GENERAL ELECTRIC COMPANY

2151 SOUTH FIRST ST., SAN JOSE 12, CALIF. . . . AREA CODE 408, TELEPHONE 297-3000
TWX NO. 287-6484

ATOMIC PRODUCTS DIVISION

ATOMIC POWER EQUIPMENT DEPARTMENT

March 1, 1963

Mr. Robert Lowenstein, Director
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Re: License No. TR-1
Docket No. 50-70

L&R File Copy

Dear Mr. Lowenstein:

Enclosed herewith are three (3) signed and nineteen (19) conformed copies of Proposed Change No. 1 to the subject license. This change concerns redesign of GETR control rods and involves a change in the GETR Technical Specifications.

A Supplementary Report is being forwarded to Mr. Levine of your staff in order to provide background information concerning the redesign.

Very truly yours,

B. D. Wilson
Administrator-Licensing
Building N - Room 114

ems

Enclosures

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PROPOSED CHANGE NO. 1

GENERAL ELECTRIC TEST REACTOR

DOCKET NO. 50-70

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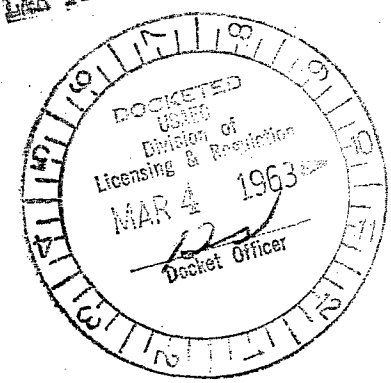
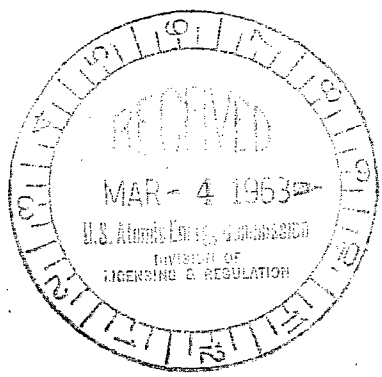
L&R File Copy



March 1, 1963



General Electric Company
Atomic Power Equipment Department
2151 South First Street
San Jose, California

1623

PROPOSED CHANGE NO. 1
GENERAL ELECTRIC TEST REACTOR
DOCKET NO. 50-70

I INTRODUCTION

Pursuant to the provisions of Section 50.59 (d) of 10 CFR Part 50, General Electric hereby requests a change in the Technical Specifications set forth in Section 1 of the Final Summary Safeguards Report in order to permit certain changes in the reactor control rods which involve an unreviewed safety question as defined in Section 50.59 (c) of 10 CFR Part 50.

Since the start of operation of the GETR in 1958, no major changes in the control rod design or operation have been made, although some small engineering modifications have been made. As a result of the operational experience obtained, it is evident that redesign of the control rods in certain selected areas will contribute to ease of operation and enhance over-all reliability of the control rod system. A review of the performance of the existing rod design indicates that the poison material attachment, the rod latches, and the rollers are the areas in which improvements can be made through design changes. Presented herein is a description of the proposed control rod changes, the required change in the Technical Specification, and a discussion of the hazards considerations pertinent to these changes. This information and a supplementary report containing additional engineering detail is submitted pursuant to our letter dated September 7, 1962.

II SUMMARY OF PROPOSED CONTROL ROD CHANGES

The changes to be made in the control rod are:

1) The existing boron-stainless steel in the poison section will be replaced by a "sandwich" type construction containing a structural stainless steel box covered with boron-stainless steel which in turn is covered with a stainless steel skin.

2) The latches which couple the poison section to the fuel follower section, and it to the shock absorber section will be replaced with a simplified spring latch. This latch is essentially identical to the latch currently being used in the ETR control rods. The new latch design does not require the "latch plate" in the fuel follower section so that two additional fuel bearing plates can be added to the fuel follower section.

3) The control rod rollers, both the fixed and the spring loaded types, will be replaced with rollers similar to those currently used in the ETR control rods.

