



SHIELD SOURCE INCORPORATED

**2007
ANNUAL COMPLIANCE REPORT**

CNSC LICENCE NSPFOL-12.02/2009

**Shield Source Incorporated
CNSC Licence NSPFOL-12.02/2009
Annual Compliance Report**

Year 2007

Submitted to:

**Canadian Nuclear Safety Commission
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1. Introduction

Shield Source Incorporated is a Class 1B Nuclear Facility possessing a Nuclear Substance Processing Facility Operating Licence NSPFOL-12.02/2009 issued by the Canadian Nuclear Safety Commission. Condition 8.4.1 of this licence requires Shield Source Incorporated to prepare and submit to the Commission an annual report that summarizes the performance of the facility and equipment, personnel radiation exposures, and any changes in the organizational structure.

2. Operational Review

Shield Source Incorporated operates a safe, clean work environment with trained staff using approved procedures and equipment to ensure the safety of the workers and the environment. The facility's ventilation system was maintained in full operational condition with no system failures during 2007.

2.1 Tritium Processing and Assembly

The total quantity of tritium processed at Shield Source Incorporated is reported in Attachment 1. As this information is commercial information, it is classified in a separate document.

Maximum possession quantity for tritium under Shield Source Incorporated's Operating Licence is 18,500 TBq. This total includes both raw tritium and tritium in sealed sources. Shield Source Incorporated did not exceed this limit at any time throughout 2007.

Shield Source Incorporated increased sign assembly production in the 3rd and 4th quarters of 2007, however the amount of tritium processed remained the same. All new processes and materials associated with the increase in production were non-nuclear. Additional storage space for non-nuclear material was acquired from the adjacent business.

All employees at Shield Source Incorporated Plant 1 are considered Nuclear Energy Workers (NEW's), therefore the increase of production at Shield Source Incorporated corresponded to an increase of NEW's. The volume of weekly samples for bioassay increased from 11 to 24 in 2007. Employees of Plant 2 are not considered NEW's and are only required to submit an initial sample for bioassay.

2.2 Equipment

All equipment on-site was calibrated accordingly and a new Liquid Scintillation Counter was purchased, calibrated and placed into operation in September 2007. A proportional counter was re-instated in November 2007 to analyze surface swabs for contamination.

2.3 Non-Compliance

There was one non-compliance incident in 2007 regarding the Packaging and Transport of Nuclear Substances Regulations. Three drums were shipped from Shield Source Incorporated for disposal without the proper labels attached. An incident report was forwarded to the CNSC on March 30 2007, and corrective action was taken by reviewing all shipping regulations with the employees.

3. Production

In accordance with Section IV of the Nuclear Substance Processing Facility Operating Licence-12.02/2009 Shield Source Incorporated:

- a) operated a nuclear substance processing facility in compliance with the documents in Appendix A of the licence;
- b) possessed, transferred, used, processed, managed, and stored nuclear substances that are required for, associated with or arise from the operation of the facility described in (a); and
- c) at no time imported more than 37 TBq without applying for a licence issued by the CNSC to do so.

Shield Source Incorporated has operated in compliance with the conditions set out in Section V of the Nuclear Substance Processing Facility Operating Licence-12.02/2009.

At no time throughout 2007 did Shield Source Incorporated possess more than 18,500 TBq of tritium in the form of sealed or unsealed source material. Unsealed source material was stored on the uranium beds or in the handling volumes of the gas fill rigs. A monthly processing average is reported in Attachment 1. This is considered commercial information and is reported separately.

4. Administrative Changes

A total of 18 employees were hired in 2007, including a full-time quality assurance laboratory technician. The responsibilities of the laboratory technician are to perform bioassay sampling and testing, process the stack samples and monitor surface contamination for the facility and products. The remaining employees were hired as production workers in both nuclear and non-nuclear activities. All employees hired to work with the nuclear activities were given the proper Radiation Safety Training. There were no procedural changes that affected the licensed activities in 2007.

5. Health Physics

During 2007, Shield Source Incorporated maintained a Dosimetry Service License, 08785-6-10.0 for the purpose of providing dosimetry services to the employees and visitors of Shield Source Incorporated.

