

Table A-2 Changes in ASME Code Case N-660, Revision 0 for PWROG Passive Categorization

N-660, R0 Section	ASME Code Case N-660 Revision 0	Proposed Changes to ASME Code Case N-660 Revision 0 For PWROG Passive Categorization	Basis for Change
-1320	<p>“Personnel with expertise in the following disciplines shall be included in the classification process.</p> <p>(a) probabilistic risk assessment (PRA)</p> <p>(b) plant operations</p> <p>(c) system design</p> <p>(d) safety or accident analysis</p> <p>Personnel may be experts in more than one discipline, but are not required to be experts in all disciplines.”</p>	<p>Replaced with “(a) An Integrated Decisionmaking Panel (IDP) shall use the information and insights compiled in the initial categorization process and combine that with other information from design bases, defense-in-depth, and safety margins to finalize the categorization of functions/SSCs.</p> <p>(b) The designated as members of the IDP shall have joint expertise in the following fields:</p> <ul style="list-style-type: none"> - Plant Operations (SRO qualified), - Design Engineering, - Safety analysis, - Systems Engineering, and - Probabilistic Risk Assessment. <p>(c) Requirements for ensuing adequate expertise levels and training of IDP members in the categorization process shall be established.</p> <p>(d) To the extent possible, the classification of pressure retaining and support items in a system should be performed by the same IDP members as the categorization of active SSCs in that system.”</p>	<p>Clarification of the process used for the categorization of pressure retaining and support items. An initial categorization of pressure retaining and support items can be performed by an engineering function. The IDP, composed of the members with expertise in the disciplines identified in the original paragraph -1320, then considered the initial categorization, along with other information from their respective disciplines, to finalize the categorization. This method results in a categorization process for classifying pressure retaining and support items that is similar to that used for active SSCs. This helps to ensure consistent consideration of information used the two categorization processes.</p>
-9000	Definition of high-safety-significant function	Added to end of definition – “or from other relevant information (e.g., defense in depth considerations)”	Added to consider defense in depth in determining the safety significance of a function.
-9000	N/A	Added new term and definition, “Plant features – systems, structures, and components that can be used to prevent or mitigate an accident”	Plant features terminology added to Code Case relative to operator and possible automatic actions

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-9000	Definition of PRA, “a qualitative and quantitative assessment...”	Changed to read, “an assessment...”	Changed to be consistent with the ASME PRA Standard.
-9000	Definition of spatial effects, “A failure consequence affecting other systems or components, such as failures due to pipe whip, jet impingement or flooding.”	Changed to read, “A failure consequence affecting other systems or components, such as failures due to pipe whip, jet impingement, jet spray, loss of inventory due to draining of a tank or flooding.”	Including other possible forms of spatial effects.
I-1.0	N/A	Added figure ¹ illustrating the modified RISC methodology process, including scope identification, consequence evaluation, consequence categorization, classification considerations, and final classification definitions.	Figure added to provide high level overview of RISC methodology process. New process calls for all segments to be included in the consequence evaluation to determine high, medium, low or none consequence category. Then only the non-high category segments would be considered in the classification considerations of I-3.2.2(b) – previously I-3.1.3.
I-2.0	“The owner shall define the boundaries included in the scope of the RISC evaluation process.”	Changed to read, “The owner shall define the boundaries included in the scope of the RISC evaluation process. Items optionally classified to Class 1 and Class 1 items connected to the reactor coolant pressure boundary, as defined in paragraphs 10 CFR 50.55a (c)(2)(i) and (c)(2)(ii), are within the scope of the RISC evaluation process. All other Class 1 items shall be classified High Safety Significant (HSS) and the provisions of the RISC evaluation shall not apply.”	The second and third sentences added for clarification of the scope of items to be evaluated, consistent with -1200
I-3.0, Title	“Consequence Assessment”	Changed to read, “Evaluation of Risk Informed Safety Classifications”	For clarification to meet Figure I-1.

