# LETTER OF TRANSMITTAL

(803) 256-0450

DATE: 07-Jun-06
ATTN: JON YOUNG
RE: CC# 4685
DTK PLAN

| *Description of Documents Transmitted* | *Qty.* |
|---|---|
| 1. CS-SH-PN-002, Rev. 1, HEALTH AND SAFETY PLAN - STERIS ISOMEDIX (REMOVAL, PACKAGING AND DISPOSAL OF COBALT-60 SOURCES FROM THE ISOMEDIX FACILITY - WHIPPANY, NEW JERSEY) | 1 |
| 2. CS-WM-PN-003, Rev. 1, WORK PLAN FOR STERIS/ISOMEDIX REMOVAL, PACKAGING, AND TRANSPORT PREPARATION OF COBOLT-60 SOURCES | 1 |

**TRANSMITTED FOR THE FOLLOWING REASON:**

**For your use or update files -- destroy superseded documents**

**FROM:** *Duratek, Inc.*
*Document Control Center*
*140 StoneridgeDrive*
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**TO:** JON YOUNG
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# HEALTH AND SAFETY PLAN

## STERIS ISOMEDIX
## REMOVAL, PACKAGING AND DISPOSAL OF COBALT-60 SOURCES FROM THE ISOMEDIX FACILITY WHIPPANY, NEW JERSEY

**Revision 1**

| | | |
|---|---|---|
| Authored By: | Paul Ely<br>Paul Ely, Project Engineer | 06/02/2006<br>Date |
| Reviewed By: | Larry Grob<br>Larry Grob, Project Manager | 06/02/06<br>Date |
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| Reviewed By | M S W Whittaker<br>Mark Whittaker, CHP, Radiation Safety Officer | 2 June 2006<br>Date |
| Approved By | Greg Lane for<br>Greg Lane, Duratek Program Manager | 6/2/06<br>Date |

- [ ] New Plan
- [ ] Title Change
- [X] Plan Revision
- [ ] Plan Rewrite

Effective Date: 6/6/006

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CONTROLLED COPY NO. 4685

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# 1. PURPOSE AND SCOPE

## 1.1 Purpose

Duratek has been contracted to remove, package, encapsulate, and transport Co-60 sealed sources located at the STERIS Isomedix Facility in Whippany, New Jersey. The project involves moving approximately 3,900 Ci of Co-60 from the Isomedix storage cask to the Duratek CNS 1-13G & C casks containing liners fabricated for these sources. This plan covers radiation protection, ALARA, and health and safety. The source handling, transfer, encapsulation within the liner, and cask handling work will be done under the Duratek United States Nuclear Regulatory Commission (US NRC) Materials license No. 39-23004-01, and approved plans and procedures. STERIS Isomedix will maintain control over the facility in accordance with their Radiation Safety Program. Duratek will follow and support the STERIS Isomedix program requirements. Duratek personnel will control the work evolution, establish and verify boundaries, and ensure the radiological safety of individuals involved in the project.

## 1.2 Applicability

This plan applies to all Duratek employees, subcontractors and STERIS Isomedix personnel who work within the designated restricted areas during the source removal, and packaging. It will be made available to all personnel for review at any time and will be maintained by the Duratek project manager for the duration of the project. All Duratek employees, subcontractors and visitors who work at the project site, within the designated restricted areas, will review the plans and procedures prior to any on-site work. This will indicate personnel understand the contents and agree to abide by the requirements of the plans.

## 1.3 Scope

### 1.3.1 Description of Sources

The sources to be removed and disposed of are encapsulated special form Co-60 sources with a total activity of approximately 3900 curies (as of 6/1/06).

The sources are presently stored in a shielded shipping cask Model ISC-1 at the STERIS Isomedix Facility in Whippany, NJ. These sources have been in storage for approximately 29 years.

1.3.2 Description of Source Removal and Dose Rates

Sources will be moved from the storage cask to the fabricated liners located within the CNS 1-13G & C casks using the Duratek Filter Transfer Bell. Each of the two baskets within the storage cask will be moved individually to the fabricated liners using the transfer bell.

The general task sequence is:

1. Station the trailer trucks with the CNS 1-13G & C casks in the parking lot where the transfer will be made.
2. Station a mobile crane in the yard.
3. Prepare the transfer area by laying a herculite liner on the designated portion of the parking lot surface.
4. Using the mobile crane remove impact limiter from the CNS 1-13G cask, remove the cask from the trailer and place both in the area designated for the source transfer.
5. Remove the CNS 1-13C cask from the trailer and locate it next to the CNS 1-13G.
6. Stage the grout equipment in a convenient location so that grout transfer into the liner can be accomplished quickly once the sources have been transferred into the liner.
7. Move the Isomedix ISC-1 (storage) cask into the yard area designated for source transfer beside the CNS 1-13G & C Casks. The storage cask will be positioned such that the mobile crane will be able to move the Duratek Filter Transfer Bell from the storage cask to the CNS 1-13G & C casks smoothly with dose to workers ALARA.
8. A berm of concrete blocks will be assembled around the three casks.
9. Position the Duratek Filter Transfer Bell in the yard with the cameras and lights as needed, secured in place within the Filter Transfer Bell, around the 1-13G & C casks, etc as determined during dry runs of the work.
10. Remove the lids from the CNS 1-13G & C casks.
11. Remove the lid from the liner within the CNS 1-13G & C casks.
12. Ensure the tack welds have been ground off the top rim of the storage cask plug.
13. Prepare the area for the transfer.
14. Remove the bolts from the storage cask lid.
15. Using the mobile crane remove the lid from the storage cask.
16. Ensure the Filter Transfer Bell camera and light are working and the bottom gate is open.
17. Using the mobile crane move the Filter Transfer Bell over the storage cask and pick up the top basket raising it up into the transfer bell.
18. Close the bottom gate on the Filter Transfer Bell .
19. Locate the Filter Transfer Bell over the CNS 1-13 C.

20. Open the bottom gate on the Filter Transfer Bell .
21. Lower the 12-inch basket of Co-60 sources into the liner within the 1-13Ccask.
22. When moving the Filter Transfer Bell from the CNS 1-13 C carefully extend the pickup winch until enough cable is exposed for cutting.
23. Using a bolt cutter cut the cable.
24. Lower the Filter Transfer Bell and install the air operated vise grip grabber.
25. Move the Filter Transfer Bell onto the storage cask.
26. Lower the grabber and raise the 18-inch basket into the Filter Transfer Bell .
27. Close the bottom gate on the Filter Transfer Bell .
28. Locate the Filter Transfer Bell over the CNS 1-13 G.
29. Open the bottom gate on the Filter Transfer Bell .
30. Lower the 18-inch basket of Co-60 sources into the liner within the 1-13 G cask.
31. Remove the Filter Transfer Bell and locate on the transfer bell stand.
32. When the source baskets have been verified to be in the correct position within the liners (using remote cameras or mirrors), the sources will be encapsulated in approximately 4 inches of grout on all sides.
33. Once grout has been installed, place the cask lids on the casks.
34. Allow sufficient time for the grout to cure and remove the lids and inspect the grout with remote cameras or mirrors. Verify that there is no standing water on top of the grout.
35. Install the liner lids.
36. Install the cask lids.
37. Install the cask and impact limiter back on the CNS 1-13G trailer.
38. Perform surveys to prepare the shipments for transfer to the disposal site.

Exposure rates on contact with the transfer bell containing approximately 2,710 Ci of Co-60 have been estimated to be 2.6 R/hr.

The highest exposure rate from this job is projected to be during transfer of the sources in/out the transfer bell. The bottom gate on the transfer bell will be opened and closed to allow the source baskets to pass from the storage cask to the transfer bell and then to the liner within the cask. The area above the 1-13G & C casks and liner after transfer of the sources to the liner will be a VERY HIGH RADIATION AREA and NO ONE WILL BE ALLOWED TO LOOK OVER THE TOP OF THE CASK TO INSPECT the position of the sources within the liners. All inspections will be done with remote cameras or mirrors.

Table 1-1 below shows the dose rates at various distances calculated for this project for the 2,730 Ci basket and for the 1,090 Ci basket of sources. The exposure rates are from the side of the transfer bell.

**Table 1-1**

**Transfer Bell Exposure Rates in Air**

**(No Additional Shielding Assumed)**

| Distance from Transfer Bell (feet) | 2,730 Ci Co-60 Exposure Rate (mR/hr) | 1,090 Ci Co-60 Exposure Rate (mR/hr) |
|---|---|---|
| 0.08 | 2,569 | 1,354 |
| 2 | 587 | 248 |
| 20 | 14 | 5.7 |
| 40 | 3.7 | 1.5 |
| 50 | 2.3 | 0.9 |
| 100* | 0.55 | 0.22 |
| 120 | 0.37 | 0.15 |
| 150 | 0.22 | 0.089 |
| 200 | 0.11 | 0.046 |

* 100 feet is the distance to the fence line. Using these exposure rates and assuming it takes 6 minutes to transfer each basket, the total integrated exposure at the fence line is projected to be less than 0.1 mR.

## 2. COMMITMENTS

### 2.1 Management Commitment to Health and Safety

Duratek's policy is to conduct operations in a way that protects and ensures the safety and health of employees, subcontractors, the public and the environment. Accordingly, all Duratek activities will comply with all the applicable safety and health regulations and requirements. Without exception, safety will take precedence over production and survey goals for the duration of this project. Duratek is committed to good health and safety practices to reduce potential safety and health risks and to reduce exposures to hazardous materials and ionizing radiation to levels that are as low as reasonably achievable (ALARA).

## 3. REFERENCES AND FORMS

### 3.1 References

3.1.1 10 CFR 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations."

