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CBI INDUSTRIES

ISOTOPE RADIATION SAFETY MANUAL

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RADIATION SAFETY & CONTROL COMMITTEE

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1.0 RADIATION SAFETY AND CONTROL COMMITTEE:

- 1.1 The primary function of the Committee is to establish and enforce policy and safe practices in the use of radioactive isotope sealed sources in the field.
- 1.2 The Committee is composed of personnel with an extensive background in the theory and applications of radioactive isotopes and other forms of radiation producing devices.
- 1.3 The Corporate Committee consists of the Chief Welding Engineer, Manager of Welding and QA Services, Radiation Safety Officer, Assistant Radiation Safety Officers, Safety Director, and Manager of Inspection and Testing.

2.0 RESPONSIBILITIES OF COMMITTEE PERSONNEL:

2.1 Committee Personnel shall:

- 2.1.1 Read and become familiar with the requirements of these procedures and other applicable documents.
- 2.1.2 Be responsible for adherence by CBI personnel to the procedures in this safety manual.
- 2.2 The Chief Welding Engineer and the Manager of Welding and QA Services have management responsibility for the radiation safety program outlined in this manual.
- 2.3 The Radiation Safety Officer (RSO) reports directly to the Chief Welding Engineer or the Manager of Welding and QA Services and has the following responsibilities.
 - 2.3.1 Liaison officer with the NRC and State agencies on license matters.
 - 2.3.2 Maintain up-to-date operating and emergency procedures.
 - 2.3.3 Maintain control of licensed by-product material procurement, transfer within CBI and return to the exposure device manufacturer.
 - 2.3.4 Examine and determine competency of isotope radiography personnel.
 - 2.3.5 Conduct and/or supervise the Company forty (40) hour classroom Safety Training Program for Isotope Radiographers.
 - 2.3.6 Establish Leak Testing Program.

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- 2.3.7 Establish adequate storage facilities.
- 2.3.8 Establish and maintain the internal inspection system.
- 2.3.9 Establish a record keeping system to meet NRC and State regulations.
- 2.3.10 Review and assure maintenance of records required by NRC and State regulations.
- 2.3.11 Assume control and institute corrective action in emergency situations.
- 2.3.12 Investigate the cause of incidents and determine necessary preventive action.
- 2.3.13 Act in an advisory capacity to management and radiography personnel.
- 2.4 The Assistant Radiation Safety Officers (ARSO) are directly responsible to the RSO and will assume his duties in his absence, or when he is not available for any reason. They will serve as directed by the RSO and in addition will have the following responsibilities.
 - 2.4.1 Maintain personnel monitoring program.
 - 2.4.2 Maintain leak testing program.
 - 2.4.3 When necessary, perform source replacement operations.
 - 2.4.4 Review quarterly inventories and utilization logs.
 - 2.4.5 Assist in determining competency of isotope radiography personnel and six months review of these personnel.
 - 2.4.6 Assist in conducting the Company forty (40) hour classroom Safety Training Program for Isotope Radiographers.
- 2.5 The Safety Director is responsible for the CBI Accident Prevention Program. Construction Safety Supervisors, who have satisfactorily completed the forty (40) hour classroom Safety Training Program shall inspect radiographic operations on jobsites visited to determine that license provisions, operating and emergency procedures in this manual and NRC and state regulations are being followed. They shall report the results to the Safety Director on the Radiography Internal Inspection Checklist (Form WL 238).



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2.6 The Manager of Inspection and Testing has the following responsibilities.

2.6.1 Maintain qualification records of Radiographers and Assistant Radiographers.

2.6.2 Maintain records of reports, surveys and calibration of instruments.

2.7 District Radiation Safety Officers and District Assistant Radiation Safety Officers have the following responsibilities.

2.7.1 Review and monitor jobsite and district office records.

2.7.2 Examining and qualify Assistant Radiographers.

2.7.3 Frequent contact with the jobsites and visits to the jobsites for safety training and supervision for compliance with this program. Send the results to the RSO using the Safety/Training Meeting Report (Form WL 46).

2.7.4 Conduct quarterly jobsite inspection checks of radiographic operators to determine that license provisions, operating and emergency procedures in this manual and NRC and state regulations are being followed. Send the report of each inspection to the RSO on the Radiography Internal Inspection Checklist (Form WL 238). This inspection by the DRSO or DARSO is not necessary at a jobsite for a quarter in which this inspection has already been conducted by a Construction Safety Supervisor.

