NRC FORM 313 (10-2005) 10 CFR 30, 32, 33, 34, 35, 36, 39, and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIAL LICENSE

APPROVED BY OMB: NO. 3150-0120 EXPIRES: 10/31/2008

Estimated burden per response to comply with this mandatory collection request: 4.4 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, MISSISSIPPI, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

NMSB2

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

LL 31218
03037401

NUCLEAR MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-4005

03214

(37-31218-01)

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S.NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [x] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [ ] C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include ZIP code)*

Lancer Systems LP
2075 Detwiler Rd
Kulpsville, Pa. 19443

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Lancer Systems LP.
7566 Morris Ct. Suite 300
Allentown, Pa. 18106

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Glenn Ward

TELEPHONE NUMBER

(803) 443-8283

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES *(See 10 CFR 170 and Section 170.31)*

FEE CATEGORY 3A | AMOUNT ENCLOSED $ 10,000.00

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER – TYPED/PRINTED NAME AND TITLE	SIGNATURE	DATE
Brian W. Hodges, President Lancer Systems LP	Brian W Hodges	1/30/07

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			$		
APPROVED BY				DATE	

NRC FORM 313 (10-2005) PRINTED ON RECYCLED PAPER

140031

NMSS/RGN1 MATERIALS-002

Tuesday, January 30, 2007

Licensing Assistance Team
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Sir/Madam,

Lancer Systems LP is submitting the attached application and required documentation for a manufacturing and distribution license for our location in Allentown, PA. This application information has been prepared in accordance with recommendations found in NUREG 1556, Vol. 12, Rev. 1, "Program-Specific Guidance about Possession Licenses for Manufacturing and Distribution"

The Drift Tube Module that will be manufactured is responsible for the identification of nerve and mustard agents within improved chemical agent monitors (ICAM & CAM). This device is intended only for use by the Department of the Army, any specific licensee of the NRC or an Agreement State that is under contract to the Department of the Army, or any foreign manufacturer under contract to Department of the Army and whose products are subject to provisions of 10 CFR 110.27 for import. This device is a component to be used as a part for the (ICAM) Improved Chemical Agent Monitor or the (CAM) Chemical Agent Monitor approved under Radioactive Sealed Sources and Devices Safety Evaluation of Devices No. NR-1129-D-103-S. Lancer Systems will be building the Drift Tube Module to print as described in this device registry.

In accordance with 10 CFR 170.30 and 33 of, I am including application fees in the amount of $10,000 for a Category 3A license for processing or manufacturing of items containing byproduct material for commercial distribution. If this is incorrect, please notify me as soon as possible.

Please feel free to contact me Brian Hodges, President at 215-256-9521 ext. 1701 or Glenn Ward at (803)443-8283 or Ms. Anne Stumpf , project consultant at (352) 455-2354, if you have any questions about this request.

ATTACHMENT 5

5. RADIOACTIVE MATERIALS

a. ELEMENT AND MASS NUMBER	b. CHEMICAL AND/OR PHYSICAL FORM	c. MAXIMUM AMOUNT TO BE POSSESSED AT ANY ONE TIME.
Nickel 63	Sealed or foil source – Model #' NER-004R (Isotope Products Laboratories), Source Registrations CA-406-S-215-S 03/09/2001	600 sources not to exceed 15 millicuries each, or the maximum activity authorized for each custom device.

Attachment 6

Use of Radioactive Materials

To be used for possession, use, storage, and manufacture of drift tube assemblies used in chemical detectors. The licensed material is contained within chemical detectors with the following device registry numbers and Sealed Source Registry numbers:

6. Use of RADIOACTIVE MATERIAL.			
a. ELEMENT AND MASS NUMBER	b. CHEMICAL AND/OR PHYSICAL FORM	c. MAXIMUM AMOUNT TO BE POSSESSED AT ANY ONE TIME.	d. Use of source Materials
Nickel 63	Sealed or foil source – Model #' NER-004R (Isotope Products Laboratories), Source Registrations CA-406-S-215-S 03/09/2001	600 sources not to exceed 15 millicuries each, or the maximum activity authorized for each custom device.	15 millicurie source in chemical detector U.S. Department of Army Device Registry No. NR-1129-D-103-S CAM and ICAM 02/05/2001

This device is a component for the chemical agent monitor to be used as a post attack monitor strictly used to detect nerve and blister agents for the US Military or other agencies of the federal government. The Drift Tube Module is responsible for the identification of nerve and mustard agents within these chemical agent monitors (the "detectors").

The detectors and Drift Tube Module have been approved under Radioactive Sealed Sources and Devices Safety Evaluation of Devices No. NR-1129-D-103-S. The detectors are limited in their use and shall be distributed by the Department of the Army, U.S. Army TACOM, Life Cycle Management Command, AMSTA-CS-CZR {Formerly US Army Tank-Automotive & Armaments Command}, Rock Island, IL 61299-76300 for use by any U.S. Federal Government agency anywhere authorized by the applicable specific license. Further, custom users other than Department of Defense are limited to perform only external maintenance on the detectors, with the exception of the modular sieve packs. For all internal maintenance and repair, with the exception of the modular sieve replacement, the detectors will be returned to the Army for repair either by the manufacturer or by trained Department of Defense personnel/contractors.

Lancer Systems will build the drift tube to print as approved under the Device Registration NR-1129-D-103-S. The Drift Tube Module, NSN: 6665-01-383-6257, consists of a cell

Attachment 6

assembly and a sieve breather assembly. The cell assembly, which contains the radioactive source, is in the form of a stack of components held together with stainless steel rods and a retaining clip. Two of the rods provide airflow paths for the drift and source regions of the cell. A third retaining rod is used to assist in keeping the cell assembly secured. The radioactive source used in the device may contain up to 15 millicuries (0.56 GBq) of Ni-63 in the form of a foil source. The sources have been approved under SSDR No. CA0406S215S.

The radioactive source is located in the cell assembly. The radioactive source is held in the cell assembly by the source screen assembly, drawing 442-497 (see Article 1) and shows the completed source screen assembly which consists of a source insulator (Article 1, Drawing 442-413) and a source screen (Article 1, Drawing 442-415) which will hold the radioactive source (Article 1, Drawing 442-416) in place within the device. The source insulator may be composed of DuPont™ Zenite® LCP liquid crystal polymer resin, Grade 6130, or Ticona Vectra® A130 Liquid Crystal Polymer (LCP). The source screen material is stainless steel UNS S30323 (Grade 303, see Article 2 for more information).

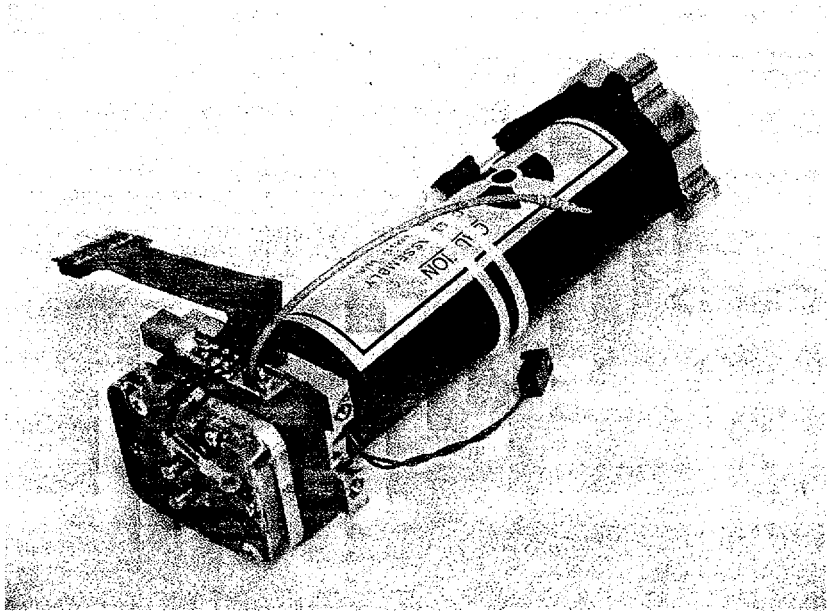
The source screen assembly is located within the cell assembly (see Article 3, "Cell Assembly", Drawing 442-306). It is located between the sensor assembly (Article 4, Drawing 442-425) and the exhaust collar (Article 4, Drawing 442-410) will help hold the radioactive source within the source screen assembly. The sensor body is also composed of DuPont™ Zenite® LCP liquid crystal polymer resin, Grade 6130, or Ticona Vectra® A130 Liquid Crystal Polymer (LCP). See Article 2 for more information concerning these materials.

The source is removed from its container with a tool and carefully inserted by hand into the source screen assembly all the way down to flush or a little below flush. The worker must ensure the source is held captive with the prongs of the source screen. The worker then replaces the sensor assembly on the top of the cell stack, being extremely careful not to bind or pinch wires on source. When fully assembled, the radioactive source will only be in contact with the sensor body, the source insulator, and the source screen.

The cell assembly is inserted into the cell sieve assembly (see Article 5, "Cell Sieve Assembly", drawing 442-701). The drift tube body is manufactured from aluminum alloy, UNS A96061, Temper T-6 per ASTM-B211 or ASTM-B221 (Article 5, "Drift Tube Body ", Drawings 442-718). The sieve body assembly (Article 5 "Sieve Body Assembly"' drawing 5-15-20016) is then attached to the drift tube body and secured with a machine screw, thus securing the cell assembly within the cell assembly.

Attachment 6

The final product is shown in the figure below:



There are no moving parts on this device. In the event the Ni-63 source becomes dislodged from the source screen assembly, it will remain within the drift tube module. There should be no change in external radiation levels as a result of a source becoming dislodged from the source screen assembly due to the thickness of the device and shielding provided by the housing materials. See Attachment 2-6 for drawings of the device and components.

LABELING AND HANDLING INSTRUCTIONS

Article 6, "Cell Assembly Labeling" provides information concerning the nature and location of the label to be placed on each device. Drawing No.442-579 shows the design of the label to be used. The label will be and adhesive label, 3M Type 7120 with a yellow background and black characters. The label will be applied to the drift tube thermal foil heater assembly on the insulation sleeving, as indicated on Drawing No. 442-702.

After insertion of the sieve breather through the terminal block assembly, these to components are now inserted into the drift tube body, the surface of the terminal block assembly is etched with the cell assembly serial number with characters 3.5 $\pm$ 1 mm in height (see Article 5, Drawing 442-701).

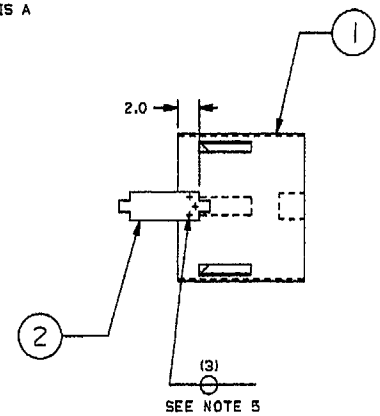
Article 1- Source Screen Assembly

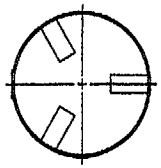
December 31, 2006 3:57 PM [78.CAL]

NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN DOD-STD-100.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES 0.25 MAX
   - ☐ FILLETS R 0.25 MAX
   - ☐ 3.2 ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
   - ■ ANSI Y14.5-DATED 1982 APPLIES
   - ☐ FED-STD-H28 APPLIES
3. ASTM E380 APPLIES. METHOD B SHALL BE USED IN CONVERTING AND ROUNDING OFF. 1 INCH = 25.4 MM APPLIES.
4. MAY BE PROCESSED IN ACCORDANCE WITH ADVISORY PD EA-C-1798; SEE SPECIAL PROCEDURES FOR CLEANING AND BAKING SUB-ASSEMBLIES, GENERAL HANDLING, AND GENERAL STORAGE.
5. ONE SPOT WELD IS ACCEPTABLE IF IT IS A MINIMUM OF 1 MM IN DIAMETER.

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	REPLACES WITH CHANGE DWG 3B/442-497, REV 1, DATED 87-03-31, NOR Z16-369-0001, 97-12-11, Z16-490-0004, 88-08-17, Z16-737-0002, 89-10-31	91-11-08	RE/LPK
B	NOR 52C0785-0025, 92-08-28 NOR 53C0753-0008, 93-03-15	93-06-11	JSR/KTL
C	NOR Z16-1338-0001, 97-02-12	97-04-14	JSR





PARTS LIST					
QTY REQD	DWG SIZE	DRAWING OR PART NO.	NOMENCLATURE OR MATERIAL	SPECIFICATION	ITEM NO.
1	B	442-496	CONTACT STRIP, SOURCE SCREEN		2
1	C	442-415	SOURCE SCREEN		1

APPLICATION	
DWG SIZE	NEXT ASSY
E	442-306
D	5-15-17065

END ITEM CODE NO.		
		Z16
		Z47

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MM
TOLERANCES ON:
WHOLE NUMBERS ±
1 PLACE DECIMALS ± 0.1
2 PLACE DECIMALS ±
ANGLES ± 0° 30"
MATERIAL

ORIGINAL DATE (YR-MO-DA) 91-11-08
DRAWN BY DBA
CHECKED RLE
SUBMITTED RONNIE L. ECKSTEIN
DESIGN APPROVAL RAYMOND E. LEBLANC
DRAWING APPROVAL GEORGE P. PANKOFF
CONTRACT NO.

U.S. ARMY ARMAMENT, MUNITIONS & CHEMICAL COMMAND
CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
ABERDEEN PROVING GROUND, MARYLAND, 21010-5423

SOURCE SCREEN ASSEMBLY

SIZE	CAGE CODE	DWG NO.
C	81361	442-497

SCALE 4/1 SHEET

DISTRIBUTION STATEMENT C: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS TO PROTECT TECHNICAL DATA. THIS DETERMINATION WAS MADE ON JULY 1, 1991. OTHER REQUESTS FOR THIS DOCUMENT WILL BE REFERRED TO: COMMANDER, U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, ATTN: SMCCR-PET, ABERDEEN PROVING GROUND, MD 21010-5423.

THIRD ANGLE PROJECTION METRIC

=DATA,PARTS,442.497 DRAW 1 DATE: 97-04-14 14:39:06 BY: MJHOLT

Article 1- Source Screen Assembly

December 31, 2008 4:03 PM [56.CAL]

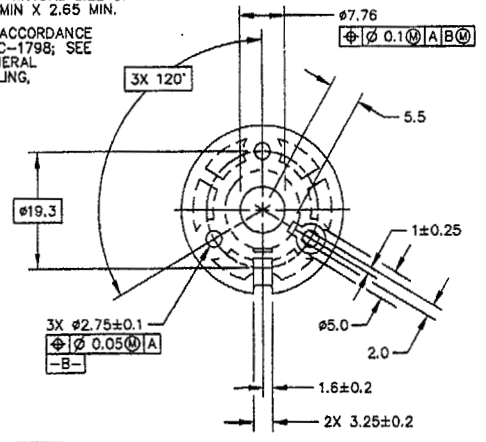
NOTES:

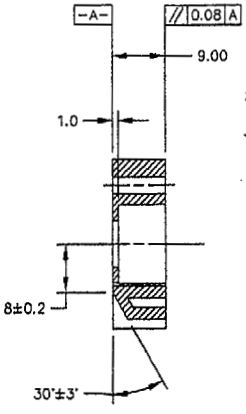
1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN MIL-STD-100.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - □ REMOVE BURRS ■ BREAK SHARP EDGES 0.5 MAX
   - ■ FILLETS R 0.3 MAX
   - ■ 0.8 ALL OVER, EXCEPT AS NOTED
   - □ DIMENSIONS APPLY AFTER PLATING
   - □ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
   - ■ ANSI Y14.5-DATED 1982 APPLIES
   - □ FED-STD-H28 APPLIES
3. METRIC, 1 INCH = 25.4 MM APPLIES.
4. BURR HEIGHT SHALL NOT EXCEED 0.5. NO LOOSE BURRS PERMITTED.
5. IF BURRS ARE PRESENT, VIRTUAL SIZE OF FEATURE SHALL BE 0.1 MIN X 2.65 MIN.
6. MAY BE PROCESSED IN ACCORDANCE WITH ADVISORY PD EA-C-1798; SEE GENERAL CLEANING, GENERAL BAKING, GENERAL HANDLING, AND GENERAL STORAGE.

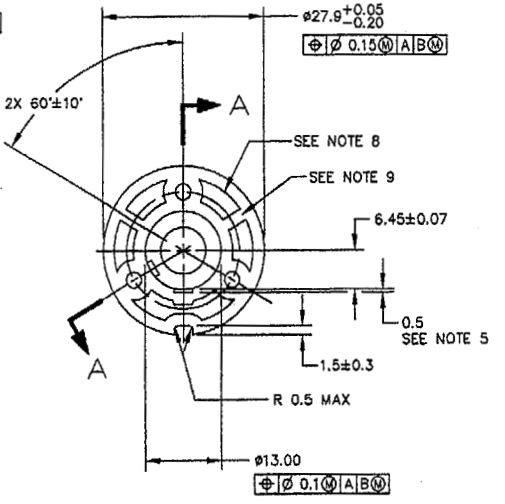
NOTES CONTINUED:

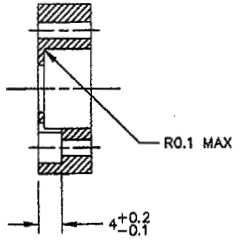
7. ZENITE LCP, GRADE 6130, NON-LUBRICATED, VIRGIN
   OR
   VECTRA A130 NATURAL
   SUGGESTED SOURCE OF SUPPLY:
   TICONA
   90 MORRIS AVENUE
   SUMMIT, NJ 07901
8. MAINTAIN MINIMUM WALL THICKNESS OF 2.0 mm
9. RIB SHOWN IS OPTIONAL FEATURE LOCATED EITHER ONE OR TWO PLACES. RIB THICKNESS 2 ± 0.5.

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
F	REPLACES 442-413 REV E; DATED 99-08-09, NOR Z16-1530-0002, 01-09-26	02-01-04	JSR









SECTION A-A

QTY REQD	DWG SIZE	DRAWING OR PART NO.	NOMENCLATURE OR MATERIAL	SPECIFICATION	ITEM NO.

PARTS LIST

APPLICATION	
DWG SIZE	NEXT ASSY
E	442-306
D	5-15-17065

EQUIPMENT CODE NO.	
	Z16
	Z47

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MM
TOLERANCES ON:
WHOLE NUMBERS ±
1 PLACE DECIMALS ± 0.1
2 PLACE DECIMALS ± 0.05
ANGLES ± 0° 30'

MATERIAL
SEE NOTE 7

ORIGINAL DATE (YR-MO-DA): 91-11-08
DRAWN BY: R.GEORGE
CHECKER: RLE
SUBMITTED: RONNIE L. ECKSTEIN
DESIGN APPROVAL: RAYMOND E. LEBLANC
DRAWING APPROVAL: GEORGE P. PANKOFF
CONTRACT NO.

U.S. ARMY SOLDIER AND BIOLOGICAL CHEMICAL COMMAND
EDGEWOOD CHEMICAL BIOLOGICAL CENTER
ABERDEEN PROVING GROUND, MARYLAND, 21010-5424

INSULATOR, SOURCE

SIZE	CAGE CODE	DWG NO.
C	81361	442-413

SCALE 2/1 SHEET

DISTRIBUTION STATEMENT C: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS TO PROTECT TECHNICAL DATA. THIS DETERMINATION WAS MADE ON JULY 1, 1991. OTHER REQUESTS FOR THIS DOCUMENT WILL BE REFERRED TO: COMMANDER, U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, ATTN: SMCCR-PET, ABERDEEN PROVING GROUND, MD 21010-5423.

THIRD ANGLE PROJECTION

METRIC

\data\parts\442\413\1.dwg DATE: 01-12-27 16:17 BY: mjcampbe

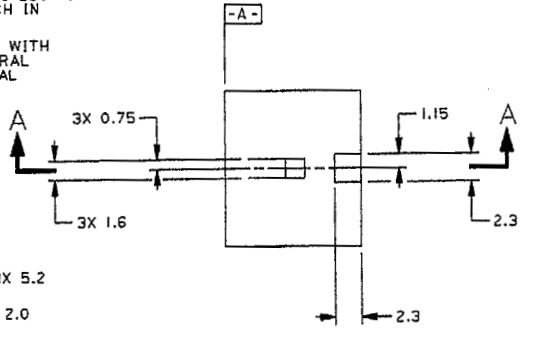
Article 1- Source Screen Assembly

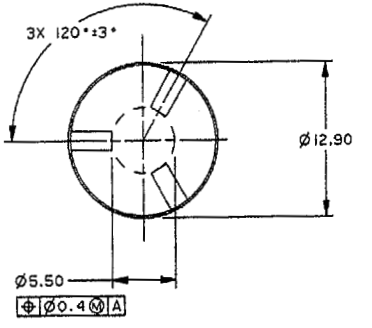
December 31, 2006 4:02 PM [58.CAL]

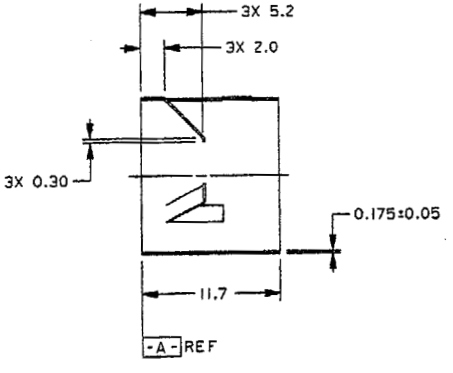
NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN DOD-STD-100.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ■ REMOVE BURRS ■ BREAK SHARP EDGES 0.25 MAX
   - ■ FILLETS R 0.25 MAX
   - ■ 0.8 ALL OVER, EXCEPT AS NOTED
   - □ DIMENSIONS APPLY AFTER PLATING
   - □ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
   - ■ ANSI Y14.5-DATED 1982 APPLIES
   - □ FED-STD-H28 APPLIES
3. ASTM E380 APPLIES. METHOD B SHALL BE USED IN CONVERTING AND ROUNDING OFF. 1 INCH = 25.4 MM APPLIES.
4. FINISH 1.11.2.8 OF MIL-STD-171 OR DEFENSE STD. 03-2 WITH ELECTRO DEPOSITION OF GOLD 0.5 MICRONS PER DEFENSE STD. 03-17.
5. FINISH ADHESION TEST: PLACE IN AN AIR OVEN AT 200° TO 250° C FOR A MIN. OF 1 HOUR AND QUENCH IN WATER AT ROOM TEMPERATURE.
6. MAY BE PROCESSED IN ACCORDANCE WITH ADVISORY PD EA-C-1798: SEE GENERAL CLEANING, GENERAL BAKING, GENERAL HANDLING, AND GENERAL STORAGE.

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	REPLACES WITH CHANGE DWG 2D/442-415, REV 1, DATED 87-03-30, NOR Z16-490-0001, 88-08-17, Z16-737-0005, 89-10-31, S0C0794-0001, 90-05-14	91-11-08	RE/LPK
B	NOR S2C0785-0001, 92-08-28 NOR S3C0753-0003, 93-03-15	93-06-11	JSR/KTL
C	NOR Z16-1384-0001, 97-06-25	97-09-03	JSR







SECTION A-A

QTY REQD	DWG SIZE	DRAWING OR PART NO.	NOMENCLATURE OR MATERIAL	SPECIFICATION	ITEM NO.

PARTS LIST

APPLICATION	
DWG SIZE	NEXT ASSY
C	442-497

END ITEM CODE NO.: Z16, Z47

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MM
TOLERANCES ON:
WHOLE NUMBERS :
1 PLACE DECIMALS ± 0.1
2 PLACE DECIMALS ± 0.05
ANGLES ± 0° 30'

MATERIAL
STAINLESS STEEL, UNS S30323, CONDITION A, PER ASTM-A582 OR AISI 321 HALF HARD

ORIGINAL DATE (YR-MO-DA): 91-11-08
DRAWN BY: R.GEORGE
CHECKER: RLE
SUBMITTED: RONNIE L. ECKSTEIN
DESIGN APPROVAL: RAYMOND E. LEBLANC
DRAWING APPROVAL: GEORGE P. PANKOFF
CONTRACT NO.:

U.S. ARMY ARMAMENT, MUNITIONS & CHEMICAL COMMAND
CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
ABERDEEN PROVING GROUND, MARYLAND, 21010-5423

SOURCE SCREEN

SIZE	CAGE CODE	DWG NO.
C	81361	442-415

SCALE 4/1 SHEET

DISTRIBUTION STATEMENT C: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS TO PROTECT TECHNICAL DATA. THIS DETERMINATION WAS MADE ON JULY 1, 1991. OTHER REQUESTS FOR THIS DOCUMENT WILL BE REFERRED TO: COMMANDER, U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, ATTN: SMCCR-PET, ABERDEEN PROVING GROUND, MD 21010-5423.

