

Roadmap of Detailed Changes Made to the 435-B SAR from Rev. 4.3 to Rev. 5

This document identifies and summarizes the changes made to the 435-B SAR, Revision 4.3, to create Revision 5. The location and discussion of the principal changes are provided in the table below. Of note, some relatively minor textual changes to the SAR are not listed separately in the table below. However, all changes are marked in the SAR text with revision bars.

The principal purpose for this application is to add several payloads to the approved contents, including a family of lead-shielded Disposal Canisters, a series of shielded irradiator bodies manufactured by Hopewell Designs, Inc., and a large shielded device, the IBL 437. The added payloads result in revisions to structural, thermal, and shielding analyses, as well as changes to the operating procedures.

Some additional, relatively minor changes are also included in this application, as described below:

1. In Chapters 1, 4, and 7, the applicable version for ANSI N14.5 has been changed from 1997 to 2014, in order to use the latest issue of that standard.
2. To enhance the security of the package, the rain shield bolts may be made with security heads. The material, size, and tightening torque of the bolts remains unchanged, and the requirement to use a tamper-indicating lockwire between two adjacent bolts remains unchanged. The only changes made to the SAR in relation to security bolts is to clarify that at least two of them are cross-drilled for the tamper-indicating lockwire, and to remove the designation as socket head cap screws.
3. Radium-bearing sources have been added back into the application. The initial application included radium-bearing sources (both with and without beryllium), but an error in the source term analysis resulted in a very slight error in the neutron source strength. To speed the approval of the Revision 3 and Revision 4 SAR applications, all radium was removed. In Revision 5, the error in the shielding analysis has been corrected and the radium has been again added to the list of approved radionuclides.
4. To facilitate the shipping of the GC-40 shielded device, a change has been made to the orientation in which it is shipped. This makes it easier to handle and to emplace into the IC. Next, to reduce worker exposure, it is no longer required to cut off the lower base weldment, which also facilitates the horizontal shipment. Finally, due to security upgrades that have been made to GC-40 units in the field, it is no longer possible to place the shipping fixture into the device. Due to the design of the device, the shipping fixture is not necessary to ensure that the source remains shielded during shipping. These changes had a very small effect on the shielding analysis and on the operating procedure.

Roadmap of Detailed Changes Made to the 435-B SAR from Rev. 4.3 to Rev. 5

Section Reference	Change	Comment
Section 1.0, Section 1.1, and Section 1.2.1	Integrate the Disposal Canister and large shielded device categories into the discussion.	Update.
Sections 1.1, 1.3.1, 2.12.1, 4.5.1, 7.5.3, and 8.3.1	Change the reference year for ANSI N14.5 from 1997 to 2014.	Update for latest issue of standard.
Section 1.2.1.5	Add descriptions of Disposal Canister lodgment and IBL 437 lodgment.	Update.
Section 1.2.1.6	Add description of Disposal Canister as a source container.	Update.
Section 1.2.2	Add description of the Disposal Canister contents, the Hopewell device contents, and the IBL 437 contents.	Update.
Table 1.2-1	Expand table to include Disposal Canister contents, and add Radium contents.	Update.
Table 1.2-1	Revise footnote 3 to emphasize that the isotopic activities in the table are absolute maximums only, and actual payload configuration must be determined from specified sections of Chapter 7.	Clarification.
Table 1.2-1	Revise footnote 4 to clarify its meaning.	Clarification.
Table 1.2-2	Add IBL 437 information to the table.	Update.
Table 1.2-3	Add table showing activity limits and bounding weight of Hopewell devices.	Update.
Figure 1.2-17 and Figure 1.2-18	Add figures of Disposal Canister and IBL 437 lodgments.	Update.
Figure 1.2-19, Figure 1.2-20, and Figure 1.2-21	Add figures of the Disposal Canisters.	Update.
Figure 1.2-22 and Figure 1.2-23	Add figures of IBL 437.	Update.

