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Policy Document	Document Title	Hyperlink to documents	Comments
DOE 5480.30	NUCLEAR REACTOR SAFETY DESIGN CRITERIA	https://www.directives.doe.gov/directives-documents/5400-series/5480.30-BOrder-Chg1/@@images/file	
DOE O 151.1C	Comprehensive Emergency Management System (ARCHIVED)	https://www.directives.doe.gov/directives-documents/100-series/0151.1-BOrder-c	**ARCHIVED**
DOE O 210.2A	DOE Corporate Operating Experience Program	https://www.directives.doe.gov/directives-documents/200-series/0210.2-BOrder-a	
DOE O 225.1B	Accident Investigations	https://www.directives.doe.gov/directives-documents/200-series/0225.1-BOrder-b/@@images/file	
DOE O 227.1	Independent Oversight Program	https://www.directives.doe.gov/directives-documents/200-series/0227.1-BOrder-A	
DOE O 232.2 Chg 1	Occurrence Reporting and Processing of Operations Information	https://www.directives.doe.gov/directives-documents/200-series/0232.2-BOrder-A	No direct HPI content
DOE O 422.1	Conduct of Operations	https://www.directives.doe.gov/directives-documents/400-series/0422.1-BOrder/@@images/file	
DOE O 425.1D Chg 1	Verification of Readiness to Startup or Restart Nuclear Facilities	https://www.directives.doe.gov/directives-documents/400-series/0425.1-BOrder-d-chg1-admchg	No direct HPI content
DOE O 426.2 Chg 1	Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities	https://www.directives.doe.gov/directives-documents/400-series/0426.2-BOrder-chg1-admchg	No direct HPI content
DOE O 452.1E	NUCLEAR EXPLOSIVE AND WEAPON SURETY PROGRAM	https://www.directives.doe.gov/directives-documents/400-series/0452.1-BOrder-e/@@images/file	
DOE O 452.2E	NUCLEAR EXPLOSIVE SAFETY	https://www.directives.doe.gov/directives-documents/400-series/0452.2-BOrder-e/@@images/file	
DOE G 414.1-1C	MANAGEMENT AND INDEPENDENT ASSESSMENTS GUIDE	https://www.directives.doe.gov/directives-documents/400-series/0414.1-EGuide-1C/@@images/file	
DOE G 420.2-1A	Accelerator Facility Safety Implementation Guide for DOE O 420.2 C, SAFETY OF ACCELERATOR FACILITIES	https://www.directives.doe.gov/directives-documents/400-series/0420.2-EGuide-1a/@@images/file	
DOE G 433.1-1A	NUCLEAR FACILITY MAINTENANCE MANAGEMENT PROGRAM GUIDE FOR USE WITH DOE O 433.1B	https://www.directives.doe.gov/directives-documents/400-series/0433.1-EGuide-1a-Chg%201-admchg/@@images/file	
DOE G 450.4-1C	Integrated Safety Management System	https://www.directives.doe.gov/directives-documents/400-series/0450.4-EGuide-1c/@@images/file	

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Policy Document	Document Title	Hyperlink to documents	Comments
DOE-STD-1027-92	Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports (ARCHIVED)	https://www.standards.doe.gov/standards-documents/1000/1027-AStd-1992-cn1	DOE-STD-1027-1992 cn1 archived and replaced by DOE-STD-1027-2018, cn1. See related document DOE-STD-1104-2016
DOE-STD-1027-2018 (cn1)	Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports	https://www.standards.doe.gov/standards-documents/1000/1027-astd-2018-cn1	Supersedes: DOE-STD-1027-2018, Hazard Categorization of DOE Nuclear Facilities on Dec 18, 2018
DOE-STD-1029-92	Writer's Guide for Technical Procedures. (ARCHIVED)	https://www.standards.doe.gov/standards-documents/1000/1029-astd-1992-cn1-1998/@@images/file	**ARCHIVED** Rev 1 - In 2010, the Procedure Professionals Association (PPA) assumed ownership and maintenance responsibilities for AP-907-001, Procedure Process Description, and AP-907-005, Procedure Writers' Manual. PPA is an industry working group for procedure related interests and is composed of subject matter experts from the U.S. commercial nuclear field, the U.S. Department of Energy, and other similar business interests. PPA is an open forum for procedure related issues and accepts membership from a variety of business entities. Rev 2 - In 2012...Additional minor changes were made to align this standard with Department of Energy (DOE) document needs in support of cancellation of DOE-STD-1029-92. DOE adopted PPA AP-907-001 and PPA AP-907-005 as the writing standards for DOE in conjunction with cancellation of DOE-STD-1029-92 in July of 2015
DOE-STD-1030-96	Guide to Good Practices for Lockouts and Tagouts	https://www.standards.doe.gov/standards-documents/1000/1030-astd-1996/@@images/file	
DOE-STD-1031-92	Guide to Good Practices for Communications	https://www.standards.doe.gov/standards-documents/1000/1031-AStd-1992-cn1/@@images/file	
DOE-STD-1036-93	Guide to Good Practices for Independent Verification.	https://www.standards.doe.gov/standards-documents/1000/1036-AStd-1993-cn1/@@images/file	
DOE-STD-1038-93	Guide to Good Practices for Operations Turnover.	https://www.standards.doe.gov/standards-documents/1000/1038-AStd-1993-cn1/@@images/file	
DOE-STD-1104-2016	Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents	https://www.standards.doe.gov/standards-documents/1100/1104-astd-2016	See DOE-STD-1027-92 and DOE-STD-1027-2018, cn1
DOE-STD-1186	SPECIFIC ADMINISTRATIVE CONTROLS	https://www.standards.doe.gov/standards-documents/1100/1186-astd-2016/@@images/file	
DOE-STD-3009-2014	Preparation of Nonreactor Nuclear Facility Documented Safety Analysis	https://www.standards.doe.gov/standards-documents/3000/3009-astd-2014	
National Fire Protection Association (NFPA) 70E	Standard for Electrical Safety in the Workplace		
DEAR 970.5223-1	Integration of Environment, Safety, and Health into Work Planning and Execution;	https://www.govinfo.gov/content/pkg/CFR-2010-title48-vol5/pdf/CFR-2010-title48-vol5-sec970-5223-1.pdf	No direct HPI content

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Policy Document	Document Title	Hyperlink to documents	Comments
PPA AP-907-001	Procedure Profesionals Association Procedure Process Description	http://www.ppaweb.org/documents/PPA-AP-907-001.pdf	Rev 1 - In 2010, the Procedure Professionals Association (PPA) assumed ownership and maintenance responsibilities for AP-907-001, Procedure Process Description, and AP-907-005, Procedure Writers' Manual. PPA is an industry working group for procedure related interests and is composed of subject matter experts from the U.S. commercial nuclear field, the U.S. Department of Energy, and other similar business interests. PPA is an open forum for procedure related issues and accepts membership from a variety of business entities. Rev 2 - In 2012...Additional minor changes were made to align this standard with Department of Energy (DOE) document needs in support of cancellation of DOE-STD-1029-92. DOE adopted PPA AP-907-001 and PPA AP-907-005 as the writing standards for DOE in conjunction with cancellation of DOE-STD-1029-92 in July of 2015