Dosimetry results were reported for 24 individual staff members to the National Dose Registry in accordance to Section 19 of the Radiation Protection Regulations.

The minimum effective dose for 2007 was 0.003 mSv. The maximum effective dose was 1.97 mSv and the average for 2007 was 0.31 mSv.

Table 1 details the Average, Minimum, Maximum and Collective Annual Effective Dose for Shield Source Incorporated staff for years 2003 through 2007.

Table 1: Annual Effective Dose Comparison

	2003	2004	2005	2006	2007
Average Dose (mSv)	0.51	0.44	0.45	0.19	0.31
Minimum Dose (mSv)	0.04	0.04	0.02	0.03	0.003
Maximum Dose (mSv)	1.57	1.63	1.93	0.76	1.97
Collective Annual Dose (mSv)	5.135	5.257	5.406	2.875	7.13

In 2007, Shield Source Incorporated increased the number of workers from 11 to 24 full time employees. Many employees commenced employment in the 3rd and 4th quarters. The minimum dose reflects the fact that some employees were not present throughout an entire reporting period. Similarly, the increase in the number of employees increases the collective annual dose.

There was one incident in which the action level of 500 Bq/mL was exceeded. Details of the action taken are documented in Shield Source Incorporated 2007 Dosimetry Annual Report.

Table 2: Action Level Exceedance

Action Level	NEW		
	Week 500 Bq/mL	Quarter 2 mSv	Year 5 mSv
Exceeded	Yes	No	No
No. of Times	1	-	-
Cause	Rig Maintenance	-	-

A distribution of the annual effective doses for Shield Source Incorporated workers for 2003 to 2007 are included in Table 3 below. In 2007, one operator and one production personnel had an effective dose between 0.5 and 1.0 mSv. Three operators had an effective dose between 1.0 and 2.0 mSv. No employee received a dose greater than 2.0 mSv. All annual effective doses reported were below the Administrative Limit of 3 mSv and the Action limit of 5 mSv.

Table 3: Distribution of Annual Effective Doses

	2003	2004	2005	2006	2007
Annual Dose	Worker Distribution				
<0.5 mSv	4	9	8	12	19
0.5-1.0 mSv	3	0	2	3	2
1.0-2.0 mSv	3	3	2	0	3
2.0-3.0 mSv	0	0	0	0	0

6. Environmental and Radiological Compliance

Shield Source Incorporated has an environmental protection program that includes continuous stack monitoring of airborne releases to the environment and an Environmental Monitoring Program (EMP) to measure the effects of those releases on the environment.

Surface water, ambient air, milk and vegetation (during harvest time) samples were collected in 2007 by Shield Source Incorporated and sent to an independent third party laboratory for analysis.

The annual EMP report is attached under separate cover for review. This report contains a summary of the environmental monitoring results, including emissions data and critical group dose calculations.

6.1 Surface Contamination Monitoring Program

In 2007, 8625 surface swabs monitoring tritium contamination were performed at Shield Source Incorporated. Routine surface swabs were taken from gaseous tritium light sources (GTLS), signs, packaging, work areas, and scrap material. Non-routine surface swabs were taken if there was reason to believe contamination had occurred, such as a GTLS breakage.

Routine surface swabs for 2007 are summarized in Table 4.

Table 4: Routine Surface Swabs

	# SWABS	# PASS	% SUCCESS
GTLS	3651	3534	96.8
SIGNS	940	926	98.5
PACKAGING	649	648	99.8
WORK AREA	1624	1588	97.8
SCRAP	275	242	88.0

There were 1486 non-routine swabs performed in 2007, with a success rate of 91.0%. These non-routine swabs were comprised of 41% scrap material, 22% receivables and returns, and 37% miscellaneous material.

Non-routine swabs were expected to have a lower success rate because they are only performed if there is reason to believe the material is contaminated.

Shield Source Incorporated receives a wide variety of expired signs to dispose of safely. Expired sign swabs are expected to have a lower success rate because the nature of the incoming material is signs that may have been damaged.

All tested surfaces determined to be unacceptable were thoroughly washed and re-tested until a pass was achieved.

