NRC FORM 374
(7-94)

U.S. NUCLEAR REGULATORY COMMISSION

MATERIALS LICENSE

Amendment No. 03

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	In accordance with letter dated February 14, 1997,
1. Health Physics Associates, Inc.	3. License Number 37-28246-01 is amended in its entirety to read as follows:
2. 1005 Old Route 22 Lenhartsville, Pennsylvania 19534	4. Expiration Date September 30, 2004
	5. Docket or Reference No. 030-30694

6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum Amount that Licensee May Possess at Any One Time Under This License
A. Cesium 137	A. Sealed source (Atomchem Model CS-2-10)	100 millicuries
B. Cesium 137	B. Sealed source (Nuclear Chicago Model RR-138)	B. 50 millicuries
C. Cesium 137	C. Sealed source (Texas Nuclear Model 57157C)	C. 10 curies
D. Cesium 137	D. Sealed source (Texas Nuclear Model 57157C)	D. 500 millicuries
E. Americium 241	E. Sealed source (Amersham-Searle custom design)	E. 3 curies
F. Cesium 137	F. Sealed sources	F. 100 millicuries
G. Americium 241	G. Sealed neutron sources	G. 500 millicuries
H. Americium 241	H. Sealed neutron source (NUMEC Model AM-62)	H. 2 curies
I. Cadmium 109	I. Sealed source (Amersham Model X.130/6)	I. 10 millicuries
J. Curium 244	J. Sealed source (Amersham Model X.130/7 or X.131/4)	J. 10 millicuries
K. Any byproduct material between atomic Nos. 1 through 98	K. Any	K. 1 microcurie of each isotope and 5 microcuries total
L. Cesium 137	L. Sealed source	L. 100 curies
M. Americium 241	M. Sealed source and sealed neutron sources	M. 80 curies
N. Cobalt 60	N. Sealed source	N. 5 curies
O. Cesium 137	O. Sealed sources (Isotopes Products Labs Model 193 or HEG-137 or Amersham Model CDC.700)	O. 100 millicuries

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MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number
37-28246-01
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9. Authorized use

A. For use in an Eon Corporation Model 64-764 calibrator to perform the calibration of instruments, including the calibration of instruments for other persons as defined in 10 CFR 20.1003.

B. For use in an Accuray Corporation Model SH-301 source housing to perform the calibration of instruments, including the calibration of instruments for other persons as defined in 10 CFR 20.1003.

C. For use in a Texas Nuclear Corporation Model 5183AS source housing to perform the calibration of instruments, including the calibration of instruments for other persons as defined in 10 CFR 20.1003.

D. For use in Texas Nuclear model 5190, 5191 and 5192 source housings to perform the calibration of instruments, for the training of students, and for evaluation of scrap monitoring systems.

E. For use in a Nuclear Chicago custom design calibrator to perform the calibration of instruments, for the training of students, and for evaluation of scrap monitoring systems.

F. and G. For possession and use in Troxler Electronic Laboratories, Inc., Campbell Pacific Nuclear Corp., Humboldt Scientific, Inc., Seaman Nuclear Corporation, or Soiltest, Incorporated devices which have been evaluated and approved for licensing purposes under a license issued by the U.S. Nuclear Regulatory Commission or any Agreement State for the training of students.

H. through J. For use in the calibration of instruments and for the training of students.

K. Collection and analysis of leak test samples as a service for other persons as defined in 10 CFR 20.1003.

L. and M. For installation, relocation, and initial surveys of Kay Ray, Accuray, Ohmart, LFE, Berthold System, Inc., Data Measurement Corp., Flow Measurement Systems, Ronan Engineering or Texas Nuclear devices, and for training students.

N. For installation and removal of refractory wear monitoring sources in blast furnaces for persons, as defined in 10 CFR 20.1003, having a license to posess and use such sources.

O. For field calibration of installed detection instrumentation and testing of scrap monitoring systems.

CONDITIONS

10. A. Licensed material listed in items 6.A. through 6.K. may be used at the licensee's facilities located at 140 East Broad Street, Bethlehem, Pennsylvania, and 1005 Old Route 22 (1.5 miles west of PA 737), Lenhartsville, Pennsylvania.

B. Licensed material listed in items 6.D. through 6.O. may be used at temporary job sites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material.

11. A. Licensed material shall only be used by, or under the supervision and in the physical presence of, Anthony LaMastra or individuals who have received the training described in application dated July 21, 1993 and have been designated in writing by the Radiation Safety Officer.

B. The Radiation Safety Officer for this license is Anthony LaMastra.

12. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders or detector cells by the licensee.

13. A. Sealed sources and detector cells containing licensed material shall be tested for leakage and/or contamination at intervals not to exceed six months or at such other intervals as are specified by the certificate of registration referred to in 10 CFR 32.210, not to exceed three years.

B. Notwithstanding Paragraph A of this Condition, sealed sources designed to emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed three months.

C. In the absence of a certificate from a transferor indicating that a leak test has been made within six months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.

D. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to any use or transfer as a sealed source.

E. Sealed sources and detector cells need not be leak tested if:

(i) they contain only hydrogen-3; or

(ii) they contain only a radioactive gas; or

(iii) the half-life of the isotope is 30 days or less; or

(iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more than 10 microcuries of alpha emitting material; or

(v) they are not designed to emit alpha particles, are in storage, and are not being used. However, when they are removed from storage for use or transfer to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

F. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission and the source or detector cell shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within five days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406. The report shall specify the source or detector cell involved, the test results, and corrective action taken.

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G. The licensee is authorized to collect leak test samples for analysis by the licensee. Alternatively, tests for leakage and/or contamination may be performed by persons specifically licensed by the Commission or an Agreement State to perform such services.

14. Each gauge shall be tested for the proper operation of the on-off mechanism and indicator, if any, at no longer than six-month intervals or at such longer intervals as specified by the manufacturer, not to exceed 3 years.

15. Each portable nuclear gauge shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The gauge or its container must be locked when in transport, storage or when not under the direct surveillance of an authorized user.

16. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license. Records of inventories shall be maintained for 5 years from the date of each inventory.

17. The licensee may transport licensed material in accordance with the provisions of 10 CFR 71, "Packaging and Transportation of Radioactive Material."

18. The licensee shall not acquire licensed material in a sealed source or device unless the source or device has been registered with the U.S. Nuclear Regulatory Commission pursuant to 10 CFR 32.210 or equivalent regulations of an Agreement State.

19. In addition to the possession limits in Item 8, the licensee shall further restrict the possession of licensed material to quantities below the minimum limit specified in 10 CFR 30.35(d), 40.36(b), and 70.25(d) for establishing financial assurance for decommissioning.

20. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Application dated July 21, 1993
B. Letter dated March 19, 1994
C. Letter dated September 12, 1994
D. Letter dated February 14, 1997
E. Letter dated May 16, 1997

For the U.S. Nuclear Regulatory Commission

Original Signed By:
John R. McGrath

Date MAY 21 1997

By _____

Nuclear Materials Safety Branch
Region I
King of Prussia, Pennsylvania 19406

MAY 2 1 1997

Anthony LaMastra
President
Health Physics Associates, Inc.
1005 Old Route 22
Lenhartsville, Pennsylvania 19534

Dear Mr. LaMastra:

This refers to your license amendment request. Enclosed with this letter is the amended license. Please note that as part of this amendment, in accordance with 10 CFR 30.36, effective February 15, 1996, the expiration date of your license has been extended by a period of five years. Your new expiration date is stated in Item 4 of the license.

Please review the enclosed document carefully and be sure that you understand and fully implement all the conditions incorporated into the amended license. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region I Office, Licensing Assistance Team, (610) 337-5093 or 5239, so that we can provide appropriate corrections and answers.

Thank you for your cooperation.

