

Figure 5
Radiation Dose Exposures
(Sheet 13 of 14)

2. Abnormal conditions

a. External Exposures

- 1) Exposure to firefighter from fire at manufacturing plant
5 μ R.
- 2) Exposure to clean-up worker - 0.01 μ R.

b. Internal dose (50 year dose commitment).

- 1) Ingestion of a single foil - 0.74 rem

The probability of an individual swallowing a single foil or source is negligible. The foils are mounted securely in the ionization chamber assemblies. No failures of the mounting assemblies have been observed.

- 2) Inhalation from a fire in protected building

- a) Lymph nodes - 8.7×10^{-2} rem
- b) Pulmonary region - 1.2×10^{-3} rem

The probability of the foil burning completely before the residents escape from the building is low. In a one hour burn test of the gold encased foils at ORNL only 0.31% of the activity was released. The fraction released in five minutes would be expected to be much lower.

- 3) Inhalation from a fire at Fytron manufacturing area.

- a) Lymph nodes - 1.6 rem
- b) Pulmonary region - 0.023 rem

The probability of a fire of this magnitude occurring is very low since the area is equipped with warning devices. As in part 2), the fraction of the activity released in five minutes will be considerably less than the 0.31% factor used.

- 4) Inhalation from a fire at Fytron manufacturing area (dose to fireman)

-) Lymph nodes - 3.3 rem

Figure 5
Radiation Dose Exposures
(Sheet 14 of 14)

- a) Lymph nodes - 3.3 rem
- b) Pulmonary region - 4.5×10^{-2} rem

It is improbable that a fireman would work under the conditions of such a fire inside the building without a respirator. The dose commitment to firemen outside the building would be negligible due to the rapid dilution of the air from the building by outside air. Therefore the actual 50 y dose commitment to the fireman would be much lower. The probability of the limits set in 10CFR 32:28 Column III being exceeded is negligible.

- 5) Clean-up worker - 50 y dose commitment from inhalation
 - a) Lymph nodes - 1.5 rem
 - b) Pulmonary region - 2.2×10^{-2} rem

It is highly unlikely that 1% of the radioactive debris from a fire would become airborne. In all probability the ash would still be wet when clean-up operations commence thereby making it even more unlikely that airborne contamination would be a significant problem.

- 6) Disposal of debris to sanitary landfill

No significant internal radiation dose would be expected to result from the disposal of fire debris to sanitary landfill.

- c. The probability of the limits set in 10CFR 32:28 Column III being exceeded is negligible.

Security Products Division

Scovill

SID-100 SMOKE DETECTORS MANUFACTURING AND QUALITY ASSURANCE PLAN

IN FORCE: JULY 1985

1.0 PURPOSE

THIS MANUFACTURING AND QUALITY ASSURANCE PLAN FOR THE MONROE PLANT, SECURITY PRODUCTS DIVISION, SCOVILL INC. PROVIDES GUIDELINES, STANDARDS AND PROCEDURES FOR THE USE AND CONTROL OF RADIOACTIVE MATERIALS FOR THE MANUFACTURE OF THE IONIZATION CHAMBER SMOKE DETECTOR MODULE MODEL SID-100. THIS PLAN ASSURES THAT QUALITY CONTROL STANDARDS, SAMPLING PROCEDURES, INSPECTION METHODS AND EQUIPMENT, AND RADIOACTIVE SOURCE ACCOUNTING, DISTRIBUTION AND INTEGRITY ARE MET. THE PLAN IS ORGANIZED INTO THE FOLLOWING CATEGORIES:

- 1.1 PROCUREMENT, RECEIVING, STORAGE, AND DISPOSAL
- 1.2 PRODUCTION LINE AND MATERIAL FLOW
- 1.3. RADIATION SAFETY PROTECTION.

2.0 PROCUREMENT, RECEIVING AND STORAGE

2.1 THE SEALED AMERICIUM 241 RADIOACTIVE SOURCES WILL BE PROCURED FROM AMERSHAM CORPORATION, ARLINGTON HEIGHTS, IL 60005-4692 (A USNRC LICENSED MANUFACTURER AND DISTRIBUTOR) ACCORDING TO SCOVILL INC. ENGINEERING DRAWING SPECIFICATION 99-9973-0084B (AMERSHAM'S LISTED SOURCE IN HOLDER, USNRC MODEL AMM-1001-H). THE SOURCES WILL BE PROCURED FOR QUANTITY DELIVERIES IN ACCORDANCE WITH PLANNED PRODUCTION SCHEDULES TO MINIMIZE INVENTORY ON HAND AT ANY ONE TIME.

2.0 **PROCUREMENT, RECEIVING AND STORAGE (CONT'D)..**

2.2 THE QUANTITY OF SOURCES WILL BE CONTROLLED AT A STOCK LEVEL NOT TO EXCEED 1,000 LOOSE SEALED SOURCES AT ANY ONE TIME.

2.3 FOR SHIPMENT TO SCOVILL INC., AMERSHAM MUST SEND ALL SOURCES IN SPECIAL DEPARTMENT OF TRANSPORTATION APPROVED CONTAINERS.