Routine surface swabs were over 96% successful, which indicated good housekeeping conditions.

Surface contamination swabs were analyzed solely by Liquid Scintillation Counting until November 15, 2007. A proportional counter was introduced to analyze surface swabs on November 16, 2007. The proportional counter was employed because Shield Source Incorporated experienced a dramatic increase in the volume of testing. The proportional counter also obtains results faster than the Liquid Scintillation Counter (LSC). The efficiency of the proportional counter is lower than the LSC, therefore, the proportional counter is used only as a pass or fail device. If the surface swab fails in the proportional counter the sample is analyzed by the LSC for verification. The pass limit is set at <39 CPM which accounts for the efficiency of the proportional counter.

7. Facility Effluents

Radiological releases from Shield Source Incorporated's operations to the environment include airborne releases (stack emissions) and contaminated aqueous effluent (wastewater).

Tritium emissions from the facility are measured continuously. A total of 23.3 TBq of Tritium Oxide and 87.7 TBq of Tritium Gas were released to the atmosphere in 2007. These quantities did not exceed the Derived Release Limits (DRLs) as calculated by Golder Associates, Shield Source Incorporated's Action or Administrative Limits. The Environmental Monitoring Program Annual Report summarizes stack emission for 2007.

Wastewater from decontamination processes was collected into two holding tanks, analyzed and then discharged in accordance with the procedure EM2.2, "Effluent Monitoring".

A total of 2.41 GBq of wastewater was released from the Shield Source Incorporated holding tanks, which was well below the liquid effluent release limit of 100 GBq of tritium.

There were no unplanned releases of gaseous or aqueous tritium or any other type of hazardous material from Shield Source Incorporated in 2007.

8. Waste Management

In 2007 there were two shipments of tritium-contaminated waste transferred to a CNSC licensed waste disposal facility. These shipments consisted of two types of waste. Boxes containing compacted waste containing tritium contaminated gloves and paper products packaged as Excepted Package – Limited Quantity of Material, UN2910 and drums containing tritium contaminated waste, GTLS, oils and liquids in absorbent material and spent tritiated parts from machinery that were packaged as Type A Package, Class 7, UN2915.

- Shipment 1 included:
3 drums UN2915 - total volume of 0.21m³ and total activity of 2.85E+1 TBq.
4 boxes UN2910 - total volume of 0.24m³ and total activity of 1.31E-4 TBq.
- Shipment 2 included:
5 drums UN2915 - total volume of 0.35m³ and total activity of 1.08E+2 TBq.
4 boxes UN2910 - total volume of 0.24m³ and total activity of 1.74E-4 TBq.

In 2007 there were four - Excepted Package-Limited Quantity of Material, UN2910 shipments of contaminated glass tube stubs to a CNSC licensed waste handling facility to be compacted and transferred to a CNSC licensed waste disposal facility.

- Shipment 1 included:
7 drums - total volume of 0.49 m³ and total activity of 6.83E-4 TBq
- Shipment 2 included:
9 drums - total volume of 0.63 m³ and total activity of 3.70E-4 TBq
- Shipment 3 included:
10 drums - total volume of 0.70 m³ and total activity of 3.36E-4 TBq
- Shipment 4 included:
10 drums - total volume of 0.70 m³ and total activity of 1.41E-4 TBq

In 2007 there were four - Class 7, UN2915, Type A shipments of tritium GTLS shipped for reuse.

- Shipment 1 included:
28 containers - total activity of 1.06E+3 TBq
- Shipment 2 included:
2 containers - total activity of 2.63E+2 TBq
- Shipment 3 included
7 containers - total activity of 2.40E+2 TBq
- Shipment 4 included:
23 containers - total activity of 8.18E+2 TBq

All shipments were packaged, stored and shipped in accordance with the Transport of Dangerous Goods Regulations, IAEA Safety Standards Series and Regulations for the Safe Transport of Radioactive Material.

9. Updates

9.1 Safety

Shield Source Incorporated held routine safety meetings throughout 2007 in which pertinent safety issues were discussed. Safety policies and procedures were reviewed and updated accordingly. All new employees were trained in the safe handling of tritium and emergency procedures. All security and tritium alarms were checked in 2007.