Sincerely,

Original Signed By:
John R. McGrath

John R. McGrath
Senior Health Physicist
Division of Nuclear Materials Safety

License No. 37-28246
Docket No. 030-30694
Control No. 124279

Enclosure:
Amendment No. 03

OFFICIAL RECORD COPY ML 10

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To receive a copy of this document, indicate in the box: "C" = Copy w/o attach/encl "E" = Copy w/ attach/encl "N" = No copy

OFFICE	DNMS/RI	N	DNMS/RI					
NAME	McGrath							
DATE	05/19/97		05/ /97		05/ /97		05/ /97	

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HEALTH PHYSICS ASSOCIATES, INC.

1005 OLD ROUTE 22
LENHARTSVILLE, PA 19534
(610) 756-4153 (VOICE)
(610) 756-0042 (FAX)

M516
Q-0

May 16, 1997

US Nuclear Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, PA 19406

Attn: John McGrath

VIA FAX: 610-337-5393

re: Amendment to Byproduct Material License
Number 37-28246-01

Dear Mr. McGrath:

The model number for the. The model numbers are as follows:

- 3011 capsule - IPL model 193, Registry number CA406S126S.
- 3023 capsule - IPL model HEG-XXX series (formerly 225) (where XXX is the mass number of the radionuclide), Registry number CA406S122S.
- X.31/1 capsule - Amersham model CDC.700, Registry number NR-136-S-204-S

I have copies of the Source and Device Registrations, if you need them.

Should there be any questions regarding the application, please contact me at (610) 756-4153.

Sincerely,

A. LaMastra

A. LaMastra
Certified Health Physicist

/24279

TELEPHONE CONVERSATION RECORD	Date: 5/12/97	Time:
Mail Control No.: 124279	License No.: 37-28246-01	Docket No.: 030-30694
Person Called: Tony LaMastra	Organization: Health Physics Associates	Telephone Number:
Person Calling:		
Subject: Amendment Request		
Summary: Requested additional information regarding the two sealed sources requested. It appears that neither source is currently in the SS&S Catalog.		
Action Required/Taken:		
Signature: John R. McGrath	Date: 5/14/97	

HEALTH PHYSICS ASSOCIATES, INC.

1005 OLD ROUTE 22
LENHARTSVILLE, PA 19534
(610) 756-4153 (VOICE)
(610) 756-0042 (FAX)

February 14, 1997
~~July 21, 1993~~

US Nuclear Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, PA 19406

030-30694

Attn: Materials Licensing

re: Amendment to Byproduct Material License
Number 37-28246-01

Gentlemen:

This is an application for an amendment of our byproduct material license. Attached is a copy of our revised Policies and a check in the sum of $590.

Please amend item 8D to read: "500 millicuries". This is to include two new sources.

Please amend item 9D to read: " For use in Texas Nuclear (TN Technologies) models 5190, 5191, and 5192 source housings ....".

Please add the following:

> Isotope Products Laboratories model 3023 or 3011 or Amersham model X.31/1 source capsules containing no more than 50 millicuries of cesium 137 per source, and 100 millicuries total. To be used for field calibrating installed detection instrumentation and testing scrap monitoring systems.

Should there be any questions regarding the application, please contact me at (610) 756-4153.

Sincerely,

A. LaMastra
Certified Health Physicist

POLICIES GOVERNING
THE USE OF
IONIZING RADIATION

JANUARY 1997

HEALTH PHYSICS ASSOCIATES, INC.
1005 OLD ROUTE 22 LENHARTSVILLE, PA 19534

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Purpose -- These regulations are for the purpose of promoting the safe use of ionizing radiation, the maintenance of personnel doses as low as reasonably achievable, and general compliance with applicable governmental regulations with respect to the acquisition, possession, utilization, storage and disposal of all ionizing radiation sources within Health Physics Associates, Inc., hereafter referred to HPA.

1.2 For the purposes of these policies, the words, "*ionizing radiation*" or "*radiation*" mean: x and gamma rays, alpha and beta particles, high speed electrons, neutrons, protons and other nuclear particles capable of producing ion pairs, directly or indirectly, as the result of interaction with matter.

2. RADIATION CONTROL RESPONSIBILITY

2.1 The immediate responsibility for maintaining radiation exposures as low as is reasonably achievable, compliance with applicable rules and regulations, and the safe use of radiation sources rests with A. LaMastra, President.

2.2 All proposed uses of ionizing radiation shall be reviewed and approved by A. LaMastra prior to acquisition.

2.3 Either Mr. LaMastra or a person having received a minimum of 20 hours training in radiation protection shall be present whenever an isotope or x-ray radiation source is being used.

2.3.1 For the purposes of these policies, the term, "*radiation source*" means: any radioactive material or any radiation machine which emits ionizing radiation when energized.

2.4 Radiation protection surveys include all surveys in which the radiation exposure or dose rate is determined for the purpose of: (1) protecting personnel; (2) informing personnel of the intensity of a radiation field or the quantity of radioactive material in a particular location; (3) assuring that a radiation source is "off" prior to entry into an area; or (4) determining personnel radiation dose.

2.4.1 Radiation protection surveys shall be performed by either Mr. LaMastra or a person having received a minimum of 20 hours training in radiation protection.

2.4.2 An initial survey shall be performed prior to the use of all new radiation sources or after significant modification or relocation of existing equipment. The purpose of the initial survey is to evaluate radiation hazards and operating procedures associated with the subject radiation source. Records of all initial surveys shall be maintained by Mr. LaMastra.

2.4.3 Survey meters shall be calibrated on an annual frequency, or sooner if the meter is malfunctioning. Records of calibration shall be maintained by Mr. LaMastra.

2.5 A semi-annual physical inventory shall be made of each radiation source. Records of such inventories shall be maintained by Mr. LaMastra and shall show the date of the inventory, the location of the device, the manufacturer, model, and serial number, the isotope and quantity for radioactive material sources or the maximum kilovoltage and milliamperage of the beam if an x-ray source.

2.6 Sealed radioactive material sources shall be leak tested prior to initial use and every three years thereafter or at intervals specified by applicable regulations or licenses. The testing is for the purpose of detecting faulty or damaged containment capsules which may permit the escape of radioactive material to the environment.

2.6.1 Analyses of leak test samples shall be performed by either Mr. LaMastra or a person having received a minimum of 2 hours training in the operation of the analysis equipment.

2.6.2 Leak test wipes shall be taken by either Mr. LaMastra or a person having received a minimum of 20 hours training in radiation protection, in accordance with the following procedures.

2.6.3 Immediately following sampling, the wipes shall be checked with a thin window Geiger survey meter as follows:

2.6.3.1 Move away from all sources of radiation, turn the meter to its lowest scale and make a background reading. It should not exceed 0.05 mR/hr. If it does, move farther away and reread.

2.6.3.2 Place the wipe near the probe window of the Geiger counter and measure. The reading should not exceed 0.05 mR/hr.

2.6.3.3 If the wipe meets the above limits, place it in the envelope and complete the requested information.

2.6.3.4 Should the radiation levels exceed .05 milliroentgen per hour at a point in close proximity to the sample, place wipe in a plastic bag, seal bag and place it in envelope and seal envelop. *DO NOT LICK ENVELOPE*.

2.6.3.5 Following completion of testing, wash your hands.

2.6.4 Should a leak test reveal the presence of transferable activity in the amount 0.005 microcurie or more, steps shall be initiated to have the device immediately withdrawn from service, decontaminated, repaired or disposed of.

2.6.5 Leak testing shall be accomplished by one of the following methods depending on the type of device or source. In all cases the person making the wipe should wash his hands following testing. *DO NOT, UNDER ANY CIRCUMSTANCES, BRING YOU HANDS WITHIN 6 INCHES OF THE SOURCE CAPSULE.*

2.6.5.1 **"Free Air" Sources** - "Free Air" sources are those which are not incorporated in remote handling devices or shielded source holders. These sources may be handled by the string and pole method, a threaded rod, tongs, or a magnet attached to the end of a rod.

