

ENCLOSURE

**NUCLEAR ENERGY INSTITUTE (NEI)
SPECIFIC COMMENTS ON DRAFT REVISION TO NUREG-1536, “STANDARD
REVIEW PLAN FOR SPENT FUEL STORAGE CASKS”**

NO.	NUREG-1536 Line No.	COMMENT
1	General	<p>The SRP discusses the content of the Technical Specifications in numerous locations. While the NRC does not have a policy statement on technical specifications for dry cask storage systems, the NRC Final Policy Statement on Technical Specification Improvements for Nuclear Power Reactors, as published in the Federal Register at 58 FR 39132, July 22, 1993, provides useful guidance. The Final Policy Statement discusses, in the Background, the trend towards adding information to the Technical Specifications by stating:</p> <p style="padding-left: 40px;">“... since 1969 there has been a trend towards including in technical specifications not only those requirements derived from the analyses and evaluation included in the plant's safety analysis report but also essentially all other NRC requirements governing the operation of nuclear power plants. ... In the Commission's view, this has diverted both NRC staff and licensee attention from the more important requirements in these documents to the extent that it has resulted in an adverse but unquantifiable impact on safety.”</p> <p>The Final Policy Statement also stated:</p> <p style="padding-left: 40px;">“The purpose of Technical Specifications is to impose those conditions or limitations upon reactor operation necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety by identifying those features that are of controlling importance to safety and establishing on them certain conditions of operation which cannot be changed without prior Commission approval.”</p> <p>A similar philosophy where only those items that have a direct nexus to the protection of the public health and safety from an immediate threat are included in the Technical specifications should be adopted. The guidance to the staff in the draft SRP in regards to Technical Specifications should be revised accordingly.</p>
2	General	<p>The document should state throughout that for canister-based systems the “confinement cask” is the welded canister assembly.</p>

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3	General	In a number of locations, the guidance gets into specifying the details of the ASME Code and other codes. Unless NRC does not accept what the codes require, the guidance should avoid repeating the code details and simply refer to the code at a higher level (e.g., "Section III, Subsection NB").
4	General	Renumbering the chapters in the SRP may create confusion during future licensing actions where the SRP chapters will not coincide with the SAR chapters. Please consider restoring the current SRP revision chapter numbering sequence.
5	34	The statement that ISGs were developed to address changes in requirements differs from the definition of ISGs provided at line 660. This statement should be consistent with line 660 to avoid implying that ISGs impose new requirements as could be interpreted by the current wording.
6	535	Delete "and held in place against lift forces in the core by a retainer mechanism." This does not add to the definition and could be confusing or misleading.
7	542	Editorial: Change "term" to "terms."
8	542 791 1259 4522 4993 6853	Change "containment" to "confinement" to use more storage-specific language.
9	541-542 8319-8320	It is not clear why peak rod average burnup is included in this definition and later in the SRP. Assembly average burnup is typically used for specifying allowable contents and should be sufficient.
10	605-606	Revise definition to account for a DFC that could contain less than one assy (e.g. failed rod basket with 50 rods vs. 264 for an assy) or more than one assy for a consolidated rod can. Suggest "A metal enclosure to confine damaged spent fuel. A damaged fuel can with its damaged spent fuel contents must satisfy ..."
11	667-669	a) M.O.S. is not "identical" to F.O.S. b) "M.O.S" in the first set of parentheses should be "F.O.S." c) Line 669: delete the first occurrence "-1" ,
12	684	In the 2 nd sentence, add "neutron" between "high" and "absorption."
13	687	Suggest deleting "and transporting" because this SRP is exclusively for storage.
14	720	A definition is provided for BPRA at line 532 but definitions are not provided for control element assemblies (CEAs) or thimble plug assemblies (TPAs).

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15	740	While preferential loading is currently used for thermal loading, it is also used for dose reduction and could be used in the future for other reasons (e.g., criticality control). This definition should be more flexible.
16	748-752	The definition of “Ready Retrievability” is incorrect and inconsistent with Section 12.4.5 (lines 11208 – 11219) of the SRP and draft ISG-2 Rev 1 which has been issued by the NRC for comment. The first sentence of this definition is the definition of recovery not retrievability. This definition should be revised and a definition for “recovery” should be added.
17	810	Clarify this definition to say that the supplemental shielding is only ITS if it is credited in the 72.104 dose analysis.