3.0 RADIATION SAFETY AND CONTROL COMMITTEE PERSONNEL:

3.1 Corporate Committee

John B. Christofferson
Chief Welding Engineer

22 Palisades
Oak Brook, Illinois 60521
Phone: 312/279-0159

John B. Trout
Manager Welding & QA Services

6414 Hickorycrest Drive
Spring, Texas 77389
Phone: 713/376-7538

Charles N. Sherlock
Radiation Safety Officer and
Manager of Inspection & Testing

23910 Creekview
Spring, Texas 77389
Phone: 713/376-7691



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3.1 Corporate Committee (continued)

Ronald W. Kruzic
Assistant Radiation
Safety Officer

3622 Rolling Forest Drive
Spring, Texas 77388
Phone: 713/288-4804

Hugh K. Howerton
Assistant Radiation
Safety Officer

London Operations
London, England

James R. Rhudy
Safety Director

11 Huntington Circle
Naperville, Illinois 60540
Phone: 312/355-9336

3.2 CBI Services District Radiation Safety Personnel

3.2.1 Kankakee District (Central)

Gary F. McLish
2 Ravinia Court
Bourbonnais, Ill. 60914
Phone: 815/939-7767

W. R. Wagner
610 Oak Run Dr.
Bourbonnais, Ill. 60914
Phone: 815/935-2053

Raymond H. Bryant
809 Sample
Marseilles, Ill. 61341
Phone: 815/795-4796

3.2.2 New Castle District (Eastern)

Cecil G. May
34 Ferncliff
Windy Hills
Newark, Delaware 19711
Phone: 302/737-7955

Stanley Ray Howard
550 So. DuPont Parkway #9G
New Castle Delaware 19720
Phone: 302/328-4049

W. L. Reed
115 Woodshade Drive
Newark, Del. 19702
Phone: 302/737-9698



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3.2.3 Birmingham District (Southern)

