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September 25, 1978

Office of Inspection & Enforcement
Region IV
U. S. Nuclear Regulatory Commission
Suite 1000
611 Ryan Plaza Drive
Arlington, TX 76012

RE: Docket 50-188

Gentlemen:

Pursuant to 10CFR50.59(b), the following items are submitted for the Kansas State University TRIGA Mk. II Nuclear Reactor, Facility license R-88, for the period 1 Aug 1977 - 30 June 1978:

A. Changes in Procedures

1. Facility Procedure No. 1, "Biennial Control Rod Inspection," as revised, was approved by the Reactor Safeguards Committee on 27 Jan 1978. A copy of the revised procedure is attached.

2. Facility Procedure No. 10, "Fuel Element Inspection," was approved by the Reactor Safeguards Committee on 27 Jan 1978. A copy of the procedure is attached.

3. Facility Procedure No. 11, "Reactor Start-up with Period Scram Bypassed," was approved by the Reactor Safeguards Committee on 27 Jan 1978. A copy of the procedure is attached.

B. Tests and Experiments Conducted Without Prior Commission Approval.

During the reporting period, no new tests or experiments were performed.

C. Changes in the Facility

1. Control-Rod Position Indicators

New control-rod position indicators were installed for the shim rod and regulating rod. The position indicators are digital panel meters with LED display. Rod position is derived from a direct current electrical signal taken from a ten-turn potentiometer on a common shaft with the control-rod drive motor. The proposed changes, safety analyses, and test procedures were approved by the Reactor Safeguards Committee on 9 Nov 1977 and 27 Jan 1978. In their determination that the changes did not involve unreviewed safety questions, the Committee took into accout the facts that the control-rod position indicators are not covered by technical specifications

nor are the position indicators connected to scram circuitry, power-level-indication circuitry, or control-rod drive circuitry.

2. End Fitting for Pulse-rod Poison Section

A new end fitting for the pulse-rod poison section was installed on 13 Mar 1978. The new fitting was threaded over the old and circumferentially welded. Specifications, installation procedures, and test procedures were approved by the Reactor Safeguards Committee on 10 Mar 1978.

Sincerely,

Richard E. Faw

Richard E. Faw, Director
KSU Nuclear Reactor Facility

cc: (40 copies)

Director
Office of Inspection & Enforcement
DDC, ADM
U. S. Nuclear Regulatory Commission
Washington, DC 20555

REF/sk

January 1978

Procedure No. 11

REACTOR START-UP WITH PERIOD SCRAM BYPASSED

PURPOSE: To satisfy Technical Specification No. H.1." Written Instructions, Approved by the Reactor Safeguards committee, shall be in effect for, but not limited to: reactor start-up..."

BASIS: This procedure is designed to allow the reactor to be brought to full power on a short period while limiting the insertion of reactivity so as to remain in the delayed-supercritical condition.

BACKGROUND: Amendment No. 5 to License No. R-88 (dated 14 Nov 77) authorizes operation without a period scram. The console circuitry has been modified by placing a key operated switch, with an indicator lamp, between the period meter relay and the period scram relay. For training operations the period scram will be engaged. For all console check-outs the period scram will be engaged. For other operations the senior operator who is serving as reactor supervisor may authorize bypassing the period scram.

PROCEDURE:

1) Determine the desired positive period, in seconds, to be used for the reactor start-up.

NOTE

Under no circumstances will the reactor be operated with a predicted period less than one second. All data and calculations will be entered in the Operations Log.

2) From the tabulated solution of the In-hour equation in the Operations Notes notebook in the control room calculate the amount of positive reactivity which must be inserted into the reactor to achieve the desired period.

3) Determine the positions of the control rods which will insert the calculated amount of positive reactivity.

4) Disengage the period scram by turning the key 60 degrees clockwise. The red indicator lamp will go out.

5) Perform the start-up as per the calculated control rod positions.

6) If circumstances permit, measure the resulting period from the linear recorder to check the calculation.

