

Table of Changes for BRR SAR Revision 19

The BRR SAR has been updated to create Revision 19. Each change in the SAR document from Revision 18 to Revision 19 is marked by a revision bar on the right-hand side of the page. A summary of these changes and brief reason for change is included below.

Section no. of change	Material changed	Reason for change
Front Matter and Chapter 1		
Table of Contents	Page Number/Section Heading Changes	To match revised page numbers and section headings throughout
1.0	Added new RITC Figures	To accommodate new RITC basket
1.1	Added acronyms	To accommodate new LEU versions of Research Reactor Fuels
1.2.1.1	Clarifying statements about thermal shield stand-offs and name change of Rainier Rubber	Clarification/Update
1.2.1.4	Added new basket description and clarified text	To accommodate new RITC basket
1.2.1.4.7	Section Title change and descriptor change to “irradiated metal canister”	To use a consistent and more clarifying component description
1.2.1.4.8	New section	To accommodate new RITC basket and hardware
1.2.2	Added new basket description and clarified text	To accommodate new RITC basket
1.2.2.1	Added new MURR LEU Fuel Element payload	To accommodate new LEU versions of Research Reactor Fuels
1.2.2.2	Added new MITR-II LEU Fuel Element payload	To accommodate new LEU versions of Research Reactor Fuels
1.2.2.3	Added new ATR LEU Fuel Element payload	To accommodate new LEU versions of Research Reactor Fuels
1.2.2.4 & 1.2.2.5	Added more clarity regarding the fuel length in order to support Section 2.7.1.6 computations	Clarification
1.2.2.8	Descriptor change to “irradiated metal canister”	To accommodate Section 1.2.1.4.7 clarifications
1.2.2.9	New section	To accommodate new RITC basket authorized contents

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1.2.3	Clarifications to incorporate new authorized contents	To accommodate new authorized contents
Tables 1.2-5 and 1.2-6	Title change	To specify that this only applies to existing contents when using the ATR basket
Figure 1.2-21	Caption update	To accommodate Section 1.2.1.4.7 clarifications
Figures 1.2-22 through 1.2-26	Added new figures	To accommodate new RITC basket and hardware
1.3.2	Added new terms/acronyms	To accommodate new RITC basket and hardware
1.3.3	Added new SAR drawing	To accommodate new RITC basket and hardware
Chapter 2		
2.1.1	Clarifications to accommodate new RITC basket and description about thermal shield stand-offs	Clarification/Update and use of new RITC basket
2.1.2	Added new RITC hardware and clarified existing baskets	Clarification/Update and use of new RITC basket
2.1.2.1	Clarifications about fuel baskets	Added more complete description about baskets
2.1.2.2	Clarifications to accommodate new RITC basket and irradiated metal canister	Clarification/Update and use of new RITC basket
2.1.2.3.1	Added information regarding RITC and RITC basket	Updated to incorporate use of new aluminum RITC and RITC basket
2.1.2.3.3	Revised to current Code Case N-284-4 reference and added RITC basket	Revised to N-284-4 which is updated in references Section 2.12.1 and added RITC basket to discussion
2.1.3	Added the equation for package CG determination used in Table 2.1-2	Clarification
2.1.4	Added new RITC hardware and clarified existing baskets	Clarification/Update and use of new RITC basket