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I-3.0, 1 st Paragraph	“Piping segments can be grouped based on common conditional consequence...”	Changed to read, “All pressure retaining items, including supports for a piping system, shall be evaluated by defining piping segments that are grouped based on common conditional consequence...”	For clarification of the scope of components to be evaluated.
I-3.0, 1 st Paragraph	“Additionally, information shall be collected for each piping segment that is not modeled in the PRA, but considered relevant to the classification (e.g., information regarding design basis accidents, shutdown risk, containment isolation, flooding, fires, seismic conditions).”	Changed to read, “Additionally, information considered relevant to the classification shall be collected for each piping segment (e.g., information regarding design basis accidents, at-power risk, shutdown risk, containment isolation, flooding, fires, seismic conditions, etc.). This other relevant information is considered in conjunction with the Consequence Category to determine the Risk Informed Safety Classification. The Consequence Category is Determined from the Consequence Evaluation.”	Clarifies requirement to collect relevant information for ALL piping segments, not just those modeled in the PRA.
I-3.1.1, 1 st Sentence	“Potential failure modes for each piping segment shall be identified...”	Changed to read, “Potential failure modes for each system or piping segment shall be identified...”	Clarify that evaluation should consider system level failure modes as well as piping segment failure modes.

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I-3.1.1(a)	N/A	<p>Added text, “(4) a small break with a calculated leak rate at design basis conditions for a through-wall flaw with a length six times its depth can be used when certain design and operational considerations are satisfied:</p> <ul style="list-style-type: none"> - the pipe segment is not susceptible to any large break mechanisms or plant controls are in place to minimize the potential for occurrence of large break mechanisms, + a large break mechanism is one that produces significant loadings above the normal loading on the system and specifically includes water hammer for which no mitigation is provided and internal deflagrations, but excludes seismic, - the pipe segment is not part of a high energy system, - the pipe segment is greater than 4 inches in diameter.” 	To provide relief from the large break assumption for pipe segments in which large breaks are not expected to occur. This is consistent with the technical basis provided in the response to RAI No. 2 in the PWROG October 2007 submittal.
I-3.1.1(c), Indirect Effects	“These include spatial interactions such as pipe whip, jet spray, and loss of inventory effects (e.g., draining of a tank).”	Changed to read, “A failure consequence affecting other systems or components, such as spatial effects.”	To be consistent with glossary term for spatial effect.
I-3.1.1(d), Initiating Events	“These are identified using a list of initiating events from any existing plant specific Probabilistic Risk Assessment (PRA) or Individual Plant Examination (IPE) and the Owner’s Requirements.”	Changed to read, “For systems or piping segments that are modeled either explicitly or implicitly in any existing plant-specific Probabilistic Risk Assessment (PRA), any applicable initiating event is identified using a list of initiating events from that PRA.”	Clarify source of initiating events.
I-3.1.2, 3 rd sentence	“... (high, medium, low)...”	Changed to read, “... (high, medium, low, or none)...”	“None” is one of the four consequence categories which can be assigned in I-3.1.

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I-3.1.2	N/A	Added text, “In assessing the appropriate consequence category, risk information for all initiating events, including fire and seismic, should be considered.”	This statement was added to help clarify Section I-3.0 when considering other relevant information.
I-3.1.2(a)(1)	“The initiating event shall be placed in one of the categories in Table I-1.”	Changed to read, “The initiating event shall be placed in one of the Design Basis Event Categories in Table I-1.”	More clearly defined what “category” means relative to Table I-1.
I-3.1.2(a)(1)	“... updated final safety analysis report, PRA, or IPE shall be included”	Changed to read, “... updated final safety analysis report or PRA shall be included”	Removed IPE because it was felt that the IPE is no longer relevant for this application and does not provide any additional information in this area.
I-3.1.2(b)	“The consequence category of a failure that does not cause an initiating event, but degrades or fails a system essential to prevention of core damage shall be based on the following:”	<p>Changed to read, “The consequence category of a failure:</p> <ul style="list-style-type: none"> • modeled in a PRA that degrades or fails a high-safety-significant function but does not cause an initiating event, or • not modeled explicitly or implicitly in a PRA, or • that results in failure of another high-safety-significant piping segment, e.g., through indirect effects, or • that will prevent or adversely affect the plant’s capability to reach or maintain safe shutdown condition, <p>shall be based on the following:”</p>	For consistency with RI-ISI program criteria for system impact group assessment.
I-3.1.2(b)(1)	“Frequency of challenge that determines how often the mitigating function of the system is called upon. This corresponds to the frequency of initiating events that require the system operation.”	Changed to read, “Frequency of challenge that determines how often the affected function of the system is called upon. This corresponds to the frequency of events that require the system operation.”	Clarified to include functions other than simply mitigating functions and all events as opposed to only initiating events.
I-3.1.2(b)(3)	“Exposure time shall be obtained from Technical Specification limits.”	Sentence deleted	Deletion made because it was redundant to the 2 nd sentence.