NO.	NUREG-1536 Line No.	COMMENT
18	892-895 2358-2359 6623-6625 7261-7266 7286 7318-7319 7413-7414 7456-7457 11350-11351 11366 11454-11461 11513-11516 11521-11523 11527-11597	<p>The bases for what requirements should be in the CoC or TS provided in these sections are vague, subjective, not risk-informed, and not consistent with practice in NRR (i.e., Part 50 TS). Examples:</p> <p>a) “Any aspect of the design or procedures that the NRC determines should not be changed” (892-895)</p> <p>b) “preclude the possibility of damage to the structure or damage to the confined nuclear material” (2358-2359)</p> <p>c) “any technical aspect of the design which is deemed critical to nuclear safety” (7318-7319)</p> <p>d) whatever “the staff deems necessary” (11350 – 11351)</p> <p>e) “a reviewer deems an item so important” (11366)</p> <p>Given that these casks are loaded and operated at NRC-licensed Part 50 facilities, we suggest SFST adopt a function-based, risk-informed set of criteria for what information belongs in the CoC and TS, similar to 10 CFR 50.36(c) for power reactors, recognizing the passive design and operation of storage casks and modules.</p> <p>In general, the TS should only cover operational items under the user’s control for implementation, and only critical design features under the control of the CoC holder, similar to those in the “Design Features” section of Part 50 TS.</p> <p>Examples of information not appropriate for inclusion in TS: fuel basket dimensions (line 6624); alternate materials and other material requirements (7261-7266, 7456-7457); QA/QC documents, procedures, and test protocols for neutron absorbers (7413-7414); ASME Code information (11454-11461), and training (11521-11523).</p> <p>Including this information only in the FSAR is appropriate based on risk. 72.48 provides adequate controls for determining whether prior NRC approval is required for changes to these items, and the QA program adequately addresses training and manufacturing. It is also a poor practice from a human factors standpoint to incorporate portions of the FSAR into the CoC by reference.</p>
19	1255	Suggest the word “removed” instead of “retrieved”. The damaged fuel container is used to assist in placing and removing damaged fuel from the canister.
20	1259 11524 11527	Editorial: Add “and Limits” to the title of Chapter 13.
21	1540-1541	The operational history parameters need to be reasonable values assumed in the depletion calculations and not bounding values the user must verify that their reactor history meets.

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22	1552-1553	Delete this bullet. "Inerting atmosphere requirements" is not an SNF specification and the maximum number of fuel assemblies is specified two bullets prior.
23	1154-1155	Based on the elimination of the SAR chapter on decommissioning, consider deleting the sentence regarding the planned decommissioning process.
24	1253 1600-1601 2139 2204 2337-2338 2401 (flowchart box for Chapter 12) 2508-2512 3037 3053 8803 9075 11314	These lines are inconsistent with Section 12.4.5. of the draft SRP (lines 11215-11219) and other portions of the SRP which state that retrievability in 10CFR72.122(l) applies only to normal and off-normal conditions and not accident conditions. These lines are also inconsistent ISG-2 Revision 0 and draft ISG-2 Revision 1. Reference to retrievability should be removed in discussions of accident conditions throughout the SRP.
25	1374	Since the NRC is currently working on rulemaking that would change the licensed lifetime of a cask, it is suggested that a reference to the 20 year limit be removed here and throughout the document and that a reference to the regulation be provided instead.
26	1704	Identifying the fuel vendor is not pertinent to the review and should be deleted.
27	1795-1800	"Latent" equipment or instrument failure is a new requirement and does not appear to have a regulatory basis. Typically a single failure of one active component is assumed concurrent with accident events. But most dry cask storage systems are completely passive in design such that single active failures do not occur. It is unclear how, when, and to what extent a "latent" failure needs to be assumed. As it is currently described, the application of latent failures is too subjective (e.g., how many blocked vents should be assumed and for how long before the event?). This concept is inconsistent with Part 50 practice.
28	1913-1917	This paragraph is inconsistent with ISG-5 (for metal casks) and ISG-18 for welded canisters. Non-mechanistic confinement boundary failures are no longer part of the cask design and licensing basis.
29	1992	Editorial: Change "." to ."
30	2041	Change "SNF retrieval" to "retrievability".
31	2110	Change "retrieval capability" to "retrievability".

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32	2271-2280	ANSI/ANS-57.9 is outdated and not germane to many of today's commercial spent fuel systems. Other than the design event classifications, care should be used in referring to this standard for today's DSS designs.
33	2278-2280	Editorial: The last sentence of this paragraph does not appear to be grammatically correct.
34	2308 2626 3085 3501	Some inconsistency is noted regarding the specified Code years. When referring to the ASME code, no code year was mentioned. However, when referring to a non-ASME code, a code year was mentioned. For example, line 2308, IBC code (2006), line 2626, ASTM C33 (2002), line 3085, ANSI/ANS-57.9 (1992), line 3501, ACI 349 (2006). To avoid confusion and permit appropriate flexibility for the applicant, the code year should not be mentioned in the review plan.
35	2340 and 2713	<p>Regarding Line 2340, "This position does not necessarily require that all confinement system and other structures important to safety survive all design-basis accident and extreme natural phenomena without any permanent deformation or other damage" and Line 2713, "The system should not experience any permanent deformation or loss of safety function capability during normal or off-normal operation conditions. However, the system may experience some permanent deformation, but no loss of safety function capability, in response to an accident" please consider the following:</p> <p>Based on the above discussion, elastic-plastic analysis should be allowed to analyze the accident load; however, Line 3168, "to be consistent with the provision in Section III of the ASME code, the analysis should use linear material properties. For materials that do not serve in structural capacity (such as shielding materials), inelastic material properties may be used for cask components that are not stress-limited and respond inelastically to the load conditions for storage casks" implies that only elastic analysis can be used unless you use strain limited criteria. In the past NRC has accepted the use of elastic-plastic properties for all the accident load analyses and stress limited criteria are used per ASME Appendix F.</p>
36	2357-2362	The first sentence of this paragraph seems to indicate that TSs should be in place to preclude possibility of damage to the structure or the confined material during cask handling and operations. The second sentence of the same paragraph seems to indicate that TS should describe the actions and inspections to be conducted upon occurrence of "events" that may cause such damage. These two statements appear to be contradicting each other.
37	2380	Editorial: Add a blank line between lines 2379 and 2380

