

NOTES: Prepared in June 2015 with latest update by JRWWhite in July 2015 (and again in March 2017)

This file focuses on the flow distribution calculation - all axial power info in separate file

Here we do calc's for both the UMLRR and WPI fuel elements

For the bypasses, all the calcs have 5 RBs, 4 control blades , and 1 RegBlade

We also do a calc based on only flow area for comparison purposes

Basic geometry parameters and assumption are tabulated at the top and then the PLTEMP input is prepared below

This file is based on the original work done by JRWWhite back in 1991 for the HEU to LEU conversion.

Added the power-to-flow plot on 7/30/15

Reviewed in March 2017 -- Fixed a couple of typos in the comments and changed the # channels from 19 to 18 in the min flow area calc for the fuel channels.

This was modified to account for the fact that the two end channels are only approximately 1/2 the size of the interior channels (19 full channels was simply not correct).

This change only affected the flow area distribution for the no-friction case (Tables 8 and 9 in the safety analysis report), but this was only used for comparison purposes anyway. Thus, this change does not affect any of the results and conclusions from the PLTEMP full-core analysis.

Fuel Assembly Info (units ----> centimeters)

		UMLRR	WPI							
fuel	top channel area (assume 2.6" x 2.6")	43.613	43.613							
	top channel length (about 4.5" for top end box)	11.430	11.430	# fuel Assy	fuel	UMLRR Flow Areas (cm ²)				
	plate height	63.500	62.548	20	704.435	88.595	106.819	1.068		909.918
	channel width	6.604	6.706	21	739.657	88.595	106.819	10.068		945.140
	channel thickness	0.296	0.271	22	774.879	88.595	106.819	10.068		980.362
	bottom channel area (assume 2.6" x 2.6")	43.613	43.613	23	810.101	88.595	106.819	10.068		1015.584
	bottom channel length (about 6" for grid plate)	15.240	15.240	24	845.323	88.595	106.819	10.068		1050.805
	min flow area	35.222	32.698	25	880.544	88.595	106.819	10.068		1086.027
				26	915.766	88.595	106.819	10.068		1121.249

rad basket	flow area (1.87" diameter hole)	17.719								
	length (35")	88.900								
	min flow area	17.719		# fuel assy	fuel	UMLRR Normalized Flow Areas				
				20	0.774	0.097	0.117	1 regblade		total
control blade	shroud area (10.944 x 0.75)	52.471		21	0.783	0.094	0.113	0.011	1.000	
	blade area (10.65 x 0.575)	25.767		22	0.790	0.090	0.109	0.010	1.000	
	top control in flow area (shroud - blade)	26.705		23	0.798	0.087	0.105	0.010	1.000	
	top length (30")	76.200		24	0.804	0.084	0.102	0.010	1.000	
	middle control out flow area	52.471		25	0.811	0.082	0.098	0.009	1.000	
	middle length (21")	55.340		26	0.817	0.079	0.095	0.009	1.000	
	bottom (10.844 x 47) - very conservative since incore holes	33.882								

		10.844 x 4.7 -- very conservative since ignore holes									
		bottom length (6")	15.240								
		min flow area									
			26.705								
				# fuel Assy							
				fuel							
				5 mid baskets	4 large blades	1 regblade					
regblade	shroud area (2.465 x 4.465)	20	653.957	88.595	106.819	10.068			859.440		
	blade area (2.125 x 1.125)	21	686.655	88.595	106.819	10.068			892.138		
	top control in (shroud - blade)	29	719.353	88.595	106.819	10.068			924.835		
	top length (26")	23	752.050	88.595	106.819	10.068			957.533		
	middle control out flow area	24	784.748	88.595	106.819	10.068			990.231		
	middle length (22")	25	817.446	88.595	106.819	10.068			1022.929		
	bottom length (25")	26	850.144	88.595	106.819	10.068			1055.627		
	middle (grid box)	43.613									

bottom length (6")		15.240			WPI Normalized Flow Areas					
min flow area		10.068	# fuel assy	fuel	5 rad baskets	4 large blades	1 regblade	total		
			20	0.761	0.103	0.124	0.012	1.000		
convert cm to m		100	21	0.770	0.099	0.120	0.011	1.000		
convert cm^2 to m^2		10000	22	0.778	0.096	0.116	0.011	1.000		
PLTEMP Data for LEU1 Core Flow Distribution Calculation			23	0.785	0.093	0.112	0.011	1.000		
			24	0.792	0.089	0.108	0.010	1.000		
Card 0100			25	0.799	0.087	0.104	0.010	1.000		
ANAME	case description	umlr_flow21	26	0.805	0.084	0.101	0.010	1.000		
		wpi_flow21								

convert cm to m

convert cm² to m²

PLTEMP Data for LEU Core Flow Distribution Calculation

case description

umlr_flow21

wpi_flow21

Summary Results

UMLRR Assembly

WPI Assembly

fuel Assy

flow area calc

PLTEMP calc

flow area calc

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