THIRD ANGLE PROJECTION METRIC

:DATA.PARTS.442.415 DRAW | DATE: 97-08-29 8:28:15 BY: MACHILDE

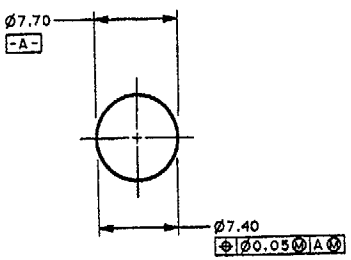
Article 1- Source Screen Assembly

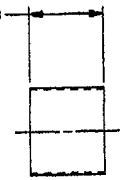
December 31, 2006 4:01 PM [59.CAL]

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	REPLACES WITH CHANGE DWG 4D/442-416, REV 1, DATED 87-04-01, NOR Z16-477-0001 88-07-27, Z16-585-0001, 89-01-04	91-11-08	RE/LPK
B	NOR S2C0785-0019, 92-08-28 NOR S3C0753-0015, 93-03-15	93-06-11	JSR/KTL
C	NOR Z16-1302-0001, 96-11-20	97-04-11	JSR 9/5

NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN DOD-STD-100.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ■ REMOVE BURRS ■ BREAK SHARP EDGES 0.25 MAX
   - □ FILLETS R 0.25 MAX
   - □ 32 ALL OVER, EXCEPT AS NOTED
   - ■ DIMENSIONS APPLY AFTER PLATING
   - □ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
   - ■ ANSI Y14.5-DATED 1982 APPLIES
   - □ FED-STD-H28 APPLIES
3. ASTM E380 APPLIES. METHOD B SHALL BE USED IN CONVERTING AND ROUNDING OFF. 1 INCH = 25.4 MM APPLIES.
4. ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, ABERDEEN PROVING GROUND, MD 21010-5423 FOR USE IN THE APPLICATION(S) SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER.
5. IDENTIFICATION OF THE APPROVED SOURCE(S) OF SUPPLY HEREON IS NOT TO BE CONSTRUED AS A GUARANTEE OF PRESENT OR CONTINUED AVAILABILITY AS A SOURCE OF SUPPLY FOR THE ITEM DESCRIBED ON THE DRAWING.
6. MATERIAL - BRASS, UNS26000 OR UNS27200, TEMPER OPTIONAL PER ASTM-B135 OR NICKEL-CHROMIUM TUBING UNS NO. N06600 PER ASTM-B163 OR ASTM-B167.
7. FINISH 1.4.3.2 PER MIL-STD-171.
8. SOURCE SHALL BE PLATED WITH NI 63 -10 Mci $^{+3}_{-5}$ Mci.
9. THE ION CURRENT SHALL BE 9 ± 3 NANOAMPERES.
10. THE ION CURRENT SHALL BE 4.25 ± 1.75 NANOAMPERES.
11. HANDLING, SHIPPING, LABELING AND DISPOSAL OF RADIOACTIVE COMMODITIES SHALL BE IN ACCORDANCE WITH DSAM 41458 "RADIOACTIVE" COMMODITIES IN THE DOD SUPPLY SYSTEM.
12. MAY BE PROCESSED IN ACCORDANCE WITH ADVISORY PD EA-C-1798; SEE CLEANING AND BAKING SPECIAL PROCEDURES FOR RADIOACTIVE SOURCE.





APPROVED SOURCE(S) OF SUPPLY				
PART NO.	VENDOR ADDRESS	CAGE CODE	VENDOR PART NO.	ITEM IDENTIFICATION
442-416	DU PONT MERCK PHARMACEUTICAL CO, RADIOPHARMACEUTICAL DIV, SOURCE MARKETING, BLDG 300 331 TREBLE COVE ROAD NO. BILLERICA, MA 01862 (SEE NOTE 10)	51851	NER-004R	81361SOCN442-416 MFR-51851
	AMERSHAM CORP, QUALITY AND SAFETY ASSURANCE DEPT. 2636 SOUTH CLEARBROOK DRIVE ARLINGTON HEIGHTS, IL 60005 (SEE NOTE 9)	51431	NBCQ8681	81361SOCN442-416 MFR-51431

SOURCE CONTROL DRAWING

QTY REQD	DWG SIZE	DRAWING OR PART NO.	NOMENCLATURE OR MATERIAL	SPECIFICATION	ITEM NO.
PARTS LIST					

APPLICATION	
DWG SIZE	NEXT ASSY
E	442-306
E	5-15-17036

END ITEM CODE NO.		
		Z16
		Z47

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MM
TOLERANCES ON:
WHOLE NUMBERS ±
1 PLACE DECIMALS ±
2 PLACE DECIMALS ±0.05
ANGLES ± 0° 30'

MATERIAL
SEE NOTE 6

ORIGINAL DATE (YR-MO-DA) 91-11-08
DRAWN BY DBA
CHECKED RLE
SUBMITTED RONNIE L. ECKSTEIN
DESIGN APPROVAL RAYMOND E. LEBLANC
DRAWING APPROVAL GEORGE P. PANKOFF
CONTRACT NO.

U.S. ARMY ARMAMENT, MUNITIONS & CHEMICAL COMMAND
CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
ABERDEEN PROVING GROUND, MARYLAND, 21010-5423

SOURCE

SIZE	CAGE CODE	DWG NO.
C	81361	442-416

SCALE 4/1 SHEET

DISTRIBUTION STATEMENT C: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS TO PROTECT TECHNICAL DATA. THIS DETERMINATION WAS MADE ON JULY 1, 1991. OTHER REQUESTS FOR THIS DOCUMENT WILL BE REFERRED TO: COMMANDER, U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, ATTN: SMCCR-PET, ABERDEEN PROVING GROUND, MD 21010-5423.

THIRD ANGLE PROJECTION

METRIC

#DATA.PARTS.442.416 DRAW 1 DATE: 97-04-14 13:12:43 BY: MJHOLT

Product Information

DuPont™ Zenite® LCP

liquid crystal polymer resin

Zenite® 6130 WT010

Zenite® 6130 WT010 is a 30% glass reinforced white liquid crystal polymer resin having excellent toughness and a heat deflection temperature of 268°C.

Property	Test Method	Units	Value
Identification			
Resin Identification	ISO 1043		LCP-GF30
Part Marking Code	ISO 11469		>LCP-GF30<
Mechanical			
Stress at Break	*ISO 527*	MPa (kpsi)	130 (18.9)
Tensile Strength, 0.8mm (0.031in)	ASTM D 638	MPa (kpsi)	
-40°C (-40°F)			250 (36.3)
23°C (73°F)			165 (23.9)
120°C (250°F)			82 (11.9)
150°C (300°F)			55 (8)
200°C (390°F)			22 (3.2)
250°C (480°F)			21 (3)
Tensile Strength, 3.2mm (0.125in)	ASTM D 638	MPa (kpsi)	
-40°C (-40°F)			185 (26.8)
23°C (73°F)			125 (18.2)
120°C (250°F)			60 (8.7)
150°C (300°F)			50 (7.3)
200°C (390°F)			35 (5.2)
250°C (480°F)			14 (2.0)
Strain at Break	ISO 527	%	2.2
Elongation at Break	ASTM D 638	%	2.7
Tensile Modulus	ISO 527	MPa (kpsi)	13500 (1960)

Contact DuPont for Material Safety Data Sheet, general guides and/or additional information about ventilation, handling, purging, drying, etc.
ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

During molding, use protective equipment and clothing. Skin contact with molten Zenite ® resins can cause severe burns. Be particularly alert during purging.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Mechanical			
Tensile Modulus, 1.6mm (0.062in)	ASTM D 638	MPa (kpsi)	
-40°C (-40°F)			20000 (2900)
23°C (73°F)			15000 (2200)
120°C (250°F)			8300 (1200)
150°C (300°F)			6700 (1000)
200°C (390°F)			4800 (700)
250°C (480°F)			3400 (500)
Tensile Modulus, 3.2mm (0.125in)	ASTM D 638	MPa (kpsi)	
-40°C (-40°F)			29000 (4200)
23°C (73°F)			14000 (2000)
120°C (250°F)			12000 (1700)
150°C (300°F)			12000 (1700)
200°C (390°F)			10000 (1400)
250°C (480°F)			4000 (600)
Shear Strength, 0.8mm (0.031in)	ASTM D 732	MPa (kpsi)	68 (9.8)
Shear Strength, 3.2mm (0.125in)	ASTM D 732	MPa (kpsi)	51 (7.4)
Flexural Modulus	ISO 178	MPa (kpsi)	11000 (1600)
Flexural Modulus, 0.8mm (0.031in)	ASTM D 790	MPa (kpsi)	
-40°C (-40°F)			25000 (3600)
23°C (73°F)			19000 (2700)
120°C (250°F)			10000 (1500)
150°C (300°F)			9000 (1300)
200°C (390°F)			6900 (1000)
250°C (480°F)			4100 (600)
Flexural Modulus, 1.6mm (0.062in)	ASTM D 790	MPa (kpsi)	
-40°C (-40°F)			19000 (2800)
23°C (73°F)			15000 (2200)
120°C (250°F)			8300 (1200)
150°C (300°F)			6900 (1000)
200°C (390°F)			6200 (900)
250°C (480°F)			3400 (500)

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ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Mechanical			
Flexural Modulus, 3.2mm (0.125in)	ASTM D 790	MPa (kpsi)	
-40°C (-40°F)			15000 (2100)
23°C (73°F)			12000 (1700)
120°C (250°F)			6200 (900)
150°C (300°F)			5500 (800)
200°C (390°F)			4800 (700)
250°C (480°F)			2800 (400)
Flexural Strength	ISO 178	MPa (kpsi)	190 (27.6)
Flexural Strength, 0.8mm (0.031in)	ASTM D 790	MPa (kpsi)	
-40°C (-40°F)			340 (49.3)
23°C (73°F)			195 (28.3)
120°C (250°F)			90 (13.0)
150°C (300°F)			70 (10.2)
200°C (390°F)			50 (7.2)
250°C (480°F)			23 (3.3)
Flexural Strength, 1.6mm (0.062in)	ASTM D 790	MPa (kpsi)	
-40°C (-40°F)			295 (42.8)
23°C (73°F)			195 (28.3)
120°C (250°F)			80 (11.6)
150°C (300°F)			64 (9.3)
200°C (390°F)			45 (6.5)
250°C (480°F)			22 (3.2)
Flexural Strength, 3.2mm (0.125in)	ASTM D 790	MPa (kpsi)	
-40°C (-40°F)			245 (35.5)
23°C (73°F)			170 (24.6)
120°C (250°F)			62 (9.0)
150°C (300°F)			50 (7.3)
200°C (390°F)			33 (4.8)
250°C (480°F)			17 (2.5)
Compressive Strength	ASTM D 695	MPa (kpsi)	105 (15.2)
Compressive Modulus	ASTM D 695	MPa (kpsi)	6900 (1000)

Contact DuPont for Material Safety Data Sheet, general guides and/or additional information about ventilation, handling, purging, drying, etc.
ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Mechanical			
Deformation Under Load	ASTM D 621	%	
27.6MPa (4000psi)			0.04
Notched Izod Impact Strength	ISO 180/1A	kJ/m^2	
-40°C (-40°F)			20
23°C (73°F)			25
Izod Impact, 0.8mm (0.031in)	ASTM D 256	J/m (ft lb/in)	
-40°C (-40°F)			300 (5.6)
23°C (73°F)			215, 40%NB (4.0, 40%NB)
Izod Impact, 1.6mm (0.062in)	ASTM D 256	J/m (ft lb/in)	200 (3.8)
Izod Impact, 3.2mm (0.125in)	ASTM D 256	J/m (ft lb/in)	
-40°C (-40°F)			110 (2.1)
23°C (73°F)			125 (2.4)
Unnotched Izod Impact Strength	ISO 180/1U	kJ/m^2	
-30°C (-22°F)			30
23°C (73°F)			35
Unnotched Impact, 0.8mm (0.031in)	ASTM D 4812	J/m (ft lb/in)	
-40°C (-40°F)			735, 60%NB (13.8, 60%NB)
23°C (73°F)			NB
Unnotched Impact, 1.6mm (0.062in)	ASTM D 4812	J/m (ft lb/in)	685 (12.8)
Unnotched Impact, 3.2mm (0.125in)	ASTM D 4812	J/m (ft lb/in)	
-40°C (-40°F)			440 (8.2)
23°C (73°F)			655 (12.3)
Notched Charpy Impact Strength	ISO 179/1eA	kJ/m^2	
-30°C (-22°F)			25
23°C (73°F)			35
Unnotched Charpy Impact Strength	ISO 179/1eU	kJ/m^2	
-30°C (-22°F)			25
23°C (73°F)			35

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ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Thermal			
Deflection Temperature	ISO 75f	°C (°F)	
1.80MPa			268 (514)
Melting Temperature	ISO 11357-1/-3	°C (°F)	
10°C/min			335 (635)
CLTE, Normal	ASTM E 228	E-4/C (E-4/F)	
23 - 150°C (73 - 302°F), 1.6mm (0.062in)			0.49 (0.27)
23 - 150°C (73 - 302°F), 3.2mm (0.125in)			0.37 (0.21)
CLTE, Parallel	ASTM E 228	E-4/C (E-4/F)	
23 - 150°C (73 - 302°F), 1.6mm (0.062in)			0.05 (0.03)
23 - 150°C (73 - 302°F), 3.2mm (0.125in)			0.13 (0.07)
Glass Transition Temperature	ASTM D 3418	°C (°F)	120 (250)
Extrapolated End Melt Temp.	ASTM D 3418	°C (°F)	350 (662)
Thermal Conductivity	ASTM C 177	W/m K (Btu in/h ft^2 F)	0.27 (1.9)
Specific Heat	ASTM C 351	J/kg K (Btu/lb F)	
25°C (77°F)			800 (0.19)
125°C (257°F)			1100 (0.26)
225°C (437°F)			1300 (0.31)
325°C (617°F)			1400 (0.33)
Electrical			
Surface Resistivity	ASTM D 257	ohm	1E16
Volume Resistivity	ASTM D 257	ohm cm	1E17
Dielectric Strength, Short Time, 0.8mm	ASTM D 149	kV/mm (V/mil)	
23°C (73°F)			40 (1020)
120°C (250°F)			41 (1050)
150°C (300°F)			37 (950)
200°C (390°F)			40 (1010)
Dielectric Strength, Short Time, 1.6mm	ASTM D 149	kV/mm (V/mil)	
23°C (73°F)			35 (900)
120°C (250°F)			33 (840)
150°C (300°F)			31 (800)
200°C (390°F)			33 (850)

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Test temperatures are 23°C unless otherwise stated.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Electrical			
Dielectric Strength, Short Time, 3.2mm	ASTM D 149	kV/mm (V/mil)	
23°C (73°F)			29 (740)
120°C (250°F)			28 (730)
150°C (300°F)			27 (680)
Dielectric Strength, Step by Step, 0.8mm	ASTM D 149	kV/mm (V/mil)	30 (760)
Dielectric Strength, Step by Step, 1.6mm	ASTM D 149	kV/mm (V/mil)	29 (740)
Dielectric Strength, Step by Step, 3.2mm	ASTM D 149	kV/mm (V/mil)	26 (650)
Dielectric Constant, 0.8mm (0.031in)	ASTM D 150		
23°C (73°F), 1E03 Hz			4.0
120°C (250°F), 1E03 Hz			4.5
150°C (300°F), 1E03 Hz			4.5
200°C (390°F), 1E03 Hz			4.5
23°C (73°F), 1E06 Hz			3.6
120°C (250°F), 1E06 Hz			4.3
150°C (300°F), 1E06 Hz			4.4
200°C (390°F), 1E06 Hz			4.4
Dielectric Constant, 0.8mm (0.031in)	ASTM D 2520 B		
23°C (73°F), 1E09 Hz			4.4
120°C (250°F), 1E09 Hz			4.4
150°C (300°F), 1E09 Hz			4.4
200°C (390°F), 1E09 Hz			4.5
Dielectric Constant, 1.6mm (0.062in)	ASTM D 2520 B		
23°C (73°F), 1E09 Hz			4.3
120°C (250°F), 1E09 Hz			4.4
150°C (300°F), 1E09 Hz			4.4
200°C (390°F), 1E09 Hz			4.5

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ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Electrical			
Dielectric Constant, 3.2mm (0.125in)	ASTM D 150		
23°C (73°F), 1E03 Hz			4.4
120°C (250°F), 1E03 Hz			5.0
150°C (300°F), 1E03 Hz			5.0
200°C (390°F), 1E03 Hz			5.0
23°C (73°F), 1E06 Hz			3.9
120°C (250°F), 1E06 Hz			4.8
150°C (300°F), 1E06 Hz			4.8
200°C (390°F), 1E06 Hz			4.9
Dielectric Constant, 3.2mm (0.125in)	ASTM D 2520 B		
23°C (73°F), 1E09 Hz			4.3
120°C (250°F), 1E09 Hz			4.4
150°C (300°F), 1E09 Hz			4.4
200°C (390°F), 1E09 Hz			4.5
250°C (480°F), 1E09 Hz			4.8
Dissipation Factor, 0.8mm (0.031in)	ASTM D 150		
23°C (73°F), 1E03 Hz			0.013
120°C (250°F), 1E03 Hz			0.008
150°C (300°F), 1E03 Hz			0.009
200°C (390°F), 1E03 Hz			0.015
23°C (73°F), 1E06 Hz			0.026
150°C (300°F), 1E06 Hz			0.016
200°C (390°F), 1E06 Hz			0.010
Dissipation Factor, 0.8mm (0.031in)	ASTM D 2520 B		
23°C (73°F), 1E09 Hz			0.004
120°C (250°F), 1E09 Hz			0.012
150°C (300°F), 1E09 Hz			0.018
200°C (390°F), 1E09 Hz			0.025

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ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Electrical			
Dissipation Factor, 1.6mm (0.062in)	ASTM D 2520 B		
23°C (73°F), 1E09 Hz			0.004
120°C (250°F), 1E09 Hz			0.014
150°C (300°F), 1E09 Hz			0.020
200°C (390°F), 1E09 Hz			0.028
Dissipation Factor, 3.2mm (0.125in)	ASTM D 150		
23°C (73°F), 1E03 Hz			0.013
120°C (250°F), 1E03 Hz			0.006
150°C (300°F), 1E03 Hz			0.007
200°C (390°F), 1E03 Hz			0.014
23°C (73°F), 1E06 Hz			0.027
120°C (250°F), 1E06 Hz			0.032
150°C (300°F), 1E06 Hz			0.018
200°C (390°F), 1E06 Hz			0.009
Dissipation Factor, 3.2mm (0.125in)	ASTM D 2520 B		
23°C (73°F), 1E09 Hz			0.004
120°C (250°F), 1E09 Hz			0.016
150°C (300°F), 1E09 Hz			0.023
200°C (390°F), 1E09 Hz			0.032
250°C (480°F), 1E09 Hz			0.034
Flammability			
Flammability Classification	IEC 60695-11-10		
0.38mm			V-0
Flammability Classification	UL94		
0.38mm			V-0
Oxygen Index	ASTM D 2863	%	
3.2mm (0.125in)			38

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ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Temperature Index			
RTI, Electrical	UL 746B	°C	
0.75mm			240
RTI, Impact	UL 746B	°C	
0.75mm			220
RTI, Strength	UL 746B	°C	
0.75mm			240
Other			
Density	ISO 1183	kg/m^3 (g/cm^3)	1680 (1.68)
Hardness, Rockwell	ASTM D 785		
Scale M			61
Scale R			108
Taber Abrasion	ASTM D 1044	mg	
CS-17 Wheel, 1kg, 1000 cycles			49
Water Absorption	ASTM D 570	%	
50%RH,23°C,24h, 3.2mm (0.125in)			0.002
Water, tap 23°C,10000h, 3.2mm (0.125in)			0.08
UL Regrind Approval	UL 746D	%	50
Mold Shrinkage	ASTM D 955	%	
Flow, 0.8mm (0.031in)			-0.07
Flow, 1.6mm (0.062in)			-0.07
Flow, 3.2mm (0.125in)			-0.07
Transverse, 0.8mm (0.031in)			0.5
Transverse, 1.6mm (0.062in)			0.8
Transverse, 3.2mm (0.125in)			0.5

Contact DuPont for Material Safety Data Sheet, general guides and/or additional information about ventilation, handling, purging, drying, etc.
ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

051220/051221

Product Information

Zenite® 6130 WT010

Property	Test Method	Units	Value
Processing			
Melt Temperature Range		°C (°F)	350-360 (660-680)
Melt Temperature Optimum		°C (°F)	355 (670)
Mold Temperature Range		°C (°F)	40-150 (105-300)
Mold Temperature Optimum		°C (°F)	80 (175)
Drying Time, Dehumidified Dryer		h	3
Drying Temperature		°C (°F)	140 (285)
Processing Moisture Content		%	<0.01

Contact DuPont for Material Safety Data Sheet, general guides and/or additional information about ventilation, handling, purging, drying, etc.
ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.
Test temperatures are 23°C unless otherwise stated.

051220/051221

MatWeb, The Online Materials Database

Ticona Vectra® A130 Liquid Crystal Polymer (LCP), 30% Glass Reinforced

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

Physical Properties	Metric	English	Comments
Density	1.62 g/cc	0.0585 lb/in³	ISO 1183
Water Absorption	0.02 %	0.02 %	Immersion to equilibrium; ISO 62
Moisture Absorption at Equilibrium	0.02 %	0.02 %	ISO 62
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in	
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in	
Mechanical Properties			
Hardness, Rockwell M	87	87	ISO 2039-2
Tensile Strength, Ultimate	190 MPa	27600 psi	ISO 527
Elongation at Break	2.3 %	2.3 %	IEC 527
Tensile Modulus	16 GPa	2320 ksi	ISO 527
Flexural Modulus	15 GPa	2180 ksi	ISO 178
Flexural Yield Strength	280 MPa	40600 psi	ISO 178
Compressive Yield Strength	100 MPa	14500 psi	1% Deflection, ISO 604
Charpy Impact, Notched	4 J/cm²	19 ft-lb/in²	ISO 179
Tensile Impact Strength	80 kJ/m²	38.1 ft-lb/in²	Notched; ASTM D1822
Compressive Modulus	14.5 GPa	2100 ksi	ISO 604
Coefficient of Friction	0.14	0.14	Dynamic vs. Steel; ASTM D1984
Izod Impact, Notched (ISO)	26 kJ/m²	12.4 ft-lb/in²	ISO 180/1A
Electrical Properties			
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	IEC 93
Surface Resistance	1e+017 ohm	1e+017 ohm	IEC 93
Dielectric Constant	3.2	3.2	10 MHz
Dielectric Constant, Low Frequency	3.7	3.7	1 kHz; IEC 250
Dissipation Factor	0.008	0.008	10 MHz
Dissipation Factor, Low Frequency	0.02	0.02	1kHz; IEC 250
Arc Resistance	140 sec	140 sec	
Comparative Tracking Index	175 V	175 V	IEC 112
Thermal Properties			
CTE, linear 20°C	0 µm/m-°C	0 µin/in-°F	Flow. -50 to 200°C (-58 to 390°F)
CTE, linear 20°C Transverse to Flow	79 µm/m-°C	43.9 µin/in-°F	-50 to 200°C (-58 to 390°F).
CTE, linear 100°C	0 µm/m-°C	0 µin/in-°F	Flow from -50 to 200°C (-58 to 390°F)

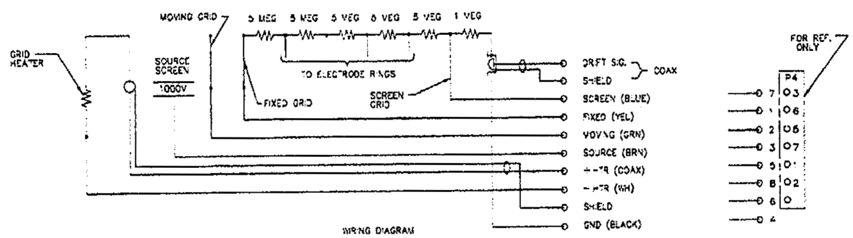
CTE, linear 100°C	79 µm/m-°C	43.9 µin/in-°F	Transverse from -50 to 200°C (-58 to 390° F)
Melting Point	280 °C	536 °F	ISO 3146
Maximum Service Temperature, Air	240 °C	464 °F	240/220°C (460/430°F) UL746 RTI Electrical/Mechanical
Deflection Temperature at 0.46 MPa (66 psi)	252 °C	486 °F	ASTM D648
Deflection Temperature at 1.8 MPa (264 psi)	235 °C	455 °F	ISO 75/A
Vicat Softening Point	232 °C	450 °F	ASTM D1525
UL RTI, Electrical	240 °C	464 °F	
UL RTI, Mechanical with Impact	220 °C	428 °F	
Flammability, UL94	V-0	V-0	V-0 UL94
Oxygen Index	43 %	43 %	ISO 4589

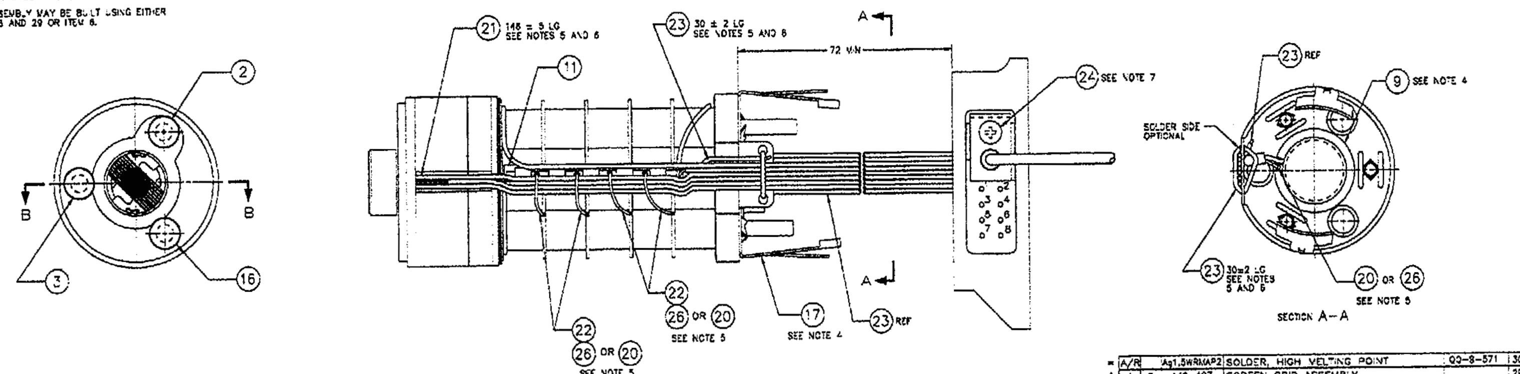
Article 3 - Drift Tube Cell Assembly

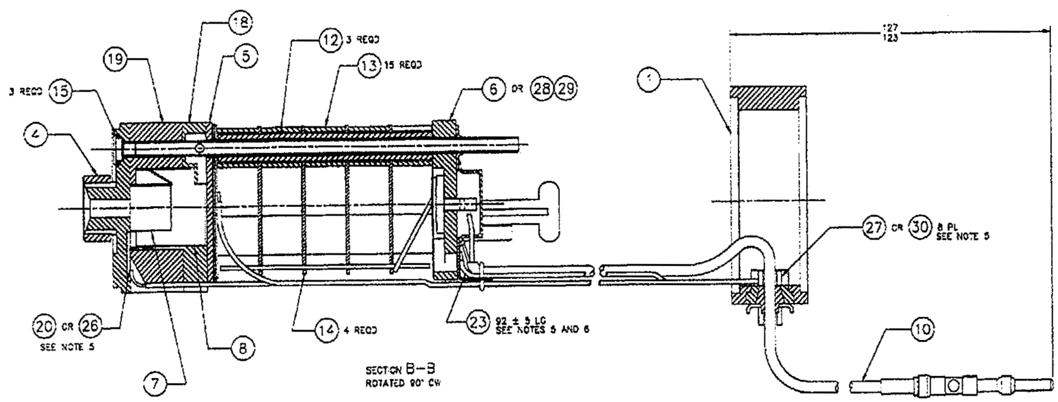
December 31, 2008 4:14 PM [26.CAL]

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN MIL-STD-100.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES 0.13 MAX
   - ☐ FILLETS R 0.25 MAX
   - ☐ 3.2/ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS
   - ■ ANSI Y14.5M-1982 APPLIES
   - ☐ PED-STD-H28 APPLIES
3. METRIC, 1 INCH = 25.4 MM APPLIES.
4. PRIOR TO SOLDERING ITEM 9 TO ITEM 17, ITEMS 9 AND 17 TO BE PRE-TINNED USING ITEM 20 OR 26. FINAL JOINT TO BE MADE USING ITEM 25.
5. SOLDER IN ACCORDANCE WITH IPC-A-610 USING ITEM 27 OR 30.
6. STRIP AND TIN BOTH ENDS OF ITEMS 21 AND 23 TO A DIMENSION OF 4.5 ± 2.5.
7. TORQUE TO 50 ± 2.5 OZ. INCHES.
8. FOR SCHEMATIC DIAGRAM SEE DRAWING 442-1033.
9. FOR SAFETY INFORMATION SEE HAZARDOUS COMPONENT SAFETY DATA STATEMENT NO. 20206.
10. MAY BE PROCESSED IN ACCORDANCE WITH ADVISORY PD EA-C-1798; SEE CLEANING AND BAKING SPECIAL PROCEDURES FOR LOOSE STACK ASSEMBLY AND GENERAL HANDLING.
11. CELL ASSEMBLY MAY BE BUILT USING EITHER ITEMS 28 AND 29 OR ITEM 6.