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38	2612-2640	This section seems to imply that the alternate concrete temperatures described apply only to the steel-lined concrete confinement cask system designed to ACI 359. Similar concrete temperature provisions have been accepted for the NUHOMS HSM type concrete structure designed to ACI 349.
39	2621 8210	Add ASTM C150 as the standard specification for Type II cement.
40	2627	Delete "2002" (edition year of ASTM C33)
41	2729 2735 5908 8889	Change "retrieval" to "unloading" or "removal" as applicable.
42	2879-2882	The passage: "The SAR should identify the maximum response determined. That response should be sufficiently low such that while damage may occur, it would not impair the capability of the component to perform its safety functions" is not clear. What, specifically, is meant by "maximum response"?
43	2885	The third paragraph of the current SRP version has been deleted in this proposed revision to NUREG 1536. The deleted paragraph accepted the fire parameters from Part 71 as a basis for characterizing the fire during storage. Additionally, it accepted spalling of concrete due to fire without further evaluation. It also accepted concrete temperatures that exceeded ACI 349 limits as long as corrective actions are taken for continued safe storage. The revised version does not provide guidance on the structural assessment to fire event. Suggest restoring this paragraph.
44	2962	Line 2962 states that consequences of floods such as damage to access routes, temporary blockage of ventilation passages, etc. "should be identified in the CoC so that a general licensee will be able to consider these factors when sitting an ISFSI". This is a general site characterization issue more appropriate to be addressed in the 212 Report. Generic flooding depth and moving water limits the DSS is designed for should be described in the SAR and the CoC.

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45	3083-3103	Lines 3085-3103 deal with the response of the storage system sitting on a flexible pad and subjected to earthquake loads. It requires that the flexibility of the pad be taken into consideration in the seismic analysis. This is not an appropriate requirement for a system that is licensed to be used under a general license where the system design is based on a design response spectra (e.g. a RG 1.60 response spectra) anchored to a defined maximum acceleration for the horizontal directions and a maximum acceleration in the vertical direction. Each particular user is to ensure as part of their 72.212 evaluation that the system as qualified is adequate for each particular site considering the characteristics of the pad and its response when coupled with the underlying supporting media.
46	3106 12357	RG 1.60 imposes excessive conservatism for seismic evaluations. RG 1.60 should be replaced by NUREG/CR-6728 and also NUREG/CR-6865.
47	3139-3140	The term “confinement casks” is confusing. Should this be “confinement boundary”?
48	3153	In the previous paragraph, Subsection NB is used to define stress qualification for the confinement boundary, which is a pressure retaining boundary. In the paragraph including line 3153 it does not clearly state that the basket is a non pressure retaining boundary, and that the applicant should use Subsection NG. Need to state that Subsection NG is acceptable, or the reader is left to believe that Subsection NB applies to non pressure boundary baskets. It should also confirm that Appendix F is applicable for use with Subsection NG.
49	3168	Although not a change from the existing version of NUREG 1536, this paragraph appears to imply that Section III analysis should be only linear elastic. This section should be clarified to allow elastic-plastic and other non-linear analysis as permitted by the Code. It should state that Subsection NB and Subsection NG do permit the use of Appendix F which does permit the use of inelastic properties for components which serve as the pressure boundary or also non-pressure boundary applications, such as baskets. It should also state that strain-based criteria can be employed for energy-limited accident conditions, provided the applicant provides such basis for its use.
50	3171	In many applications for drop conditions, it should be acceptable to use strain-rate-sensitive properties. Appendix F permits their use. Need to include “strain rate properties, which needs the appropriate references.”
51	3315	Editorial: Delete either “for” or “of.”

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52	3321 3338	Please clarify the trunnion design stress criteria used to compare the stress at the trunnion connection with the cask body at that interface. Regarding Line 3338, “the applicant should evaluate the stresses and forces in the trunnion connections with cask body...”, since the cask body is typically designed per ASME Code Section NB, the NB stress criteria should be used instead of yield and tensile strength. Please clarify.
53	3380	Section 3.5.2 “Other System Components Important to Safety” does not contain the alternate concrete temperatures as listed in Lines 2612-2640 for the steel-lined concrete confinement cask structure.
54	3747	“Appendix C” should read Appendix F for the version year of the ACI 349 that is described in Line 3501.
55	3758	Editorial: “30 ksi” should be “3 ksi.” Also, should the example list include a maximum compressive strength because that value is a limit for drop and tipover analyses?
56	4182-4184	The sentence regarding delivery of electronic media is guidance for the applicant rather than the staff and as such should it may be more appropriate in another document.
57	4302	The discussion about annotation of input files is too broad. It may be important for the reviewer to see and perhaps use the applicant’s files, but it is not necessary to understand all aspects of the input files. Some of these files come from Journal files or Log files which are generated by the program. It is not feasible to add comments to these files. Open ended statements such as adding “annotation” leads to vague expectations by the reviewer for the need of such documentation.
58	4313-4315	Delete these lines. The level of review described here seems to be beyond an audit review and more like a third party validation of the computer analysis. It is the responsibility of the applicant’s QA program to ensure that the analyses are performed correctly.
59	4332	Clarify or delete “mesh type.”
60	4335-4336	A mesh sensitivity study is not required when stress linearization is being used for primary loading. Such detailed studies should be restricted to fatigue evaluations at stress discontinuities.
61	4349	Delete “plots.” Including plots of <u>all</u> results generates an enormous amount of unneeded data in the FSAR.
62	4411	The guidance stating that the decay heat removal system should operate reliably under off-normal and accident conditions is inappropriate given that some of the abnormal and accident conditions themselves involve impairment or loss of the decay heat removal system (e.g., blocked air ducts).

