HEALTH PHYSICS ASSOCIATES, INC.

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December 29, 2004

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

Attn: Betsy Ullrich

re: Renewal of Byproduct Material License, Number 37-28246-01
Health Physics Associates, Inc., Docket Number 030-30694, Control Number 135545

Dear Ms. Ullrich:

This is in response to your November 30, 2004 request for additional information for the referenced license renewal application, dated August 14, 2004. The item numbers refer to those in your November 30, 2004 letter.

1. Iodine 131 will only be used at Lenhartsville to calibrate instruments owned by Health Physics Associates and clients. Attached are safe handling procedures for preparing the standards, their use in calibrating instruments and storage for decay.

2. This activity would be done under client's licenses, provided they have the authorization. I wanted to make sure that I would be authorized to perform the recovery under a client's license. Would I have to be named on their license?

3. Please refer to the attached Procedure for Replacing External Shutters on TN Technologies Model 5200 Series Source Housings and Shutter Closure Mechanisms on TN Technologies Model 5197 Source Housings. The procedure describes the steps that will be taken to assure that the provisions of Appendix P are followed, including all necessary surveys. All records pertaining to the task, survey instruments and survey data will be maintained for at least 3 years.

4. The reference in Item 11 should be NUREG-1556, not 1557. We commit to following the provisions in Appendix N, NUREG-1556, Volume 18, which appear to satisfy the requirements of Section 8.11.

5. All activities involving sealed sources outside of shields are performed at clients facilities for field calibration of installed monitoring systems

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6. The party having responsibility is a function of the client's license. If the client has a license authorizing a particular service, the service will be performed under the client's license. If the client does not have authorization, the service will be provided under the Health Physics Associate's license. These are part of the terms specified in the bid proposal and subsequent purchase order.

7. Several years ago, the University of Missouri (source manufacturer/irradiator/supplier) advised us that the iron and chrome in the stainless steel source capsules were being activated, along with the cobalt wire, in the reactor. As such, they required an amendment to the license (former Bethlehem Steel - 37-01861-05) that listed iron 55 and chromium 51, along with the cobalt 60, before they could ship the sources. The activities were provided by the physicists at the University of Missouri.

8. Specifically with regard to M and N (Items 6 to 9), the sources would be those possessed by the client. We no longer have any soils gauges in our inventory, as described in the cover letter of August 14, 2004 accompanying the renewal application, and have no intention to purchase these devices. In terms of our actual possession inventory, we posses sub-items A through I, K, L (a 65 mCi (currently) TN Technologies source, model 57157C), and under O through Q: a Berthold model LB300 (< 1 mCi currently), and a TN Technologies model 5202 with 500 mCi of cesium 137. With the exception of the two sources listed above, the remainder of O through Q would be client owned sources, possessed incident to installation, relocation and initial surveys. Please refer to the attached Procedure for Installation, Relocation and Initial Surveys of Fixed Gauging Devices. The procedure describes the steps that will be taken to assure that the provisions of Appendix P are followed, including all necessary surveys. All records pertaining to the task, survey instruments and survey data will be maintained for at least 3 years.

9. This refers to an unnumbered paragraph following paragraph 8 at the bottom of page 2. You list O and P, but it also includes Q (cobalt 60). These are limitations that a former NRC reviewer required to limit possession so that we would not be required to post a surety bond for financial assurance. I believe these were used because of the NRC's policy of writing licenses in the past that had no real possession limits, only limits on the specific source and device combinations, and in many cases, of just listing manufacturers and requiring the sources and devices to have been previously approved.

10. This refers to the unnumbered paragraph at the top of page 3. I am not aware of any licensee possessing and using refractory wear indicating sources who also has the authorization to install these sources. The client's responsibility would be to purchase, receive, and safely store the new sources while awaiting installation. Our responsibilities would be as follows:

    - To assist in receiving, if requested.

- Check the sources for removable contamination, inventory the sources, check each source for radiation output, and reseal the container until installation occurs.
- Provide radiation safety training to personnel working inside the furnace.
- Assure that radiation dosimeters are issued to all personnel working inside the furnace once the first source has been installed.
- Perform the installations, radiation surveys, and other radiation safety activities (posting warning signs, etc.).
- Assure the security of the sources until they are installed, at which time the responsibility for security transfers to the client licensee.
- Perform the removals, radiation surveys, contamination wipes, and other radiation safety activities (posting warning signs, safe temporary storage, etc.).
- Assure the security of the recovered sources until they are charged into the furnace once it is returned to service or in another operating furnace.

