R-42
2/78

REVISION 0

APPROVED: MANAGER RADIOACTIVE PRODUCTS AND SERVICES; DATE: 11/5/81

REVIEWED: ☐ MGR. SG; ☒ MGR. NST 11.4.81; ☒ MGR. 11/5/81; ☐ INDUST. SAFETY

REVIEWED: ☒; ☒ MGR. RHO 11/4; ☒ ANALYST 11/4

REVISION: ☒ NO ☐ YES; MGR. EE; MGR. IPM 11/4/81; MGR. PD&S

CHAPTER: X. PROCESSED ISOTOPE PROCEDURES

SECTION: B. Radiation Exposure Test

FOIA-84-863

(G3)

1. Purpose

To describe the method for conducting radiation exposure tests on materials, devices, components or assemblies.

2. Equipment

a. Dose rate probe and meter
b. Interlock table
c. Plastic bag or sheet
d. Tape
e. Smears
f. Co-60 source and holder
g. Yardstick
h. Thermometer, Weston, Dial Type, °F
i. Sealed container for enclosing test item

3. Special Requirements

a. The Co-60 source used for the radiation exposure should be cleaned to remove loose contamination before each use to minimize transfer of radioactive contamination into the testing area.
b. Care should be taken to avoid contaminating materials, devices, components or assemblies to be exposed.
c. The "Radiation Exposure Test Data Sheet," IPM 180 is a permanent test record. All critical steps should be initialed and verified by a second individual. The completed checksheet must be signed by the Responsible Engineer.
d. The "Radiation Exposure Test Configuration," IPM 190, is a permanent test record. The completed form must be signed by the Responsible Engineer.

4. Procedure

a. Receive the item for radiation exposure and visually examine for physical condition based on criteria provided by the requestor.

b. If the item appears defective or does not meet criteria above, contact the Responsible Engineer.

c. If the item is satisfactory, completely enclose in a plastic bag or sheet using tape to completely seal the item to prevent contamination. If a sealed container is available, place the item securely in the container and seal, in lieu of sealing in plastic.

d. Transfer the work table, yardstick, and thermometer into the designated cell interlock. Clean the interlock manipulator fingers and boots.

e. Close the outer door. Clean the Co-60 source and holder and transfer onto the interlock table.

f. Position the Co-60 source relative to the expected location of the test item as defined by the Responsible Engineer.

g. Take dose rate readings with the dose rate probe and meter at various distances from the Co-60 source to establish the source to test item distance required for the test as defined by the Responsible Engineer.

h. Place the test item or sealed container
onto the table in the location determined in step g.

i. Measure the source to test item distances and record on the "Radiation Exposure Test Configuration Record," IPM 190. Record the exposure starting time on the "Radiation Exposure Data Sheet", IPM 180.

j. Take dose rate readings at various positions on the test item as shown on the "Radiation Exposure Test Configuration Record", IPM 190. Record the readings on the "Radiation Exposure Test Data Sheet".

k. Calculate the average dose rate on the test item and the time necessary to reach the radiation exposure requested.

l. Measure the ambient temperature near the test item and record on the "Radiation Exposure Data Sheet".

m. Repeat the temperature measurement daily as appropriate and record on the data sheet.

n. Continue the radiation exposure for the time calculated. Visually examine the test periodically to assure the test is proceeding as planned.

o. When the total radiation exposure is reached, remove the Co-60 source and place in storage. Record the time the exposure was stopped. Calculate the actual average radiation exposure of the test item and record on the data sheet.

p. Survey equipment for contamination. Remove the equipment from the interlock. Take the test item to a clean controlled area and carefully remove the plastic covering or remove item from the sealed container.

q. Take a smear of the test item, clean as appropriate and have the item released by Nuclear Safety for shipment.

r. Visually examine the test item for radiation damage compared to the condition upon original receipt. Record observations on the "Radiation Exposure Data Sheet".

s. Complete and initial all data records. Return to the Responsible Engineer for his approval.

t. Store the other test equipment and clean the work area.

