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**Pacific Northwest Laboratory
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OPERATING LIMITS HANFORD PRODUCTION REACTORS

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IRRADIATION PROCESSING DEPARTMENT
GENERAL ELECTRIC
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August 28, 1963

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OPERATING LIMITS - HANFORD PRODUCTION REACTORS
HW-76327 RD REV3

Ref: HW-76³27 RD Rev 2, "Operating Limits - Hanford Production Reactors," and Cover Letter, May 21, 1963.

The attached document is the second draft of the Operating Limits which has been transmitted to a wide Company distribution. This issue, which reflects your comments on the first draft (the reference document), has been tentatively approved by the local Commission engineers. It is intended that this be the final draft for comment by the various Company organizations which will be affected by the approved Operating Limits document.

In discussion with persons responding to the reference draft, we attempted to come to reasonable agreements as to changes which would be appropriate. It is believed that this draft reflects those oral agreements; however, it is realized that there may be exceptions because of subsequent conflicts or because no firm agreement was reached in the discussions. Therefore, it is suggested that in reviewing this draft, you also compare the various Limits with your comments on the previous draft.

It is believed that application of these mandatory Limits will not require any significant change in current operating practices. Limits which you believe would restrict current operating practice or which you believe could result in an "undue hazard" should be pointed out in your comments.

You are requested to direct your written or oral comments and questions to me as soon as practical. If we do not hear from you by September 18, it will be assumed that you concur with the provisions of this draft. We will respond to your comments prior to formal issuance of the Operating Limits to the Commission for their approval.

Process and Reactor Development
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HANFORD PRODUCTION REACTORS

By the

Research and Engineering Operation
IRRADIATION PROCESSING DEPARTMENT

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HANFORD PRODUCTION REACTORS

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OPERATING LIMITS
HANFORD PRODUCTION REACTORS

I. FACILITY IDENTIFICATION

These Operating Limits shall be applicable to the eight operating production reactor facilities, namely B, C, D, DR, F, H, KE and KW (hereinafter referred to as the Hanford Production Reactors), located at the Hanford site in the State of Washington.

II. REFERENCES TO DESCRIPTION OF FACILITIES

Basic descriptions of the reactor facilities are contained in the following early HAP0 reports.

HDC-2225, C-431-B Scope Document, 105-C Reactor Plant, E. L. Hollister, 6-1-51.

HDC-2524, Basic Design Specifications for "X" File No. 1.10 (Twin K Reactors), G. M. Roy, 3-11-52.

HW-44708, Vol. I Rev., Hazards Summary Report, Projects CG-558 and CG-600 Reactor Plant Modifications, R. E. Trumble, 3-6-57.

HW-44708, Vol. II, Hazards Summary Report, Projects CG-558 and CG-600 Reactor Plant Modifications, R. E. Trumble, 12-21-56.

Hazards Summary Reports for all existing Hanford Production Reactors have been updated and revised, and provide more complete descriptions of the process and facilities than contained in the above. These reports are as follows:

HW-74094, Hazards Summary Report - Six Oldest Hanford Reactors
Vol. 1 - Hazards Evaluation and Accident Analysis
Vol. 2 - Process Control and Technical Data
Vol. 3 - Description of the Plants

HW-74095, Hazards Summary Report - Hanford K Reactors
Vol. 1 - Hazards Evaluation and Accident Analysis
Vol. 2 - Process Control and Technical Data
Vol. 3 - Description of the Plants

None of the above reports is to be considered a part of these Operating Limits.

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III. OPERATING AND PERFORMANCE RESTRICTIONS

A. Operating Parameter Limitations

1. Process tube outlet temperatures during steady state operating conditions shall not exceed 150 C, or the instability temperature less 10 C, whichever is lower.
2. Process tube outlet temperatures during shutdown conditions shall not exceed 95 C. Coolant may be removed from process tubes during shutdown conditions as required for fuel discharge or maintenance purposes. Such interruptions to coolant flow shall be limited to time and duration such that there will be no melting of either fuel cladding or bond material.⁽¹⁾
3. Operating practice shall be to limit the maximum bulk outlet temperature during steady state operating conditions to 95 C. Operation shall be such that during steady state operation normal power level oscillations and uncertainties in temperature measurements shall not result in the bulk outlet temperature exceeding 97 C.
4. Operating practice shall be to limit the maximum power levels of the reactors during steady state operating conditions to the following values:

<u>Reactor</u>	<u>Power Level Limit - MW</u>
B, D, DR, F, H	2090
C	2310
KE, KW	4400

Operation shall be such that during steady state operation normal power level oscillations and uncertainties in flow and temperature measurements shall not result in the power levels exceeding the above values by more than three per cent.