Other than these three basic changes the rods are substantially similar to the existing rod design. The attached drawing shows the details of the proposed control rods (Mark II).

III PROPOSED TECHNICAL SPECIFICATION CHANGE

The GETR Technical Specifications, Section 1 of the Application, requires a change to permit operation with the redesigned fuel rod. In Table I-D, item number 12, delete the "Maximum" value (which is "14") and substitute therefor the value "16". In our opinion,

no other changes are required in the Technical Specifications or the Final Summary Safeguards Report to permit operation with the Mark II control rod as described herein.

IV DESCRIPTION OF CONTROL ROD CHANGES AND SAFETY ANALYSIS

The control rod poison section is a square box approximately 2 3/8 inches square by 38 inches long. The configuration and dimensions of the redesigned poison section are identical to the present design. The center frame, which will provide support for the entire poison piece, is a solid box structure which will be fabricated of 3/16-inch-thick 304 stainless steel and then machined down to the required dimensions. The poison material is stainless steel containing approximately 1% boron enriched to 92% B-10. Strips of this material are fitted to the outside of the center frame and held in place by flat-head screws. A stainless steel "skin" 0.015 inch thick is wrapped around the poison plates and welded in place. As shown on the attached drawing, the flat-head screws used to attach the poison plates also hold the skin in place. There are weep holes in the frame and skin to vent the area around the poison material. As shown on the drawing, the flat-head screws are countersunk with the skin enclosed and tack-welded to the skin to prevent loosening of the screws. One difficulty experienced with Mark I control rods was the loss of poison material through the embrittlement of the boron-stainless steel material and subsequent cracking and chipping. The sandwich type construction which completely encloses the boron-steel will eliminate loss of poison material if cracking should occur.

New and improved latches will be used to couple the three control rod sections (poison, fuel, and shock absorber sections) into a single integral unit. The new latches are identical in principle to those currently used in the ETR control rods. They are made from one piece of spring material with dogs that engage holes in the mating part. The enlarged detail on the attached drawing shows the springs, dogs, and holes of a typical latch coupling. There are two spring latches each on the poison and shock absorber sections. The fuel follower section has holes on each end to accept the spring latches on the poison and shock sections respectively. Each spring latch also has a guard with protruding fingers around the latch spring and dog. The purposes of the guards are to protect the latch springs from possible mechanical damage during handling and to provide alignment of the rod sections once they are coupled together.

Latching of rod components is performed by butting one piece against the mating piece, which causes the spring latches to snap into place. Unlatching is performed by holding one section stationary and rotating the other section, thereby permitting the latch dogs to disengage from their holes (note beveled area to permit this action). Unlatching cannot occur in the reactor since all rod sections are held in alignment by the square guide tubes which contain the control rods. The latch springs, dogs and guards are made of Inconel X. As shown on the attached drawing the new latch does not require the actuating rods or latch plates which were part of the original design. The latch plate will

therefore be removed from the fuel follower section and two additional fuel bearing plates will be installed in its place. The fuel followers will now have sixteen fuel plates. Some of the existing fuel pieces will be modified to accept the new latch. These fuel pieces will have two non-fueled plates in place of the original latch plate. The roller design is similar to the original roller. The springs and method of attachment to the poison and shock section will be modified slightly to strengthen them and to reduce coolant hydraulic resistance. As shown on the attached drawing, only the poison and shock sections have rollers, and each has both the fixed and spring loaded roller types.

Analytical and experimental evaluations of the reactivity worth of the redesigned rod have been made. The results of these studies show that the new rods will have essentially the same reactivity worth as the existing rods. This feature was a design requirement. In practice the complete control rods will be fully interchangeable (existing to redesigned type) and no measurable reactivity effects will result from such changes. The total six-rod bank worth may be slightly less (17.5% Δk to 16.8% Δk) although the core maximum excess reactivity and the shutdown margin will remain unchanged.