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63	4551	In item (2), it appears that this is an option addressing when fuel cladding temperature <u>does</u> exceed 400°C (i.e., delete “not”). Please clarify.
64	4469-4471	Clarification should be provided for “address, quantify and report the degree of conservatism associated with the proposed models and the resulting safety margin.” This statement is vague. It is unclear what the specific information is requested and to what level of detail.
65	4580	Editorial: Change “on” to “in.”
66	4612	Editorial: add a closing parentheses at the end of the sentence
67	4686-4687	Delete this sentence. It does not appear to add value to the review guidance. Alternatively, clarify why this is only applicable to horizontal basket designs.
68	4768-4770	The SRP requires test data for each thermal effective conductivity. Are correlations from handbooks which are based on test data acceptable? Is test data still a requirement if a CFD sub-model is used to calculate the effective conductivity as specified in Line 4686 to 4687? It is recommended that “from test data” be changed to “from test data, or CFD sub-models, or other appropriate sources”
69	4678-4681	Limiting convection to the outer surface of the cask contradicts already-approved designs that credit convection inside the fuel canister. This is clearly permissible with appropriate justification.
70	4687	Delete the word “robust.” Words like this are vague and subjective, allowing each reviewer to apply his or her personal definition of “robust” in their review and generate RAIs if the model is not “robust” enough.
71	4742	Editorial: Delete misplaced closing parentheses in this line
72	5041	Allowance should be made for a properly scaled mock-up instead of an “as-built cask system” to confirm the thermal analysis.
73	5185-5187	Delete or clarify this sentence. No such “periodic surveillance program” has “typically” been required or performed for stainless steel welded canister confinement systems. Periodic surveillance of the confinement boundary, if any, should only be required case-specifically, if the particular design features of the confinement system require it. Inspections of the air vents or temperature monitoring have been accepted as the sole periodic surveillance.
74	5347-5348	The statement that the monitoring systems are not important to safety <u>and</u> classified as Category B (an ITS class) does not appear to be consistent.
75	5384	Editorial: Change “Review” to “Evaluation.”

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76	5413-5426	This paragraph does not appear to be consistent with ISG-5 and ISG-18 and would only apply to non-welded-canister type confinement systems. Based on NUREG/CR-6397, damaged fuel would not have a driving force to release fines from the fuel matrix. What is the technical or safety issue of concern? What factors are suggested for damaged fuel?
77	5800-5801	"radionuclide content, and estimated radiation source strength in Becquerel's, should be described": This appears to be a new expectation from the NRC. It is not clear what the basis of this request is as radiation source strength in Ci or Bq is not clearly related to gamma/neutron source strength (e.g. beta emitters).
78	5809-5810	"characteristics for each gamma-ray source type should be provided, including isotopic composition, and photon yields": Is a tabulation of spent fuel isotopics requested here? If so, for what purpose? Typically, inputs into depletion analysis are provided, but not isotopics of depleted materials.
79	5813-5814	Within gamma source description "describe extent to which radioactivity may be induced by interactions involving neutron originating in the stored materials": If this implies n-gamma reactions, then the current SRP version is clearer. If activation is to be considered for decommissioning, that should be clarified.
80	5868-5870	Shielding analyses do not need to be "bounding analyses." Applicants need only provide representative dose rates to demonstrate reasonable assurance that the system is capable of meeting the offsite dose limits or 72.104 for an entire ISFSI. (See line 5723 and subsequent text.)
81	5873-5882	High burnup fuel has been licensed for storage on several dockets. There is no indication that high burnup fuel produces substantially high dose rates due to limited validation data. If limited data is available it leaves an open ended question as to how to specify uncertainties. "Conservative assumptions" and "design margins" are not defined, leaving it up to each reviewer when, and how much, in uncertainties to apply. There is no correlation as to how maximum fuel assembly heat load is related to uncertainties - low heat capacity /minimal shield system may be affected by low fuel assembly heat load, and vice versa.
82	5968	Editorial: Change "Principline" to "Principle."
83	5996	Editorial: This line references Figure 6-2 which does not appear in the document and does not exist in the List of Figures. The figure should be added or the reference removed.