2.4 WHEN THESE CARTONS ARE RECEIVED AT SCOVILL, THEY WILL NOT BE OPENED ON A DOCK OR ORDINARY RECEIVING AREA FOR COUNTING, INSPECTION, OR ANY OTHER REASON.

2.5 THE SOURCES MAY BE STORED IN THE UNOPENED CARTONS IN ANY LOCATION IN THE RECEIVING HOLD AREA WHILE THE PAPERWORK IS CLEARED.

2.6 THE UNOPENED CARTONS WILL BE DELIVERED TO A PREDETERMINED AREA. THESE CARTONS WILL BE KEPT IN A RESTRICTED AREA IN A LOCKABLE STEEL CABINET. THE ENTIRE AREA AND CABINET WILL BE POSTED WITH A "CAUTION - RADIOACTIVE MATERIAL" SIGN.

2.7 THERE WILL BE NO FUME HOODS, SHIELDED FACILITIES OR REMOTE HANDLING EQUIPMENT ASSOCIATED WITH THIS FACILITY.

2.8 WHEN DELIVERED TO THE RESTRICTED AREA, THE OPENED CARTONS WILL BE INSPECTED, TESTED, AND COUNTED ACCORDING TO THE QUALITY CONTROL PROCEDURES TO VERIFY COMPLIANCE TO THE SPECIFICATIONS AND INVOICE QUANTITY BEFORE OFFICIAL ACCEPTANCE BY THE RADIATION CONTROL OFFICER.

2.9 SOURCES ACCEPTED WILL BE ENTERED IN THE INVENTORY LOG BOOK ACCORDING TO PART NUMBER, PURCHASE ORDER NUMBER, AND DATE RECEIVED.

2.10 AN INVENTORY CARD SHALL BE AVAILABLE TO CONTROL THE MAXIMUM MATERIAL TO BE ISSUED, PERSON WHO WITH-DRAWS THE SOURCES, AND DATE.

2.11 UNUSED MATERIAL RETURNED AT THE END OF THE WORKING PERIOD SHALL BE ENTERED ON THE INVENTORY CARD AND PLACED IN LOCKED STORAGE CONTAINER VAULT.

2.0

PROCUREMENT, RECEIVING, AND STORAGE (CONT'D)

2.12 QUALITY CONTROL OF THE REMOVABLE CONTAMINATION AT AMERSHAM CORPORATION CONSISTS OF BATCH WIPING THE SOURCES AFTER MOUNTING IN THE SOURCE HOLDER. AMERSHAM CORP. WILL CERTIFY THAT THE REMOVABLE CONTAMINATION PER BATCH WAS LESS THAN 0.005 uCi, IN BATCH WIPE TESTS PERFORMED ON 100% OF THE SOURCES SHIPPED. SINCE THE EXPECTED REMOVABLE CONTAMINATION IS SO LOW, SCOVILL INC. WILL PERFORM LEAKAGE TESTS DIRECTLY ON ONLY 1% (NO LESS THAN 10 RANDOM SELECTED) OF THE FOILS DURING INCOMING INSPECTION.

2.13 RECORDS WILL BE KEPT OF THE NUMBER OF RADIOACTIVE SOURCES RECEIVED, THE NUMBER ACCEPTED OR REJECTED, AND THE NUMBER TRANSFERRED ANNUALLY TO PERSONS EXEMPT FROM SPECIFIC LICENSING.

2.14 ALL AMERICIUM 241 ASSEMBLIES THAT ARE DEFORMED, SCRATCHED, OR SHOW ANY EVIDENCE OF VISUAL DEVIATION FROM THE SCOVILL PURCHASE CONTROL DRAWING 99-9973-0084B WILL BE RETURNED TO THE SUPPLIER OF THE FOILS FOR DISPOSAL. RECORDS OF ALL RETURNS WILL BE DOCUMENTED. ANY OTHER RADIOACTIVE WASTE WILL BE SENT TO A NRC LICENSED WASTE DISPOSAL FIRM IF SUCH A NEED ARISES.

3.0

PRODUCTION LINE AND MATERIAL FLOW

3.1 RESTRICTED AREA AND FACILITIES

THE RESTRICTED AREA, SEE ATTACHMENT I, WILL BE ISOLATED FROM OTHER SCOVILL INC. MANUFACTURING AREAS. ACCESS TO THIS AREA WILL BE LIMITED TO A RESTRICTED NUMBER OF EMPLOYEES OVER 18 YEARS OF AGE WHO HAVE BEEN SPECIFICALLY TRAINED UNDER THE DIRECTION OF THE RADIATION CONTROL OFFICER IN THE PRECAUTIONS AND SAFETY REQUIREMENTS FOR THE HANDLING OF RADIOACTIVE SOURCES. A BULLETIN BOARD IN THE RESTRICTED AREA WILL BE USED TO POST ALL APPLICABLE DOCUMENTS FOR EMPLOYEE PERUSAL WHICH RELATE TO THE REQUIREMENTS, PROCEDURES, PRECAUTIONS, AND RESTRICTIONS

3.0

PRODUCTION LINE AND MATERIAL FLOW (CONT'D)

OF THE RESTRICTED AREA AND OPERATIONS THEREIN. A WARNING SIGN WILL BE POSTED ON THE DOOR TO IDENTIFY THIS AS A RADIATION CONTROL AREA. THE SIGN WILL READ "CAUTION - RADIOACTIVE MATERIAL".