The mechanical changes made in the Mark II, namely latches and rollers, have decreased the hydraulic resistance of the rod. It is expected as a result of hydraulic tests and ETR experience that approximately 10% more coolant flow will be present in the new rod. The fuel loading has not been increased, although two additional fuel bearing plates

will be added to the new elements. There is therefore more heat transfer area, more flow, and essentially the same amount of power produced, which means that adequate cooling of the control rod is assured.

The mechanical changes in the rods were made to correct operational deficiencies and to improve reliability. The new latches, for example, are simpler and less susceptible to damage. ETR experience with this latch has been very good. The attachment of the rollers to the original type rods weakened the poison plates at the place of attachment. The redesigned rollers have reinforcing back plates and those on the poison piece are attached to the structural frame (not the boron-steel) thereby eliminating this problem. The sandwich type construction of the poison piece will preclude loss of poison material in the event of cracking or fracture of the boron-steel material--which has been a problem in the past. The attachment of the control rod to the rod drive mechanism has not been changed.

In conclusion, General Electric believes that each change to be made as described above will increase the integrity, reliability and safety

of the control rod system and that no new or different hazards are presented as a result of these changes.

GENERAL ELECTRIC COMPANY
ATOMIC POWER EQUIPMENT DEPARTMENT

By _____
for George White, General Manager

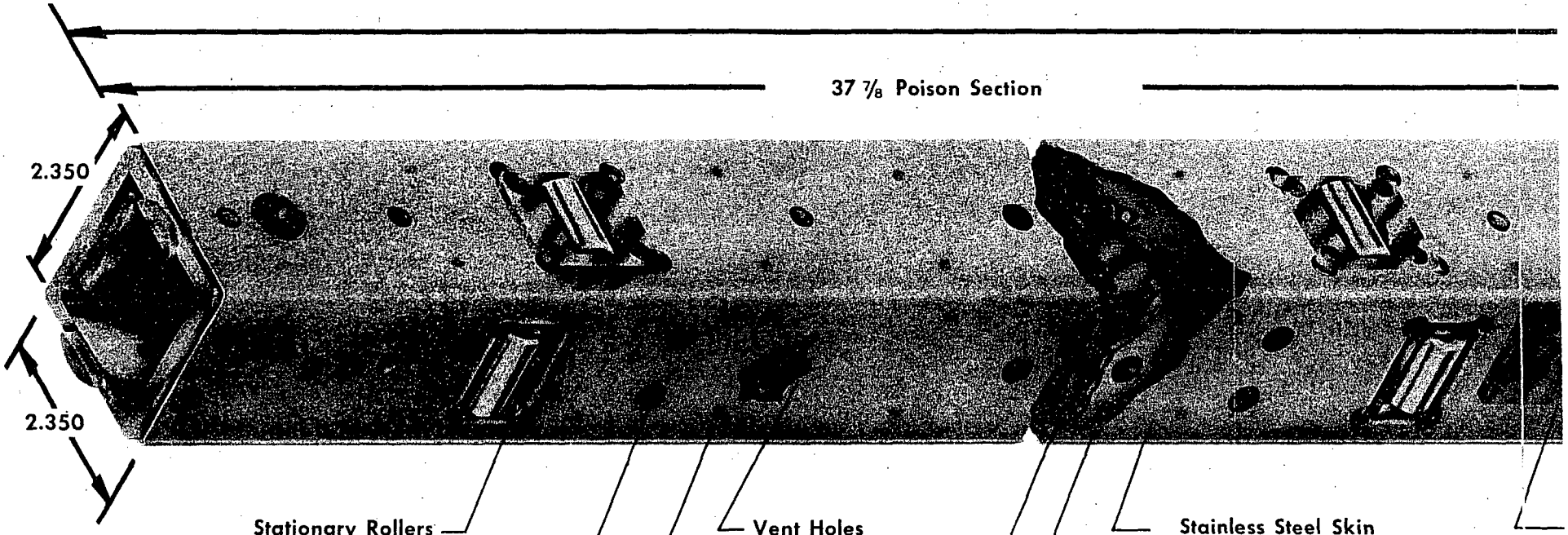
Attest:

_____
Attesting Secretary

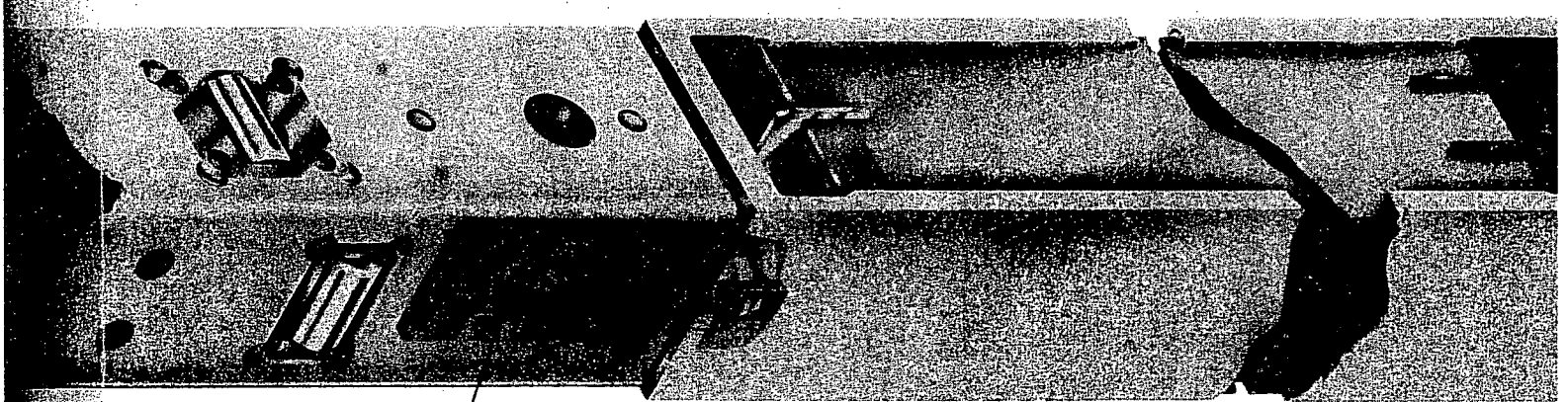
Sworn to before me this 1ST day of MARCH, 1963.

_____
Notary Public in and for the County of Santa Clara, State of California.

F. E. LORD, Notary Public,
State of California - Principal Office, Santa Clara County
My Commission Expires Sept. 5, 1964
175 Curtner Ave., San Jose, Calif.


37 7/8 Poison Section
2.350
2.350
Stationary Rollers
(Typical 2 Adjacent Sides)
Tack Weld All Screws
(Typical Poison Section)
Vent Holes
(Typical Poison Section)
Tack Welds
(Typical Poison Section)
Stainless Steel Box Section
Boron Stainless Steel Plate
Stainless Steel Skin
Typi

40 13/16 Fuel Section



Stainless Steel Skin

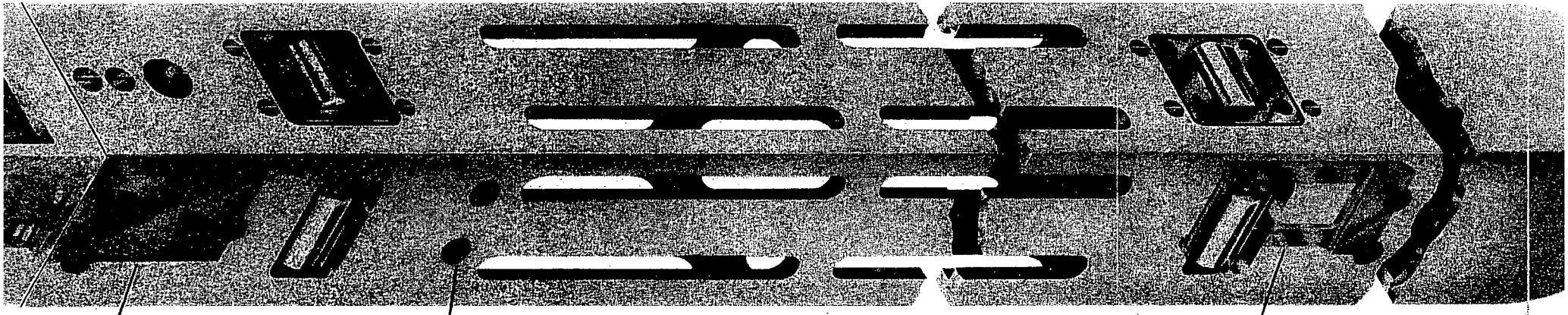
Stainless Steel Plate

I Box Section

Spring Latch
(Typical 2 Sides Poison Section)