Approved: KSU Reactor Safeguards Committee

N. Dean Eckhoff — 27 January 1978

N. D. Eckhoff, Chairman — Date

Revised January 1978

Procedure No. 1

BIENNIAL CONTROL ROD INSPECTION

PURPOSE: To satisfy Technical Specification No. H.1. "Written instructions, approved by the Reactor Safeguards Committee, shall be in effect for, but not limited to: Surveillance and calibration of reactor operating instrumentation and control...."

BASIS: This procedure is designed to compliment existing Reactor Experiment No. 20, "Control Rod Inspection."

BACKGROUND: In order to disable a control rod drive mechanism and remove the control rod poison section from the core for inspection or other purposes, it will almost always be necessary to unload one or more fuel elements to reduce the positive reactivity of the core to comply with Technical Specifications A.1.a., A.1.d., D.1., and E.5. Experiment 20 addresses this point in some detail.

PROCEDURE: I Control Rod Removal

1. Loosen any clamps or ties on the control rod drive mechanism electrical cables between the structural steel center channels so as to provide approximately 1.25 meters of slack in the cables.

2. Use a 7/32 hollow set screw key to remove the four 5/16 x 18 hex-head bolts which fasten the control drive mechanism mount to the center channel cover plate.

3. Lift the entire control rod drive mechanism, connecting rod and control rod poison section straight up as a unit, being careful not to damage the rod down/contact limit switch actuator foot or stress the control rod drive mechanism electrical cables.

CAUTION

Great care should be taken not to dent or damage these drives in any way. This includes rubbing the poison section against another connecting rod, the central thimble, etc.

4. After the unit has been lifted high enough to raise the upper connecting rod pin above the center-channel cover plate, cut the stainless steel "keeper wire," carefully saving all fragments; remove the upper connecting rod pin and withdraw the connecting rod from the tubular section of the upper control rod drive assembly.

5. The upper control drive assembly may now be placed horizontally on suitable padding on the pool covers.

6. Remove the connecting rod and poison section from the pool as a unit.

CAUTION

The poison section and lower portion of the connecting rod will be radioactive. Proper precautions must be taken by health physics personnel to prevent overexposure of the personnel who perform this procedure.

II Control Rod Inspection

After removal of the control rod from the reactor tank the poison section diameter will be measured with a vernier caliper and the dimensions will be compared to previous measurements and as-built dimensions. The rod will be visually inspected for any indication of loss of cladding integrity and will be weighed, radiographed, or further tested, if deemed necessary.

Connecting rod pins will be inspected for fit. If significant play is encountered the existing pins will be replaced with oversized pins. The upper pin will be smooth stainless steel with a flat head on one end and secured by a stainless steel "keeper-wire" at the other end. The lower pin will be aluminum and, in order to prevent inadvertent withdrawal, will be press fit with "upset" or peened ends.

III Control Rod Reassembly

1. Lower the poison section and the connecting rod into the pool as a unit.

2. Carefully place the upper end of the connecting rod into the hollow aluminum tubular section of the upper control rod drive assembly.

3. Line up the holes in the connecting rod with the holes in the upper control rod assembly.

4. Insert the smooth stainless steel flat head pin into the hole and secure it by means of a stainless steel "keeper-wire."

5. Lower the entire control rod drive mechanism into a fully seated position. This step will involve placing the poison section into the control rod guide tube in the core and pulling the control rod drive mechanism electrical cables down through the cable hole in the support structure.

CAUTION

Great care should be taken not to damage the poison section, control rod drive electrical cables or rod down/contact limit switch actuator foot.

6. Use a 7/32 hollow set screw key to secure the four 5/16 x 18 hex-head bolts which fasten the control rod drive mechanism mount to the center channel cover plate.

7. Secure any slack in the control rod drive mechanism electrical cables with appropriate clamps or ties.

IV Testing for Proper Operation

A removed control rod must be fully reinstalled and be demonstrated to be capable of normal operation, including unrestricted drop from a fully withdrawn position in less than one second, before this procedure is considered complete. It is recommended that ten rod drop time measurements from full withdrawal to full insertion be made and recorded to prove compliance with Technical Specification E.11.b.