RADIATION EXPOSURE TEST DATA SHEET

TEST ITEM: ______________________________

DRAWING NO.: ______________ ______________

ITEM SERIAL NO.: ______________ LOT NO.: ______________

REQUESTED RADIATION EXPOSURE: ______________________________

REQUESTOR: ______________ ______________ COMPONENT ______________

RECEIVING VISUAL EXAMINATION: ______________________________

____

DATE: ______________ BY: ______________

TEST EQUIPMENT

DOSE RATE METER: ______________ SERIAL NO.: __________ CALIB.DATE: __________

DOSE RATE PROBE: ______________ SERIAL NO.: __________ CALIB.DATE: __________

THERMOMETER TYPE: ______________________________

COBALT-60 SOURCE: ______________ CURIES

EXPOSURE START TIME: ______ DATE: ________ BY: __________ VERIFIED: __________

		Position Dose Rate, R/Hr										
Date	Time	A	B	C	D	E	F	G	H	I	J	Avg
1.												
2.												
3.												

DOSE RATE MEASURED BY: ______________ VERIFIED: ______________

AMBIENT TEMPERATURE: __________ °F TIME: ______ DATE: ________ BY: ______________

AMBIENT TEMPERATURE: __________ °F TIME: ______ DATE: ________ BY: ______________

AMBIENT TEMPERATURE: __________ °F TIME: ______ DATE: ________ BY: ______________

EXPOSURE COMPLETED TIME: ________ DATE: ________ BY: __________ VERIFIED __________

ACTUAL EXPOSURE TIME. ______ hrs AVERAGE DOSE RATE: ______ R/hr TOTAL EXPOSURE: ______ R

FINAL ITEM SMEAR: ________ Counts per Minute BY: ______________

POST TEST VISUAL EXAMINATION: ______________________________

____

DATE: ______________ BY: ______________

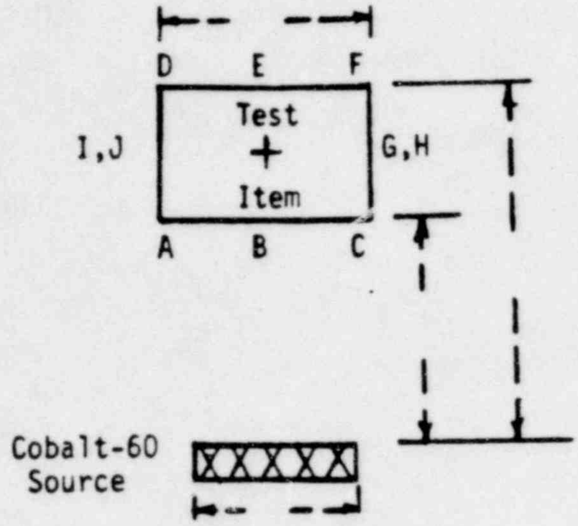
DATA REVIEWED AND APPROVED: ______________ DATE: ______________

Responsible Engineer

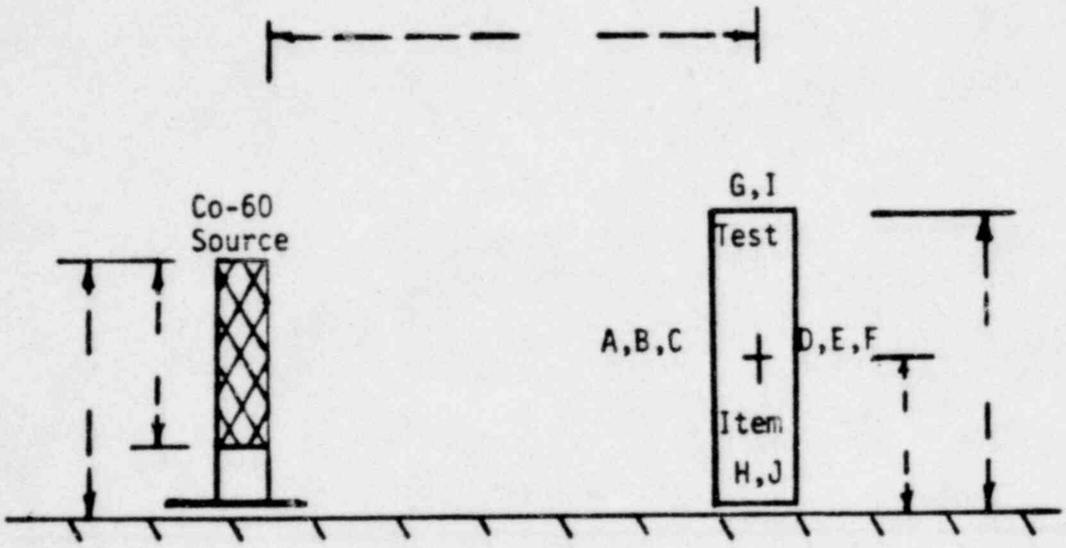
IPM 180
11/81

RADIATION EXPOSURE TEST CONFIGURATION

PLAN VIEW



SIDE VIEW



Test Item: ______________________________

Serial No.: ______________ Size: ______________

Measurements Taken By: ______________________ Date______________

Verified By: ______________________

IPM 190
11/81

January 12, 1979

cc: R. E. Butler
D. W. France
L. A. Hanson
T. J. Slosek

To: J. H. Cherb

Subject: COBALT-60 CALIBRATION STANDARDS

Standard "1A"