[N]Nominal Overall Length

56 9/16 Shock Section

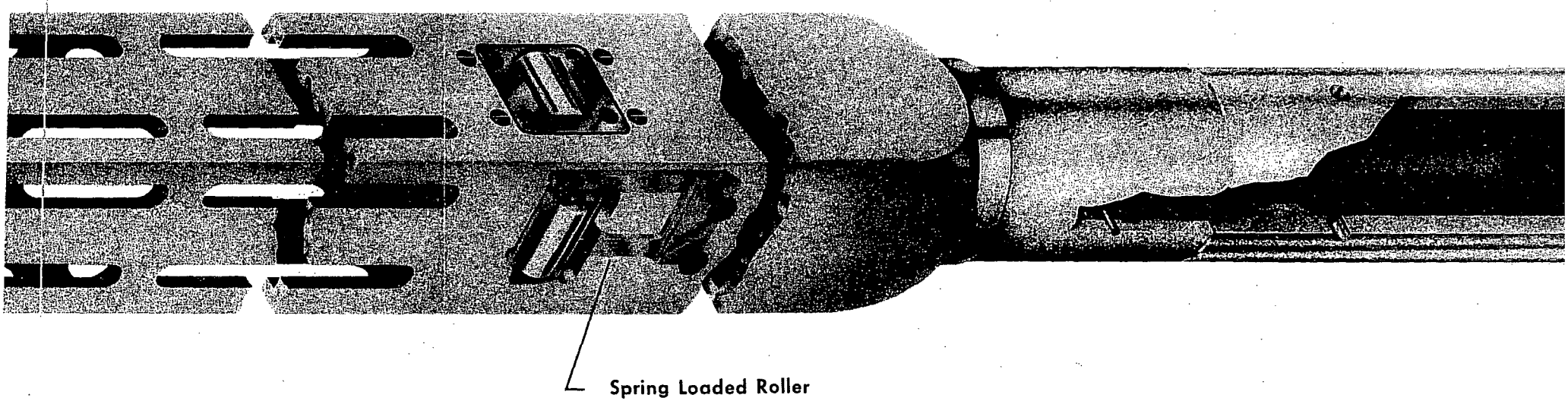


Spring Latch
(Typical 2 Sides Shock Section)

Stake All Screws
(Typical Shock Section)

Spring Loaded Roller
(Typical 2 Adjacent Sides)

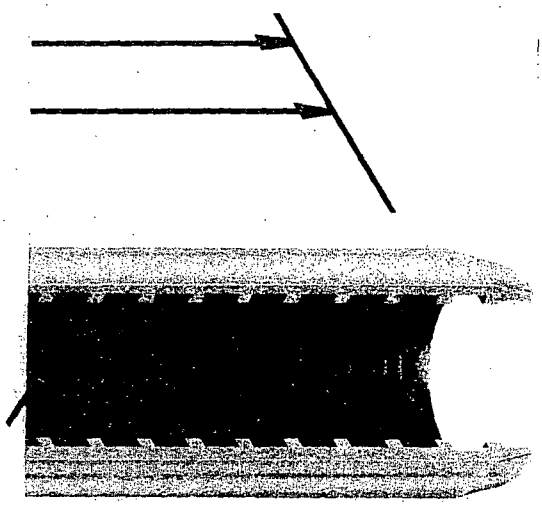
56 9/16 Shock Section



Spring Loaded Roller
(Typical 2 Adjacent Sides)

GENERAL ELECTRIC TEST REACTOR CONTROL ROD ASSEMBLY MAR

VA



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