⁽¹⁾ The melting temperature of aluminum is 660 C and of the "Al-Si" bond material is 580 C.

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5. The calculated fuel surface heat flux during steady state operation shall not exceed 70 per cent of heat transfer burnout, based upon established burnout correlations.
6. Operating practice shall be to limit the maximum linear rate of power rise to 15 per cent per minute of the steady state power level limit as determined from Item 4. Operation shall be such that the linear rate of power rise shall not exceed 25 per cent per minute of the steady state power level limit as determined from Item 4.
7. The startup period shall not be less than ten seconds.

B. Reactivity Limitations

1. The potential reactivity of the water-cooled loading⁽²⁾ shall not exceed 5 per cent in the B, D, DR, and F Reactors and 6 per cent in the C, H, KE, and KW Reactors.
2. The minimum control margin for the water-cooled reactor shall be as follows:

a. Operating Control

B, C, D, DR, F, and H Reactors

The operable vertical rod system shall be capable of inserting control equivalent to 2.0 per cent $\Delta k/k$ of reactivity poisoning.

KE and KW Reactors

The operable vertical rod system shall be capable of inserting control equivalent to 1.5 per cent $\Delta k/k$ of reactivity poisoning.

An operating amount of control shall be available from the Ball 3X System should the vertical rod system fail to function.

b. Shutdown Control

B, C, D, DR, F, and H Reactors

The reactor shall be maintained at least 2.0 per cent $\Delta k/k$ subcritical during shutdown conditions; for a maximum period of two hours immediately

(2) The water-cooled loading as used here specifically excludes control rods and poisons in supplementary control devices.

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following the shutdown action, the shutdown margin may be 2.0 per cent $\Delta k/k$ less the gain in reactivity from cooling the fuel from operating to shutdown status.

KE and KW Reactors

The reactor shall be maintained at least 1.5 per cent $\Delta k/k$ subcritical during shutdown conditions; for a maximum period of two hours immediately following the shutdown action, the shutdown margin may be 1.5 per cent $\Delta k/k$ less the gain in reactivity from cooling the fuel from operating to shutdown status.

c. Operating Readiness Control(3)

B, C, D, DR, F, and H Reactors

There shall be 2.0 per cent $\Delta k/k$ of control available from the vertical rod system or the reactor shall be 2.0 per cent $\Delta k/k$ subcritical.

KE and KW Reactors

There shall be 1.5 per cent $\Delta k/k$ of control available from the vertical rod system or the reactor shall be 1.5 per cent $\Delta k/k$ subcritical.

C. Control and Safety Systems

1. VSR System

- a. The maximum allowable response time of the No. 1 Safety System to a

(3) This control requirement is permissible and may supersede (b) above only when the top-of-the-riser pressure is not less than 45 psig, coolant continuity is normal for operating conditions, and the Ball-3X System is operable.

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Panellit system or high level fluxmonitor trip shall be 3.0 seconds.

The response time to any other trip event actuating the No. 1 Safety System shall not exceed 3.5 seconds. The response time is defined as the interval between the trip event and 90 per cent downward travel of the Vertical Safety Rods.

- b. The maximum allowable insertion time of the vertical rods shall be 2.8 seconds. Rod insertion time is defined as the interval between first movement and 90 per cent insertion.
- c. The minimum number of operable Vertical Safety Rods during operating conditions shall be as follows:

<u>Reactor</u>	<u>Minimum Number of Operable Vertical Safety Rods</u>
B,D,DR,F	22
H,C	35
KE,KW	35

The outer six rod channels at the K Reactors are not considered as part of the Safety System. There shall be no more than one inoperable rod adjacent to another inoperable rod at the B, D, F, KE and KW Reactors. There shall be no more than one inoperable rod adjacent to two inoperable rods at the C, DR, and H Reactors; no more than one of three adjacent inoperable rods shall be a peripheral rod.