THE MANUFACTURING SUPERVISOR OF THIS AREA WILL INSURE THAT ALL ACTIVITIES WITHIN THE AREA ARE CARRIED OUT IN ACCORDANCE WITH THIS PLAN.

RADIOACTIVE SOURCES AS RECEIVED AND ACCEPTED FROM OUTSIDE LICENSED SUPPLIERS WILL BE STORED IN THE SHIPPING CONTAINERS, IN A LOCKED CABINET WITHIN THE RESTRICTED AREA. ACCESS TO THE LOCKED CABINET WILL BE CONTROLLED BY THE AREA SUPERVISOR. A SIGN WILL BE POSTED ON THE DOOR IDENTIFYING THE PRESENCE OF RADIOACTIVE MATERIALS.

AS PRODUCTION LOTS ARE REMOVED FROM THE CABINET FOR ASSEMBLY INTO PRODUCTS, THEY WILL BE COUNTED AND THE INVENTORY LOG BOOK UPDATED TO REFLECT DATE, QUANTITY OF ISSUE, AND FACTORY ORDER NUMBER. ISSUES WILL BE MADE ON A FIRST-IN , FIRST-OUT BASIS AND REQUIREMENTS INTEGRATED WITH SCOVILL INC. INVENTORY MANAGEMENT PROGRAM FOR CONTROL OF FURTHER PROCUREMENT.

SOURCES WHICH HAVE NOT BEEN ASSEMBLED INTO PRODUCTS WILL BE RETURNED TO THE LOCKED CABINET AT THE END OF EACH WORK DAY.

3.2 MATERIAL FLOW AND QUALITY INSPECTION

ATTACHMENT I ILLUSTRATES THE RESTRICTED LAYOUT. CONVENTIONAL ELECTRONIC ASSEMBLY NOT INVOLVING RADIOACTIVE MATERIALS IS DONE OUTSIDE THIS AREA. THE MATERIAL FLOW AND QUALITY INSPECTION PLAN WILL PROVIDE:

3.0

PRODUCTION LINE AND MATERIAL FLOW (CONT'D)

- A. ASSURANCE THAT THERE IS THE CORRECT ACTIVITY AND MECHANICAL INTEGRITY OF THE RADIOACTIVE SOURCE BEFORE INSTALLATION IN THE ION CHAMBER.
- B. ASSURE CORRECT SOURCE MOUNTING INTEGRITY VITAL TO SOURCE SECURITY AND SMOKE DETECTOR PERFORMANCE.
- C. VERIFY FUNCTIONAL PERFORMANCE OF THE ION CHAMBER AND COMPLETE SMOKE DETECTOR ASSEMBLY.
- D. PROVIDE REWORK PROCEDURES FOR FIELD RETURNS AND IN-HOUSE ASSEMBLY REJECTS.

ALL PRINTED CIRCUIT BOARD ASSEMBLIES CONTAINING ALL THE ASSOCIATED ELECTRONICS, **LESS RADIOACTIVE SOURCE** AND ION CHAMBER ASSEMBLY, WILL BE MANUFACTURED, INSPECTED, AND FUNCTIONALLY TESTED IN A GENERAL MANUFACTURING NONRESTRICTED AREA. THE FINISHED AND CLEANED SUB-ASSEMBLIES WILL BE DELIVERED TO THE RESTRICTED AREA WHERE THE RADIOACTIVE SOURCE IS INSERTED FOLLOWED BY ION CHAMBER ASSEMBLY AND FINALLY FUNCTIONAL CHECK-OUT OF THE ENTIRE SMOKE DETECTOR. THE LAST STAGE WILL INCLUDE 24 HOUR POWER BURN-IN ON HOLDING RACKS AT AMBIENT ENVIRONMENT AND FINALLY EITHER INTEGRATION INTO COMBINATION DOOR CLOSERS AND HOLDERS WITH SMOKE DETECTOR OR STOCKING IN FINISHED GOODS, FOR FUTURE USE OR SERVICE PART SHIPMENTS.

ONLY RADIATION, MECHANICAL AND VISUAL INSPECTION OF A FEW SAMPLES OF THE AMERICIUM 241 SOURCES IS ACCOMPLISHED UPON RECEIVING AND INCOMING INSPECTION. THIS PREVENTS MISSHIPMENT OF SOURCES AND VERIFIES LOW LEAKAGE OF THE LOT. THE SOURCES ARE 100% INSPECTED FOR MECHANICAL INTEGRITY AND ALPHA ACTIVITY DURING INSTALLATION INTO THE ION CHAMBER INSULATORS.

3.0

PRODUCTION LINE AND MATERIAL FLOW

DETAILS OF THE RESTRICTED AREA ASSEMBLY PROCEDURE, INCLUDING THE RADIOACTIVE SOURCE INSPECTION, ARE SHOWN IN ATTACHMENT I, "SCOVILL INC., RESTRICTED AREA ASSEMBLY QUALITY ASSURANCE PROCEDURES FOR SID-100 DOOR RELEASE SMOKE DETECTOR".