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Table 2.1-2	Moved basket info to Table 2.1-3 and updated weight to accommodate higher LEU contents and added RITC basket and contents and revised to include as-fabricated impact limiter weights	To accommodate new authorized contents and clarification on overall weight inputs (slightly lower cask body weight, slightly higher impact limiter weight)
Table 2.1-3	Updated weight to accommodate higher LEU contents and added RITC basket and contents	To accommodate new authorized contents
Table 2.1-4	Added allowable stress limits table for aluminum	To incorporate use of new aluminum RITC and RITC basket
2.2	Added information regarding RITC and RITC basket	Updated to incorporate use of new aluminum RITC and RITC basket
2.2.1	Revised Table reference	Updated to use new aluminum material table for RITC and RITC basket
2.2.2	Added information regarding RITC and RITC basket and removed acronym use for "RAM"	Updated to incorporate use of new aluminum RITC and RITC basket and made clarification
2.2.3	Added word "aluminum"	To incorporate use of new aluminum RITC and RITC basket
Table 2.2-1	Added ASTM A312 and 250°F temperature line	To accommodate new RIT hardware
Table 2.2-7	Added new aluminum material properties table	To incorporate use of new aluminum RITC and RITC basket
2.3.1	Revised to current Code Case N-284-4 reference	Revised to N-284-4 which is updated in references Section 2.12.1, due to new/revised buckling analyses
2.3.2	Added AWS D1.2 aluminum welding code and added new RITC hardware and clarified existing baskets	Clarification/Update and to incorporate use of new aluminum RITC and RITC basket
2.5.1	Revised to include as-fabricated impact limiter weight	Updated to include Table 2.1-2 weights

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2.6.1.1	Added information regarding RIT, RITC and RITC basket and corrected section cross-reference	Correction and to accommodate new RITC basket and hardware
2.6.1.2	Added “fuel, lead” to list of considered components for thermal expansion	Added clarification
2.6.1.2.1	Descriptor change to “irradiated metal canister” and added section on thermal expansion for new RITC basket	To accommodate Section 1.2.1.4.7 clarifications and to accommodate new RITC basket
2.6.1.2.2	Added thermal expansion computation for RIT and fuel contents	To accommodate new RIT
2.6.4	Revised to current Code Case N-284-4 reference	Revised to N-284-4 which is updated in references Section 2.12.1, due to new/revised buckling analyses
2.6.7.1.1	Added Section numbering, revised computation values	For clarity and to accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight
2.6.7.1.2	Added Section numbering, revised computation values	For clarity and revised to accommodate higher MURR LEU fuel weight
2.6.7.1.3	Added Section numbering, revised computation values	For clarity and revised to accommodate higher MURR LEU fuel weight
2.6.7.1.4	Added Section numbering	For clarity
2.6.7.1.5	Added Section numbering, revised computation values and revised to current Code Case N-284-4 reference	Revised to N-284-4 which is updated in references Section 2.12.1 and to accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight
2.6.7.2	Revised computation values	To accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight

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2.6.7.3	Revised computation values	To accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight
Table 2.6-1	Changed column heading	Clarify this is for stainless steel baskets
Table 2.6-4	Changed table caption and updated values	Clarify and revised to N-284-4 which is updated in references Section 2.12.1
Table 2.6-5	Updated value	To accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight
Table 2.6-6	Changed table caption, and revised to current Code Case N-284-4 reference and updated values	Clarify and revised to N-284-4 which is updated in references Section 2.12.1 and accommodate Section 2.6.7.1.5 changes
2.7.1.2.1	Added Section numbering, revised computation values	For clarity and to accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight
2.7.1.2.2	Added Section numbering, revised computation values	For clarity and revised to accommodate higher MURR LEU fuel weight
2.7.1.2.3	Added Section numbering, revised computation values	For clarity and revised to accommodate higher MURR LEU fuel weight
2.7.1.2.4 and 2.7.1.2.5	Added Section numbering	For clarity
2.7.1.2.6	Added Section numbering, revised computation values, and revised to current Code Case N-284-4 reference	For clarity and revised to accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight and revised to N-284-4 which is updated in references Section 2.12.1
2.7.1.2.7	Added Section numbering	For clarity