- d. The reactivity insertion rate afforded by Vertical Safety Rod withdrawal shall be limited to less than .035 per cent per second for a cold startup.
- e. The reactivity insertion rate afforded by Vertical Safety Rod withdrawal shall be limited to less than .30 per cent per second for a hot startup.

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2. Horizontal Control Rods

- a. The reactivity insertion rate afforded by Horizontal Control Rod withdrawal shall be limited to less than 0.05 per cent per second.
- b. A Horizontal Control Rod shall be replaced when its calculated control effectiveness is reduced by more than ten per cent due to poison burnout.

3. Ball-3X System

Balls with a maximum diameter of 0.5 inch shall be available for insertion into the Vertical Safety Rod channels.

The effective average macroscopic 20 C neutron cross section of the balls insertable in each channel shall not be less than 2.4 cm^{-1} . The minimum number of operable Ball-3X columns shall be as follows:

<u>Reactor</u>	<u>Minimum Number of Operable Ball-3X Columns</u>
B,D,DR,F	22
H,C	35
KE, KW	35

An operable column is one which is insertable by a manual trip from the control room and by an automatic trip during operating conditions. There shall be no more than one inoperable column adjacent to another inoperable column at the B, D, F, KE, and KW Reactors. There shall be no more than one inoperable column adjacent to two inoperable columns at the C, DR, and H Reactors; no more than one of three adjacent inoperable columns shall be a peripheral column.

4. Supplementary Control Devices

Solid materials used in supplementary control devices, such as poison

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splines, poison column control facilities, or supplementary control columns may be used to facilitate reactor operating control and may be utilized in satisfying shutdown margin and Total Control requirements. Supplementary control devices which are used for nuclear safety purposes shall have lost a calculated control effectiveness due to burnout of not more than ten per cent. During operating conditions reactivity insertion increments with supplementary control devices shall not exceed 0.2 per cent, and the rate of reactivity insertion for two or more increments, including the time to effect such increments and the time interval between increments, shall not exceed 0.01 per cent per second.

D. Reactor Fuel Loadings

1. Production Scale Loads

Production scale fuel loads shall consist of fertile and/or fissionable material supplemented with enriched uranium fuel containing not more than 0.96 per cent U-235. The fuel elements shall be metallic uranium enclosed in metallic aluminum cans. Production scale fuel loads which have not previously been approved for irradiation shall not be utilized in the reactors without prior approval of the General Electric Company and the Commission.

2. Test Scale Loads

Test scale fuel loads shall be limited in size such that the additional potential reactivity of the test load could not cause an increase of more than one per cent in the gross pile reactivity.

3. Blanket Loadings

It shall be permissible to load the two lattice units adjacent to the reflector with enriched lithium-aluminum poison pieces, and to provide

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additional enriched columns of 0.96 per cent U-235 to supply reactivity for reactor operation.

E. Coolant Requirements with Irradiated Fuel in the Reactor

1. During shutdown conditions the minimum flow shall be 1000 GPM at the B, C, D, DR, F, and H Reactors and 2000 GPM at the K Reactors, and there shall be a positive pressure differential on all tubes containing irradiated fuel.
2. Coolant water shall be available from reservoirs during reactor operation to provide full normal flow for 15 minutes and a minimum of 24 hours of shutdown cooling including the shutdown transient.⁽⁴⁾
3. Each reactor shall have three independent, reliable sources of coolant supply as follows:

a. Primary Cooling System

The primary cooling system shall be designed to:

- 1) Be capable of providing adequate process channel cooling during all phases of normal reactor operation.

b. Secondary Cooling System

The secondary cooling system shall be designed to:

(4) Applicable water storage requirements at each of the reactors for flow conditions in July, 1963 were as follows:

	Water Storage - 10 ⁶ Gallons		
	<u>B, D, DR, F, H</u>	<u>C</u>	<u>KE, KW</u>
Full normal flow for 15 minutes	1.36	1.58	3.15
24 hours of shutdown cooling including the shutdown transient	<u>6.35</u>	<u>7.16</u>	<u>13.05</u>
TOTAL	7.71	8.74	16.20

