

**Enclosure 2**  
**Staff Responses to Public Comments on Draft Regulatory Guide DG-1159**  
**(Proposed Revision 3 of Regulatory Guide 1.136)**

Comments		NRC Comment Resolution	
Originator	DG-1159 Section	Specific Comments	
Nuclear Energy Institute 12/12/2006 letter (ML063560045)	B	Second paragraph mentions AP-1000 and ESBWR. ABWR is also an advanced reactor using concrete containment, and it should be mentioned.  Proposed Alternative: Add ABWR.	No change. The paragraph cites AP-1000 and ESBWR as examples.
	C.5.A	Requirements for loads and load combinations associated with P <sub>g1</sub> , P <sub>g2</sub> , and P <sub>g3</sub> appear related to Regulatory Position C.5 of RG 1.7, Revision 3. A cross reference would be helpful for a better understanding of the requirements.  Proposed Alternative: Add RG 1.7, Revision 3, in the references.	Agreed. The staff will add a sentence referencing RG 1.7 after the definition of P <sub>g3</sub> .
	C.5.A	Descriptions for P <sub>g1</sub> , P <sub>g2</sub> , and P <sub>g3</sub> are not exactly the same as those in DG-1158.  Proposed Alternative: Use consistent descriptions for P <sub>g1</sub> , P <sub>g2</sub> , and P <sub>g3</sub> in DG-1158 and DG-1159.	Agreed.
	C.5.A, second (2)	P <sub>g3</sub> is defined to be pressure resulting from post accident inerting assuming carbon dioxide is the inerting agent. Since it is associated with post accident conditions, Factored Load Category would be more appropriate than Service Load Category as proposed.  Proposed Alternative: Move P <sub>g3</sub> to Factored Load Category.	No change. The regulations in 10 CFR 50.34(f)(3)(v)(B)(1) address the containment structure pressure loading for Service Load Category. The staff will coordinate load combinations with the latest version of proposed SRP 3.8.1, Rev. 3, December 5, 2006.
	C.8	Modern modularization of rebar (cages) requires termination of bars at same point; otherwise modularization concept is not efficient.  Proposed Alternative: Allow splicing at one location with additional small surface bars to limit cracking to hairline width.	No change. Section C.8 in DG-1159 states that the adjacent splices need not be staggered if the slip is low.
American Society Of Mechanical Engineers	CC-2243	RG 1.107 is dated 1977. With advances in grout technology in the past 30 years, it should be confirmed that the exceptions noted in RG 1.107 are still valid.	No action. RG 1.107 has limits that are not in the Code, and the staff finds them useful.

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12/19/2006 letter (ML063470347)	CC-2433.2.3	No comment.	
	CC-2434	No comment.	
	CC-2463.1	The Code calls for "not less than two static tests." Determining what constitutes a "sufficient number of tests" as noted in this regulatory position will be subjective and difficult. We recommend that the minimum required number of tests based on the available data be specified.	The staff does not want to be too prescriptive and prefers giving flexibility to applicants as long as they provide a justification.
	CC-3000	<p>Based on a review of SRP 6.2.5, Revision 3, an accident that releases hydrogen, generated from 100 percent fuel clad-coolant reaction accompanied by combustible gas burning, is classified as "beyond design basis accident." As such, load combinations included in this regulatory position (also included in 10 CFR 50.34) to take into account hydrogen generation/burning are not applicable to CC-3000 which includes "design basis" load cases and combinations. Using factored load criteria to evaluate a "beyond design basis" condition is overly conservative. It is more appropriate to compare the loads due to hydrogen release with the containment ultimate capacity.</p> <p>Assuming that Regulatory Position 5 will remain as is:</p> <p>1. 5 A. (1)—SRP Section 3.8.1 appears to be intended to apply only for BWR Mark III type containments. Suggest changing the DG words to "combined according to the approach contained in the appendix to SRP Section 3.8.1" or suggest that the NRC revise SRP Section 3.8.1 to address other types of containments or clarify if/how the appendix can be used for other reactor types.</p>	<p>This is a requirement of 10 CFR 50.34.</p> <p>1. Appendix A to SRP 3.8.1 applies to all BWRs (not Mark III only). The staff agrees to change the wording as suggested.</p>
CC-3000 (continued)	<p>2. 5 A. (2)—F already is defined in the Code Section CC-3221.1 as prestress loads, not post-LOCA flooding. H<sub>a</sub> is already defined in the Code in Section CC-3222.3 as "load on the containment resulting from internal flooding, if such an occurrence is defined in the Design Specification as a design basis event."</p> <p>3. 5 A. (2)—It seems that the additional load combination defined here is already covered by the 3<sup>rd</sup> load combination listed under "Abnormal/severe environmental" in Table CC-3230-1 which includes H<sub>a</sub> loads. Thus, possibly it would be sufficient for the NRC to endorse this combination as it already exists in Table CC-3230-1. If desired, supplemental clarification, such as</p>	<p>2. Agreed.</p> <p>3. Agreed. The staff will delete this load combination and add a paragraph from SRP 3.8.1 (December 2006 version).</p> <p>4. The staff will add, "These loading conditions should include the effect of temperature. For prestressed concrete containment, the effects of prestress should also be considered."</p> <p>5. No change. 10 CFR 50.44 has this provision.</p>	