A FUNCTIONAL TEST IS USED TO MAKE A COMPLETE CHECKOUT OF THE IONIZATION CHAMBER AND DETECTOR ELECTRONICS. DETAILS OF THE ELECTRICAL CHECKOUT ARE NOT INCLUDED SINCE THEY ARE NOT RELATED TO THE RADIOACTIVE SOURCE AND DO NOT INVOLVE EXPOSURE TO THE SOURCE IN ANY WAY. THE TESTS USED TO PROVIDE FINAL ASSEMBLY ASSURANCE OF THE SOURCES INTEGRITY ARE DESCRIBED AS FOLLOWS.

- A. AFTER COMPLETE ASSEMBLY OF THE ION CHAMBER, THE CHAMBER WALLS ARE RUBBED WITH FILTER PAPER OR A Q-TIP, AND THE SMEARS ARE MEASURED IN AN ALPHA SCINTILLATION DETECTOR TO VERIFY THAT NO MATERIAL BEYOND $(R_b + \sqrt{R_b})$ IS REMOVED. THE SMOKE DETECTOR MODULE IS THEN APPROVED FOR TRANSFER FROM THE RESTRICTED PRODUCTION AREA.
- B. OUTSIDE THE RESTRICTED PRODUCTION AREA, THE FINISHED SMOKE DETECTOR IS PLACED IN A TEST JIG. A VOLTAGE IS MEASURED WHICH DETERMINES THE CORRECT PERFORMANCE OF A TRANSISTOR IN THE ION CHAMBER OR INDICATES THE POSSIBILITY OF A LOW ACTIVITY SOURCE.
- C. A MALFUNCTIONING ION CHAMBER VOLTAGE REQUIRES RETURN OF THE DETECTOR TO THE RESTRICTED AREA WHERE THE CHAMBER COVER IS OPENED TO REPLACE THE TRANSISTOR OR SOURCE. TESTS ON PARAGRAPHS (A) AND (B) ARE THEN REPEATED.
- D. THE FINISHED DETECTORS ARE AGED FOR 24 HOURS IN A TEST RACK. THE SAME ION CHAMBER TEST VOLTAGE IS ALLOWED A DRIFT OR CHANGE IN TOLERANCE. IF OUT OF TOLERANCE, THE DETECTOR IS AGAIN RETURNED TO THE

3.0

PRODUCTION LINE AND MATERIAL FLOW (CONT'D)

RESTRICTED AREA FOR REPLACEMENT OF THE TRANSISTOR OR SOURCE. PAST EXPERIENCE SHOWS THAT ONLY ONE OUT OF EVERY THOUSAND SOURCES MUST BE REPLACED. A SOURCE REJECTION IS ALMOST ALWAYS CAUSED BY ABNORMALLY LOW AND NOT HIGH ACTIVITY.

D. ALL DETECTORS ARE 100% INSPECTED BY A DESIGNATED TECHNICIAN, ONCE IN THE CHAMBER ASSEMBLY RESTRICTED AREA AND ONCE AT THE FINAL TEST.

E. THE FINAL STAGE AFTER POWER AGING REQUIRES DETECTOR SERIALIZATION, DOCUMENTATION AND TRANSFER TO THE DOOR CLOSER AND HOLDER ASSEMBLY AREA, STORAGE OR SHIPPING IN CARDBOARD CONTAINERS. ALL DETECTORS IN STOCK ARE STORED IN A LOCKED, REMOTE ROOM AT SCOVILL INC. ONLY. COMPLETE SHIPPING DOCUMENTS ARE MAINTAINED AT ALL TIMES AS TO SHIPPING DESTINATION, QUANTITY, SERIAL NUMBER, AND DATE OF MANUFACTURE.

4.0

RADIATION SAFETY PROGRAM

SECTIONS 2.0 AND 3.0 AND ATTACHMENT I OF THIS PLAN, AND SCOVILL'S RADIATION PROTECTION PROGRAM DESCRIBE THE PURCHASE, STORAGE, ISSUE, REJECTION, USAGE CRITERIA, AND DISPOSAL OF ALL AMERICIUM 241 SOURCES USED AT SCOVILL INC. ATTACHMENT II DESCRIBES THE RADIATION SAFETY INSTRUCTIONS THAT WILL ALWAYS BE POSTED ON THE BULLETIN BOARD IN THE PRODUCTION AREA.

THE RADIATION PROTECTION PROGRAM WAS DESIGNED BY CONSULTATION WITH DR. EDWARD MENHINICK, PROFESSOR OF BIOLOGY AT THE UNIVERSITY OF NORTH CAROLINA IN CHARLOTTE, AND LOUIS RIED, FORMER PRESIDENT OF FYTRON, INC. IN BOULDER, CO. THEY WILL PERIODICALLY REVIEW THE PROGRAM AND BE AVAILABLE FOR CONSULTATION PURPOSES. DR. MENHINICK WILL ALSO VERIFY BY QUANTITATIVE ASSAY ALL WIPE TESTS.

4.0

RADIATION SAFETY PROGRAM (CONT'D)

QUALITY CONTROL PROCEDURES TO INSURE THAT THE AMERICIUM 241 SOURCES USED HAVE THE PROPER ACTIVITY AND THE MINIMUM REMOVABLE CONTAMINATION WILL BE IN EFFECT BOTH AT AMERSHAM CORPORATION, THE SUPPLIER OF THE FOILS, AND AT SCOVILL, INC.