3.1.2 10 CFR 20, "Standards for Protection Against Radiation"

3.1.3 10 CFR 71, "Packaging and Transportation of Radioactive Materials"

3.1.4 29 CFR 1910.1000 series, "Labor/OSHA, Department of Labor"

3.1.5 29 CFR 1926, "Labor/OSHA, Department of Labor"

3.1.6 40 CFR 260-270, "Hazardous Waste Management"

3.1.7 49 CFR 100-189, "Transportation"

3.1.8 49 CFR 172, Subpart H, "Transportation Training"

3.1.9 STERIS Isomedix 1500 Series Procedure Manual

### 3.2 Forms

None

# 4. GENERAL

## 4.1 Definitions

4.1.1 Filter Transfer Bell – a component hung from the crane hook that will be used to transfer the sources from the STERIS Isomedix cask to the Duratek supplied liner.

4.1.2 High Radiation Area – an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 100 mrem/hr at 30 cm from the radiation source or 30 cm from any surface that the radiation penetrates. (10CFR20.1003)

4.1.3 Radiation Area – an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 5 mrem in 1 hour at 30 cm from the radiation source or from any surface that the radiation penetrates. (10CFR20.1003)

4.1.4 Restricted Area – an area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. (10CFR20.1003)

4.1.5 Very High Radiation Area – an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess of 500 rads in 1 hour at 1 meter from a radiation source or 1 meter from any surface that the radiation penetrates.

## 4.2 Responsibilities

The organization will consist of Duratek employees and a contracted crane operator. The organization will ensure training and experience required to transfer the sources ensuring personnel exposure is maintained ALARA. The organization will also ensure compliance with license requirements.

The following are the responsibilities of the project staff.

4.2.1 STERIS Isomedix Radiation Safety Officer or Designee

The STERIS Isomedix Radiation Safety Officer has administrative responsibility over all radiation safety matters at the STERIS Isomedix Facility and has authority and responsibility to interrupt or suspend any activity, which involves radiation, which in his professional opinion is deemed to be unsafe or contrary to regulations.

4.2.2 Duratek Project Manager

The Project Manager is responsible for providing the necessary technical expertise for source management concerns during the project. The project manager will be responsible for the implementation of the project approach and maintenance of the project schedule and deliverables. The project manager is responsible for interfacing with the client and will manage the project and subcontractors in order to meet safety and schedule objectives. The project manager may also act as the Radiological Control Supervisor (RCS) and the authorized user for the use of NRC Materials License No. 39-23004-01, as approved by the Duratek Radiation Safety Officer and the Chem Nuclear System (CNS) Safety Review Board for this project.

4.2.3 Duratek Health Physics Shipping Broker

Responsible for completing the radiological surveys and preparing shipping manifests.

4.2.4 Duratek Program Manager (Home Office)

Responsible for providing project management support, coordinating any home office support, and evaluation of resources, costs, and provide additional support as needed.

4.2.5 Duratek License, Radiation Safety Officer, RSO (Home Office)

Responsible for the oversight and implementation of all the activities associated the NRC license.

4.2.6 Duratek Senior Health Physics Technicians

HP technicians ensure compliance with the Radiation Protection Program and license conditions. HP technicians review work plans and assist in preparing Radiation/Hazardous Work Permits (RHWPs). HP techs may provide onsite safety and radiological training as needed, and monitor the work place for radiological and safety concerns.

Responsible for:

- Performance of all surveys and instrument operation to support the source movement
- Duratek radioactive check source storage, handling, and control
- Waste packaging
- Preparing RHWPs
- Ensuring all monitoring equipment and instrumentation meet operational check requirements
- Assist with ensuring proper ingress and egress procedures are followed

- Assist with ensuring area posting and controls are maintained
- Providing radiation continuous coverage of the source removal work.

4.2.7 Duratek Cask Handling Technicians

Responsible for removing and replacing bolts from the casks, assisting the rigger with directions to the crane operator, encapsulating the sources within the liner, and for ensuring the cask is properly positioned on the trailer and ready for shipment.

### 4.3 Precautions and Limitations

All radiation work will be performed in accordance with the controls specified in this plan, the work plan and the associated procedures.

### 4.4 Records

Surveys will be documented in accordance with requirements of the applicable procedures.

## 5. REQUIREMENTS AND GUIDANCE

### 5.1 Plans and Procedures

Written plans and procedures will be used to control the work process. Procedures approved by the Duratek Safety Review Board required to support US NRC Materials License No. 39-23004-01 as well as additional procedures required for the project are listed in Table 5-1.

**Table 5-1**
**Project Procedures**

| Procedure Number | Procedure Title |
|---|---|
| CN-AD-001 | CNS Safety Review Board |
| CN-AD-019 | Chem-Nuclear Systems (CNS) ALARA Policy |
| CN-AD-020 | CNS Health Physics Policy Manual |
| CP-HP-PG-300 | Personnel Monitoring Program |
| CP-INST-100 | Radiation Protection Instrumentation Program |
| CP-INST-102 | Quality Control of Counting Systems and Portable Counters |
| CP-INST-104 | Calibration and Test Requirements for Radiation Protection Instrumentation |
| CP-INST-204 | Operation of the Eberline RO-7 High Range ION Chamber |
| CP-INST-207 | Operation of the Eberline Ion Chamber Model RO-2/RO-2A |
| CP-INST-208 | Operation of the Model 12 Count Rate Meter |
| CP-INST-209 | Operation of the Model 177 Portable Count Rate Meter |
| CP-INST-211 | Operation of the Eberline BC-4 Portable Beta Counter |

| Procedure Number | Procedure Title |
|---|---|
| CP-IN-WI-212 | Operation of the Eberline Teletector 6112B |
| CP-IN-WI-234 | Operation of the Ludlum Model 2929 Dual Channel Scaler |
| CP-IN-WI-248 | Operation of the Eberline Model E-520 Portable Survey Meter |
| CP-RP-208 | Radiation/Hazardous Work Permit |
| CP-RP-301 | Performance of Surveys |
| | Vendor Procedure for the Operation of the Technical Associates CP-MU with Model # DMU-1 High Range Probe |
| DK-AD-PR-002 | Document Control (supercedes CN-AD-002) |
| DK-AD-PR-005 | First Notification Procedure (supercedes CN-AD-005) |
| DK-AD-PR-008 | Condition Reports |
| DK-QA-PG-001 | Quality Assurance Program (supercedes QA-AD-001) |
| DK-QA-PO-001 | Quality Assurance Policy |
| DK-QA-PR-001 | Audits (supercedes QA-AD-011) |
| DK-QA-PR-003 | Vendor Evaluation (supercedes QA-AD-007) |
| DK-SH-PR-021 | Case Management of Occupational Injuries |
| DK-SH-PG-001 | Safety and Health Program |
| DK-SH-PO-001 | Safety and Health Policy |
| DK-SH-PR-004 | Fire Protection |
| DK-SH-PR-011 | Recordkeeping of Occupational Injuries and Illnesses |
| DK-SH-PR-005 | Hazard Communication |
| DK-SH-PR-012 | Personal Protective Equipment |
| DK-SH-PR-015 | Lifting and Rigging |
| DTK-OP-001 | Operating Procedure for Brokering of Hazardous Materials |
| DTK-SF-006 | Portable Electrical Equipment Inspection |
| DTK-SF-008 | Ladder Inspection and Use |
| DTK-SF-009 | Care and Use of Hand Tools and Portable Electric Power Tools |
| DTK-SF-020 | Minimum Industrial Safety Standards |
| FS-RP-001 | Radiological Control Procedure for Field Projects |
| FS-RP-002 | Portable Instrument Procedure for Field Projects |
| | |
| TR-OP-013 | Handling Procedure for Transport Cask Number 1-13G, Certificate of Compliance Number 9216 |
| TR-OP-012 | Handling Procedure for Transport Cask Number 1-13C, Certificate of Compliance Number 9081 |
| QA-TP-004 | Soap Bubble Testing of the Model CNS 1-13C Transportation Cask |

## 5.2 Training

Training requirements for this project include, but are not limited to:

a) Work Plan and applicable procedures,
b) Health and Safety Plan and applicable procedures,
c) Radiation worker training,
d) OSHA training and orientation to the STERIS Isomedix facility

e) First aid/CPR training (minimum of one employee per shift, unless onsite responders are available),
f) Fall protection and fall protection equipment use, maintenance and inspection,
g) Fork truck training,
h) Crane operator training.

In addition to the above, all project personnel will receive applicable site-specific orientation and familiarization with STERIS Isomedix license requirements, security, Radiation Safety Program, and its procedures. All project personnel training records and safety meeting attendance sheets will be held on-site and will be available for review as necessary.

## 5.3 Postings

### 5.3.1 License, Regulations, and Notice to Employees

In accordance with conditions of Duratek's US NRC Materials License No. 39-23004-01, and 10 CFR 19.11, *Posting of Notices to Workers*, current copies of the following documents are required to be posted:

- Regulations: 10 CFR 19 and 10CFR 20
- The license, license conditions, amendments, and documents incorporated into the license by reference
- NRC Form 3, "Notice to Employees"

If posting of a document is not practical, the licensee may post a notice, which describes the document and states where it may be examined.

### 5.3.2 Area Postings and Control

During source transfers, the sources will be constantly attended to limit exposure; therefore the area will not be posted.

Positive control of the facility population will be maintained during all activities associated with source movement. During the cobalt source removal and transfer to the cask, the Hanover Township Police will be responsible for securing the perimeter of the restricted area. This evolution will be conducted during a time of minimum personnel in the area being cognizant of work schedule and public activities.

Positive control will be maintained for each individual entry into a High Radiation Area or a Very High Radiation Area. Control will ensure that there are no unnecessary entries and that no individual is prevented from leaving the area.

Because the calculations show that transfer of the source baskets will result in a High Radiation Area and a Very High Radiation Area,

boundaries will be established to keep non-essential personnel out of the area. Prior to source relocation into the transfer bell, all non-essential personnel will be evacuated from the area. The entry points to the yard will be guarded to prevent entry into the area. All site personnel will be accounted for prior to proceeding with source transfer, and source encapsulation within the liner in the CNS 1-13G & C shipping casks.