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2.7.1.3	Revised computation value	To accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight
2.7.1.5.1	Revised section heading, clarified baskets, added heavier LEU fuels	Clarified this is for the stainless steel BRR baskets and revised to accommodate higher MURR and ATR LEU fuel weights
2.7.1.5.2	Corrected table number and section heading cross-references	Editorial update
2.7.1.5.3	Section title and corresponding text changes and clarify for HEU fuel	To specify that this only applies to existing contents when using the ATR basket
2.7.1.5.4	New section	To accommodate new RITC basket and hardware
2.7.1.6	Various clarifications and added heavier ATR LEU fuel resulting in revised computation values	Contextual improvements and to accommodate higher ATR LEU fuel weight
2.7.1.8	Various clarifications and revised computation values	Contextual improvements and to accommodate higher MURR and MITR-II LEU fuel density
2.7.4.1 and 2.7.4.2	Corrected table number cross-reference and added description	Editorial updates
2.7.7	Revised to current Code Case N-284-4 reference	Revised to N-284-4 which is updated in references Section 2.12.1, due to new/revised buckling analyses
2.7.8	Revised to current Code Case N-284-4 reference, moved isotope basket results to Table 2.7-4, added RITC basket references	Revised to N-284-4 which is updated in references Section 2.12.1, due to new/revised buckling analyses and other editorial updates
Table 2.7-1	Applied stress updated	Updated per Section 2.7.1.2.6 revisions
Table 2.7-2	Revised to current Code Case N-284-4 reference, and changed table caption and updated values	Clarify and revised to N-284-4 which is updated in references Section 2.12.1

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Table 2.7-4	Added reference section numbering and updated safety margins	Editorial updates and corresponding section updates to accommodate new authorized contents
Table 2.7-5	Added ATR (LEU) fuel row, clarified note 1 and added notes to fuel types	Accommodate new LEU authorized contents
Table 2.7-8	Revised to current Code Case N-284-4 reference, and changed table caption and updated values	Clarify and revised to N-284-4 which is updated in references Section 2.12.1
Table 2.7-9	Revised to current Code Case N-284-4 reference and updated safety margins	Clarify and revised to N-284-4 which is updated in references Section 2.12.1 and providing corresponding section updates
Appendix 2.12.1	Revised reference 13 and added references 41-44	Revised to N-284-4 and new references needed to support Chapter 2 updates
Appendix 2.12.3 (Section 2.12.3.3)	Updated Note 3 on page 2.12.3-2	Revised to accommodate higher MURR LEU fuel weight
Appendix 2.12.4 (Section 2.12.4.1)	Added ANSYS revisions 19.2 and 2022	Updated to reflect usage of newer versions of the FEA code
Appendix 2.12.4 (Sections 2.12.4.4.3 through 2.12.4.4.11)	Revised computation value	To accommodate Table 2.1-2 slightly lower cask body weight and slightly higher impact limiter weight
Appendix 2.12.4 (Table 2.12.4-1)	Updated Safety margins	To reflect updates in Sections 2.12.4.4.3 through 2.12.4.4.11
Appendix 2.12.4 (Figures 2.12.4-6 through 2.12.4-15)	Figures updated	To reflect updates in Sections 2.12.4.4.3 through 2.12.4.4.11
Appendix 2.12.4 (Figures 2.12.4-18 through 2.12.4-21)	Figures updated	To reflect updates in Sections 2.12.4.4.3 through 2.12.4.4.11
Appendix 2.12.8	Added new RITC hardware and clarified existing baskets	Clarification/Update and use of new RITC basket