THE QUALITY CONTROL OF REMOVABLE CONTAMINATION AT AMERSHAM CORPORATION CONSISTS OF BATCH WIPING 100% OF THE SOURCES, AFTER MOUNTING IN THE SOURCE HOLDER. AMERSHAM CORPORATION WILL CERTIFY THAT THE REMOVABLE CONTAMINATION PER BATCH IS LESS THAN 0.005 uCi.

SINCE THE EXPECTED REMOVABLE CONTAMINATION IS SO LOW, SCOVILL INC. WILL PERFORM LEAKAGE TESTS DIRECTLY ON ONLY 1% (NO LESS THAN 10 RANDOM SELECTED) OF THE FOILS. LEAKAGE TEST SHALL CONSIST OF RUBBING THE ACTIVE FACE OF THE SOURCE (FOIL) WITH A DAMP Q-TIP, PREVIOUSLY DIPPED IN METHANOL. EACH Q-TIP (SMEAR) IS IDENTIFIED WITH THE SOURCE THAT WAS RUBBED, UNTIL THE TEST IS COMPLETED. THE Q-TIPS ARE FIRST MEASURED WITH AN ALPHA SCINTILLATION DETECTOR AND SECONDLY WITH A NaI DETECTOR, TO VERIFY THAT NO READING EXCEEDS $(R_b + \sqrt{R_b})$. FAILURE OF ONE SOURCE TO PASS THIS TEST CONSTITUTES REJECTION OF THAT SOURCE AND THE NEED TO INSPECT THE LOT 100%. REQUIREMENTS AND SPECIFICATIONS FOR 100% INSPECTION ARE THE SAME AS FOR A SINGLE SOURCE WIPE TEST, EXCEPT THAT BATCH WIPING WILL BE PERMITTED.

THERE ARE SEVERAL ASSEMBLY LINE TESTS THAT INDIRECTLY MEASURE THE ACTIVITY OF THE RADIOACTIVE SOURCE. IF BY CHANCE A SOURCE IS USED THAT HAS AN ACTIVITY SIGNIFICANTLY OUTSIDE OF THE RANGE CERTIFIED BY THE SUPPLIER, IT WILL BE REJECTED AND SENT BACK TO THE SUPPLIER FOR DISPOSAL.

RADIATION SAFETY PROGRAM (CONT'D)

RECORDS WILL BE KEPT OF THE NUMBER OF RADIOACTIVE SOURCES RECEIVED, THE NUMBER THAT ARE ACCEPTED OR REJECTED, AND THE NUMBER TRANSFERRED ANNUALLY TO PERSONS EXEMPT FROM SPECIFIC LICENSING. SOURCES WILL BE LOGGED ACCORDING TO PURCHASE ORDER, INVOICE NUMBER, LOT NUMBER, AND DATE.

THE WORK AREA WILL BE WIPE TESTED WEEKLY AND THE WIPES WILL BE COUNTED IN THE ALPHA SCINTILLATION AND THE NaI DETECTORS.

4.1 WHATMAN No.1 FILTERS, 4.25 CM DIAMETER WILL BE USED TO WIPE THE WORK AREAS. THE INDIVIDUAL FILTERS WILL BE PLACED IN PLANCHETS FOR ALPHA COUNTING AND IN TEST TUBES FOR GAMMA COUNTING.

4.2 CONTAMINATION

ANALYSES WILL BE PERFORMED WEEKLY UNDER THE DIRECTION OF DR. EDWARD MENHINICK, PROFESSOR OF BIOLOGY AT THE UNIVERSITY OF NORTH CAROLINA IN CHARLOTTE.

EMPLOYEES HANDLING THIS DEVICE WILL SUBMIT A RADIATION DOSAGE HISTORY TO THE COMPANY AND WILL RECEIVE A SHORT TRAINING SESSION ON HANDLING RADIOACTIVE MATERIAL. (SEE ATTACHMENT II). THE RADIATION SAFETY OFFICER IS RESPONSIBLE TO SEE THAT THIS TRAINING IS ADMINISTERED.

THE MANUFACTURING SUPERVISOR WILL BE RESPONSIBLE TO SEE THAT PROPERLY TRAINED AND SCREENED OPERATORS ARE AVAILABLE AS BACKUP.

4.3 EQUIPMENT

SCOVILL HAS IN CUSTODY AT ALL TIMES EBERLINE MODEL ESP-1 PORTABLE RATEMETER AND SCALER WITH ONE ALPHA SCINTILLATION PROBE MODEL AC-3.

4.0

RADIATION SAFETY PROGRAM (CONT'D)

THIS SURVEY METER WILL ALLOW SCOVILL TO PERFORM FREQUENT ALPHA SMEAR TESTS OF THE PRODUCTION AREA. THE EQUIPMENT AT THE DEPARTMENT OF BIOLOGY, UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE (NAI WELL AND LIQUID SCINTILLATION ANALIZERS) WILL ALLOW PRECISE VERIFICATION OF SCOVILL'S OBSERVATIONS.