All site personnel will be accounted for and moved to a low dose area during High Radiation Area work activities.

## 5.4 Radiation Protection

It is Duratek's intent to perform all activities involving radioactive materials consistent with the requirements in Duratek's Materials license and its associated procedures. Although not all elements of the procedures may apply, the degree or level of implementation of these requirements and policies will be based upon the scope of work commensurate with the hazards present at the work site. Personnel will be trained with regard to the application of the License to this project during site orientation training. Duratek radiation protection procedures will be followed for all work performed.

## 5.5 Radiation/Hazardous Work Permits, (RHWPs)

Access to, and work in, radiologically controlled areas (radiation areas, high radiation areas, very high radiation areas, contamination areas, or airborne areas) will be administratively controlled using radiological/hazardous work permits (RHWPs). RHWPs will define the requirements for:

- Specific engineering controls
- Protective clothing
- Dosimetry
- Specialized training
- Stay times
- Any other appropriate measures

Additionally, RHWPs will contain useful information such as:

- Expected area radiation gradients
- Area contamination levels
- Health Physics coverage and monitoring requirements for the job
- The location of areas where radiation and/or contamination levels are elevated
- Other information pertinent to the job being performed

Personnel may be monitored for contamination upon exiting controlled areas regardless of whether or not they actually entered a contaminated area.

It is not anticipated that this project will include work in any contaminated areas. However, one of the 12-inch sources is suspected to have been leaking and there is a potential for contamination during transfer from the storage cask to the liner within the 1-13G cask. The source transfer area will be prepared with herculite, or other suitable sheeting, in a way that minimizes the potential for contamination. A berm will also be constructed around the transfer area.

5.5.1 Radiation Monitoring

Surveys for radiation and contamination will be performed in all occupied areas where work is performed. The surveys will be performed in accordance with Duratek procedures. The Duratek RCS or designee will prescribe the frequency of the surveys after initial surveys of the facility have been evaluated. The purpose of the surveys is to minimize exposure of personnel to radiation and minimize the potential for ingestion or spread of contamination.

Video cameras and remote monitoring will be used to maintain project doses ALARA.

5.5.2 Exposure Monitoring

Personnel exposure to ionizing radiation will be monitored in accordance with the STERIS Isomedix dosimetry program for the contracted crane operators and any contracted riggers. Personnel exposure to ionizing radiation for Duratek employees will be monitored in accordance with the Duratek procedures. Dose received from external radiation sources will be determined by thermoluminescent dosimetry (TLD) or equivalent monitoring device and/or self-reading pocket dosimetry (SRD).

Duratek has established additional administrative limits for occupational radiation doses that are defined in procedure CN-AD-019 and shown below. Approvals for extensions to the administrative limits will be in accordance with the procedure.

**Table 5-2**
**Administrative Limits on Occupational Dose**

| | Annual Limit | Quarterly Limit | Monthly Limit |
|---|---|---|---|
| Total Effective Dose Equivalent (TEDE) | 4.0 rem | 1.0 rem | 0.25 rem |
| Lens Dose Equivalent (LDE) | 12 rem | 3.0 rem | 0.75 rem |
| Skin Dose Equivalent (SDE), Total Organ Dose Equivalent (TODE) | 40 rem | 10 rem | 2.5 rem |

Onsite project personnel will be issued a whole body TLD (or equivalent). Additional dosimetry requirements will be prescribed on the RHWP. The TLD will be worn on the part of the whole body receiving the highest dose; this will likely be the head but will be determined and prescribed by the health physics technician.

5.5.3 ALARA Evaluation and Dose Estimate

ALARA has been incorporated into the design and planning of this project. The Filter Transfer bell contains 9 inches of Steel to reduce the Co-60 exposure. Source movement will be performed by experienced personnel who are knowledgeable and proficient in the details of handling operations. Time, distance and shielding concepts have been incorporated into the work plan. Dry runs of the work tasks will be performed to improve on the time and coordination of activities involving occupational exposure. Lessons learned from the dry runs will be incorporated into the movement of the source baskets.

***Time Minimization***

- Utilizing personnel experienced in the operation of the transfer bell, and 1-13G & C cask loading to load the sources into the liner and casks,
- Performing dry runs of the expected high dose events, and
- Establishing check lists to ensure all equipment is operational prior to use.

***Distance Maximization***

- Use of remote handling tools,

- Use of a crane that will allow the operator to be positioned as far away from the sources as possible during transfer bell movement of sources from the storage cask to the 1-13G & C casks,
- Establishing boundaries to control personnel access to the area during source removal, movement, and cask loading,
- Use of mirrors and cameras to view sources, and
- Use of dose rate instrumentation with extension probes, and arms with remote readouts to minimize health physics technician exposure during dose rate surveys.

***Shielding Maximization***

- Use of shielded transfer bell (9 inches of steel).
- Fabrication of shield walls as necessary to minimize the dose to the person providing direction to the crane operator while moving the sources.

A review of previous work similar in scope shows:

- A post job review of the Co-60 source removal (68,000 Ci) from Georgia Tech showed the total project dose was approximately 85 mrem.
- A post job review of Co-60 source removal from Brookhaven gamma pool showed the total project dose to be approximately 140 mrem.
- A post job review of Co-60 source removal (100,000 Ci) from the Permagrain reactor pool showed the total project dose to be 271 mrem.

ALARA dose estimate for this project is a total of 0.051 person-rem total accumulated dose. The Dose Assessment Worksheet in Attachment 6.1 lists the man-hours and the average dose rate for this project. Attachment 2 to this plan contains the ALARA Checklists and Worksheets contained in Duratek Procedure CN-AD-019, *Chem-Nuclear (CNS) ALARA Policy.*

## 5.6 Health and Safety

### 5.6.1 Hazards and Site Controls

#### 5.6.1.1 Power Tool Operation

The following protocols will be observed when operating power tools at the site:

a) Power tools will be inspected prior to operation to ensure that they are in good working condition.

b) Personnel will avoid wearing loose fitting clothing while operating power tools.
c) All electrical tools and equipment in the work areas shall be intrinsically safe or grounded.
d) All electrical equipment shall be connected through a ground fault circuit interrupter when working in a damp or conductive environment or in the immediate vicinity of standing liquids.
e) Damaged electrical cords shall be removed from service and will not be spliced together.

5.6.1.2 Compressed Gas Cylinders

Compressed gas cylinders can be extremely hazardous if mishandled. The following guidelines will be used to ensure all gas cylinders are properly handled and stored.

a) Cylinders will be clearly labeled as to the contents and considered full until verified to be empty.
b) Cylinders in use, storage or transit will be secured using a chain, retaining bar, cord or structure to prevent cylinders from falling or being knocked over.
c) Protective valve caps will be in place on all cylinders in storage or transit.
d) A regulator, gauge or regulating manifold will be used on all cylinders when in use.
e) Cylinder contents will be identified by means of legible labels or stencils or by identifying marking embossed on the cylinder by the supplier.
f) Compressed gas cylinders should not be dropped, bumped or handled roughly.

5.6.1.3 Slips, Trips and Falls

Prevention measures include the following:

a) Good housekeeping is everyone's responsibility. Maintaining the workplace clean and free of clutter greatly reduces the risk of slips, trips and falls for everyone.
b) Potential hazards will be removed or conspicuously posted upon discovery.
c) Defined walkways will be utilized whenever possible.
d) Three point contact will be maintained at all times when using ladders.
e) Proper fall protection or engineering controls will be used whenever personnel are working more than 4 feet above the ground or near an unprotected edge.

5.6.1.4 Site Controls

Duratek will identify and, if possible, remove hazards to personnel. In situations where it is not feasible to remove these hazards they will be properly posted and the existence of the hazards will be promptly communicated to the work force.

Access to the site will be controlled by STERIS Isomedix and limited to personnel who have a legitimate reason to be at the site. This will minimize the potential for unauthorized individuals to be exposed to hazards that are present at the site.

5.6.1.5 Rigging

Duratek will conduct lifting and rigging using mobile cranes and will take the following actions:

a) Assign only qualified personnel to operate cranes and hoists
b) Assign only personnel who have been trained in proper rigging techniques, for attaching and securing loads to cranes and hoists
c) Maintain daily and monthly inspections of cranes
d) Maintain inspections of rigging equipment

5.6.1.7 Material Handling Safety

Mechanical material handling devices such as forklifts, dollies, hand carts, etc. should be used whenever possible to minimize manual material handling. Workers shall minimize lifting and restrict any lifting by a single person to less than 40 pounds. Workers shall ensure that hands and feet are not placed in a position where they could become pinched, crushed or caught between materials being moved. Material should be inspected for sharp edges or splinters before moving. Workers shall use proper manual lifting techniques when moving material.

5.6.2 Personnel Protective Equipment (PPE)

Personnel protective equipment encompasses all of the items that workers might wear or use to protect themselves from the hazards around them. PPE will be used as prescribed in Duratek procedures. The RHWPs will address the PPE requirements for this project. As a minimum, personnel will wear hardhats, safety shoes, and safety glasses at all times unless specifically exempted by a posted exemption permit. Additionally, personnel may be directed to wear hearing protection, or other protective equipment in specific circumstances.

5.6.3 Emergency Contact/Notification List and Response

5.6.3.1 Emergency Contact/Notification List:

| | |
|---|---|
| **Medical Emergency/Fire: 911** | |
| **Medical Facility:**<br>Morristown Memorial Hospital<br>Madison Ave.<br>Morristown, NJ | 973-971-7100 |
| **STERIS Isomedix:**<br>Senior Manager, Radiation Safety Officer: Jon Young | 973-579-2493<br>973-651-1168 (Cell) |
| **Duratek Team:**<br>Onsite Project Manager: Larry Grob<br>Offsite CHP/License Radiation Safety Officer: Mark Whittaker<br>Offsite Program Manager: Greg McGinnis<br>ESH/QA: Richard Barrow | 865-481-6328<br>803-758-1898<br>865-425-4562<br>865-425-4567 |

5.6.3.2 Emergency Response

During daily site briefings workers will be reminded of the provisions provided in the event of an emergency associated with the work site.

