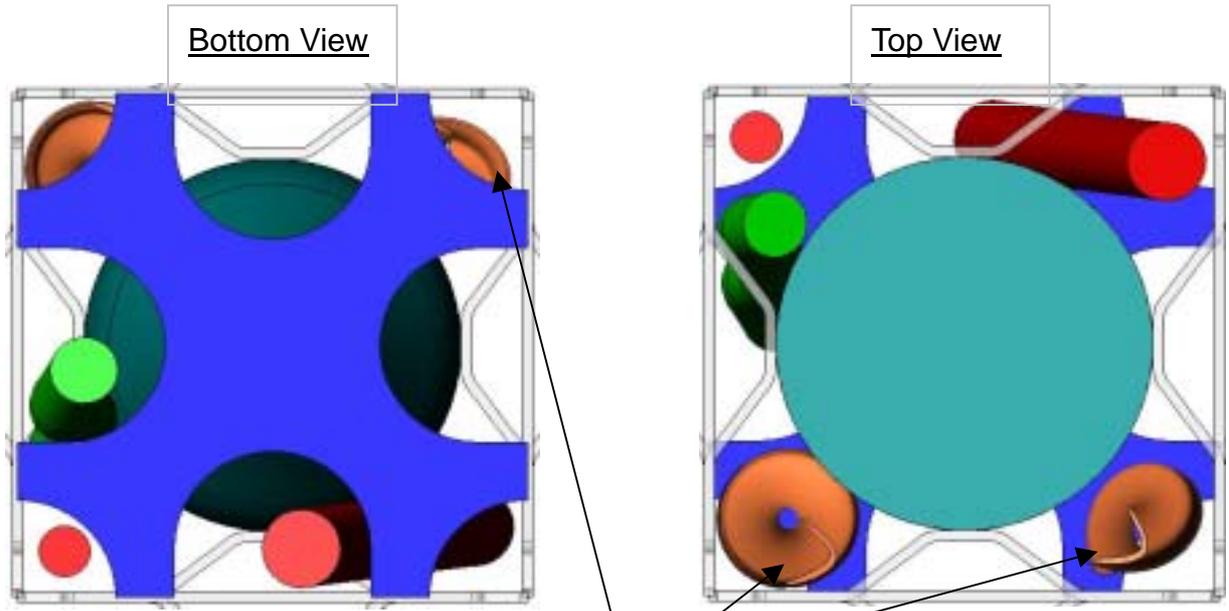
C (B)