ATTACHMENT I

SCOVILL INC. SECURITY PRODUCTS DIVISION MONROE, NC PLANT

RESTRICTED AREA ASSEMBLY AND QUALITY CONTROL PROCEDURES FOR THE SID-100 IONIZATION CHAMBER SMOKE DETECTOR FOR COMBINATION DOOR CLOSERS AND HOLDERS

1.0 PURPOSE:

- 1.1 To ASSURE THE CORRECT ACTIVITY AND MECHANICAL INTEGRITY OF THE RADIOACTIVE SOURCE BEFORE INSTALLATION IN THE ION CHAMBER.
- 1.2 To ASSURE THE CORRECT RADIOACTIVE SOURCE MOUNTING INTEGRITY IN THE ION CHAMBER VITAL TO THE SOURCE SECURITY AND SMOKE DETECTOR PERFORMANCE.
- 1.3 FUNCTIONAL PERFORMANCE OF THE ION CHAMBER AND COMPLETE SMOKE DETECTOR ASSEMBLY.

2.0 DOCUMENTS:

- 2.1 ENGINEERING DRAWING #20-7700-0334D, SID-100 IONIZATION CHAMBER SMOKE DETECTOR.
- 2.2 ALPHA SOURCE ASSEMBLY ENGINEERING DRAWING #99-9973-0084B.
- 2.3 FIGURE 1, RESTRICTED AREA LAYOUT FOR IONIZATION CHAMBER ASSEMBLY
- 2.4 FIGURE 2, MOUNTING JIG FOR SOURCE INSTALLATION.

3.0 PROCEDURE:

3.1 AMERICIUM SOURCE INSPECTION

- 3.1.1 ALL PERSONNEL WORKING IN THE RESTRICTED AREA MUST WASH THEIR HANDS UPON COMPLETION OF WORK.
- 3.1.2 DOCUMENT ALL SOURCE REMOVAL OR RETURN IN THE LOG BOOK ACCORDING TO QUANTITY, DATE, AND INITIAL.
- 3.1.3 ALL SOURCES ARE 100% INSPECTED. BEFORE INSTALLATION OF THE SOURCE IN THE ION CHAMBER,

3.0

PROCEDURE:

EXAMINE EACH SOURCE FOR:

FOIL ALPHA ACTIVITY,

QUALITY OF TIN PLATING,

SCRATCH OF ANY KIND ON THE FOIL SURFACE;

IF ANY, PLACE THE HOLDER IN THE REJECT CONTAINER
FOR LATER RETURN TO THE MANUFACTURER.

RETURN THE SOURCES TO THE ORIGINAL CONTAINER
TO PREVENT SCRATCHING OF THE FOIL.

3.1.4 THE SOURCES ARE READY TO INSTALL IN THE
ION CHAMBER USING THE SOURCE INSERTION JIG.

3.2 ION CHAMBER ASSEMBLY

USING THE JIG SHOWN IN FIGURE 2, PRESS THE SOURCE
HOLDER THROUGH THE CHAMBER INSULATOR AND PWB,
TO SEAT ON THE INSULATOR COUNTERBORE.

NOTE: THE RADIOACTIVE FOIL **NEVER** TOUCHES ANY
PART OF THE FIXTURE. IT IS SEPARATED FROM THE
DIE BY THE CRIMPED LIPS, WHICH IS THE **ONLY**
PART OF PHYSICAL CONTACT BETWEEN THE SOURCE
HOLDER FLAT SURFACE AND THE FIXTURE.

3.2.2 THE MOUNTING JIG WILL MAINTAIN LIGHT
PRESSURE BETWEEN THE SOURCE HOLDER AND PLASTIC
INSULATOR. SOLDER THE SOURCE HOLDER SHAFT TO
THE PRINTED CIRCUIT. THE SOLDER CONNECTION
MUST COMPLETELY ENCLOSE THE SOURCE HOLDER SHAFT
AND SHOW A SMOOTH, SHINY APPEARANCE. ANY OTHER
APPEARANCE MUST BE REJECTED AND RESOLDERED.

3.2.3 AFTER REMOVAL FROM THE MOUNTING JIG,
VISUALLY CHECK THE SOURCE HOLDER FOR A FLUSH
FIT ONTO THE INSULATOR SOURCE SEAT. CHECK FOR
ANY SIGN OF FOIL SCRATCHING. ANY SCRATCHED,
SMEARED, OR DIRTY FOIL WILL AUTOMATICALLY BE
REJECTED. DO NOT ATTEMPT TO CLEAN ANY FOIL.

3.0 PROCEDURE (CONTINUED)

3.2.4 ADD THE ION CHAMBER COVER AND RIVET IN PLACE.

3.2.5 RUB ALL EXTERIOR SURFACES OF THE ION CHAMBER WITH FILTER PAPER (OR Q-TIP) AND PLACE PAPER (OR Q-TIP) ON PLANCHET WITH RUBBING SIDE UP. WITH ALPHA SCINTILLATION PROBE AT $<.25"$ FROM PAPER (Q-TIP) SURFACE, CHECK THAT READING IS UNDER $(R_b + \sqrt{R_b})$.

3.2.6 THE ION CHAMBER IS READY FOR ELECTRICAL PRETEST IN THE NONRESTRICTED PRODUCTION ASSEMBLY AREA. ANY ION CHAMBER NOT PASSING THE PRETEST WILL BE RETURNED TO THE RESTRICTED AREA FOR REPAIR.