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I-3.1.2(b)(3)	“In lieu of Table I-2, quantitative indices may be used to assign consequence categories in accordance with Table I-5.”	Moved out from (b)(3) to directly under (b) and changed text to, “For failures modeled in a PRA, quantitative indices may be used to assign consequence categories in accordance with Table I-5 in lieu of Table I-2. The quantitative index for the system impact group is the product of the change in conditional core damage frequency (CDF) and the exposure time.”	Clarification; this statement applies to all of (b) and not only (3) for Exposure Time.
I-3.1.2(c)	“In lieu of Table I-3, quantitative indices may be used to assign consequence categories in accordance with Table I-5.”	Changed to read, “For failures modeled in a PRA, quantitative indices may be used to assign consequence categories in accordance with Table I-5 in lieu of Table I-3. The quantitative index for the combination impact group is the product of the change in conditional core damage frequency (CDF) and the exposure time.”	Clarification of the use of Table I-5 and how the combination impact group quantitative index is calculated.
I-3.1.2(d)	“The above evaluations determine failure importance relative to core damage.”	Changed to read, “The above evaluations determine failure importance relative to core damage or the plant’s capability to reach or maintain safe shutdown conditions.”	Added consistent with the changes made to I-3.1.2(b).
I-3.1.3, 3.1.4, & 3.1.5	<p>These three sections have been removed and categorization guidance has been moved to the revised Sections I-3.2.2(b) and (c). In most cases the old guidance in I-3.1.3 through 3.1.5 and the new guidance in I-3.2.2(b) and (c) is identical or very similar. The disposition of each paragraph for I-3.1.3 through I-3.1.5 is provided directly below.</p> <p>The original intent of section was to provide additional considerations for segments not modeled in the PRA. However, the grouping of components into piping segments and the use of surrogate components in the PRA provides quantitative evaluations for each piping segment. The intent of this section now is to provide further considerations for piping segments with MEDIUM, LOW, or NONE consequence categories. The new process calls for all segments to be created and assigned a consequence category according to the guidance in Sections I-3.1.1 & I-3.1.2. For those segments with a consequence category of MEDIUM, LOW, or NONE, the user must then use the guidance in I-3.2.2(b), which is based on the old considerations in Sections I-3.1.3, 3.1.4, and 3.1.5, to assign a final high or low safety significance. See the table entries for specific changes made to Sections I-3.1.3, 3.1.4, and 3.1.5.</p>		

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Old I-3.1.3; New I-3.2.2(b)	All	Questions changed such that all TRUE responses will support LSS and any single FALSE response will support HSS.	For consistency with NEI 00-04 process where a TRUE response to similar questions supports a LSS finding.
I-3.1.3(a)(1)	“Failure of the piping segment will significantly increase the frequency of an initiating event, including those initiating events originally screened out in the PRA, such that the CDF or large early release frequency (LERF) would be estimated to increase by more than 10 ⁻⁶ /yr or 10 ⁻⁷ /yr, respectively.”	Consideration deleted	Redundant to the considerations in I-3.1.1 and I-3.1.2 when determining failure consequences and consequence category.
I-3.1.3(a)(2)	“Failure of the piping segment will compromise the integrity of the reactor coolant pressure boundary as defined in – 1200(b).”	Consideration deleted	All reactor coolant pressure boundary segments are ranked high safety significant per -1200(b).
I-3.1.3(a)(3)	“Even when considering operator actions used to mitigate an accident, failure of the piping segment will fail a high safety significant function.”	Consideration changed and moved to new Section I-3.2.2(b)(1), “Even when taking credit for plant features and operator actions, failure of the piping segment will not directly fail another high safety-significant function.”	Added ability to credit plant features and operator actions when evaluating failure impact on high safety significant functions. Footnote provided for credible operator actions (see below).
I-3.1.3(a)(4)	“Failure of the piping segment will result in failure of other safety-significant piping segments, e.g., through indirect effects.”	Consideration changed and moved to new Section I-3.2.2(b)(2), “Failure of the piping segment will not result in failure of another high safety-significant piping segment, e.g., through indirect effects.”	Consistent with definition of HSS function

