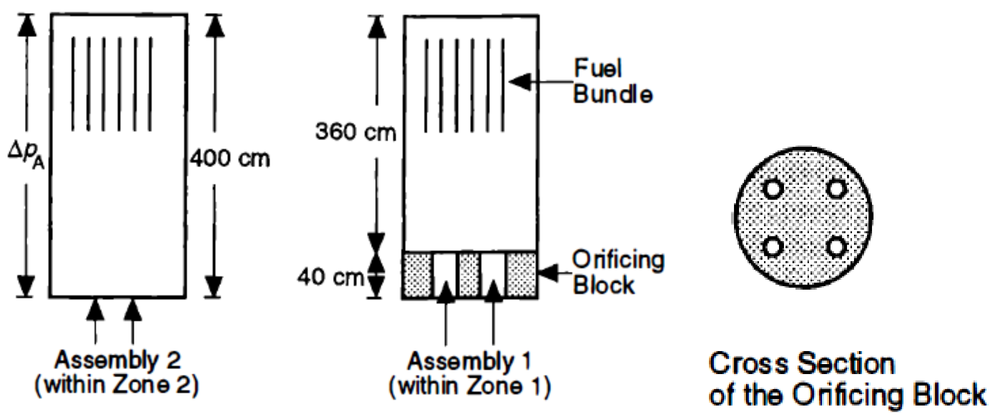
Homework #7

1. (*Taken from Nuclear Systems I Text*, problem 9-4) In a hypothetical reactor an orificing scheme is sought such that the core is divided into two zones. Each zone produces one-half of the total reactor power. However, zone 1 contains 100 assemblies, whereas zone 2 contains 80 assemblies. It is desired to obtain equal average temperature rises in the two zones. Therefore, the flow in the assemblies of lower power production is to be constricted by the use of orificing blocks, as shown in Figure 9-40. Determine the appropriate diameter (D) of the flow channels in the orificing block. Assume negligible pressure losses in all parts of the fuel assemblies other than the fuel rod bundle and the orifice blocks. The flow in all the assemblies may be assumed fully turbulent. All coolant channels have smooth surfaces.

   Data:

Pressure drop across assembly	$\Delta P_A = 7.45 \cdot 10^5 N/m^2$
Total Core Flow Rate	$\dot{m}_T = 17.5 \cdot 10^6\ kg/hr$
Coolant Viscosity	$\mu = 2 \cdot 10^{-4} N\ s/m^2$
Coolant Density	$\rho = 0.8\ g/cm^3$
Contraction Pressure loss coefficient	$K_c = 0.5$
Expansion Pressure loss coefficient	$K_e = 1.0$



2. **TEAM Problem:** Create a system curve for your reactor concept. This means you will put together a basic primary system including piping, elbows, tees, and components. Once you've sketched and compiled a concept primary system for your reactor, consider minor and friction losses for this system, then develop a head/pressure loss curve as a function of flow rate. Based on your stated Q, indicate where on this curve a pump would need to operate in order to provide the needed head and flow rate.
   Alternatively, If your reactor is a stagnant (no forced flow) reactor, please make some simplifying assumptions and then calculate the natural circulation flow that will likely occur within your stagnant salt.