3.2.7 AT THE END OF THE WORK DAY, RETURN ALL UNUSED SOURCES TO THE SHIELDED STORAGE CABINET IN THE RESTRICTED AREA.

400/7700 50/1600

A I S L E

ELECTRO STORAGE
IN PROCESS STORAGE
DL & LOCKTRONIC

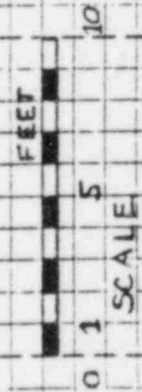
NO ENTRY
EMERGENCY
EXIT ONLY

RADIOACTIVE
MATERIAL
STORAGE
WORK AREA

CONTROLLED
ACCESS
*ELECTROMECHANICAL
PRODUCTS ASSEMBLY AREA

HANDLING SOURCES
FOR

FLOOR PLAN



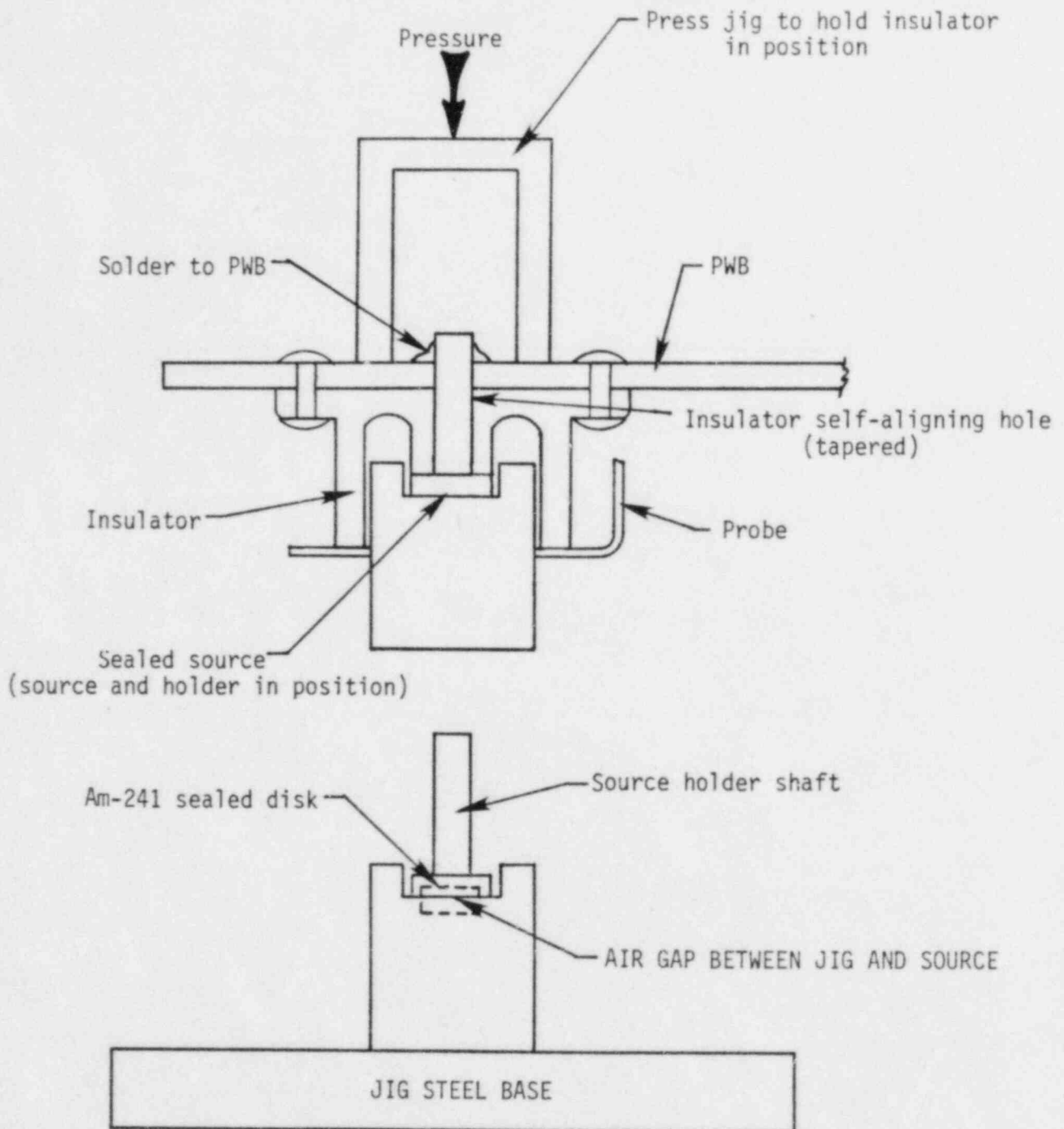
AMERICIUM SOURCES WILL BE STORED AND
HANDLED ONLY IN ROOM LABELED
"WORK AREA FOR HANDLING SOURCES"

W I P E T E S T S M E A R

ATTACHMENT I - FIGURE I
RESTRICTED AREA: LAYOUT
FOR IONIZATION CHAMBER
ASSEMBLY.

