RALEIGH RESEARCH REACTOR II  
(NCSCR-2)

GENERAL

REACTOR TYPE: Aqueous homogenous, fully enriched (93%) uranium, light water moderated, graphite reflected, uncooled

HISTORY: June 1955 Modified from NCSCR-1 to NCSCR-2
May 1957 Criticality achieved as NCSCR-2
December 1958 Modified from NCSCR-2 to NCSCR-4 during relocation to the Bureau of Mines Building

DESIGNER/BUILDER: North Carolina State College and Atomics International

REACTOR PHYSICS

MAXIMUM POWER: 500 watts thermal

NEUTRON FLUX: Average Thermal - $3 \times 10^8 \text{n/cm}^2\cdot\text{sec}$, Average Fast - $3 \times 10^9 \text{n/cm}^2\cdot\text{sec}$.  

CORE PARAMETERS: Core Excess = 0.36\% $\Delta k/k$

CORE LOADING

SHAPE: Cylinder, 10.6875 inch diameter, 5.71 inches high with hemispherical bottom with 5.344 inch radius

CRITICAL MASS: 766.5 grams $^{235}\text{U}$

CORE LOADING: 775.7 grams $^{235}\text{U}$ in form of 1.29 kg $\text{UO}_2\text{SO}_4$, enrichment 93\%, diluted in 13.628 liter $\text{H}_2\text{O}$ solution

POWER DENSITY: 0.0367 kW/liter

FUEL ASSEMBLY DATA

FORM & COMPOSITION: (not applicable)

CLADDING: (not applicable)

SUBASSEMBLIES: (not applicable)
CORE HEAT TRANSFER

COOLANT FLOW AREA: (not available)
COOLANT FLOW RATE: (not available)
TEMPERATURES: (not available)

CONTROL

CONTROL RODS: Two combined regulating and safety rods, stainless steel tubes, 0.98 inch O.D., 12 inches long containing 0.9 inch diameter B,C. Worth of one rod = 2.8% $\Delta k/k$

SCRAM MECHANISM: Gravity fall of both rods

REACTOR VESSEL and OVERALL DIMENSIONS

FORM: Cylinder with hemispherical bottom, type 347 stainless steel, inside diameter = 10.6875 inches, wall thickness = 0.0625 inches, overall height = 14.406 inches

WORKING PRESSURE: 15 inches $H_2O$ vacuum

DIMENSIONS: Octagon, 17 feet across flats, 11 feet high

REFLECTOR and SHIELDING

REFLECTOR: Graphite, forming cube of 5 feet

SHIELDING: On sides: 4 inches lead, 6 feet heavy concrete containing barytes and colmanite ore

On top: 0.25 inches boral, 2 inches lead, 3 inches steel, 3 feet heavy concrete

CONTAINMENT

TYPE & MATERIAL: Core vessel contained in secondary enclosure: 0.0625 inch thick aluminum cylinder, 34.06 inches long, free space filled with graphite

Shielded reactor located below ground level in center of 57 feet diameter reactor hall, surrounded by laboratories
RESEARCH FACILITIES

One 1 inch vertical exposure tube
One 3 inch diameter horizontal beam tube (tangential to core)
Four 4 inch diameter horizontal beam tubes (radial to vessel surface)
One 60 x 60 inch thermal column with 6 access ports

COST

REACTOR: Design and construction $25,000 (Building, shielding, etc. available from NCSCR-1)

SUPPORT FACILITY: Available from NCSCR-1

REMARKS

When the Raleigh Research Reactor (NCSCR-1) developed a reactor vessel leak and was shutdown, the Raleigh Research Reactor II (NCSCR-2) was designed and installed to allow additional time to complete the engineering design for modification to the R-3 Reactor which would employ MTR-type fuel. Thus, the NCSCR-2 was an "interim" facility intended to bridge the time period between the NCSCR-1 shutdown and R-3 Reactor installation. The reduced authorized power level of the NCSCR-2 Reactor (500 watts), as compared to the NCSCR-1 Reactor (10 Kw), was a result of not reinstalling the catalytic recombiner system for this interim facility.