In August 1962, two cobalt wafers (1 centimeter diameter by 2 millimeters thick) were selected to establish a VNC Co-60 Standard. The activity in each wafer was measured by gamma scanning. One wafer was completely dissolved in acid. Accurate aliquots were counted by Radiochemistry to establish the Co-60 content of the dissolved wafer. The Co-60 content of the other wafer, retained as a standard, was calculated using the Co-60 value for the dissolved wafer and the ratio of the gamma scan activity in both wafers. The retained standard contained 81.1 curies on 9/6/62 and was identified as "1A". Use of this standard began in September 1962.

Standard "569"

A larger standard was assembled in June of 1964. Ten wafers (1 cm by 5 mm) were individually calibrated using Standard "1A" as a basis. The wafers were encapsulated into a configuration to simulate an "X" Series capsule. The activity of the assembly was measured by gamma scanning and by using an RHM rate meter. The assembly was identified as Standard "569". The Co-60 content of the assembly on 7/1/64 was 1,768 curies corresponding to 2,192 RHM. This standard was used from July 1964 until April 1972.

Standard "GET 20-47"

A new standard identified as "GET 20-47" was fabricated on August 31, 1970 using Standard "569" as a calibration base. This standard is a doubly encapsulated teletherapy source with an active diameter of 2 centimeters. The source was loaded with 5,361 curies of 1 mm x 1 mm pellets and calibrated at 5,960 RHM on 8/31/70. In 1971, this source was shipped to Brookhaven National Laboratory for certification of Co-60 content. BNL made six measurements in July 1971 using a calorimetry method. The results ranged from a high of 5,026 curies to a low of 4,795 curies

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Standard "GET 20-47" (continued)

... with an average of 4,881 curies as of September 1, 1971. Our input value decayed to 9/1/71 would be 4,702 curies; 3.7% lower than the BNL value but still within limits of measurement accuracy. The G.E. calibration value was not changed to agree with the BNL value, probably since our value was conservative (i.e. more product delivered than ordered). "GET 20-47" has been in use since 1972 for Co-60 calibration.

Standard "GET 20-48"

Another standard, "GET 20-48", was also fabricated on August 31, 1970 using standard "569" for a calibration basis. This standard is a doubly encapsulated teletherapy source loaded with 1 mm x 1 mm pellets having an active diameter of 2 centimeters. The source contained 1,454 curies of Co-60 on 8/31/70 and was calibrated at 1,695 RHM.

Brookhaven National Laboratory also calibrated this source in July 1971 using the calorimetry method. Their 5 measurements ranged from 1,349 to 1,305 curies averaging 1,325 curies on 9/1/71. Our input value decayed to 9/1/71 would be 1,275 curies which is 3.8% lower than BNL. The standard has been used since 1972 using the G.E. measured value.

Comparison with Industry

Over the years, there have been numerous comparisons with customers and other suppliers. Our calibrations were accurate as we do not have a history of deviations. The majority of these checks have not been permanently documented. The attached letter is one exception. Comparative values are tabulated below.

Date	Other Supplier	Co-60 Source Material	Difference - Supplier Value Compared to G.E. Measurement
August 1974	ICN	Teletherapy ICN-274	- 2.7%
August 1974	AOS	Teletherapy GET 20-47	- 4.9%
August	AECL	Teletherapy S1603	- 1.1%
May 1978	AECL	Bulk Co-60	- 1.2%

Product Calibration

The method of assaying Co-60 products is as follows:

Bulk Co-60 - A measured quantity of cobalt (usually 50 grams) in a fixed configuration is measured on a gamma dosimetry system. The standard is independently read with the same dosimetry system. The bulk Co-60 assay is calculated using the dosimetry value, probe factor from the standard source, and the conversion value of 1.24 RHM per curie.

Radiography, Process Irradiator, and Custom Sources - The assay calibration is based on input curies established by the bulk Co-60 method described.

Teletherapy - Products are delivered on the basis of output RHM. The fabricated source and standard are independently measured on the gamma dosimetry system. The source output is determined from its dosimetry value and probe factor derived from the standard source.