ATTACHMENT I - FIGURE 2

RADIOACTIVE SOURCE INSTALLATION ASSEMBLY JIG PROCESS DETAIL



INSTALLATION SEQUENCE:

1. Position source on jig anvil with tweezers.
2. Seat insulator, hole over shaft, and start source into insulator.
3. Press source through insulator and PWB, to seat-in-place point.
4. Hold PWB in position, with jig, and solder source to PWB.

ATTACHMENT II
RADIATION SAFETY INSTRUCTIONS
SCOVILL INC. EMPLOYEES

1.0 **PURPOSE:**

TO INSTRUCT EMPLOYEES IN THE PROPER METHODS OF HANDLING AMERICIUM 241 SOURCES FOR SMOKE DETECTORS AND TO GIVE THE RATIONALE FOR PRECAUTIONARY MEASURES AND BIOASSAY PROCEDURES.

2.0 **INSTRUCTOR:**

RADIATION SAFETY OFFICER - LARRY LEE

3.0 **INTRODUCTION:**

THE SMOKE DETECTOR UNIT CONTAINS ONE SEALED RADIO-ACTIVE SOURCE MADE WITH AMERICIUM 241. EACH SOURCE IS NOMINALLY 0.7uCi $\pm 10\%$ EACH. THE RADIOACTIVE MATERIAL IN THE SOURCE IS SANDWICHED BETWEEN GOLD AND SILVER LAYERS AND AS SUCH IS SEALED TO PREVENT LOSS OF RADIO-ACTIVITY. IN ITS SEALED FORM THE SOURCE IS NOT HAZARDOUS AND IS PERMITTED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION AND THE NORTH CAROLINA STATE DEPARTMENT OF HEALTH TO BE SOLD TO THE GENERAL PUBLIC IN THE SCOVILL INC. SID-100 SMOKE DETECTOR. THERE ARE, HOWEVER, CERTAIN PRECAUTIONARY MEASURES WHICH MUST BE OBSERVED IN THE DETECTOR ASSEMBLY AREA. THESE ARE DESCRIBED BELOW:

3.1 EATING, DRINKING, OR SMOKING IS NOT PERMITTED IN THE SMOKE DETECTOR ASSEMBLY AREA. THERE IS A VERY SMALL PROBABILITY THAT AN OCCASIONAL SOURCE MAY LEAK A SMALL AMOUNT OF RADIOACTIVITY. THE WORK AREAS WILL BE CHECKED ROUTINELY TO DETECT IF LEAKAGE HAS OCCURRED. HANDS MUST ALWAYS BE WASHED AFTER LEAVING THE WORK STATION.

3.0 INTRODUCTION (CONT'D)

- 3.2 WORKERS DO NOT NEED TO WEAR RADIATION MONITORING DEVICES E.G. FILM BADGES, SINCE THE EXPOSURE FROM THE AMERICIUM SOURCES IS SOO SMALL THAT ALMOST NO RADIATION WILL BE MEASURED. FOR INFORMATION PURPOSES, THE MAXIMUM EXPOSURE RATE AT 10 INCHES FROM A COMPLETED SMOKE DETECTOR IS 0.4uR/HR. FOR COMPARISON PURPOSES, THE RADIATION BACKGROUND EXPOSURE IN A TYPICAL BRICK HOME IS APPROXIMATELY 20uR/HR.
- 3.3 THE RADIOACTIVE SOURCES HAVE ESSENTIALLY NO MONETARY VALUE. HOWEVER, A COMPLETE AND CURRENT INVENTORY OF ALL SOURCES IS REQUIRED BY THE U.S. NUCLEAR REGULATORY COMMISSION AND THE NORTH CAROLINA STATE DEPARTMENT OF HEALTH.
- 3.4 A COLLECTION OF READING MATERIALS ON RADIATION CONTROL SUCH AS NCRP REPORT NO. 39 **BASIC RADIATION PROTECTION CRITERIA** IS AVAILABLE AT ANY TIME TO EMPLOYEES.
- 3.5 EMPLOYEES WILL BE INSTRUCTED IN THE PROPER HANDLING OF ALL RADIOACTIVE MATERIALS BEFORE STARTING TO WORK AND WILL BE ENCOURAGED TO ASK QUESTIONS REGARDING ANY ASPECT OF RADIOACTIVITY CONTROL.
- 3.6 A CONSULTANT, DR. EDWARD MENHINICK, PROFESSOR OF BIOLOGY AT THE UNIVERSITY OF NORTH CAROLINA IN CHARLOTTE, IS HIGHLY EXPERIENCED AND FULLY CREDITED IN THE HANDLING AND ASSEMBLY OF RADIOACTIVE SUBSTANCES AND HAS DESIGNED TOGETHER WITH OUR ENGINEERS, OUR RADIATION SAFETY PROGRAM.

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INTRODUCTION (CONT'D)

OFFICIALS FROM THE NORTH CAROLINA STATE DEPARTMENT OF HEALTH WILL PERIODICALLY INSPECT OUR OPERATION. WEEKLY PAPER SMEAR TESTS WILL BE MEASURED BY THE BIOLOGY DEPARTMENT AT THE UNIVERSITY OF NORTH CAROLINA IN CHARLOTTE.