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		<p>inclusion of <math>R_o</math> loads with a 1.0 factor, could be added as note/footnote to Table CC-3230-1.</p> <p>4. 5 A. (2) (1), (2) and (3)—Load combinations in this regulatory position only include “D”—Dead load. In a prestressed containment, the liner strain is also affected by the sustained prestress force. Therefore, true liner strain evaluation (as required per CC-3720) must include the effects of prestress and temperature. This should be noted and clarified.</p> <p>5. It seems that the <math>P_{g1}</math>, <math>P_{g2}</math>, <math>P_{g3}</math> loads are already included in load combinations involving <math>P_a</math> as shown in Table CC-3230-1. Introducing these loads as a new combination with dead load is confusing since it is not clear how to work this combination with the other loads/combinations. It is suggested that if it is desired to clarify <math>P_a</math> by including <math>P_{g1}</math>, <math>P_{g2}</math>, <math>P_{g3}</math> loads, then this might be best accomplished in the DG as a note/footnote to Table CC-3230-1 stating something like “<math>P_a</math> loads shall include the following <math>P_{g1}</math>, <math>P_{g2}</math>, <math>P_{g3}</math> loads, as applicable, defined as follows....” Similar comment for the D+45psig combination—the minimum value should be imposed as a note/footnote rather than a D + pressure combination.</p> <p>6. The type of analysis to derive liner strains to meet the requirements of CC-3720 should be clarified. Should the liner strains be derived from an elastic basis analysis or a nonlinear analysis considering concrete, reinforcing and liner?</p> <p>7. This regulatory guide only requires liner strain check per CC-3720. It is implied that evaluation and documentation of other design parameters (e.g., rebar and concrete stresses) are not required. This should be noted and clarified.</p> <p>8. Regarding containment internal pressure loads, it seems that some cross-reference, explanation, and/or description consistent with RG 1.7, “Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident” (or its intended replacement/update), should be made on this page and/or in the References section of the DG.</p>
	CC-3421.5	<p>A number of existing plants were designed</p> <p>6. The staff wants to give freedom to choose an analysis if justification is provided.</p> <p>7. The applicant has to meet Code sections, so there is no need for further clarification.</p> <p>8. Agreed.</p> <p>No change.</p>