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- 1) Be capable of providing adequate process channel cooling indefinitely immediately following a reactor scram from full level, assuming loss of power to the primary cooling system. The minimum demonstrated flow of this system shall be as follows:

<u>Reactor</u>	<u>Minimum Flow (GPM)</u>
B,D,DR,F,H	20,000
C	25,000
KE,KW	50,000

- 2) Be independent of both the primary and the last ditch cooling systems.

c. Last Ditch Cooling System

- 1) B, D, F, and H Reactor Areas:

The last ditch cooling system shall be designed to be capable of providing post-transient shutdown flow requirements indefinitely to any reactor area assuming loss of power to the primary cooling system at all reactor areas and concurrent loss of flow from the secondary cooling system at any one of the reactor areas.

- 2) K Reactor Area

The last ditch cooling system shall be designed to be capable of providing post-transient shutdown requirements indefinitely to any reactor assuming loss of power to the primary cooling system at both K Reactors and concurrent loss of flow from the secondary cooling system at any one K Reactor.

- 3) The minimum demonstrated flow of the last ditch system shall be:

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<u>Reactor</u>	<u>Flow (GPM)</u>
B,D,DR,F,H	9,500 from the high tanks and 5,000 from the export system when the high tank supply is exhausted.
C	12,000 from the high tanks and 6,000 from the export system when the high tank supply is exhausted.
KE,KW	30,000

- 4) The last ditch system shall be independent of both the primary and secondary cooling systems, including piping to the reactor coolant manifold.

All three coolant supply systems shall be in service during operating conditions, except that the export portion of the last ditch system may be unavailable for a maximum of two hours.

Two of these systems shall be in service during shutdown conditions.

The following definitions are appropriate for the interpretation of this specification:

- a. Systems are independent of each other if failure or cause of failure in one system cannot induce failure of another system. In addition, failure of any single component within a system shall not be capable of rendering the system inadequate. In practice, common use of selected valves, pumps, and piping may be qualified as exceptions in meeting the requirements of this specification.
- b. Adequate cooling is defined, as a minimum, as that required to maintain reactor process channel components below the melting point of the fuel bond or jackets.

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4. The reactor shall be shut down upon loss of primary coolant.
5. Emergency power shall be supplied by:
- a. Coal-fired boilers supply steam to turbines driving coolant supply pumps at the B, C, D, DR, F, and H Reactors. The demonstrated maximum firing rate of each of these boilers shall be at least 100,000 pounds of steam per hour. The minimum number of fired boilers shall be as follows:

<u>Reactor Area</u>	<u>Two Reactors Operating</u>	<u>One Reactor Operating</u>	<u>No Reactors Operating</u>
B, D	3 on line	2 on line ⁽⁵⁾	1 on line and 1 banked
F, H	---	2 on line	1 on line and 1 banked

- b. Oil-fired boilers supply steam to turbines driving electrogenerators and a pump at the K Reactors. The demonstrated maximum steaming rate of each of these boilers shall be at least 50,000 pounds of steam per hour. For each K Reactor, at least two boilers shall be on the line⁽⁶⁾ during operating conditions and one on the line during shutdown conditions. The last ditch coolant flow shall be provided for the K Reactors by an independent diesel powered pumping station.

F. Reactor Confinement

Normal practice at each reactor shall be to operate with a confinement system.

This system shall be designed primarily for the removal of particulate

(5) At the B, D, F, and H Reactor Areas a boiler must be supplying steam at a rate of not less than 20,000 pounds per hour to be considered as "on line".

(6) At the K Reactor area a boiler must be supplying steam at a rate of not less than 12,000 pounds per hour to be considered as "on line".

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fission products and halogens from the ventilation exhaust air which might be released as a result of a minor accident such as burning of a few fuel elements. The system shall consist of a ventilation system and a fog spray system.

Exhaust air from the reactor building shall pass through the ventilation system filters; normally a minimum of one bank of filters shall be on the line during all phases of operation. The filter cells shall have demonstrated a capability of removing at least 90 per cent of the halogens and 95 per cent of the particulates.