PPA AP-907-005	Procedure Profesionals Association Procedure Writer's Manual	http://www.ppaweb.org/documents/PPA-AP-907-005.pdf	Rev 1 - In 2010, the Procedure Professionals Association (PPA) assumed ownership and maintenance responsibilities for AP-907-001, Procedure Process Description, and AP-907-005, Procedure Writers' Manual. PPA is an industry working group for procedure related interests and is composed of subject matter experts from the U.S. commercial nuclear field, the U.S. Department of Energy, and other similar business interests. PPA is an open forum for procedure related issues and accepts membership from a variety of business entities. Rev 2 - In 2012...Additional minor changes were made to align this standard with Department of Energy (DOE) document needs in support of cancellation of DOE-STD-1029-92. DOE adopted PPA AP-907-001 and PPA AP-907-005 as the writing standards for DOE in conjunction with cancellation of DOE-STD-1029-92 in July of 2015
PPA AP-907-001-001	Procedure Profesionals Association Procedure Performance Metrics	http://www.ppaweb.org/Documents/PPA-AP-907-001-001.pdf	Rev 1 - In 2010, the Procedure Professionals Association (PPA) assumed ownership and maintenance responsibilities for AP-907-001, Procedure Process Description, and AP-907-005, Procedure Writers' Manual. PPA is an industry working group for procedure related interests and is composed of subject matter experts from the U.S. commercial nuclear field, the U.S. Department of Energy, and other similar business interests. PPA is an open forum for procedure related issues and accepts membership from a variety of business entities. Rev 2 - In 2012...Additional minor changes were made to align this standard with Department of Energy (DOE) document needs in support of cancellation of DOE-STD-1029-92. DOE adopted PPA AP-907-001 and PPA AP-907-005 as the writing standards for DOE in conjunction with cancellation of DOE-STD-1029-92 in July of 2015

			Volume 1: Concepts and Principles										Volume 2: HPI Tools for Individual															Volume 2: HPI Tools for Work Teams																Volume 2: HPI Tools for Management															
Document	Location (Page, number, etc.) within document	BEHAVIORS HPI Policy Document Verbiage	Overview, ISMS, Behavior, etc. (Chapter 1)	Strategic Approach for Human Performance (Chapter 1)	Principles of Human Performance (Chapter 1)	Human Fallibility (Error Traps) (Chapter 2)	Performance Modes (Skill, Rule Knowledge) (Chapter 2)	Error Likely Situations (Precursors) (Chapter 2)	Managing Controls (Chapter 3)	Safety Culture (Chapter 4)	Leadership and Key Leadership Practices (Chapter 4)	Create a Just Culture (Chapter 4)	Human Performance Evolution (Chapter 5)	Task Preview	Job-Site Review	Questioning Attitude	Stop When Unsure	Self-Checking	Procedure Use & Adherence	Validate Assumptions	Signature	Three-Way Communication	Phonetic Alphabet	Place-Keeping	Do-Not-Disturb Sign	Pre-Job Briefing	Peer-Checking	Concurrent Verification	Independent Verification	Peer Review	Flagging	Turnover	Post-Job Review	Project Planning	Problem Solving (PACTS)	Decision Making	Project Review Meeting	Vendor Oversight	Benchmarking	Observations	Self-Assessments	Performance Indicators	Independent Oversight	Investigating Events Triggered by Human Error	Operating Experience	Change Management	Reporting Errors and Near Misses	Culpability Decision Tree	Employee Surveys	Comments
DOE 5480.30	Page 9	8 Requirements c. General Design Requirements (9) Human Factors Engineering (HPE) HFE shall be considered per DOE 5480.23 in the design of nuclear reactors or nuclear reactor systems that have a human interface for operating or maintenance. The formality and the extent of the HFE program shall be graded on the basis of the extent of the human interaction, the overall design effort, and the risk associated with human performance failures.	K-I	K-D	M-I K-D	M-D K-D	K-D	M-D K-D	M-D K-D		K-I		K-D																																										LK - Just Definition
DOE 5480.30	Page 31, Attachment 2, pg. 3	Attachment 2: Definitions Human Factors Engineering means the application of knowledge about human performance capabilities and behavioral principles to the design, operation, and maintenance of human-machine systems so that personnel can function at their optimum level of performance.	K-I	K-D	M-I K-D	M-D K-D	K-D	M-D K-D	M-D K-D		K-I		K-D																																									L - N/A
DOE 5480.30	Page 45, Attachment 3, pg. 13	3 Implementation Guidance (9) Human Factors Engineering (HPE) HFE shall be considered per DOE 5480.23 in the design of nuclear reactors or nuclear reactor systems that have a human interface for operating or maintenance. The formality and the extent of the HFE program shall be graded on the basis of the extent of the human interaction, the overall design effort, and the risk associated with human performance failures.	K-I	K-D L-I	M-I K-D	M-D K-D	K-D	M-D K-D	M-D K-D		K-I		K-D																																									
DOE 5480.30	Page 46, Attachment 3, pg. 13	3 Implementation Guidance (9) Human Factors Engineering (HPE) (a) Program Plan. A HFE program plan should be prepared during conceptual design of a system, the plan should address the approach to providing a human-oriented design of the facility. The plan should detail the types of HFE analyses, design efforts, evaluations, and schedule of the HFE effort to provide timely input to the overall design. The plan should reflect the integration of HFE with other design disciplines. The plan should provide a description of human performance objectives, applicable standards and specifications, and other project-specific information.	K-I	K-D L-I	M-I K-D	M-D K-D	K-D	M-D K-D	M-D K-D		K-I		K-D																																								
DOE 5480.30	Page 46, Attachment 3, pg. 13	Attachment 3 3 Implementation Guidance (9) Human Factors Engineering (HPE) (b) Analysis of Requirements. HFE should be involved in function analysis where the various functions necessary to meet the facility mission objectives are determined. HFE should provide the analyses to properly allocate functions to man or machine (see Meister, 1985), identifying the role of the human in system/facility operation and maintenance. A Task Analysis should be performed, identifying and analyzing task for implications for design, human error, safety and other human performance issues. Human Factors Engineering design requirements related to human performance should be defined. These analyses should be reviewed during normal design reviews and evaluations. (DOD-HDBK-763, Meister, 1985)	K-I	K-D	M-I K-D L-I	M-D K-D	K-D	M-D K-D	M-D K-D		K-I		K-D																																								
DOE 5480.30	Page 46, Attachment 3, pg. 14	3 Implementation Guidance (9) Human Factors Engineering (HPE) (e) HFE Design Guidance. There are several sources of HFE design criteria from which a set of design criteria may be adopted. The areas covered by these criteria, when applicable, include the following: - Working Environment: safe, comfortable and compatible with human performance; - Design for Maintainability: allows access to, space for maintenance and does not exceed human performance capabilities; - Human-Computer Interface: user-friendly software interface;			K-I M-I	M-D K-D		M-D K-D	M-D K-D																																											