2.6.5.1.1 The primary hazard associated with the leak testing of "free air" sources is that of external radiation exposure. The test should be performed as rapidly as possible in a manner which makes maximum use of available shielding, such as the source storage container or lead bricks.

2.6.5.1.2 The source shall be removed from the storage container using an approved handling tool and wiped with a cotton swab. *DO NOT PICK UP THE SOURCE CAPSULE WITH YOUR HANDS.* The wipe shall then be surveyed for excessive contamination as described in Section 2.6.2 and placed in the accompanying labeled envelope.

2.6.5.1.3 After wiping, the source shall be immediately returned to the storage container.

2.6.5.2 **Sources Used In Shielded Containers** - Shielded containers are usually constructed in such a manner that there are only a few areas where the radioactive material can escape to the environment if the source capsule should leak.

2.6.5.2.1 The primary hazards associated with the leak testing of this type of sealed source is the possibility of radiation exposure from the primary beam.

2.6.5.2.2 At the time of the initial survey, the person performing the initial survey shall determine the areas where leak test wipes should be made on the housing.

2.6.5.2.3 The same housing areas shall be wiped during subsequent leak tests. The resulting wipe shall be surveyed for excessive contamination as described in Section 2.6.2 and placed in an envelope.

2.6.5.2.4 At the time the leak test is made, the person making the test shall operate the shutter mechanism on all housings having a shutter. Any malfunction or difficulty in moving the shutter is to be noted on the leak test envelope, and also brought to the attention of Mr. LaMastra. For installed gaging devices, the shutter test is to be performed semi-annually.

2.6.5.3 **Sources Used In Remote Handling Devices** - Radiographic exposure devices containing sealed radiation sources which are operated by remote means are included in this category. Normally, the high activity of the sources dictates against removing the source from the equipment so that the source itself can be leak tested directly. In lieu of such direct testing, surfaces of the device which make contact with the source capsule, such as exit ports, guide tube interiors, etc., shall be tested as an indication of the integrity of the capsule.

2.6.5.3.1 The primary hazard associated with the leak testing of this type of device is the potential for personnel exposure. A calibrated and operating survey meter is to be used as well as a personnel monitoring badge and a pocket dosimeter.

2.6.5.3.2 Immediately prior to leak testing, a radiation survey shall be made to assure that the source is in the shielded position and that the shield is locked.

2.6.5.3.3 A surface (or surfaces) of the device which makes contact with the capsule shall be wiped with a cotton swab. The swab shall be surveyed as described in Section 2.6.2 and placed in the sample envelope.

2.6.5.4 **Soils Gages** - Soils gages contain sources which, while they are attached to the gage mechanism, the source capsule is capable of being projected outside of the protective shielding of the housing.

2.6.5.4.1 The primary hazard associated with the leak testing of soils gage sources is that of external radiation exposure. The test should be performed as rapidly as possible in a manner which makes maximum use of available shielding from the source storage container.

2.6.5.4.2 The source shall be extended from the storage container using an approved handling tool and wiped with a cotton swab. *DO NOT TOUCH THE SOURCE CAPSULE WITH YOUR HANDS.* The wipe shall then be surveyed for excessive contamination as described in Section 2.6.2 and placed in the accompanying labeled envelope.

2.6.5.4.3 After wiping, the source shall be immediately returned to the storage container.

2.6.5.5 **Special Sources** - Leak testing methods of unique sources or those presenting specialized problems will be devised by Mr. LaMastra.

2.6.5.6 Leak test samples shall be analyzed in the following manner:

2.6.5.6.1 Filter Paper and Cotton Swabs--The activity contained on the filter paper and cotton swabs shall be determined by direct counting in appropriate laboratory counting equipment and shall be considered to constitute the transferable activity, following corrections for detector efficiency and geometry.

2.6.5.6.2 Special Methods--As dictated by the sampling procedures, special analyses will be developed by Mr. LaMastra so as to adequately test specialized sources for transferable contamination.

2.6.5.7 Results of the individual leak tests shall be maintained by Mr. LaMastra.

2.7 All radioactive materials, whether in the form of sealed sources or unsealed sources, shall be stored in a manner which will not present a radiation exposure hazard either internally or externally. The method of storage shall preclude unauthorized removal or handling and maintain personnel exposures as low as reasonably achievable.

2.7.1 All incoming radioactive material shipments shall be examined by either Mr. LaMastra or a person having received a minimum of 20 hours training in radiation protection, to see if the radioactive material security seal is intact. The outside of the shipping container is to be surveyed with a survey meter for external radiation levels within 3 hours of receipt (during normal working hours), or within 18 hours if received after normal working hours. The radiation level should not exceed 200 mrem/hr against the package surface or 10 mrem/hr at 1 meter (3.3 feet) from any surface.

2.7.2 For those packages meeting the dose rates in 2.7.1, wipe the outer surfaces of the shipping package, especially around the seams, with a cotton tipped swab. (It is not necessary to wipe the device itself unless the source housing serves as the shipping package.)

2.7.2.1 Check each wipe with a thin end-window GM meter survey meter. Follow the procedures given in Section 2.6.3.

2.7.3 If intensities higher than those stated above are encountered, restrict access to the package, and notify Mr. LaMastra for further instructions.

2.8 Disposal or transferal of radiation sources is not to be made without prior approval by Mr. LaMastra.

2.8.1 A copy of all shipping papers and disposal records shall be maintained.

2.9 Personnel performing initial and relocation surveys or supervising the installation or removal of radiation devices shall have successfully completed at least a 20 hour course in radiation protection and have at least one year experience in making surveys under the direction of Mr. LaMastra.

3. PERSONNEL RADIATION EXPOSURE

3.1 As part of the Company's effort to maintain radiation exposures as low as reasonable achievable, Mr. LaMastra will review all proposed and existing uses of ionizing radiation to assure that personnel exposures are maintained well below established limits.

3.2 Radiation exposures, from both internal and external sources being used by or under the control of the Company shall not exceed current regulatory limits. Exposures approaching 10 percent of regulatory limits shall require an investigation of the cause and the likelihood of reducing future exposures.

3.3 All radiation sources shall be used or stored in such a manner as to maintain external radiation levels in unrestricted areas as low as reasonably achievable. In no case are they to exceed levels which will result in penetrating exposures to the head and trunk, active blood-forming organs, or gonads of personnel in unrestricted areas exceeding 0.1 rem in any one calendar year.

3.3.1 In the case of short term exposures of less than 24 hours, radiation sources shall be used or stored in such a manner so as to not create, in any unrestricted area, external radiation doses exceeding 2 millirems in any one hour to a major portion of the body.

3.4 In addition to levels stated above, no fetus is to receive a dose exceeding 0.5 rem during its term, due to the radiation exposure of the mother.

3.5 Personnel (either employees or visitors) who enter a high radiation or restricted area; or, commonly encounter areas where there is a reasonable likelihood of receiving an exposure to a major portion of the body of 0.3 rem or greater in any calendar quarter or 0.5 rem or greater in any calendar year shall be required to wear whole body dosimeter badges.

3.6 Personnel whose work causes their hands to be in such proximity to radiation sources that (1) there is a reasonable likelihood of their hands receiving a dose of 1.0 rem in any calendar quarter or 5.0 rem in any calendar year shall be required to wear finger dosimeters.

3.7 Each person shall wear the dosimeter badge that is specifically assigned to him during a wearing period. He shall not transfer the badge to another person or wear another person's assigned badge during a wearing period.

3.8 Each person shall wear his dosimeter badge in such a manner as to accurately reflect his exposure. The loss of any personnel monitoring equipment shall be immediately reported to Mr. LaMastra and a proper replacement obtained.