LTR	DESCRIPTION	DATE	APPROVED
D	REPLACES 442-306 REV C, DATED 96-04-15 NOR Z16-1558-0001, 02-05-15 NOR Z16-1547-0001, 02-03-08	02-04-03	LFP
E	NOR Z16-1556-0001, 02-05-15	02-09-03	LFP
F	NOR Z16-1575-0002, 03-02-28	03-03-06	LFP







	QTY REQD	SIZE	DRAWING OR PART NO.	NOMENCLATURE OR MATERIAL	SPECIFICATION	ITEM NO.
*	A/R		Ag1.5WRMAP2	SOLDER, HIGH MELTING POINT	QQ-S-571	30
Δ	1	C	442-427	SCREEN GRID ASSEMBLY		29
Δ	1	C	442-473	ELECTRODE ASSEMBLY		28
*	A/R		Ag1.5WRMAP3	SOLDER, HIGH MELTING POINT	QQ-S-571	27
	A/R		SN60WRMAP3	SOLDER, ROSIN CORED	QQ-S-571	26
	A/R		SN63WS	SOLDER, FLUXLESS	QQ-S-571	25
	A/R		B18673C020040	SCREW, MACH, PAN HD, M2 X 4 LG	ANSI B18.6.7M	24
	A/R		M16878/6BC80	WIRE, ELECT, 28 GA, COLOR BLACK	MIL-W-16878/6	23
	A/R		QQW343S24S?	WIRE, ELECT., COPPER (UNINSULATED)	QQ-W-343	22
	A/R		M16878/5BCB1	WIRE, ELECT., 28 GA, COLOR BROWN	MIL-W-16878/5	21
	A/R		SN63WRMAP3	SOLDER, ROSIN CORED	QQ-S-571	20
	1	C	442-413	INSULATOR, SOURCE		19
	1	D	442-410	EXHAUST COLLAR		18
	1	D	442-381	CLIP, EARTH COUPLING		17
	1	C	442-348	ROD, RETAINING		16
	3	C	442-508	'O' RING, FLOW TUBE		15
	4	C	442-333	RING, ELECTRODE		14
	18	B	442-332	SPACER, INSULATING		13
	3	C	442-331	TUBE, INSULATING		12
	1	D	442-221	RESISTOR CHAIN		11
	1	D	442-614	CO-AXIAL CONNECTOR ASSEMBLY		10
	1	C	442-580	SCREENING CAN		9
	1	C	442-497	SOURCE SCREEN ASSEMBLY		8
	1	C	442-416	SOURCE		7
Δ	1	D	442-1928	GRID AND ELECTRODE ASSEMBLY		6
	1	D	442-426	FIXED AND MOVING GRID ASSEMBLY		5
	1	C	442-425	SENSOR ASSEMBLY		4
	1	C	442-423	RETURN TUBE SUBASSEMBLY		3
	1	C	442-422	FLOW TUBE SUBASSEMBLY		2
	1	C	442-325	TERMINAL HOLDER ASSEMBLY		1

PARTS LIST

Δ ALTERNATES
* ALTERNATES

APPLICATION: 5 | 442-701

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MM

91-11-08

C.L. WRIGHT | REL

RAYMOND S. LEBLANC

RAYMOND E. LEBLANC

GEORGE P. PANKOFF

U.S. ARMY SOLDIER AND BIOLOGICAL CHEMICAL COMMAND EDGEWOOD CHEMICAL BIOLOGICAL CENTER ABERDEEN PROVING GROUND, MARYLAND, 21010-5424

CELL ASSEMBLY

E | 81361 | 442-306

SCALE 4/1

THIRD ANGLE PROJECTION

METRIC

DISTRIBUTION STATEMENT C. DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS.

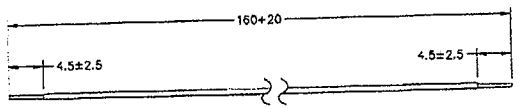
Article 4 - Sensor Assembly

December 31, 2006 4:00 PM [64.CAL]

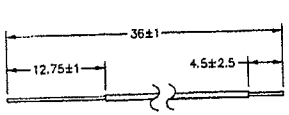
NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH ASME Y14.100 WITH THE ADDITION OF APPENDICES B THROUGH E.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ☒
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES 0.25 MAX
   - ☐ FILLETS R 0.25 MAX.
   - ☐ $\frac{32}{}$ ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
   - ☒ ANSI Y14.5-DATED 1982 APPLIES
   - ☐ FED-STD-H28 APPLIES
3. METRIC, 1 INCH = 25.4 MM APPLIES.
4. ASSEMBLE OUTER RING (ITEM 2) ONTO SENSOR BODY (ITEM 1) ENSURING ALIGNMENT OF HOLES FOR WIRES. THIS STEP MAY BE PERFORMED PRIOR TO NOTE 5 OR PRIOR TO NOTE 8.
5. BOND GRID HEATER (ITEM 3) ONTO OUTER RING (ITEM 2) USING ADHESIVE (ITEM 6 OR 8).
6. APPLY AND CURE ADHESIVE (ITEM 6) ACCORDING TO THE MANUFACTURER'S RECOMMENDED INSTRUCTIONS.
7. TRIM EXCESS MATERIAL OF GRID HEATER (ITEM 3). GRID HEATER SHALL NOT EXTEND BEYOND OUTER DIAMETER OF OUTER RING (ITEM 2).
8. PRIOR TO ASSEMBLY OF WIRES (ITEMS 4 AND 5) TO GRID HEATER (ITEM 3) TRIM WIRES AS SHOWN. IF USING 442-1925 IN NEXT ASSEMBLY USE DETAIL ITEM 5-A. IF USING 442-427 AND 442-473 IN NEXT ASSEMBLY USE DETAIL ITEM 5-B.
9. SENSOR ASSEMBLY RESISTANCE, WHEN MEASURED AT THE END OF THE CONDUCTORS (ITEMS 4 AND 5) SHALL BE 9.35 ± 1.75 OHMS.
10. SOLDER IN ACCORDANCE WITH PC-A-610 USING ITEM 7 OR 9.
11. AFTER ASSEMBLY OF ITEMS 2, 3, 4, AND 5, CHAMFER 0.4 MAX X 0.4 MAX ENSURING ITEMS 4 AND 5 ARE FREE OF CHAMFER.
12. MAY BE PROCESSED IN ACCORDANCE WITH ADVISORY PD EA-C-1798; SEE WORK STATIONS, CLEANING AND BAKING SPECIAL PROCEDURES FOR SUBASSEMBLIES, GENERAL HANDLING, AND GENERAL STORAGE.
13. WIRES (ITEMS 4 AND 5) SHALL BE LOCATED IN GROOVE OF ITEM 1 AS SHOWN.

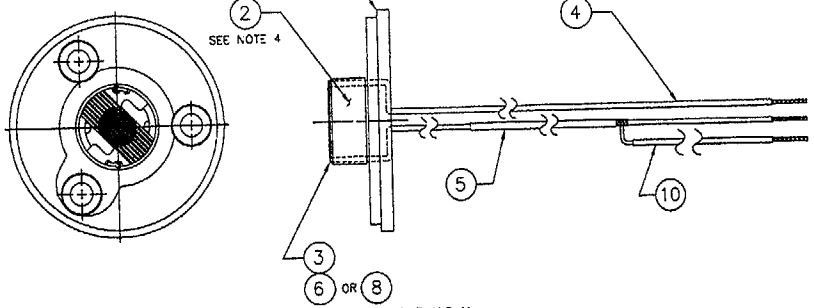
REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
D	REPLACES 442-425 REV C, DATED 99-08-09 NOR Z16-1550-0001, 02-03-08 NOR Z16-1569-0001, 02-06-13 NOR Z16-1575-0001, 03-02-26	03-03-04	LFP



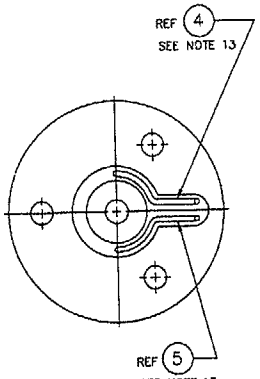
DETAIL ITEM 4
SEE NOTE 8

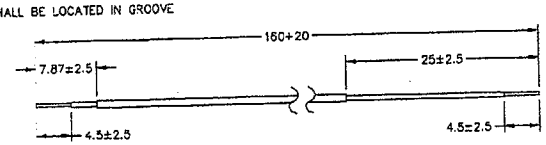


DETAIL ITEM 10
SEE NOTE 8

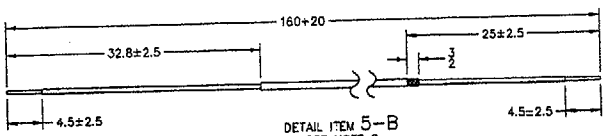


SEE NOTES 8, 6, 7 AND 11





DETAIL ITEM 5-A
SEE NOTE 8



DETAIL ITEM 5-B
SEE NOTE 8

QTY REQD	DWG SIZE	DRAWING OR PART NO.	NOMENCLATURE OR MATERIAL	SPECIFICATION	ITEM NO.
A/R		M16878/6BC80	WIRE, ELECT., 28 AWG, COLOR BLACK	MIL-W-16878/6	10
A/R		SN63WRMAP3	SOLDER, ROSIN CORED	QQ-S-571	9
A/R			HYSOL EA934NA ADHESIVE, THIXO TROPIC PASTE, CAGE CODE 3D523		8
A/R		SN60WRMAP3	SOLDER, ROSIN CORED	QQ-S-571	7
A/R		M-BOND 600	ADHESIVE, EPOXY-PHENOLIC, CAGE CODE 88952		6
A/R	C	442-162	CABLE, COAXIAL		5
A/R		M16878/6BC89	WIRE, ELECT., 28 AWG, COLOR WHITE	MIL-W-16878/6	4
1	D	442-533	HEATER, GRID		3
1	C	442-503	RING, OUTER, SENSOR		2
1	D	442-502	SENSOR BODY		1

PARTS LIST

APPLICATION	
DWG SIZE	NEXT ASSY
E	442-306

EQUIPMENT CODE NO.: Z16

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MM TOLERANCES ON: WHOLE NUMBERS ± 1 PLACE DECIMALS ± 2 PLACE DECIMALS ± ANGLES ± 0° 30'

MATERIAL

ORIG. DATE (YR-MO-DA)	91-11-08
DRAWN BY	C.L. WRIGHT
ENGINEER	WRIGHT
APPROVED	RONNIE L. ECKSTEIN
DESIGN APPROVAL	RAYMOND E. LEBLANC
RELEASE APPROVAL	GEORGE P. PANKOFF
CONTRACT NO.	

U.S. ARMY SOLDIER AND BIOLOGICAL CHEMICAL COMMAND
EDGEWOOD CHEMICAL BIOLOGICAL CENTER
ABERDEEN PROVING GROUND, MARYLAND, 21010-5424

SENSOR ASSEMBLY

SIZE	CAGE CODE	DWG NO.
D	81361	442-425

SCALE 4/1 SHEET

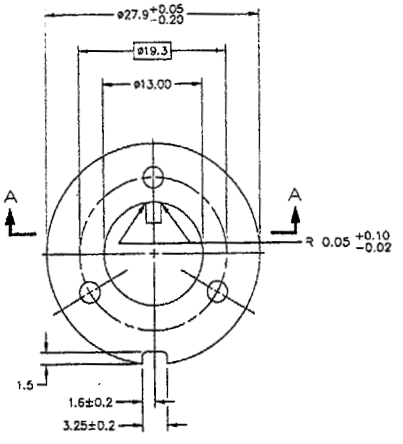
THIRD ANGLE PROJECTION METRIC

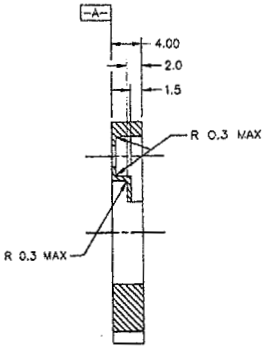
Article 4 - Sensor Assembly

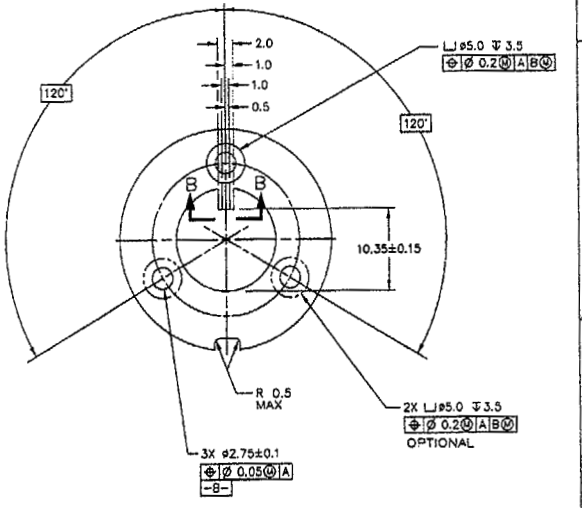
December 31, 2006 4:04 PM [53.CAL]

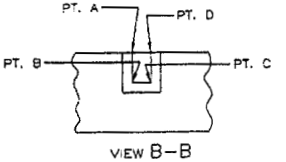
NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN MIL-STD-100.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ■ BREAK SHARP EDGES 0.5 MAX
   - ☐ FILLETS R 0.25 MAX.
   - ■ 0.8 ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
   - ■ ANSI Y14.5-DATED 1982 APPLIES
   - ☐ FED-STD-H28 APPLIES
3. METRIC, 1 INCH = 25.4 MM APPLIES.
4. LCP, DUPONT ZENITE 6130, NON-LUBRICATED, VIRGIN.
   OR
   VECTRA A130 NATURAL
   SUGGESTED SOURCE OF SUPPLY:
   TICONA
   90 MORRIS AVENUE
   SUMMIT, NJ 07901
5. BURR HEIGHT SHALL NOT EXCEED 0.5. NO LOOSE BURRS PERMITTED.
6. NO BURRS SHALL PROJECT INTO ZONE DEFINED BY PT. A TO PT. B, PT. B TO PT. C, PT. C TO PT. D, AND PT. D TO PT. A.
7. MAY BE PROCESSED IN ACCORDANCE WITH ADVISORY PD EA-C-1798; SEE GENERAL CLEANING, GENERAL BAKING, GENERAL HANDLING, AND GENERAL STORAGE.

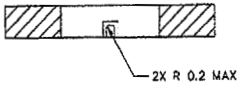








VIEW B-B
SCALE 10/1
SEE NOTE 6



SECTION A-A

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
E	REPLACES 442-410 REV C, DATED 99-08-09; NOR Z16-1530-0001, 01-09-26	02-01-04	JSR

QTY REQD	DWG SIZ	DRAWING OR PART NO.	NOMENCLATURE OR MATERIAL	SPECIFICATION	ITEM NO.

PARTS LIST

APPLICATION	
DWG SIZ	NEXT ASSY
F	442-306
E	5-15-17036

EQUIPMENT CODE NO.
Z16
247

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MM
TOLERANCES ON:
WHOLE NUMBERS ±
1 PLACE DECIMALS ± 0.1
2 PLACE DECIMALS ± 0.05
ANGLES ± 0° 30'

MATERIAL
SEE NOTE 4

ORIGINAL DATE (YR-MO-DA)	91-11-08
DRAWN BY	CHECKED
JCG	RLE
SUBMITTED	
RONNIE L. ECKSTEIN	
DESIGN APPROVAL	
RAYMOND E. LEBLANC	
RELEASE APPROVAL	
GEORGE P. PANKOFF	
CONTRACT NO.	

U.S. ARMY SOLDIER AND BIOLOGICAL CHEMICAL COMMAND
EDGEWOOD CHEMICAL BIOLOGICAL CENTER
ABERDEEN PROVING GROUND, MARYLAND, 21010-5424

EXHAUST COLLAR

SIZE	CAGE CODE	DWG NO.
D	81361	442-410

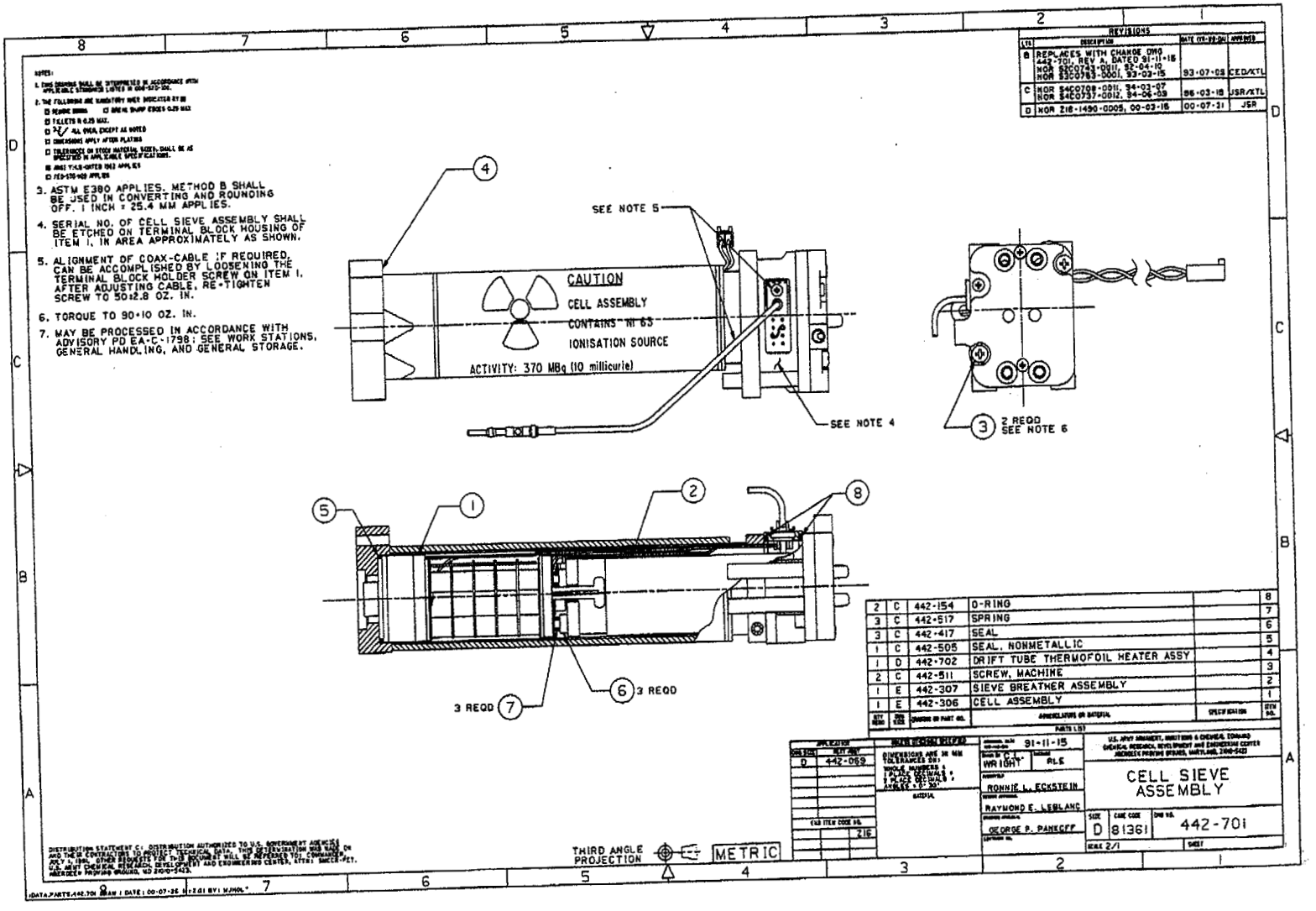
SCALE 4/1 SHEET

THIRD ANGLE PROJECTION METRIC

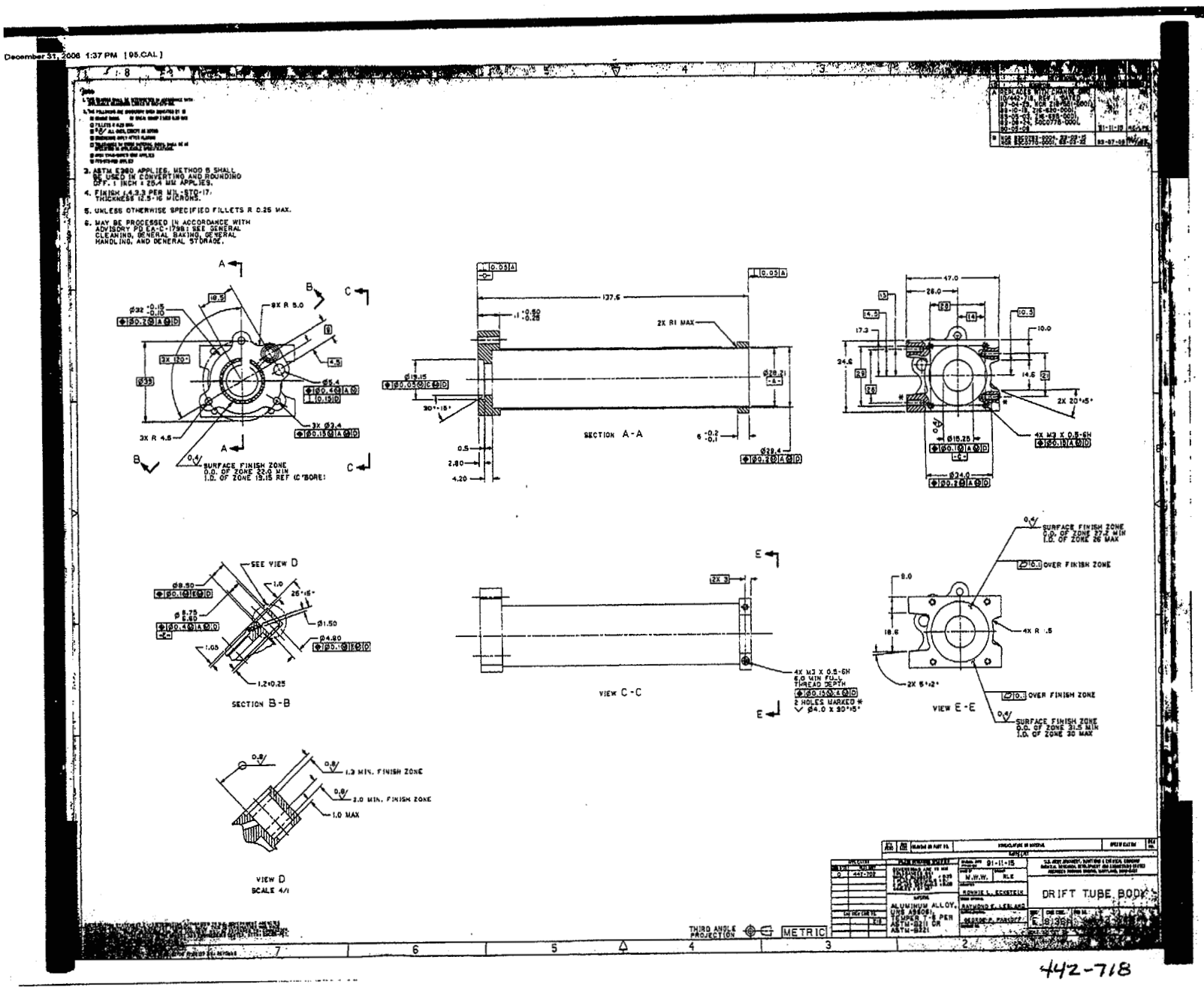
DISTRIBUTION STATEMENT C: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS TO PROTECT TECHNICAL DATA. THIS DETERMINATION WAS MADE ON JULY 1, 1991. OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO: COMMANDER, U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, ATTN: SMCCR-PET, ABERDEEN PROVING GROUND, MD 21010-5423.