Conclusions

1. Calibration records do exist and have been compiled into a calibration file.
2. The G.E. calibration value is within 4% of calorimetry value measured by BNL and 1.2% of the AECL value.
3. The value used for Co-60 assay is within the accuracy specified on the product specifications.
4. The system used for measuring Co-60 appears to provide reasonable reliability.

R E Jones
R. E. Jones
Co-60 Product Manager

bjs

NUCLEAR ENGINEERING DIVISION
San Jose, California

March 9, 1981

TO: ALL NUCLEAR ENGINEERING DIVISION PERSONNEL

SUBJECT: ENGINEERING OPERATING PROCEDURES

The Nuclear Engineering Division is responsible for producing superior quality engineering designs for the Boiling Water Reactor Product line; assuring that high quality items of equipment are procured to meet technical, code and contract requirements; and conducting all phases of the irradiated processing business. This complex endeavor involves many people, long time intervals, sophisticated and changing technologies, substantial financial commitments, and numerous interfaces with other organizations both internal and external to the General Electric Company.

Success demands that we conduct our work in accordance with a disciplined and documented procedural system that includes clear assignment of responsibilities, well-defined requirements and interfaces, and appropriate management controls.

The Engineering Operating Procedures Manual establishes the basis for managing the engineering work for all organization components of the Nuclear Engineering Division except the Irradiation Processing Operation which is authorized to continue the procedural system now in place. In addition, Engineering Operating Procedures are applied by other Group organization components as prescribed in their individual procedures.

Due to the magnitude and diversity of our assigned scope, individual organization components within the Division required to comply with Engineering Operating Procedures may need supplementary administrative procedural documentation. Such documentation can be supportive to the Engineering Operating Procedures and can provide additional detail information for implementing assigned responsibilities and interfaces.

H. E. Stone

H.E. STONE, VICE PRESIDENT AND GENERAL MANAGER
NUCLEAR ENGINEERING DIVISION

FOIA-84-863

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FOREWORD

NUCLEAR ENGINEERING DIVISION
San Jose, California

January 10, 1983

TO: ALL NUCLEAR ENGINEERING DIVISION PERSONNEL

SUBJECT: ENGINEERING OPERATING PROCEDURES

The Nuclear Engineering Division is responsible for producing superior quality engineering designs for the Boiling Water Reactor Product line; and assuring that high quality items of equipment are procured to meet technical, code and contract requirements. This complex endeavor involves many people, long time intervals, sophisticated and changing technologies, substantial financial commitments, and numerous interface with other organizations both internal and external to the General Electric Company.

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H.E. Stone

H.E. STONE, VICE PRESIDENT AND GENERAL MANAGER
NUCLEAR ENGINEERING DIVISION

FOIA-84-863

(34)

NUCLEAR POWER SYSTEMS ENGINEERING DEPARTMENT MEMO

TO H. Ehsan J.S. Mokri R.L. Hughes

DATE January 11, 1983

FROM C.W. Dillmann

REQUIRED RESPONSE DATE

SUBJECT

FOR: ACTION ☐ DECISION ☐ INFORMATION ☐

There are several questions that have arisen which hopefully this memo will put to bed.

1) Margin on Aging - Margin on aging is not required except that necessary to account for instrument inaccuracy. For example, if your operating temperature is 200°F, calculate your accelerated temperature based on 200°F without margin. Further, suppose that the accelerated temperature is 300°F and you can only measure within ±5°F, then test at 305°F.

2) DBE must include operation at the performance extremes, i.e., voltage, amperage, etc. If this is not feasible, then justification and a suitable alternative must be provided.

3) DBE transients normally should have a double transient applied. There is a school of thought that one does not apply margin to the peak; however, Fig. 1, 323-75 shows margin applied. <u>We should apply margin therefore</u>.

Please see that everyone in your group, with a need to know, knows the above.