Section 8 of our Policies Governing the Use of Ionizing Radiation has been modified to reflect Appendix P.

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

Sincerely,

A. LaMastra
Certified Health Physicist

Health Physics Associates, Inc.

Procedures for Handling Iodine 131 Used To Calibrate Portable MCA Instruments

General

1. Only non-volatile solutions of iodine 131 shall be purchased in quantities not to exceed 50 μCi. All preparations shall have a known activity, traceable to NIST.
2. Upon receipt, the package shall be checked for obvious damage and a surface wipe made. A minimum of 100 cm^2 shall be wiped. The wipe shall be counted in the NMC PC-5 or a liquid scintillation counter. Removable surface activities shall not exceed 2200 dpm/100 cm^2. If activities exceed this limit, immediate notification shall be made to the shipper, the carrier, the NRC and the US DOT.
3. Iodine 131 stock and diluted solutions shall be stored in tightly closed glass containers behind at least 2 half-value thickness of shielding. This will reduce the intensity to at least 0.07 mR/hr at three feet from to container. Place all containers in holder bases that will prevent the tipping of the container if accidentally hit during standard preparation activities.
4. Iodine 131 has a useful life of 10 days. Arrange to have all MCAs ready for calibration before purchasing the stock solution.

Standard Preparation

5. All standard preparation shall be conducted in impervious trays at least 18 by 24 inches and with a lip of at least ½ inch. The trays shall be lined with plastic backed absorbent paper. The tray, all glassware, pipettes and vials shall be labeled with a radiation symbol. Containers shall also have the words "Radioactive Material", the activity and date of assay.
6. All handling of loose radioactive material shall be done while wearing rubber gloves.
7. Calculate the desired dilution of the stock solution to produce an activity of 45 μCi in 50 ml of distilled water. Uniformly pour the diluted solution into 250 grams of "kitty litter" or oil absorbent contained in a Nalgene jar (250 ml). Wipe the jar with absorbent paper and seal with a screw lid taped with electrical tape. This will produce 40 μR/hr at 50 cm from the jar. Label the jar with the activity and assay date and a radioactive material label. The standard has a useful life of approximately 10 days for instrument efficiency calculations and can be used for approximately 30 days as an energy calibration standard.
8. Absorb remaining stock solution in kitty litter and place in the rad-waste bag.
9. Following preparation of the standard, wipe the surface of the Nalgene jar for removable activity and count the wipe in the NMC PC-5 or liquid scintillation counter. Clean the jar with "Scrubbing Bubbles" foam if any activity is detected above background plus 1 σ and rewipe. Check the gloves with a pancake GM detector. Remove the gloves using anti-contamination techniques and dispose in a Rad-Waste bag. Check your hands and clothing. Wipe all surfaces for removable contamination and clean as necessary. Dispose all contaminated materials in the rad-waste bag.
10. **No disposal shall be via the sink.**

Energy & Activity Calibration

11. Expose the MCA detector to the jar at a distance of 50 cm (jar center to detector center). Acquire counts for 300 seconds, set the ROI and calculate the efficiency based on the integral counts in the ROI and the activity.
12. Determine if the MCA can identify the radioactive material as iodine 131 or identify the energy peaks [284 keV (5.1%), 364 keV (85.3%), 637 keV (6.9%), and 723 keV (1.2%)]. Note whether identification was made and the energy peaks identified.

Emergency Procedures

13. In the event of a spill, the tray should contain all liquid.
14. Check your gloves with a pancake GM. If the gloves are not contaminated, put on a pair of 16 inch heavy duty rubber gloves over the standard rubber gloves. If the gloves are contaminated, carefully remove and wash your hands. Check your hands with a pancake GM. Rewash and recheck as necessary until they are clean.
15. Check the soles of your shoes with a pancake GM to make sure they are not contaminated. If contaminated put on bootie coverings. Put on double rubber gloves and the heavy duty gloves.
16. Obtain a few 1 gallon Zip Lock bags, duct tape, additional heavy duty rubber gloves, "Scrubbing Bubbles" foam cans, additional absorbent paper, a Rad-Waste plastic bag, and plastic sheeting at least 12 inches larger than the tray. Carefully slide the plastic sheeting under the tray and tape it to the bench top. Place 2 – 3 layers of absorbent paper over the plastic sheeting beneath the tray.
17. Use absorbent paper to soak up the liquid in the tray. Place the absorbent paper in a 1 gallon Zip Lock bag and tape the bag closed. Use forceps or other impervious tools to handle the wet absorbent paper as much as possible to reduce contamination of your gloves. Place the Zip Lock bag in the Rad-Waste bag. Check your gloves frequently for contamination and place in the Rad-Waste bag if contaminated. Check your hands for contamination and wash as necessary. Label the Rad-Waste bag with the date and exposure rate and store in the Barn Cage.
18. Check the table top, floor and front surface of the table for contamination. Clean with Scrubbing Bubbles as necessary until they are free of detectable contamination.