An associated company of Shield Source Incorporated closed at the end of 2007 in the United States, resulting in an increase of non-nuclear production at Shield Source Incorporated during the last quarter of 2007. The layout of the production area changed slightly, however all nuclear-related modifications were approved by the CNSC.

An air quality test was performed by an independent contractor in 2007; they tested for fumes from adhesive material used during production. It was determined that the adhesive was safe to use, and air quality for the employees was not compromised.

9.2 Fire Protection

Shield Source Incorporated's Fire Protection conditions were reviewed by the CNSC in 2007 [Ref.1]. Revisions were recommended for completion prior to Shield Source Incorporated's re-licensing in 2009. Shield Source Incorporated plans to implement these recommendations within 2008. The fire extinguishers on-site at SSI were inspected by an independent third party on March 9, 2007. All fire extinguishers were found to be up-to-date, and in working order. Monthly on-site fire extinguisher inspections were performed by qualified SSI personnel in 2007.

The annual fire inspection by an independent third party was not completed in 2007, as required by SSI's Licence NSPFOL-12.01/2009. It was overlooked in 2007; however has since been completed. An inspection is scheduled for the earliest convenience of the Fire Inspector. Results of the most recent fire inspection will be forwarded to the CNSC once they are received.

The current Fire Safety Program, PRO7.2-1/2005, was reviewed annually by Shield Source Incorporated staff, and found to be in compliance with SSI's operating licence and internal Quality Control documents.

9.3 Security

An independent security company continues to monitor Shield Source Incorporated through an alarm system that includes motion detectors and door sensors. Motion sensors are present in all locations of the facility which contain nuclear materials. Access doors have sensors to monitor entry into the facility. The security system is checked and recorded daily to ensure proper function. The current Security Program, PRO6.2-2/2006 was reviewed annually by Shield Source Incorporated staff.

9.4 Quality Assurance

Shield Source Incorporated continues to have an effective quality assurance program in place. A new laboratory technician was hired in 2007 to perform sampling and testing of bioassays, surface contamination and stack emissions.

QMP1-0 and QMP2-0 were revised and submitted to the CNSC for review in September 2007. The revision of these documents was based on an overall assessment of the effectiveness of the programs. Improvements were implemented where necessary. Program effectiveness was reviewed according to QMP1.1 and QMP2.1 by multiple members of SSI's management team. It was determined that manuals for all work processes are still pending completion (QMP3). These manuals will be completed in 2008 prior to SSI's application for re-licensing. It was also determined that an external audit is still pending, and has been scheduled for summer 2008.

In compliance with QMP1.1 and QMP2.1, a management self-assessment was completed in the last quarter of 2007. It was determined from the management self-assessment that a more structured system for tracking calibration due dates was necessary. This system has since been implemented. All other areas of management were deemed satisfactory. Management self-assessments will be performed quarterly in 2008.

9.5 Emergency Preparedness

All new employees are trained in emergency preparedness and a certificate of training is retained on file. Shield Source Incorporated has an Emergency Plan PRO8.2-0/2004, which is reviewed annually by staff. The review of PRO8.2-0/2004 determined that no changes were necessary at the time.

9.6 Research and Development

Shield Source Incorporated did not conduct any research and/or development in 2007.

9.7 Waste Management

The continued use of washable protective clothing, boots and floor mats for operators and waste control personnel have reduced the amount of disposable clothing in the contaminated waste stream. All wash water was monitored for tritium contamination and the values calculated with the Facility Effluents.

9.8 Training

Shield Source Incorporated maintains current records of training for each employee. Training programs are specific to each employee and the duties which they perform. Shield Source Incorporated Training Program PRO5.2-0/2004 was reviewed in 2007 and determined to be a complete and comprehensive training guide. Shield Source was in compliance with the training program PRO5.1-0/2004 throughout 2007. Shield Source hired 18 new production staff in 2007, which were all given initial radiation safety training on their first day of employment, consisting of effects and types of radiation, structure of matter, emergency situations and preparedness, and an overview of the bioassay program. A certificate signed by the employee and the RSO of the training completed by each employee is retained on file at SSI. Up to date training certificates are maintained at SSI. Informal job-specific training sessions were held in small groups, and SSI plans to hold similar documented training sessions in 2008.