The following equipment will be available at the site to combat any potential emergencies:

- First-Aid Kit
- Emergency Exits
- Cellular Telephones
- Emergency Contact/Notification List

5.6.3.3 Medical Emergency

If an illness or injury occurs while working within a radiologically controlled area, activities shall be terminated and the affected individual will be given immediate attention. The project manager will ensure that the STERIS Isomedix RSO and the Duratek RSO are informed of any injury or illness.

Personnel will properly survey before exiting a radiologically controlled area unless performance of surveys would interfere with medical treatment or aggravate the individual's condition. If the illness/injury requires immediate attention, steps shall be

taken to ensure that possible contamination on the individual is contained without hindering medical treatment.

The closest medical facility to the work area is Morristown Memorial Hospital, 4.5 miles from the STERIS Isomedix Facility, in Morristown, NJ. A map to the facility and emergency information will be posted at the worksite.

If the potentially contaminated injured individual requires transportation to a clinic or hospital for treatment, a radiation protection technician will accompany the injured person to identify, survey, and monitor for radiological hazards.

Monitoring and release surveys will be conducted and provided to ambulance and/or hospital staff responsible for treating the injury.

Procedures DK-AD-PR-005, "First Notification Procedure," and DK-SH-PR-011, "Recordkeeping of Occupational Injuries and Health," will be completed as required.

5.6.3.4 Fire

In the event of a fire in the controlled areas, the RSO will be notified as soon as practical. Upon arrival of response personnel, the project manager, or designee will advise the person in charge of the responding agency of the location, nature, and identification of possible hazardous materials, and possible risk to response personnel.

Properly trained project personnel may use fire-fighting equipment available on-site to control or extinguish the fire; and/or remove or isolate flammable or hazardous materials, which may contribute to the fire if they believe it is safe to do so.

5.6.3.5 Spills or Leaks

In the event of a spill or a leak, site personnel will:

- Isolate the affected area,
- Minimize exposure to personnel,
- Stop the flow of the spillage if it can be done safely, and
- Begin containment and recovery of the spillage material.

5.6.3.6 Emergency Response for a Transfer of Source Related Incident

The emergency notification requirements will be in accordance with STERIS Isomedix requirements and the notifications required in section 5.6.3 of this plan.

Should an accident occur where the integrity of the basket transfer is compromised, the following actions should be taken

1. Immediately place the basket back in the cask as practical
2. If there are sources outside the cask and transfer bell, secure the area.
3. Minimize Exposure to Personnel
4. Establish a recovery plan. The recovery plan will consider immediate needs to minimize the exposure of personnel at the facility and personnel outside the facility, as well as source retrieval.

Attachment 6.2 contains pre-planed responses for the most probable critical emergencies: (1) Dropping a source out of the transfer bell and (2) Crane failure during source transfer or lid placement.

## 5.7 Quality Assurance and Quality Control

Duratek's Quality Assurance/Quality Control Programs ensure that all quality and regulatory requirements are satisfied. Procedures control all activities affecting quality. The following quality control measures are included as an integral part of the survey process.

5.7.1 Selection of Personnel

Project management and supervisory personnel are required to have extensive experience with Duratek procedures and the QA/QC plan and be familiar with the requirements of this Radiation Protection Plan and the Work Plan. Management must have a working knowledge of the instruments and techniques to minimize personnel exposure.

Health physics technicians who will perform the surveys will be selected based upon their qualifications and experience.

5.7.2 Written Procedures

Duratek procedures, this plan, and the work plan will control all survey tasks that are essential to survey data quality and minimization of personnel exposure. A controlled copy of the project procedures will be available on-site.

5.7.3 Instrumentation Selection, Calibration and Operation

Duratek has selected instruments proven to reliably measure Co-60 exposure rates underwater and in air. Duratek will calibrate instruments or make use of qualified vendors under approved procedures using calibration sources traceable to the NIST. All detectors are subject to daily response checks when in use.

Procedures for calibration, maintenance, accountability, operation and quality control of radiation detection instruments implement the guidelines established in American National Standard Institute (ANSI) standard ANSI N323-1978 and ANSI N42.17A-1989.

## 6. ATTACHMENTS

6.1 ALARA Checklists and Worksheets from Duratek Procedure CN-AD-019, Chem-Nuclear (CNS) ALARA Policy

6.2 Pre-Planned Emergency Responses to the Most Probably Source Handling Emergencies

## Attachment 6.1 - ALARA Checklists and Worksheets from Duratek Procedure CN-AD-019, "Chem-Nuclear (CNS) ALARA Policy"

### ALARA CHECKLIST

**Project / Activity:** **STERIS Isomedix Co-60 Source Transfer from Storage Cask to Duratek CNS 1-13G & C Casks and Liners**

The Health Physics Manager or Manager/Coordinator should use the checklist for projects dealing with exposure.

| ALARA CHECKLIST | N/A | Y | N | COMMENTS |
|---|---|---|---|---|
| **1. PLANNING** | | | | |
| a. Project/Activity Scope Defined | | X | | |
| b. Schedule Determined | | X | | |
| c. Task Breakdown | | X | | |
| d. Manpower Identified | | X | | |
| e. Equipment Identified | | X | | |
| f. Radiological Survey Data Provided | | X | | |
| **2. DOSE ASSESSMENT** | | | | |
| a. Dose Assessment Completed (Appendix D) | | X | | |
| b. Comparison of Expected Dose to Individual Worker Dose History(s) Completed | X | | | To be completed prior to start of Job |
| c. Dose Goals Set | | X | | |
| d. Dose Goals submitted to RSO | | X | | |
| **3. ALARA Sub Committee Review Completed** | | | | |
| Dosimetry approval to be issued | X | | | |
| **4. TRACKING** | | | | |
| a. Compare actual doses to plans and goals | X | | | At completion of job |
| b. Investigate and resolve discrepancies | X | | | At completion of job |
| **5. REVISIONS** | | | | |
| a. Revise plan if radiation data or operations plans change | X | | | |
| b. Revised plan/dose goals approved | X | | | |
| **6. REPORTING** | | | | |
| a. Monthly summary of dose goals vs. actual | | X | | Review after project |
| b. Summary submitted to ASC | X | | | |

## ALARA DESIGN ELEMENTS CHECKLIST

**Project / Activity:** STERIS Isomedix Co-60 Source Transfer from Storage Cask to Duratek CNS 1-13G & C Casks and Liners

| ALARA DESIGN ELEMENTS CHECKLIST | | | N/A | Y | N | COMMENTS |
|---|---|---|---|---|---|---|
| **1.0** | **Equipment Layout / Selection** | | | | | The grapple within the transfer bell used to grab baskets will be designed to fail closed. |
| | 1.1 | Have materials been selected to facilitate decon? | | X | | |
| | 1.2 | Does the design/layout have provisions to prevent crud traps? | X | | | |
| | 1.3 | Have components, e.g. valves, been selected to minimize potential for airborne emissions? | X | | | |
| | 1.4 | Does the layout provide access for operator tours/inspections? | X | | | |
| | 1.5 | Does the layout minimize proximity to high dose rate items? | | X | | |
| | 1.6 | Is the control panel placed in a low dose rate area? | | X | | Use of cameras |
| | 1.7 | Are inspection/test/sample points placed in low dose rate areas? | | X | | Use of mirrors and cameras |
| | 1.8 | Does the design incorporate siphon breaks? | X | | | |
| | 1.9 | Does the design incorporate low point drains? | X | | | |
| **2.0** | **Shielding** | | | | | |
| | 2.1 | Is the source term known? | | X | | |
| | 2.2 | Are ambient radiation levels known? | | X | | |
| | 2.3 | Is shielding sufficient to attain dose rate goals? | | X | | |
| | 2.4 | Has the need for a labyrinth been assessed? | | X | | A 3 foot concrete shield will be used for the cask handlers using the remote camera to provide direction to the crane operator |
| | 2.5 | Are penetrations adequately shielded? | | X | | |
| | 2.6 | Are provisions made for temporary shielding? | | X | | |
| **3.0** | **Isolation/Separation** | | | | | |
| | 3.1 | Are remote readouts used? | | X | | |
| | 3.2 | Are there provisions for control or alarm systems to identify unplanned movements of process material? | | X | | |

| ALARA DESIGN ELEMENTS CHECKLIST | | N/A | Y | N | COMMENTS |
|---|---|---|---|---|---|
| 3.3 | Are remote valve/equipment operators used? | | X | | |
| 3.4 | Are remote handling tools (reach rods, long handled tools) used? | | X | | |
| **4.0** | **Contamination Control** | | | | |
| 4.1 | Are containments (i.e. drip pans, berms) used? | | X | | |
| 4.2 | Are secondary spill control systems needed? | | | X | |
| 4.3 | Do high-pressure flanges have spray deflectors? | X | | | |
| 4.4 | Are HEPA filters and/or charcoal used on the exhaust in areas which have the potential for airborne? | X | | | |
| 4.5 | Are pressure gradients and airflows such that air flows from low to high contamination areas? | X | | | |
| 4.6 | Are there provisions for chemical cleaning of the system? | X | | | |
| 4.7 | Are there provisions to vent, drain, flush, or rinse the system? | X | | | |
| 4.8 | Does the design incorporate features to reduce the potential for cross-contamination of clean systems? | X | | | |
| 4.9 | Are there provisions for secondary containment of process liquids, i.e. ability to transfer materials to secondary containments? | X | | | |
| **5.0** | **Maintenance** | | | | |
| 5.1 | Is there sufficient space for maintenance? | | X | | |
| 5.2 | Are there provisions to remove items to a low dose area for maintenance? | X | | | |
| 5.3 | Have provisions been made for quick disconnect/connect of hoses, pumps, or other expected replacement items? | | X | | |
| 5.4 | Are appropriate spare parts available? | | X | | |