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84	6003-6004	"...applicant and the staff should not attempt to establish specific source terms as operating control and limits for cask use.": If this true, why does the SRP focus in the Section 6.4.2 on curie content and isotopic description of the spent fuel? For Cobalt-60 dominated hardware sources, a source term may be more appropriate than other limits (e.g., mass, exposure, cool time).
85	6036	Editorial: Add a close parenthesis at the end of the line.
86	6149-6150	"...homogenization should not be used in neutron dose calculation when significant neutron multiplication can result from moderated neutrons...": While not changed from the current SRP, it should be noted that standard, NRC-approved, practice is to homogenize the rod lattice in shielding calculations (not necessarily homogenizing basket structure into the fuel region).
87	6188	Editorial: Change "Evakuation" to "Evaluation."
88	6221-6222	"The reviewer should be aware that often adjoint calculations are performed by the applicant ... importance functions..." Review staff should recognize that importance functions may also be produced with Monte Carlo, point-kernel and transport codes.
89	6246-6248	"The applicant should use the latest released computer code version that is valid for the particular computational platform used to perform the analysis.": This item in particular has been discussed with NRC staff as a significant issue. A licensed code for the same type of application should not require a code version change simply because the code developer has issued a new version. Use of different code versions within one or more applications is difficult to reconcile and potentially leads to unnecessary confusion. Such burdens should only be borne by the applicant if a significant safety issue has been identified with the previous code version. Typical new release code versions tend to contain a certain amount of bugs that get resolved through user feedback to code originator. While it could be postulated that newer code provide more "accurate" results, but if the previous version was found to be acceptable for system approval with no safety issues identified, why should applicants be required to change? The goal per draft SRP Section 6.4 is to provide reasonable assurance that system will meet limits. This is also inconsistent with how NRR deals with updated codes (e.g., ASME Code).

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90	6302 6309	"by verifying that the following information has been provided in the SAR ... The computer code solutions to a series of test problems ...": The draft SRP revision does not contain the previous SRP statement "that these solutions may be referenced, and need not be submitted in the SAR". This change would add a substantial amount of information to the SAR without any safety benefit as the referenced documents, per current SRP, should be public information and/or have been previously submitted to NRC.
91	6578	This implies that only boron can be employed as a fixed absorber. It is recommended that "boron" be changed to "neutron poison material"
92	6739	Neither Section 8.5.4.3 nor Attachment 8-3 exist in the document.
93	7099-7104	This section requires explicit analyses of atypical control rod insertion while Section 7.5.5.6 (lines 7138-7157) discusses margin to cover higher-than-modeled reactivity due to control rod insertion. These two sections appear to conflict. Please clarify what is required in the design basis calculations.
94	7102-7104	These lines explicitly require the analysis of integral fuel burnable absorbers. However, there are NUREG/CR reports that provide guidance on when these absorbers need to be considered in the analysis. These lines should be revised accordingly.
95	7242 7390	"Foreign standards are not generally acceptable..." What is the basis for this statement? For non-ASME code applications, there are many recognized standards essentially equivalent to ASTM, such as Euronorm, JIS, etc. The applicant should be able to use foreign standards with appropriate justification.
96	7248	The Chapter 8 convention of indicating with an asterisk the items that should be addressed in the Technical Specifications is not used in any other chapter. All of the chapters should be consistent and not use this convention.
97	7266 7554-7564	Replace "weathering steel" with "0.20% copper steel" or "carbon steel with a minimum copper content of 0.20%". Also, add "salt water" to "coastal marine sites". The term "weathering steel" applies to a class of low-alloy steels that contain small amounts of such alloying elements as Cr, Ni, P, Si and Cu. These steels are covered by ASTM A242 and A588. Also "copper bearing steel" should be generalized to allow for other appropriate measures to control corrosion.

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98	7317-7321	This paragraph should be deleted for several reasons. The portion of the sentence stating that the body of the SAR “is not enforceable” is incorrect. Users must comply with the Part 72 cask SAR unless a change, appropriately reviewed and authorized under the provisions of 10 CFR 72.48, is performed. If not, NRC enforcement action may be taken. In addition, using this logic as the basis for putting information in the CoC or TS is flawed because it is not risk-informed, is too subjective, and dilutes the CoC holder’s and licensee’s ability to implement changes that meet the criteria of §72.48. Moreover, this increases the NRC’s need to spend resources reviewing changes to the CoC that are not risk- or safety-significant.
99	7334	a) Amendments are not “completely new designs.” New designs are submitted as a new CoCs. This statement should be revised. b) Use of the term “beware” is derogatory in that it implies the applicants are trying to sneak changes through the NRC without them being noticed. Please revise.
100	7338-7345	This paragraph should be deleted for a couple of reasons. It is incorrect to state that things previously approved and outside the scope of the amendment request are subject to review again. This is contrary to good regulatory practice and re-reviewing approved information could create a contradiction with a previous staff SER. In addition, the sentence in lines 7341 and 7342 could be viewed as derogatory towards both the NRC project management and the applicant.
101	7362-7263	“copper bearing structural carbon steel” should be generalized to allow for other appropriate measures to control corrosion. Also, it seems inappropriate to single out one DSS design in review guidance.
102	7382	This should read “All ASME materials are a subset of AWS and ASTM materials”
103	7394	The statement that all ITS materials are typically ASME II materials is not correct. That is only true of components subject to ASME Section III jurisdiction, typically confinement boundary and fuel basket. ITS attachments to the confinement boundary, as well as structural components of the overpack, are likely not ASME section II materials; for non-ASME ITS components, ASTM materials can be used.
104	7400	Non-ITS materials specified to ASTM. This is not correct. According to Reg Guide 7.10, Appendix A, ITS Category B must be used in accordance with rigorous specifications; ITS Category C need not. Therefore, it is correct to state that ITS A and B should be specified to ASTM, ASME, or equivalent standards; ITS Category C, and non-ITS items can be specified by generic names such as “stainless steel”, “aluminum,” “carbon steel,” etc., as appropriate for the application.

