



SHIELD SOURCE INCORPORATED

**2004  
ANNUAL COMPLIANCE REPORT**

**CNSC LICENCE NSPFOL-12.00/2009**



**Shield Source Incorporated  
CNSC Licence NSPFOL-12.00/2009  
Annual Compliance Report**

**Year 2004**

**Submitted to:**

**Canadian Nuclear Safety Commission  
280 Slater Street, Ottawa, ON K1P 5S9**

**Prepared by:**

---

**Peggy Hirst  
Radiation Safety Officer**

**Approved By:**

---

**Susanne J. Tanney  
General Manager**

**Date: March 30, 2005**

Facility: Shield Source Incorporated  
Licence No: NSPFOL-12.00/2009  
Owner: Mr. R. White  
Reporting Period: January 2004 through December 31, 2004  
Signing Authority: Peggy Hirst  
Title: Radiation Safety Officer  
Address: RR#5 Municipal Airport, Peterborough, On K9J 6X6  
Phone Number: (705) 743-6146  
Facsimile Number: (705) 743-2942  
Email: [phirst@shieldsource.com](mailto:phirst@shieldsource.com)

**TABLE OF CONTENTS**

<b><u>SECTION</u></b>	<b><u>PAGE</u></b>
1. Introduction .....	1
2. Operational Review .....	1
3. Production .....	1
4. Administrative Changes .....	1
5. Health Physics .....	2
6. Environmental and Radiological Compliance .....	3
7. Facility Effluents .....	3
8. Waste Management .....	4
9. Updates .....	4
10. Compliance With Other Regulations .....	5
11. Public Information Initiatives .....	5
12. Future Outlook .....	6

**LIST OF TABLES**

<b><u>TABLE</u></b>	<b><u>PAGE</u></b>
Table 1: Annual Effective Dose Comparison .....	2
Table 2: Administrative Limit Exceedence .....	2
Table 3: Distribution of Annual Affective Doses .....	3

## 1. Introduction

Shield Source Incorporated (SSI) is a Class 1B Nuclear Facility possessing a Nuclear Substance Processing Facility Operating Licence (NSPFOL-12.00/2009) issued by the Canadian Nuclear Safety Commission (CNSC). Condition 8.4.1 of this licence requires SSI to prepare and submit to the Commission an annual report that summarizes SSI's facility and equipment performance, personnel radiation exposures, and any changes in SSI's organizational structure.

This report is written in order to satisfy Condition 8.4.1 of the above mentioned licence.

## 2. Operational Review

SSI's operating licence was renewed on August 1, 2004 for a period of 5 years. SSI continued to revise documentation in support of the operating licence. Action Levels were revised and incorporated into the new licence. A Safety Analysis Report was completed summarizing SSI operations and is now referenced in the new licence.

SSI's Preliminary Decommissioning Plan was approved by CNSC in 2004. SSI is still negotiating the Financial Guarantee.

No new equipment or processes were purchased or implemented in 2004.

## 3. Production

In accordance with Section IV of the Nuclear Substance Processing Facility Operating Licence-12.00/2009 SSI:

- 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.

SSI has operated in compliance with the conditions set out in Section V of the Nuclear Substance Processing Facility Operating Licence-12.00/2009.

At no time through out 2004 did SSI 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 and/or in the handling volumes of the gas fills rigs.

## 4. Administrative Changes

During 2004 there were no changes within the organization including administration and/or procedures that affected licensed activities.

**5. Health Physics**

During 2004, SSI maintained a Dosimetry Service License (08785-6-05.0) for the purpose of providing dosimetry services for the staff and visitors of Shield Source Incorporated.

Dosimetry results were reported for 12 individual staff members to the National Dose Registry in accordance to Section 19 of the Radiation Protection Regulations. At no time in 2004 did an individual’s effective dose exceed SSI’s weekly, quarterly or yearly Action Levels. The minimum effective dose for 2004 was 0.04 mSv. The maximum effective dose was 1.63 mSv and the average for 2004 was 0.44 mSv.

Table 1 details the Average, Minimum and Maximum Annual Effective Dose for SSI staff for years 2000 through 2004.

**Table 1: Annual Effective Dose Comparison**

	2000	2001	2002	2003	2004
Average Dose (mSv)	0.49	0.47	0.44	0.51	0.44
Minimum Dose (mSv)	0.02	0.02	0.02	0.04	0.04
Maximum Dose (mSv)	2.59	1.88	1.74	1.57	1.63

There was one incident however, in which the administrative limit of 100 Bq/mL per week was exceeded due to rig maintenance (see Table 2). Exposure levels were monitored in accordance with QMP2A, “QMS Appendix A, Action Levels and Administrative Limits”. No restrictions of duties were given.

**Table 2: Administrative Limit Exceedence**

Action Level	NEW	Administration/Assembly		Operators	
	Week 100 Bq/mL	Quarter 0.5 mSv	Year 1mSv	Quarter 1mSv	Year 3 mSv
Exceeded	Yes	No	No	No	No
No. of Times	1	-	-	-	-
Cause	Rig Maintenanc e	-	-	-	-

A distribution of the annual effective doses for SSI workers for 2000 to 2004 is included in Table 3 below. In 2004, only operators had a dose exceeding 1 mSv, all other workers remained below 0.5 mSv.

**Table 3: Distribution of Annual Affective Doses**

Annual Dose	No. Of Workers				
	2000	2001	2002	2003	2004
<0.5 mSv	9	8	8	4	9
0.5 – 1.0 mSv	1	1	0	3	0
1.0 – 2.0 mSv	2	2	3	3	3
2.0 – 3.0 mSv	1	0	0	0	0

## 6. Environmental and Radiological Compliance

SSI 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.