J. H. Sisk
908 Rockingham Road
Birmingham, Ala. 35235
Phone: 205/853-5578

Tom Kendrick
4325 Windsong Lane
Trussville, Ala. 35173
Phone: 205/655-8568

Thomas D. Warner
9406 Denbury
Houston, Texas 77025
Phone: 713/661-0337

James C. Jordon
10014 Hanka
Houston, Texas 77080
Phone: 713/467-0908

J. A. Pritchard
Route 2, Box 16B
Trussville, Ala. 35173
Phone: 205/655-3100

3.2.4 Fremont District (Western)

William F. Walsh
6923 Corte Barcelona
Pleasanton, CA 94567
Phone: 415/426-0237

Larry O. Lamb
2404 Del Monte
Livermore, CA 94550
Phone: 415/447-4736

Richard E. Nelson
501 Kawella Circle
Union City, CA 94587
Phone: 415/487-1539

3.3 CBI NaCon District Radiation Safety Personnel

3.3.1 Eastern Division (Norcross)

Ron Nichley
1153 Staples Drive
Lilburn, GA 30247
Phone: 404/564-1515

3.3.2 Central Division (Plainfield)

Phil D. Belt
2116 Cherrywood Circle
Naperville, IL 60565
Phone: 312/355-7566

3.3.3 Central Division (Houston)

M.G. Thomas
13618 Jessica Lane
Houston, Texas 77069
Phone: 713/583-4119

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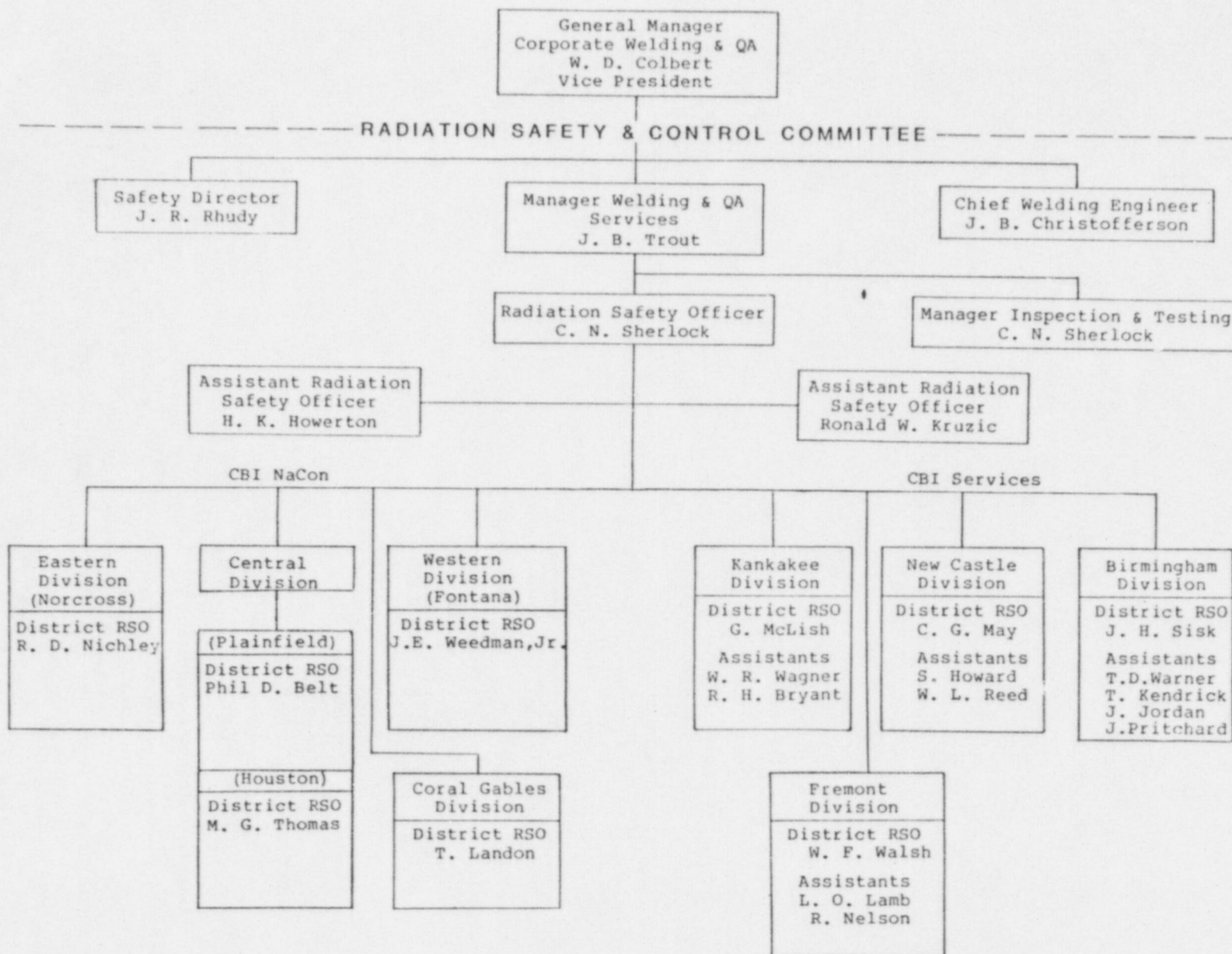
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3.3.4 Western Division (Fontana)

James E. Weedman, Jr.
8849 Hamilton Street
Rancho Cucamonga, CA 91730
Phone: 714/989-2958

3.3.5 Coral Gables (Virgin Island, Puerto Rico, etc.)

Tom Landon
11350 S.W. 164th Street
Miami, Florida 33157
Phone: 305/255-3451





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4.0 RESUMES:

4.1 RESUME OF CHARLES N. SHERLOCK

EDUCATION AND BACKGROUND

Pennsylvania State University, January 1955
Bachelor of Science in Civil Engineering
Former LTJG USNR
Two Week Course on NDT Fundamentals at Ohio State University
from September 14-25, 1970
Various NDT related seminars
CBI One Week Isotope Safety Class #2 - October 1967

PROFESSIONAL LICENSES

Illinois #62-23538 and Pennsylvania #PE-010029E - in Civil
Engineering
California #QU 1897 in Quality Engineering

SOCIETIES

Member of ASCE and ASTM and a Fellow of ASNT; Ad Hoc ASM
Committee on NDE of weldments; ASNT Leak Testing Handbook
Executive Review Committee; Chairman of Leak Testing Methods
Committee of ASNT; Vice-Chairman of Visual Methods Committee
of ASNT; Member of ASME Section V SGRT

EXPERIENCE

Inspection and Test Engineer responsible for company wide
review of testing and inspection procedures, implementation
of new procedures, manuals and equipment in all phases of
nondestructive examination on such structures as nuclear
reactors, nuclear containment vessels, space chambers,
cryogenics, and low temperature vessels. 5 years