**Manager/Coordinator** _____ Date _____

## DOSE ASSESSMENT WORKSHEET

**Project / Activity: STERIS Isomedix Co-60 Source Transfer from Storage Cask to Duratek CNS 1-13G & C Casks and Liners**

**Occupational Exposure - Dose Estimate for Removal and Packaging of Co-60 Sources at STERIS Isomedix**

| Evolution | Workers | Number Exposed | Exposure Time (min) | Exposure Rate (mR/hr) | Dose (mrem) | Comments |
|---|---|---|---|---|---|---|
| 1 Remove bolts from STERIS Isomedix storage cask lid | Cask Handler | 2 | 10 | 1.5 | 0.5 | |
| | HP Tech | 1 | 10 | 1.5 | 0.25 | |
| 2 Remove lid from storage cask | Crane Operator | 1 | 1 | 0 | 0 | 120 feet from cask |
| | Cask Handler | 1 | 1 | 0 | 0 | 80 feet from cask behind 8" concrete wall |
| 3 Remove plug from storage cask | Cask Handler | 2 | 10 | 1.5 | 0.5 | |
| | HP Tech | 1 | 10 | 1.5 | 0.25 | |
| 4 Using transfer shield hook top basket (1,090 Ci) in storage cask, hoist basket into transfer shield, close shield bottom gate. | Cask Handler | 1 | 1 | 248 | 4.13 | 2 feet from transfer shield |
| | HP Tech | 1 | 1 | 248 | 4.13 | 2 feet from transfer shield |
| 5 Using transfer shield for 1,090 Ci basket, open shield bottom gate, lower basket into liner in storage cask, unhook basket. | Cask Handler | 1 | 1 | 248 | 4.13 | 2 feet from transfer shield |
| 6 Crane operations during movement of 1,090 Ci basket, move transfer shield over storage cask, move transfer shield to shipping cask, temporarily set lid on cask. | Crane Operator | 1 | 6 | 2.5 | 0.25 | 120 feet from transfer bell |
| | Cask Handler | 1 | 6 | 0.5 | 0.05 | 80 feet from transfer bell behind 8" concrete wall |
| 7 Using transfer shield hook bottom basket (2,730 Ci) in storage cask, hoist basket into transfer shield, close shield bottom gate. | Cask Handler | 1 | 1 | 587 | 9.78 | 2 feet from transfer shield |
| | HP Tech | 1 | 1 | 587 | 9.78 | 2 feet from transfer shield |
| 8 Using transfer shield for 2,730 Ci basket, open shield bottom gate, lower basket into liner in storage cask, unhook basket. | Cask Handler | 1 | 1 | 587 | 9.78 | 2 feet from transfer shield |

## DOSE ASSESSMENT WORKSHEET

**Project / Activity: STERIS Isomedix Co-60 Source Transfer from Storage Cask to Duratek CNS 1-13G & C Casks and Liners**

**Occupational Exposure - Dose Estimate for Removal and Packaging of Co-60 Sources at STERIS Isomedix**

| | Evolution | Workers | Number Exposed | Exposure Time (min) | Exposure Rate (mR/hr) | Dose (mrem) | Comments |
|---|---|---|---|---|---|---|---|
| 9 | Crane operations during movement of 2,730 Ci basket, move transfer shield over storage cask, move transfer shield to shipping cask, temporarily set lid on cask. | Crane Operator | 1 | 6 | 6.1 | 0.61 | 120 feet from transfer bell |
| | | Cask Handler | 1 | 6 | 1.3 | 0.13 | 80 feet from transfer bell behind 8" concrete wall |
| 10 | Encapsulate sources in liners with grout (remove lid from 1,090 Ci cask, place grout in both liners) | Cask Handler | 2 | 60 | 1.2 | 2.4 | 1 foot from cask, monitor by video |
| | | HP Tech | 1 | 60 | 1.2 | 1.2 | 1 foot from cask, monitor by video |
| 11 | Reposition cask lids on casks | Crane Operator | 1 | 20 | 0 | 0 | 120 feet from cask |
| | | Cask Handler | 1 | 20 | 1.3 | 0.43 | contact with cask part of time |
| | | HP Tech | 1 | 20 | 1.3 | 0.43 | contact with cask part of time |
| 12 | After grout cures remove cask lid and verify no standing water | Crane Operator | 1 | 5 | 0 | 0 | 120 feet from cask |
| | | Cask Handler | 1 | 6 | 1.3 | 0.13 | video inspection |
| | | HP Tech | 1 | 6 | 1.3 | 0.13 | video inspection |
| 13 | Install liner lid and cask lid, transfer cask onto the truck, install the impact limiter and survey | Crane Operator | 1 | 20 | 0 | 0 | 120 feet from cask |
| | | Cask Handler | 2 | 20 | 1.3 | 0.87 | contact with cask part of time |
| | | HP Tech | 1 | 40 | 1.3 | 0.87 | contact with cask part of time |
| | | | | | **Total Job Dose (mrem)** | **50.8** | |

**Prepared by** Paul Ely **Date:** 6/1/06

**Manager/Coordinator** _____ **Date:** _____

**HPM/RSO** _____ **Date:** _____

## ALARA OPTIMIZATION CHECKLIST

**Project / Activity** **STERIS Isomedix Co-60 Source Transfer from Storage Cask to Duratek CNS 1-13G & C Casks and Liners**

| | | N/A | Y | N |
|---|---|---|---|---|
| **I.** | **Equipment Layout / Selection** | | | |
| A. | Can the equipment layout or type/model be modified to: | | | |
| 1. | Decrease installation dose by: | | | |
| | minimizing assembly in radiation areas? | | X | |
| | decreasing installation duration? | | X | |
| 2. | Decrease operational dose by: | | | |
| | increasing distance from the source? | | X | |
| | modifying equipment for remote handling? | | X | |
| | selecting more efficient equipment? | | X | |
| | relocating control panels? | | X | |
| 3. | Decrease maintenance dose by: | | | |
| | improving equipment access? | | X | |
| | providing for temporary shielding? | | X | |
| | selecting more reliable equipment? | | X | |
| | providing for modular replacements? | X | | |
| | improving decontamination? | | X | |
| B. | Can the equipment location be altered to reduce dose by: | | | |
| 1. | locating equipment in a lower dose rate area? | | X | |
| | decontaminating adjacent equipment/areas? | | X | |
| | adding shielding on existing equipment | | X | |
| | adding shield walls | | X | |
| | | | X | |
| **II.** | **Shielding** | | | |
| A. | Can shielding be added or relocated to reduce operation or maintenance dose? | | X | |
| B. | Can shielding configuration be modified to reduce installation, operation, or maintenance dose? | | X | |

X: These items have been considered and incorporated in the design and planning of the project

## ALARA OPTIMIZATION CHECKLIST (CONTINUED)

**Project / Activity** **STERIS Isomedix Co-60 Source Transfer from Storage Cask to Duratek CNS 1-13G & C Casks and Liners**

| | | N/A | Y | N |
|---|---|---|---|---|
| **III.** | **Installation/Startup** | | | |
| | A. Can installation sequence be modified to reduce dose? | | X | |
| | B. Can a mockup be used for some/all operator training to reduce dose? | | X | |
| | C. Can additional testing be performed to reduce startup duration and reduce dose? | | | X |
| **IV.** | **Operations** | | | |
| | A. Can operational tasks be modified or added to reduce dose? | | X | |
| | B. Can operational sequence be modified to reduce dose? | | X | |
| **V.** | **Other (Discuss details below)** | | | |

**Comments:**

X: These items have been considered and incorporated in the design and planning of the project

**Prepared By** _____ **Date** _____

**Manager/Coordinator** _____ **Date** _____

**HPM** _____ **Date** _____

## Attachment 6.2

## Pre-Planned Emergency Responses to the Most Probable Source Handling Emergencies

### Introduction

For this project, the only emergency scenarios not covered by either the STERIS emergency plans or the Hittman Transportation emergency plans involve the transfer of the sources from the storage cask to the shipping cask. The transfer will be performed utilizing the Duratek Filter Transfer Bell and a standard boom crane as outlined in the Work Plan. The two postulated emergency scenarios are: (1) Material drop from the transfer bell during transfer to the liner/shipping cask and (2) Crane failure during source transfer or cask lid placement.

Emergency Scenarios

(1) Material Drop from the Transfer Bell During Transfer to the Shipping Cask

Postulated Scenario:

During the transfer of the sources from the storage cask to the shipping cask, material is dropped from the Filter Transfer bell. This scenario applies to any material dropped, however it is very unlikely that anything other than a source or the source basket would be dropped. A change in Filter Transfer bells was enacted during the Phase I to Phase II period due to higher than expected exposure rates and the occurrence of a plug existing on the top of the 12-inch basket. The plug was attached to the 12 inch basket. The replacement Filter Transfer Bell has a greater shielding thickness producing lower dose rates external to the Filter Transfer bell surface. It also has a 9-inch thick movable bottom door containing any material within the Filter Transfer bell. Therefore, this emergency is not feasible.

(2) Crane Failure During Source Transfer or Cask Lid Placement

The crane operator for this project is a trained professional subcontracted specifically for this project. Should an emergency situation arise related to the operation of the crane, the crane operator shall take the immediate actions as appropriate based upon his or her training and experience. The operator will be thoroughly briefed regarding the nature of the transfer and "dry-runs" will be performed prior to the actual transfer of the sources.

In addition, all rigging equipment and cables will be certified and tested in accordance with applicable ANSI standards. Due to these engineering and training factors, this scenario will be limited to an unexpected crane stall or shutdown. Catastrophic crane or rigging failure is extremely unlikely and therefore will not be considered.