Approved: KSU Reactor Safeguards Committee

N. Dean Eckhoff

N. Dean Eckhoff, Chairman

27 January 1978

Date

January 1978

Procedure No. 10

FUEL ELEMENT INSPECTION

PURPOSE: To satisfy Technical Specification No. H.1. "Written instructions, approved by the Reactor Safeguards Committee, shall be in effect for, but not limited to: d. Fuel loading or unloading; f. Maintenance operations which may affect core safety. And to satisfy Technical Specification No. D.6. "Each Fuel Element shall be checked for transverse bend and longitudinal elongation after each 100 pulses of magnitude greater than $1.00."

BASIS: This procedure is designed to accommodate a modification of the fuel-element inspection tool originally furnished by the reactor manufacturer.

BACKGROUND: Many of the fuel elements in the present inventory are of the Mark III type and, as such, will not fit the original fuel-element inspection tool. According to the reactor manufacturer's suggestions, the fuel-element inspection tool has been modified to accept either Mark II or Mark III fuel elements.

NOTE

As in other fuel handling operations an NRC licensed senior operator must be in attendance to provide direct supervision and an NRC licensed operator must attend a live console during this procedure.

PROCEDURE:

I ZEROING THE DIAL INDICATOR

1) With the fuel-handling tool lower a graphite dummy element into the GO-NO-GO gauge so that the bottom of the cladding can rests on the forks at the lower end of the fuel-element inspection tool.

2) Remove the fuel-handling tool.

3) Place the standard element indexing rod on the upper surface of the cladding can so that the forks on the indexing rod straddle the triflute of the graphite dummy element. The mark on the indexing rod must line up with the mark on the flat surface of the fuel-element inspection tool.

4) Adjust the dial-indicator bezel to zero the pointer.

5) To ensure that the standard indexing rod and the graphite dummy element are not distorted repeat Step 3 twice, rotating the graphite dummy element 120 degrees each time.

6) Remove the standard indexing rod and the graphite dummy element.

II INSPECTING A STANDARD FUEL ELEMENT

1) Insert the fuel element into the GO-NO-GO guage using fuel-handling tool. If the element passes freely through the gauge, it is within allowable straightness tolerance; if not, the element has a bow or swelling in excess of 0.062 inch (1.57 mm).

CAUTION

Never force or drop a fuel element through the GO-NO-GO gauge. To do so could possibly damage the gauge, rupture the cladding or jam an element in the gauge. To pass the bow and swelling test the element should pass through the GO-NO-GO gauge while being slowly lowered into a seated position.

2) After the straightness test, remove the fuel-handling tool and place the standard indexing rod on the upper surface of the cladding can so that the forks on the indexing rod straddle the triflute of the fuel element. The mark on the indexing rod must line up with the mark on the flat surface of the fuel-element inspection tool.

3) Read the dial-indicator and record the reading.

4) Repeat Step 2 twice, rotating the fuel element 120 degrees each time.

NOTE

If the fuel element being inspected is of the Mark III variety, the fuel-handling tool must be used to lift the fuel element before rotation so that the fins on the lower end fixture of the fuel element clear the forks at the lower end of the fuel-element inspection tool.

5) Average the three dial-indicator readings and add this average algebraically to the length of the graphite dummy element; the result is the length of the fuel element inspected.

6) Remove the standard indexing rod and the fuel element.

III INSPECTING INSTRUMENTED FUEL ELEMENTS

1) Zero the dial-indicator with the graphite dummy element and special indexing rod as in Section I.

2) Utilizing the 1/2 inch aluminum tubing or 5/8 inch stainless steel tubing that houses the thermocouple leads place the instrumented fuel element in the GO-NO-GO gauge as in II 1) above.

3) Test for straightness as in II) above.

4) Place the special indexing rod on the upper lip of the cladding can so that the "Vee" in the indexing rod fits over one of the corners of the triflute.

5) Read the dial-indicator and record the reading.

6) Repeat Steps 4 and 5 twice, lifting the instrumented fuel element up about six inches and rotating at 120 degrees each time.

7) Average the three dial-indicator readings and add this average algebraically to the length of the graphite dummy element; the result is the length of the instrumented fuel element.

8) Remove the special indexing rod and the instrumented fuel element.

Approved: KSU Reactor Safeguards Committee

N. Dean Eckhoff

N. D. Eckhoff, Chairman

27 January 1978

Date