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Appendix 2.12.8 (Section 2.12.8.1)	Updated weight to accommodate higher MURR LEU contents	To accommodate new authorized contents
Appendix 2.12.8 (Section 2.12.8.1.1 through 2.12.8.1.3)	Updated weight to accommodate higher MURR LEU contents, revised to current Code Case N-284-4 reference and revised computation values and safety margins	To accommodate heavier LEU MURR fuel contents and revised to N-284-4 which is updated in references Section 2.12.1
Appendix 2.12.8 (Section 2.12.8.2 and Section 2.12.8.2.1)	Updated weight to accommodate higher MURR LEU contents, revised to current Code Case N-284-4 reference and revised computation values and safety margins	To accommodate heavier LEU MITR-II fuel contents and revised to N-284-4 which is updated in references Section 2.12.1
Appendix 2.12.8 (Section 2.12.8.3)	Updated weight to accommodate higher ATR LEU contents	To accommodate new authorized contents
Appendix 2.12.8 (Section 2.12.8.3.1 through 2.12.8.3.3)	Updated weight to accommodate higher MURR LEU contents and revised computation values and safety margins	To accommodate heavier LEU ATR fuel contents
Appendix 2.12.8 (Section 2.12.8.4.3)	Revised to current Code Case N-284-4 reference	Revised to N-284-4 which is updated in references Section 2.12.1
Appendix 2.12.8 (Section 2.12.8.9)	Added RIT, RITC and RITC basket structural calculation section and sub-sections	To accommodate new authorized contents
Appendix 2.12.8 (Section 2.12.8.10)	Added new RITC hardware and clarified existing baskets and revised to current Code Case N-284-4 reference	Clarification/Update and use of new RITC basket
Appendix 2.12.8 (Table 2.12.8-1)	Added RIT with material properties and allowable values to table	Update to use new RIT
Appendix 2.12.8 (Table 2.12.8-2)	Revised to current Code Case N-284-4 reference and updated values	Revised to N-284-4 and revised margins to higher axial stresses because of higher LEU fuel weights
Appendix 2.12.8 (Table 2.12.8-3)	Added new RITC hardware and updated margins due to new LEU fuel weights	To accommodate new authorized contents

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Appendix 2.12.8 (Table 2.12.8-4)	Added table for RITC basket tube buckling results	To accommodate new RITC basket
Chapter 3		
3.0	Clarifications to incorporate new authorized contents	To accommodate new authorized contents
3.1.1.5	Added new cross-references and revised basket number, clarified basket height	To accommodate new RITC basket and that it is aluminum
3.1.2	Added new cross-references and updated fuel descriptions	To accommodate new authorized contents and clarified decay heat values for use in Section 3.1
3.1.3	Updated fuel descriptions	To clarify decay heat values for use in Section 3.1
Table 3.1-1	Updated caption, added footnote 6, updated HAC values	Clarifying this is for HEU fuel, and updated HAC values to include insolation per Section 3.4
Table 3.1-3	Updated fuel descriptions	To clarify this is for HEU fuel
3.2.1	Updated fuel descriptions	To clarify this is for HEU fuel
Table 3.2-2	Updated fuel descriptions	To clarify this is for HEU fuel
3.3.1	Updated fuel descriptions	To clarify this is for HEU fuel
3.3.1.1	Updated fuel descriptions	To clarify this is for HEU fuel
3.3.2	Updated fuel descriptions	To clarify this is for HEU fuel
Tables 3.3-1 through 3.3-3 and 3.3-6	Updated caption and fuel descriptions	To clarify this is for HEU fuel
3.4	Updated fuel description and clarified the bounding thermal payload	To clarify this is for HEU fuel and the bounding payload contents provided the new authorized contents being added
3.4.1	Added NUREG reference and changed analysis to include insolation	To update to current NRC guidance
3.4.2	Changed analysis to include insolation	To update to current NRC guidance