Waste Handling

19. All waste, including old standards shall be stored in a Rad-Waste bag in the Barn Cage until they are free of detectable external when measured with a Micro-R type survey meter. At this point they may be disposed via normal trash once all "radioactive materials" labels have been obliterated. Do not dispose in a yellow Rad-Waste bag. Transfer all waste from the yellow Rad-Waste bag to a double black trash bag. Tape the trash bag closed before discarding.

HEALTH PHYSICS ASSOCIATES, INC.

INSTALLED RADIATION MONITOR CALIBRATION

This procedure covers the field calibration of fixed radiation monitors, other than scrap and waste monitors.

1. Pre-calibration Checks

1.1 Check the voltage of all batteries in the instrument and replace those having less than the nominal battery voltage.

1.2 Make sure pre-set alarm points are set to the desired values.

KEEP RADIATION SOURCE SHIELDED UNTIL READY TO EXPOSE THE DETECTOR
USE DISTANCE TO REDUCE PERSONNEL DOSE

2. Repairs: If the instrument is not working properly, do not attempt to calibrate until it has been repaired.

3. Calibration

3.1 Alarming Rate-Meters

3.1.1 Low level detectors (0.5 to 100 mR/hr)

3.1.1.1 Expose the detector to the following radiations fields (in mR/hr), note the instrument response and the exposure rate at which the various alarms activate (low, moderate, high, etc.). Note if the audible and/or visual alarms activate. It may require creating an exposure rate other than those listed. If so, determine this in advance to reduce your exposure time. Use the accompanying chart to determine the distance producing the desired exposure rate. Shield the source when finished making the exposures.

0.5	1	2
5	10	20
50	100	

3.1.2 High level detectors (Greater than 100 mR/hr)

3.1.2.1 Determine the exposure rates (and their corresponding distances) in mR/hr that are needed to cause the various alarms for the instrument, as well as selected

exposure rates to test the accuracy of the instrument. Make the exposures and note the instrument response and the exposure rate at which the various alarms activate (low, moderate, high, etc.). Note if the audible and/or visual alarms activate. Shield the source when the exposures are finished.

3.1.3 Make any necessary adjustments to the alarm set points and retest the instruments only at the adjusted alarm set points.

3.1.4 If the instrument response requires adjustment (an error greater than 20 percent), make the adjustments and retest at the pre-selected exposure rates. Repeat until the instrument response is within 20 percent. If this is not possible, note the errors and make the RSO aware of the errors. Mark the instrument with the percent errors, whether high or low, and the exposure rates.

3.1.5 Complete and attach calibration stickers to the detector(s) and the rate-meter housing.

3.2 Non-Rate-Meter Alarming Detectors: These are simple alarming dosimeters that do not show the exposure rate and only activate an alarm signal. Determine the exposure rates (and their corresponding distances) in mR/hr that are needed to cause the various alarms for the instrument. Make the exposures and note if the audible and/or visual alarms activate. Shield the source when the exposures are finished. Complete and attach calibration stickers to the detector(s) and the alarm housing(s).

4. Report Generation: All Instruments

4.1 The report is found in WORD under Forms / Calibrations/(name of client) / (instrument identity). Use the previous report as a model and make the necessary changes. Calculate the errors and insert in the report.

4.2 Prepare a cover letter to the client and note any errors in excess of 20 percent and other out of specification conditions. Mail the report and cover letter.

POLICIES GOVERNING

THE USE OF

IONIZING RADIATION

REVISION 1

DECEMBER 2004

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

the end of the tube to make sure there is no removable contamination and check with the pancake GM. Save the wipe for analysis at Lenhartsville.

8.11.2.3 Record the removal location

8.11.2.4 Repeat for each location having a source.

8.11.2.5 Following the removal of all sources, perform a complete survey of the furnace using the ASP-1/SPA-2 to make sure no sources remain in the furnace. Once this is completed, the furnace may be released for quenching and refractory removal.

8.12 **Refractory Tear Out - Brick Installations – Shell Cutting**

8.12.1 The periodic surveys will be used as the basis of making an initial determination of the location of remaining sources. Review the last periodic survey report to determine the location of any remaining source(s) prior to quenching.

