



Rensselaer

Department of Nuclear Engineering & Engineering Physics

August 16, 1991

Mr. Keith R. Brown
Office of External Affairs
U.S. Department of Energy
Idaho Operations Office
One Energy Drive
Idaho Falls, ID 84302

Dear Sir:

The RCF Fuel Vault (see Figures 1 and 2) currently is licensed under CX-22 to store about 600 SPERT(F1) fuel pins. To double this storage capacity certain modifications are required as noted below. Consideration of these modifications involves fuel rack strength as well as criticality.

A current maximum of 15 SPERT(F1) fuel pins, each 42" long, are stored in each of 41 open aluminum storage tubes 5" in diameter and 42" in length. An additional aluminum storage tube 5" in diameter and 45" in length has a welded back cover and a bolted and wire-sealed front cover for storage of three demountable fuel pins. This wire-sealed aluminum storage tube is for security of the UC-2 fuel pellets in the demountable fuel pins and was requested by the U.S. Nuclear Regulatory Commission; it appears as the first item in Table 1.

Thirty-nine additional aluminum storage tubes appear as the second item in Table 2. The $80 = 41 + 39$ storage tubes can hold $1200 = 80 \times 15$ SPERT(F1) fuel pins for a total of 1203 fuel pins, subject to strength and criticality considerations. The 81 fuel storage tubes are supported by a Unistrut structure which is bolted to the concrete back, floor, and sides of the 8' x 10' x 8' high Fuel Storage Vault. The bolt fastenings to the sides are a consequence of adding two Unistrut P1000 members (item 3 in Table 1) horizontally (see Figure 2) bolted into the side walls for additional stability. The main Unistrut structure is built up of 8 Unistrut P1000 vertical columns 80" high, 18 Unistrut P3300 horizontal beams 120" long, and 36 Unistrut P3301 front-to-back members 25" long. The 81 aluminum storage tubes are fastened to the P3300 members with Unistrut P1122 clamps of which 162 are required, all of which are on hand. Forty of the aluminum storage tubes are wrapped with 15 mil thick cadmium sheets 28" in length and 18" in width, all of which are on hand. The total cost for the storage rack upgrade to double the stored fuel pins is \$2430.

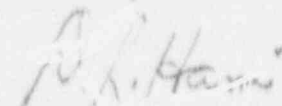
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With 15 SPERT(F1) fuel pins stored in each aluminum storage tube the capacity of the rack is $80 \times 15 + 3$ or 1203 fuel pins, the calculated multiplication factor flooded with water is far below 0.95 with or without the cadmium wraps. The static load is 1/20 of the allowable load on each Unistrut column and 1/8 of the allowable load on each Unistrut beam. No additional criticality calculations are required to demonstrate this, because the criticality calculations submitted earlier to the U.S. NRC were for infinite arrays of storage tubes with and without cadmium wraps.

It is useful to compare the proposed fuel content of the fuel rack with that originally licensed in the 1950's. The original license assumed 81kg U-235, 5.6kg U-238, 6kg 0, and 760kg stainless steel in about 2900 fuel plates stored in the rack. Each SPERT(F1) fuel pin contains 35.2g U-235 so in 1203 fuel pins there are 42.3kg U-235 and the pins have a mass of about 1200kg. Thus the proposed mass loading is somewhat larger and the U-235 loading is smaller.

Sincerely,



Dr. Donald E. Harris, Director
RPI Reactor Chemical Facility (RCF)

DRH:jjd

cc: R.C. Block
J. Schoonbeck
R. Rohr
E. Muzzey
T. Michaels (USNRC) ✓

Table 1. Fuel Vault Components for Enhanced Storage

1.	One (1) closed storage tube of aluminum with welded back cover and bolted front cover with wire-seal fixture.	\$ 280.00
2.*	Thirty-nine (39) fuel storage tubes of aluminum 42" long by 5" outer diameter and about 1/8" wall thickness, cut and deburred.	\$1700.00
3.	Two (2) Unistrut P1000 members 10' long with bolt fixtures.	\$ 150.00
4.	Installation	<u>\$ 300.00</u>
Total		\$2430.00

*Prices for aluminum are subject to change.

Figure 1. RPI Reactor Critical Facility (RCF) Showing Reactor Tank (RT), Subtank (ST), Core Water Storage Tank (WST), Reactor Fill Pump (FP), Sump Pump (SP), Cable Switchyard (SW) and Trench, Control Room, Control Console, Computer (Comp), Power Panel (PP), Fuel Storage Vault (FV), Fuel Storage Rack (FSR), Utility Panel (UP), Piping Pit (PD), Ion Exchange Columns (IE), Shielded Room (SR), Fuel Rod Counting Apparatus (RCA), and Other Components.

Figure 2. RCF Fuel Vault Showing Some of the $9 \times 9 = 81$ Fuel Storage Tubes and Clamps (dimensions in inches).

RESEARCH POLYTECHNIC INSTITUTE
REACTOR CRITICAL FACILITY (RCF)

WIRE MESH FENCE

ACCESS RAILWAY

WIRE MESH FENCE

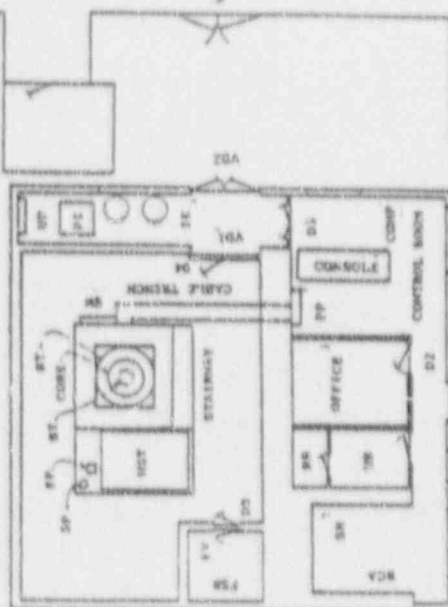
SECURITY BARRIERS

CIVIL PROTECTION BARRIERS

VEHICLE GATE 1

WILL. EXHAUST

WILLER BUILDING



PARKING LOT

GUARD BUILDING

STEEL SLOPE W/ MONOLITH BITTS