C.W. Dillmann, Manager
Reactor Assembly & Plant
Equipment Qualification
MC-712, X51842

eqn

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CC:

FOIA-84-863

G6

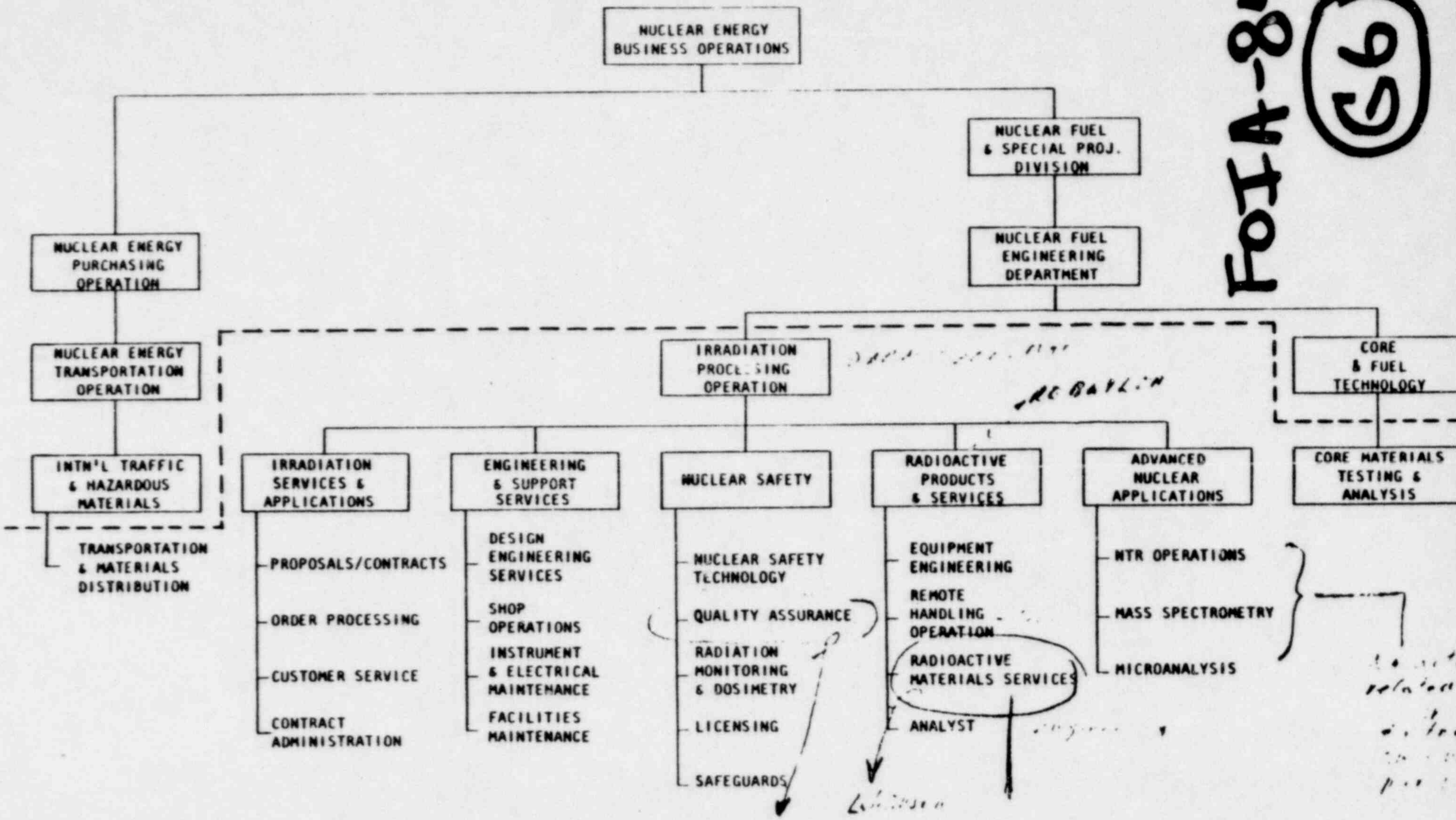

FIGURE 1-1. PARTIAL ORGANIZATION CHART

(OPERATIONS BELOW BROKEN LINE ARE REPRESENTED AT VALLECITOS NUCLEAR CENTER)

4/5/83

FEDERAL LAW CONCERNING THE REPORTING OF NONCOMPLIANCES AND DEFECTS IN PRODUCTS/SERVICES SUBJECT TO REGULATION BY THE NUCLEAR REGULATORY COMMISSION

SECTION 206 OF THE ENERGY REORGANIZATION ACT OF 1974, AS AMENDED, IS AS FOLLOWS:

(a) Any individual director, or responsible officer of a firm constructing, owning, operating, or supplying the components of any facility or activity which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended, or pursuant to this Act, who obtains information reasonably indicating that such facility or activity or basic components supplied to such facility or activity—

(1) Fails to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order, or license of the Commission relating to substantial safety hazards, or

(2) Contains a defect which could create a substantial safety hazard, as defined by regulations which the Commission shall promulgate.

