QSA Global, Inc.
40 North Avenue
Burlington, MA 01803
Telephone: (781) 272-2000
Toll Free: (800) 815-1383
Facsimile: (781) 273-2216

14 July 2006

Docket 71-9269

Ms. Jill Caverly, Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
One White Flint
Rockville, MD 20852

RE: TAC No. L23950, Supplemental Information for Current Amendment USA/9269/B(U)-96 for the Model 650L Transport Package

Dear Ms. Caverly:

The following is provided in response to your voicemail on 11 July 2006.

1. Enclosed are copies of the radiation profile sheets referenced in Section 5 of the SAR.

2. Tables 5.1a through 5.1c have been revised to correct the table entries.

3. Section 1.1 has been modified to include reference to the IAEA regulations referenced in this SAR.

Enclosed are pages 1-1, 5-1 and 5-2 as well as the cover sheet for the SAR. All other sections of the SAR remain unchanged in Revision 6. Also enclosed is a list of affected pages for this revision of the SAR. Changes to the text of Revision 6 of the SAR addressing items discussed in this letter are indicated by vertical lines in the right hand margin. Should you have any additional questions or wish to discuss this submission, please contact me as shown below.

Sincerely,

Lori Podolak
Product Licensing Specialist
Regulatory Affairs Department

Enclosures:

- SAR Revision 6, Cover page, Pages 1-1, 5-1 and 5-2
- List of Affected Pages
- Radiation Profile Sheets for 650L TP80 and Se-75

WM5501

List of Affected Pages	
Revision 1, 19 November, 1999	Replacement of Appendix A Index; Added Drawing R65006, Revision F to Appendix A.
Revision 2, 31 October, 2000	Replacement of Appendix A Index; Added Drawing R65006, Revision G to Appendix A.
Revision 3, 31 October 2005	Reformatting of the SAR to cover compliance to IAEA TS-R-1 and NRC guidance format. Addition of Se-75 as authorized nuclide.
Revision 4, 6 June 2006	Changes to Sections 1, 2, 5, 7 and 8 to address NRC RAI dated 31 May 2006
Revision 5, 29 June 2006	Changes to pages 5-1, 5-2, 5-5, 5-6 and 7-1.
Revision 6, 14 July 2006	Changes to pages 1-1, 5-1 and 5-2.

Safety Analysis Report

QSA Global Inc.

Model 650L
Type B(U) - 96
Transport Package

14 July 2006

Revision 6

Section 1 - GENERAL INFORMATION

1.1 Introduction

The Model 650L is designed as an industrial radiography source changer and transport package for Type B quantities of special form radioactive material. It conforms to the Type B(U)-96 criteria for packaging in accordance 10 CFR 71, 49 CFR 173, and IAEA Regulations for the Safe Transport of Radioactive Material 1996 Edition (Revised) No. TS-R-1 (ST-1, Revised).

1.2 Package Description

(Reference:

- *10 CFR 71.33*
- *IAEA TS-R-1, paragraph 220 & 807)*

The Model 650L package is constructed in accordance with the drawings included in Section 1.4. The package measures approximately 13 ¼ inches (337 mm) in tall by 10 inches (254 mm) wide by 8 ¼ inches (210 mm) deep. The general package information is shown in Table 1.2a:

Table 1.2a: Model 650L Package Information

Identification	Nuclide	Form	Maximum Capacity[1]	Chemical/ Physical Form	Maximum Content Weight	Maximum Decay Heat[3]	Maximum DU Weight	Maximum Package Weight
650L	Ir-192	Special Form[2] Sources	240 Ci	Metal	< 1 gram	4.8 Watts	44 lbs (20 kg)	90 lbs (41 kg)
	Se-75	Special Form[2] Sources	300 Ci	Metal-Selenide Compound	< 1 gram	1.52 Watts		

[1] Maximum Activity for Ir-192 is defined as output Curies as required in ANSI N432 and 10 CFR 34.20 and in line with TS-R-1 and Rulemaking by the USNRC and the USDOT published in the Federal Register on 26 January 2004.

[2] Special Form is defined in 10 CFR 71, 49 CFR 173, and IAEA TS-R-1.

[3] Maximum decay heat for Ir-192 is calculated by correcting the output activity to content activity. A factor of 2.3 is used for Ir-192 to account for source capsule and self-absorption in this conversion. No corrections are made for Se-75.