3.9 The permanent record of the cumulative radiation exposure for all monitored personnel shall be maintained by Mr. LaMastra.

3.10 All employees issued radiation dosimeters may obtain a record of their accumulated dose from Mr. LaMastra.

3.11 A radiation dosimeter badge is not to be taken outside of Company property unless the employee is engaged in job-related radiation work off site.

4. POSTING OF NOTICES, WARNING SIGNS AND LABELING

4.1 Required warning signs and labels, unless otherwise specified, shall bear the standard radiation symbol and appropriate wording in the conventional colors of magenta or purple on a yellow background. Colors other than the conventional magenta or purple and yellow may be used if such colors are permitted by applicable regulations.

4.2 All radiation areas shall be conspicuously posted with a sign or signs bearing the words, **CAUTION - RADIATION AREA**. For the purpose of these policies, the term, *"radiation area"*, means: any area, accessible to personnel, in which radiation exists so that a major portion of the body could receive a dose in excess of 5 millirem in any one hour.

4.3 All high radiation areas shall be conspicuously posted with a sign or signs bearing the words, **CAUTION - HIGH RADIATION AREA**. For the purpose of these policies, the term, *"high radiation area"*, means: any area, accessible to personnel, in which radiation exists so that a major portion of the body could receive a dose, in any one hour, in excess of 100 millirem.

4.4 All radiation producing machines shall be posted with a label bearing the words, **CAUTION - THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED.** Such labels shall be affixed on the control panel near the switch which energizes the tube. Caution or warning signs, in addition to the above label, shall be posted in the vicinity of the radiation producing tubes if such tubes are significantly remote from the control panel.

4.5 All devices in which it is possible to insert any part of the body shall be posted with a warning sign(s) alerting personnel of the potential presence of a radiation beam in the air gap. The sign or signs shall be visible from the normal avenues of approach to the device.

4.6 All containers in which radioactive materials are stored, transferred or used shall be conspicuously posted with a label bearing the words, **CAUTION - RADIOACTIVE MATERIAL.** Additional information such as the kind and quantity of the material as well as the date of assay shall also be provided on the label.

4.7 All rooms in which X-ray machines are used shall be posted with a sign or signs bearing the words, **CAUTION - X-RAY EQUIPMENT**, during such use.

4.8 All areas or rooms in which radioactive materials are used or stored in amounts exceeding 10 times (100 times in the case of natural uranium and natural thorium) the quantities specified in **Appendix C, Title 10, Code of Federal Regulations, Part 20, Standards for Protection Against Radiation,** shall be conspicuously posted with a sign or signs bearing the words, **CAUTION - RADIOACTIVE MATERIALS.**

4.8.1 However, areas or rooms are not required to be posted with the caution sign stated in 4.8 if the radioactive material is in the form of a sealed radioactive material source, and, if the radiation intensity at a distance of 12 inches from the surface of the source container does not exceed 5 millirem per hour and the container is adequately labeled as described in Section 4.6.

4.9 Copies of Form NRC-3, Notice to Employees, and/or a similar form as designated by a State agency having such jurisdiction, shall be posted, if required, in such a manner and in sufficient locations so that all employees who work in restricted areas may observe a copy.

4.10 The Company's Notice to Employees shall also be posted in such a manner and in sufficient locations so that all employees who work in restricted areas may observe a copy.

5. EMERGENCY PROCEDURES

5.1 An up-to-date list of the names, office and home telephone numbers of personnel qualified to cope with radiation problems shall be kept on file.

5.2 Should an emergency occur, radiation sources located in the affected area should be turned off if an X-ray machine, or returned to their shielded position if a radioactive material source, provided such action does not jeopardize the safety of personnel.

5.3 The immediate area in which the radioactive material is located shall be evacuated and roped off to a distance which will insure that dose rates beyond the restricted area do not exceed 2 millirem in any one hour.

5.4 Upon arrival of qualified personnel, appropriate steps shall be taken to confine the radioactive materials; warn other personnel who might be in the area; take immediate measures to decontaminate personnel if such is required; and by the use of available survey instruments, redefine the boundaries of the area to be restricted. Further corrective action, unless otherwise dictated by the circumstances of the emergency, shall await the arrival or recommendations of Mr. LaMastra.

5.5 Personnel who were potentially exposed to radiation shall be identified, and their location and amount of time in the area shall be determined for later use in determining dose estimates.

5.6 Personnel present in or frequenting the area in which the emergency occurred shall be surveyed for contamination, and decontaminated if such action is required prior to leaving the specific facility.

5.7 Where there is a likelihood of significant airborne radioactive materials, personnel shall not enter the area unless approved by Mr. LaMastra. Entry into such areas shall require respiratory protective equipment and anti-contamination clothing as appropriate.

6. TRANSPORTATION OF RADIOACTIVE MATERIALS

6.1 Radioactive material may only be shipped in Department of Transportation approved specification containers.

6.2 **Definitions**

6.2.1 **A_1** means the maximum activity of special form radioactive material permitted in a Type A package.

6.2.2 **A_2** means the maximum activity of normal form radioactive material permitted in a Type A package.

6.2.3 **Special Form** means a solid massive form, either by the physical makeup of the material or by encapsulation, and also, if released to the environment, the material would present a low radiotoxicity hazard. This could be due to the isotope involved or to the physical makeup of the material, such as by ceramic pelletization.

6.2.4 **Normal Form** means essentially loose material. It is defined as not "special form" materials.

6.2.5 **Fissile Radioactive Materials** are:

Pu 238	U 233
Pu 239	U 235
Pu 241	U 235

6.2.6 **Transport Index** is numerically equal to the maximum radiation dose rate in millirem/hr (**rounded upward to the nest highest tenth**) as measured at a distance of 1 meter (3.3 feet) from any surface of the shipping container.

6.3 **Quantities**

6.3.1 **Type A Quantity** is any activity of radioactive material not exceeding the limit A_1, if special form, or A_2, if normal form. Type A quantities must be shipped in Type A packages.

6.3.2 **Type B Quantity** is any activity of radioactive material exceeding the limit A_1, if special form, or A_2, if normal form. Type B quantities must be shipped in Type B Packages. Type B packages must have their design approved by the USNRC; and a quality assurance program written and followed for the design, construction, repair and maintenance of the packages.

6.3.3 **Highway Route Controlled** is any activity, equal to or exceeding: (1) 3000 times the A_1 or A_2 limits, as applicable, or (2) 30,000 curies, whichever is less.

6.3.4 Table of A_1 and A_2 Quantities for Specific Isotopes (in curies)

Isotope	Type A	
	Special Form (A_1)	Normal Form (A_2)
Americium 241	8*	0.008
Cadmium 109	1000	70
Californium 252	2	0.009
Carbon 14	1000	60
Cesium 137	30	10
Cobalt 51	90	90
Cobalt 60	7	7
Curium 244	10	0.01
Iridium 192	20	10
Iron 55	1000	1000
Lanthanum 140	30	30
Lead 210	100	0.2
Nickel 63	1000	100
Plutonium 239	2 (32g)*	0.002 (32mg)
Polonium 210	200	0.2
Promethium 147	1000	25
Radium 226	10	0.05
Strontium 90	10	0.4
Tritium Gas	1000	1000
Thorium (natural)	unlimited	
Uranium (natural)	unlimited	

* Except that americium and plutonium as americium-beryllium or plutonium-beryllium neutron sources can have a special form limit of 20 curies.

6.4 **Limited Quantities** are any activity of radioactive material not exceeding the limits specified in 6.4.1 below for special and normal form. Packaging requirements for limited quantity radioactive materials are described in 6.5.7. They are exempt from the other packaging and labelling requirements of this section.