Shall immediately notify the Commission of such failure to comply, or of such defect, unless such person has actual knowledge that the Commission has been adequately informed of such defect or failure to comply.

(b) Any person* who knowingly and consciously fails to provide the notice required by subsection (a) of this section shall be subject to a civil penalty in an amount equal to the amount provided by Section 234 of the Atomic Energy Act of 1954, as amended.

(c) The requirements of this section shall be prominently posted on the premises of any facility licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended.

(d) The Commission is authorized to conduct such reasonable inspections and other enforcement activities as needed to insure compliance with the provisions of this section.

Regulation 10CFR21 promulgated by the Nuclear Regulatory Commission implements the foregoing requirement of the law. This regulation sets forth the kinds of non-compliance or defect situations which suppliers and licensees must report to the Commission, and requires suppliers and licensees to institute various measures to implement the reporting requirement.

One such measure is that each supplier or licensee subject to the regulation must establish a Procedure for dealing with deviations, and for informing its director or responsible officer of any resulting defect or failure to comply.

EMPLOYEES AT NEBO FACILITIES

A copy of the full text of Regulation 10CFR21, and of the Procedure to be followed in this facility pursuant thereto, is available for examination by any employee in the office of the:

Position Title	Bldg.	Location
Manager, Safety & Licensing	K	San Jose, CA
Manager, Nuclear Safety	401, VNC	Pleasanton, CA
Manager, Product Assurance and Services	955	Sunnyvale, CA
Manager, Morris Operations		Morris, IL
Manager, Operator Training		Morris, IL
Manager, Quality Assurance		Wilmington, NC

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[redacted] Manager, Operator Training Tulsa, OK

Manager, Qualification Engineering Valley Forge, PA

EMPLOYEES AT NON-NEBO FACILITIES

Employees assigned off-site to non-NEBO facilities for periods greater than six months shall post this NOTICE at their off-site work location. A copy of the full text of Regulation 10CFR21, and of the Procedures to be followed pursuant thereto, are available for examination from the employee's immediate supervisor or manager or from the Manager, Safety & Licensing, General Electric Company, 175 Curtner Avenue, San Jose, CA 95125, Mail Code 682.

ALL EMPLOYEES

Any employee who has reason to believe that hardware or software subject to regulation by the Nuclear Regulatory Commission has been released to the customer or placed into service by this General Electric facility which are noncompliant or defective, as defined in Section 206 above, or Regulation 10CFR21, is hereby instructed to so inform his immediate supervisor or manager.

SECTION 223(b) OF THE ATOMIC ENERGY ACT OF 1954, AS AMENDED, IS AS FOLLOWS:

(b) Any individual director, officer, or employee of a firm constructing, or supplying the components of any utilization facility required to be licensed under sections 103 or 104 b. of this Act who by act or omission, in connection with such construction or supply, knowingly and willfully violates or causes to be violated, any section of this Act, any rule, regulation, or order issued thereunder, or any license condition, which violation results or if undetected could have resulted in a significant impairment of a basic component of such a facility shall, upon conviction, be subject to a fine of not more than $25,000 for each day of violation, or to imprisonment not to exceed two years, or both. If the conviction is for a violation committed after a first conviction under this subsection, punishment shall be a fine of not more than $50,000 per day of violation, or imprisonment for not more than two years, or both. For the purposes of this subsection, the term "basic component" means a facility structure, system, component or part thereof necessary to assure—

(1) the integrity of the reactor coolant pressure boundary,

(2) the capability to shut-down the facility and maintain it in a safe shut-down condition, or

(3) the capability to prevent or mitigate the consequences of accidents which could result in an unplanned offsite release of quantities of fission products as established by the Commission.

Any employee who has reason to believe that goods or services subject to regulation by the Nuclear Regulatory Commission have been released to the customer which are noncompliant or defective, as defined in Section 206 above, or Regulation 10CFR21, is hereby instructed to so inform his immediate supervisor or manager.

The provisions of this subsection shall be prominently posted at each site where a utilization facility licensed under section 103 or 104 b. of this Act is under construction and on the premises of each plant where components for such a facility are fabricated.

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*Any person in this paragraph refers to the director or responsible officer identified in paragraph (a).

NOTE: THIS NOTICE IS NOT TO BE REMOVED WITHOUT THE AUTHORIZATION OF THE DIVISION QUALITY ASSURANCE MANAGER.

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