Postulated Scenario:

The crane stalls, shuts down or one of the functions becomes inoperable during either the source transfer or the installation of the cask or liner lids in a manner that cannot be immediately corrected by the crane operator.

Response:

1. The crane operator shall place the equipment in the safest condition possible.
2. If not apparent, verbally inform all personnel in the work area of the crane failure.
3. Assess the current radiological conditions, notify personnel and evacuate the immediate area if necessary.
4. The project lead shall confer with crane operator, the health physics technician and the plant RSO to determine if any actions can safely be taken to improve the situation in terms of both radiological and/or industrial safety. Possible scenarios/actions include:
    a. If the transfer bell is over the storage cask or shipping cask and the sources are retracted into the transfer bell, lower the sources into that cask.
    b. If the sources are in the transfer bell and not over one of the casks, lower the transfer bell to the ground if possible.
    c. If cask or liner lid cannot be reinstalled due to the crane, consider the use of a forklift to temporarily place one of the lids or another shield object on top of the cask until the crane issue can be resolved.
5. The crane operator shall contact their management to coordinate repairs or replacement of the crane.
6. The project team shall develop recovery plans for immediate actions to secure the work area and recovery plans once the crane is returned to service.

Duratek

CS-WM-PN-003

# WORK PLAN

## FOR

## STERIS ISOMEDIX
## REMOVAL, PACKAGING AND TRANSPORT PREPARATION OF COBALT-60 SOURCES

**Revision 1**

| | | |
|---|---|---|
| Authored By: | Larry Grob, Project Manager | 06-02-06 Date |
| Reviewed By: | Rick Barrow, ESHQA Professional | 6/2/06 Date |
| Reviewed By: | Paul Ely, Radiological Engineer | 06/02/2006 Date |
| Approved By | Greg McGinnis, Program Manager | 6/2/06 Date |

- [ ] New Plan
- [ ] Title Change
- [ ] Plan Revision
- [X] Plan Rewrite

Effective Date 6/6/06

Electronic documents, once printed, are uncontrolled and may become outdated.
Refer to the intraweb or the Document Control authority for the correct revision.

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## TABLE OF CONTENTS

# 1.0 PROJECT DESCRIPTION

## 1.1 Introduction

Duratek will provide on-site management, technical personnel, equipment, and resources to remove and package Cobalt 60 sources from the cobalt storage cask at the STERIS Isomedix facility at 9 Apollo Dr., Whippany, N.J. Specifically, this work will include removal of the sources from the storage cask using a Duratek supplied Filter Transfer Bell and packaging of the Cobalt 60 sources into two Duratek supplied liners within the CNS 1-13G & C casks. The sources will be encapsulated using approved media within the liners. After remote inspection and closing of the liner lid and cask, the CNS 1-13G & C Type B Casks will be reinstalled on their trailers for transportation.

The contents of this plan are applicable to the work activities that will be performed at the STERIS Isomedix facility, and will describe the actions necessary to remove, package, and transport the Cobalt 60 sources. The sources are to be disposed of at the Barnwell Disposal Site in Barnwell SC.

Duratek will implement radioactive material NRC License 39-23004-01 to allow acceptance of the sources for loading into the CNS 1-13G & C Casks and preparation for transportation.

## 1.2 Scope of Work

The scope of work for this project essentially involves a three (3) phase approach:

Phase 1: Equipment and personnel mobilization, Implementation of NRC License, and Work Plans

Phase 2: Removal of the Cobalt-60 sealed sources from the Isomedix cask ISC-1, placement in two disposal liners, preparation for shipment in the CNS 1-13G & C casks, and reinstallation of the casks onto their trailers.

Phase 3: Perform surveys (surveys will be performed in accordance with Duratek procedures outlined within this *Work Plan*) of the transport trailers, equipment and work area at the facility, and then demobilize.

This *Work plan* addresses the overall execution of the project, including clean-up work. During the course of the project, review Attachment 8.1 and 8.2 to ensure that all items have been addressed.

### 1.3 Assumptions

Key assumptions in performance of the work at STERIS Isomedix include:

1.3.1 All Duratek activities will be performed under Duratek's NRC Radioactive Materials License # 39-23004-01.

1.3.2 Total activity of all Co-60 sources does not exceed 4,000 curies of Co-60 as decayed to June 1, 2006.

1.3.3 The plug in the STERIS Isomedix Cask and the baskets are not fastened to the cask in such a manner that they can not be removed easily

1.3.4 The work area will be surveyed and documented prior to Duratek beginning source loading operations.

1.3.5 No Co-60 sources are known to be leaking and no leak testing will be required prior to removal, packaging, transport, and disposal. However due to the longevity of storage, Duratek will encapsulate the sources within the disposal liner with an approved media.

1.3.6 Physical security of the facility during source removal operations will be the responsibility of STERIS Isomedix.

1.3.7 STERIS Isomedix will remove the weld joining the cask lid to body and present the cask Model ISC-1 to the parking lot for source retrieval.

1.3.8 Duratek's source removal schedule and the establishment of radiological protection boundaries during the source removal process will be in accordance with guidelines outlined by STERIS Isomedix as related to site activities and RAMQC guidelines.

1.3.9 STERIS Isomedix will provide dosimetry and dose tracking for the crane operators.

## 2.0 PROJECT ADMINISTRATION

### 2.1 Office Space, Furnishings, Equipment and Utilities

The Steris/Isomedix facility will provide adequate office space, standard utilities such as electrical power, water, air and sanitary facilities.

### 2.2 Staffing Organization

Staffing will consist of the Project Manager, Senior Health Physics/Broker Technician and Cask Technicians. Off–site staffing will consist of Duratek's Program Manager, and the Duratek RSO.

## 2.3 Responsibilities

The following are the responsibilities of the project staff.

STERIS Isomedix Project Manager (RSO)

Responsible for coordination and facilitation of the cobalt source removal project on behalf of STERIS Isomedix.

Responsible for the review, approval and oversight of all radiation safety matters and activities.

Project Manager (Authorized User NRC License)

Responsible for interfacing with the client with regard to project scope, schedule, and cost.

Program Manager (Home Office)

Responsible for providing project management support and evaluation of resources, costs, and provisions of additional support as needed.

Radiation Safety Officer (RSO Home Office)

Responsible for the oversight and implementation of all the activities associated the NRC license.

Senior HP Technician(s)

Responsible for the performance of all surveys, instrument operations, Duratek radioactive sources, and waste packaging.

Cask Technician(s)

Responsible for all activities and requirements associated with moving the sources to the 1-13G-1C & G cask, cask closure and reinstalling the cask onto the trailer.

Broker

The Broker is responsible for ensuring that the radioactive material in the shipment is described and classified properly. He will also confirm that the shipment meets the disposal site Waste Acceptance Criteria. Prior to shipment he prepares the manifest and shipping papers and confirms that the trailer is correctly labeled and identified.

QA/QC Inspector

Perform cask soap bubble leak test on the CNS 1-13C after closure.

## 2.4 Resource Requirements

### 2.4.1 Personnel Qualifications

Project personnel will have experience consistent with similar types of projects. This will include experience with the project instrumentation, equipment, radiological survey protocols, and waste packaging and shipping.

### 2.4.2 Training

All on-site Duratek project working personnel will be Duratek radiation worker qualified under the Duratek training program. On-site personnel will also be trained to the project procedures and plans, site-specific hazards and operations of equipment. All training will be documented and records made available as necessary.

### 2.4.3 Equipment and Instrumentation

Duratek will provide the instrumentation and equipment listed in the following table and maintain the appropriate quality records:

**Table 2-1**
**Duratek Instruments/Equipment**

| Instrument/Equipment |
|---|
| Eberline Beta/Gamma Survey Meter, Model E-520 |
| Eberline Ion Chambers, Model RO-2a |
| Dosimeter Corporation of America Self Reading Dosimeter, |
| Eberline Teletector, Model 6112B |
| Ludlum Scaler with M 43-10-1 Sample Counter, Model 2929 |
| CS-137 Gamma Button Source (if required) |
| TC-99 47mm, Beta Source (if required) |
| Printer |

### 2.4.4 Supplies and Consumables

Duratek will provide consumables, supplies and services for the successful completion of the project.

### 2.4.5 Subcontracts

Vendor services will be utilized on a "purchase order" basis as required.

# 3.0 PROJECT CONTROLS AND MANAGEMENT

## 3.1 Project Schedule

The present scheduled mobilization date is June 22,2006 and the project is expected to last one week. Upon completion of on-site activities, personnel and equipment will be demobilized.

## 3.2 Meetings and Logs

A daily log of activities will be maintained.

## 3.3 Reporting Requirement

Significant findings or activities will be documented in the daily log and verbally reported to the client, on an as discovered daily basis. Any safety concerns will be immediately reported to the client RSO or designee and subsequently documented in the daily log.

## 3.4 Plans and Procedures

Overall project management will be guided through the use of the project plans and procedures. All on-site Duratek personnel will be required to review these plans and procedures and be familiar with their content.

### 3.4.1 Project Plans

The Duratek project plans will consist of a *Health and Safety Plan,* and this *Work Plan.*

The plans will specify the overall project approach and requirements. Approved copies of plans will be maintained on-site and available to all Duratek personnel for reference.

### 3.4.2 Duratek Procedures

Duratek operating procedures will control work related, survey and source management activities. A controlled copy of the project procedures will be issued and maintained on-site. A list of the applicable procedures is provided in Table 3-1.

