msre design

1 introduction

the design and dimensions of the molten salt reactor experiment is detailed in several ornl reports. this document aims at providing a comprehensive overview of the core design dimensions and materials, for the purpose of creating an accurate cad model of the reactor. care is taken to give proper references to where data comes from or how its extrapolated from the available information.

2 core design

the msre core design can be seen in figure 1 and figure 2, note that they differ slight, e.g. the vessel drain line and around the control rod.

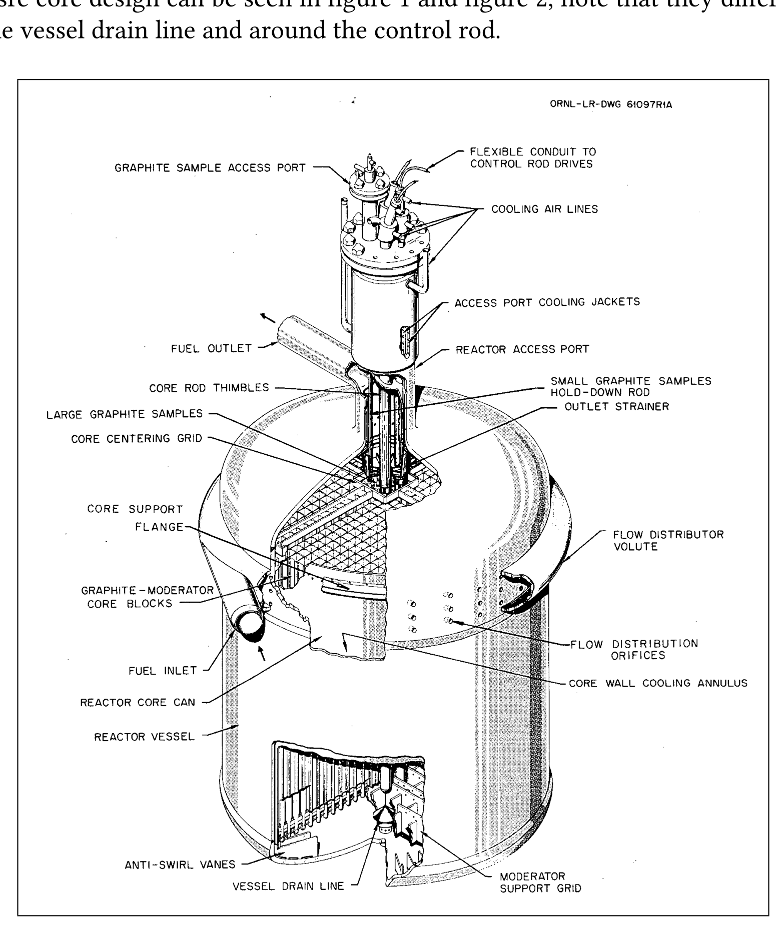

figure 1: msre reactor vessel (kedl 1970, figure 1).