1.2.1 Packaging

Except for the shield assembly, fill foam and some components of the lock assembly, all materials of construction are stainless steels. The major components of the package consist of the following:

- Inner and Outer Shells
- Depleted Uranium shield
- Locking assemblies
- Protective Lid

Section 5 - SHIELDING EVALUATION

5.1 Description of Shielding Design

(Reference:

- *USNRC, 10 CFR 71.31*
- *IAEA TS-R-1, paragraph 701 and 702)*

5.1.1 Design Features

The principal shielding in the Model 650L transport package is the depleted uranium shield assembly. In some cases additional supplemental lead shielding is added to the shield assembly as described in the drawings included in Section 1.4.

5.1.2 Summary Table of Maximum Radiation Levels

The tables in this Section include radiation profile data obtained from the 650L packages that were tested to the Normal and Hypothetical Accident Conditions of Transport under Test Plan 80 Report (see Section 2.12.2). The following notes apply to all tables in this section:

Note 1: Transport Index may not exceed 10. The Transport Index is equivalent to the 1 meter reading in mRem per hour (i.e., 5 mRem per hour at 1 meter = a Transport Index of 5.0).

Note 2: The maximum Transport Index based on the mrem per hour readings at one meter from the surface of this package was 0.8. All packages accepted and released for shipment under this Model designation will have a Transport Index less than or equal to 10.

Table 5.1a: Model 650L Test Unit TP80(A) After Normal Transport Testing Summary Table of External Radiation Levels Extrapolated to Capacity of 240 Ci Ir-192 (Non-Exclusive Use)

Normal Conditions of Transport	Package Surface mSv per hour (mrem per hour)			1 Meter from Package Surface mSv per hour (mrem per hour)		
Radiation	Top	Side	Bottom	Top	Side	Bottom
Gamma	0.94 (94)	0.89 (89)	0.94 (94)	0.024 (2.4)	0.008 (0.8)	0.007 (0.7)
Neutron	NA	NA	NA	NA	NA	NA
Total	0.94 (94)	0.89 (89)	0.94 (94)	0.024 (2.4)	0.008 (0.8)	0.007 (0.7)
10 CFR 71.47(a) Limit	2 (200)	2 (200)	2 (200)	0.1 (10)	0.1 (10)	0.1 (10)

Table 5.1b: Model 650L Test Unit TP80(B) After Normal Transport Testing
Summary Table of External Radiation Levels Extrapolated to Capacity of 240 Ci Ir-192
(Non-Exclusive Use)

Normal Conditions of Transport	Package Surface mSv per hour (mrem per hour)			1 Meter from Package Surface mSv per hour (mrem per hour)		
Radiation	Top	Side	Bottom	Top	Side	Bottom
Gamma	0.71 (71)	0.83 (83)	0.83 (83)	0.02 (2.0)	0.008 (0.8)	0.007 (0.7)
Neutron	NA	NA	NA	NA	NA	NA
Total	0.71 (71)	0.83 (83)	0.83 (83)	0.02 (2.0)	0.008 (0.8)	0.007 (0.7)
10 CFR 71.47(a) Limit	2 (200)	2 (200)	2 (200)	0.1 (10)	0.1 (10)	0.1 (10)

Table 5.1c: Model 650L Test Unit TP80(C) After Normal Transport Testing
Summary Table of External Radiation Levels Extrapolated to Capacity of 240 Ci Ir-192
(Non-Exclusive Use)

Normal Conditions of Transport	Package Surface mSv per hour (mrem per hour)			1 Meter from Package Surface mSv per hour (mrem per hour)		
Radiation	Top	Side	Bottom	Top	Side	Bottom
Gamma	0.59 (59)	1.06 (106)	0.59 (59)	0.002 (2.0)	0.008 (0.8)	0.005 (0.5)
Neutron	NA	NA	NA	NA	NA	NA
Total	0.59 (59)	1.06 (106)	0.59 (59)	0.002 (2.0)	0.008 (0.8)	0.005 (0.5)
10 CFR 71.47(a) Limit	2 (200)	2 (200)	2 (200)	0.1 (10)	0.1 (10)	0.1 (10)

Table 5.1d: Model 650L Test Unit TP80(A) After Hypothetical Accident Transport Testing
(9 meter Drop Test and Puncture Bar Test)
Summary Table of External Radiation Levels Extrapolated to Capacity of 240 Ci Ir-192
(Non-Exclusive Use)