DOE O 210.2A	Page 1	1. PURPOSE. a. To institute a Department of Energy (DOE) wide program for the management of operating experience complex-wide to prevent adverse operating incidents and facilitate the sharing of good work practices among DOE sites, while enabling tailored local operating experience programs based on the nature of work, hazards, and organizational complexities. Operating experiences can be found in all disciplines.		K-D	K-I	K-D	K-D	K-D	K-D	K-I	K-I	K-I	K-D																																								M-D L-D K-D										
DOE O 210.2A	Page 6	6. Definitions d. Lesson Learned. A good work practice or innovative approach that is captured and shared to promote repeat application or an adverse work practice or experience that is captured and shared to prevent recurrence. e. Operating Experience. Information that relates to the methods by which work is planned and conducted and an organization's missions are performed. Operating experience provides the basis for knowledge and understanding that fosters development of lessons learned and improvement of operational performance.		K-D	K-I	K-I	K-D	K-D	K-D	K-I	M-D K-I	K-I	K-I																																								M-D K-D										LK: n/a
DOE O 225.1B	Page 6, Section 4.c (2) (c)	4. Requirements c. Conduct the Investigation (2) Investigate the Accident (c) The AIB must analyze the facts and derive causal factors (direct, root, and contributing causes) associated with human performance and safety management systems. Each identified root and contributing causal factor must support a corresponding Judgment of Need.	M-D K-I	M-I K-D	M-I K-D	M-I K-D	M-I K-D	M-I K-D	M-I K-D	M-I K-D	M-I K-D	M-D K-D	M-I K-D																																									M-D K-D L-D	M-I		K-D	M-D						

Document	Location (Page, number, etc.) within document	BEHAVIORS HPI Policy Document Verbiage	Volume 1: Concepts and Principles										Volume 2: HPI Tools for Individual												Volume 2: HPI Tools for Work Teams														Volume 2: HPI Tools for Management												Comments
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DOE O 225.1B	Page 7, Section 4.c.(3) (c) 2	4. Requirements c. Conduct the Investigation (3) Report Investigation Results (c) Before completion of the accident investigation report, the AIB Chairperson must: 2. Ensure that the report includes results from an analysis of management control, safety systems, and human performance, that may have contributed to the accident;	K-D	K-D	M-I K-D	K-D	K-D	K-D	K-D	M-I K-D	K-D	K-D	K-D																																M-I K-D L-D			M-I K-D			
DOE O 225.1B	Page 13, Section 6	6. References k. DOE Technical Standard Human Performance Improvement Handbook, Volume 1: Concepts and Principals, DOE-HDBK-1028-2009 l. DOE Technical Standard Human Performance Improvement Handbook, Volume 2: Human Performance Tools for Individuals, Work Teams, and Management, DOE-HDBK-1028-2009	M-D						M-D																																		M-D K-D			K-D			L - N/A
DOE O 225.1B	Page 21, Appendix B, B-1	Definitions 6. Causal Factor. An event or condition in the accident sequence necessary and sufficient to produce or contribute to the unwanted result. A causal factor is a collective descriptive term associated with human performance or a safety management system which can be broken down to identify direct, root, and contributing causes.	M-I				M-I		M-I	M-D	M-I																																M-D K-D			K-D			
DOE O 225.1B	Page 22, Appendix B, B-1	Definitions 15. Judgments of Need. Managerial controls, safety measures, or human performance improvements necessary to prevent or minimize the probability or severity of a recurrence of an accident.	M-I		M-I		M-I		M-I																																		M-I K-D			K-D			
DOE O 225.1B	Page 22, Appendix B, B-1	Definitions 16. Learning Organization A learning organization is one that values learning and is committed to facilitating continuous performance improvement. It encourages a culture of openness and trust in an environment that rewards efforts to learn from experiences. The organization recognizes Human Performance Improvement concepts and principals in problem analysis, solution planning, and solution implementation. It rewards ongoing efforts to learn from experience, learn from others, and from self-directed studies and aggressively seeks to know what it doesn't know..	M-D	M-I					M-I	M-I			M-D																																K-D	M-D		K-D			
DOE O 225.1B	Page 22, Appendix B, B-1	Definitions 17. Lesson Learned. A "good work practice" or innovative approach that is captured and shared to promote its repeated application. A lesson learned may also be an adverse work practice or experience, or human factor that is captured and shared to avoid recurrence	M-D		M-D				M-D	M-D																																		K-D	M-D		K-D			
DOE O 227.1	Page 1	1. PURPOSE. To prescribe the requirements and responsibilities for the Department of Energy (DOE) Independent Oversight Program.	K-I	K-I							M-D K-I		K-I																															M-D K-D						LK: N/A This is DOE internal
DOE O 422.1	page 1, section 1: Purpose	The goal is to minimize the likelihood and consequences of human fallibility or technical and organizational system failures. The purpose of this Order is to ensure that management systems are designed to anticipate and mitigate the consequences of human fallibility or potential latent conditions and to provide a vital barrier to prevent injury, environmental insult or asset damage, and to promote mission success.	K-I M-D	K-D M-D L-I	K-D M-D L-D	K-D M-D L-D	K-D	K-D M-D L-D	K-D M-D L-D	K-I	K-D	K-I	K-D																																K-I	K-I		K-I	K-I					
DOE O 422.1	Page 7, section 7; Definitions	c. Concurrent Dual Verification. A method of checking an operation, an act of positioning, or a calculation, in which the verifier independently observes and/or confirms the operation or calculation. (DOE-STD-1036-93 (CH-1))				K-I	K-I	K-I	M-D K-D																																									LK: N/A
DOE O 422.1	Page 7, section 7; Definitions	d. Conduct of Operations Program. The formal documentation, practices, and actions implementing disciplined and structured operations that support mission success and ensure worker, public, and environmental protection. The program goal is to minimize the likelihood and consequences of human fallibility or technical and organizational system failures.	K-I	K-D M-D	K-D L-I	K-D M-D L-D	K-D	K-D M-D	K-D L-I	K-I	K-D	K-I	K-D																																M-D						
DOE O 422.1	Page 7, section 7; Definitions	g. Independent Verification. The act of checking, by a separate qualified person, that a given operation or component position conforms to established criteria. (DOE-STD-1036-93 CH-1))				K-I	K-I	K-I	M-D K-D																																									LK: n/a
DOE O 422.1	Attachment 2; Page 3, Specific Requirements	b. Shift Routines and Operating Practices. (DOE-STD-1041-93 (CH-1), Guide to Good Practices for Shift Routines and Operating Practices) (3) awareness by operating personnel of the status of equipment through inspection, conducting checks, and tours of equipment and work areas;	K-I						K-D		K-D		K-I			M-D K-D	M-D L-I			M-I L-I	L-I																																	