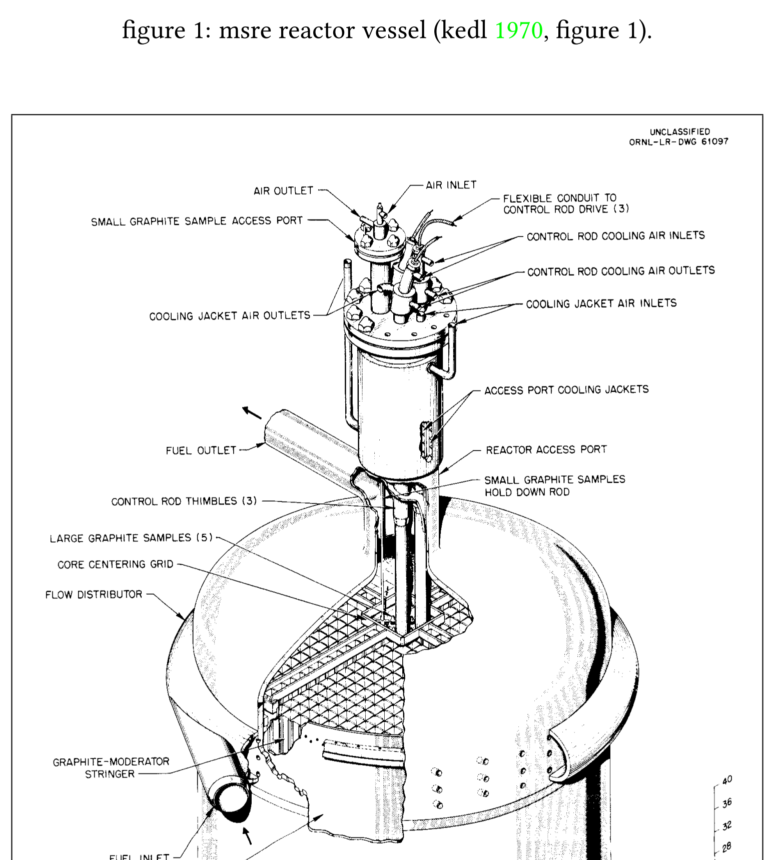

figure 2: cutaway drawing of IGRE core and core vessel (engel and haubenreich 1962, figure 1).

table 1 gives many of the key dimensions left out of the figures 1 and 2.

table 1: reactor vessel design data (beall, briggs, and westsik 1961, table 4).

Construction material	INOR-8
Inlet nozzle, sched-40, in., IPS	5
Outlet nozzle, sched-40, in., IPS	5
Reactor vessel	
OD, in.	59-1/8 (60 in. max)
ID, in.	58
Wall thickness, in.	9/16
Over-all height, in. (to ℄ of 5 in. nozzle)	100-3/4
Head thickness, in.	1
Design pressure, psi	50
Design temperature, °F	1300
Fuel inlet temperature, °F	1175
Fuel outlet temperature, °F	1225
Inlet	Constant-area distributor
Annulus ID, in.	56
Annulus OD, in.	58
Graphite core	
Diameter, in.	55-1/4
Core block section, in.	2 x 2
Number of fuel channels	1064
Fuel channel size, in.	1.2 x 0.4 (rounded corners)
Effective core length, in.	~63
Effective core volume, ft^3	~88
Fractional fuel volume	0.225
Core container	
ID, in.	55-1/2
OD, in.	56
Wall thickness, in.	1/4
Height, in.	68

2.1 graphite rods

the graphite moderator rod dimension, given in figure 3, are missing the angle of the spike, the dimensions of the pole, and disk at the bottom.

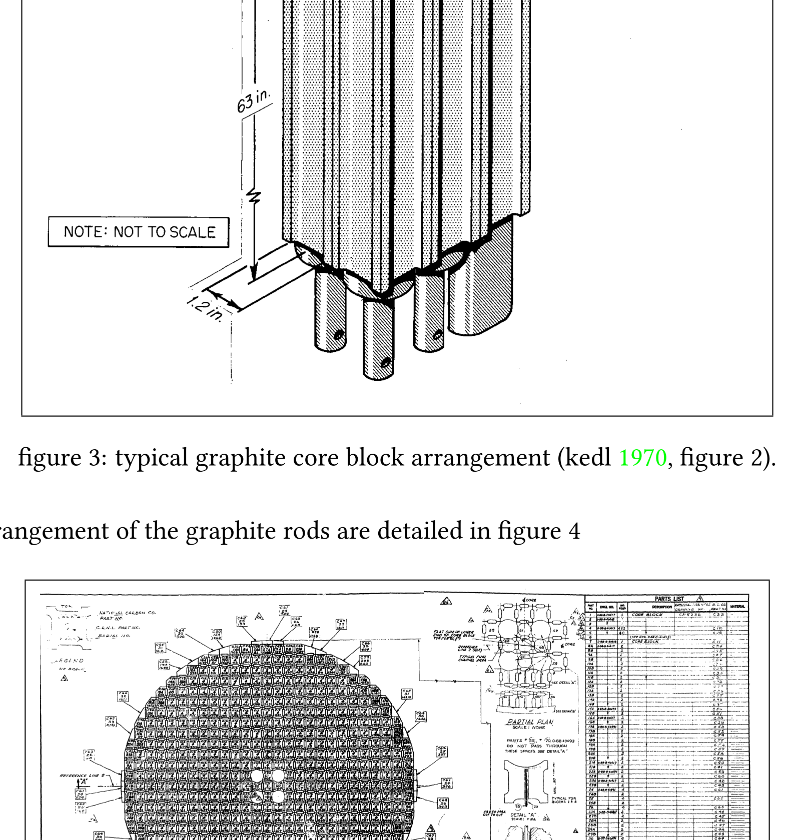

figure 3: typical graphite core block arrangement (kedl 1970, figure 2).