8.12.2 Prior to quenching the furnace, remove all sources from the furnace.

8.12.2.1 Restrict access to the catwalk following the procedures in 8.7.1 through 8.7.5.

8.12.2.2 Prior to all work provide radiation dosimeters to the burner who will assist on the job, unless union rules permit burning to be done by A. LaMastra. If a facility burner will be used, provide instruction in the work to be done, the likely radiation levels, and the principles of time, distance and shielding. Document the burner's name, social security number, dosimeter number, and the amount of time spent at each location.

8.12.2.3 Survey the shell to determine the exact location of the source and mark the furnace shell for cutting. The cut line shall extend at least 24 inches on each side from the source location.

8.12.2.4 Place a ¼ inch steel plate on the catwalk, extending 10 feet on either side of the source location. Bring a 5 gallon pail, hammers and chisels, a Micro-R type survey meter, a GM meter with a pancake probe plus the ability to read to at least 200 mR/hr, 12 inch tongs, and 6 inch Q-Tips to the source location.

8.12.2.5 Once the shell is marked, have the burner cut through the steel. Note the source is at least 8 inches into the refractory brick, so it will not be damaged by any cutting. Once the shell is cut, the burner shall leave the area.

8.12.2.6 Remove the cut section of shell and resurvey to find the source location in the exact brick. Mark the brick. Chisel out the bricks 2 courses below the one containing the source. Pry the source brick down into the space vacated by the removed bricks, remove the source brick and place it into the 5 gallon pail. Mark the pail with the source location and the time and date of removal. Wipe the brick to assess removable contamination and check with the pancake GM. Save the wipe for analysis at Lenhartsville.

8.12.2.6 Bring the pail to the secure storage location and update the storage inventory.

8.12.2.7 Repeat for all other source locations. Following the removal of all sources, perform a complete survey of the furnace using the ASP-1/SPA-2 to make sure no sources remain in the furnace. Once this is completed, the furnace may be released for quenching and refractory removal.

8.13 **Refractory Tear Out - Brick Installations – Rubble Removal** Note that this method is the least desirable because of its interference with the reline schedule, but is included here in case a client may be forced into this method of removal for whatever reason. Refractory wear sources are only located in areas of known high wear. Thus, source removal is typically limited to only a few locations (less than 10) at the end of a furnace refractory's life.

8.13.1 The periodic surveys will be used as the basis of making an initial determination of the location of remaining sources. Review the last periodic survey report to determine the location of any remaining source(s) prior to quenching.

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

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

8.13.2.2 Spread the load on the ground and using the Micro-R meter, search the pile until the brick is located. Prior to releasing the loader, survey the bucket with the pancake to make sure no contamination is present on the bucket.

8.13.2.3 All recovered bricks shall be wiped to make sure 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 pails and closed.

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

8.13.2.4 Repeat for each location showing a missing source.

8.13.2.5 Following the recovery of all sources following quenching, the furnace shall be released for the removal of refractory. This is a process in which the top of the furnace is removed and an automated machine is lowered by cables. The machine uses a chisel to break the refractory away from the interior shell of the furnace, allowing the rubble to fall to the bottom of the furnace, typically in large blocks of mortared bricks.

8.13.2.6 A survey will be made of the furnace shell in the area where the machine is removing refractory. When a source is dislodged, stop all operations and begin the removal of rubble from the bottom of the furnace, Repeat each time a brick is dislodged until all bricks have been recovered.

8.13.2.7 Following the removal of all sources, perform a complete survey of the furnace using the ASP-1/SPA-2 to make sure no sources remain in the furnace. Update the furnace and storage inventory. Once this is completed, the furnace may be released for the remainder of refractory removal

8.14 Once the furnace is brought back on-line, hand-charge bricks containing sources into the top of the furnace. Ten millicuries or less shall be charged into a single furnace heat. Document source charges and update the storage 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 15 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.

Health Physics Associates, Inc.

Procedures for Installation, Relocation and Initial Surveys Of Fixed Gauging Devices