6.4.1 **Limited Quantities**

LIMITED QUANTITIES
INSTRUMENTS AND ARTICLES

CONTENTS	LIMIT	LIMIT	DEVICES
Solids			
Special Form	10^{-2} A_2	A_1	10^{-3} A_1
Normal Form	10^{-2} A_2	A_2	10^{-3} A_2
Tritium	20 Ci	200 Ci	20 Ci
Liquids (Other than tritium)	10^{-3} A_2	10^{-1} A_2	10^{-4} A_2
Gases			
Tritium	20 Ci	200 Ci	20 Ci
Other (Special Form)	10^{-3} A_1	10^{-2} A_1 10^{-3} A_1	
Other (Normal Form)	10^{-3} A_2	10^{-2} A_2 10^{-3} A_2	

6.5 **General Package Requirements:** There are general requirements for any packaging used to contain a hazardous material, of which radioactive materials are one type.

6.5.1 Under the normal conditions of transportation, the packaging should not be substantially damaged or the contents should not be released to the environment.

6.5.2 The device containing the radioactive material shall be securely closed to prevent accidental opening during transport.

6.5.3 The outer package shall have a security seal that is not easily breakable and is capable of showing that the package has not been opened.

6.5.4 The outer shipping container shall be free of removable contamination is excess of the limits given in the following table. Contamination levels are to be averaged over any 300 square centimeter area (approximately 7" x 7") of any part of the outer surface of the package that will give a representative assessment of the package's contamination levels.

	Maximum Permissible Contamination Levels	
Contaminant	uCi/cm^2	$dis/min/cm^2$
Natural or depleted uranium, natural thorium, uranium-235 uranium-238, thorium-232, alpha emitting radionuclides with a half-life of less than 10 days and all beta and gamma emitters.....	0.00001	22
All other alpha emitting radionuclides.....	0.000001	2.2

6.5.4.1 To determine removable contamination, follow the instructions given in 2.6.2, except that the envelope should be marked **"Shipping Wipe -- Immediate Analysis Requested".**

6.5.5 Packages cannot have any dimension smaller than 4 inches, and internal bracing has to be provided to prevent the shifting of the device or inside container within the outer shipping package.

6.5.6 Radiation levels on the outside of the outer package are limited to:

200 millirem/hr at the surface,
10 millirem/hr at 1 meter from surface
(transport index - see 6.2.6)

6.5.7 **Exempt Packages:** Packages which are exempt from marking and labeling requirements and can be sent via air, highway or water with no indication that a radioactive material is contained inside, must meet the following conditions:

6.5.7.1 Limited quantity as defined in 6.4.1 and;

- Packaged in strong, tight packages that will not leak the contents during conditions normally incident to transportation and which have at least one dimension not less that 4 inches;
- Surface radiation intensity not exceeding 0.5 millirem per hour;
- No significant removable surface contamination (See 6.5.4); and
- The outside of the *inner* container is marked **"Radioactive"**.

6.5.8 Postal shipments may be made through the mails *only if*:

- No alpha, beta or neutron radiation is detected on, or emitted through, the package surface.
- Gamma radiation levels must be below 0.05 millirem per hour (essentially background).
- The package must not contain special nuclear or source material, or more than 0.002 microcurie of other radioactive material.

6.6 **Package Shipping Labels:** Three types of shipping labels are used for radioactive material packages. All information on the label must be completed.

6.6.1 **Contents** - Inset the nuclide name and mass number, i.e., Cobalt 60, Cesium 137, etc. Do not use abbreviations. If the package contains more than one isotope, use the word, **"MIXED"**.

6.6.2 **Number of Curies** - Insert the number of curies or millicuries even if this number is very small. For example, a 100 microcurie source may be written: 0.0001 curie or 0.1 millicurie

1 microcurie (uCi) = 0.001 millicurie (mCi) = 0.000001 curie (Ci)

6.6.3 **Transport Index** (on Radioactive II and III labels only) - For all radioactive material except fissile material, the Transport Index is equal to the dose rate in millirem/hour at 1 meter (3.3 feet) from the surface of the outer package *rounded up* to the nearest tenth. The Transport Index is to be inserted in the space provided on Radioactive II or Radioactive III labels. Do not include the units "millirem/hr." **If neutron sources are being shipped, the contribution from the neutron radiation must be added into the total Transport Index.**

6.6.4 The shipping labels used for packages containing radioactive materials are to be placed on opposite sides of the outer package (excluding the bottom). One label must be next to the shipping name marked on the outer package. Their use is described as follows.

6.6.4.1 **RADIOACTIVE I (WHITE)** - Any package having a surface radiation level of 0.5 millirem/hr or lower and no detectable radiation at 1 meter from the surface. NO VEHICLE PLACARD REQUIRED.

6.6.4.2 **RADIOACTIVE II (YELLOW)** - Any package having a surface radiation level of greater than 0.5 millirem/hr but not greater than 50 millirem/hr. The Transport Index has to be 1.0 or less. NO VEHICLE PLACARD REQUIRED.

6.6.4.3 **RADIOACTIVE III (YELLOW)** - Any package having a surface radiation level of greater than 50 millirem/hr but not exceeding 200 millirem/hr. The Transport Index has to be 10 or less.

VEHICLES WITH RADIOACTIVE III LABELED PACKAGES MUST BE PLACARDED.

6.6.4.4 *NO PACKAGE CAN BE SHIPPED WITH A SURFACE RADIATION LEVEL EXCEEDING 200 MILLIREM/HR OR A TRANSPORT INDEX EXCEEDING 10.*

6.6.4.5 *THE TOTAL OF THE TRANSPORT INDEXES OF ALL PACKAGES IN A SHIPMENT CANNOT EXCEED 50.*

6.7 The proper shipping name is to be marked on the outer package near one of the labels. A list of the proper shipping names is given below.

Radioactive material, Special Form, NOS, UN No. 2974 (Most likely)
Radioactive material, NOS, UN No. 2982
Radioactive material, Limited Quantity, NOS, UN No. 2910
Radioactive material, Instruments and Articles, UN No. 2911
Radioactive material, LSA, NOS, UN No. 2912
Radioactive material, Fissile, NOS, UN No. 2918
Radioactive material, Empty Package, UN No. 2908
Radioactive material, Thorium Nitrate, Solid, UN No. 2976
Radioactive material, Uranium Nitrate, Solid, UN No. 2981

6.8 A Shipper's Certification is to be completed for all shipments containing radioactive materials made over public roads, even when private or company vehicles are used. The shipper's certification should contain the following information:

6.8.1 The proper shipping names and UN number listed in 6.7 above.

6.8.2 The name of each isotope and its mass number, even if the term, **"MIXED"** is used on the shipping label.

6.8.3 A description of the chemical and physical form if the material is not special form, or the description "special form".

6.8.4 The activity of each source. Either curies or millicuries may be used.

6.8.5 The type of shipping label.

6.8.6 The transport index.

6.8.7 If a placard is required, indicate; "PLACARD--RADIOACTIVE", under **SPECIAL HANDLING.**

6.8.8 A 24 hour emergency response telephone number.

6.8.9 The following statement:

> This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to applicable regulations of the Department of Transportation.

6.8.10 The certification statement is to be signed, if transport is by a common carrier.

6.8.11 A copy of the shipper's certification is to be attached to each package and a copy must be given to the driver of the vehicle. One copy should be supplied for each driver, if multiple vehicles will be used to transport the shipment.

6.9 The carrier is to be told that the shipment will contain radioactive materials and if vehicle placards are required. *(All packages having a Radioactive III label require placards.)*

6.9.1 Vehicle placards are diamond shaped, 10-3/4 inches on a side. Four placards are to be placed on a vehicle (both sides, front and back).