Normal practice shall be to maintain, as a minimum, one exhaust fan⁽⁷⁾ on the line and one available as backup. Power to the backup fan shall be steam at the B, C, D, DR, F, and H Reactors and direct-drive diesel motors at the KE and KW Reactors. These diesel motors shall have sufficient fuel available to operate for a minimum of five days.

The fog spray system shall discharge from the top of the rear face area, shall have a minimum demonstrated flow rate of 400 gallons of water per minute, and shall be activated either automatically by an increase in the I^{131} content in the exhaust air or manually.

(7) The ratings of the exhaust fans at the reactors are as follows:

<u>Reactor</u>	<u>Flow, cfm</u>	<u>Exhaust Fan Head Inches</u>
B, D, F	50,000	10-1/2
DR	42,500	11
C, H	75,000	11
KE, KW	67,500	11

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G. Test Facilities

Irradiation Test Facilities installed in the Hanford Production Reactors shall be operated in accordance with the Administrative procedures described in Section IV agreed to by the General Electric Company and the Commission.

H. Code Compliance

Wherever applicable in the design, procurement, construction, alteration, maintenance, and operation of plant facilities, the intent of national codes and standards shall be observed as minimum standards to the extent required in Engineering Standards adopted by the General Electric Company and in use at the Hanford Atomic Products Operation. In those cases where national codes and standards are not applicable, the design, procurement, construction, alterations, maintenance and operation shall be guided by safe and uniform designs consistent with the use intended and with sound engineering principles.

I. Safety Instrumentation and Set Points⁽⁸⁾

Nuclear and process control instrumentation shall be provided to shut down the reactor automatically when certain process limits are exceeded. The following specifies the instrumentation and trip set points for each function which is required to shut down the reactors automatically.

1. Neutron Flux Level

Approach to critical shall be monitored by at least one neutron flux monitor which is sensitive to a fission-induced power level of 500 watts or less.

(8) Safety circuit activation shall result in automatic control action as follows:

- a. No. 1 Safety Circuit - insertion of Vertical Safety Rods.
- b. No. 2 Safety Circuit - insertion of Horizontal Control Rods.
- c. No. 3 Safety Circuit - insertion of poison balls into the Vertical Safety Rod channels (Ball-3X System).

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Exceeding power trip settings on two out of a minimum of three flux monitors, failure of two monitors, failure of one monitor and exceeding the power trip setting on one monitor, or fewer than three flux monitors in the safety circuit, shall actuate the No. 1 Safety Circuit. During operating conditions with no process tube outlet temperature in excess of 80 C, power trip settings on three safety channels shall be no more than two decades above the operating signal, or 120 per cent of the expected signal at full operating power, whichever is lower; with process tube outlet temperatures in excess of the 80 C, the power trip setting shall not exceed the following values:

<u>Maximum Process Tube Outlet Temperature (°C)</u>	<u>Trip Setting - % of Operating Signal</u>
80 - 90	150
90 - 100	140
100 - 110	130
Above 110	120

2. Low Reactor Coolant Pressure

A No. 1 Safety Circuit trip shall result when process water riser pressure drops below normal operating pressure more than 60 psig. Trip of the flow detection device for individual process channels as noted under item 4, "Process Channel Coolant Adequacy", shall provide this protection.

3. Rapid Loss of Reactor Coolant Pressure

A No. 3 Safety Circuit trip shall result when a process water pressure decay rate from operating conditions is sustained which is greater than 40 psig per second for a total pressure loss exceeding 300 psig. The system may be manually bypassed for repair or for resetting trips.

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4. Process Channel Coolant Adequacy

All process channels containing fuel materials shall be equipped with pressure sensing flow detection devices. Trip points actuating the No. 1 Safety Circuit shall be set such that flow reductions and/or power level increases in individual process tubes will result in reactor shut down prior to melting of fuel bond or jackets. The operating pressure span between the high trip and the low trip shall not exceed 100 psig. These flow detection devices may also be used to actuate the No. 1 Safety Circuit for the condition of low reactor coolant pressure. Normal operating practice will permit bypassing individual pressure monitor trips when the coolant pressure or exit temperature of the affected channel is under continuous surveillance. The system shall not be bypassable when the reactor power level exceeds approximately 0.1 per cent of the normal operating power level.