**Table 3-1**
**Duratek Commercial Projects Operating Procedures**

| Procedure Number | Procedure Title |
|---|---|
| CN-AD-001 | CNS Safety Review Board |
| CN-AD-019 | Chem-Nuclear Systems (CNS) ALARA Policy |
| CN-AD-020 | CNS Health Physics Policy Manual |

| Procedure Number | Procedure Title |
|---|---|
| CP-HP-PG-300 | Personnel Monitoring Program |
| CP-INST-100 | Radiation Protection Instrumentation Program |
| CP-INST-102 | Quality Control of Counting Systems and Portable Counters |
| CP-INST-104 | Calibration and Test Requirements for Radiation Protection Instrumentation |
| CP-INST-204 | Operation of the Eberline RO-7 High Range ION Chamber |
| CP-INST-207 | Operation of the Eberline Ion Chamber Model RO-2/RO-2A |
| CP-INST-208 | Operation of the Model 12 Count Rate Meter |
| CP-INST-209 | Operation of the Model 177 Portable Count Rate Meter |
| CP-INST-211 | Operation of the Eberline BC-4 Portable Beta Counter |
| CP-IN-WI-212 | Operation of the Eberline Teletector 6112B |
| CP-IN-WI-234 | Operation of the Ludlum Model 2929 Dual Channel Scaler |
| CP-IN-WI-248 | Operation of the Eberline Model E-520 Portable Survey Meter |
| CP-RP-208 | Radiation/Hazardous Work Permit |
| CP-RP-301 | Performance of Surveys |
| | Vendor Procedure for the Operation of the Technical Associates CP-MU with Model # DMU-1 High Range Probe |
| DK-AD-PR-002 | Document Control (supercedes CN-AD-002) |
| DK-AD-PR-005 | First Notification Procedure (supercedes CN-AD-005) |
| DK-AD-PR-008 | Condition Reports |
| DK-QA-PG-001 | Quality Assurance Program (supercedes QA-AD-001) |
| DK-QA-PO-001 | Quality Assurance Policy |
| DK-QA-PR-001 | Audits (supercedes QA-AD-011) |
| DK-QA-PR-003 | Vendor Evaluation (supercedes QA-AD-007) |
| DK-SH-PR-021 | Case Management of Occupational Injuries |
| DK-SH-PG-001 | Safety and Health Program |
| DK-SH-PO-001 | Safety and Health Policy |
| DK-SH-PR-004 | Fire Protection |
| DK-SH-PR-011 | Recordkeeping of Occupational Injuries and Illnesses |
| DK-SH-PR-005 | Hazard Communication |
| DK-SH-PR-012 | Personal Protective Equipment |
| DK-SH-PR-015 | Lifting and Rigging |
| DTK-OP-001 | Operating Procedure for Brokering of Hazardous Materials |
| DTK-SF-006 | Portable Electrical Equipment Inspection |
| DTK-SF-008 | Ladder Inspection and Use |
| DTK-SF-009 | Care and Use of Hand Tools and Portable Electric Power Tools |
| DTK-SF-020 | Minimum Industrial Safety Standards |
| FS-RP-001 | Radiological Control Procedure for Field Projects |
| FS-RP-002 | Portable Instrument Procedure for Field Projects |
| | |
| TR-OP-013 | Handling Procedure for Transport Cask Number 1-13G, Certificate of Compliance Number 9216 |
| TR-OP-012 | Handling Procedure for Transport Cask Number 1-13C, Certificate of Compliance Number 9081 |
| QA-TP-004 | Soap Bubble Testing of the Model CNS 1-13C Transportation Cask |

# 4.0 SITE SPECIFIC TASKS

## 4.1 Mobilization

Duratek will mobilize personnel and equipment to the Isomedix facility and will implement NRC Radioactive Material License 39-23004-01to enable the acceptance of the sources for insertion in the liners, loading in the casks and preparation for transport.

### 4.1.1 Onsite Personnel

- Project Manager
- Broker/Health Physics Technician
- Cask Technicians (2)
- Hittman Transport Services
- QA/QC inspector
- Crane operating personal

### 4.1.2 Training

- Isomedix Radiation Safety Program
- Work Plan and supporting procedures
- Health and Safety Plan
- Current radiation worker and HAZWOPER qualifications (excluding the Crane Operator)

### 4.1.3 Project Equipment

- Handling tools
- Duratek designed liners and slings
- Fork Truck (supplied by Isomedix)
- 30 & 200 ton Mobile Crane
- Type B Duratek CNS 1-13G & C Casks (to site as needed in schedule)
- Filter Transfer Bell and lifting equipment
- Remote handling tools
- Magnets, power supplies, and handlers
- Encapsulation equipment and media (Portland cement and sand)
- AOD pump, hoses, fittings and air manifold
- Cameras, lights and video monitoring equipment
- Blocks for temporary berm
- Shield blocks for personnel

## 4.2 Processing Methodology

In consideration of the high activity of the Cobalt within the Isomedix cask Model ISC-1 (~4,000 curies), several design activities have been implemented to ensure the project is conducted safely, within regulatory compliance, and worker radiation exposure maintained As Low As Reasonably Achievable (ALARA). The three main focal points of any ALARA program are: 1) *Time* -minimize the time that a worker is exposed to the high radiation associated with the sources; 2) *Distance* - Maximize the distance between the worker and the sources during transfer of the liner; 3) *Shielding* - Maximize the use of shielding in the construction of the disposal liners, fork truck transfer shield, and air transfer pathway. Different methods that will be utilized for this project to achieve the focal points are:

***Time*** minimization

- Utilizing personnel experienced in the operation of remote handling tools to load the sources into the liners;
- Performing dry runs of the expected high dose events; and
- Establishing check lists to ensure all equipment is operational prior to use.

***Distance*** maximization

- Use of remote handling tools and video system (install video and remote actuation system between the shield wall and the Transfer Bell);
- Utilization of a large capacity crane (200 ton) to maximize the allowable boom angle during cask loading to reduce operator exposure;
- Establishing boundaries including Isomedix security controlled exclusion area to control personnel access during source movement, and cask loading;
- Use of dose rate instrumentation with extension probes to minimize health physics technician exposure during dose rate surveys.

***Shielding*** maximization

- Use of shielded disposal liners (0.5" steel, 3" lead);
- Performing source loading operations within the Filter Transfer Bell;
- Location of crane spotters to allow operator to be positioned behind shielding during source extraction from the Isomedix cask;

### 4.2.1 Setup

Setup activities will be performed during mobilization and refined after the dry runs are completed. The proposed general project location and layout is in the Isomedix parking lot adjacent to the building. The project team will remove the CNS 1-13G & C casks from their trailers and position them next to the Isomedix cask. The three casks will reside inside a bermed area covered with herculite. A piece of herculite will be installed on top of the CNS 1-13G & C casks to protect the cask surface. Camera

and light access will be provided through the top of the Filter Transfer Bell.

A concrete block shield wall will be erected in the parking lot 90 degrees from the crane to provide the crane operator with position information from the crane. An operator will be positioned behind the shielding at a distance to ensure that exposure is ALARA. A second concrete block shield wall will be erected at 90 degrees to the first to provide operator protection. The remote camera system will be installed there to allow different angles of work areas to be viewed remotely and to assist the crane operator during Transfer Bell moves if it is deemed necessary following dry runs. In addition indexing marks between the cask and Transfer Bell will be located at this time.

4.2.2 Dry Run

A dry run associated with the major sub task activities shall be performed. This process is necessary to ensure that exposure is ALARA during the actual performance of these tasks. Prior to the dry run, a pre-job briefing will be given to identify each specific function and location, and the individual responsible for each. As necessary, modifications will be made following completion of the run. If an additional run is necessary, a briefing is required to incorporate any modifications.

Dry runs will consist of the following task associated activities:
Sources will be moved from the storage cask to the fabricated liners located within the CNS 1-13G & C casks using the Duratek Filter Transfer Bell. Each of the two baskets within the storage cask will be moved individually to the fabricated liners using the Transfer Bell. Utilize the checklist.

The general task sequence is:

1. Station the trailer trucks with the CNS 1-13G & C casks in the parking lot where the transfer will be made.
2. Station a mobile crane in the yard.
3. Prepare the transfer area by laying a herculite liner on the designated portion of the parking lot surface.
4. Using the mobile crane remove impact limiter from the CNS 1-13G cask, remove the cask from the trailer and place both in the area designated for the source transfer.
5. Remove the CNS 1-13C cask from the trailer and locate it next to the CNS 1-13G.
6. Stage the grout equipment in a convenient location so that grout transfer into the liner can be accomplished quickly once the sources have been transferred into the liners.
7. A berm of concrete blocks will be assembled around the three casks.

8. Position the Duratek Filter Transfer Bell in the yard with the cameras and lights as needed, secured in place within the bell, around the 1-13G & C casks. Remove the lids from the CNS 1-13G & C casks.
9. Remove the lid from the liner within the CNS 1-13G & C casks.
10. Prepare the area for the transfer.
11. Remove the bolts from the storage cask lid.
12. Using the mobile crane remove the lid from the storage cask.
13. Ensure the transfer bell camera and light are working and the bottom gate is open.
14. Using the mobile crane move the Filter Transfer Bell over the simulated storage cask. Pick up the simulated basket raising it up into the Transfer Bell.
15. Close the bottom gate on the Filter Transfer Bell.
16. Locate the Filter Transfer Bell over the CNS 1-13C.
17. Open the bottom gate on the Filter Transfer Bell.
18. Lower the simulated basket into the liner within the 1-13C cask.
19. When moving the Filter Transfer Bell from the CNS 1-13C carefully extend the pickup winch until enough cable is exposed for it to be cut.
20. Using a bolt cutter simulate cutting the cable.
21. Lower the Filter Transfer Bell and install the air operated vise grip grabber.
22. Move the Filter Transfer Bell onto the simulated storage cask.
23. Lower the grabber and raise the simulated basket into the Filter Transfer Bell.
24. Close the bottom gate on the Filter Transfer Bell.
25. Locate the Filter Transfer Bell over the CNS 1-13G.
26. Open the bottom gate on the Filter Transfer Bell.
27. Lower the simulated basket into the liner within the 1-13G cask and detach vise grip grabber.
28. Remove the Filter Transfer Bell and locate on the Transfer Bell stand.
29. Set up the AOD pump and walk through the mixing of grout media and pumping of media into the liner. It is not necessary to actually pump any encapsulation media but ensure all the electrical, hoses, fittings and material is there.
30. Install the lid back on the CNS 1-13G & C cask per handling procedure

Exposure rates on contact with the Transfer Bell containing approximately 2,730 Ci of Co-60 have been estimated to be 2.6 R/hr.