Manager of Inspection and Testing responsible for the
Inspection and Testing group of the Corporate Welding
Department for 15-1/2 years. Responsibilities include:

- Company wide NDE Training Program
- Preparation of new, and review of existing, company
wide NDE procedures
- Assistance to the regions in the performance of
leakage rate tests of nuclear structures
- Assistance to the regions in special NDE situations
- Provide input to the ASME Code Committees and ASNT
Committees on NDE Code and training through
membership and other CBI representatives on
these organizations
- Member of Corporate Committee of CBI Radiation and
Safety Control Committee - 10 years
- Radiation Safety Officer - 2-1/2 years



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4.2 RESUME OF RONALD W. KRUZIC

Welding Engineer - Inspection & Testing Group
Houston Corporate Welding Office

FORMAL EDUCATION

University of Illinois (Urbana, Illinois)
Metallurgical Engineering
Bachelor of Science 1970
Master of Science 1971

RADIOGRAPHIC SCHOOL

CBI Isotope Safety Class #19 - December 1973

REGISTRATION

Registered Professional Engineer
State of Illinois (1975)

SOCIETIES

American Society of Nondestructive Testing (ASNT)
American Welding Society (AWS)

ASNT CERTIFICATIONS

NDT Level III Certification -
RT, MT, PT, UT, & LT #Q-1005

EXPERIENCE

Field/Shop Radiographic experience working with X-ray equipment, radioactive sources, training of personnel and personnel supervision. 11 Years.

Kankakee Construction District - Assistant Radiation Safety Officer. 3 Years.

Houston Corporate Welding - Corporate Assistant Radiation Safety Officer. 4-1/2 Years.

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4.3 RESUME OF HUGH K. HOWERTON

FORMAL EDUCATION

Graduate of Montgomery Blair High School - 1967
Silver Spring, Maryland

Attended: Washington University, St. Louis, Mo. - 1968 -
1 year
University of Maryland - 1969 - 1 year

RADIOGRAPHIC SCHOOLS

Chicago Bridge & Iron X-Ray Training Classes New Castle,
Del.; December 1970, December 1971, February 1973
Chicago Bridge & Iron Isotope Safety Training Class #32
Houston, Texas - January 1978; #40 Dubai UAE, July 1979;
#52 Dubai UAE, November 1981; #55 Dubai UAE, April 1982;
#59 Juaymah, Saudi Arabia, February 1983.

Gamma Industries October 1979 Radiation Health Physics
Program

SOCIETIES

American Society for Nondestructive Testing (ASNT) 1976

EXPERIENCE

Fifteen and one half (15-1/2) years experience in the field
of radiography with CBI including:

5 years on field construction projects working as a Quality
Assurance Technician performing X-ray work, monitoring
radiation safety, grading film.

3 years as a Welding and Quality Assurance Supervisor,
performing radiography, (isotope and X-ray), monitoring
radiation safety, collection of radiography records, audit
of records, film grading and setting up gamma ray and X-ray
radiography exposures.

3 years in the Inspection and Testing group of the Houston
Corporate Welding Department reviewing isotope sealed source
records (worldwide), audits of radiography records,
instruction of radiography and isotope safety classes,
Assistant Radiation Protection Officer.



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4.3 RESUME OF HUGH K. HOWERTON (cont'd)

4 years in the Saudi Arabia Construction Welding Department training Assistant Radiographers, assisting in conducting isotope radiation safety training classes in Dubai UAE and Saudi Arabia, responsible for radiography records, monitoring radiation safety on all field locations.

1/2 year in the London Welding Department training Assistant Radiographers and conducting isotope radiation safety training classes in Europe, the near East and Africa and responsible for radiation safety for these areas.