General

1. Installation and relocation work will be performed by Anthony LaMastra. Assistance may be provided by employees of Health Physics Associates, under the direct supervision and in the physical presence of A. LaMastra. These personnel will have had at least 20 hours of radiation safety training. Initial surveys will be performed by either A. LaMastra or Health Physics Associates employees who have had a minimum of 40 hours training in radiation safety. Personnel provided by the client shall be given a 1 hour general radiation safety training session prior to beginning work. The training will describe the activities to be conducted, their tasks, an estimate of their potential doses, an explanation of biological effects from radiation, a discussion of time, distance and shielding to allow them to understand how to keep their doses ALARA, an introduction of the personnel performing the work from Health Physics Associates, and who to contact if they have any questions during the work. These personnel will not be allowed within a radiation area
2. Review these procedures and all client safety procedures with all Health Physics Associates and any client provided personnel.
3. Make sure all tools, survey meters, lift equipment and work platforms are brought to the area.
4. All personnel working inside the restricted area shall wear at least a whole body TLD dosimeter. Personnel handling the source housing shall also wear TLD ring dosimeters. All personnel shall wear steel tipped safety shoes, safety glasses and hard hats. It may also be necessary to wear safety harnesses and have them properly tied off.
5. Line up the beam path, mark the locations of the source and detector housings and install or have client workers install the detector housings. Make sure the source housings are placed so that they are accessible for leak tests and shutter tests. Install or have client workers install the source housing mounting brackets.
6. Establish a restricted area boundary at a locus in which personnel outside the boundary will not be exposed to greater than 0.5 mR/hr.

Source Housing Installation

7. Check and survey the source housing to make sure the shutter is locked in the closed position. Record all survey measurements made at contact with the housing, at 1 foot from the housing, at 18 inches from the housing and at 3 feet from the housing. Make a wipe of the source housing and check it for removable contamination using a pancake GM. Save the wipe for later analysis at Lenhartsville.
8. Check the source housing labels and make sure the correct labels are applied. If the source housing is mislabeled, notify the manufacturer and obtain correct labels. Check the serial and model number against the list provided by the manufacturer. Note any

discrepancy and notify the manufacturer to make sure the correct activity source has been provided. Do not install if the activity or the model number is different from that specified by the manufacturer.

9. If the correct source and housing has been supplied, move the source housing to the installation area, keeping direct visual surveillance over the source housing at all times.
10. Establish a restricted area boundary and post with radiation area warning signs.
11. Use a sling to attach the source housing to the lifting device (ratchet winch, crane, etc.). Use plastic wire ties to secure the sling to the lifting hook.
12. Lift the source housing in place and bolt in place, using the manufacturer's specification for the bolts, nuts, washers, and tightening torque.
13. Remove all non-Health Physics Associates personnel from the restricted area and open the shutter to test the alignment of the source housing and the detector. If minor adjustments are necessary, make the necessary adjustments and retest the alignment. If major adjustments are required, remove the source, make the modifications, and reinstall the source housing, using new bolts, nuts and lock washers. Retest the alignment.
14. Once the installation is complete, make a wipe of the source housing to document the absence of removable contamination. Check the wipe with a pancake GM and save the wipe for analysis at Lenhartsville.

Relocation and Removal

15. Set up a safe work platform that allows safe access to the source housing.
16. Establish a restricted area boundary and post with radiation area warning signs.
17. Check and survey the source housing to make sure the shutter is locked in the closed position. Record all survey measurements made at contact with the housing, at 1 foot from the housing, at 18 inches from the housing and at 3 feet from the housing. Make a wipe of the source housing and check it for removable contamination using a pancake GM. Save the wipe for later analysis at Lenhartsville.
18. Use a sling to attach the source housing to the lifting device (ratchet winch, crane, etc.). Use plastic wire ties to secure the sling to the lifting hook.
19. Loosen the bolts holding the source housing in place and increase the ratchet tension to prevent the source housing from dropping when the bolts are removed, but not so much that bolt removal is inhibited. Remove the bolts and free the source housing, being careful to avoid being struck by a swinging source housing. If necessary have an assistant keep tension on a rope used to keep the source housing from freely swinging. Lower the source housing to the ground or transport vehicle.
20. If the source housing is to be immediately reinstalled, move it to its new location, maintaining security over the source during movement.

21. Reinstall following the procedures above under **Source Housing Installation**, steps 9 through 14. Check the labels to make sure they are legible. If not have the client order new labels from the manufacturer.