6.10 **Package Markings** - The outside of the shipping container is to be marked with the following information. The markings are to be permanently attached, at least 1/2 inch high and contrasted to the container so as to be readily apparent and understood. The markings must be located near one of the required radioactive labels.

6.10.1 The proper shipping name of the contents and the Type (usually Type A).

6.10.2 The USDOT container specification number (usually DOT 7A) and the gross weight in pounds.

6.10.3 Shippers name and address.

6.10.4 An example of the markings is as follows:

Radioactive Material
Special Form, NOS, UN 2974 Type A
USDOT 7A--400 lbs.
Health Physics Associates, Inc.
1005 Old Route 22
Lenhartsville, PA 19534

6.11 **Quality Assurance Check of Shipments:** Prior to any shipment each package shall be examined to determine that:

6.11.1 It meets the design specification and is labeled with the proper markings.

6.11.2 It is suitable for the contents to be shipped.

6.11.3 It is not physically damaged.

6.11.4 Each closure device (lid), including gaskets if required, are properly installed, secured and free of defects.

6.11.5 External radiation and contamination levels are within applicable limits specified in 6.5.4.

7. INSTRUMENT CALIBRATIONS

7.1 Instruments used for radiation protection surveys shall be calibrated on an annual frequency or following any maintenance or repair.

7.2 A condenser R Meter or integrating ratemeter with a calibration traceable to the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS) shall be used as a laboratory standard to initially calibrate all gamma and x-ray sources which are, in turn, used to calibrate survey instruments.

7.3 Cesium 137 shall be the normal calibration source for instruments used for general gamma and x-ray surveys, as follows.

7.3.1 Gamma intensities from the Cesium 137 source shall be determined at fixed distances from the sources using an instrument described in Section 7.2 and having known response characteristics at the energy in question. The data derived shall be used to create a plot of gamma intensity versus distance from the source. A new plot

shall be drawn every two years (0.4% decay), or if the physical conditions in the calibration lab are changed which could affect scatter patterns.

7.3.2 Survey meters shall be positioned at pre-selected distances which are chosen to permit the calibration at two points on each scale (approximately one-third and two-thirds of full scale deflection). The calibration potentiometers of the instruments shall be subsequently adjusted to agree within ± 20% of the intensity indicated by the calibration curve, as being present at the distance at which the detector is positioned.

7.4 Those instruments used for low energy surveys (100 keV maximum energy) shall also be calibrated to 60 keV photons from Americium 241.

7.4.1 Gamma intensities from the Americium 241 source shall be determined at fixed distances from the source using an instrument described in Section 7.2 and having known response characteristics at the energy in question. The data derived shall be used to create a plot of gamma intensity versus distance from the source. A new plot shall be drawn if the physical conditions in the lab are changed which could affect scatter patterns.

7.4.2 Survey meters which have been calibrated to the Cesium 137 source shall be positioned at pre-selected distances which are chosen to permit the calibration at two points on each scale (approximately one-third and two-thirds of full scale deflection). The corresponding meter reading in mR per hour at the distances selected shall be recorded and used to obtain a correction factor by which a Cesium 137 calibrated meter response may be multiplied to give the correct exposure rate when exposed to 60 keV Americium 241 photons.

7.5 Those instruments used for high energy surveys (1000 keV or greater) shall also be calibrated to a Cobalt 60 source.

7.5.1 Gamma intensities from a Cobalt 60 source shall be determined at fixed distances from the source using an instrument described in Section 7.2 and having known response characteristics at the energy in question. The data derived shall be used to create a plot of gamma intensity versus distance from the source. A new plot shall be drawn every three months to account for the decay of the source (3.2%), of if the physical conditions in the lab are changed which could affect scatter patterns.

7.5.2 Survey meters which have been calibrated to the Cesium 137 source shall be positioned at pre-selected distances which are chosen to permit the calibration at two points on each survey meter scale (approximately one-third and two-thirds of full scale deflection). The corresponding meter reading in mR per hour at the distances selected shall be recorded to obtain a correction factor by which a

Cesium 137 calibrated meter response shall be multiplied to give the correct exposure rate when exposed to a photon energy from one to three MeV.

7.6 Instruments used for neutron surveys shall be calibrated to an Americium 241/Beryllium neutron source.

7.6.1 The flux in neutrons per square centimeter per second supplied by the manufacturer shall be used to calculate the corresponding neutron dose rate in millirem per hour at selected distances. A new calculation shall be made if the physical conditions in the lab are changed which could affect neutron interaction and scatter patterns.

7.6.2 The corresponding meter reading in counts per minute or millirem per hour at the distances selected is determined by exposing the meter probe to the neutron flux at those distances. From the data obtained, a calibration curve showing the meter reading in counts per minute versus the dose rate in millirem per hour is drawn and used to interpret meter readings obtained during surveys. For rem responding instruments, the instrument will be adjusted to read directly in dose equivalent rate units (rem or millirem per hour).

8. BLAST FURNACE REFRACTORY WEAR SOURCES

8.1 Receipt of refractory wear indicating sources will be under the direction of A. LaMastra or an employee of the company licensed to possess the sources and who has received specific training in how to handle refractory wear sources.

8.2 The received shipment shall be examined by Mr. LaMastra (or a person having received a minimum of 20 hours training in radiation protection) for external package radiation levels and a wipe test shall also be taken for removable external contamination within three hours of receipt. An inventory shall be taken within 72 hours of receipt.

8.2.1 Should the external radiation levels exceed either of 200 mR/hr on the surface of the container or 10 mR/hr at 1 meter from the surface, the shipping cask shall be isolated until examined by Mr. LaMastra.

8.2.2 Should the external package removable contamination exceed the limits shown in Section 6.5.4, the shipping cask shall be isolated and Mr. LaMastra and the shipper notified. Further action shall await the arrival of Mr. LaMastra.

8.2.3 The shipping cask shall be resealed with a security seal following the physical inventory.

8.2.4 A copy of all shipping papers shall be obtained by the person receiving the shipment from the driver of the delivery truck.

8.3 Prior to sources being installed in a blast furnace, Mr. LaMastra will conduct instruction sessions with the foremen and union officials of all crafts working inside the blast furnace. Sufficient sessions will be held to instruct personnel on all shifts being worked. The instruction will be approximately one hour in length and cover the activities to be performed, the anticipated exposures to personnel and their corresponding risk, personnel restriction practices, personnel monitoring if necessary, and the surveys to be taken and who workers can contact to obtain area or personnel monitoring data.

8.3.1 Immediately prior to the first installation, Mr. LaMastra will conduct a fifteen minute orientation for personnel working inside the blast furnace. The information presented will cover the activities to be performed, the anticipated exposures to personnel and the surveys to be taken and who workers can contact to obtain area or personnel monitoring data.

8.4 **Installation of sources**

8.4.1 Required equipment for personnel handling the sources shall be: hard hat, safety glasses, metatarsal safety shoes, 12 inch tongs, whole body and extremity dosimeters, transfer pig, survey meter, security seals and sealer, adjustable wrench, lead shot bags.

8.4.2 Immediately prior to when sources are to be installed, open the shipping cask, and using the tongs, remove the number of sources required to complete a single course of brick, and place them in the transfer pig. Record the number of sources removed on the inventory and reseal the shipping cask.

8.4.3 Survey the transfer pig. The radiation level at 1 foot from the surface should not exceed 50 mR/hr. Survey the area around the shipping cask to make sure that a source was not dropped.

8.4.4 Place the transport pig in the transport vehicle and surround it with the lead shot bags.

8.4.5 Bring the transport pig inside the furnace and shield with refractory brick to less than 2 mR/hr at one foot from the shielding.

8.4.6 Make sure all personnel inside the furnace are wearing whole body dosimeters if required.

8.4.7 As a brick is ready to be loaded, bring the transfer pig to the brick, insert a source into the pre-drilled hole in the brick, fill the hole with mortar, and complete the course with a cover brick. The transfer pig shall be kept closed except when removing a source.