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1.0 POCKET DOSIMETERS:

- 1.1 Dosimeters shall be approved by the RSO and have a range of 0 to 200 milliroentgens.
- 1.2 Calibrate dosimeters at intervals not to exceed six (6) months. See Section 10 for procedure.
 - 1.2.1 Attach a calibration tag to the dosimeter(s).
 - 1.2.2 Replace dosimeters whenever:
 - 1.2.2.1 A loss in charge in a twenty-four (24) hour period exceeds twenty (20) percent of full scale.
 - 1.2.2.2 An accuracy of twenty (20) percent of the true field cannot be maintained.
 - 1.2.3 Only qualified radiographers may calibrate dosimeters.
- 1.3 A dosimeter shall be worn by Radiographers and Assistant Radiographers at all times when working with sealed sources.
- 1.4 Dosimeters shall be charged at the beginning of each shift.
- 1.5 Dosimeters shall be issued by Radiographers.
- 1.6 Dosimeter readings shall be recorded at the start and completion of each day that they are used.
- 1.7 Dosimeters shall be read by the individual several times during the work period to ensure prompt recognition of a possible high reading.
- 1.8 Whenever a dosimeter is discharged beyond 200 milliroentgens:
 - 1.8.1 Immediately notify the District RSO or ARSO.
 - 1.8.2 Send the film badge in for an emergency reading.
 - 1.8.3 The wearer shall not be allowed to work in a Restricted Area until film badge reports covering such dosages are evaluated.

2.0 FILM BADGES:

- 2.1 Film badges shall be issued by Radiographers.
- 2.2 A film badge shall be worn by Radiographers and Assistant Radiographers at all times when working with sealed sources.

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2.3 A film badge shall be worn only by the person to whom that particular film badge is assigned.

2.4 When not in use, film badges shall be kept in a rack with the control badge.

2.5 Film badges shall be changed on a periodic basis, not to exceed one (1) month. At the end of this period the badges shall be promptly sent to the district office for forwarding to the film badge supplier for processing.

2.6 The RSO or ARSO shall review all film badge reports for any high or unusual readings.

2.7 If radiography is performed at an operational Nuclear Power Plant, the Plant's film badges (or TLDs) may be substituted for CBI film badges if approved by the RSO.

3.0 SURVEY METERS:

3.1 Survey meters shall be approved by the RSO and have a range capable of measuring radiation intensities from two (2) milliroentgens per hour through one (1) roentgen per hour.

3.2 Calibrate survey meters at intervals not to exceed three (3) months.

3.2.1 Attach a calibration tag to the survey meter.

3.2.2 Only approved CBI facilities and outside agencies may calibrate survey meters.

3.2.3 Calibrate survey meters in accordance with the manufacturer's instructions.

3.2.4 Repair or replace survey meters whenever an accuracy of ten (10) percent of intensity reading on all ranges of the instrument cannot be maintained.

3.3 A survey meter shall be used by Radiographers and Assistant Radiographers at all times when working with sealed sources.

3.4 If the survey meter in use becomes inoperable for any reason, immediately cease isotope work until that meter has been repaired or replaced.

4.0 SURVEY METER CALIBRATION SERVICE AGENCIES:

4.1 The following CBI facilities are approved to calibrate survey instruments:

4.1.1 Indelco
X-Ray Division
Seattle, Washington



- 4.1.2 Chicago Bridge & Iron Company
Birmingham, Alabama
- 4.1.3 Chicago Bridge & Iron Company
Houston, Texas
- 4.2 The following outside agencies are approved to calibrate
survey instruments.
 - 4.2.1 Victoreen Instrument Company
806 Hough Avenue
Cleveland, Ohio
 - 4.2.2 Applied Health Physics, Inc.
Post Office Box 197
Bethel Park, Pennsylvania 15102
 - 4.2.3 Certified Calibration Laboratories
Philadelphia, Pennsylvania
 - 4.2.4 Industrial X-Ray
Clifton, New Jersey
 - 4.2.5 ITT Research Institute
Chicago, Illinois
 - 4.2.6 Midwest Calibration Center
Chicago, Illinois
 - 4.2.7 Gamma Industries
Baton Rouge, Louisiana
 - 4.2.8 Houston Gamma Ray Corporation
Houston, Texas
 - 4.2.9 Simco Electronics
Santa Clara, California

5.0 SUPPLEMENTARY MONITORING DEVICES:

- 5.1 Supplemental instruments may be used in conjunction with,
but not in lieu of, survey meters. Such instruments will
include the following:
 - 5.1.1 Battery operated transistorized pocket alarms or rate
meters.
 - 5.1.2 Electrically operated visual alarms with steady green
or flashing red warning lamps which are actuated by
preset radiation levels.



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- 5.2 Compare supplementary monitoring devices with a calibrated survey meter when both are exposed to radiation. Repair or replace the supplementary devices when an accuracy of thirty (30) percent of intensity reading cannot be maintained. Repairs shall be made by the manufacturer or an approved service organization.