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I-3.1.3(a)(5)	“Failure of the piping segment will prevent or adversely affect the plant’s capability to reach or maintain safe shutdown conditions.”	Consideration changed and moved to new Section I-3.2.2(b)(3), “Even when taking credit for plant features and operator actions, failure of the piping segment will not prevent or adversely affect the plant’s capability to reach or maintain safe shutdown conditions.”	Added ability to credit plant features and operator actions when evaluating failure impact on shutdown conditions. Footnote provided for credible operator actions (see below).
I-3.1.3(b)	“In addition to being HSS in terms of their contribution to CDF or LERF, piping segments might also be HSS in terms of other risk metrics or conditions. Therefore, the following conditions shall be evaluated.”	Consideration deleted	The new Section I-3.2.2(b) creates a single list of the considerations from I-3.1.3(a) and I-3.1.3(b). Therefore this lead-in to the considerations in I-3.1.3(b) is unnecessary.
I-3.1.3(b)(1)	“The piping segment is a part of a system that acts as a barrier to fission product release during severe accidents.”	Consideration deleted	This statement was too conservative to force all segments to be ranked as HSS given that just one segment in the entire system meets this criterion. The intent of this consideration is expressed in new subsections I-3.2.2(b)(6) and (11).
I-3.1.3(b)(2)	“The piping segment supports a significant mitigating or diagnosis function addressed in the Emergency Operating Procedures or the Severe Accident Management Guidelines.”	Consideration changed and moved to new Section I-3.2.2(b)(4), “The piping segment does not individually support a significant mitigating or diagnosis function addressed in the Emergency Operating Procedures or the Severe Accident Management Guidelines, with no redundancy or alternate means of support.”	The original statement was too limiting for any segment supporting functions addressed in the EOPs or SAMGs. The term ‘significant’ was too vague. New statement clarifies the interpretation and allows for reasonable consideration of plant features and operator actions. However, the new language assures that the redundant or alternate means are available in the EOP or SAMG to address the function.

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I-3.1.3(b)(3)	"Failure of the piping segment will result in unintentional releases of radioactive material in excess of plant offsite dose limits specified in 10 CFR Part 100."	Consideration changed and moved to new Section I-3.2.2(b)(6), "Even when taking credit for plant features and operator actions, failure of the piping segment will not result in releases of radioactive material that would result in the implementation of off-site emergency response and protective actions."	The off-site emergency response and protective actions limits are more limiting compared to those in 10 CFR Part 100.
I-3.1.4	"Maintain Defense in Depth. When categorizing piping segments LSS, the RISC process shall demonstrate that the defense-in-depth philosophy is maintained. Defense-in-depth may be demonstrated by following the guidelines of U.S.N.R.C Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant Specific Changes to the Licensing Basis." Dated July 1998."	Entire section I-3.1.4 deleted. See new Section I-3.2.2(b)(7-11) for replacement text.	Replacement text in I-3.2.2(b)(7-11) is not intended to change the content – changes were made to be consistent with NEI 00-04 defense in depth considerations.

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I-3.1.5	<p>“Maintenance of Adequate Safety Margins. When categorizing piping segments LSS, the RISC process shall verify that there are sufficient safety margins to account for uncertainty in the engineering analysis and in the supporting data. Safety margin shall be incorporated when determining performance characteristics and parameters, e.g., piping segment, system, and plant capability or cusses criteria. The amount of margin should depend on the uncertainty associated with the performance parameters in question, the availability of alternatives to compensate for adverse performance, and the consequences of failure to meet the performance goals. Sufficient safety margins are maintained by ensuring that safety analysis acceptance criteria in the plant licensing basis are met, or proposed revisions account for analysis and data uncertainty.”</p>	<p>Entire section I-3.1.5 deleted. See new Section I-3.2.2(c) for replacement text.</p>	<p>Replacement text in I-3.2.2(c) is not intended to change the content.</p>
I-3.2	N/A	<p>Added as first sentence, “Risk Informed Safety Classification is determined by considering the Consequence Category in conjunction with other relevant information.”</p>	<p>Added to clarify intent of I-3.2.</p>
I-3.2.2(b)	<p>Rather than referring to Sections I-3.1.3, I-3.1.4, and I-3.1.5, new considerations have been provided as listed above. The process requires the user to evaluate the additional considerations for any segment with consequence category Medium, Low, or None. To improve the process, the additional considerations were moved into this section from I-3.1.3, I-3.1.4, and I-3.1.5.</p>		