Initial Survey

22. Review with the client the conditions under which the gauge will be used and the environmental conditions likely to be present in the area. If environmental conditions appear to present a potential for degradation of radiation safety, inform the client of the concerns and arrange for a discussion with the manufacturer. If the manufacturer has no concern, request a written statement to that effect be forwarded to Health Physics Associates. Include a copy with the initial survey report to the client.
23. Determine all occupied areas, walkways, and other areas in which personnel are likely to be present, even on a temporary basis, including areas above and below the beam path. Identify conditions and structures that will increase or decrease Compton scatter (water cooling jackets, liquid in tanks and piping, etc.). Document the approximate time personnel are likely to be present and the distance to the source housing and detector.
24. Record the source identity, including the source capsule manufacturer, model and serial number, activity and radionuclide; the source housing manufacturer, model and serial number; the process equipment on which it is installed, and a brief description of its purpose.
25. Have the client provide environmental and operating conditions that simulate those during actual operation, including those that will increase Compton scatter.
26. Perform a radiation survey using an instrument capable of responding to the radiation and energy to be measured. Document the manufacturer, model, serial number of the survey meter and detector, and the date of calibration. **Do not use the instrument if the calibration due date is exceeded**. A. LaMastra will approve all instrumentation. If a neutron source is involved, survey for both gamma and neutrons using the 3 inch and 9 inch spheres. Survey measurements are to be taken at the following locations:
    - Contact with all surfaces of the source housing, and if possible in the beam path.
    - At one foot from the source housing.
    - At 18 inches from the source housing.
    - At 3 feet from the source housing.
    - In all nearby walkways.
    - At nearby equipment at which client personnel are likely to be for maintenance or other purposes.
    - In all nearby occupied areas and areas above and below the beam path.
    - At the detector (determine the spread of the radiation beam and document where exposure rates exceed 0.1 mR/hr).
27. Following the survey, review with the client's management the significance of the survey results and any recommendations or restrictions that will be made in the report.

28. The Initial Survey Report shall include the following:
    - The identity of the surveyor, the instrumentation used and the calibration date(s).
    - The identity of the installation, including the company and installation location within the facility.
    - The date of the installation and survey.
    - The identity of the source housing, including the manufacturer, model and serial number and the corresponding equipment to which it is attached.
    - A detailed sketch or table showing the locations of all radiation measurements and the exposure/dose rate.
    - The locations of all occupied areas and the amount of time occupied, including the location of routine work stations, walkways, and areas only infrequently occupied, including areas above and below the beam path.
    - Recommendations and operating restrictions that are felt to be necessary, including:
        - Locations on the source housing for leak testing if the client is take their own wipes.
        - Whether radiation warning signals or signs are required or desirable and their location, and the recommended wording for the signals or signs.
        - Whether a restricted area is required and its boundary location.
        - Recommendations for personnel radiation safety training.
        - Recommendations for suitable survey meters if the client desires to purchase a survey meter.
        - Recommendations to maintain personnel doses ALARA.
        - Recommendations for safe working procedures or practices.
        - Recommendations for emergency procedures.
        - Any operating restrictions felt necessary.

Training

29. If the client will take his own wipes, train a responsible person in management and the personnel likely to take the wipes on the proper technique and the locations on the source housing to wipe.
30. If the client is purchasing a survey meter, train a responsible person in management and the personnel likely to use the instrument in the safe use, limitations, proper survey technique, and interpretation of the results.
31. If the client desires or is required to be trained and chooses to retain Health Physics Associates to provide a full radiation safety training course, discuss the options and arrange for a suitable time.

Emergency Procedures

32. There are limited emergency situations involved in installing or relocating a fixed gauging device. These are addressed below.

33. **Source housing shutter open from the manufacturer:**
    - Close and lock the shutter.
    - Determine the amount of time the source was on-site, the direction of the beam, the personnel likely to have been exposed (including receiving and transportation personnel) and their likely maximum doses. Assist client in preparing a dose estimate for their employees and contractors who may have been exposed.
    - Calculate the maximum likely dose and compare it to license and regulatory dose limits.
    - Determine reporting requirements and advise the client on reporting to the US NRC, US DOT, carrier, and manufacturer.
    - Determine if the source housing is acceptable for installation.
34. **Removable contamination on source housing:**
    - Make use anti-contamination procedures and clothing.
    - Determine spread of contamination and potential for aerosolization and advise client. Assist in clean up if necessary and requested.
    - Isolate source housing and place in impervious container to prevent the spread of contamination.
    - Notify manufacturer and NRC. Determine if surface contamination on package exceeded regulatory limits and accordingly notify US DOT and carrier.
    - Assist client in returning source housing to manufacturer.
35. **Source housing falls during installation:**
    - Determine if personnel injury has occurred and notify appropriate plant emergency personnel of the accident. Provide necessary first aid until assistance arrives.
    - Restrict and secure impact area if it is outside established restricted area.
    - Evaluate shutter integrity, perform survey of source housing and make surface contamination wipe. Analyze using a pancake GM detector. Save wipe for later analysis at Lenhartsville.
    - Perform area survey and determine personnel doses of workers in the area.
    - If radiation levels are acceptable and no surface contamination is present, return source housing to its shipping crate, notify manufacturer of accident and determine whether source housing should be returned to manufacturer for evaluation. If it is to be returned, assist client in returning source housing to manufacturer. If surface contamination is present, follow guidance under #34.
    - Prepare a report of the incident and determine if it is a reportable incident.