Hypothetical Accident Conditions of Transport	1 Meter from Package Surface mSv per hour (mrem per hour)		
Radiation	Top	Side	Bottom
Gamma	0.027 (2.7)	0.010 (1.0)	0.006 (0.6)
Neutron	NA	NA	NA
Total	0.027 (2.7)	0.010 (1.0)	0.006 (0.6)
10 CFR 71.47(a)(2) Limit	10 (1,000)	10 (1,000)	10 (1,000)

SENTINEL TP80(A) - AFTER 1.2M (4 FOOT) DROP TEST

DROP TEST UNIT

SHIELDING PROFILE AND INSPECTION FORM

Model: 650L Serial Number: 2243 Radionuclide: IR192 Max.Capacity: 240 Ci

Shield Data

Shield Heat#:	Mass of Shield: Lbs.	Lot #:

Initial Profile

Source Model: Source SN: Activity: Ci

Survey Inst.: SN: Date Cal.: Date Due:

Surface	Observed Intensity mR/hr	Surface Correction Factor		Adjusted Intensity mR/hr
Top			Capacity Correction Factor:	
Right				
Front				
Left				
Rear				
Bottom				

Inspector: Date: NCR #:

Final Profile

Source Model: 424-9 Source SN: C9252 – 44.8 Ci; C8991 – 107.8 Ci Activity: 202.6 Ci Mass of Device: Lbs.

Survey Inst.: AN/PDR27T SN: SM 392402; 392404 Date Cal.: 8Oct98 Date Due: 8Oct99

MDB 13 Apr. 99

Surface	Observed Intensity mR/hr At Surface	Surface Corr. Factor	Observed Intensity mR/hr At One Meter		Adjusted Intensity mR/hr At Surface	Adjusted Intensity mR/hr At One Meter
Top	80	*N/A	2.0	Capacity Correction Factor: 1.18	94	2.4
Right	40		.6		47	.7
Front	75		.7		89	.8
Left	55		.6		65	.7
Rear	75		.7		89	.8
Bottom	80	↓	.6		94	.7

Inspector: MDBoyd Date: 17March99 NCR #: N/A

Q16-1/1

Comments: * Per WI-009 worksheet

Amersham QSA

SENTINEL TP80(B) - AFTER 1.2M (4 FOOT) DROP TEST

DROP TEST UNIT

SHIELDING PROFILE AND INSPECTION FORM

Model: 6501 Serial Number: 182 Radionuclide: IR192 Max.Capacity: 240 Ci

Shield Data

Shield Heat#:	Mass of Shield: ____ Lbs.	Lot #:

Initial Profile

Source Model: ____ Source SN: ____ Activity: ____ Ci

Survey Inst.: ____ SN: ____ Date Cal.: ____ Date Due: ____

Surface	Observed Intensity mR/hr	Surface Correction Factor		Adjusted Intensity mR/hr
Top			Capacity Correction Factor: ____	
Right				
Front				
Left				
Rear				
Bottom				

Inspector: ____ Date: ____ NCR #: ____

Final Profile

Source Model: 424-9 Source SN: C9222 - 44.8 Ci; CB981 - 107.8 Activity: 202.6 Ci Mass of Device: ____ Lbs.

Survey Inst.: AN/PDR27T SN: SM 392402 Date Cal.: 8Oct98 Date Due: 8Oct99

Surface	Observed Intensity mR/hr: At Surface	Surface Corr. Factor	Observed Intensity mR/hr: At One Meter		Adjusted Intensity mR/hr: At Surface	Adjusted Intensity mR/hr: At One Meter
Top	60	*N/A	1.7	Capacity Correction Factor: 1.18	71	2.0
Right	45		.5		53	.6
Front	70		.7		83	.8
Left	70		.5		83	.6
Rear	65		.7		77	.8
Bottom	70	↓	.6		83	.7

Inspector: MRBoyd Date: 17March99 NCR #: N/A

QI6-1/1

Comments: * Per WI-QQ9 worksheet

Amersham QSA

SENTINEL TP80(c) - AFTER 1.2M (4 FOOT) DROP TEST

DROP TEST UNIT

SHIELDING PROFILE AND INSPECTION FORM

Model: 650L Serial Number: 195 Radionuclide: IR192 Max.Capacity: 240 Ci

Shield Data

Shield Heat#:	Mass of Shield: Lbs.	Lot #:

Initial Profile

Source Model: Source SN: Activity: Ci

Survey Inst.: SN: Date Cal.: Date Due:

Surface	Observed Intensity mR/hr	Surface Correction Factor		Adjusted Intensity mR/hr
Top			Capacity Correction Factor:	
Right				
Front				
Left				
Rear				
Bottom				

Inspector: Date: NCR #:

Final Profile

Source Model: 424-9 Source SN: C9232 – 94.8 Ci; C8981 – 107.8 Activity: 202.6 Ci Mass of Device: Lbs.

Survey Inst.: AN/PDR27T SN: SIM 392402 Date Cal.: 8Oct98 Date Due: 8Oct99

Observed Intensity mR/hr (PDR13 Apr99) | Adjusted Intensity mR/hr

Surface	At Surface	Surface Corr. Factor	At One Meter		At Surface	At One Meter
Top	50	*N/A	1.7	Capacity Correction Factor: 1.18	59	2.0
Right	60		.6		71	.7
Front	40		.4		47	.5
Left	90		.7		106 53	.8
Rear	45		.5		53 (PDR17March99)	.6
Bottom	50	↓	.4		59	.5

Inspector: MDBgd Date: 17March99 NCR #: N/A

QI6-1/1

Comments: * Per WI-QQ9 worksheet

Amersham QSA

SENTINEL TP80(A) - AFTER 9M (30 FOOT) DROP TEST & PUNCTURE TEST

SHIELDING PROFILE AND INSPECTION FORM

Model: 650L Serial Number: 2243 Radionuclide: IR192 Max.Capacity: 240 Ci

Shield Data

Shield Heat#: Mass of Shield: Lbs. Lot #:

Initial Profile

Source Model: Source SN: Activity: Ci

Survey Inst.: SN: Date Cal.: Date Due:

Surface	Observed Intensity mR/hr	Surface Correction Factor		Adjusted Intensity mR/hr
Top			N/A	
Right			Capacity Correction Factor:	
Front				
Left				
Rear				
Bottom				

Inspector: Date: NCR #:

Final Profile

Source Model: 424-9 Source SN: C9274-112.9 ci. C9232-99.1ci Activity: 205.4 Ci Mass of Device: Lbs.

Survey Inst.: AMPDR27T SN: SM392402 Date Cal.: 8Oct98 Date Due: 8Oct99

Surface	Observed Intensity mR/hr: At Surface	Surface Corr. Factor	Observed Intensity mR/hr: At One Meter		Adjusted Intensity mR/hr: At Surface	Adjusted Intensity mR/hr: At One Meter
Top	80	*N/A	2.3	Capacity Correction Factor: 1.16	93	2.7
Right	55		.7		64	.8
Front	80		.9		93	1.0
Left	50		.6		58	.7
Rear	70		.8		81	.9
Bottom	80	↓	.5		93	.6

Inspector: MDBoyd Date: 19 March 99 NCR #: N/A

Q16-1/1

Comments: * Per WI-009 worksheet

Amersham QSA

SENTINEL TP 80(B) After Thermal Test

SHIELDING PROFILE AND INSPECTION FORM

Model: 650L Serial Number: 182 Radionuclide: Ir-192 Max.Capacity: 240 Ci

Shield Data

Shield Heat#: _____ Mass of Shield: _____ Lbs. Lot #: _____

Initial Profile

Source Model: _____ Source SN: _____ Activity: _____ Ci

Survey Inst.: _____ SN: _____ Date Cal.: _____ Date Due: _____

Surface	Observed Intensity mR/hr	Surface Correction Factor		Adjusted Intensity mR/hr
Top			NA	
Right			Capacity Correction Factor: _____	
Front				
Left				
Rear				
Bottom				

Inspector: _____ Date: _____ NCR #: _____

Final Profile total = 213.3

Source Model: 424-9 Source SN: C9313/C9312 Activity: 107.3/106 Ci Mass of Device: 83.6 Lbs.