All outside contractors are paired with a Shield Source employee who is trained in radiation protection and all of SSI's safety procedures.

The Ontario Provincial Police visit SSI annually for a familiarization tour.

Peterborough Fire department is also familiarized annually with SSI during the routine fire inspections.

10. Compliance with Other Regulations

Shield Source Incorporated must maintain compliance with not only the CNSC regulations, but also several international, federal, and provincial regulations.

These regulations include but not limited to the WHMIS, Transportation of Dangerous Goods Regulations (TDG), IAEA Safety Standard Series, Regulations for the Safe Transport of Radioactive Material and IATA Dangerous Goods Regulations. Staff members involved with the packaging, offering for transport and receipt of dangerous goods are given training in accordance with the applicable regulations and are issued certificates accordingly.

The number of employees at Shield Source Incorporated increased to 20 as of November 2007; therefore, we have initialized a Health and Safety Program according to the Canada Labour Code. An outside contractor has been appointed to create a Health and Safety Manual, which will be complete and implemented in 2008. SSI is also taking steps to establish a Health and Safety Committee, in accordance with the Canada Labour Code.

Shield Source Incorporated does not require approval from the Ministry of the Environment for processes and practices undertaken at our facility. The Ministry of the Environment conducts periodic assessments at our facility on an individual topic basis.

11. Public Information Initiatives

Shield Source Incorporated has continued to provide information to the public upon request. Area residents continue to assist with the Shield Source Incorporated environmental monitoring program by providing samples, such as well water and vegetation. Shield Source Incorporated continues to participate in community events and donate to many local charitable organizations.

The Public Information Program utilizes an information pamphlet to be distributed to area residents and workers in and around the Airport Complex. No public concerns have been discussed in 2007.

Shield Source Incorporated is also linked to the City of Peterborough website www.city.peterborough.on.ca through Business and Industry Sector and the Peterborough Chamber of Commerce website www.peterboroughchamber.ca.

Shield Source Incorporated launched our website in 2005 www.shieldsource.com. The website has provided feedback regarding sales, product information and information for the safe return of expired products. Customers and interested parties are able to find information on the website.

12. Future Outlook

Shield Source Incorporated is planning to update our website in 2008 to include more information about the company, our products and our commitments and responsibilities.

Shield Source Incorporated is planning to support an increase in production in the upcoming year, including sign assembly, packaging and shipping. We expect our tritium processing to remain constant during the upcoming year, and we expect that these increases to have little impact on the emissions and environmental.

Additional non-nuclear space will be acquired in mid-summer 2008 within the existing structure. This additional space will enable Shield Source Incorporated to handle the increase of volume of non-nuclear materials.

All rotary head machine equipment, air exchange and stack ventilation systems will be examined by staff and external specialists to help determine any updates required.

Improved processes for methods of cleaning surface contaminated GTLS products and any other materials will be reviewed in 2008. A proposal and procedure will be submitted to CNSC for discussion and approval prior to implementing any processes. These changes may reduce effluent and stack emission numbers.

Shield Source Incorporated is planning to continue our positive relationship with the general public and the City of Peterborough and Shield Source Incorporated is continually committed to respecting and maintaining the surrounding environment.

Attachment 1

**Shield Source Incorporated Tritium Processes 2007
Commercial Information - CONFIDENTIAL**

As requested by the CNSC in the letter dated June 18, 2007, item 4 [Ref. 2], Shield Source Incorporated is reporting our total quantity of tritium processes for 2007. This information is classified commercial information, and is therefore sent in this separate attachment for confidentiality.

References

[1] Letter from CNSC Staff "Shield Source Inc. Future License Fire Protection Conditions. May 23, 2007.

[2] Letter from CNSC Staff "Shield Source Inc. CNSC Staff Acceptance of the 2006 Annual Compliance Report." June 18, 2007.

[3] Letter from Ann Erdman "Please Supply additional information regarding the Annual Compliance Report". April 30, 2008