\data\parts\442\410\1.dwg DATE: 01-12-27 14:19 BY: mjcorpse

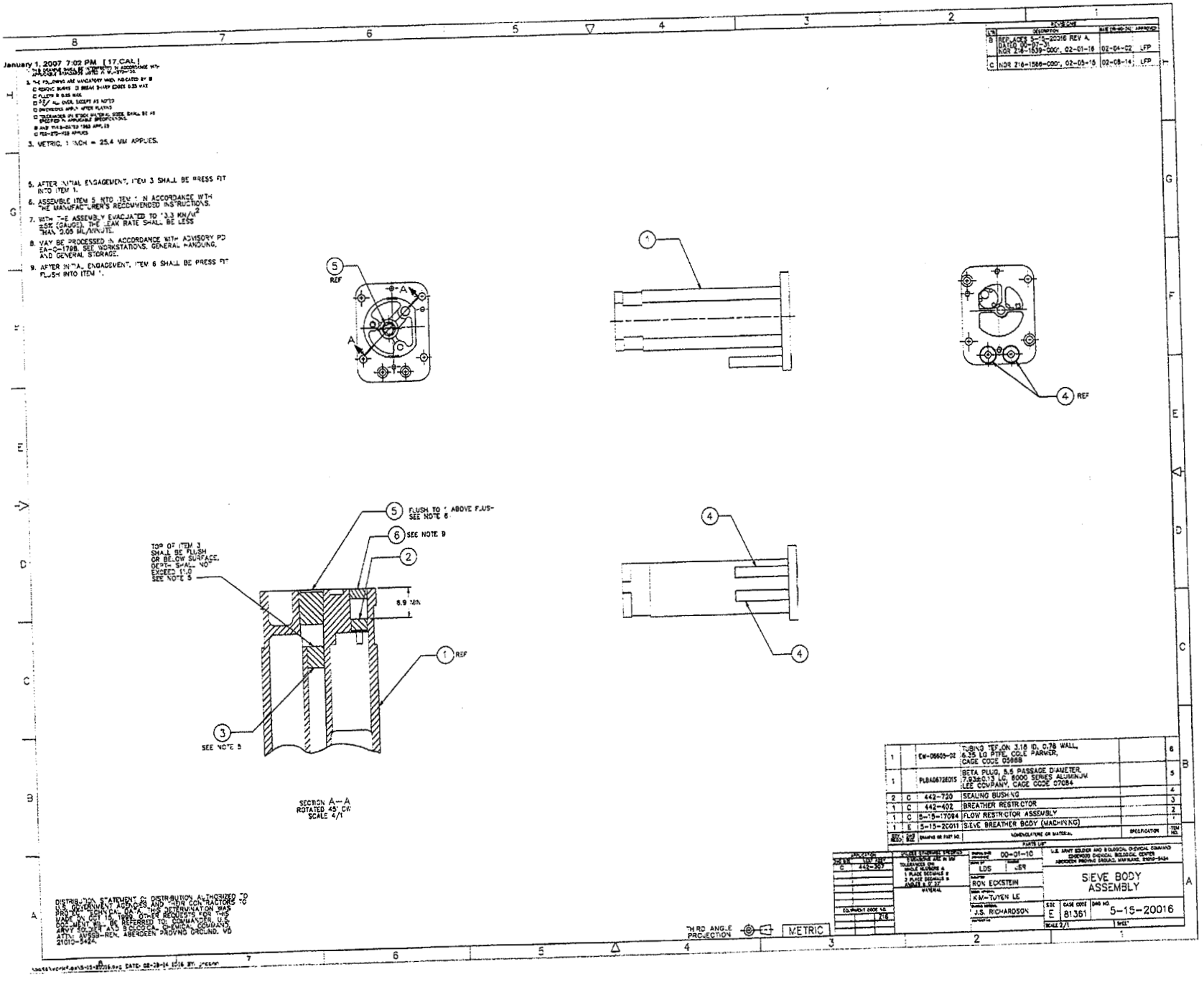
Article 5 - Cell Module Assembly



Article 5 - Cell Module Assembly



Article 5 - Cell Module Assembly



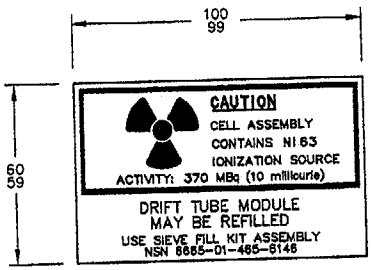
Article 6 - Drift Tube Module Labeling

December 31, 2006 3:53 PM [55.CAL]

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
C	REPLACES 442-579 SHT. 1, REV B, DATED 00-10-25 NOR Z16-1592-0001, 05-01-20	05-02-02	LFP

NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH ASME Y14.100 WITH THE ADDITION OF APPENDICES B THROUGH E.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES 0.25 MAX
   - ☐ FILLETS R 0.25 MAX
   - ☐ 3.2 ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
   - ■ ANSI Y14.5-DATED 1982 APPLIES
   - ☐ FED-STD-H28 APPLIES
3. ASTM E380 APPLIES. METHOD B SHALL BE USED IN CONVERTING AND ROUNDING OFF. 1 INCH = 25.4 MM APPLIES.
4. FOR MANUFACTURING PURPOSES, THE PRODUCTION MASTER (STABLE BASE ARTWORK) WILL BE FURNISHED, UPON REQUEST, TO THE MANUFACTURER BY THE CONTRACTING OFFICER.
5. USE ORIGINAL SHEET 2 OF THIS DRAWING FOR THE ARTWORK REQUIRED TO PRODUCE THE MASTER PATTERN REQUIRED FOR MARKING THE LABEL.
6. MATERIAL: ADHESIVE LABEL 3M TYPE 7120, MAY BE SUPPLIED BY: 3M CENTER, BLDG. 220-7W-03, ST. PAUL, MN 55144-1000.
7. COLOR: BACKGROUND - YELLOW
   CHARACTERS - BLACK



QTY REQD	DWG SIZE	DRAWING OR PART NO.	NOMENCLATURE OR MATERIAL	SPECIFICATION	ITEM NO.

PARTS LIST

APPLICATION	
DWG SIZE	NEXT ASSY
D	442-702

EQUIPMENT CODE NO.
Z16

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MM
TOLERANCES ON:
WHOLE NUMBERS ±
1 PLACE DECIMALS ±
2 PLACE DECIMALS ±
ANGLES ± 0° 30'
MATERIAL

ORIGINAL DATE (YR-MO-DA)	91-11-15
DRAWN BY	R.GEORGE
CHECKER	RLE
SUBMITTED	RONNIE L. ECKSTEIN
DESIGN APPROVAL	RAYMOND E. LEBLANC
DRAWING APPROVAL	GEORGE P. PANKOFF
CONTRACT NO.	

U.S. ARMY RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND
EDGEWOOD CHEMICAL BIOLOGICAL CENTER
ABERDEEN PROVING GROUND, MARYLAND, 21010-5424

LABEL, RADIATION WARNING

SIZE	CAGE CODE	DWG NO.
C	81361	442-579

SCALE 1/1 SHEET 1 OF 2

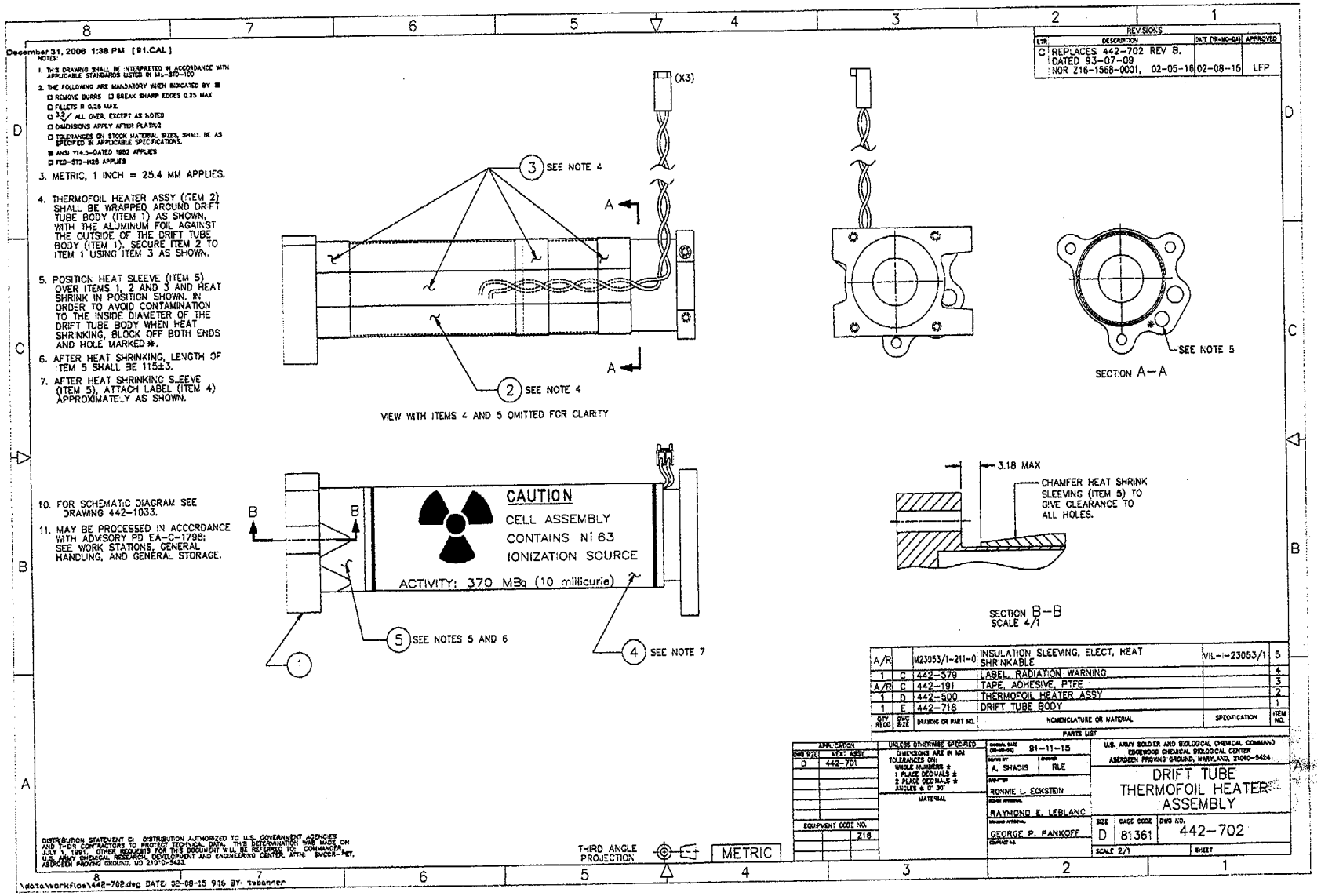
DISTRIBUTION STATEMENT C. DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS TO PROTECT TECHNICAL DATA. THIS DETERMINATION WAS MADE 91-07-01. OTHER REQUESTS FOR THIS DOCUMENT WILL BE REFERRED TO: COMMANDER, U.S ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, ATTN: SMCCR-PET, ABERDEEN PROVING GROUND, MD 21010-5424.

THIRD ANGLE PROJECTION

METRIC

\data\workflow\442-579.dwg DATE: 05-02-02 8:40 BY: JJcall

Article 6 - Drift Tube Module Labeling



LANCER SYSTEMS, LP
RESUME AND EXPERIENCE FOR ANNE M. STUMPF

Anne M. Stumpf, CIH, CSP to be listed as Radiation Safety Officer

A **Formal Training** – Trained as a Radiation Officer as described below:

i. **Initial Radiation Safety Officer training-October 25- 29, 1993** conducted by Northwestern University Technological Institute and lasting 40 hours in duration consisted of the following elements:
   1. Biological effects of radiation
   2. Principles and practices of radiation protection,
   3. Radioactivity measurement and monitoring techniques
   4. Use of instruments and results interpretation
   5. Conditions of license
   6. Emergency Procedures and security
   7. Included hands on and Written examination

ii. **1998 – 2004 Annual Training** - conducted by the RSO specific to (intellitec) and included the following:
   1. Review of biological effects of radiation
   2. Annual ALARA Report
   3. Review of safe work practices and procedures
   4. Changes in license conditions

ii. **Refresher RSO Training May, 14, 2006** – Managing Ionizing Radiation Programs for Industrial Hygienists conducted as PDC420 – American Industrial Hygiene Association.

iv. **Refresher RSO Training May 21, 2000** - Managing Ionizing Radiation Programs for Industrial Hygienists conducted as PDC426 – American Industrial Hygiene Association.

B. **Experience** – Below is a listing of the experience as a Radiation Safety Officer or Assistant Safety Officer:

C.

I. Ms. Stumpf since she had served as both an RSO and Assistant RSO on previous licenses in the State of Florida - license numbers 2601-1 and DOH license 3447-1. These licenses were obtained for work with Ni-63 (15 millicuries sealed source) and Am-241(250 microcuries sealed source) in the development testing and manufacturing of chemical detectors (CAM & ICAM) at Intellitec (General Dynamics).

Maximum possession limit of 10,000 Ni-63 sources. Ni-63 (15 millicuries sealed source). November 1999 – June 2004.

II. Ms. Stumpf currently serves as the RSO for the State of Florida - license number 3829-1 for Coalescent Technologies. This license was obtained for work with Ni-63 (15 millicuries sealed source) during refurbishment of chemical detectors (CAM & ICAM). Maximum possession limit of 800 of Ni-63 (15 millicuries sealed source) April 2006-current.

III. Ms. Stumpf served as Environmental & Safety Specialist/Industrial Hygienist at UOP in Des Plaines, IL She Developed and managed programs and conducted training for respiratory protection, industrial hygiene monitoring, reproductive hazards, safety inspections, Hazard Communication, Emergency Preparedness and Radiation Safety Operating Procedures. She also Directed the company Emergency Response Team, Safety Committee and Radiation Safety Committee. April 1990 – December 1994

C. Certifications & Education

1986 Master of Science Toxicology - Michigan State University East Lansing, MI
Areas of study included Environmental Toxicology, Biochemistry, Toxic Substance Law.

1982 Bachelor of Science Environmental Sciences Michigan State University East Lansing, MI

Certified Industrial Hygienist 1992. (Certificate # 5848CP) She has been trained in the recognition, evaluation and control of hazards in the workplace for both radiological and chemical hazards, written safety programs and conducted safety training .

Certified Safety Professional 1995 (Certificate # 13791)

LANCER SYSTEMS
RESUME AND EXPERIENCE FOR GLENN WARD

Glenn Ward to be listed as Authorized User

Glenn Ward

a. Formal Training – Trained as an authorized user for work with Ni-63 (15 millicuries sealed source) and Am-241(250 microcuries sealed source) in the development testing and manufacturing of chemical detectors at each of the below listed companies. Recent training from 1995 to November 2005 conducted at Intellitec (General Dynamics)
included initial training as an authorized user and subsequent annual refresher training.

iv. **1995 Initial training-** conducted by Intellitec RSO and lasting 3 hours in duration consisted of the following elements:
1. Biological effects of radiation
2. Principles and practices of radiation protection,
3. radioactivity measurement and monitoring techniques
4. Use of instruments and results interpretation
5. Conditions of the license
6. Emergency Procedures and security
7. Written examination

ii. **1998 – 2005 Annual Training** - conducted by the RSO and included the following:
1. Review of biological effects of radiation
2. Annual ALARA Report
3. Review of safe work practices and procedures
4. Changes in license conditions

b. Experience – Below is a listing of the experience obtained handling chemical detectors and radioactive sources used in these devices.

1995 to Nov 1998 Intellitec (General Dynamics ATP) – Deland, FL

Lead Mechanical Engineer on ICAM Production Contract. Initially set up production line and designed hardware and processes for all ICAM related production automatic test.
Additionally, planned, wrote, and conducted first article tests and results analysis for the ICAM production contracts. Provided technical guidance to the program manager, production manager, Radiation Safety Officer (RSO), manufacturing engineering, and quality managers and their staffs over the course of three production programs involving the assembly and test of over 20,000 CAMs and ICAMs.
Trained in the use of Survey meters, scintillation counters and radiation safety procedures in support of the chemical detector programs.

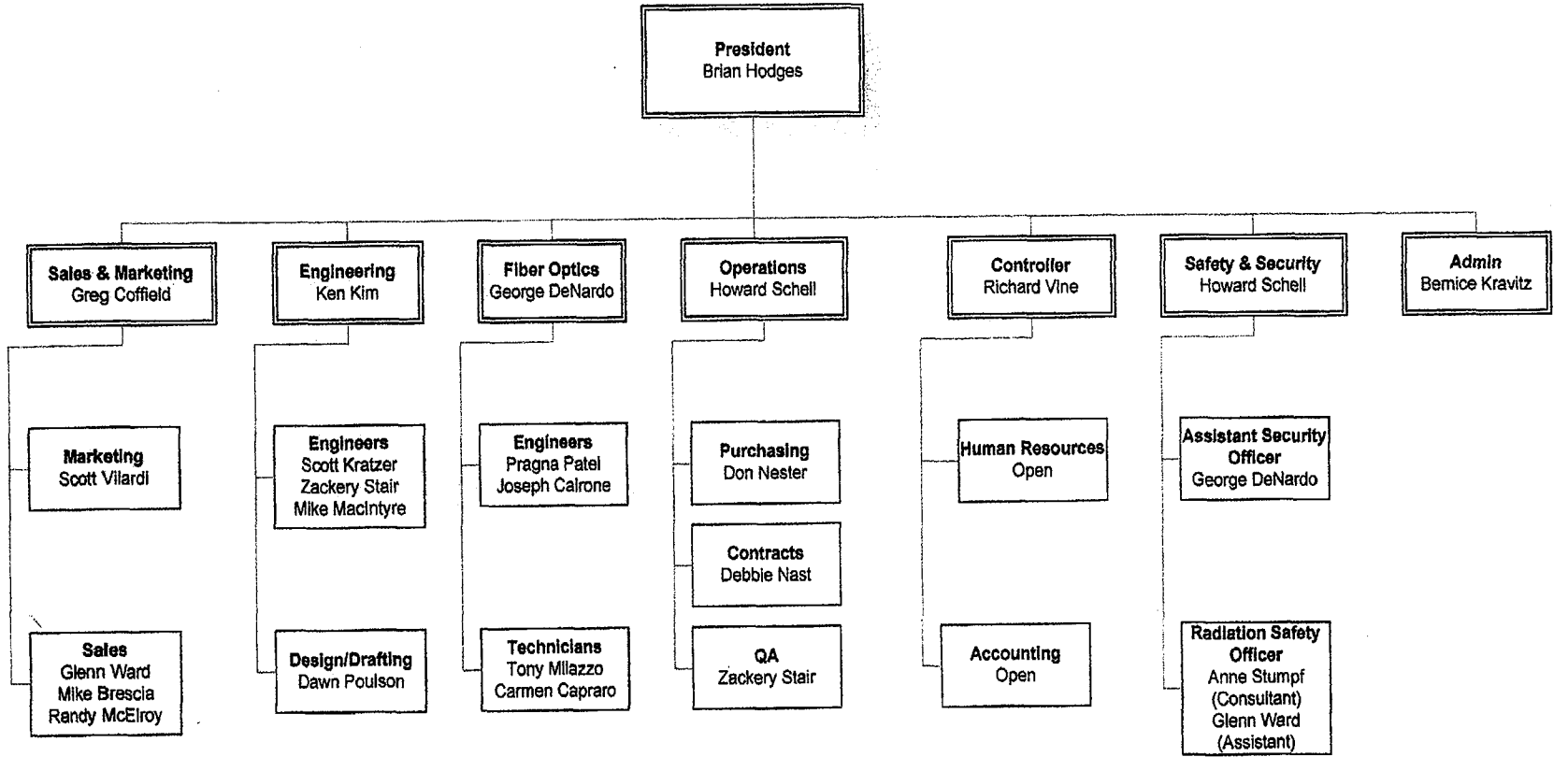
1998 to Nov 2005 Intellitec (General Dynamics ATP) – Deland, FL

Acting as Program Manager, responsibilities included oversight for all chemical defense programs including all Improved Chemical Agent Monitor (ICAM/CAM) related contracts. These duties included, Review/approval of cost information,

planning program schedules, and monitoring of program performance, Allocation of management labor., Identifying new build processes, facility modifications, and component sources that provide cost effective, efficient production, Simultaneously managing four contracts for refurbishment, initial production, spares, and overhaul of devices for three major US Armed Services, Monitoring qualification efforts, process control, radiation program and supplier quality assurance for numerous development and production programs, Served as the central stakeholder between vendors, clients, logistics, engineering, and the installation team and Created and monitored the schedule and resource plan. Provided technical guidance to the program manager, production manager, Radiation Safety Officer (RSO),
Continued training and education in the use of Survey meters, scintillation counters and radiation safety procedures in support of the chemical detector programs.

Lancer Systems – Assuring Quality

Organization Chart



ATTACHMENT 8

LANCER SYSTEMS LP

RADIATION TRAINING PROGRAM CONTENTS

The Radiation Safety Training Program Contents are outline in the Lancer Systems LP Radiation Manual Page 6. These elements are summarized below:

TRAINING REQUIREMENTS

5.1 All Employees that may work with radioactive materials or in a radiation controlled area shall receive initial **general radiation training** on the hazards and safe work practices related to the use or radioactive materials prior to beginning work with radiation. Personnel that would receive this training include authorized users and trained technicians.

7.2 The Radiation Safety Officer and Authorized Users must have sufficient documented radiation Safety training and hands on experience with handling radioactive materials. Previous experience as a Radiation Safety officer or Authorized User may be used to meet this re*quirement.* This training may include the following: principles and practices of radiation protection, radioactivity measurement, monitoring techniques and the use of instruments, mathematics and calculations basic to the use and measurement of radioactivity, and biological effects of radiation.

7.3 The employee's **general radiation training** will be conducted by the RSO or Authorized User and will include both lecture and video presentation and will cover (but not be limited to) the following topics:

- Storage, transfer or use or radioactive materials in the facility.
- Health risks associated with exposure to radiation and the precautions and procedures to minimize such exposures.
- Explanation of monitoring devices and equipment to determine radiation exposures
- An explanation of an employee's responsibilities to report promptly to the Radiation Safety Officer any condition that may cause a violation of the facilities license or potential over exposure to radiation.
- Emergency response procedures and reporting for any unusual events.
- Advised to the annual radiation monitoring reports that radiation workers will be provided
- Proper disposal of RAM
- Written examination of understanding following the training

7.4 Employees will receive annual refresher training, which will include a review of the safe work practices, hazards and regulatory requirements.

7.5 Additional training may be required based on individual state or local authority requirements or if a change in procedures or equipment is made. Remedial training for missed test questions or other areas of apparent weakness should be conducted or additional formal training planned to cover deficient areas.

7.6 Hazardous **Materials Training** will be conducted for all employees whose duties require them to receive, handle, or prepare hazardous materials for transportation. The requirements of this training are as follows:

7.6.1 General Awareness training/familiarization training designed to provide familiarity with 49 CFR requirements and to enable the employee to recognize and identify hazardous materials.

7.6.2 Function Specific training concerning USDOT requirements which are specifically applicable to the functions the employee performs.

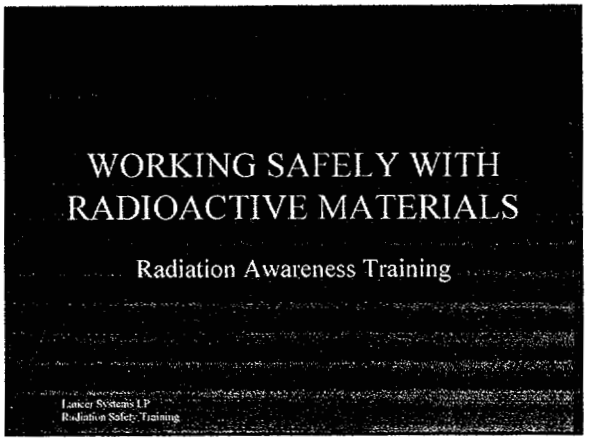
7.6.3 Safety training concerning emergency response information, measures to protect the employee from hazards posed by materials and the methods a procedures for avoiding accidents.

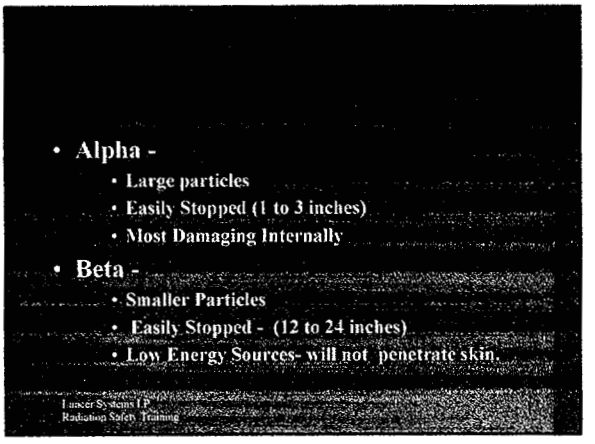
7.6.4 Training will be conducted prior to the employee performing transportation duties on hazardous material or within 90 days of employment.