DOE O 422.1	Attachment 2; Page 3, Specific Requirements	b. Shift Routines and Operating Practices. (DOE-STD-1041-93 (CH-1), Guide to Good Practices for Shift Routines and Operating Practices) (4) procedures for completing round sheets or inspection logs, responding to abnormal conditions, and periodic supervisory reviews of round sheets or inspection logs; (5) procedures for protecting operators from personnel hazards, e.g. chemical, radiological, laser, noise, electromagnetic, toxic or nano-scale materials; (7) procedures for resetting protective devices	K-I			K-D		K-D	K-D		K-D		K-I					L-I		M-D L-D K-D																															
DOE O 422.1	Attachment 2; Page 4, Specific Requirements	d. Communications. (DOE-STD-1031-92 (CH-1), Guide to Good Practices for Communications) (5) use of oral instructions and communications, including use of repeat-backs and sender/receiver identifications.							K-D		K-D		K-I					L-I			M-D L-D K-D	M-D L-D K-D																															
DOE O 422.1	Attachment 2; Page 4, Specific Requirements	f. Investigation of Abnormal Events, Conditions, and Trends. (DOE-STD-1045-93 (CH-1), Guide to Good Practices for Notifications and Investigation of Abnormal Events) .	K-I			K-D	K-D	K-D	K-D	K-D	K-D	K-D	K-I																															M-I L-I			M-D L-D K-D				M-D L-D K-D	K-D		
DOE O 422.1	Attachment 2; Page 7, Specific Requirements	j. Independent Verification. (DOE-STD-1036-93 (CH-1), Guide to Good Practices for Independent Verification)	K-I			K-I	K-I	K-I	K-D									L-I							L-D	L-D K-D	M-D L-D K-D																									

Document	Location (Page, number, etc.) within document	BEHAVIORS HPI Policy Document Verbiage	Volume 1: Concepts and Principles										Volume 2: HPI Tools for Individual												Volume 2: HPI Tools for Work Teams															Volume 2: HPI Tools for Management												Comments
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DOE O 422.1	Attachment 2; Page 8, Specific Requirements	l. Turnover and Assumption of Responsibilities. (DOE-STD-1038-93 (CH-1), Guide to Good Practices for Operations Turnover) The operator must establish and implement operations practices for thorough, accurate transfer of information and responsibilities at shift or operator relief to ensure continued safe operation, addressing the following elements:	K-D						K-D		K-D		K-I			K-D	L-I				L-I											M-D L-D K-D	K-I			K-D								K-D							
DOE O 422.1	Attachment 2;Page 9, Specific Requirements	p. Technical Procedures. (DOE-STD-1029-92 (CH-1), Writer's Guide for Technical Procedures) The operator must establish and implement operations practices for developing and maintaining accurate, understandable written technical procedures that ensure safe and effective facility and equipment operation, addressing the following elements:	K-I			K-D		K-D	M-D L-I K-D		K-D		K-I						M-D L-D K-D					L-D							L-I																				
DOE O 422.1	Attachment 2, Page 10, section 3:Defintions	c. Concurrent Dual Verification. A method of checking an operation, an act of positioning, or a calculation, in which the verifier independently observes and/or confirms the operation or calculation. (DOE-STD-1036-93 (CH-1))	L-I			K-I	K-I	K=I	M-D L-I K-D									L-I								L-D K-D	M-D L-D L-D																							
DOE O 422.1	Attachment 2, Page 10,section 3:Defintions	d. Conduct of Operations Program. The formal documentation, practices, and actions implementing disciplined and structured operations that support mission success and ensure worker, public, and environmental protection. The program goal is to minimize the likelihood and consequences of human fallibility or technical and organizational system failures.	K-D M-D	K-D M-D	K-D L-I	K-D L-D	K-D	K-D	K-D M-D L-I	K-I	K-D M-D	K-I	K-D															M-D																							
DOE O 422.1	Attachment 2, Page 10, section 3:Defintions	g. Independent Verification. The act of checking, by a separate qualified person, that a given operation or component position conforms to established criteria. (DOE-STD-1036-93 CH-1))	K-I			K-I	K-I	K-I	M-D L-I K-D									L-I								L-D	K-D	M-D L-D K-D																							
DOE O 422.1	Attachment 2, Page A-4, Appendix A,	Organization and Administration, Attachment 2, Paragraph 2.a 2.a.(3) Monitoring and self-assessment of operations a. Operating problems are documented and evaluated, and corrective actions are taken		L-I					K-D		K-D		K-I			L-D																							K-D	M-D K-D			M-I L-D	M-I L-D K-I		M-D L-D K-D				
DOE O 422.1	Attachment 2, Page A-4, Appendix A,	Organization and Administration, Attachment 2, Paragraph 2.a 2.a.(3) Monitoring and self-assessment of operations b. Supervisors and managers directly observe operations frequently and provide feedback							K-D		K-D		K-I																											M-D L-D K-D	M-D L-D K-D					K-I		K-D				
DOE O 422.1	Attachment 2, Page A-4,Appendix A,	Organization and Administration, Attachment 2, Paragraph 2.a 2.a.(3) Monitoring and self-assessment of operations c. Appropriate outside organizations such as Quality Assurance or other oversight organizations observe operations and provide feedback	K-D						K-I		K-D		K-I																										K-D	M-D	K-D	M-D L-D K-D			K-I		K-D				
DOE O 422.1	Attachment 2, Page A-4, Appendix A,	Organization and Administration, Attachment 2, Paragraph 2.a 2.a.(3) Monitoring and self-assessment of operations d. Assessment and observation issues are tracked and corrected	K-D						K-I		K-D		K-I																										K-D	M-D L-D	M-D L-I K-D	L-I K-D	L-I	K-I		K-D				
DOE O 422.1	Attachment 2, Page A-4,Appendix A,	Organization and Administration, Attachment 2, Paragraph 2.a 2.a.(4) Management and worker accountability for the safe performance of work a. Management systems are designed to minimize the effects of human performance failures.	K-D	K-D M-D L-I	K-D	K-D M-D	K-D	K-D M-D	K-D L-D	K-D	K-D L-I	K-D	K-D																																								
DOE O 422.1	Attachment 2, Page A-4,Appendix A,	Organization and Administration, Attachment 2, Paragraph 2.a 2.a.(4) Management and worker accountability for the safe performance of work b. Personnel involved in repeated or willful violations of operating practices are counseled, retrained, or disciplined as appropriate	K-D							K-D	K-I	L-D K-D	K-I																																K-D				M-D L-D K-D			
DOE O 422.1	Attachment 2, Page A-5,Appendix A,	Organization and Administration, Attachment 2, Paragraph 2.a 2.a.(4) Management and worker accountability for the safe performance of work c. Personnel are recognized for notable safety improvement actions or ideas.	K-D						M-D L-D K-D	M-D L-I K-I	M-D K-D	K-I		K-I																		K-I		K-I	K-I																		