Roadmap of Detailed Changes Made to the 435-B SAR from Rev. 4.3 to Rev. 5

Section Reference	Change	Comment
Section 1.3.2	Update glossary.	Update.
Section 1.3.3, Drawing No. 1916-01-01-SAR	Change item description of item No. 6 from “SHCS” to “bolt”.	Facilitates potential application of tamper-resistant security fasteners. See Note 2 above.
Section 1.3.3, Drawing No. 1916-01-01-SAR	Change Flag Note 45 to specify that at least two adjacent bolt heads are cross-drilled.	Facilitates potential application of tamper-resistant security fasteners. See Note 2 above.
Section 1.3.3, Drawing No. 1916-01-04-SAR	Add SAR drawing of Disposal Canister lodgment.	Update.
Section 1.3.3, Drawing No. 1916-01-05-SAR	Add SAR drawing of IBL 437 lodgment.	Update.
Section 2.0 and Section 2.1.1	Editorial updates.	Update.
Section 2.1.3	Revised center of gravity location for lodgment-supported payloads	Update. The change to the location is only 0.5 inches, and will not have a significant effect on the dynamic behavior of the package.
Table 2.1-2 (revised) and Table 2.1-3 (added)	Placed the payload information in a new table for clarity.	Update.
Section 2.7.1.6	Added structural evaluation of Hopewell devices and IBL 437.	Update.
Section 2.7.1.7	Added structural evaluation of lodgments for Disposal Canister and IBL 437.	Update.
Figure 2.7-1 and Figure 2.7-2	Added picture frame for consistency with other figures.	No change to figure contents.
Figure 2.7-3 through Figure 2.7-9	Added depictions of internal arrangement of Hopewell devices.	Update.
Figure 2.7-10 through Figure 2.7-13	Added depictions of internal arrangement of IBL 437.	Update.
Figure 2.7-14 through Figure 2.7-16	Added figures in support of new structural evaluations.	Update.

Roadmap of Detailed Changes Made to the 435-B SAR from Rev. 4.3 to Rev. 5

Section Reference	Change	Comment
Section 3.0	Added discussion of new payloads to introduction.	Update.
Section 3.1.1.2	Added discussion of design features of the IBL 437.	Update.
Section 3.1.1.3	Added discussion of design features of the Disposal Canisters.	Update.
Section 3.1.1.4	Added discussion of design features of the Hopewell devices.	Update.
Section 3.1.2	Added discussion of decay heat of new payloads.	Update.
Section 3.1.3	Specifies the summary tables are bounding for all payloads.	Existing temperatures are bounding over new payload temperatures.
Section 3.2	Expand discussion of material properties.	Update.
Section 3.3.1	Add discussion of new payloads.	Update.
Section 3.4.3.4	Added evaluation of the bounding HAC configuration with the Disposal Canisters.	Accounts for the higher emissivity surface on the Disposal Canisters.
Section 3.4.3.7 and Table 3.4-4	Revised section to include the maximum temperature of the paint on the Disposal Canisters.	Update.
Section 3.5.3.3	Added thermal evaluation of Hopewell devices.	Update.
Section 3.5.5	Added thermal comparison of lodgment supported payloads.	Update.
Section 5.0	Added discussion of new payloads to introduction.	Update.
Section 5.2.2	Added radium-bearing source to discussion of neutron source.	See Note 3 above.
Table 5.2-2	Corrected typographical error in table.	Correction.
Table 5.2-15	Corrected neutron source strength for radium-bearing sources.	Correction.
Table 5.4-2	Corrected maximum quantity of radium allowed in the 435-B.	Correction.