5. Earthquake

Seismoscopes at each reactor shall be set to trip upon detection of an earthquake having an intensity of four on the Modified Mercalli Scale. Exceeding trip settings on two out of two or more seismoscopes shall actuate the No. 1 Safety Circuit. The system may be manually bypassed for repair or for resetting trips.

6. Electrical Power Loss

Loss of primary electrical power shall actuate the No. 1 Safety Circuit.

7. In-Reactor Test Loops

Special procedures shall be provided for operation of in-reactor test loops. Instrumentation and set points will be variable depending on

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function and complexity of the loop. Set points will be provided to shut down the reactor under conditions established by Administrative Procedures.

J. Control Criteria for Hanford Production Reactors

Reactivity and operating limitations imposed by the Total Control and the Speed-of-Control criteria will be applicable when more restrictive than other limits specified in the Operating and Performance Restriction.

1. Total Control Criterion

The operation of the Hanford reactors shall be such that in the event of any credible combination of events, and including complete and permanent loss of coolant, the total control strength will be sufficient to ensure that no reactivity state will develop which would significantly increase the consequences of the accident.

2. Speed-of-Control Criterion

The operation of the Hanford reactors shall be such that in the event of a power excursion resulting from any credible combination of events, and including complete and permanent loss of coolant, the response of the reactor safety control system will be sufficient to ensure that no energy state will develop during the excursion which would significantly increase the consequences of the accident.

IV. ADMINISTRATIVE PROCEDURES

The General Electric Company shall establish and place into effect specifications, process controls, reviews, approvals, and other administrative procedures designed to assure safety of the reactor process during all phases of reactor operation. These procedures shall include the following:

A. Process Control Procedures

The General Electric Company shall establish and maintain in force a system of administrative control of reactor operation including the eight features

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as defined below. These control methods shall include written technical and operating guides directed toward safety of the reactor process during all phases of reactor operation. The procedures or limitations developed shall not be less restrictive than the limitations imposed by the Operating and Performance Restrictions, and they shall not authorize operation under conditions which involve an Unreviewed Safety Question.

1. Process Standards

The Process Standards are mandatory written instructions, prepared by an independent component having no line responsibility for reactor operation or production efficiencies. The Process Standards specify, for the reactor process and vital auxiliary plants, the process limits, conditions, and materials where such specification is necessary to safeguard against nuclear hazards.

2. Equipment Maintenance Standards

The Equipment Maintenance Standards are mandatory written instructions, prepared by an independent component having no line responsibility for reactor operation or production efficiencies. The Equipment Maintenance Standards specify, for the reactor process and vital auxiliary plants, the equipment and component specifications, methods and frequency of performing functional tests, and maintenance procedures where such specification is necessary to safeguard against nuclear hazards.

3. Process Change Authorization

The Process Change Authorization is a method of providing for reactor operation under temporary waiver of Process Standards when, in the best judgment of qualified and responsible technical and operating personnel;

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such deviation will not result in increased hazard. Copies of Process Change Authorizations involving nuclear hazards are transmitted to the Commission for information.

4. Production Test Authorization

A test which has the prime objective of developing engineering or technological data may be conducted under a Production Test Authorization. Such tests may be conducted outside the conditions authorized by Process Standards or Equipment Maintenance Standards. Authorizing documents describe the risks and hazards involved in the test so that formal approval by the technical and operating components signify that the risks are known, understood and reasonable. Copies of Production Test Authorizations involving nuclear hazards are transmitted to the Commission for information immediately upon issuance.

5. Process Improvement Transition Authorization

A test which has the prime objective of piloting the application of knowledge or techniques to the reactors on a large scale may be conducted under a Process Improvement Transition Authorization. Such tests may be conducted outside the conditions authorized by Process Standards or Equipment Maintenance Standards, and require authorization similar to Production Test Authorizations. Copies of Process Improvement Transition Authorizations involving nuclear hazards are transmitted to the Commission for information immediately upon issuance.