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105	7408	Editorial: Delete. This line repeats lines 7391-7392.
106	7411-7412	No changes in neutron absorbers without NRC review. This is not correct; changes should be acceptable with appropriate review or testing by the certificate holder, with only select critical limiting characteristics included in the TS. 72.48 provides adequate change control for these items given the risk of dry cask storage operations.
107	7420-7425	Editorial: This information repeats prior information.
108	7470-7471	Remove “transportation” as transfer is already listed. Remove “retrieval”. In this context it is the same as unloading.
109	7515-7518	The information pertaining to steel producers is unnecessary for review guidance and should be deleted. If it is retained, at a minimum delete the last sentence regarding “defeating” a steel producer and clarify who is meant by “steel producers.”
110	7520-7523	This paragraph appears to be an editorial opinion and serves no value as review guidance. Delete.
111	7554-7557	References to specific dry storage vendors is typically not appropriate in the SRP. Please consider revising this section. If reference to a vendor is appropriate, the corporate name should be used rather than abbreviations. Therefore, change TN to Transnuclear, Inc.
112	7562-7564	What is the basis for no credit for coatings unless periodically inspected? Thermal spray Al-Zn coatings and hot dip galvanizing are widely used in marine applications, and are much more predictable than paint with respect to adhesion.
113	7577	It is recommended that “AWS D1.6 (current edition), “Structural Welding Code – Stainless Steel” be added to this list of codes.
114	7608	The full penetration welds should only apply to the confinement boundary of the canister. In some designs the bottom closure weld is not a confinement boundary weld. For non-confinement boundary welds, other design should be acceptable. Please clarify
115	7621-7622 8465	“helium leakage test is performed of the entire shell” – Please clarify that this testing only applies to the confinement pressure boundary (i.e., not attachment shell welds).
116	7621-7622	What is the basis for requiring a helium leakage test? The confinement boundary is designed in accordance with ASME Section NB, NC, or ND. The Code includes pressure tests to confirm pressure boundary integrity. If this is sufficient for high pressure vessels and piping systems in a power plant, it should be acceptable for a confinement boundary given the relative risk and service conditions.

NO.	NUREG-1536 Line No.	COMMENT
117	7624-7625	Not all of these tests (e.g., hydrostatic or pneumatic) are performed in the fabrication shop. Testing is in accordance with the design code. No additional review guidance is necessary. Shop helium testing would be an additional commitment beyond what the design code requires. Please clarify.
118	7630	Editorial: Add “as” after “or.”
119	7641	Editorial: Change “designedto” to “designed to.”
120	7646	The N45.2 series has been replaced by NQA-1. Suggest referring to both for older commitments and newer commitments to the QA code.
121	7697-7701	For stainless steel canisters and welding, this is too limiting. The J-integral method to evaluation flaw size is used, which limits the size of a single weld pass. In order to be consistent with line 7682, it should explicitly state that the applicant can use J-integral methodology incorporating plasticity for ductile weld materials such as stainless steel.
122	7700	The canister is designed per ASME Section III, Division 1, Subsection NB, not Division 3. Has Division 3 been endorsed by NRC? If so, both Division 3 and Division 1 should be discussed. If not, reference to Division 3 should be deleted.
123	7715	Delete “Pursuant to NRC to Bulletin 96-04 (1996).” This language implies regulatory requirements are contained in the bulletin. An NRC bulletin is a request for information at a particular point in time. It is not something to be referenced as a source of information upon which to base a review of an application. The SRP should stand alone and refer to regulations and approved guidance only.
124	7743	The statement that aluminum-based metal matrix composites are employed for all presently utilized neutron poison materials is incorrect. Boral, for example, is used through the industry and is not a metal-matrix composite.
125	7750 7763	Analysis of creep for all aluminum based structural materials, including those only supporting dead weight – “any kind of loading.” There is no sound basis for requiring a creep review of materials that have no structural function except bearing accident loads through their thickness, and supporting their own dead weight during normal storage.
126	7724 7824 7881	This section is entitled “Exterior Protective Coatings” but lines 7824 and 7881 refer to interior coatings.

NO.	NUREG-1536 Line No.	COMMENT
127	7772	Exterior coatings. Scope and level of review for this area appears excessive and inconsistent with the “low priority” given. This should be reduced to specifying the generic coating systems that are acceptable, with surface preparation and paint application in accordance with manufacturer’s instructions. Specifying the manufacturer and submitting the paint technical data sheets requiring qualification testing (lines 7881) are overly burdensome given the low risk.
128	7824-7825	It is not necessary to include the coating manufacturer’s technical literature in the SAR. The critical characteristics of the coating material are what is important and should be sufficient. The supplier should be free to use whatever coating material and manufacturer that has these characteristics for the service conditions.
129	7832-7942	Delete Sections 8.4.11.4 through 8.4.11.6. Surface preparation coating repairs, and coating qualification testing are all details not necessary for the staff to review. These attributes of the coating system are dictated by the coating manufacturer or the CoC holder for the particular coating material and service conditions. Appropriate surface preparation, repairs and qualification testing are all adequately governed by the CoC holder’s or licensee’s coating specification and procedures developed under the applicable QA program and the coating manufacturer’s requirements. All of the above is subject to NRC inspection for verification of compliance.
130	7882-7884	It appears that this sentence is written for paints and does not account for the possibility of plating as a coating.
131	7950	The statement that neutron shielding materials are not ITS appears to conflict with NUREG/CR-6407, which specifies that shielding materials are ITS Category B. Please clarify.
132	7963	The first sentence in this line is unnecessary. Delete.
133	8021	Impurity limits may or may not be established as a result of qualification testing; that is not the main purpose of qualification testing.
134	8008	Editorial: “Surrey” should be “Surry.”
135	8048	Submittal of manufacturer’s data sheet for neutron absorber is only applicable if the applicant is proposing a trade name product. Add “as applicable” at the end of the sentence.