Environmental samples were collected monthly by SSI and sent to an external 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.

## 7. Facility Effluents

Radiological releases from SSI 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  $1.73 \times 10^{13}$  Bq of Tritium Oxide and  $9.07 \times 10^{13}$  Bq of Tritium Gas were released to the atmosphere in 2004. These quantities did not exceed the Derived Release Limits (DRLs) as calculated by Golder Associates, SSI's Action Levels (ALs) or SSI's Administrative Limits (AdminLs). The environmental monitoring program annual report summarizes stack emission for 2004.

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

A total of  $2.48 \times 10^9$  Bq of wastewater was released from the SSI holding tanks, which was well below SSI's liquid effluent release limit of 100 GBq of tritium.

## 8. Waste Management

In 2004 there were three shipments of tritium-contaminated waste transferred to a CNSC licensed waste handling facility.

- Shipment 1 included:  
Four boxes containing tritium safety signs packaged as Type A, Class 7, UN2915 and two boxes containing tritium safety signs packaged as Excepted Package, Articles UN2911, with a total volume of 0.36 m<sup>3</sup> and a total tritium activity of 62.80 TBq.
- Shipment 2 included:  
Fifteen boxes containing tritium contaminated gloves and paper products packaged as Surface Contaminated Objects (SCO-1), UN 2913, with a total volume of 1.35 m<sup>3</sup> and a total tritium activity of 0.001 TBq.  
Four boxes containing tritium safety signs packaged as Class 7, Type A Packages, UN2915, with a total volume of 0.36 m<sup>3</sup> and a total tritium activity of 50.82 TBq.
- Shipment 3 included:  
Six cartons compact waste having a total volume of 0.54 m<sup>3</sup> and a total tritium activity of  $5.1 \times 10^{-6}$  packaged as Surface Contaminated Objects (SCO-1) UN2913.  
Eight cartons containing Tritium Safety Signs having a total volume of 0.72 m<sup>3</sup> and a total tritium activity of 43.16 TBq packaged as Type A, Class 7, UN2915 and as Excepted Packages, UN2911.  
Four drums containing contaminated oil, filters and leaking sources with a total volume of 0.28 m<sup>3</sup> and a total tritium activity of 8.07 TBq packaged as Type A, Class 7, UN2915.

In 2004 there were also 2 shipments of expired tritium light sources sold for reclamation.

- Shipment 1 included 37 Class 7, UN2915, Type A packages with a total volume of 2.04 m<sup>3</sup> and a total activity of contained 1270 TBq.
- Shipment 2 included 34 Class 7, UN2915, Type A packages with a total volume of 1.88 m<sup>3</sup> and a total activity of 1108 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

SSI continued to revise the documentation supporting the operation of the facility in 2004. The revised documents included the: Safety Analysis Report, Quality Management Guide,

Quality Management Systems, Training Program, Emergency Preparedness Program, Fire Safety Program, Preliminary Decommissioning Plan, and the Public Information Program.

The Safety Analysis Report, Preliminary Decommissioning Plan and the Public Information Program were approved in 2004.

The Quality Management Guide, Quality Management Systems and the Training Program were revised and are currently under review by CNSC.

SSI is currently revising the Emergency Preparedness Program to include CNSC comments.

CNSC conducted a Fire Protection Inspection in February 2004. CNSC made five recommendations, eleven directives and one action notice in order to improve fire safety. SSI responded to CNSC's recommendations and completed the action notice and six of the eleven directives. SSI is still working to complete all CNSC's comments.

CNSC conducted a Compliance Inspection in June 2004. The inspection resulted in four recommendations. SSI implemented CNSC's recommendations.

In compliance with Regulatory Guide G-129, CNSC requested an ALARA analysis to be conducted of SSI tritium emissions. However SSI decided to revisit the environmental pathway model and examine the key assumptions used in the construction of the model in order to determine if incorporating more realistic assumptions, as opposed to the current conservative assumptions, would affect the doses to the public. It was determined that the use of more realistic assumptions significantly reduced the dose to the critical receptor and therefore greatly reduces the probability of exceeding the 50uSv/year threshold (Regulatory Guide G-129). Therefore, SSI concluded that Regulatory Guide G-129 is being met and an ALARA analysis of tritium emissions was not required. CNSC reviewed SSI's response to their request and forwarded further comments. SSI has responded to CNSC's comments and has forwarded the required information.

There were no security updates in 2004.

## **10. Compliance With Other Regulations**

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

SSI must comply with the requirements of the Transportation of Dangerous Goods Regulations (TDG), IAEA Safety Standard Series, Regulations for the Safe Transport of Radioactive Material, 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 by management.

## **11. Public Information Initiatives**

SSI has continued to provide information to the public upon request. Area residents continue to assist with the SSI environmental monitoring program by providing samples, such as well water, vegetation and milk. SSI also continues to participate in community events and local charitable organizations in order to educate the public the benefits of the products.

The revised PIP 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 at this point.

SSI is also linked to the City of Peterborough Web Site [www.city.peterborough.on.ca](http://www.city.peterborough.on.ca) through Business and Industry, Chamber of Commerce [www.peterboroughchamber.ca](http://www.peterboroughchamber.ca). Currently, this link only gives SSI contact information, however, SSI plans to expand this information in 2005 to include a brief summary of the SSI operation.

## **12. Future Outlook**

SSI continues to examine the idea of a new facility. It is hoped that construction of a new facility to house additional processes will begin in 2004. These processes will not include Tritium manufacturing or assembly at this time. However once these additional processes are implemented (2006), SSI plans to move the Tritium process to the new facility. SSI will be looking to CNSC for the guidance and assistance required to accomplish this task.

SSI plans to continue to research and develop new products in order to explore foreign markets.