8.4.8 Record the location and activity of the source.

8.4.9 Survey the area around where the source was installed. Add temporary refractory brick to reduce bricklayer exposure whenever practicable.

8.4.10 When the section of refractory laid from the current scaffold level is completed, survey the refractory to determine if carpenters building the new scaffold will require radiation dosimeters. Radiation levels at one foot from the refractory in excess of 5 mR/hr will require dosimeters to be worn.

8.5 Refractory Tear Out

8.5.1 Review the last periodic survey report to determine the location of any remaining source(s) prior to quenching.

8.5.2 Following quenching, resurvey the remaining source locations to determine if any source(s) became dislodged during quenching.

8.5.2.1 If sources were dislodged, begin monitoring all rubble removed from the furnace interior and isolate any sources found. Use gloves to handle bricks.

8.5.3 The preferred method of brick removal is to cut through the vessel shell and remove intact bricks from outside the furnace. Alternatively, bricks can be removed intact from within the furnace or rubble monitored as it is brought from the furnace.

8.5.3.1 Any brick removed containing a source shall be wiped to make sure that it does not have removable contamination. A measurement of 200 counts above background shall be indicative of excessive removable contamination. Any brick found to have removable contamination shall be placed in double plastic bags and taped closed. The bags shall be placed in steel drums and closed.

8.5.3.2 Should removable contamination be present, begin air sampling. Airborne concentrations of cobalt 60 exceeding 10^{-10} microcurie per milliliter shall require respiratory protection.

8.5.4 Periodically hand-charge bricks containing sources into hot metal submarine cars or into the top of an operating blast furnace. Twenty millicuries or less shall be placed in any one car or any one furnace heat. Document source charges and update the inventory.

9. FIELD TESTING OF SCRAP MONITORING SYSTEMS

9.1 A. LaMastra shall be present for all testing involving radioactive material.

9.2 Scrap Monitoring Testing Using a Single Source Steel Container

9.2.1 Both a steel box and steel cylinder are included in this classification. The box shall be 12 inches on a side and constructed of at least 3/8 inch steel plate with welded seams. The lid shall be of the same construction and shall be removable. The lid shall bolt onto the box using a minimum of 6, one-half inch diameter bolts. The cylinder is constructed of schedule 160 steel pipe and shall be at least 2 inches in diameter. The length shall be 12 inches. The ends shall be screw threaded and contain a mechanism to prevent the ends from accidentally opening. Both the box and the cylinder are designed to protect the source from all commercial grades of scrap. They shall not be used with such scrap as "crop ends" or large ingot or roll sections weighing more than 100 pounds each.

9.2.2 The source shall be fixed within the box or cylinder to prevent shifting during loading in a vehicle. The box will be secured within the vehicle to prevent movement during the addition of scrap around the box. The distances from the front and read and sides of the vehicle shall be recorded. The cylinder will be used to test charge bucket systems and lowered into the bucket by a magnet. Once in the bucket, it will be covered with scrap until it is no longer detectable.

9.2.3 If the steel box is to serve as the shipping container, it shall qualify as a TYPE 7A shipping container. The cylinder will be constructed to the old US DOT "2R" specification and qualifies as a TYPE 7A shipping container. It may be placed inside an outer container to provide sufficient area for labels.

9.2.3.1 The requirements of 49 CFR 100 to 177 shall be followed for transporting the source housing over public roads.

9.2.4 Because of the energy degradation that occurs as photons interact with the shielding in a typical shielded source housing, making the resultant photons more susceptible to attenuation by the scrap steel, it is necessary to test detection systems with a source that is similar to those likely to be found in scrap.

9.2.4.1 Multiple sources may be used.

9.2.4.1.1 Box sources:

- A 200 millicurie cesium 137 source in a Texas Nuclear model 5191 housing. This housing is designed for 2000 millicuries of cesium 137 and will present a severe test for a detection system.

- A 15 millicurie cesium 137 source in a Texas Nuclear model 5192 shield. This housing is designed for 150 millicuries of cesium 137 and will present a similar test as the 200 mCi/5191 source, but with slightly less attenuation of the gamma ray flux rate and less energy degradation of the initial 662 keV gamma photons.

- A 100 millicurie cesium 137 source in a Texas Nuclear model 5190 shield. This is the design activity for this housing and will present a test that simulates a large radiation source being buried in scrap.

9.2.4.1.2 Cylinder sources: Multiple source sizes and source holders may be used during the course of a test to simulate different gamma flux rates and photon energies. A source capsule (not to exceed 50 millicuries) will be placed inside a steel, lead/steel, or tungsten cylinders, and this cylinder will be placed inside the outer protective 2R steel cylinder. The source activities utilized will be in the range of 1 to 50 millicuries of cesium 137 or barium 133.

9.3 Scrap Monitoring Testing Using a Single Source Steel Tube Stand

9.3.1 This test system is designed to protect the source from the lighter commercial grades of scrap, such as shredded scrap, punchings, slitter scrap, etc. It shall not be used with heavier scrap such as demolition scrap, bundles, or heavy melt. The stand shall be constructed as follows:

- A flat bottom plate (12 inches by 60 inches and 1/4 inch minimum thickness), onto which are welded three, 6 inch diameter schedule 40 steel pipe sections, approximately 6 inches tall.

- Vertical riser pipes constructed of 5 inch diameter schedule 40 steel pipe having a height of approximately 4 feet. These pipes shall be secured into the base stand by bolts. The vertical pipes shall have removable steel caps.

- Inserts that will fit inside the vertical pipes shall be made of mechanical steel tubing that fits the internal diameter of 5 inch schedule 40 steel pipe. The inserts will be filled with a measured amount of shredded "frag" scrap to provide a packing density of 60 pounds per cubic foot. Multiple sizes of inserts will be available (6, 12, and 18 inch heights).

- The source housing will be inserted in the pipes to selected heights controlled by the inserts placed below and above the housing.

9.3.2 The test stand shall be secured to prevent movement in the truck during scrap loading and care shall be exercised to prevent bridging of scrap that will cause voids. This design permits the source to be moved both vertically and horizontally (from the vehicle wall) without moving the stand. The distance of the vertical pipes from the front, rear, and sides of the vehicle shall be documented.

9.3.3 A standard TYPE 7A shipping container shall be used to transport the sources used in this stand.

9.3.3.1 The requirements of 49 CFR 100 to 177 shall be followed for transporting the source housing over public roads.

9.3.4 Multiple sources may be used during the course of a test.

- A 20 millicurie cesium 137 source in a Texas Nuclear model 5192 housing. This housing is designed for 150 millicuries of cesium 137 and will present a relatively severe test for a detection system.

- A 150 millicurie cesium 137 source in a Texas Nuclear model 5192 shield. This is the design activity for this housing and will present a test that simulates a large radiation source being buried in scrap.

9.4 Scrap Monitoring Testing Using a Multiple Source Steel Box

9.4.1 The box shall be no larger than 60 inches long by 60 inches high by 12 inches wide. The outer shell shall be constructed of a minimum of 3/4 inch steel plate, with removable top access plates. The lid shall bolt onto the box using one-half inch diameter bolts. Within the box, vertical tubes shall be installed into which the source holders are inserted. This box is designed to protect the source from all commercial grades of scrap. It shall not be used with such scrap as "crop ends" or large ingot or roll sections that are generated within a plant. The box shall be secured to prevent moving during scrap loading in the vehicle. This design permits the source to be moved both vertically and horizontally (from the vehicle wall)

without moving the box. The distance of the vertical pipes from the front, rear, and sides of the vehicle shall be documented. The vertical position of the source will be controlled by using inserts that can be constructed to simulate any type of scrap packing density equivalent.

