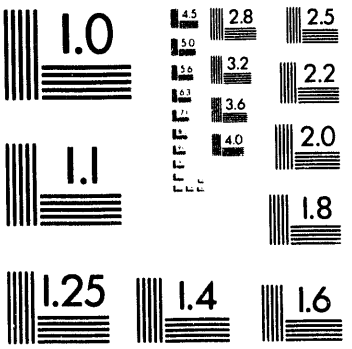
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1 of 1

HW - 84080 RD

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GENERAL ELECTRIC

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TITLE

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IRRADIATION ANALYSIS
PRODUCTION TEST IP-572, HAPO 283
IRRADIATION OF IMPACTED UO_2-PuO_2 FUEL ROD BUNDLES IN C REACTOR

J. H. Cox

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IRRADIATION ANALYSIS
PRODUCTION TEST IP-672, HAPO 288
IRRADIATION OF IMPACTED UO_2-PuO_2 FUEL ROD BUNDLES IN C REACTOR

Loss of Flow

Loss of Inlet Hydraulic Connector:

The burnout characteristics of this test are quite similar to a C-IIN loading, with reduced power, in a C Area ribbed process tube. The pressure drop for the fuel bundle is ~280 psig compared to 320 psig for a C-IIN loading with the same flow rate; likewise, the cross-sectional area of a tube bundle is 0.00398 ft^2 compared to 0.00403 ft^2 for a C-IIN element. As a result, the reverse flows and average velocities are very similar.

The heat flux on the fuel bundle is a maximum of 260,000 BTU/hr-ft^2. A C-IIN loading with a peak heat flux the same has a tube power of ~490 KW.* From Figure IV-6 (see also Figure IV-8) HW-74094, Volume 1, the back pressure required to prevent fuel element burnout is < 20 psig for a tube power of ~490 KW. The rear header pressure available for the fuel bundle tubes is ~ 57 psig. Likewise, from Figure IV-6, 57 psig rear header pressure will protect fuel cladding from burnout up to a tube power of ~1150 KW. As a result, complete severence of the inlet hydraulic connector should not result in melting of the fuel cladding in this test.

Inlet Plugging:

It appears that the probability of inlet plugging to a process tube is very low. If inlet plugging were to occur, it would result in melting of the fuel rod bundles and the process tube; fission products would be released to the reactor core and into the reactor atmosphere.

Water Shutoff Time:

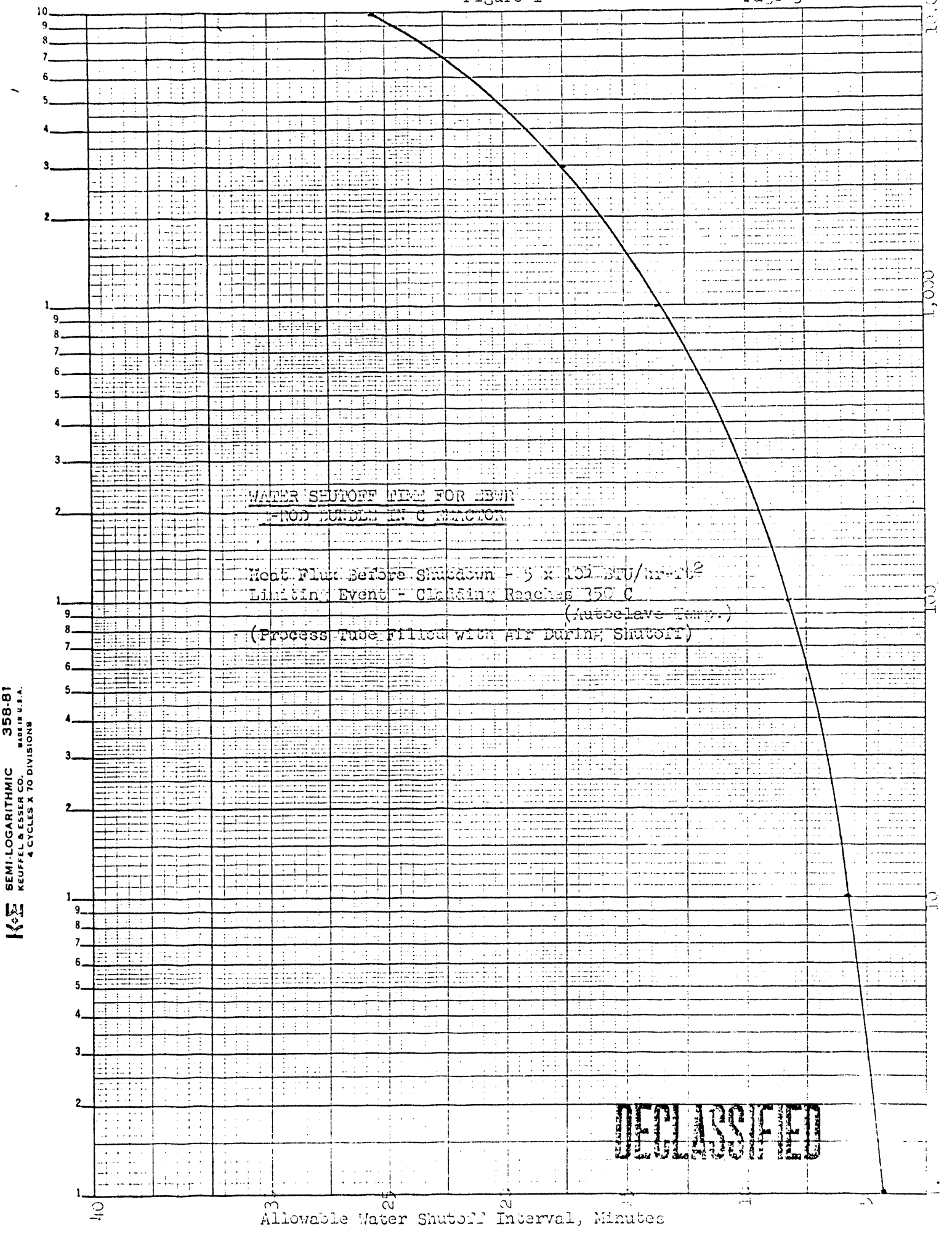
Due to the short water shutoff interval available, as shown in Figure 1, it is imperative that water be kept on the fuel elements at all times. Special care should be taken during discharge and shipment. During discharge, the front cap should remain on until time to push the tube; as much flow as practical should be left on the tube. In addition, a man should view the discharge and be prepared to activate the fog spray. The element must have water cooling during shipment; the water-cooled PRTR loadout cask will be used for shipment. If water is taken off the fuel bundles, fission gases will be released and some fission products could be spread, depending on the location of the fuel bundles at the time.

Vibration and Corrosion

The fuel element bundles were mocked up in the 189-D Flow Laboratory and checked for vibration; none was evident.

*Hazards Summary Report, HW-74094, Volume 2

Figure I



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Vibration and Corrosion (continued)

At the low temperatures present, there should be no problem of corrosion at the interface of the stainless steel and aluminum tube. Likewise, past experience in the KER loops and MTR has shown no problems at the Zr-SST interface.

Plutonium Considerations

The UO_2-PuO_2 elements, similar to the type used in PRTR, should produce no unusual problems. The fact that plutonium is contained in the elements before irradiation will require some additional precautions; alpha monitoring equipment will be used to detect a cladding break during charging.

Prepared by J H Cox
Engineer
Test Engineering

Approved by
Test Engineering

JH Cox:mkc

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