DOE O 422.1	Attachment 2, Page A-9,Appendix A,	Shift Routines and Operating Practices, Attachment 2 Paragraph 2.b 2.b.(6) Prompt response to instrument indications, including the use of multiple indications to obtain parameters a. Operators believe their indications unless proven otherwise. b. Operators check other indicators when possible to confirm unexpected readings c. Operators take prompt action to investigate and correct abnormal conditions d. Operators identify inaccurate or malfunctioning instruments and inform appropriate supervisors and repair organizations e. In case of doubtful readings, operators place safety above production.	K-I						K-D							M-D L-D K-D	M-D L-I K-D	K-D		K-D																K-D	K-D															
DOE O 422.1	Attachment 2; Page A-11, Appendix A,	Shift Routines and Operating Practices, Attachment 2 Paragraph 2.b 2.b.(10) Professional and disciplined operator performance of duties a. Potential distractions such as electronic devices (radio, TV, music players, games), personal telephone calls, game playing, and horseplay are prohibited b. Non-work-related written materials are prohibited. Operators may read training bulletins, technical manuals, or operating experience information or review other written, audible, or visual materials that relate to operator duties. c. Supervisors ensure operators' primary duties are not compromised and provide guidance on potentially distracting materials and devices						K-D	L-I		K-I		K-I												M-I L-I																											
DOE O 422.1	Attachment 2, Page A-15, Appendix A,	Communications, Attachment 2 Paragraph 2.d 2.d.(5) Use of oral instructions and communications, including use of repeat-backs and sender/receiver identifications a. Policies require clear and concise oral communications b. Policies define when repeat-backs are appropriate and how they are implemented	K-I			K-D			K-D													M-D L-D K-D	M-I L-D				K-D	K-D																									

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Document	Location (Page, number, etc.) within document	BEHAVIORS HPI Policy Document Verbiage	Overview, ISMS, Behavior, etc. (Chapter 1)	Strategic Approach for Human Performance (Chapter 1)	Principles of Human Performance (Chapter 1)	Human Fallibility (Error Traps) (Chapter 2)	Performance Modes (Skill, Rule Knowledge) (Chapter 2)	Error Likely Situations (Precursors) (Chapter 2)	Managing Controls (Chapter 3)	Safety Culture (Chapter 4)	Leadership and Key Leadership Practices (Chapter 4)	Create a Just Culture (Chapter 4)	Human Performance Evolution (Chapter 5)	Task Preview	Job-Site Review	Questioning Attitude	Stop When Unsure	Self-Checking	Procedure Use & Adherence	Validate Assumptions	Signature	Three-Way Communication	Phonetic Alphabet	Place-Keeping	Do-Not-Disturb Sign	Pre-Job Briefing	Peer-Checking	Concurrent Verification	Independent Verification	Peer Review	Flagging	Turnover	Post-Job Review	Project Planning	Problem Solving (PACTS)	Decision Making	Project Review Meeting	Vendor Oversight	Benchmarking	Observations	Self-Assessments	Performance Indicators	Independent Oversight	Investigating Events Triggered by Human Error	Operating Experience	Change Management	Reporting Errors and Near Misses	Culpability Decision Tree	Employee Surveys	Comments
DOE O 422.1	Attachment 2, Page A-20,Appendix A,	Investigation of Abnormal Events, Conditions, and Trends, Attachment 2, Paragraph 2.f 2.f.(3) Investigation process and techniques f. The event is analyzed to determine equipment and personnel response, procedure and equipment adequacy, human performance factors, and safety impact		L-I						K-I		K-I	K-I																														K-D M-D L-D	L-D		L-I			
DOE O 422.1	Attachment 2, Page A-36, Appendix A,	Independent Verification, Attachment 2 Paragraph 2.j 2.j.(3) Methods for performing and documenting independent verification a. Management develops and approves verification techniques appropriate to facility-specific equipment, using manufacturer's recommendations and expert operators b. Operators are trained in techniques appropriate to the facility's equipment. c. Procedures provide reference documentation explaining how to perform verification of the facility's components, e.g. manual, solenoid-, motor- and air-operated valves, circuit breakers, blank flanges, removable links and fuses, control power availability, and any other specific component position or condition required d. Procedures specify how to achieve independence, including having each check include identification of the component and determining both its required and actual position, and minimizing interactions between operators positioning components and those verifying position, except in special situations for throttled valves or to reduce radiation or toxic exposure. (concurrent dual verification)	K-I			K-D	K-I	K-D	M-D L-I K-D		K-D		K-I						K-D	K-D							K-D	M-D L-D K-D																					
DOE O 422.1	Attachment 2, Page A-38, Appendix A,	Independent Verification, Attachment 2 Paragraph 2.j 2.j.(4) Situations, if any, allowing concurrent dual verification a. Procedures specify situations where concurrent dual verification is used. Examples are throttled valves that must be repositioned to determine position, or sequential operations such as a bolt torqueing pattern.	K-I			K-I	K-I	K-I	L-I K-D											K-D							M-D L-D K-D	L-I K-D																					
DOE O 422.1	Attachment 2, Page A-38,Appendix A,	Independent Verification, Attachment 2 Paragraph 2.j 2.j.(5) Methods for performing concurrent dual verification, if used. a. Procedures specify how concurrent dual verification is done, if at all.	K-I			K-I	K-I	K-I	L-I K-D											K-D							M-D L-D K-D	L-I K-D																					
DOE O 422.1	Attachment 2, Page A-42, Appendix A,	Turnover and Assumption of Responsibilities, Attachment 2 Paragraph 2.l 2.l. The operator must establish and implement operations practices for thorough, accurate transfer of information and responsibilities at shift or operator relief to ensure continued safe operation, addressing the following elements:	K-D						K-D		K-D		K-I		K-D	L-I				L-I										M-D L-D K-D	K-I			K-D				K-D									
DOE O 422.1	Attachment 2, Page A-54,Appendix A,	Technical Procedures, Attachment 2, Paragraph 2.p 2.p.(3) Procedure content k. Critical steps include signature/initial/checkoff blocks, with only one action per block	K-I			M-D K-I		M-D K-I	K-D									M-I L-I	M-D L-D K-D		K-D							L-I																				
DOE O 422.1	Attachment 2, Page A-54, Appendix A,	Technical Procedures, Attachment 2, Paragraph 2.p 2.p.(3) Procedure content o. Procedures reflect human factors considerations such as procedure callouts exactly matching equipment labels, units in procedures match instrument markings, charts and graphs easily read, and important steps or information highlighted.		K-I	K-D	K-D M-D	K-D	K-D M-D	K-D								L-I		K-D M-D L-I								L-I																				
DOE O 422.1	Attachment 2, Page A-54, Appendix A,	Technical Procedures, Attachment 2, Paragraph 2.p 2.p.(5) A process for training personnel on new, revised, or changed procedures 2.p.(6) A process for approval of new, revised, or changed procedures 2.p.(7) Initial-issue and periodic review and testing of procedures	K-I			K-D		K-D	L-D K-D		K-D		K-I						M-I L-I K-D																										M-I L-I					