8. B

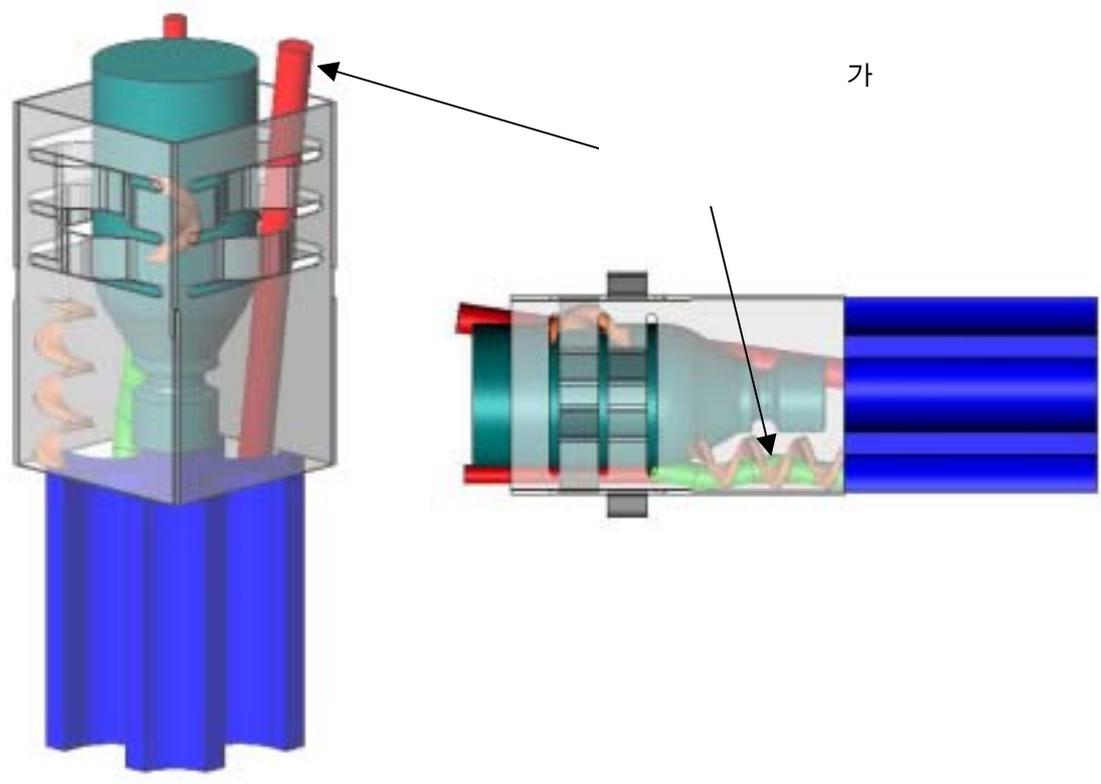
3



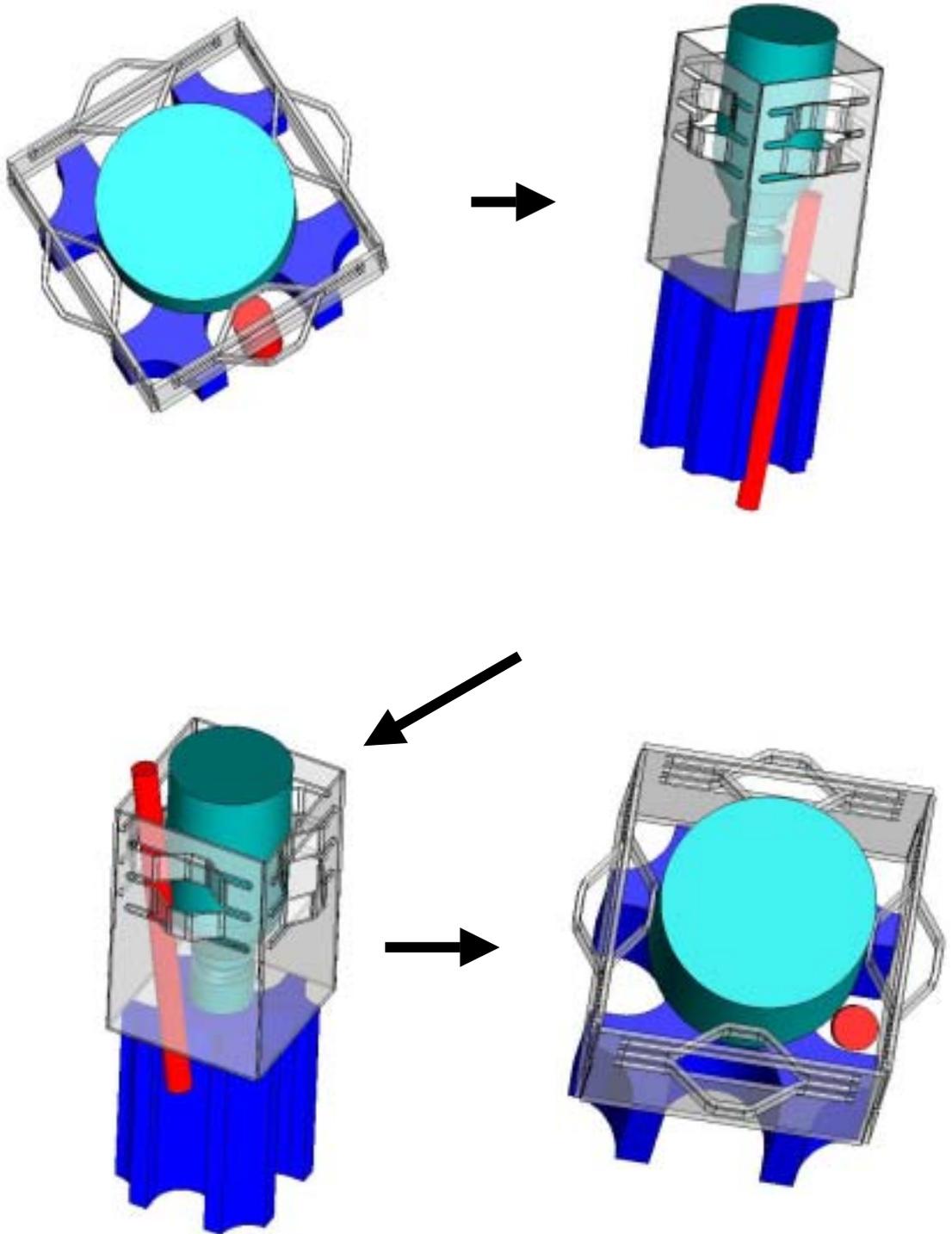