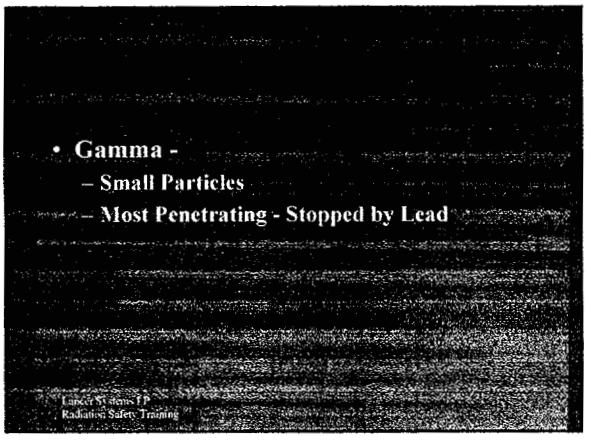
7.6.5 Training will be conducted every 3 years.

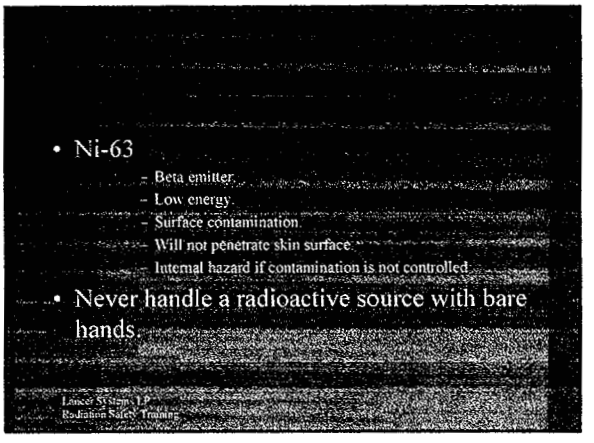
7.6.6 Training records will be maintained for the duration of employment plus 90 days.

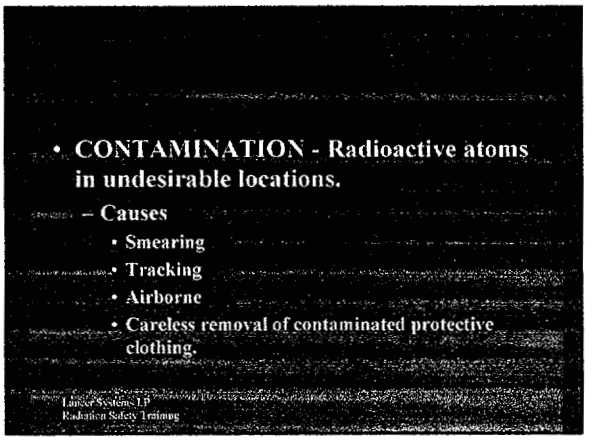
A copy of the PowerPoint Presentation provided to each employee is also attached.

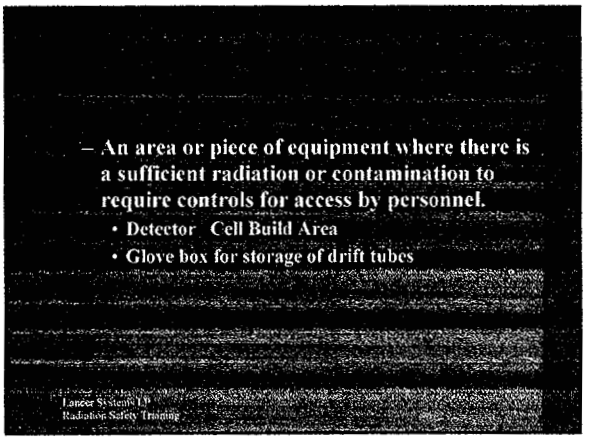

WORKING SAFELY WITH
RADIOACTIVE MATERIALS
Radiation Awareness Training
Lancer Systems LP
Radiation Safety Training

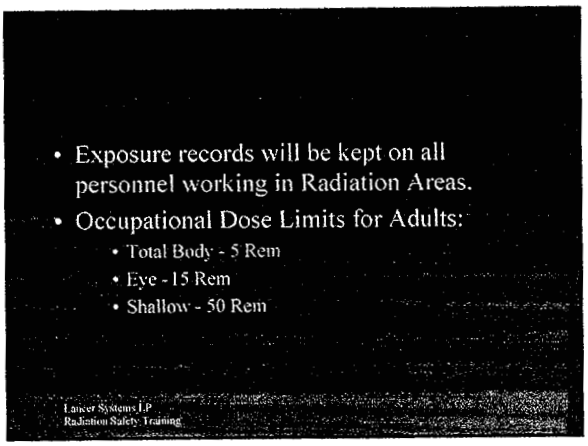

• Alpha -
• Large particles
• Easily Stopped (1 to 3 inches)
• Most Damaging Internally
• Beta -
• Smaller Particles
• Easily Stopped - (12 to 24 inches)
• Low Energy Sources- will not penetrate skin.
Lancer Systems LP
Radiation Safety Training

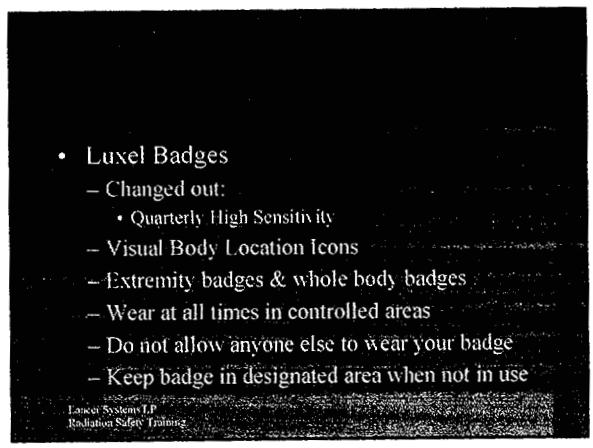

• Gamma -
– Small Particles
– Most Penetrating - Stopped by Lead
Lancer Systems LP
Radiation Safety Training

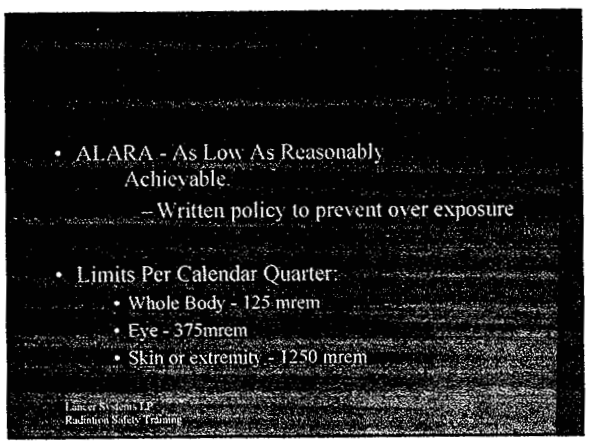

• Ni-63
– Beta emitter
– Low energy
– Surface contamination
– Will not penetrate skin surface
– Internal hazard if contamination is not controlled
• Never handle a radioactive source with bare hands
Lancer Systems LP
Radiation Safety Training

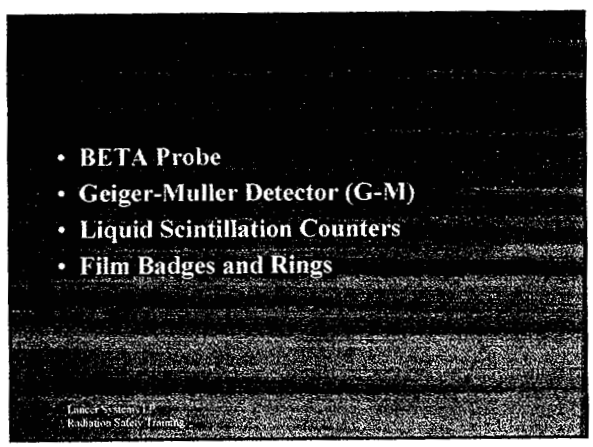

• CONTAMINATION - Radioactive atoms in undesirable locations.
– Causes
• Smearing
• Tracking
• Airborne
• Careless removal of contaminated protective clothing.
Lancer Systems LP
Radiation Safety Training

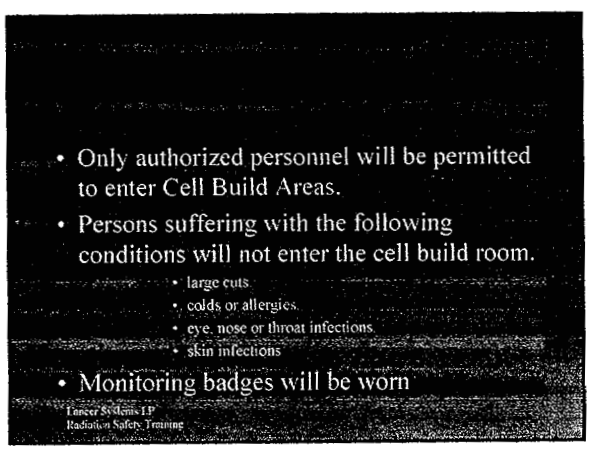

– An area or piece of equipment where there is a sufficient radiation or contamination to require controls for access by personnel.
• Detector Cell Build Area
• Glove box for storage of drift tubes
Lancer Systems LP
Radiation Safety Training

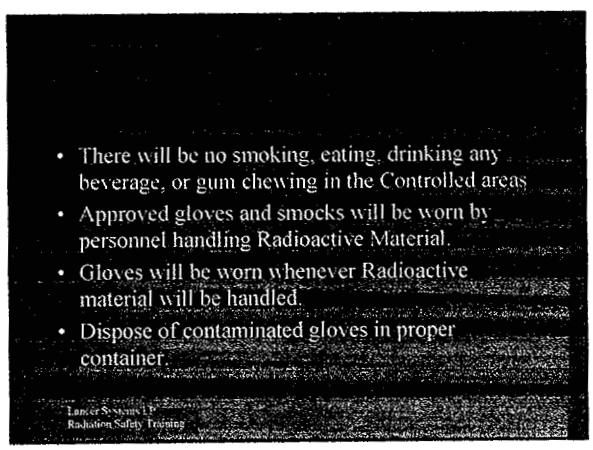

• Exposure records will be kept on all personnel working in Radiation Areas.
• Occupational Dose Limits for Adults:
• Total Body - 5 Rem
• Eye - 15 Rem
• Shallow - 50 Rem
Lancer Systems LP
Radiation Safety Training

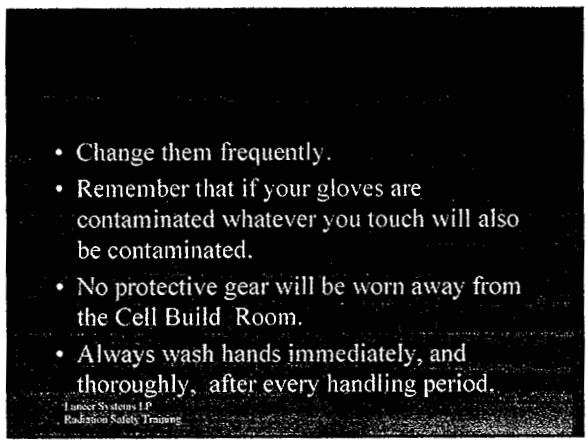

• Luxel Badges
– Changed out:
• Quarterly High Sensitivity
– Visual Body Location Icons
– Extremity badges & whole body badges
– Wear at all times in controlled areas
– Do not allow anyone else to wear your badge
– Keep badge in designated area when not in use
Lancer Systems LP
Radiation Safety Training

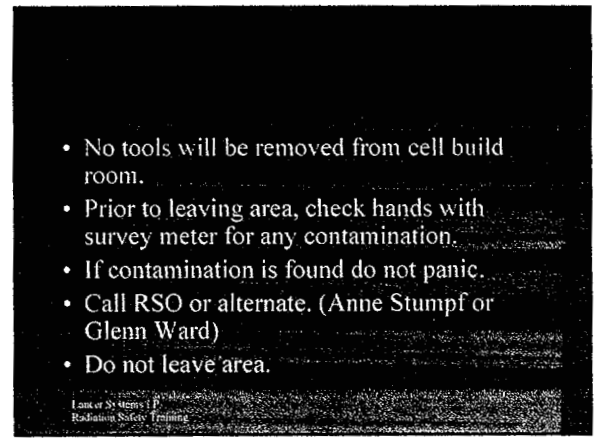

• ALARA - As Low As Reasonably Achievable.
– Written policy to prevent over exposure
• Limits Per Calendar Quarter:
• Whole Body - 125 mrem
• Eye - 375mrem
• Skin or extremity - 1250 mrem
Lancer Systems LP
Radiation Safety Training

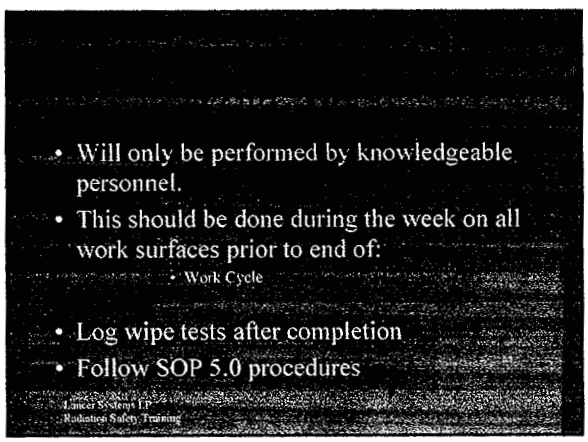

• BETA Probe
• Geiger-Muller Detector (G-M)
• Liquid Scintillation Counters
• Film Badges and Rings
Lancer Systems LP
Radiation Safety Training

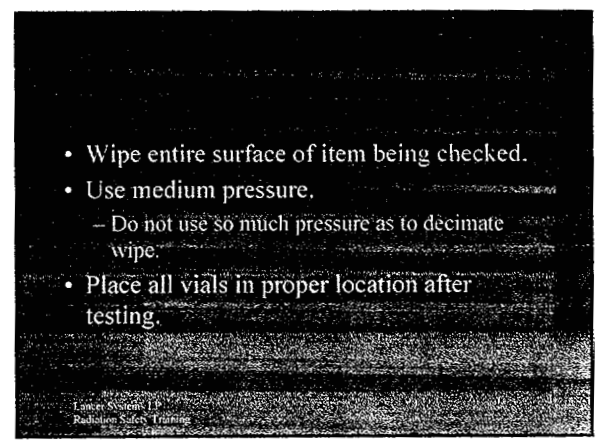

• Only authorized personnel will be permitted to enter Cell Build Areas.
• Persons suffering with the following conditions will not enter the cell build room.
• large cuts
• colds or allergies
• eye, nose or throat infections
• skin infections
• Monitoring badges will be worn
Lancer Systems LP
Radiation Safety Training

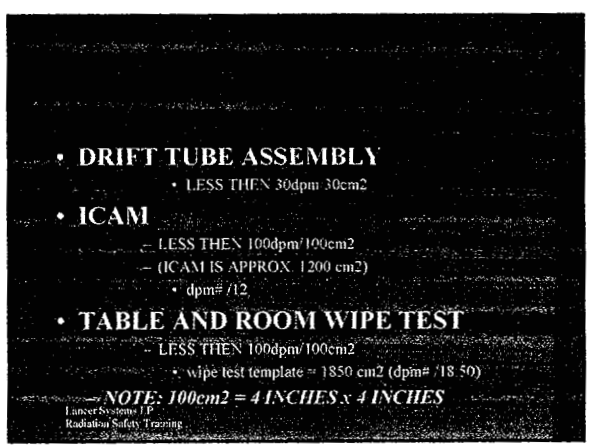

• There will be no smoking, eating, drinking any beverage, or gum chewing in the Controlled areas
• Approved gloves and smocks will be worn by personnel handling Radioactive Material.
• Gloves will be worn whenever Radioactive material will be handled.
• Dispose of contaminated gloves in proper container.
Lancer Systems LP
Radiation Safety Training

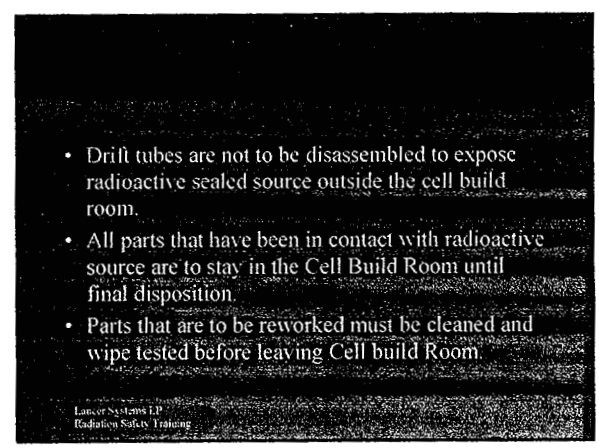

• Change them frequently.
• Remember that if your gloves are contaminated whatever you touch will also be contaminated.
• No protective gear will be worn away from the Cell Build Room.
• Always wash hands immediately, and thoroughly, after every handling period.
Lancer Systems LP
Radiation Safety Training

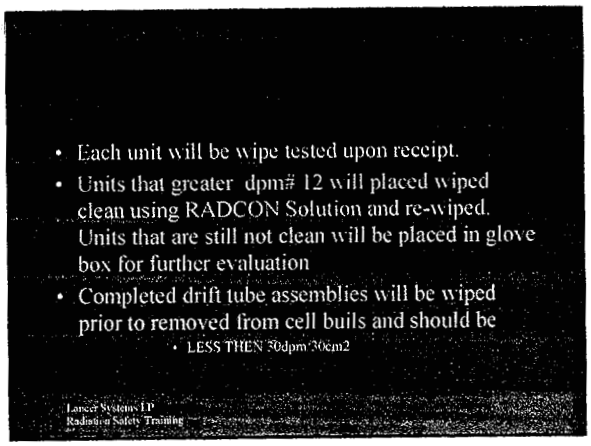

• No tools will be removed from cell build room.
• Prior to leaving area, check hands with survey meter for any contamination.
• If contamination is found do not panic.
• Call RSO or alternate. (Anne Stumpf or Glenn Ward)
• Do not leave area.
Lancer Systems LP
Radiation Safety Training

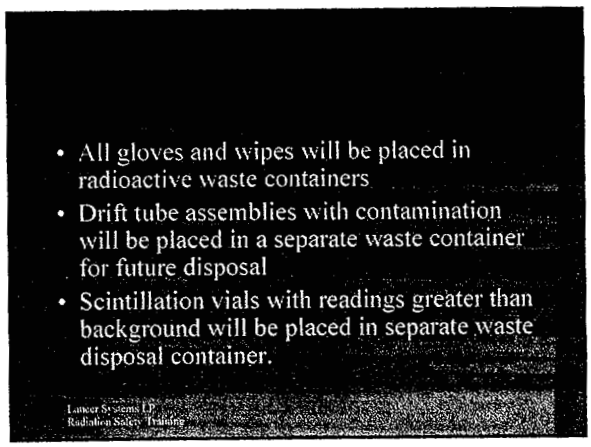

• Will only be performed by knowledgeable personnel.
• This should be done during the week on all work surfaces prior to end of:
– Work Cycle
• Log wipe tests after completion
• Follow SOP 5.0 procedures
Lancer Systems LP
Radiation Safety Training


• Wipe entire surface of item being checked.
• Use medium pressure.
– Do not use so much pressure as to decimate wipe.
• Place all vials in proper location after testing.
Lancer Systems LP
Radiation Safety Training


• DRIFT TUBE ASSEMBLY
– LESS THEN 30dpm 30cm2
• ICAM
– LESS THEN 100dpm/100cm2
– (ICAM IS APPROX 1200 cm2)
– dpm# /12
• TABLE AND ROOM WIPE TEST
– LESS THEN 100dpm/100cm2
– wipe test template = 1850 cm2 (dpm# /18.50)
– NOTE: 100cm2 = 4 INCHES x 4 INCHES
Lancer Systems LP
Radiation Safety Training


• Drift tubes are not to be disassembled to expose radioactive sealed source outside the cell build room.
• All parts that have been in contact with radioactive source are to stay in the Cell Build Room until final disposition.
• Parts that are to be reworked must be cleaned and wipe tested before leaving Cell build Room.
Lancer Systems LP
Radiation Safety Training


• Each unit will be wipe tested upon receipt.
• Units that greater dpm# 12 will placed wiped clean using RADCON Solution and re-wiped. Units that are still not clean will be placed in glove box for further evaluation
• Completed drift tube assemblies will be wiped prior to removed from cell builds and should be
• LESS THEN 50dpm/30cm2
Lancer Systems LP
Radiation Safety Training


• All gloves and wipes will be placed in radioactive waste containers
• Drift tube assemblies with contamination will be placed in a separate waste container for future disposal
• Scintillation vials with readings greater than background will be placed in separate waste disposal container.
Lancer Systems LP
Radiation Safety Training

ATTACHMENT 9

LANCER SYSTEMS LP
FACILILITIES AND EQUIPMENT

Lancer Systems utilizes two areas within the 17,257 sqft one-story building for handling and storing radioactive materials. These areas are located as indicated on the attached diagrams and are secured against entry at all times. The entire building is secured with an alarm system that is monitored 24 hours a day. Access to the building is restricted to employees only using card key access .A key card is necessary to enter the lobby of the regulated area and further key card access is required to enter the main area. Additional key card access is required to enter the restricted areas of the **Cam and Secure Storage areas and is restricted to authorized trained users**.

The sources will enter the facility at Shipping and receiving where the packages are wipe tested before moving to the Secure Storage Area. Sources will be transferred to the CAM cell build area then the completed Drift Tube Modules will be transferred back to the secure storage area prior to shipment off site.

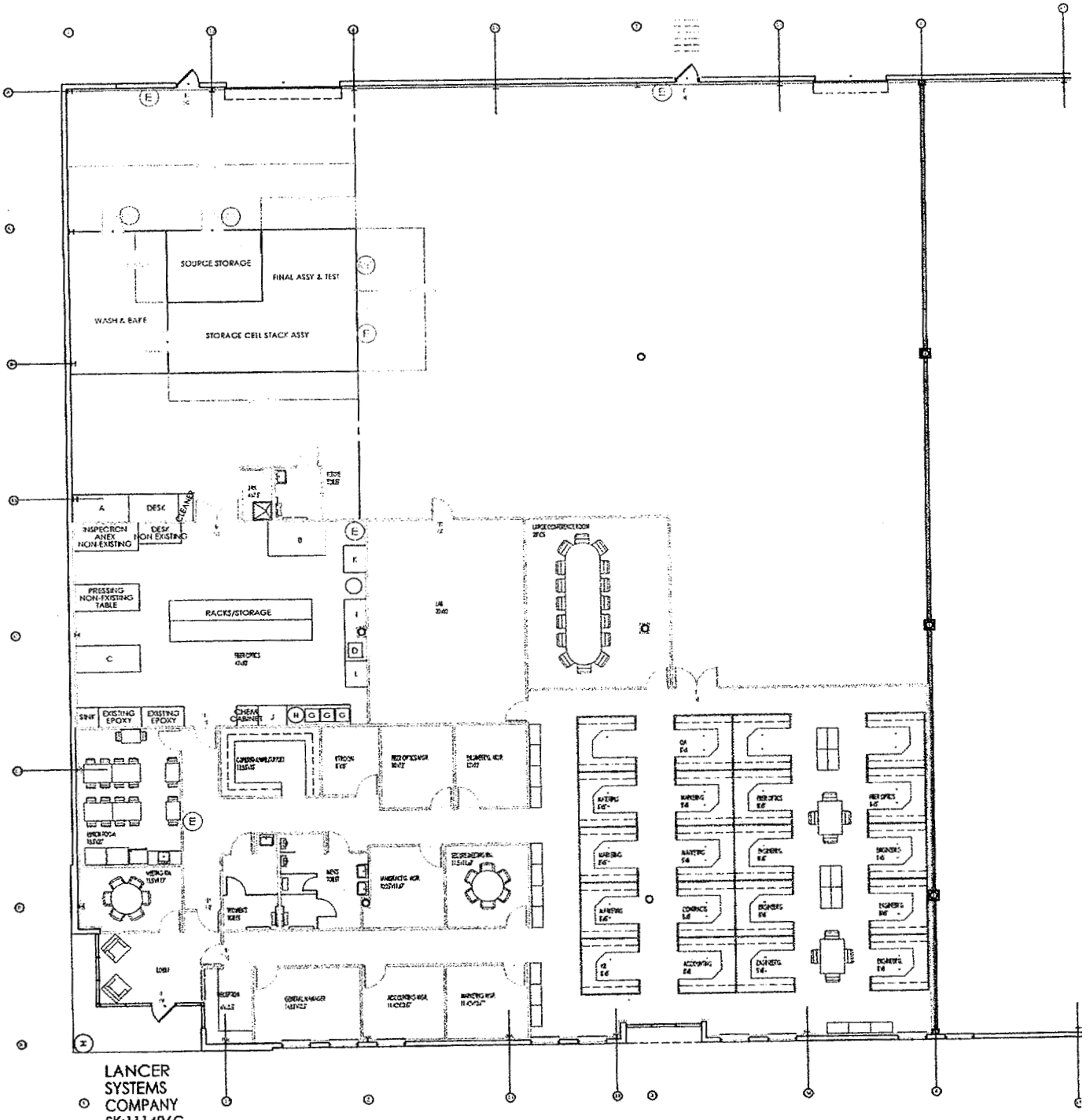
Emergency numbers and procedures will be posted in each restricted access area. A phone, fire extinguisher and hand washing facilities are also available in these areas. A copy of the emergency number posting is attached.