36. **Source housing struck by moving equipment while on the ground:**
    - Determine if personnel injury has occurred and notify appropriate plant emergency personnel of the accident. Provide necessary first aid until assistance arrives.
    - Restrict and secure accident area.
    - Evaluate shutter and source housing integrity, perform survey of source housing and make surface contamination wipe. Analyze using a pancake GM detector. Save wipe for later analysis at Lenhartsville.
    - Perform area survey and determine personnel doses of workers in the area.
    - If radiation levels are acceptable and no surface contamination is present, return source housing to its shipping crate, notify manufacturer of accident and determine whether source housing should be returned to manufacturer for evaluation. If it is to be returned, assist client in returning source housing to manufacturer. If surface contamination is present, follow guidance under #34.
    - Prepare a report of the incident and determine if it is a reportable incident.
37. **Source housing struck by heavy object during installation and falls:**
    - Follow guidance in # 35.
38. **Source housing struck by heavy object during installation but does not fall:**
    - Determine if personnel injury has occurred and notify appropriate plant emergency personnel of the accident. Provide necessary first aid until assistance arrives.
    - Evaluate shutter and source housing integrity, perform survey of source housing and make surface contamination wipe. Analyze using a pancake GM detector. Save wipe for later analysis at Lenhartsville.
    - Perform area survey and determine personnel doses of workers in the area.
    - If radiation levels are acceptable and no surface contamination is present, contact manufacturer and obtain advice on returning source housing for evaluation. If it is to be returned, assist client in returning source housing to manufacturer.
    - If surface contamination or elevated radiation levels are present, evaluate how source housing will be removed while maintaining personnel doses ALARA. Follow guidance under #34 if surface contamination is present.
    - Prepare a report of the incident and determine if it is a reportable incident.

Health Physics Associates, Inc.

Procedures for Replacing External Shutters TN Technologies Model 5200 Series Source Housings and Shutter Closure Mechanisms on TN Technologies Model 5197 Source Housings

General

1. The shutters on TN model 5200 series source housings and the shutter closure mechanisms on TN model 5197 source housings are external to the source housing and easily disassembled with minimal potential for personnel dose, provided the beam port is directed away from personnel or occupied areas.
2. All replacement will be performed by Anthony LaMastra. Assistance may be provided by employees of Health Physics Associates, under the direct supervision and in the physical presence of A. LaMastra. These personnel will have had at least 20 hours of radiation safety training. Review these procedures with all involved personnel.
3. No work will be started until the client has the replacement parts on site and they have been inspected and determined to be the correct parts, in good working order, and all parts are present.
4. Review these procedures with all
5. Once it has been determined that work can proceed, bring all tools and supplies to the area.
6. All personnel working inside the restricted area shall wear at least a whole body TLD dosimeter. Personnel handling the source housing shall also wear TLD ring dosimeters. All personnel shall wear steel tipped safety shoes, safety glasses and hard hats. It may also be necessary to wear safety harnesses and have them properly tied off.

Initial Inspection

7. Discuss the history of the source housing with a responsible person from the client and determine the cause of the failure. Make sure the cause of the failure has been addressed. Advise client that shutter failure is a reportable incident and that a report will have to be sent to the NRC.
8. Perform a radiation survey to determine the extent and intensity of radiation fields and document.
9. Perform a leak test wipe of the source housing to assure there is no removable contamination. Check the wipe with a pancake GM and save for final counting at Lenhartsville.
10. Based on the survey data, establish a restricted area boundary and post with radiation area warning signs.
11. Based on the survey data and the installation of the source housing, determine if the work can be conducted with the source housing installed or if removal is necessary. If removal is necessary, secure the shutter or a replacement piece of lead in its closed position before removing. Use metal strapping if necessary.

Model 5197 Shutter Closure Mechanism Replacement

12. This task is performed with the source housing in place.
13. Set up a safe work platform that allows safe access to the source housing.
14. Secure the shutter in a closed position and lock or bolt it in place to prevent shutter movement.
15. If the shutter closure cable is defective, remove it from the shutter and from the driver mechanism. Replace the entire cable and cable housing. Make sure there are no sharp bends that would cause binding in the cable/cable housing. Secure the cable housing to available structures to prevent damage. Reconnect the cable to the shutter and to the driver mechanism.
16. Unlock the shutter and test the shutter closure mechanism several times to assure there is no binding.
17. Check all labels on the source housing and warning and instructional signs. If any are illegible, advise the client order replacements.
18. Remove all work platforms, ladders, tools, etc.
19. Perform an initial radiation survey of the installation. Document the task, including personnel involved, duties and exposure times, any model and serial numbers, all replaced parts, and models and serial numbers of survey meters.
20. Prepare an initial radiation survey report and forward to the client.