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I-3.2.2(b)	“Piping segments determined to be Medium consequence category in any table by the consequence evaluation (I-3.1.1) and (I-3.1.2) shall be determined HSS or LSS by considering the RISC evaluation and the other relevant information (I-3.1.3, I-3.1.4, and I-3.1.5) provided for determining classification.”	Changed text to read, “Piping segments determined to be Medium, Low or None (no change to base case) consequence category in any table by the consequence evaluation in Section I-3.1 shall be determined HSS or LSS by considering the other relevant information for determining classification.”	Changed to include Low and None consequence category segments for consideration and removed reference to deleted Sections.
I-3.2.2(b)	“Any piping segment initially determined to be a Medium consequence category and that is subject to a known active degradation mechanism shall be classified HSS.”	Consideration deleted	This is too restrictive. Consideration should be given to existing plant programs that may affect the ability to prevent a pipe segment from failing given a known active degradation mechanism
I-3.2.2(b)	N/A	Added the following sentence just before I-3.2.2(1); “The following conditions shall be evaluated and answered true or not true:”	Clarification provided to answering the additional considerations as true or not true. If any one of the eleven considerations is not true then the segment shall be assigned HSS, otherwise it can be assigned LSS.
I-3.2.2(b), footnote	N/A	<p>Added footnote to “operator actions” as follows;</p> <p>“To credit operator actions, the following criteria must be met:</p> <ul style="list-style-type: none"> • There must be an alarm or clear indication of the failure. • A procedure must direct the response to the alarm or indication. • Equipment activated to alleviate the condition must not be affected by the failure. • There must be sufficient time to perform the compensatory action.” 	Words paraphrased from Supplement 2, Rev 1 of WCAP-14572, Rev 1, the Pressurized Water Reactor Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report Clarifications. The guidance is provided for expert panel members when relying on operator actions to make decisions regarding safety significance.

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I-3.2.2(b)(1)	N/A	Added new Section I-3.2.2(b)(1), “Even when taking credit for plant features and operator actions, failure of the piping segment will not directly fail another high safety-significant function.”	Based on original Section I-3.1.3(a)(3) – see table entry above.
I-3.2.2(b)(2)	N/A	Added new Section I-3.2.2(b)(2), “Failure of the piping segment will not result in failure of another high safety-significant piping segment, e.g., through indirect effects.”	Based on original Section I-3.1.3(a)(4) – see table entry above.
I-3.2.2(b)(3)	N/A	Added new Section I-3.2.2(b)(3), “Even when taking credit for plant features and operator actions, failure of the piping segment will not prevent or adversely affect the plant’s capability to reach or maintain safe shutdown conditions.”	Based on original Section I-3.1.3(a)(5) – see table entry above.
I-3.2.2(b)(4)	N/A	Added new Section I-3.2.2(b)(4), “The piping segment does not individually support a significant mitigating or diagnosis function addressed in the Emergency Operating Procedures or the Severe Accident Management Guidelines, with no redundancy or alternate means of support.”	Based on original Section I-3.1.3(b)(2) – see table entry above.
I-3.2.2(b)(5)	N/A	Added new Section I-3.2.2(b)(5), “The plant condition monitoring program would identify any known active degradation mechanisms in the pipe segment prior to its failure in test or an actual demand event (e.g., flow accelerated corrosion program).”	In response to removal of statement regarding treatment of Medium consequence category segments subject to a known active degradation mechanism (see above I-3.2.2(b)).