DOE O 422.1	Attachment 2,Page A-57, Appendix A,	Technical Procedures, Attachment 2, Paragraph 2.p 2.p.(7) Initial-issue and periodic review and testing of procedures a. Directives include provisions for review of new and revised procedures prior to use and periodically for technical accuracy and human factors considerations.		K-I	K-D	K-D M-D	K-D	K-D M-D	K-D									L-I	K-D M-D								L-I																				
DOE O 422.1	Attachment 2, Page A-57, Appendix A,	Technical Procedures, Attachment 2, Paragraph 2.p 2.p.(7) Initial-issue and periodic review and testing of procedures c. Directives include provisions for reviewing procedures after a significant occurrence, either human error or equipment upset.		K-I	K-D L-I	K-D M-D L-I	K-D	K-D M-D	K-D										K-D M-D																									L-I		K-D L-D	K-D L-I	L-D	K-D			
DOE O 422.1	Attachment 2, Page A-58, Appendix A,	Technical Procedures, Attachment 2, Paragraph 2.p 2.p.(8) Availability and use of the latest revisions of procedures 2.p.(9) Specified and defined procedure use requirements, i.e. reader-worker method, reference use only, use-each-time, and emergency response	K-I			K-D		K-D	M-D L-D K-D		K-D		K-I						M-D L-D K-D			L-D	L-D					K-D	K-D	K-D																		
DOE O 452.1E	Page 11, Section 6	6. Definitions Adverse Environment . An "adverse environment" is an environment that is capable of producing an unwanted response. Examples include anything that introduces unintended or unauthorized energy hazardous to a nuclear explosive such as human error; deliberate acts; equipment malfunction; other accident initiators, precursors, or sequences; and the conditions those events create.	K-I	K-D	K-D M-I	K-D M-D	K-D	K-D	K-D M-I		K-D		K-D																																		

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DOE O 452.2E	Page 5, section 4	4. Requirements A. Nuclear Explosive Safety Program (4) Human Factors Newly proposed (startup) NEOs must incorporate human factors principles into NEO procedures, processes, facility layouts, new tooling and equipment, including Category 1 electrical equipment, starting with the NEO design and development phase and maintained throughout the lifecycle of NEOs. Existing NEOs that are being evaluated (i.e. during an OSR or NCE) should strive to meet human factors principles to the extent reasonably achievable. Organizations developing NEOs must consider the application of established research in human factors and ergonomics, including human-system interface design, human cognition and perception, stress and workload, anthropometry and workspace design, environmental factors, training, and human error.	K-I	K-D M-I	K-D L-D M-I	K-D L-D M-D	K-D	K-D L-D	K-D		K-D		K-D																													L-I			L-I	L-D				
DOE O 452.2E	Page 10, section 4	4. Requirements b. Independent Oversight The Associate Administrator for Safety and Health executes independent oversight of the implementation of this directive and associated NNSA Supplemental Directives by NNSA personnel. This oversight may be carried out through execution of NNSA NES evaluations, independent assessments, or other appropriate mechanisms. On an annual basis, the Office of the Associate Administrator for Safety and Health will summarize its oversight activities, along with any recommendations for changes in the NES program in a report to the NNSA Deputy Administrator for Defense Programs and the Assistant Deputy Administrator for Stockpile Management. A copy of this report will be provided to the NNSA CTA and CDNS for information.	K-I	K-I							K-I		K-I																													K-D	M-D K-D							
DOE O 452.2E	Attachment 2, page 1 (document page 25)	TWO-PERSON CONCEPT REQUIREMENTS 1. BASIC REQUIREMENTS Each person on a two-person concept team must a. be certified in the Human Reliability Program, b. have authorized access to the NEA, c. have technical knowledge of the task being performed, d. be knowledgeable of pertinent safety and security requirements, and e. be in a position to detect incorrect or unauthorized acts and take appropriate action.	K-I			K-I		K-D	K-D										K-D						M-I	M-I	K-D	M-I					K-D										K-D							
DOE O 452.2E	Attachment 2, page 1 (document page 25)	TWO-PERSON CONCEPT REQUIREMENTS 2. IMPLEMENTATION OPTIONS. b. Person-to-Person Coverage Person-to-person coverage is the more stringent form of the two-person concept. Person-to-person coverage is designed to protect configurations that are particularly vulnerable to inadvertent acts (errors of omission or commission) or deliberate unauthorized acts.	K-I			M-D K-D		M-D L-I K-D	M-D L-D K-D																M-I L-I	M-I L-D		M-I L-I K-D					K-D										K-D							
DOE O 452.2E	Attachment 2, page 3 (document page 27)	TWO-PERSON CONCEPT REQUIREMENTS 4, HOW TO APPLY PERSON-TO-PERSON COVERAGE. . c. During the performance of operations on a configuration requiring person-to-person coverage (1) the two-person concept team must be in the immediate vicinity of the configuration; (2) each person on the two-person concept team must observe all operations, ensure that only authorized operations are performed, and ensure that operations are performed correctly; and (3) a reader-worker process that includes the following must be incorporated (a) The procedure must be read aloud, the operation must be performed, and the completion of the operation must be documented in the stated sequence. (b) One of the two people performing the operation may read the procedure aloud to the other person provided that both people can move away from the immediate vicinity of the configuration while the reading is accomplished. (c) If both people cannot move away from the immediate vicinity of the configuration while the reading is accomplished, then a third person must read the procedure aloud to the other people.	K-I			K-I		K-D	M-I L-I K-D										M-D L-D K-D			L-I	L-I	L-I	M-D L-D K-D	M-D L-D K-D	K-D	M-I L-I					K-D										K-D							
DOE G 414.1-1C	Page 11, section 3	3, General Information 3.6 Organizational Activity Levels 3.6.2. System Level Assessments Some of the elements within the work control systems that might be assessed are: • evaluating human performance elements;	K-D	K-D M-D	K-D	K-D	K-D	K-D	K-D L-D		K-D M-D		K-D																													L-I	L-I	L-D		L-I M-D					
DOE G 414.1-1C	Page 24, section 3	4. Guidelines 4.7Independent Assessment Process 4.7.4. Independent Assessment Techniques 4.7.4.3. Observation is the viewing of actual work activities. This is often considered the most effective technique for determining whether performance is in accordance with requirements. Assessors should understand the effect their presence has on the person being observed and convey an attitude that is helpful, constructive, positive, and unbiased. The primary goal during observation is to obtain the most complete picture possible of the performance, which should then be put into perspective relative to the overall program, system, or process.	K-I			K-D		K-D	K-D		M-D L-D K-I		K-I																													L-I		M-D L-D K-D	K-D		L-I M-D K-D					