the arangement of the graphite rods are detailed in figure 4

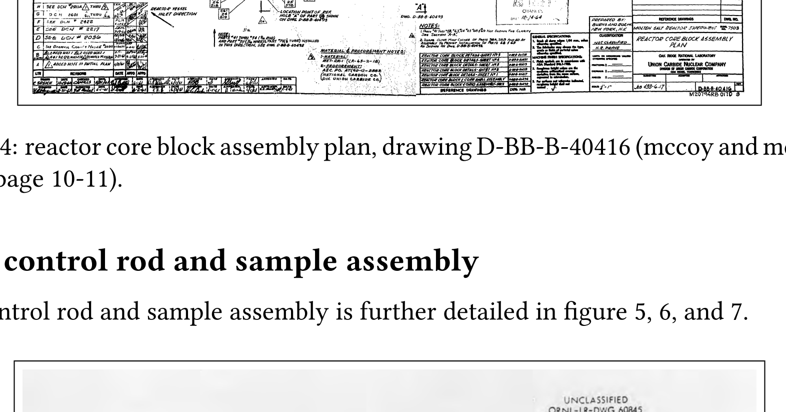

figure 4: reactor core block assembly plan, drawing D-BB-B-40416 (mccoy and mcnabb 1972, page 10-11).

2.2 control rod and sample assembly

the control rod and sample assembly is further detailed in figure 5, 6, and 7.

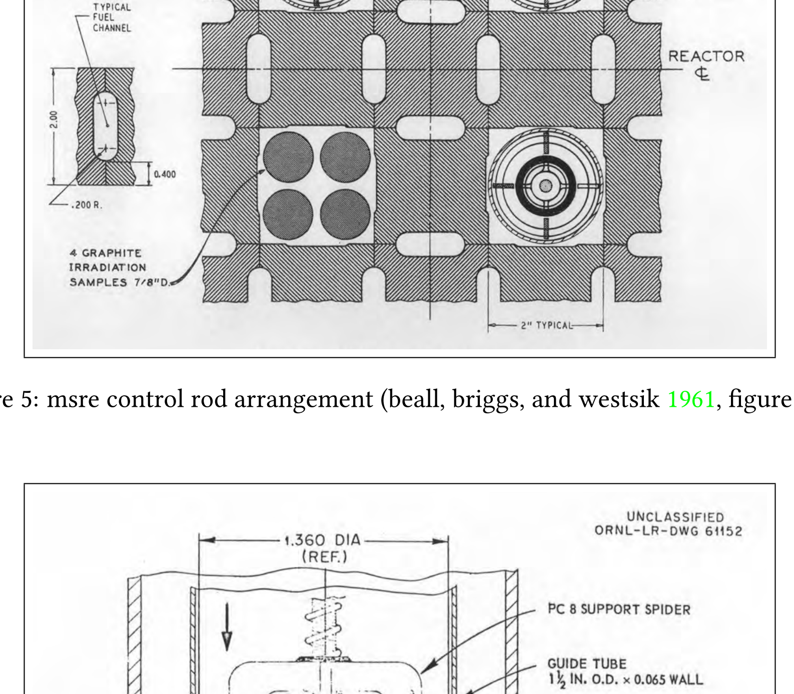

figure 5: msre control rod arrangement (beall, briggs, and westsik 1961, figure 14a).