NO.	NUREG-1536 Line No.	COMMENT
136	8103	ZrB2 standard: All standards are a compromise of some kind: homogeneous standards like ZrB2 must be paired with aluminum sheets to simulate the scattering by aluminum in the neutron absorber; scattering by carbon in boron carbide is generally not simulated. Non-homogeneous standards that have a very fine uniform dispersion of the boron-containing phase are only an approximation of the homogeneous material assumed in the criticality safety calculations, but they get the appropriate aluminum and carbon scattering. Therefore, change “a qualified homogeneous standard such as ZrB2” to “a calibrated standard that is either homogeneous, such as ZrB2, or that has a very fine and uniform dispersion of boron such that it approximates homogeneity.”
137	8110	P=0.999: Previously the staff has accepted P=0.95 and should continue to do so considering all the conservatisms involved (e.g. $k_{eff} \leq 0.95$, the 90% maximum credit for boron 10).
138	8122	Quantitative measures (porosity testing, tensile testing, etc.) are now preferred over qualitative examination (TEM, SEM). Metallic/ceramic systems are generally accepted as not susceptible to radiation damage from gammas or from neutrons at the fluences encountered in dry storage.
139	8155	A sample from every other piece is too prescriptive for a standard review plan; according to ASTM C1671, random or systematic sampling should be applied.
140	8156-8157	Lot definition based on billet may not be appropriate for material from small billets; allow alternate definitions that are uniform for sampling purposes.
141	8186	Please delete the following sentence “Zinc, zinc rich coatings, zinc-clad materials, and aluminum should not be used for any embedded objects that will be in contact with wet concrete, because of the potential for concrete degradation from an adverse chemical reaction”. Zinc galvanized reinforcing steel and zinc plated/galvanized embedded lifting devices are common and widely used in the concrete industry. Even though chemical reaction between the zinc and water in concrete may occur at any age, this reaction is not proven to have any adverse impact on concrete. Note that Section 3.5.3.8 of ACI 318-08 allows the use of galvanized reinforcing steel per ASTM A 767.
142	8202	Editorial: Change “used” to “use.”
143	8228-8229	Delete this sentence. Requirements for water-to-cement ratios and air content (mainly controlled by the use of air entraining admixtures), which are based on the severity of the anticipated exposure of concrete, are provided in ACI 349/318. The w/c ratio and air content are design requirements and not fabrication details.

NO.	NUREG-1536 Line No.	COMMENT
144	8301-8303	Samples normally taken in HAZ, same weld thickness and materials of construction, etc.: This area needs clarification. Testing is done per ASME Section III and Section IX. Weld thickness relation to the thickness of the design weld is governed by Section IX. Impact testing is required of the base metal (NX-2300 and the weld metal (NX-2400), but not the HAZ. Weld qualifications are performed using materials of the same class (P-number), but not necessarily the same material and grade as that used in construction.
145	8319-8320	Specifying peak rod burnup is inconsistent with past practice, which has been to specify assembly average burnup.
146	8358-8359	The text refers to “the following Part 72 regulations” yet no regulations are discussed in the text that follows.
147	8453	Delete “and retrieval” since this is covered by fuel handling
148	8567-8568	The text states that this review should be coordinated with the materials reviewer. The guidance in this section is specifically for the materials reviewer. Please clarify.
149	8593-8595	Delete the last sentence of this paragraph. It is opinion, not review guidance.
150	8636	Replace the word “dangerous” with “large” or “significant.”
151	8645-8656	Helium testing of the entire confinement boundary is not necessary. Confinement boundary welds are volumetrically tested in the fabrication shop and the entire vessel is pressure tested after loading. Both the inspections and testing are performed per the ASME Section III Code. Additional testing beyond what the ASME Code requires should not be necessary. Please revise.
152	8726	RG 1.183 should be RG 1.193.
153	8914-8956	References to Part 71 regulations do not appear appropriate in these lines. Please revise accordingly.
154	8990-9013	Editorial: The numerals in the compound names should be subscripts to be consistent with the convention in other portions of the SRP. Please revise.
155	9077 9271	Sections 8.7.3 and 8.8.3 should be removed and the references moved to the consolidated references in Appendix A to be consistent with the treatment of references in other chapters and to eliminate duplicate references (e.g. line 9089 and line 12923).
156	9090	Editorial: The reference incorrectly lists the upper temperature as 400. The correct value is 360 as listed in line 12923.
157	9231-9232	The limit could be interpreted as the limit in any one cycle is 65°C. It needs to explicitly state that the 65°C range can be exceeded but for less or equal to 10 cycles.
158	9518 9520	Editorial: Sketches A and B should more appropriately be listed as Figures and the references to the sketches appropriately revised.