DOE G 420.2-1A	Page 23, Section 2	2 Accelerator Facility Preoperational Activities 2.4 Procedures Program Development for Safe Operations 2.4.1 Title 10 CFR 835 establishes requirements for written procedures and 10 CFR 851 establishes requirements for procedures to incorporate hazard controls.	K-D	M-D					M-D L-D		K-I		K-I						M-I L-I K-D																	K-I														

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DOE G 420.2-1A	Page 23, Section 2	2 Accelerator Facility Preoperational Activities 2.9 Contractor Assurance System and Safety Reviews Managers of an accelerator facility should consider operating the accelerator so that management systems for identifying deficiencies, performing assessments, conducting peer reviews and oversight, completing corrective actions, and sharing lessons learned are consistent with and support the overall CAS.	K-D	M-D L-I K-I	K-I	K-D	K-D	K-D	L-I K-D	K-I	K-D	K-I	K-I																		K-D					K-D	K-D							K-D	K-D	K-D	M-D L-D K-D	K-D	M-D L-D K-D			M-D L-D K-D			
DOE G 420.2-1A	Page 46, Section 3	3 Accelerator Facility Operations Guidance 3.1 Managing the Accelerator for Safety and Mission Success Using the tailored approach, managers should consider operations goals that include the following: ▯ minimizing the unavailability of safety systems ▯ minimizing personnel errors	K-I L-D	K-I L-D M-D	K-D L-D M-I	K-D L-D M-I	K-D L-I M-I	K-D L-D M-I	K-D L-D M-D	L-I	K-D L-I	L-I	K-D																											L-I	L-D	L-I		L-D	L-I	L-D	L-D				
DOE G 420.2-1A	Page 47, Section 3	3 Accelerator Facility Operations Guidance 3.1 Managing the Accelerator for Safety and Mission Success Accelerator managers should consider implementing procedures for performance of accelerator activities. Operations procedures can help minimize the unavailability of safety systems by requiring operations be curtailed if safety systems fail to operate. Human performance approaches to implementing procedures can minimize events by training accelerator personnel to recognize error-likely situations.	K-I	K-I M-D	K-D M-I	K-D M-I	K-D	K-D M-D	K-D M-I		K-D		K-D																																							
DOE G 420.2-1A	Page 47, Section 3	3 Accelerator Facility Operations Guidance 3.1 Managing the Accelerator for Safety and Mission Success Managers should observe operations and maintenance activities frequently and document problems for evaluation. Consider using scheduled inspections, work observations, performance indicators, audits, reviews, critiques, injury and illness reports, self-assessments, and self-evaluations to document problems for further evaluation. Consider employing critiques or similar thoughtful review practices for minor issues to reduce the chances that they lead to future occurrences. Managers should consider reviewing SF6 leak detection surveys and usage data routinely to estimate the potential GHG emissions. Operators should use a machine-performance-monitoring log and regularly inform the accelerator managers on equipment availability and downtime. Managers should participate in safety inspections and audits, attend meetings of safety review committees, and "manage by walking around."	K-I		K-I	K-D	K-D	K-D	M-D K-D	L-I K-D	K-D	K-D	K-I		M-D																							L-I		M-D L-D K-D	M-D L-D K-D	M-D L-D K-D	K-D	L-I K-D	L-I K-D		M-D L-D K-D			
DOE G 420.2-1A	Page 47, Section 3	3 Accelerator Facility Operations Guidance 3.1 Managing the Accelerator for Safety and Mission Success Managers should enhance safety in the workplace by observing work and learning how the workers have integrated safety into daily activities. By doing this, managers are able to evaluate the effectiveness of safety management systems, the communication of these systems to the worker, and any impediments that might influence the worker away from performing the work as required. If an unsafe act is observed, managers should use the observation as a topic for discussion in which the manager and worker come to an agreement as to how to eliminate such an act from reoccurring. In addition, managers and workers should discuss how safety is integrated into the worker's activities, determine if there are any areas of concern a worker has for himself or his co-workers, and learn if the worker has any positive suggestions.	K-I	M-D L-D	K-I	K-D	K-D	K-D	M-D L-I K-D	L-I K-D	K-D	K-D	K-I		M-D																							L-I		M-D L-D K-D	M-D L-D K-D	K-D	K-D	K-D	K-D		K-D		M-I	
DOE G 420.2-1A	Page 47, Section 3	3 Accelerator Facility Operations Guidance 3.1 Managing the Accelerator for Safety and Mission Success Managers should consider investigating events that do not meet the criteria of a DOE-reportable occurrence via a contractor occurrence reporting system. An operator's log could document day-to-day changes in accelerator facility status, and managers could review it each day. A good practice is to review reports of deficiencies using trouble reports or in the electronic logs of the groups that perform regular tours of the accelerator.	K-I		K-D	K-D	K-D	K-D		K-D		K-I		M-D L-I																K-D	K-D			K-D		L-I				K-I	K-I		M-I L-I K-D	L-I K-D		K-D			
DOE G 420.2-1A	Page 52, Section 3	3 Accelerator Facility Operations Guidance 3.2 Basic Operations Principles and Practices Consider implementing a practice that establishes appropriate actions should an operator experience trouble when implementing a procedure. Examples of problems that may be encountered with procedures includes							K-I						M-I L-D K-D	M-D L-D K-D		M-D L-D K-D																								M-D L-I	L-I							
DOE G 420.2-1A	Page 53, Section 3	3 Accelerator Facility Operations Guidance 3.2 Basic Operations Principles and Practices Sharing information within the DOE accelerator community is considered a good practice. By screening all abnormal events against any internal contractor-developed criteria and the assumptions in the accelerator's safety analyses and ASE requirements, not only can accelerator facility managers maintain the ASE requirements, but they can also help ensure that their safety analyses and controls are adequate.	K-D								K-D		K-I																																M-D L-D K-D					
DOE G 420.2-1A	Page 53, Section 3	3 Accelerator Facility Operations Guidance 3.2 Basic Operations Principles and Practices Accelerator managers should consider establishing an accelerator facility abnormal-events management practice that includes concepts to address ownership, corrective actions, and lessons learned objectives. In addition, the abnormal events management practice should include - establishing and documenting the requirements used to identify abnormal events and situations that might be considered "near misses" or below reporting thresholds	K-I		L-I						K-D		K-I																														M-I L-I	K-D		M-D L-D K-D			

			Volume 1: Concepts and Principles										Volume 2: HPI Tools for Individual												Volume 2: HPI Tools for Work Teams													Volume 2: HPI Tools for Management											