Roadmap of Detailed Changes Made to the 435-B SAR from Rev. 4.3 to Rev. 5

Section Reference	Change	Comment
Table 5.4-6	Added radium sources into table.	Correction.
Section 5.5.3	Revised shielding evaluation of GC-40	See Note 4 above.
Section 5.5.4	Added shielding evaluation of Hopewell devices and IBL 437.	Update.
Section 5.5.5	Added shielding evaluation of Disposal Canisters.	Update.
Section 7.1.1	Step 4, reduce maximum depth of penetration to 2-1/4 inches.	To ensure no contact from bolt ends at bottom of hole (during maintenance only, no change to closure bolts).
Section 7.1.2	Added discussion of new payloads.	Update.
Sections 7.1.2.1, 7.1.2.2, 7.1.2.3, and 7.1.2.4	Revised step #1 in each section to change rain shield attachment fastener designation from “socket head cap screws” to “bolts”.	Facilitates potential application of tamper-resistant security fasteners. See Note 2 above.
Section 7.1.2.1 and Section 7.1.2.2	Revise step #4 in each section.	To improve handling of bell component.
Section 7.1.2.2	Revise step #7.d.	Allow GC-40 to be transported with its axis horizontal. See Note 4 above.
Section 7.1.2.2	Revise step #7.d, combine sub-steps i and ii.	Improve clarity.
Section 7.1.2.2	Revise step #7.d, add sub-step iii.	Control orientation of Hopewell devices in the IC.
Section 7.1.2.2.1	Revise step #3 to include verification of activity.	Improve payload control.
Section 7.1.2.2.2	Move step #3 to step #5.	This action is part of preparing the upper head.
Section 7.1.2.2.2	Revise step #5 and step #11 to include verification of activity.	Improve payload control.
Section 7.1.2.2.2	Revise step #6 and step #13, remove mention of shipping fixture (GC-40).	See Note 4 above.
Section 7.1.2.2.2	Revise steps for preparing the GC-40 upper and lower heads for shipment.	See Note 4 above.

Roadmap of Detailed Changes Made to the 435-B SAR from Rev. 4.3 to Rev. 5

Section Reference	Change	Comment
Section 7.1.2.2.3	Add section for preparing Hopewell devices for transport.	Update.
Section 7.1.2.3	Add section for loading the Disposal Canisters into the 435-B.	Update.
Section 7.1.2.4	Add section for loading the IBL 437 into the 435-B.	Update.
Section 7.1.3	Revise tiedown steps.	Corrects for better accuracy and order of actions.
Section 7.1.3	Inserted a new step #4 that Disposal Canisters must be transported as exclusive use.	Update.
Section 7.1.4.1	Update section heading.	Update.
Section 7.1.5	Added section for loading and preparing the Disposal Canisters for transport.	Update.
Figure 7.1-2	Added figure to support procedural steps related to the IBL 437.	Update.
Table 7.1-1, Table 7.1-2, and Table 7.1-5	Added radium-bearing sources to tables.	Update.
Table 7.1-6, Table 7.1-7, and Table 7.1-8	Added tables specifying activity limits for the Disposal Canisters.	Update.
Table 7.1-9	Added table specifying the basket configurations for the Disposal Canisters.	Update.
Section 7.2.1.1 and Section 7.2.1.2	Revised step #3 to change rain shield attachment fastener designation from “socket head cap screws” to “bolts”.	Facilitates potential application of tamper-resistant security fasteners. See Note 2 above.
Section 7.2.1.1	Added steps for unloading the Disposal Canisters and IBL 437.	Update.
Section 7.2.1.1	Revise tiedown steps.	Corrects for better accuracy and order of actions.
Section 7.2.1.2	Revise tiedown steps.	Corrects for better accuracy and order of actions.

Roadmap of Detailed Changes Made to the 435-B SAR from Rev. 4.3 to Rev. 5

Section Reference	Change	Comment
Section 7.5.1	Added an example for loading of radium-bearing sources.	Update.
Section 7.5.2	Added examples for loading of the Disposal Canisters.	Update.
Chapter 9	AREVA Federal Services changed to Orano Federal Services	Update for new corporate name.
Table 9.2-2	The category “LTSS lodgment” has been broadened to simply “lodgment” to encompass the two new lodgments. There is no change to the quality categories.	Update.