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Section no. of change	Material changed	Reason for change
3.4.3.1 and 3.4.3.2	Updated fuel description	To clarify this is for HEU fuel
Table 3.4-1	Updated temperatures and fuel descriptions	Updated per Section 3.4.3.1 revisions and to clarify this is for HEU fuel
Figures 3.4-1 through 3.4-3	Updated temperatures	Updated per Section 3.4.3.1 revisions
Appendix 3.5.1	Updated References 1, 22, and 23, Added References 46-52	To support Chapter 3 revisions
3.5.3.2 through 3.5.3.4 and 3.5.3.9	Updated Section title and fuel descriptions	To clarify this is for HEU fuel
Tables 3.5-1 through 3.5-3	Updated captions	To clarify this is for HEU fuel
Figure 3.5-16	Editorial correction	Consistency clarification regarding MITR-II fuel description
Table 3.6-1	Editorial update	Grammar update
3.6.5.3	Section cross-reference update	Correction
3.7 and 3.8	Added new sections	To accommodate new authorized contents
Chapter 4		
Appendix 4.5.1	Updated References 2 and 6	Editorial only updates
Chapter 5		
5.0	Clarifications to incorporate new authorized contents	To accommodate new authorized contents
5.1.1	Cross-reference update	Editorial
5.3.1	Cross-reference update and clarification regarding baskets	Editorial and that Section 5.3 only applies to the stainless steel baskets
Appendix 5.5.1	Added References 18 to 21	To support Chapter 5 revisions
Sections 5.7 and 5.7.5	Revised Title of Sections	To specify that this only applies to existing contents when using the ATR basket
Section 5.8 and 5.8.5	Revised Title of Sections	To specify that this only applies to existing contents when using the Irradiated Metal Canister

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5.9 and 5.10	Added new sections	To accommodate new authorized contents
Chapter 6		
6.0	Clarifications to incorporate new authorized contents	To accommodate new authorized contents
6.10 and subsections	Revisions to incorporate new authorized contents (RIT fuel segments)	To accommodate new authorized contents
6.11	Added new section	To accommodate new LEU versions of ATR, MITR-II and MURR fuel authorized contents
Chapter 7		
7.1.2	Added note about fuel types and loading	Clarified irradiated fuel segment payloads are loaded dry and added clarifying statement about HEU/LEU fuel versions
7.1.2.1 and 7.1.2.2	Added optional step 2 and step 25 and renumbered steps and step cross-references in steps 36 and 37	To reduce potential for alignment pin breakage upon lid removal, added the option to remove pin prior to lid removal
7.1.2.2	Editorial in first paragraph and add "RITC" to renumbered cross-reference to step 7	Improve Grammar and corrected step cross-reference, clarify the RITC basket is not used with a pedestal
7.1.2.2	Clarification in renumbered step 15 that the step applies only to irradiated fuel segment contents within the ATR basket	Clarified irradiated fuel segment payload loading for ATR basket only
7.1.2.2	In renumbered step 16, corrected typo in last two sub-bullets numbering sequence	General editorial
7.1.2.2	Added new step 17	Clarified irradiated fuel segment payload loading for RITC basket only

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Section no. of change	Material changed	Reason for change
7.2.2	Added note about unloading RITC basket	Clarified irradiated fuel segment payloads in RITC are unloaded dry
7.2.2.1	Added optional step 4 and step 23 and renumbered steps and step cross-references	To reduce potential for alignment pin breakage upon lid removal, added the option to remove pin prior to lid removal
7.2.2.2	Editorial in first paragraph and renumbered cross-reference to step 10	Improve Grammar and corrected step cross-reference
7.2.2.2	In renumbered step 13, revised to clarify items to remove	Allowed for removal of all RITC basket hardware
7.2.2.2	Added optional step 4 and step 18	To reduce potential for alignment pin breakage upon lid removal, added the option to remove pin prior to lid removal
7.4.1	Revised references 1 to 3	Editorial to remove CFR regulation code years, since not necessary
Chapter 8		
8.1.2	Added AWS D1.2 aluminum welding code and added new RITC hardware and clarified existing baskets	Clarification/Update and to incorporate use of new aluminum RITC and RITC basket
8.2.3.1	Added closure bolt replacement cycle	To accommodate long term use of closure bolts, per section 2.1.2.3.2.1 added a minimum replacement maintenance term
8.2.3.5	Added new section	Clarified maintenance on thermal shield due to routine handling and operations
8.3.1	Revised references 1 and 2, 11 to 17, Added reference 18	Editorial to remove CFR regulation code year and update rubber testing Code Years to current, added aluminum welding code for RITC and RITC basket