Secure Storage Area: This area is used for storage of chemical detectors that contain Ni-63 prior to repairs and for units awaiting shipment once. This area is restricted by key card access to authorized trained users.

CAM cell build Area – All manufacture of the cells are conducted in this area. This area also houses the scintillation counter and any waste generated during manufacturing activities. This area is restricted by key card access to authorized trained users.

The Attached map shows the facility and locations where radioactive materials will be handled.

ATTACHMENT 9



ATTACHMENT 10

LANCER SYSTEMS LP

RADIATION SAFETY PROGRAM CONTENTS

The Radiation Safety Program Contents are outlined in the attached LS-101 Radiation Safety Manual and any referenced SOPs listed below. Additional Specific license application information for each section is summarized below:

Radiation Safety Program Audit program:

An audit program has been established to ensure Compliance with NRC and DOT regulations and the terms and conditions of the license. Components of the Audit programs are included in SOP LS-110- Radiation Safety Audits

Radiation Monitoring Instruments

We will use instruments that meet the radiation monitoring instrument specifications published in Appendix K to NUREG-1556, Vol. 12. We reserve the right to upgrade our survey instruments as necessary. Annual calibrations of the equipment will be conducted by the manufacturer of the equipment.

TYPE OF INSTRUMENTS (include manufacturer and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	USE (e.g., monitoring, surveying, measuring)
Ludlum Model 3 Survey Meter with Model 44-142 BETA Detector	1	BETA	Personnel and facility contamination measurements
Ludlum Model 3 Survey Meter with Model 44-9 pancake G-M Detector	1	Alpha, Beta, gamma	Package surveys
PerkinElmer TRI-CARB 2800TR Scintillation Counter	1	Alpha, Beta, gamma	Personnel and facility contamination measurements

ATTACHMENT 10

Material Receipt and Accountability

The following procedure(s) have been developed to ensure material accountability:

SOP LS-106 Control of Radioactive Material
SOP LS-102 Receipt of Radioactive Material
SOP LS 104 Shipment of Radioactive Materials

Physical inventories will be conducted at intervals not to exceed 6 months, to account for all sealed sources and devices received and possessed under the license as outlined in SOP LS-106 Control of Radioactive Material section 6.5.1

Occupational Dose

Lancer Systems will monitor individuals in accordance with the criteria in the section entitled 'Radiation Safety Program - Occupational Dose' in NUREG-1556, Vol. 12, 'Consolidated Guidance About Materials Licenses: Program-Specific Guidance About Possession Licenses for Manufacturing and Distribution.'

A description of the personnel monitoring practices is found in section 8.0 of LS-101 Radiation Safety Manual.

Safe Use of Radionuclides and Emergency Procedures

Procedures have been developed for safe use and emergencies as described in LS 101 Radiation Safety Manual.

Procedures will be revised only if:

(1) the changes are reviewed and approved by the licensee management and the RSO in writing;
(2) the licensee staff is provided training in the revised procedures prior to implementation;
(3) the changes are in compliance with NRC regulations and the license; and
(4) the changes do not degrade the effectiveness of the program."

Surveys

Lancer Systems will survey our facility and maintain contamination levels in accordance with the survey frequencies and contamination levels published in Appendix P to NUREG-1556, Vol. 12. We will perform contamination

ATTACHMENT 10

checks on all fabricated sealed sources prior to distribution. Leak tests will be performed at the intervals approved by NRC or an Agreement State and specified in the SSD Registration Certificate. Leak tests will be performed by an organization authorized by NRC or an Agreement State to provide leak testing services to other licensees or using a leak test kit supplied by an organization authorized by NRC or an Agreement State, to provide leak test kits to other licensees and according to the sealed source or plated foil manufacturer's (distributor's) and kit supplier's instructions

EMERGENCY RESPONSE
STANDARD OPERATING PROCEDURE
LS-100 REV A

Table of Contents

1. OBJECTIVE

The objective of this procedure is to provide the requirements for reacting to emergency conditions.

2. REFERENCES

2.1 Lancer Systems Safety Manual

2.2 Lancer Systems Radiation Protection Program Manual

2.3 Radiological Health Handbook, Revised Edition, Jan 1970. US Department of Health, Education, and Welfare

3. EQUIPMENT

3.1 Ludlum Model 3 Survey Meter with beta-emitting detection probe

4. PRECAUTIONS

4.1 Radiation presents minimal risk to workers, emergency response personnel, and the public for the amounts of licensed material contained within the assemblies used in the drift detection devices.

4.2 If emergency first aid is required during an incident involving licensed material, medical problems take priority over any radiological concerns. Do not delay care and/or transport of a seriously injured person due to any radiological concerns.

4.3 This procedure will be posted in all areas where radioactive materials are stored.

4.4 All reports of emergencies and reports for release of radioactive materials will be maintained for a period of three years.

4.5 Procedures will be revised only if:

(1) the changes are reviewed and approved by the licensee management and the RSO in writing;
(2) the licensee staff is provided training in the revised procedures prior to implementation;
(3) the changes are in compliance with NRC regulations and the license; and
(4) the changes do not degrade the effectiveness of the program."

5. DISCUSSION

It is the policy of Lancer Systems Management to ensure that company business is conducted in a safe manner that is in keeping with all regulatory and procedural requirements. Occasionally different emergency conditions may occur at the facility, which have radiological aspects that must be addressed for both corporate and public safety. It is not the intent of this procedure to be a detailed emergency plan for all eventualities, but rather a means by which to address radiological aspects. It cannot be stated enough *that personal safety supersedes any procedure*! If at any time personnel feel unsure or uncomfortable with performing any of the steps in the procedure, they should inform their supervisor or RSO.

6. INSTRUCTIONS

6.1 Fire

6.1.1 MOVE undamaged devices containing licensed material from the fire area if you can do it without risk.

6.1.2 DO NOT ATTEMPT TO MOVE damaged packages from the fire area.

> **NOTE**
>
> If unable to safely move licensed material to a secure location, place source(s) in as safe a condition as possible. Exit the building as per Reference 2.1 and 6.1.5 of this SOP.

6.1.3 FOLLOW Lancer Systems Safety Manual Section 4.6 Emergency Fire Procedures (Ref 2.1)

6.1.4 INFORM the RSO or your Supervisor of the location of the source material if not located in the normal storage area.

6.1.5 NOTIFY responding emergency personnel of the location of radioactive material in the building and any other pertinent information as per Reference 2.1. and summarized below.

a. In the event of a fire, use the nearest fire alarm pull station, if available, and evacuate the area immediately. If the pull station does not activate (fire alarm is NOT sounding) or if no pull station is available, call 911 from the nearest phone that is located in a safe area.

b. Employees are not required to fight a fire.

c. Keep non-essential personnel away from the fire.

d. If explosive materials, radioactive materials or compressed gases are involved or other hazards may exist, ensure that affected personnel are immediately evacuated to a safe distance.

e. Once evacuation is complete, supervisors must account for everyone who reports to them or for whom they are responsible. If an employee is missing, notify the facilities security officer or fire department personnel immediately.

f. The Program Manager must make a full investigation of the incident and submit a written report to the Lancer Systems management representative within 24 hours of the occurrence.

6.2 Contaminated Personnel

6.2.1 Upon discovery of personnel contamination, NOTIFY the RSO.

6.2.2 REMOVE contaminated clothing and survey the skin.

6.2.3 If contamination is found on the skin or hair, DECONTAMINATE using the guidelines in Attachment A.

6.2.4 If unable to remove contamination, REQUEST DIRECTION from the RSO.

6.3 Contaminated Areas

6.3.1 Upon discovery of area contamination, NOTIFY the RSO.

6.3.2 DETERMINE the extent of contamination by surveying the area in accordance with SOP-LS-103 Routine Radiological Surveys.

6.3.3 If a package swipe test or meter survey exceeds 2200dpm/100cm2 or 0.5mR/hr respectively, EVACUATE all personnel from the affected area(s).

6.3.4 ISOLATE the affected area until emergency response personnel survey and decontaminate the area.

7.0 FORMS AND ATTACHMENTS

7.1 , *Emergency Call List*
7.2 , Notification Criteria
7.3 Attachment 4.0 A, Decontamination Methods

Form SOP-LS-100-01

In case of emergency involving licensed radioactive sources, contact one or more of the following individuals as soon as possible.

Title	Individual	Phone Number
Radiation Safety Officer or Authorized User	Anne Stumpf Glenn Ward	Cell: [redacted] Cell: [redacted]
2. Facility Security Officer	**Howard Schell**	**Extension: 1747** [redacted] **Cell**
3. Assistant Facility Security Officer	**George Denardo**	**Extension: 1809** [redacted]
President	**Brian Hodges**	**215-256-9521 ext 1701**
Director	**Rick Vine**	**215-256-9521 ext 1739**
NRC Headquarters Operations Center	On-Call Person	(301) 816-5100l
Fire Department	On-Call Duty Officer	911 to report a fire
Police Department	On-Call Duty Officer	911 for emergencies

Form SOP-LS-100-02

NOTIFICATION CRITERIA

	Stolen, Lost, or Missing Licensed Material	Notification of Incidents
Immediate Notification	Immediately after it becomes known that stolen, lost, or missing radioactive material in aggregate quantity equal to or greater than 100 mCi of Ni-63, and the circumstances are that an exposure could result to individuals in unrestricted areas.	An event that may have caused a total effective dose equivalent of 25 rem or more, or Indication that a damaged package of radioactive material has removable contamination levels or external radiation levels in excess 2,200 dpm/100 cm^2.
Twenty-Four Hour Notification	N/A	An event that may have caused a total effective dose equivalent of 5 rem or more.
Five-Day Notification	N/A	A sealed source that indicates leakage or contamination in excess of 0.005 uCi.
Thirty-Day Notification	After it becomes known that stolen, lost, or missing radioactive material in aggregate quantity equal to or greater than 10 mCi of Ni-63, and the material is still missing.	N/A

The above notifications may be made by calling the NRC Headquarters Operations Center (301) 816-5100

Notifications regarding stolen, lost, or missing licensed material as listed above must be followed by a written report. The written report must be made within 30 days after making the telephone report.

Attachment A
DECONTAMINATION METHODS

Method	Surface	Action	Technique	Advantages	Disadvantages
Soap And Water	Skin And Hands	Emulsifies and dissolves contaminate	Wash 2-3 minutes and monitor. Do not wash more 3-4 times.	Readily available and effective for most radioactive contamination	Continued washing will defat the skin. Indiscriminate washing of other than affected parts may spread contamination.
Soap and Water	Hair	Same as above	Wash several times. If contamination is not lowered to acceptable levels, shave the head and apply skin decontamination methods.		
Lava Soap, Soft brush, and water	Skin And Hands	Emulsifies, dissolves, and erodes	Use light pressure with heavy lather. Wash for 2 minutes, 3 times. Rinse and monitor. Use care not to scratch or erode the skin. Apply lanolin or hand cream to prevent chapping	Same as above	Continued washing will abrade the skin.
Tide or Other Detergent (plain)	Same as above	Same as above	Make into a paste Use with additional water with mild scrubbing action. Use care not to erode the skin	Slightly more effective than washing with soap	Will defat and abrade skin and must be used with care
Duct Tape	Same as above	Pulls off most the of contaminatio n	Apply the tape directly to the skin and remove the tape.	Extremely effective in contamination removal.	Aside from the extreme discomfort, it will abrade the skin.
Sweating	Skin of hands and feet	Physical removal by sweating	Place hand or foot in plastic glove or booty. Tape shut. Place near source of heat for 10-15 minutes or until hand or foot is sweating profusely. Remove glove and then wash using standard techniques. Or gloves can be worn for several hours using only body heat.	Cleansing action is from inside out. Hand does not dry out.	If glove or booty is not removed shortly after profuse sweating starts and part washed with soap and water immediately, contamination may seep into the pores.

RADIATION SAFETY MANUAL
STANDARD OPERATING PROCEDURE
LS-101 REVA

Table of Contents

1. INTRODUCTION

The use of radioactive materials poses unique health hazards and risks to the workplace and to the environment, which need to be identified and controlled. Through the identification of the hazards and use of these materials safe work practices can be established to minimize risk and prevent exposure to these materials. The specific requirements for the use of radiation are established by the United States Nuclear Regulatory Agency (NRC) and any agreement state.

2. PURPOSE

The purpose of this program is to establish a means by which the use of Radioactive Materials may effectively be identified, addressed and managed to prevent over exposure.

The goals of the Radiation Protection Program are to:

- Establish procedures for the review of programs that may require the use of radioactive materials and identify regulatory requirements
- Establish minimum procedures that must be followed to reduce the potential for exposure to radiation.
- Identify minimum training requirements and monitoring requirements for employees that handle radioactive materials.
- Provide additional guidance regarding radiation safety in accordance with the requirements outline in *Lancer Systems Safety Manual.*

3. SCOPE

This document applies to all employees and operations at all locations of Lancer Systems.

4. DEFINITIONS

Agreement State – any state with which the U.S. Nuclear Regulatory Commission or the U.S. Atomic Energy Commission has entered into an effective agreement under subsection 274b of the Atomic Energy Act of 1954 as amended. Agreement state regulations have determined requirements for the state.

Dose – absorbed dose or dose equivalent, a measure of radiation exposure

Personnel Monitoring Equipment – devices such as film badges, pocket dosimeters and thermo luminescent dosimeters designed to be worn or to be

carried by an individual for the purpose of estimating the dose received by the individual.

Radiation Area – any area accessible to individuals in which there exists radiation at such levels where a potential for exposure could occur.

Radiation Safety Officer (RSO) – a person who has the knowledge and responsibility to apply appropriate radiation protection regulations.

Radioactive Material – any solid, liquid or gas which emits radiation spontaneously.

5. RESPONSIBILITIES

5.1 Supervisors/Managers have the responsibility to:

5.1.1 Ensure that employees under their direction that work with radioactive materials have received Radiation Safety Training as described in this procedure, prior to conducting their work tasks.

5.1.2 Ensure concerns related to radiation safety are investigated and addressed in a timely manner.

5.1.3 Monitor employees under their direction to assure safe work practices are followed.

5.1.4 Notify the RSO whenever new radioactive materials are being considered to be used in the facility prior to these materials being brought into the facility.

5.1.5 Include a review of potential radiation exposures hazards during the initial stages of program planning.

5.2 The Radiation Safety Officer and Assistant Radiation Safety Officer shall:

5.2.1 Ensure that all terms and conditions of the license and the regulations are complied with.

5.2.2 Ensure that all sealed sources and devices are leak tested timely and as prescribed by the manufacturer or license.

5.2.3 Ensure that the radioactive materials are used only by the individuals who are authorized by the license and that all affected personnel wear monitoring devices, where required.

5.2.4 Maintain all records required by the license and the regulations. These records shall include personnel monitoring records, leak test records, inventory records, training records for users, and receipt, transfer and disposal records.

5.2.5 Ensure that radioactive materials are properly secured against unauthorized access or removal.

5.2.6 Serve as a contact with the NRC for events such as the loss, theft or damage of radioactive material

5.2.7 Ensure that all users understand the emergency reporting procedures and serve as a point of contact with the regulatory agency for such events as theft or loss of radioactive materials.

5.3 Employees are responsible for:

5.3.1 Following rules and guidelines established as part of the radiation safety program.

5.3.2 Promptly reporting all injuries, illnesses or potential radiation problems to the RSO or Assistant RSO.

5.3.3 Wearing appropriate personnel monitoring devices as required.

6. PROCEDURES

6.1 License Requirements

6.1.1 A license to possess radioactive materials is required prior to working with any radioactive materials depending on the radioactive materials involved

6.1.2 Requirements for obtaining a license and the applicability of a license are regulated by Nuclear Regulatory Commission or an agreement state.

6.1.3 Once issued, the conditions of the license will indicate the types of radioactive materials, approved activities and the radiation safe work practices for work with the materials.

6.1.4 The Radiation Safety Manual includes the specific requirements and procedure that are required as conditions of the license.

6.1.5 The principle of ALARA (As Low As Reasonably Achievable) is the basis for the Lancer Systems radiation safety program. ALARA obligates the RSO to conduct the safety program in such a way as to minimize personnel radiation exposure. An annual ALARA report will be submitted to all authorized users and Management. The written ALARA policy is found in Attachment 1.

6.2 General Safe Practices and License Conditions

6.2.1 Written procedures will be established that include the safe practices for handling radiation materials, monitoring of personnel, storage and inventory and any other specific conditions for the license. Procedures for the Control of Radioactive Materials are described in SOP LS-106 Control of Radioactive Material.

6.2.2 Appropriate recordkeeping procedures will be maintained to include radioactive materials inventory, results of wipe and leak tests, personnel monitoring records, shipping and receiving records, and any emergency response activities.

6.2.3 Any Radiation Controlled area or equipment containing radioactive materials will be designated with yellow and purple signs and/or labels as described in SOP LS-106 Control of Radioactive Material.

6.2.4 Any person who possesses or works in the vicinity of radioactive materials shall wear a personnel-monitoring device, as appropriate, in accordance with the regulatory requirements. When not being used personnel monitoring devices should be stored in a place designated by the RSO as a low back ground area.

6.2.5 The permissible occupational radiation dose to the whole body is limited to the exposure limits as specified in the regulatory requirements. Records of all monitoring will be maintained and information regarding any over exposure results will be communicated to the employee in writing.

6.2.6 Radiation monitoring equipment such as scintillation counters and Geiger counters must be calibrated following the manufacturer requirements as described in SOP LS-103 Radiation Surveys. A sticker of the current calibration must be displayed on the monitoring device.

6.2.7 Disposal materials that are potentially contaminated with radioactive materials must be segregated from other waste and placed in containers marked for radioactive waste. Specific procedures for the handling and disposal of waste are outlined in SOP-LS-105.

6.2.8 Emergency information and procedures must be posted in all areas where radioactive materials are being used. This information (see Attachment 2) must include the name and emergency number of the RSO. Emergency Procedures are outlined in SOP-LS-100.

6.2.9 Notices to Employees, Emergency Procedures, Operating Procedures and Notices of Violations shall be posted in all radioactive material work areas. License, amendments and copies of NRC regulations are on file in Radiation Safety Officer and the Program Manager's office.

6.2.10 A sign indicating "Radioactive Materials" (see Attachment 2) must be posted on the door to any radiation controlled area. No eating or drinking is allowed in these rooms.

6.2.11 The shipping or radioactive materials must follow applicable DOT requirements and any other specifications that are indicated in the license and the governing regulatory agency. Shipping and Receiving procedures are outlined in SOP-LS-104 and SOP-LS-102.

7. TRAINING REQUIREMENTS

7.1 All Employees that may work with radioactive materials or in a radiation controlled area shall receive initial general radiation training on the hazards and safe work practices related to the use or radioactive materials prior to beginning work with radiation. Personnel that would receive this training include authorized users and trained technicians.

7.2 The Radiation Safety Officer and Authorized Users must have sufficient documented radiation Safety training and hands on experience with handling radioactive materials. Previous experience as a Radiation Safety officer or Authorized User may be used to meet this re*quirement.* This training may include the following: principles and practices of radiation protection, radioactivity measurement, monitoring techniques and the use of instruments, mathematics and calculations basic to the use and measurement of radioactivity, and biological effects of radiation.

7.3 The employee's general radiation training will include both lecture and video presentation (see Attachment 3) and will cover (but not be limited to) the following topics:

- Storage, transfer or use or radioactive materials in the facility.
- Health risks associated with exposure to radiation and the precautions and procedures to minimize such exposures.
- Explanation of monitoring devices and equipment to determine radiation exposures
- An explanation of an employee's responsibilities to report promptly to the Radiation Safety Officer any condition that may cause a violation of the facilities license or potential over exposure to radiation.
- Emergency response procedures and reporting for any unusual events.
- Advised to the annual radiation monitoring reports that radiation workers will be provided
- Proper disposal of RAM
- Written examination of understanding following the training

7.4 Employees will receive annual refresher training, which will include a review of the safe work practices, hazards and regulatory requirements.

7.5 Additional training may be required based on individual state or local authority requirements or if a change in procedures or equipment is made. Remedial

training for missed test questions or other areas of apparent weakness should be conducted or additional formal training planned to cover deficient areas.

7.6 Hazardous **Materials Training** will be conducted for all employees whose duties require them to receive, handle, or prepare hazardous materials for transportation. The requirements of this training are as follows:

7.6.1 General Awareness training/familiarization training designed to provide familiarity with 49 CFR requirements and to enable the employee to recognize and identify hazardous materials.

7.6.2 Function Specific training concerning USDOT requirements which are specifically applicable to the functions the employee performs.

7.6.3 Safety training concerning emergency response information, measures to protect the employee from hazards posed by materials and the methods a procedures for avoiding accidents.

7.6.4 Training will be conducted prior to the employee performing transportation duties on hazardous material or within 90 days of employment.

7.6.5 Training will be conducted every 3 years.

7.6.6 Training records will be maintained for the duration of employment plus 90 days.

8. PERSONNEL MONITORING – Dosimetry

8.1 A whole body dosimeter must be worn by any individual when handling sealed sources and assembly of drift tubes or chemical detectors in the controlled areas. Whole body dosimeters will be exchanged quarterly.

8.2 A ring (extremity) dosimeter must worn by any individual dismantling chemical detectors or handling sources in the controlled area. Extremity dosimeters will be exchanged monthly.

8.3 It is the responsibility of a pregnant woman to declare her pregnancy to the RSO if she wishes to have additional measures taken to insure that fetal dose limits are not exceeded. Where applicable fetal monitors will be exchanged monthly.

8.4 The procedures for personnel in the dosimetry program include:

8.4.1 Wear badge whenever working with radiation sources.

8.4.2 Badge must face outward.

8.4.3 Keep badges at work in designated area away from x-ray producing machines and sources.

8.4.4 Do not wear during medical tests.

8.4.5 Never use another worker's badge. If badge is lost or damaged, a spare can be issued through the RSO.

8.4.6 Wear whole body badges on the torso, at or above the waist and below the shoulder.

8.4.7 The ring badges should be worn under the glove on the hand that is more likely to receive radiation exposure.

8.4.8 Badges should be stored in an area designated by the RSO. They should be stored with the control badge if possible and protected from moisture and extreme environmental conditions, such as intense heat or light, which may affect their ability to accurately record radiation exposures.

8.4.9 The RSO or designee will change out the badges when required.

8.5 The RSO will notify personnel in writing when exposure readings exceed ALARA action levels.

8.6 Employees that participate in a personnel-monitoring program will be notified of the results of their monitoring on an annual basis.

9. RECORDKEEPING

9.1 Appropriate recordkeeping procedures will be maintained to include radioactive materials inventory, results of wipe and leak tests, personnel monitoring records, shipping and receiving records, and any emergency response activities.

9.2 Retention for records associated with the Radiation Program are found in the below table:

Program Element	Record Retention
Radioactive Materials inventory	3 years
Results of Wipe and Leak Tests	3 years
Personnel Monitoring Records	Permanent
Shipping and Receiving Records	3 years
Personnel Training Records	Duration of employment plus 90 days
Emergency Response Activities	3 years

10. SECURITY AND EMERGENCIES

10.1 Lancer Systems operates under a badge system that requires all individuals in the facility to wear the badge at all times. Employees are issued badges including key card access based on their level of security clearance following Lancer Systems general Security Manual Procedures.

10.2 The entire building is secured with an alarm system that is monitored 24 hours a day. Access to the building is restricted to employees only using card key access. Restricted and classified areas are also key card access only to those individuals that are trained. Additional key card access is required to enter the restricted areas of the Source and Secure Storage areas and is restricted to authorized trained users.

10.3 All incoming visitors are required to sign-in and are given a badge at the reception desk. Visitors are continuously escorted at all times.

10.4 Emergency egress doors located in the regulated area are equipped with emergency alarms that sound immediately when they are opened.

10.5 The procedures to control of access to radioactive materials moved throughout the facility are described in SOP-LS-106 Control of Radioactive Materials.

10.6 Emergency procedures are outlined in SOP-LS-100 Emergency Response.

11. ASSOCIATED FORMS OR DOCUMENTS

SOP-LS-106 Control of Radioactive Material
SOP-LS-104 Shipment of Radioactive Material
SOP-LS-102 Receipt of Radioactive Materials
SOP-LS-100 Emergency Response
SOP-LS-103 Routine Radiological Surveys
SOP-LS-105 Waste Disposal of Radioactive Material
SOP-LS-107 Lancer Systems Safety Manual
SOP-LS-108 Lancer Systems Security Manual

12. INTERPRETIVE AUTHORITY

The interpretive authority for all questions concerning this document shall be the RSO or Program Manager.

13. REFERENCE DOCUMENTS

US Nuclear Regulatory Commission Regulations – 10 CFR

ATTACHMENT 1
Lancer Systems
ALARA POLICY

1. THE ALARA PHILOSOPHY

The Nuclear Regulatory Commission, establishes standards for protection against radiation hazards. 10 CFR 20.1101(b)., requires licensees to use to the extent practical procedures and engineering controls based upon sound radiation protection principles to achieve occupational and public doses that are as low as reasonably achievable (ALARA). Management, the radiation safety officer (RSO) and all authorized users must participate in the establishment, implementation and operation of a radiation protection program which applies the ALARA philosophy of minimizing exposures to radiation.