9. A



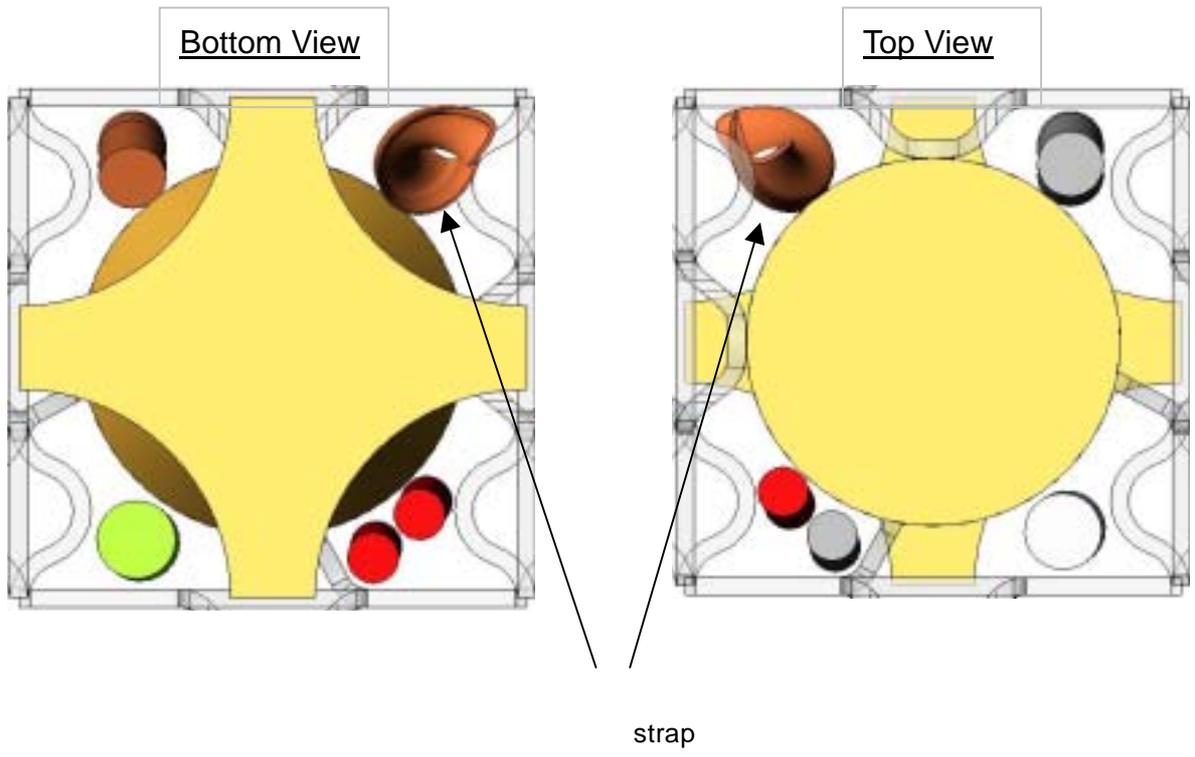
(A)
(B)
strap (C)



10. A



11. B



가