Survey Inst.: Victoreen Tech 50 SN: B-816-S Date Cal.: 8 Sep 98 Date Due: 8 Sep 99

Surface	Observed Intensity mR/hr At Surface	Surface Corr. Factor	At One Meter		Adjusted Intensity mR/hr At Surface	Adjusted Intensity mR/hr At One Meter
Top			25			28
Right	NA		5			5.6
Front			5	Capacity Correction Factor: 1.125		5.6
Left			7			7.9
Rear			7			7.9
Bottom			1			1.1

Inspector: Catherine Ringma Date: 3-24-99 NCR #: NA

QI6-1/1

Comments: _____

source SN C9313 - 109.3 Ci on 3-22-99 - 107.3 on 3-24-99 cmr
C9312 108 Ci on 3-22-99 - 106 on 3-24-99

Amersham QSA

Total Activity 3-24-99 = 213.3

SENTINEL TP80(c) - AFTER 9M (30 FOOT) DROP TEST & PUNCTURE TEST

SHIELDING PROFILE AND INSPECTION FORM

Model: 650L Serial Number: 195 Radionuclide: IR192 Max.Capacity: 240 Ci

Shield Data

Shield Heat#:	Mass of Shield: Lbs.	Lot #:

Initial Profile

Source Model: Source SN: Activity: Ci

Survey Inst.: SN: Date Cal.: Date Due:

Surface	Observed Intensity mR/hr	Surface Correction Factor		Adjusted Intensity mR/hr
Top			N/A	
Right			Capacity Correction Factor:	
Front				
Left				
Rear				
Bottom				

Inspector: Date: NCR #:

Final Profile

Source Model: 424-9 Source SN: C9274-112.9 ci. C9232-99.1ci Activity: 205.4 Ci Mass of Device: Lbs.

Survey Inst.: AMPDR27T SN: SM392402 Date Cal.: 8Oct98 Date Due: 8Oct99

Surface	Observed Intensity mR/hr: At Surface	Surface Corr. Factor	Observed Intensity mR/hr: At One Meter		Adjusted Intensity mR/hr: At Surface	Adjusted Intensity mR/hr: At One Meter
Top	60	*N/A	1.9		70	2.2
Right	85		.8		99	.9
Front	45		.5	Capacity Correction Factor: 1.16	52	.6
Left	100		.9		116	1.0
Rear	50		.5		58	.6
Bottom	60		.4		70	.5

Inspector: MRBoyd Date: 19 March 99 NCR #: N/A

Q16-1/1

Comments: * Per WT-009 worksheet

Amersham QSA

AEA TECHNOLOGY QSA

SHIELDING PROFILE AND INSPECTION FORM (SPIF)
F-Q-1806-2

Sheet 1 of 1

Shield Data

300

Model: 650L	Serial # 274	Radionuclide: SE-75	Max. Capacity 240 Ci
Shield P/N:	Shield Heat #	Lot #	

Profile Process Data

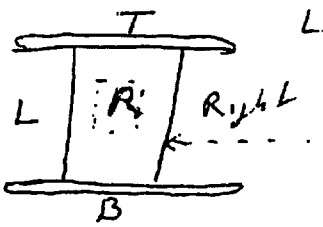
(123.63)

Source Model: 424-25W	Source Ser. # SE1428 SE1429	Radionuclide: SE-75	Activity: 61.03 62.6 Ci
Survey Inst. ND-500 P	Serial # 42363	Date Cal. 3/21/05	Date Due: 3/21/06
Inst. Uncertainty:		Capacity Correction Factor: 2.43	

	Measured Dose Rate mR/hr				Adjusted Dose Rate mR/hr		
Location	At Surface	Surface Corr. Factor	At 30 Cm [Note 1]	At one Meter	At Surface	At 30 Cm [Note 1]	At one Meter
Top	8	NA	NA	.2	19	NA	0.5
Right	5	↓	↓	.1	12	↓	0.2
Front	5	↓	↓	.2	12	↓	0.5
Left	4	↓	↓	.2	10	↓	0.5
Rear	5	↓	↓	.2	12	↓	0.5
Bottom	5	↓	↓	.1	12	↓	0.2
			Acceptance Criteria:		≤ 200	NA	≤ 2.0
			Result: (Check one)	Accept		Reject	

Inspector: _____ Date: 21 Oct 05 NCR # _____

Comments



Label to Front

Right

no Hat

Notes: 1. The 30cm readings are only required when specifically requested.

2. Additional sheets may be used to describe results or indicate reading locations using sketches. Number all sheets and indicate total number of sheets. Make sure shield Identification is included on each sheet.