The primary concept of the ALARA philosophy is that unnecessary exposure to radiation should be avoided, even though current occupational exposure limits provide a very low risk of injury. The objective is to reduce occupational exposures (both individual and collective) as far below regulatory limits as is reasonably achievable by means of good radiation protection planning and practice, as well as by a management commitment to policies that deter departures from good practices. The three primary methods of minimizing exposure to radiation are: TIME, DISTANCE and SHIELDING. When working with sources of radiation, always minimize the TIME, maximize the DISTANCE, and make use of available SHIELDING to keep exposures ALARA.

2. MANAGEMENT COMMITMENT

We, the management of **Lancer Systems**
are committed to the ALARA philosophy of maintaining occupational and public radiation doses as low as reasonably achievable.

A. It will be a management priority that all personnel working with radioactive material be made aware of our commitment to the ALARA philosophy and that they be instructed in the procedures to be used to keep their exposures as low as possible.

B. Management has delegated authority to our RSO to ensure adherence to ALARA principles. Management will support the RSO in instances where this authority must be asserted.

C. Management will make all reasonable modifications to procedures, equipment and facilities to reduce exposures, unless the cost is considered to be unjustified. We will be prepared to describe the reasons for not implementing modifications that have been recommended.

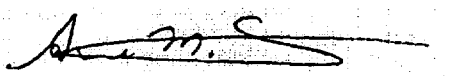
3. RADIATION SAFETY OFFICER RESPONSIBILITIES

A. The RSO will emphasize the ALARA philosophy to all personnel working with radioactive material, and will instruct workers to review current procedures and propose changes to reduce exposure levels.

B. If personnel monitoring is conducted, the RSO will review dosimetry reports for all monitored personnel upon receipt (monthly for film badges or quarterly for TLDs) to determine if unnecessary exposures are being received. The RSO will sign and date each report reviewed. The RSO will investigate within 30 days the cause of any personnel exposure considered to be excessive. If warranted, the RSO will take corrective actions to ensure that unnecessary exposures are halted and recurrence is prevented. A report of each investigation and the actions taken, if any, will be recorded and maintained for inspection purposes.

C. At least annually, the RSO will conduct a formal review of the radiation protection program's content and implementation, as required by 10 CFR 20.1101(c), The review will include an evaluation of equipment, procedures, inspection findings, and any incidents. The RSO will assess trends in occupational exposures as an index of the program's success and to determine if any modifications to the program are needed. A summary of the results of each annual review, including a description of actions proposed and taken (if any) will be documented by the RSO, discussed with management, and signed and dated by both. A report on each audit will be maintained on file for 3 years from the date of the review.

The undersigned certify that the commitments set forth above have been implemented.



Signature (RSO)

Anne M. Stumpf, CIH, CSP
Name and title

Signature (management)

___Brian Hodges. President Lancer Systems LP
Name and title

ATTACHMENT 2

In The Event Of Accident, Damage, Loss, Theft, Spill, Or Contamination Involving

RADIOACTIVE MATERIALS

IMMEDIATELY NOTIFY

Licensee's Radiation Safety Officer: **Anne M. Stumpf RSO** **Glenn Ward Asst. RSO**	Duty [redacted] **Anne's Cell** [redacted] **Glenn's Cell**
	After Duty: **352-455-2354**

For NRC Radiation Emergency Notification Or Assistance Call:

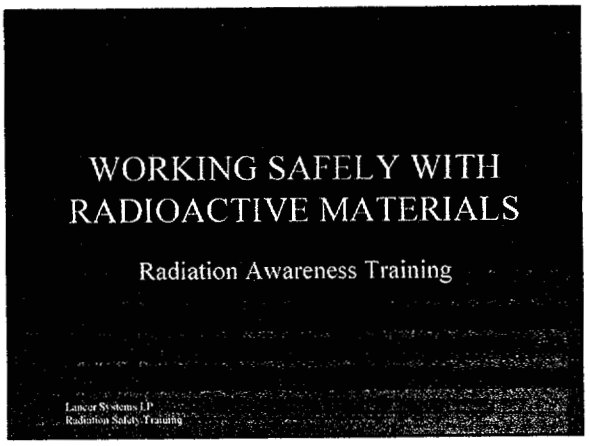
NRC Headquarters Operations Center (301) 816-5100*
Monitored 24 hours a day

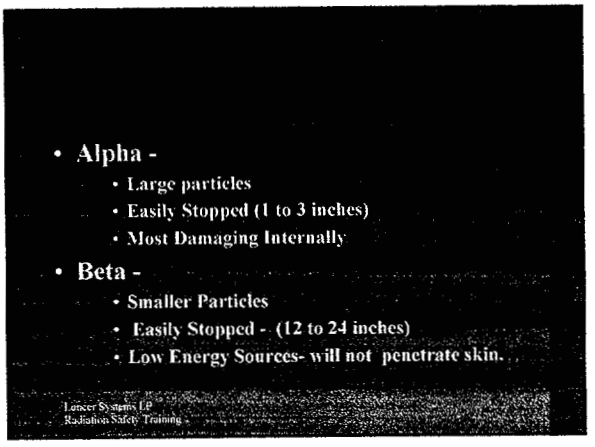
In the event of suspected contamination:

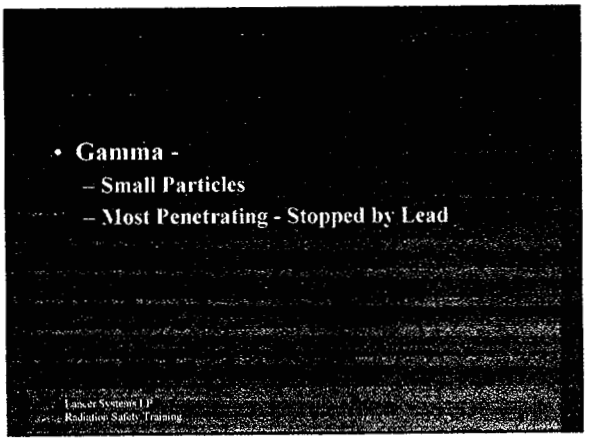
1. SEAL OFF CONTAMINATED AREA, CLOSE WINDOWS, DOORS, AND VENTILATION TO OTHER AREAS.
2. LIMIT ACCESS TO CONTAMINATED AREAS, KEEP PEOPLE OUT!

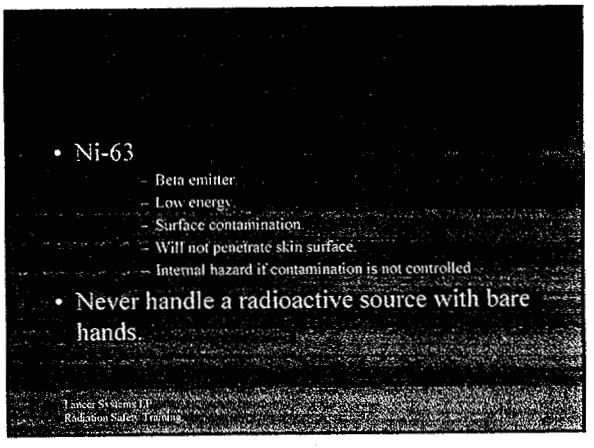
3. DO NOT TRACK RADIOACTIVITY THROUGHOUT THE BUILDING REMEMBER YOUR SHOES AND CLOTHING MAY BE CONTAMINATED!

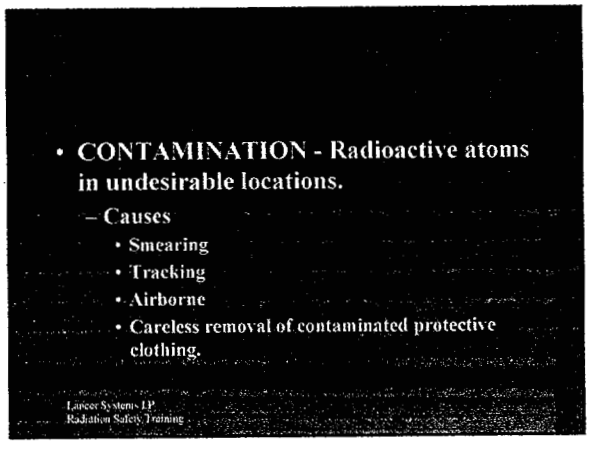
ATTACHMENT 8
Lancer Systems
Radiation Safety Training Materials

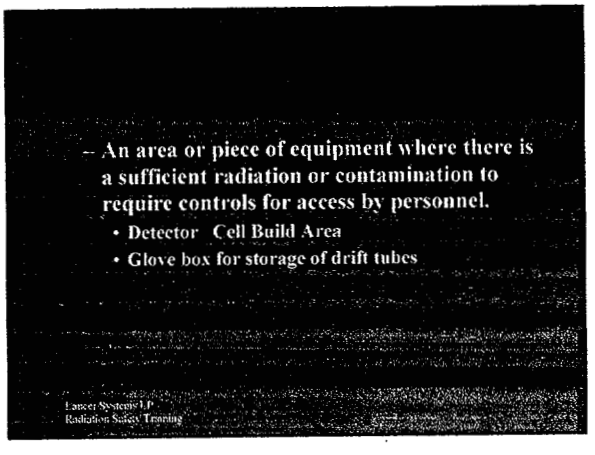

WORKING SAFELY WITH
RADIOACTIVE MATERIALS
Radiation Awareness Training
Lancer Systems LP
Radiation Safety Training


• Alpha -
• Large particles
• Easily Stopped (1 to 3 inches)
• Most Damaging Internally
• Beta -
• Smaller Particles
• Easily Stopped - (12 to 24 inches)
• Low Energy Sources- will not penetrate skin.
Lancer Systems LP
Radiation Safety Training


• Gamma -
– Small Particles
– Most Penetrating - Stopped by Lead
Lancer Systems LP
Radiation Safety Training


• Ni-63
– Beta emitter
– Low energy
– Surface contamination
– Will not penetrate skin surface.
– Internal hazard if contamination is not controlled
• Never handle a radioactive source with bare hands.
Lancer Systems LP
Radiation Safety Training


• CONTAMINATION - Radioactive atoms in undesirable locations.
– Causes
• Smearing
• Tracking
• Airborne
• Careless removal of contaminated protective clothing.
Lancer Systems LP
Radiation Safety Training


– An area or piece of equipment where there is a sufficient radiation or contamination to require controls for access by personnel.
• Detector Cell Build Area
• Glove box for storage of drift tubes
Lancer Systems LP
Radiation Safety Training

- Exposure records will be kept on all personnel working in Radiation Areas.
- Occupational Dose Limits for Adults:
  - Total Body - 5 Rem
  - Eye - 15 Rem
  - Shallow - 50 Rem

Lancer Systems LP
Radiation Safety Training

- Luxel Badges
  - Changed out:
    - Quarterly High Sensitivity
  - Visual Body Location Icons
  - Extremity badges & whole body badges
  - Wear at all times in controlled areas
  - Do not allow anyone else to wear your badge
  - Keep badge in designated area when not in use

Lancer Systems LP
Radiation Safety Training

- ALARA - As Low As Reasonably Achievable.
  - Written policy to prevent over exposure
- Limits Per Calendar Quarter:
  - Whole Body - 125 mrem
  - Eye - 375mrem
  - Skin or extremity - 1250 mrem

Lancer Systems LP
Radiation Safety Training

- **BETA Probe**
- **Geiger-Muller Detector (G-M)**
- **Liquid Scintillation Counters**
- **Film Badges and Rings**

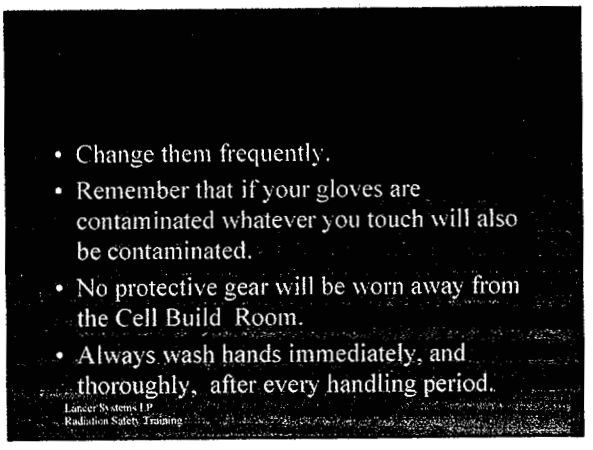
Lancer Systems LP
Radiation Safety Training

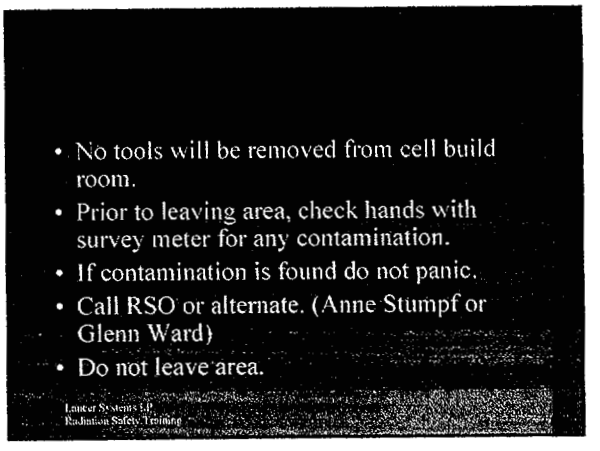
- Only authorized personnel will be permitted to enter Cell Build Areas.
- Persons suffering with the following conditions will not enter the cell build room.
  - large cuts
  - colds or allergies
  - eye, nose or throat infections
  - skin infections
- Monitoring badges will be worn

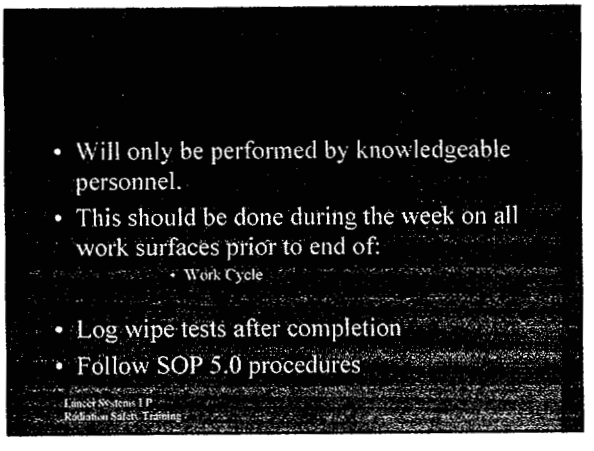
Lancer Systems LP
Radiation Safety Training

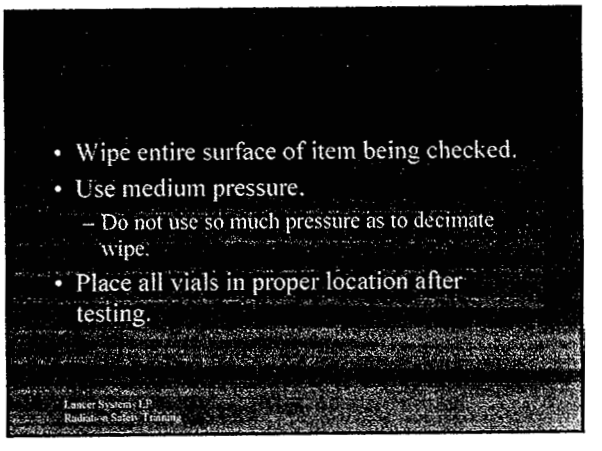
- There will be no smoking, eating, drinking any beverage, or gum chewing in the Controlled areas
- Approved gloves and smocks will be worn by personnel handling Radioactive Material.
- Gloves will be worn whenever Radioactive material will be handled.
- Dispose of contaminated gloves in proper container.

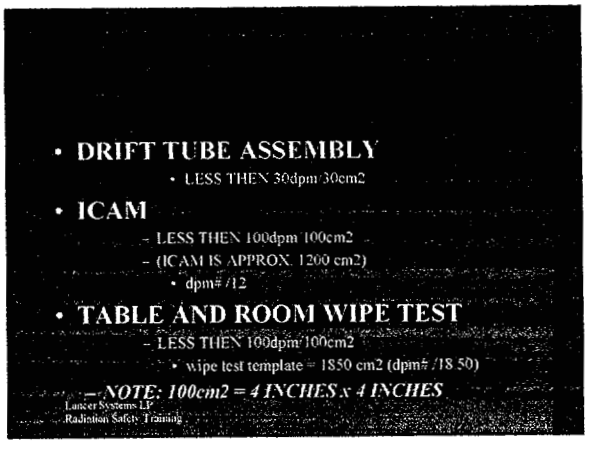
Lancer Systems LP
Radiation Safety Training

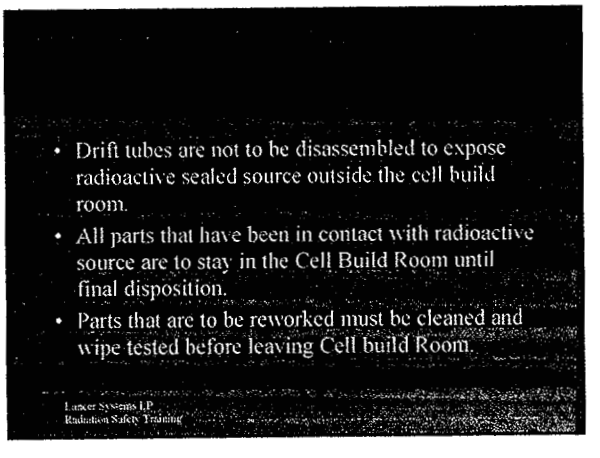

• Change them frequently.
• Remember that if your gloves are contaminated whatever you touch will also be contaminated.
• No protective gear will be worn away from the Cell Build Room.
• Always wash hands immediately, and thoroughly, after every handling period.
Lancer Systems LP
Radiation Safety Training

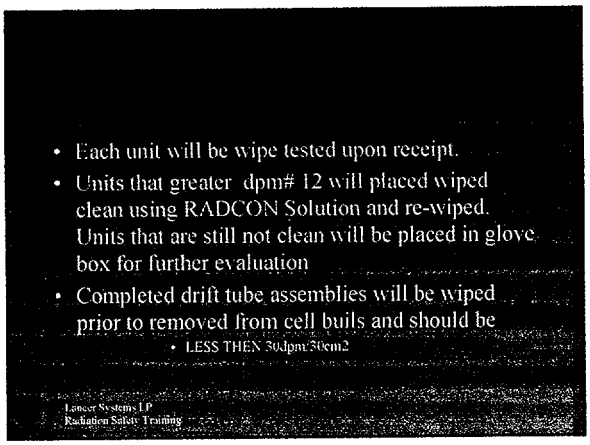

• No tools will be removed from cell build room.
• Prior to leaving area, check hands with survey meter for any contamination.
• If contamination is found do not panic.
• Call RSO or alternate. (Anne Stumpf or Glenn Ward)
• Do not leave area.
Lancer Systems LP
Radiation Safety Training

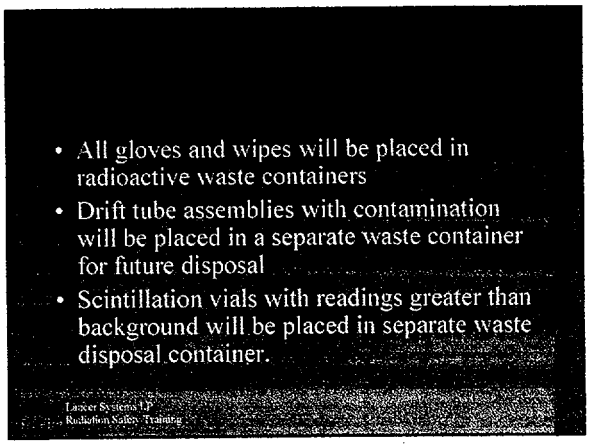

• Will only be performed by knowledgeable personnel.
• This should be done during the week on all work surfaces prior to end of:
– Work Cycle
• Log wipe tests after completion
• Follow SOP 5.0 procedures
Lancer Systems LP
Radiation Safety Training


• Wipe entire surface of item being checked.
• Use medium pressure.
– Do not use so much pressure as to decimate wipe.
• Place all vials in proper location after testing.
Lancer Systems LP
Radiation Safety Training


• DRIFT TUBE ASSEMBLY
– LESS THEN 30dpm/30cm2
• ICAM
– LESS THEN 100dpm/100cm2
– (ICAM IS APPROX. 1200 cm2)
– dpm# /12
• TABLE AND ROOM WIPE TEST
– LESS THEN 100dpm/100cm2
– wipe test template = 1850 cm2 (dpm# /18.50)
– NOTE: 100cm2 = 4 INCHES x 4 INCHES
Lancer Systems LP
Radiation Safety Training


• Drift tubes are not to be disassembled to expose radioactive sealed source outside the cell build room.
• All parts that have been in contact with radioactive source are to stay in the Cell Build Room until final disposition.
• Parts that are to be reworked must be cleaned and wipe tested before leaving Cell build Room.
Lancer Systems LP
Radiation Safety Training


• Each unit will be wipe tested upon receipt.
• Units that greater dpm# 12 will placed wiped clean using RADCON Solution and re-wiped. Units that are still not clean will be placed in glove box for further evaluation
• Completed drift tube assemblies will be wiped prior to removed from cell buils and should be
• LESS THEN 30dpm/30cm2
Lancer Systems LP
Radiation Safety Training


• All gloves and wipes will be placed in radioactive waste containers
• Drift tube assemblies with contamination will be placed in a separate waste container for future disposal
• Scintillation vials with readings greater than background will be placed in separate waste disposal container.
Lancer Systems LP
Radiation Safety Training

AUDIT OF RADIATION SAFETY PROGRAM
STANDARD OPERATING PROCEDURE
LS-110 REV A

Table of Contents

1. OBJECTIVE

This procedure provides an evaluation or audit of the Lancer Systems to (1) maintain doses for ALARA; (2) compliance with NRC requirements; (3) ability to identify and correct deficiencies in their Radiation Safety Program; (4) evaluate management of their Radiation Safety Program including the role of senior management and the RSO; and (5) review of the implementation of the Radiation Safety Program.

2. REFERENCES

2.1 10 CFR NRC Control of Radiation

2.2 Title 49 Code of Federal Regulations - Transportation

3. EQUIPMENT

3.1 Calibrated radiation survey instrument.

4. PRECAUTIONS

4.1 None

5. DISCUSSION

The Audits will cover both the management of the Radiation Safety Program and the details of its implementation in the areas chosen for review. The audit program is an integral part of Lancer Systems ISO 9000 certification and the auditing program in included within the Quality Management System.

6. INSTRUCTIONS

6.1 Auditors should have training and experience similar to that of an authorized user for the types, forms, uses, and quantities of radioactive material used in the areas audited. Auditors may be selected from the Quality Management staff of are third parties, from independent organizations.

6.2 Audits should be conducted at least once every 12 months.

6.3 During the audit documentation should be reviewed of the Radiation Safety Program, and actual observations of work being conducted in radiation areas Results of the inspections are documented using Form LS-110-01 Radiation Audit Checklist

6.4 Any deficiencies are summarized on FORM LS-110-02 Summary of Audit Findings that is forwarded to the Project Manager and Radiation Safety Officer. The Radiation Safety Officer reviews the findings monthly to ensure that the deficiency has been addressed by the action date.

6.5 Records of audits and other reviews of program content will be maintained for 3 years from the date of the record. The information will include the date of audit, name of person(s) who conducted the audit, persons contacted by the auditor(s), areas audited, audit findings, corrective actions, and follow-up. These records will be maintained for inspection by NRC.