NO.	NUREG-1536 Line No.	COMMENT
159	9518 9520	Information was removed from the sketches when they were incorporated from ISG-18 Rev. 1 (e.g. identification of cover plate and vent and drain port cover plate). This information should be restored.
160	9737	Suggest changing “use and operation” to “function”. The cask vendor may not offer all of these specialized tools or require a particular tool to be used to accomplish a task. The user needs to understand the intended function for them to purchase the equipment needed to accomplish the task.
161	9752	Delete “receipt inspection activities.” Receipt inspection is a separate QA function not related to the operations described in Chapter 9.
162	7124-7125 9767-9768	Delete references to performing measurements to confirm assembly burnup values. Reactor records have repeatedly shown to be reliable for performing core reloads and to estimate boron concentration and rod position for reactor startup. They should be equally sufficient to validate assembly burnup for cask loading, a much lower risk activity.
163	9847-9848	Delete the requirement to re-evacuate and re-backfill. The necessary helium purity can be obtained with a single backfill of high enough purity. More generally, care should be taken in using the PNL document referenced because it is over 20 years old. Cask operations have changed in that time. For example, one current cask vendor dries the canister without the use of vacuum. We realize these are examples, but the reviewer should understand that the reference document is out of date.
164	9890	Reference to “concrete casks” should be expanded to include horizontal concrete modules and metal casks.
165	9982	Editorial: :Materials Evaluation” should be “Materials Evaluation”
166	9973-9974	Delete this item. Dose rates do not belong in TS and do not verify proper loading of the cask.
167	10343	Editorial: Change “i.e.” to “e.g.”
168	10345	Editorial: Delete close parentheses after “Program” and move the period inside the close quotation.
169	10366-10367	The “basis of tests deemed acceptable” should be from regulations or something more definitive and stable than prior staff acceptance.
170	10381-10382	Recurring trunnion load tests for transfer casks is not consistent with ANSI N14.6, which permits NDE to be performed periodically rather than load testing.
171	10418-10433	Please clarify the guidance pertaining to testing. Clarification should include ASME Code concurrence that fracture testing is not required for material with wall thicknesses of less than 5/8 inch.

NO.	NUREG-1536 Line No.	COMMENT
172	10476-10479	Delete the sentence pertaining to inspection personnel qualifications. This is something governed by the QA program and outside the scope of a cask design review. At a minimum, delete “the current revision of.” The fabricator should not be forced to adopt the most recent revision of SNT-TC-1A to qualify personnel if a different code or older version of SNT-TC-1A is acceptable within their QA program. If and when to adopt a later Code should be at their discretion.
173	10513-10516	Why specify the particular NDE method if the Code does that? Suggest deleting this detail. Also, AWS should be offered as an acceptable weld code for non-confinement boundary welds.
174	10576-10577	Delete these lines. Dose rate measurements of every cask after SNF is loaded are of little value in determining whether the design criteria have been satisfied because the shielding analyses are extremely conservative. Users will perform appropriate dose rate measurements on the loaded casks as a part of their Radiation Protection Program and ALARA procedures.
175	10588-10597 and 10620- 10629	Editorial: These paragraphs are duplicates. Delete one.
176	10613	Editorial: “bench marked” should be “benchmarked” (one word).
177	10741	Clarify “periodic tests to verify shielding and thermal capabilities.” Such tests are usually not necessary for passively cooled systems beyond periodic checks of the air vents. Also, there are no credible age-related means to degrade shielding. Such tests should only be required if the particular cask design has unique features or active components requiring such tests.
178	10955	Delete “including minors.” Minors are not part of the working staff at power plants subject to occupational exposure.
179	10956	Delete “retrieval and”.
180	11003-11005	The value of applicants calculating and NRC approving dose versus distance from a hypothetical ISFSI is of questionable value in the application because of the arbitrary nature of: the number of casks, the arrangement of the casks on the ISFSI, the distance to the site boundary, and the cask contents. Licensees are required to perform a 72.104 dose analysis for their particular ISFSI by 72.212.
181	11007-11018	As only hypothetical array and single cask are evaluated, it is not clear when features would be required to show compliance with regulations and should be included in the conditions of cask use. Specific distance and shielding options and inclusion of such limitations in the CoC are not consistent with the 72.212 evaluation that a site would do to establish compliance with the requirements.

NO.	NUREG-1536 Line No.	COMMENT
182	11265-11266	Clarify this statement. Not all DSS monitoring equipment is ITS. It is only ITS if it meets the definition of ITS in the NUREG based on its design function. Suggest: "DSS monitoring equipment is classified in accordance with NUREG/CR-6407..." This also conflicts with lines 1678 and 5347.
183	11364-11368	What is the purpose of capitalizing this text?
184	11440-11452	Most of the text about the Code in this paragraph is of limited value. Suggest replacing this with simpler guidance that states the applicant should state the applicable design codes, sections, subsections, as appropriate, and any alternatives to the code being implemented.
185	11460	Editorial: Add "s" to the end of "specification."
186	11588	Editorial: Change "12" to "13."
187	12723-12724	ISG-15 should not be listed in the reference section since it has been incorporated into this document. Other ISGs are not listed in the reference section.
188	13025	Editorial: Change "to" to "10."
189	13158	Editorial: Insert a close parenthesis at the end of this line.
190	13237	Editorial: Change 'uncorrectd' to "uncorrected."
191	13475	Editorial: Change "austentic" to "austenitic."
192	13475	With regard to ISG 12, the status block states that a new revision is pending. This is inappropriate information for the SRP. In addition, a pending revision to this ISG has not been announced by NRC, yet draft revisions to ISG-2 and ISG-23 have been issued by NRC and are not noted in this appendix.