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I-3.2.2(b)(6)	N/A	Added new Section I-3.2.2(b)(6), “Even when taking credit for plant features and operator actions, failure of the piping segment will not result in releases of radioactive material that would result in the implementation of off-site emergency response and protective actions.”	Based on original Section I-3.1.3(b)(3) – see table entry above.
I-3.2.2(b) between (6) and (7)	N/A	Added, “The RISC process shall demonstrate that the defense-in-depth philosophy is maintained. Defense-in-depth may be demonstrated by following the guidelines of U.S.N.R.C. Regulatory Guide 1.174, Revision 1, “An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis,” dated November 2002. Defense-in-depth is maintained if:”	Based on original Section I-3.1.4 – see table entry above.
I-3.2.2(b)(7)	N/A	Added, “A reasonable balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation.”	Taken from Reg Guide 1.174.
I-3.2.2(b)(8)	N/A	Added, “Over-reliance on programmatic activities to compensate for weaknesses in plant design is avoided.”	Taken from Reg Guide 1.174.
I-3.2.2(b)(9)	N/A	Added, “System redundancy, independence, and diversity are preserved commensurate with the expected frequency, consequences of challenges to the system, and uncertainties (e.g., no risk outliers).”	Taken from Reg Guide 1.174.

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I-3.2.2(b)(10)	N/A	Added, “Defenses against potential common cause failures are preserved, and the potential for the introduction of new common cause failure mechanisms is assessed.”	Taken from Reg Guide 1.174.
I-3.2.2(b)(11)	N/A	Added, “Independence of fission-product barriers is not degraded.”	Taken from Reg Guide 1.174.
I-3.2.2	N/A	Added sentence following I-3.2.2(11); “If any of the above eleven (11) conditions are not true, HSS should be assigned.	Statement added to instruct expert panel which ranking to assign based on the answers to the eleven considerations. Also consistent with NEI 00-04.
I-3.2.2(c)	N/A	<p>Changed first sentence from original Section I-3.1.5 to read, “If LSS has been assigned from I-3.2.2(b), then the RSC process shall verify that there are sufficient safety margins to account for uncertainty in the engineering analysis and in the supporting data.”</p> <p>Added 2nd, 3rd, and 4th sentences from the original Section I-3.1.5 without change.</p> <p>Added new sentence, “If LSS has been assigned from I-3.2.2(b) and at least one of the above safety margin conditions are true, then LSS should be assigned; if both of the above safety margin conditions are not true, then HSS shall be assigned.”</p>	Original Section I-3.1.5 restated for clarity – no intended change in methodology. Moved to Section I-3.2.2 for consistency.

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Table I-1	Table entry for Design Basis Event Category I and Consequence Category was “N/A”	“N/A” changed to “None”	None is a recognized Consequence Category that must then be processed through the additional considerations in I-3.2.2. N/A indicated that there was no consequence category and the pipe segment could be categorized as LSS without additional considerations.

Note 1 – Figure I-1, Risk-Informed Safety Classification Process

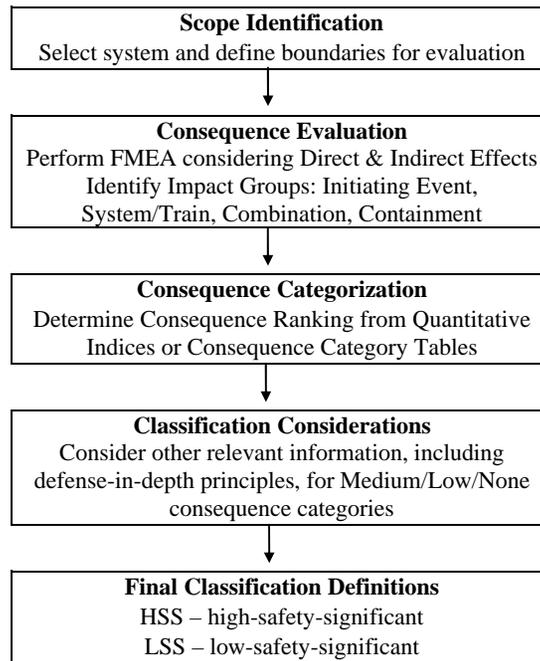


Figure I-1
Risk-Informed Safety Classification Process