6. FORMS AND ATTACHMENTS

6.1 Attachment 1- FORM LS-110-01Radiation Audit Checklist

6.2 Attachment 2 FORM LS-110-02 Summary of Audit Findings

Attachment 1

FORM LS-110-01RADIATION AUDIT CHECKLIST

CONDUCTED BY: **DATE:**

1.	**Ionizing Radiation**	N/A	Complies	Does not comply
1.1	Ensure that workers have received the training required by 10 CFR 19.12.	☐	☐	☐
1.2	– Employers must ensure that employee exposure to airborne radioactive material is limited. 10 CFR 20.1501(c) And (29 CFR 1910.1096(c)(1) – (3))	☐	☐	☐
1.3	– Employers must implement certain precautionary procedures and personal monitoring techniques. 10 CFR 20.1501(c), 10 CFR 20.2101-2104 and 20.2106, 10 CFR 19.12. and (29 CFR 1910.1096(d))	☐	☐	☐
1.4	Caution signs and labels posted in radiation areas must be of conventional size, shape, and design. 10 CFR 19.11, 10 CFR 20.1902, 20.1904, and 10 CFR 21.6. and (29 CFR 1910.1096(e)(1) – (5) and (g)(1) – (3))	☐	☐	☐
1.5	Caution signs and labels on containers must be of conventional size, shape, and design. 10 CFR 19.11, 10 CFR 20.1902, 20.1904, and 10 CFR 21.6.and (29 CFR 1910.1096(e)(6) and (h))	☐	☐	☐
1.6	Immediate evacuation warning signals must include certain audible characteristics. (29 CFR 1910.1096(f)(1))	☐	☐	☐
1.7	Verify that the facilities are as described in the license documents.	☐	☐	☐
1.8	Verify that the license authorizes the quantities and types of byproduct material that the licensee possesses	☐	☐	☐
1.9	Verify that all sealed/plated foil sources are tested for leakage at the prescribed frequency and in accordance with licensee commitments.	☐	☐	☐
1.10	Verify that inventories are conducted at least once	☐	☐	☐

	every 6 months to account for all sources; inventory records should be maintained.			
1.11	Check for compliance with the posting and labeling requirements of 10 CFR 19.11, 10 CFR 20.1902, 20.1904, and 10 CFR 21.6.	☐	☐	☐
1.12	Radioactive materials stored in a non-radiation area must be secured against unauthorized removal.	☐	☐	☐
1.13	Employers must not dispose of radioactive material except through approved means.	☐	☐	☐
1.14	Check for compliance with the notification and reporting requirements in 10 CFR Parts 19, 20, 21, 30, 40, and 70. Ensure that the licensee is aware of the telephone number for NRC's Emergency Operations Center; (301) 816-5100	☐	☐	☐
1.15	Employers must maintain certain radiation exposure records of all employees for whom personnel monitoring is required.	☐	☐	☐
1.16	Upon request, an employer must furnish a former employee with a report of the employee's exposure to radiation. (29 CFR 1019.1096(o))	☐	☐	☐
1.17	Verify that packages containing byproduct material, received from others, are received, opened, and surveyed in accordance with 10 CFR 20.1906. Ensure that transfers are performed in accordance with 10 CFR 30.41, 40.51, and 70.42. Records of surveys, receipt, and transfer must be maintained in accordance with 10 CFR 20.2103, 30.51, 40.61, 70.51, and 70.54.	☐	☐	☐
1.18	Determine compliance with Department of Transportation (DOT) requirements. Verify that radioactive packages are prepared, marked, and labeled in accordance with 49 CFR Parts 172 and 173 requirements. Verify that shipping papers are prepared, contain all needed information, and are readily accessible during transport (49 CFR 172.200-204 and 177.718).	☐	☐	☐
1.19	Note the date of the last audit, whether any deficiencies were identified, and whether actions were taken to correct the deficiencies	☐	☐	☐

LIST OF DOCUMENTATION AND ACTIVITIES TO REVIEW

1. EMPLOYEE MONITORING RECORDS

2. ALARA STATEMENT AND REVIEW 3 YEARS

3. INVENTORY RECORDS – VERIFY NO EXCEEDANCE WITH LICENSE CONDITIONS

4. REVIEW OF MATERIALS USED AND AMOUNT

5. TRAINING RECORDS AND CONTENT - INTERVIEWS WITH USERS REGARDING TRAINING, OBSERVATION OF WORK PRACTICES.

6. LEAK TEST RESULTS – FREQUENCY AND DOCUMENTATION

7. POSTINGS LAB AND STORAGE AREAS

8. EMERGENCY ACCIDENT REPORTS

9. WASTE DISPOSAL RECORDS

10. COPY OF LICENSE AND RENEWAL LETTERS

11. SOURCE MATERIAL REGISTRATION IF APPLICABLE

12. RECEIPT OF RADIOACTIVE MATERIALS – VERIFY SHIPMENT DOCUMENTS AND CONDITION OF SHIPMENT

13. TRANSFER OF RADIOACTIVE MATERIALS – CHECK DOCUMENTATION – PHYSICAL VERIFICATION OF MATERIALS

Attachment 2

FORM LS-110-02 Summary of Audit Findings

Site:_____
Date:_____

FORM LS-110-02
Summary Report of Findings

Lancer Systems, LP
Attachment 10
SOP LS-110- Ausit of Radiation Safety Programs

Finding Number	Description of Finding/Best Management Practice	Regulatory Requirement	Description of Corrective Action	Actionee	Date of Completion	Actual Date of Completion

BMP = Best Management Practice Observation FRS = Finding Regulatory FP = Finding Programs

CONTROL OF RADIOACTIVE MATERIAL
STANDARD OPERATING PROCEDURE
LS-106 REV A

Table of Contents

1. OBJECTIVE

This procedure provides instruction for the control of radioactive material for all Lancer Systems personnel who handle licensed material. It is intended to provide guidance for the handling, storage, and movement of radioactive material, to ensure that all licensed material is protected against unauthorized removal, and that all licensed sources not in storage or collected for disposal have valid leak test certifications, where applicable.

2. REFERENCES

2.1 Lancer Systems Radiation Protection Program

2.2 SOP-LS-103, Shipment of Radioactive Material

2.3 SOP-102, Receipt of Radioactive Material

2.4 10 CFR Nuclear Regulatory Commission requirements

3. EQUIPMENT

3.1 Not Applicable

4. PRECAUTIONS

4.1 Only Radioactive Material Workers with valid training shall be allowed to use and control licensed material.

4.2 Do not eat, drink, smoke, or apply cosmetics in any area where radioactive material is stored or used.

4.3 Do not store food, drink, or personal effects with radioactive material.

4.4 Wear disposable gloves at all times while handling radioactive materials.

4.5 Either after each procedure or before leaving a restricted area monitor your hands for contamination with a survey meter after washing your hands.

4.6 Wear personnel monitoring devices at all times while in areas where radioactive materials are used or stored.

4.7 Ensure security of radioactive materials. Do not leave radioactive materials in unsecured areas.

5. DISCUSSION

The handling of radioactive material should be an orderly and deliberate process in which the whereabouts of licensed material either sealed sources or device drift tubes should be known at all times. The manufactured devices contain Ni-63. There are no external exposure hazards associated with these sources once they are assembled in the drift tube. The prime concern of this procedure is to prevent the unauthorized removal of licensed sources from the controlled area and the removal of the sealed sources inside the drift tube assemblies..
The Ni-63 radioactive sources are required to be tested for leakage at intervals not to exceed either 6 or 12 months depending on the requirements of the Radioactive Sealed Sources and Devices

Registry listing. This test must be performed by persons specifically licensed by the NRC, or another Agreement State.

6. INSTRUCTIONS

6.1 Use of Licensed Material

6.1.1 ENSURE that all licensed material is under the direct surveillance of an Authorized User to protect against unauthorized removal.

6.1.1.1 IF an individual who is not recognized as an Authorized User enters a Controlled Area, INFORM the individual of the presence of licensed material and GUARD against unauthorized removal.

6.1.2 ENSURE each container of licensed material bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL".

6.1.3 ENSURE that each area where licensed material is used or stored is conspicuously posted with signs identifying the presence of radioactive material. The postings shall be standard yellow background with magenta or black lettering with the words "CAUTION: Radioactive Material".

6.2 Transport of Licensed Material within the Lancer Systems Facility

6.2.1 EXERCISE care when transporting the radioactive material through the facility from one area to another. The most direct route should be used, if possible.

6.2.2 ENSURE that the licensed material is under the direct control of the Authorized user during transport through the facility from one area to another.

6.3 Storage of Radioactive Material

6.3.1 ENSURE that all licensed material not under direct surveillance is locked in a cabinet or area to protect against unauthorized removal.

6.3.2 ENSURE that each locked cabinet or enclosure bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL".

6.3.3 ENSURE that the room or area where the locked cabinet or enclosure is located is conspicuously posted with signs identifying the presence of radioactive material. The postings shall be standard yellow background with magenta or black lettering with the words "CAUTION: Radioactive Material".

6.4 Wipe Test Validation

6.4.1 At least monthly, the RSO shall REVIEW Form 0012 A, Radioactive Material Wipe Test Inventory, to ensure that all licensed material possessed at the Lancer Systems facility has a valid wipe test.

6.4.2 IF a drift tube or sealed source is found to have a wipe test date within two months of expiration, ARRANGE to have the detector tested.

6.4.3 It is anticipated that the drift tubes that will be manufactured in the facility for will not exceed 12 months and therefore not require leak testing. .

6.5 Radiation Source Inventory

6.5.1 The RSO will conduct a physical inventory of each device that contains a sealed source every 6 months as required by the NRC.

6.5.2 Sealed sources and drift tubes that contain radiation sources will be tracked on Form 0012B, Inventory of Radioactive Sealed Sources & drift tubes, once they are received at the facility.

6.5.3 The inventory records will include the manufacturer's name, model and serial numbers of each sealed source, the identity of the sealed source radionuclide and its estimated activity, the location of each sealed source, the date of the inventory and the signature of the radiation safety officer or designee.

6.5.4 Inventory records will be maintained for 3 years

7. FORMS AND ATTACHMENTS

7.1 SOP-LS-106-01, Radioactive Material Wipe Test Inventory

7.2 SOP-LS-106-02, Inventory of Radioactive Sealed Sources & Devices

Form SOP-LS-106-01 REV A - Radioactive Material Wipe Test Inventory

Radioisotope: Ni-63
Location: CAM/SourceLab

RSO: Anne Stumpf
Date Reviewed: _____

INCOMING SHIPPING #	DATE REC'D	CUSTOMER	DEVICE TYPE	DEVICE MANUFACTURER & MODEL NO.	DEVICE SERIAL #	DRIFT TUBE SERIAL #	ACTIVITY (mCi)	DATE OF INCOMING DEVICE WIPE TEST	INCOMING DEVICE WIPE TEST RESULTS	NEXT WIPE TEST DUE DATE (6 MO. INTERVALS)	DRIFT TUBE CHANGE? (YES OR NO)	NEW DRIFT TUBE SERIAL #	INSTALL. OPERATOR INIT.	DATE SHIPPED	RSO INIT.

FORM SOP-LS-106-02
Inventory of Radioactive Sealed Sources & Devices

Total Allowable Activity (mCi)	-	Current Activity (mCi)	=	Remaining Activity (mCi)	
6000		15		5985 *	*OR **399** Source CAM UNITS

Company: Lancer Systems **Rad. Mateirals License No.:** ____________

Date of Inventory: **Radiation Safety Officer (or designee) Signature:** ____________________

Source Type: **Ni-63 (sealed)**

Notes: (1) Listing 'In Storage" under the CONDITION column identifies a source held in secured storage with no use anticipated prior to transfer/disposal.
(2) GL = General License source/device; SL = Specific License source/device;

#	GL or SL	CUSTOMER	DEVICE MANUFACTURER & MODEL NO.	DEVICE SERIAL NO.	DRIFT TUBE MANUFACTURER & MODEL NO.	DRIFT TUBE SERIAL NO.	ACTIVITY (mCi)	LOCATION	CONDITION
							15		
							0		

RECEIPT OF RADIOACTIVE MATERIAL
STANDARD OPERATING PROCEDURE
LS-102 REV A

Table of Contents

1. OBJECTIVE

The purpose of this procedure is to describe the methods for the receipt of radioactive materials at Lancer Systems.

This procedure applies to all radioactive materials received at Lancer Systems.

This procedure includes a quality control inspection on each source or device that includes checking for valid wipe test certification and proper radioactive material label. This is performed by receiving inspection personnel as they inspect and file all paperwork including the Leak Test/Wipe Test Certificates from the Shipper. It also includes provisions for updating the radioactive material inventory performed by the RSO or ARSO.

2. REFERENCES

2.1 Lancer Systems Standard Operating Procedure SOP LS-106, Control of Radioactive Material

2.2 10 CFR NRC Control of Radiation

2.3 Title 49 Code of Federal Regulations - Transportation

3. EQUIPMENT

3.1 Calibrated survey meter.

4. PRECAUTIONS

4.1 The RSO or trained designees shall perform the monitoring required by Step 6.1 as soon as practicable after receipt of the package, but not later than 3 hours after the package is received if it is received during normal working hours, or not later than 3 hours from the beginning of the next working day if it is received after working hours.

5. DISCUSSION

The shipment of radioactive material is a complex process that requires proper packaging, marking, labeling, placarding, shipping papers, training, etc. The form (Special or Normal), amount in curies or Becquerels, dose rates on the outside of the package are all determining factors for type of container, labeling, carrier restrictions and other shipping requirements. Limited Quantity shipments are exempt from most of these requirements and are, therefore, much more easily prepared and shipped.

6. INSTRUCTIONS

6.1 **ISOLATE** all packages received in the shipping department until contamination results are obtained.

6.2 **INSPECT** packages for damage upon receipt.

6.3 **SURVEY** packages for radioactive contamination and radiation levels in accordance with SOP LS-103, General Survey Procedures as described for surface wipe contamination. The radiation level at all points on the exterior of the package does not exceed 0.5 millirem per hour using an appropriate instrument.

6.3.1 Surface wipe contamination should not exceed 22 dpm/cm^2.

6.3.2 If surveys are within limits, release package for movement to a controlled area. If not within limits, designate as Contaminated Area and follow SOP LS-100, Emergency Response.

6.3.3 Inventory contents of package and note on packing list or wipe test data sheet.

6.3.4 Verify quantity does not cause license quantity limits to be exceeded.

6.4 **UPDATE** Radioactive Inventory Database.

6.5 **COPY** all paperwork and survey results associated with package. Forward copy to RSO for records and return originals to receiving department clerk.

6.6 **SECURE** sources in locked storage located in the radiation controlled until released to repair. For assemblies containing source material, place copy of survey results in package.

7. FORMS AND ATTACHMENTS

7.1 Attachment 1, Receipt Checklist

7.2 FORM SOP –LS-102-01 - Radiation Receiving Log

FORM LS-102-01 REVA-RADIATION RECEIVING LOG

INCOMING SHIPPING #	DATE REC'D	# OF PKGS.	SHIPPED FROM ADDRESS (CUSTOMER)	DEVICE QTY. REC'D	PACKAGE SURFACE LEVEL (mR/hr)	PACKAGE WIPE TEST (DPM/100cm^2)	COMMENTS
				CAMs: ACADAs: TOTAL:	First Package: Additional Package(s): Package 2: Package 3: Package 4: Package 5:	First Package: Additional Package(s): Package 2: Package 3: Package 4: Package 5:	
				CAMs: ACADAs: TOTAL:	First Package: Additional Package(s): Package 2: Package 3: Package 4: Package 5:	First Package: Additional Package(s): Package 2: Package 3: Package 4: Package 5:	
				CAMs: ACADAs: TOTAL:	First Package: Additional Package(s): Package 2: Package 3: Package 4: Package 5:	First Package: Additional Package(s): Package 2: Package 3: Package 4: Package 5:	
				CAMs: ACADAs: TOTAL:	First Package: Additional Package(s): Package 2: Package 3: Package 4: Package 5:	First Package: Additional Package(s): Package 2: Package 3: Package 4: Package 5:	

FORM LS-102-01 REVA-RADIATION RECEIVING LOG

INCOMING SHIPPING #	DATE REC'D	# OF PKGS.	SHIPPED FROM ADDRESS (CUSTOMER)	DEVICE QTY. REC'D	PACKAGE SURFACE LEVEL (mR/hr)	PACKAGE WIPE TEST (DPM/100cm^2)	COMMENTS
				CAMs:	First Package:	First Package:	
				ACADAs: TOTAL:	Additional Package(s): Package 2: Package 3: Package 4: Package 5:	Additional Package(s): Package 2: Package 3: Package 4: Package 5:	
				CAMs:	First Package:	First Package:	
				ACADAs: TOTAL:	Additional Package(s): Package 2: Package 3: Package 4: Package 5:	Additional Package(s): Package 2: Package 3: Package 4: Package 5:	
				CAMs:	First Package:	First Package:	
				ACADAs: TOTAL:	Additional Package(s): Package 2: Package 3: Package 4: Package 5:	Additional Package(s): Package 2: Package 3: Package 4: Package 5:	
				CAMs:	First Package:	First Package:	
				ACADAs: TOTAL:	Additional Package(s): Package 2: Package 3: Package 4: Package 5:	Additional Package(s): Package 2: Package 3: Package 4: Package 5:	

SHIPMENT OF RADIOACTIVE MATERIAL
STANDARD OPERATING PROCEDURE
LS-104 REV A

Table of Contents

1. OBJECTIVE

This procedure provides instruction for the shipment of radioactive material of limited quantities to authorized recipients. It is only intended for use with shipments of limited quantities of radioactive material. It is anticipated that the shipment of radioactive materials will not exceed the limited quantity values specified in the USDOT regulations (49 CFR 173.425, Table 7, and 173.435).

2. REFERENCES

2.1 Lancer Systems Standard Operating Procedure SOP-LS-106 Control of Radioactive Materials

2.2 10 CFR NRC Control of Radiation

2.3 Title 49 Code of Federal Regulations - Transportation

3. EQUIPMENT

3.1 Calibrated radiation survey instrument.

4. PRECAUTIONS

4.1 See Attachment 1

5. DISCUSSION

The shipment of radioactive material is a complex process that requires proper packaging, marking, labeling, placarding, shipping papers, training, etc. The form (Special or Normal), amount in curies or Becquerels, dose rates on the outside of the package are all determining factors for type of container, labeling, carrier restrictions and other shipping requirements. Limited Quantity shipments are exempt from most of these requirements and are, therefore, much more easily prepared and shipped.

6. INSTRUCTIONS

6.1 Shipment of Ni-63 radioactive material:

6.1.1 IF the shipment does not exceed the limit(s) specified in 49 CFR 173.425, Table 7,and 49 CFR 173.435 (Table of A_1 and A_2 values for radionuclides), PREPARE the package as a Limited Quantity shipment.

6.1.2 IF the shipment exceeds the limit(s) specified in 49 CFR 173.425, Table 7, CONTACT the RSO for determining the case specific requirements for shipping the package.

NOTE 1

For Ni-63 in Normal Form, the A(2) value is 811 Ci. The limited quantity (LQ) package limit for Instruments and Articles is 10^{-2} of the A(2) value. Therefore, the LQ shipment value per instrument for Ni-63 is 8.1 Ci.

6.2 INITIATE Form SOP-LS-104-01, Radiation Shipment Log

6.3 UPDATE the Radioactive Material Inventory.

7. FORMS AND ATTACHMENTS

7.1 Attachment 1- CFR 173.424 Statement

7.2 Attachment 2 – Shipment Checklist

7.3 Attachment 3 - USDOT 49 CFR 173.425, Table 7 - Activity Limits for Limited Quantities, Instruments, and Articles

7.4 Form SOP-LS-104-01 – Radiation Shipment Log

Attachment 1

DOMESTIC SHIPMENTS

LIMITED QUANTITY / INSTRUMENT AND ARTICLE

"THIS PACKAGE CONFORMS TO THE CONDITIONS AND LIMITATIONS SPECIFIED IN 49 CFR 173.424 FOR RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-INSTRUMENTS OR ARTICLES, UN2911"

CONSIGNEE OR CONSIGNOR _____

INTERNATIONAL SHIPMENTS

LIMITED QUANTITY / INSTRUMENT AND ARTICLE

"THIS PACKAGE CONFORMS TO THE CONDITIONS AND LIMITATIONS SPECIFIED IN 49 CFR 173.424 FOR RADIOACTIVE MATERIAL, EXCEPTED PACKAGE-INSTRUMENTS OR ARTICLES, UN2911"

CONSIGNEE OR CONSIGNOR _____

Attachment 2

Shipment Checklist

Item	Action
Packaging	Ensure the materials are packaged in strong, tight packages that will not leak any radioactive material during normal transportation.
Radiation Levels	The radiation level at all points on the exterior of the package does not exceed 0.5 millirem per hour using an appropriate instrument.
Removable Contamination	Ensure that the external package wipe test is performed and meets the limitations of 22 dpm/cm2 for Ni-63.
Marking and Labeling	Ensure that each container of radioactive material bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL."
Shipping Papers	The packing list contains, placed either inside or outside of the package, the name of the consignor and the consignee and a notice indicating the following: For Instruments and Articles; "This package conforms to the conditions and limitations specified in 49 CFR 173.424 for radioactive material, excepted package-instruments or articles, UN2911"

Attachment 3

USDOT 49 CFR 173.425

Table 7 – Activity Limits for Limited Quantities, Instruments, and Articles

Nature of contents	Instruments and articles		Materials Package Limits
	Instrument and article limits	Package Limits	
Solids:			
Special Form	$10^{-2}A_1$	A_1	$10^{-3}A_1$
Normal Form	$10^{-2}A_2$	A_2	$10^{-3}A_2$
Liquids:			
Tritiated water:			
<0.1 Ci/liter			1000 Curies
0.1Ci to 1.0 Ci/liter			100 Curies
>1.0 Ci/liter			1 Curie
Other Liquids	$10^{-3}A_2$	$10^{-1}A_2$	$10^{-4}A_2$
Gases:			
Tritium	$2 \times 10^{-2} A_2$	$2 \times 10^{-1} A_2$	$2 \times 10^{-2} A_2$
Special form	$10^{-3}A_1$	$10^{-2}A_1$	$10^{-3}A_1$
Other forms	$10^{-3}A_2$	$10^{-2}A_2$	$10^{-3}A_2$

Form SOP-LS-104-01 REV A - Radiation Shipment Log

OUTGOING SHIPPING #	DATE SHIPPED	# OF PKGS.	SHIPPED TO ADDRESS (CUSTOMER)	DEVICE QTY. SHIPPED	PACKAGE SURFACE LEVEL (mR/hr)	PACKAGE WIPE TEST (DPM/100cm^2)	COMMENTS
				Drift Tubes:	First Package:	First Package:	
				Other:	Additional Package(s): Package 2: Package 3:	Additional Package(s): Package 2: Package 3:	
				TOTAL:	Package 4: Package 5:	Package 4: Package 5:	
				Drift Tubes:	First Package:	First Package:	
				Other:	Additional Package(s): Package 2: Package 3:	Additional Package(s): Package 2: Package 3:	
				TOTAL:	Package 4: Package 5:	Package 4: Package 5:	
				Drift Tubes:	First Package:	First Package:	
				Other:	Additional Package(s): Package 2: Package 3:	Additional Package(s): Package 2: Package 3:	
				TOTAL:	Package 4: Package 5:	Package 4: Package 5:	
				Drift Tubes:	First Package:	First Package:	
				Other:	Additional Package(s): Package 2: Package 3:	Additional Package(s): Package 2: Package 3:	
				TOTAL:	Package 4: Package 5:	Package 4: Package 5:	

ATTACHMENT 11

LANCER SYSTEMS LP

WASTE MANAGEMENT

Lancer Systems will use the model waste procedures published in Appendix S to NUREG-1556, Vol. 12 Consolidated Guidance about Materials License: Program-Specific Guidance about Possession Licenses for Manufacturing and Distribution.

Lancer Systems SOP –LS-105 Disposal of Radioactive Materials is included as part of this attachment.

WASTE DISPOSAL OF RADIOACTIVE MATERIAL

STANDARD OPERATING PROCEDURE

LS105 REV A

Table of Contents

1. OBJECTIVE

This procedure provides instruction for the proper disposal of radioactive material from Lancer System. It is only intended for use with shipments of Low Level Radioactive Waste Materials.

2. REFERENCES

2.1 Lancer System Standard Operating Procedure SOP-LS-106 Control of Radioactive Materials

2.2 10 CFR Regulations for the Control of Radiation

3. GLOSSARY

3.1 Waste materials shall be defined as any material that is to be discarded, such as drift tube assemblies, device parts or waste products (Gloves, wipes, etc.) that may contain surface contamination of Ni-63.

3.2 Waste materials may also include used scintillation fluid and vials.

4. DISCUSSION

The shipment of low level radioactive waste (LLRW) material is a complex process that requires proper packaging, marking, labeling, placarding, shipping papers, training, etc. LLRW will be transferred only to licensed recipients as required by 10 CFR 20.2001(a). Each shipment must comply with all applicable NRC and DOT requirements.

5. INSTRUCTIONS

5.1 Waste will be segregated in the radiation controlled areas and collected for disposal. Personal protective Equipment and disposable equipment will be placed in separate containers from drift tube assembly parts.

5.2 Scintillation vials that have readings above background will be disposed of in a separate drum. The dpm reading for each vial will be recorded on the vial disposal log located on the top of the drum.

5.3 Packaged waste will be placed in plastic bags inside 30 or 55 gallon containers.

5.4 Wipe tests will be conducted on the outside of the waste containers prior to leaving the radiation controlled areas and shall not exceed more than 100 dpm/100cm^2.

5.5 All waste will be disposed of in DOT approved packaging with proper manifest and identification for disposal.

5.6 Upon shipment INITIATE SOP-LS-104-01, Radiation Shipment Log.

5.7 If drift tube assemblies are disposed of that contain sources, UPDATE SOP-LS-105-01 the Radioactive Material Wipe Test Inventory.

6. PROCEDURES, FORMS AND ATTACHMENTS

6.1 SOP-LS-106 Control of Radioactive Material

6.1.1 FORM SOP-LS-105-01 Radioactive Material Wipe Test Inventory Log

6.2 SOP-LS-104 Shipment of Limited Quantity Radioactive Material

6.2.1 FORM SOP-LS-104-01 - Radiation Shipment Log

6.3 FORM SOP-LS-105-01 - Drift Tube Waste Disposal Log

6.4 FORM SOP–LS-105-02- Vial Waste Disposal Log

Form SOP-LS-105-01 REV A - Drift Tube Waste Disposal Log

DATE	Drift Tube Serial Number	Activity	Comments

Form SOP-LS-105-02 REV A - Vial Waste Disposal Log

Reading	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Total
DPM													0
DPM													0
DPM													0
DPM													0
DPM													0
DPM													0
DPM													0
DPM													0
DPM													0
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DPM													0
DPM													0
DPM													0
DPM													0
DPM													0
DPM													0
DPM													0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0

This is to acknowledge the receipt of your letter/application dated

1/30/2007, and to inform you that the initial processing which includes an administrative review has been performed.

NEW LICENSE APPLICATION (03037401)

☑ There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

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A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 140031.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader

	:	(FOR LFMS USE)
	:	INFORMATION FROM LTS
BETWEEN:	:	----------
	:	
License Fee Management Branch, ARM	:	Program Code: 03214
and	:	Status Code: 3
Regional Licensing Sections	:	Fee Category: _____
	:	Exp. Date: 0
	:	Fee Comments: _____
	:	Decom Fin Assur Reqd: _
	::	::

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED
   Applicant/Licensee: LANCER SYSTEMS LP
   Received Date: 20070131
   Docket No: 3037401
   Control No.: 140031
   License No.: 37-31218-01
   Action Type: New Licensee

2. FEE ATTACHED $10,000.00
   Amount: _____
   Check No.: 1035

3. COMMENTS

Signed M.A. Perkins
Date 1/31/2007

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /__/)

1. Fee Category and Amount: _____

2. Correct Fee Paid. Application may be processed for:
   Amendment _____
   Renewal _____
   License _____

3. OTHER _____
   _____

Signed _____
Date _____