9.4.2 A source capsule shall be inserted in a carrier which can be inserted in one of several internal pipes. The position of the box in the vehicle can be varied to provide several predetermined distances from the vehicle wall. Inserts shall be placed above and below the source to control its height.

9.4.3 A standard TYPE 7A shipping container shall be used to transport the sources used in this stand.

9.4.3.1 The requirements of 49 CFR 100 to 177 shall be followed for transporting the source housing over public roads.

9.4.4 Multiple source sizes and source holders may be used during the course of a test to simulate different gamma flux rates and photon energies. The holders will be steel, lead/steel, or tungsten cylinders. The source activities utilized will be in the range of 1 to 10 millicuries of cesium 137 or barium 133.

9.5 Supervision at the client's facility that controls scrap vehicle movement shall be requested to designate a specific vehicle(s) and instruct workers that those vehicles will be used exclusively for the test and be under the control of Mr. LaMastra for the duration of the test. Mr. LaMastra shall direct all movement of the test vehicle(s).

9.5.1 Supervision and plant workers involved in the test shall be given instruction by Mr. LaMastra as to what will take place and the expected (usually non-detectable) radiation exposures at the workers locations.

9.5.2 Prior to loading a source into a test vehicle, the test vehicle shall be checked to make sure it is not carrying unknown radioactivity.

9.5.3 Following the conclusion of testing, the source shall be tested for surface contamination.

9.6 The loading of the test rig and the source into a test vehicle shall be done by Mr. LaMastra or someone authorized on the license for this activity.

9.6.1 Care shall be taken to assure that the test box or pipe stand does not move during scrap loading. the vehicle should be loaded to eliminate voids at the front and rear of the cargo area, and to provide the desired scrap cover thickness above the source.

9.6.2 The external surfaces of the vehicle shall be surveyed for radiation intensity. Generally, the reading will be below 50 uR/hr. Surveillance shall be provided of any radiation area created to assure that non-radiation workers do not exceed 2 millirem in one hour.

9.6.3 The vehicle shall be brought into the area of the detector system and the test conducted by driving the vehicle past the detectors for several trials. This will usually only test the detectors on one side of the monitoring system. The vehicle may be turned and driven past the detectors in the opposite direction to test the other detector bank. Depending on the system specification, it may be necessary to relocate the source to several locations.

9.6.4 At the conclusion of the test, the scrap shall be removed from around the box and the source removed. The source housing shall be wiped with a dry cotton tipped swab and the swab checked with a thin end-window GM prior to packaging the source in its shipping container.

9.6.5 The source shall be prepared for transportation following the instructions in Section 6 of these Policies.

9.7 **Emergency Procedures** There are only three conceivable accidents that could occur: (1) transportation accident, (2) dropping the protective box with a source housing inside, or (3) puncturing the protective box or pipe.

9.7.1 **Transportation Accident:**

9.7.1.1 If the source is shipped by common carrier, the shipping papers shall contain the phone number of Health Physics Associates. Mr. LaMastra will assist the carrier in minimizing the consequences of any transportation accident in any way possible.

9.7.1.2 If the source is transported by a Health Physics Associates employee, survey meters, swabs and emergency equipment shall be available in the vehicle. The driver shall notify the office of an expected time of arrival. If the driver is overdue by more than 2 hours, a search shall be initiated.

9.7.1.3 Should an accident occur, the driver shall survey the vehicle, restrict any area exceeding 2 mR/hr and request assistance in notifying civil authorities and the office.

9.7.1.4 Because of the design of the source housing and the protection of the steel box, it is improbable that the sealed source capsule would become damaged and lose its integrity. However, a wipe shall be taken of the exterior of the box and checked with a thin end-window GM.

9.7.2 **Dropping the Source During Loading Into a Vehicle**

These sources all qualify as "special form" and should be able to withstand a 30 foot fall onto a hard surface.

9.7.2.1 Stop all operations and survey the exterior of the source enclosure to assure that exposure rates are reasonable.

9.7.2.2 Wipe the exterior of the enclosure and check the wipe with a thin end-window GM.

9.7.2.2.1 If there is no external radioactivity, check the source itself, where possible.

9.7.2.2.1.1 If there is no external contamination, check the physical condition of the source and/or housing to make sure there is no physical damage. Perform a radiation survey and compare with the standard measurements to make sure there has not been a degradation in the shielding.

9.7.2.2.1.1.1 If no damage has occurred, the source may be used.

9.7.2.2.1.1.2 If damage has occurred, secure the source in its shipping container. If removable contamination is found, put on disposable gloves, cover the source with 2 or 3 plies of plastic sheeting or plastic bags (total 6 mils or thicker). Tape all seams. Load the source into the shipping container and wrap the container with plastic, taping all seams. Wash your hands and frisk yourself with a thin end-window GM after packaging the source. **THIS IS A VERY UNLIKELY EVENT.** Return the source to Lenhartsville.

9.7.2.2.1.1.3 If the shutter has opened, make sure the shutter moves freely, secure the shutter in its closed position, and continue with the test.

9.7.3 **Puncturing the single source protective box** This is not a likely event because of the construction of the single source box or the limitations placed on the acceptable scrap grades. It is not possible to puncture the test tube or the multiple source test box with a source in place because the sources are not loaded until fter all the scrap is placed.

9.7.3.1 Stop all operations and survey the exterior of the box to assure that exposure rates are reasonable.

9.7.3.2 Wipe the exterior of the box and check the wipe with a thin end-window GM.

9.7.3.2.1 If there is no external radioactivity, open the box and check the source itself, where possible.

9.7.3.2.1.1 If there is no external contamination, check the physical condition of the source and/or housing to make sure there is no physical damage. Perform a radiation survey and compare with the standard measurements to make sure there has not been a degradation in the shielding.

9.7.3.2.1.1.1 If no damage has occurred, the test may proceed after repairing the box.

9.7.3.2.1.1.2 If damage has occurred, secure the source in its shipping container. If removable contamination is found, put on disposable gloves, cover the source with 2 or 3 plies of plastic sheeting or plastic bags (total 6 mils or thicker). Tape all seams. Load the source into the shipping container and wrap the container with plastic, taping all seams. Wash your hands and frisk yourself with a thin end-window GM after packaging the source. **THIS IS A VERY UNLIKELY EVENT.** Return the source to Lenhartsville.

9.7.3.2.1.1.3 If the shutter has opened, make sure the shutter moves freely, secure the shutter in its closed position, and continue with the test after repairing the test box.

9.8 Upon arrival at the storage facility, remove the protective box from the van and store it in its storage location.

9.9 If the source housing is being returned in a damaged condition, it shall be returned to Lenhartsville. The storage area shall be covered with plastic sheeting. The covered box shall be placed in the storage area and secured until arrangements are made to return the source housing to the manufacturer.

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03225
STATUS CODE: 0
FEE CATEGORY: 3N
EXP. DATE: 20040930
FEE COMMENTS:
DECOM FIN ASSUR REQD: N

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED
APPLICANT/LICENSEE: HEALTH PHYSICS ASSOCIATES, INC.
RECEIVED DATE: 970218
DOCKET NO: 3030694
CONTROL NO.: 124279
LICENSE NO.: 37-28246-01
ACTION TYPE: AMENDMENT

2. FEE ATTACHED
AMOUNT: $590.00
CHECK NO.: 3424

3. COMMENTS

SIGNED M. A. Perkins
DATE 2/19/97

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED /_/)

1. FEE CATEGORY AND AMOUNT: 3N $590

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:
AMENDMENT /
RENEWAL
LICENSE

3. OTHER

SIGNED
DATE

I (97)
Log Feb 16
Received
Check No. 3424
Amount $590
Fee Category 3N
Type of Fee Amd
Date Rec'd 2/20/97
Completed 2/21/97
By DD

FEE EXEMPT