Each task, particularly those with the potential for the greatest exposure, will be timed for a dose determination. Potential failure modes or those tasks requiring excessive time will be evaluated and possible corrective actions established. Those activities of the dry run deemed critical to the success of the operation will be repeated and modified as necessary to ensure operational success.

The Isomedix RSO will be responsible for identifying and establishing a "Low Rad Area" for operations personnel involved with the project.

At the conclusion of the dry run, a critique will be conducted by those involved for possible modification and/or for improvement to the Work Plan.

4.2.3 Source Transfer

1. Conduct Safety tailgate meeting.
2. Ensure & inspect equipment setup.
3. Check operation of video system and grabbers.
4. Move the Isomedix ISC-1 (storage) cask into the yard area designated for source transfer beside the CNS 1-13G & C Casks. The storage cask will be positioned such that the mobile crane will be able to move the Duratek Filter Transfer Bell from the storage cask to the CNS 1-13G & C casks smoothly with dose to workers ALARA.
5. Check position of Security and monitoring personnel.
6. Remove CNS 1-13G & C Cask lids.
7. Remove lid and plug from Isomedix cask.
8. Using mirror/video system inspect top of sources.
9. Locate Filter Transfer Bell above and to the side of Isomedix cask.
10. Engage the hook to upper basket and plug.
11. Using mirror/video system take up slack on basket until it indicates free.

**Note: Do not lift basket into Transfer Bell before PM/Isomedix RSO indicates all perimeter/security personnel in place and area is secure.**

12. Lift upper basket into Filter Transfer Bell.
13. Close the bottom gate on the Filter Transfer Bell.
14. Move Transfer Bell over CNS 1-13C cask.
15. Open the bottom gate on the Filter Transfer Bell.
16. Carefully lower the 12-inch basket into the liner within the 1-13C.
17. When moving the Filter Transfer Bell from the CNS 1-13C carefully extend the pickup winch until enough cable is exposed for it to be cut.
18. Using a bolt cutter cut the cable and return the basket cable end to the liner.
19. Move the FTB away from the CNS 1-13C, lower the Filter Transfer Bell and install the air operated vise grip grabber
20. Relocate Transfer Bell over Isomedix cask.
21. Lower grabber into cask and engage lower basket.
22. Slowly raise basket into Filter Transfer Bell.
23. Close the bottom gate on the Filter Transfer Bell
24. Reposition Transfer Bell over CNS 1-13G cask.
25. Open the bottom gate on the Filter Transfer Bell
26. Lower basket into liner.
27. Disconnect grabber.
28. Move Transfer Bell to storage location on stand.
29. Using video inspect location of baskets the liners.

30. Mix encapsulation media in proper proportions.
31. Using video slowly pump grout into liners by hand feeding into ½ cubic foot feeder on the end of the hose.
32. When filled to mark, remove pump and hose, clean and store

**Note: Do not install liner lid at this time.**

33. Install CNS 1-13G & C cask lids. Do not torque past 200 ft lbs.
34. Install the impact liner over the CNS 1-13G cask.

4.2.4 Inspection and Closeout

1. After 12 to 16 hours remove the impact limiter and cask lids.
2. Inspect the top of the liner for liquid
3. If liquid exists add some additional cement.
4. Close the liner by installing the lid (no torque requirements)
5. Install the cask lid per procedure.
6. The loaded cask will be reinstalled on the trailer per procedure TR-CP-012 & 013 (latest revision).
7. Prepare cask for shipment

### 4.3 Transportation/Broker Management

The CNS 1-13G & C casks will be used for transporting the sources from the Isomedix facility to Barnwell.

## 5.0 RADIOLOGICAL CONTROLS

Duratek will perform all activities involving radioactive materials consistent with the requirements in the Duratek Radioactive Materials Licenses and STERIS Isomedix Safety Program. Duratek will maintain a copy of the radioactive materials license at the project site for reference.

Daily operations will be performed using Duratek procedures, which are presented in Table 3-1. The table includes Radiological Protection procedures that will be followed to ensure the safe execution of the planned work.

Following the completion of the cask shipment, a radiological survey of the work area will be performed and documented in accordance with Duratek procedures. The work area for survey will include the area around the cask.

## 6.0 DEMOBILIZATION

Upon completing the shipment of the Cobalt-60 sources for disposal, the demobilization phase will commence. Equipment that has come into direct contact of suspect radiological contamination will be surveyed and results documented. If any tools or equipment are contaminated, Duratek may attempt to perform a simple wipe down in order to decontaminate. Should attempts fail to clean the object, as determined by

follow-up survey, or if Duratek elects not to clean the item(s) they will be appropriately packaged and transported to Duratek for future project use or processed for disposal. Also, Duratek or their subcontractor will remove all tools and equipment free of any radiological hazard from the site.

## 7.0 DOCUMENTATION AND RECORDS

Duratek will establish and implement a project related document/records control program to ensure that auditable records and reports are controlled throughout all stages of the project. This program will be conducted in accordance with the Duratek Quality Assurance Program and procedures.

## 8.0 ATTACHMENTS

8.1 Pre-Mobilization Checklist

8.2 On-Site Project Records Checklist

## ATTACHMENT 8.1
## Pre-Mobilization Checklist

**Project Name:** _____

| GENERAL PROJECT | Date Completed | Initials |
|---|---|---|
| Received and reviewed the project proposal | | |
| Identified project work scope and requirements | | |
| Identified project deliverables | | |
| Obtained proper site shipping address | | |
| Set project schedule (Estimated Start Date: _____) | | |

| LICENSE RECIPROCITY | Date Completed | Initials |
|---|---|---|
| Determine the agency with jurisdiction, (Federal/State/Other: _____) | | |
| Initial contact with applicable Regulatory Agency | | |
| Project Work Plan prepared and reviewed | | |
| Reciprocal agreement filed | | |
| Reciprocal agreement approved | | |
| Advanced notification of on-site licensed operations filed | | |

| STAFFING | Date Completed | Initials |
|---|---|---|
| On-site authorized license user(s) (_____) | | |
| Identified staffing requirements and availability | | |
| Completed and submitted staffing request forms | | |
| Identified staff training requirements | | |

| OTHER PLANNING | Date Completed | Initials |
|---|---|---|
| Identified applicable project procedures list | | |
| Obtained records for or scheduled proper personnel training | | |
| Documented prospective evaluation for personnel monitoring requirements | | |
| Arranged for personnel monitoring and completed dosimetry issue forms | | |
| Identified instrumentation requirements and submitted an "Instrument Request" | | |
| Identified all project license and QA records that will be generated | | |
| Identified air sampling requirements (general area, perimeter, environmental) | | |
| Identified RPP requirements (RHWPs, PPE, etc.) | | |
| Identified and documented survey guidelines and release criteria | | |
| Radioactive materials (RAM) inventory, storage, quantities | | |
| RAM Quantities of Concern and additional controls and security | | |
| Identified any shipping support requirements | | |
| Performed **pre-project kick-off meeting**<br>Attendees: _____ _____<br>_____ _____<br>_____ _____ | | |

_____ _____

**Project Manager / Date** **Radiation Safety Officer / Date**

## ATTACHMENT 8.2
## On-Site Project Records Checklist

**Project Name:** _____

| MOBILIZATION RECORDS (Required) | SAT/UNSAT | N/A | Initial |
|---|---|---|---|
| State correspondence and reciprocal agreement | | | |
| Project Work Plan | | | |
| Radiation Safety Guide | | | |
| TN State D&D License and Amendments | | | |
| Project procedures | | | |
| Applicable State or Federal regulations | | | |
| Personnel training records | | | |

| INSTRUMENTATION | SAT/UNSAT | N/A | Initial |
|---|---|---|---|
| Instrument and Source Inventory | | | |
| Instrument and Source Calibration Certificates | | | |
| Chi-Square Tests (signed and reviewed) | | | |
| Baseline Response Test Forms (signed and reviewed) | | | |
| Daily Response Test Forms (signed and reviewed) | | | |
| Instrument Control Charts (signed and reviewed) | | | |

| RHWP's | SAT/UNSAT | N/A | Initial |
|---|---|---|---|
| Job Hazard Analyses | | | |
| RHWP log | | | |
| RHWP Forms (signed and reviewed) | | | |
| RHWP briefing sheets (signed by applicable personnel) | | | |
| RHWP entry logs (completed entry and exit) | | | |

| SURVEYS | SAT/UNSAT | N/A | Initial |
|---|---|---|---|
| Survey log (Routines, Free Release, etc. wt a unique survey numbering system) | | | |
| Surveys properly documented and numbered (signed and reviewed) | | | |
| Sample log | | | |
| Sample Analyses (on-site / off-site) | | | |
| Chain-of-Custody records (samples, waste turn-over) | | | |
| Electronic forms (signed and reviewed to ensure data properly entered) | | | |

| PERSONNEL MONITORING AND AIR SAMPLING | SAT/UNSAT | N/A | Initial |
|---|---|---|---|
| Dosimetry issue forms | | | |
| Air Sampling log with unique A/S numbering system | | | |
| Documented Air Sampling locations | | | |
| Air sampling results | | | |
| Personnel monitoring results (TLD / Bioassay) | | | |

| RADIOACTIVE MATERIALS / WASTE | SAT/UNSAT | N/A | Initial |
|---|---|---|---|
| On-site inventory tracking system | | | |
| Shipping Records | | | |
| Documented RAM shipment receipt | | | |

_____ _____

**Project Manager / Date** **Radiation Safety Officer / Date**