PROBLEM 11-12N QUESTION

Critical Flow During a Small-Break LOCA in a BWR

A small break (10 cm^2) occurs at a certain location on the coolant recirculation line of a BWR. Calculate the mass flow rate at which the coolant is discharged through the break into the containment. Use the following three models:

1) Non-equilibrium model for an orifice (L/D~0).
2) Non-equilibrium model for a short discharge nozzle (L/D~2).
3) Equilibrium model with Fauske's assumption for the slip ratio. (Use Figure 11-26 in the textbook)

Assumptions:
- The coolant inside the primary system can be modeled as saturated liquid water at 6.9 MPa (1,000 psi).
- Assume that the containment pressure remains constant at 0.1 MPa.