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		in accordance with ACI 318-63 and included tangential shear and principal tensile stress requirements in their design basis which may or may not agree with the values noted in this regulatory position. The effects of this DG on the existing plants that did not use Section III, Div. 2 (CC-3000) should be clarified.	The backfit section clarifies this.
	CC-3542	RG 1.35.1 addresses long term losses with a 40-year design life. New prestressed concrete containments consider a 60-year design life. This needs to be addressed in this regulatory position.	The regulations cover this. RG 1.35.1 may clarify it in a future revision.
	CC-4240	<p>The sentence on page 5, "The Code does not have any provision for curing concrete at temperatures higher than 4.4 °C (40 °F)," is misleading/inaccurate. Code section 4240(a) defers requirements for curing and protection against damage to the Construction Specification. Suggest deleting this sentence and the first word of the following sentence.</p> <p>Curing times are to some extent dependent on the type of construction due to exposed surfaces of concrete (wall forms vs. exposed slabs, etc.) and curing method (moisture-retaining covers, wet-curing, spray-on or roll-on curing compounds, etc.). Making a generic statement that "minimum period of curing should be 7 days after placing concrete" can be potentially misleading/inaccurate.</p> <p>If it is desired to make Section CC-4240 more explicit, suggest rewording something to the effect that "Curing and protection against physical and thermal damage from time of placement until end of minimum curing period shall be in accordance with ACI 308.1, and ACI 305R-99 or ACI 306.1-90(R2002) as applicable."</p>	<p>The staff agrees after reviewing ACI 308.1 and ACI 305R-99 or ACI 306.1-90(R2002). The staff also checked with BNL.</p> <p>The staff will add the sentence highlighted in yellow as suggested by the commenter.</p> <p>The staff will add ACI 305R-99 and ACI 306.1-90(R2002) to the reference section.</p>
	CC-4352	<p>In Discussion section, CC-4352 states that welded splices and other mechanical connections are allowed as long as they conform to ACI 349-01, Section 12.14.3. This statement goes beyond the purpose of CC-4352 which only provides spacing requirements.</p> <p>The discussion section should be revised to only address the spacing and its reference to ACI 349-01. For example, it should read, "The spacing of welded splices and other mechanical connections should conform to ACI 349-01, Section 12.14.3."</p>	<p>The staff will not change the discussion section.</p> <p>Splicing is needed for alternate bars, and staggering is not needed. Staggering is needed only for adjacent bars.</p>

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		Is the intent to waive the recommendation for alternate bars splicing or adjacent splices staggering if certain mechanical splice deformation requirements are met? If so, then the words of the last sentence in this section might better be changed to "...then neither alternate bar splicing nor adjacent splices staggering need be used."	
	CC-4470	<p>The relation between CC-3542, "Loss of Prestress," and CC-4470, "Corrosion Protection," medium (grout or sheath filler) is not clear. More explanation should be added to clearly define what type of exception to section CC-4470 is taken.</p> <p>DG-1159 recommends replacing CC-4470 with RG 1.35.1 without identifying what is deficient in CC-4470. We would like to understand what the deficiencies are in CC-4470.</p>	The staff will replace the sentence with, "Regulatory Guide, 1.35, 'Inservice Inspection of UngROUTED Tendons in Prestressed Concrete Containments,' should be used for guidance in corrosion protection."
	CC-5210	No comment.	
	CC-6430	In accordance with CC-6430, if the measurements do not satisfy the requirements of CC-6410, further study is required to determine the root cause. If these studies still indicate that CC-6410 requirements are not satisfied, either remedial actions are taken or a retest is conducted. The added value of choosing one option (remedial action or retest) as noted in this regulatory position is not clear. It is recommended that the discussion section be expanded to provide additional information to further explain staff's position.	The staff will delete this provision as it now exists in Code Section CC-6430.
	Ultimate Capacity of Concrete Containment	We recommend stating specific requirements on analytical techniques, loads to be considered and combinations and limiting stress and strain values for failure determination in lieu of referencing Appendix A to NUREG/CR-6906. To our knowledge, Appendix A to NUREG/CR-6906 was not written to provide guidance nor was it subject to a consensus peer review process.	The passage does not give explicit requirements, because the staff wants to give the applicant freedom to choose how the analysis is performed.
	Backfit Analysis	In the Backfit Analysis section, it is stated, "NRC staff considers acceptable for use in design and analysis of metal primary reactor containments in nuclear power plants." This statement should be changed to "NRC staff considers acceptable for use in design and analysis of reinforced and prestressed concrete containments in nuclear power plants."	Agreed.