6. Development Test Authorization

Development work utilizing reactor facilities which can be accomplished without deviation from Process Standards or Equipment Maintenance Standards

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is permitted under a Development Test Authorization. Authorization requirements are similar to those for Production Test Authorizations.

7. Authorizations for Facility Modifications

Major modifications to the plant facilities may be accomplished under the provisions of a Project Authorization, and minor modifications may be accomplished under a Design Change. When modifications require changes in the Operating Limits or involve an Unreviewed Safety Question, copies of the authorizing document shall be transmitted to the Commission for final authorization.

8. Standard Operating and Maintenance Procedures

Methods, procedures, and check lists for process operations with nuclear hazard potential are prepared and approved by the components having line responsibility for the operation to ensure that execution of maintenance work, process functions, inspections, functional tests of critical equipment, reactor startup preparations, and reactor operations are conducted in accordance with Process Standards and Equipment Maintenance Standards. Special operating and maintenance procedures are provided for in-reactor test facilities.

B. Operator Certification Programs

The General Electric Company shall maintain a program under which qualified employees will receive formal certification that they have the required capabilities, skills and job knowledge to operate or supervise the operation of the control console of a Hanford Production Reactor. The requirements for certification shall include the following:

- 1) The employee must meet physical and general health requirements, and

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- 2) The employee must possess the required reactor knowledge and operating capability as indicated by his performance and successful completion of examinations which will be administered by the General Electric Company.

C. Audits and Inspection of Reactor Operating and Maintenance

The General Electric Company shall maintain in force organizational and procedural arrangements which provide for frequent and periodic checks of (1) degree to which the facilities are operated in accordance with the limits specified in the Process Standards, (2) facility maintenance, particularly in those areas of equipment and components critical to reactor safety as specified in the Equipment Maintenance Standards, and (3) adequacy of training of reactor operators and maintenance personnel.

The General Electric Company shall also provide for investigation of any unusual or unpredicted reactor conditions which might affect safe reactor operation, such investigation to be by a competent body of the General Electric Company including personnel not having direct responsibility for operation or maintenance of the facility in question.

D. Reports and Records

In addition to those otherwise provided within these Specifications the General Electric Company shall make the following reports:

1. The General Electric Company shall immediately report to the Commission in writing any change in the physical or operating characteristics of the Hanford Production Reactors that might affect the safe operation of the reactors.
2. The General Electric Company shall advise the Commission in writing of

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changes, tests, or experiments involving nuclear safety, judged to be of informational interest to the Commission.

3. The General Electric Company shall transmit to the Commission an annual report of operating experience pertinent to reactor safety.
4. The General Electric Company shall maintain records for demonstrating compliance to procedures and limitations within the Operating Limits.

V. AUTHORIZATION FOR CHANGES

- A. The Hanford Production Reactors shall be operated by the General Electric Company in accordance with the Operating and Performance Restrictions and the Administrative Procedures as defined in these Operating Limits.
- B. The General Electric Company may (1) make changes in the reactor facilities, (2) make changes in the procedures described herein, and (3) conduct tests or experiments utilizing the reactor facilities, provided the change, test, or experiment does not involve a change in the Operating and Performance Restrictions, and does not involve an Unreviewed Safety Question.
- C. A proposed change, test, or experiment shall be deemed by the General Electric Company to involve an Unreviewed Safety Question (1) if the probability of occurrence of a type of accident analyzed in the referenced Hazards Summary Report may be significantly increased; or (2) if the consequences of any type of accident analyzed in the referenced Hazards Summary Reports may be significantly increased; or (3) if such change, test, or experiment may create a credible probability of a nuclear accident of a different type than any analyzed in the referenced Hazards Summary Report.
- D. If a proposed change, test, or experiment involves an Unreviewed Safety Question, or involves a change in the Operating and Performance Restrictions

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as defined in these Operating Limits, it may not be carried out unless authorized by the Commission and approved by the General Electric Company. The General Electric Company shall submit a written request to the Commission for such an authorization, accompanied by an appropriate hazards report with respect to any change, test, or experiment which must be authorized. The Commission may approve such change, test, or experiment, and in such case shall so notify the General Electric Company in writing.

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