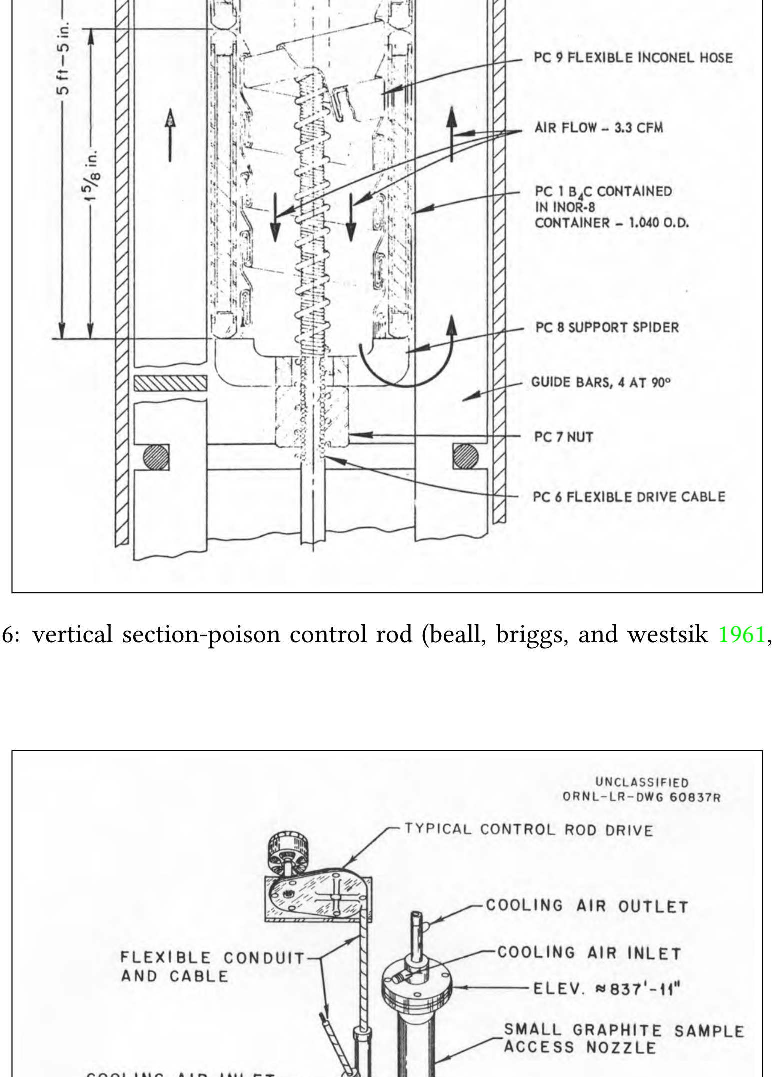

figure 6: vertical section-poison control rod (beall, briggs, and westsik 1961, figure 14b).

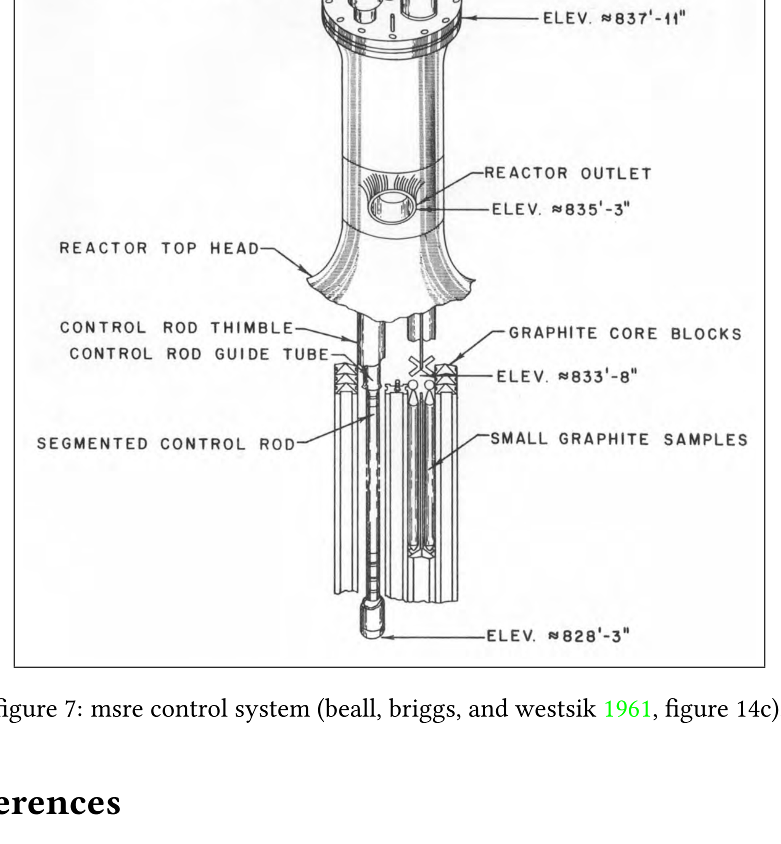

figure 7: msre control system (beall, briggs, and westsik 1961, figure 14c).

References

beall, s. e., dr. b. briggs, and j. h. westsik (1961). "addendum to ornl cf-61-2-46, molten-salt reactor experiment preliminary hazards report". In: *oak ridge national laboratory* ad-cf-61-2-46.

engel, j. r. and p. n. haubenreich (1962). "temperatures in the msre core during steady-state power operation". In: *oak ridge national laboratory* ornl-tm-0378.

kedl, r. j. (1970). "fluid dynamic studies of the molten-salt reactor experiment (msre) core". In: *oak ridge national laboratory* ornl-tm-3229.

mccoy, h. e. and b. mcnabb (1972). "postirradiation examination of materials from the msre". In: *oak ridge national laboratory* ornl-tm-4174.