Model 5200 Series Shutter Replacement - Source Housing Remains In Place

21. Depending on the installation, this task may be performed without the removal of the source housing. If this is possible, evaluate the potential primary and scatter beam areas to assure the restricted area is adequate to keep radiation doses outside the area below 0.5 mR/hr, and that radiation worker personnel doses are ALARA.
22. Set up a safe work platform that allows safe access to the source housing.
23. Make use of the natural shielding of the source housing. Remove the pivot bolt holding the shutter handle to the source housing frame. Keeping your hands out of the primary beam, remove the shutter mechanism and insert the new mechanism in place. Replace and tighten the bolt. Use only the supplied TN bolt and nut that has a shoulder to prevent over-tightening. Do not replace with a standard bolt.
24. Following replacement, operate the shutter several times to make sure it is operating properly.
25. Perform a radiation survey of the source housing with the shutter in its open and closed opposition to make sure the shutter is providing adequate protection. Have a survey performed at the detector and other areas around the installation to make sure radiation levels in unrestricted areas are below those in the initial survey performed when the

device was installed. If an initial survey is not available, make sure doses in unrestricted areas are below 0.5 mR/hr in non-routinely occupied areas or 0.1 mR/hr in occupied areas.

26. Check all labels on the source housing and warning and instructional signs. If any are illegible, advise the client order replacements.
27. Remove all work platforms, ladders, tools, etc.
28. Document the task, including personnel involved, duties and exposure times, any model and serial numbers, all replaced parts, and models and serial numbers of survey meters.
29. Prepare an initial radiation survey report and forward to the client.

Model 5200 Series Shutter Replacement - Source Housing Removed

30. Set up a safe work platform that allows safe access to the source housing and a safe area in which to change the shutter mechanism.
31. If removal is necessary, secure the shutter in place using metal or plastic banding. Secure a ratchet winch above the source housing and connect to the eyebolt on the source housing. Use plastic wire ties to secure the ratchet hook to the eyebolt. Apply slight tension to the ratchet.
32. Loosen the bolts holding the source housing in place and increase the ratchet tension to prevent the source housing from dropping when the bolts are removed, but not so much that bolt removal is inhibited. Remove the bolts and free the source housing, being careful to avoid being struck by a swinging source housing. If necessary have an assistant keep tension on a rope used to keep the source housing from freely swinging. Lower the source housing to the work platform, keeping the ratchet hook attached.
33. Position the source housing so that the primary and scatter radiation beams are directed away from all personnel and occupied areas. Secure the source housing so that its position does not move.
34. Make use of the natural shielding of the source housing. Remove the pivot bolt holding the shutter handle to the source housing frame. Keeping your hands out of the primary beam, remove the shutter mechanism and insert the new mechanism in place. Replace and tighten the bolt. Use only the supplied TN bolt and nut that has a shoulder to prevent over-tightening. Do not replace with a standard bolt.
35. Following replacement, operate the shutter several times to make sure it is operating properly. Lock the shutter in the closed position.
36. Remove the restraints and raise the source housing back into place and rebolt it to its mounting brackets. If any bolts or nuts appear damaged, replace. Use new lock washers.
37. Unlock and open the shutter to make sure it is properly aligned and that a proper signal is being received by the detector and electronics. If a proper signal is being received,

tighten the bolts to 75 to 100 foot-pounds. Recheck the beam alignment to make sure it has not changed and that the shutter operates properly.

38. Perform a radiation survey of the source housing with the shutter in its open and closed opposition to make sure the shutter is providing adequate protection. Have a survey performed at the detector and other areas around the installation to make sure radiation levels in unrestricted areas are below those in the initial survey performed when the device was installed. If an initial survey is not available, make sure doses in unrestricted areas are below 0.5 mR/hr in non-routinely occupied areas or 0.1 mR/hr in occupied areas.
39. Check all labels on the source housing and warning and instructional signs. If any are illegible, advise the client order replacements.
40. Remove all work platforms, ladders, tools, etc.
41. Document the task, including personnel involved, duties and exposure times, any model and serial numbers, all replaced parts, and models and serial numbers of survey meters.
42. Prepare an initial radiation survey report and forward to the client.