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DOE G 433.1-1A	Page 9, section B	B. MAINTENANCE ORGANIZATION AND ADMINISTRATION B.1 ORDER IMPLEMENTATION GUIDANCE The NMMP should address the following: How management and supervisory personnel will monitor and assess facility maintenance activities to improve all aspects of maintenance performance. This should include a description of how: - Frequently tours of the plant and observations of ongoing work are expected; - Observations are documented and effective corrective actions are taken for noted problems; - Senior managers will monitor the assessment activities of their subordinate managers and supervisors; - Management and supervisory assessments, and improvement efforts will be performance-oriented; - Assessments by other independent groups, such as QA, will be used by line managers and supervisors as a management tool to assist them in assessing maintenance performance; and - Selected maintenance data reflecting facility performance are analyzed and trended, and the results are forwarded to appropriate levels of management.	M-D K-I	M-D L-I	K-I	K-D	K-D	K-D	M-D L-D K-D	K-D	K-D	K-D	K-I																										M-D L-D K-D	M-D L-D K-D	M-D L-I K-D	M-D L-D K-D	K-D	K-D		K-D				
DOE G 433.1-1A	Page 12, section B	B. MAINTENANCE ORGANIZATION AND ADMINISTRATION B.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT B.2.1 Guidelines - Maintenance Organization and Administration B.2.1.6 Status Reports to Managers Managers identify what is important to them by what they monitor. Managers should receive periodic reports on the status of various programs and on the status of action items. Managers should monitor items that are nearing the completion date to verify that due dates will be met. Managers should deal with overdue items, ensure appropriate action is taken, and the item is resolved. See Section B.3, Management Involvement. Undesirable performance trends should be assessed to determine the contributing and root causes. Corrective actions should be developed and implemented to correct undesirable condition	K-I	M-I	K-I	K-D	K-D	K-D	K-D	K-D	K-D	K-D	K-I																										K-D	K-D	M-D L-D K-D	K-D	K-D	L-I K-D		L-I K-D			
DOE G 433.1-1A	Page 13, section B	B. MAINTENANCE ORGANIZATION AND ADMINISTRATION B.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT B.2.1 Guidelines - Maintenance Organization and Administration B.2.1.7 Causal Analysis and Event Prevention Problems, whether identified by management assessment, outside organizations, or events should be analyzed to determine underlying causes so effective corrective actions can be developed and implemented. The causal analysis should be graded to an appropriate level depending on factors such as safety, complexity, mission significance, and cost. Particular emphasis should be placed on deficiencies or causal factors identified as having generic implications, i.e. where there may be a broader extent of the condition. Causal analysis methods should be applied to event investigations, undesirable trends in quantitative indicators, and performance deficiencies noted in monitoring reports. For example, if a deficient condition exists because of personnel performance, the underlying cause(s) may be one or more of the following:	K-I		K-I	M-I L-I K-D	K-D	K-D	K-D	K-D	K-D	K-D	K-I																										K-D		M-I L-D K-D	L-D		K-D	K-D			
DOE G 433.1-1A	Page 14, section B	B. MAINTENANCE ORGANIZATION AND ADMINISTRATION B.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT B.2.1 Guidelines - Maintenance Organization and Administration B.2.1.7 Causal Analysis and Event Prevention Use of Operating Experience: Programs should be in place to ensure the timely review of in-house and external industry operating experience to incorporate lessons learned into maintenance programs and practices. Management should use this operating experience in assessing performance and in performing causal analyses of problems. Management should have mechanisms in place to ensure that significant in-house events are promptly provided to the industry for use by other facilities. Another aspect of operating experience involves visits to or communications with other facilities (benchmarking). Maintenance division managers, supervisors, and workers should take opportunities to visit and communicate with other facilities both to help solve specific problems and to learn different approaches to the routine business of operating facilities.		K-D	K-I	K-D	K-D	K-D	K-D	K-I	K-I	K-I	K-D																									M-D L-D K-D		K-D		K-I	M-D L-D K-D					
DOE G 433.1-1A	Page 14, section B	B. MAINTENANCE ORGANIZATION AND ADMINISTRATION B.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT B.2.1 Guidelines - Maintenance Organization and Administration B.2.1.10 Procedures: A formal systematic program should be established for the preparation, review, approval, distribution, and revision of maintenance procedures to ensure continued accuracy and usability. The program should ensure the review and updating of maintenance procedures at regular intervals.		M-D			K-D		M-D L-I K-D		K-I		K-I							M-D L-I K-D																													
DOE G 433.1-1A	Page 16, section B	B. MAINTENANCE ORGANIZATION AND ADMINISTRATION B.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT B.2.2 Guidelines - Management Involvement B.2.2.2 Management Monitors Performance The results of maintenance performance indicators, goals and objectives, and other related information should be developed, trended, and reported to provide feedback to senior management for use in the progress and feedback reviews discussed below. See Section III.O, Performance Measures, for the development and use of performance indicators, goals, and objectives.	K-I								K-D		K-D																												M-D L-D K-D										

			Volume 1: Concepts and Principles										Volume 2: HPI Tools for Individual															Volume 2: HPI Tools for Work Teams																	Volume 2: HPI Tools for Management											
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DOE G 433.1-1A	Page 16, section B	B. MAINTENANCE ORGANIZATION AND ADMINISTRATION B.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT B.2.2 Guidelines - Management Involvement B.2.2.2 Management Monitors Performance Inspections, audits, reviews, investigations, and self-assessments can assist line managers and supervisors in the identification and correction of program deficiencies. An evaluation of each maintenance program element should be conducted periodically and should include inputs from maintenance managers, supervisors, and other groups, such as operations, technical staff, and appropriate corporate departments. The evaluation should address the overall effectiveness of the program element and any inter- or intra-organizational coordination problems that create work delays or reduce productivity. Areas needing improvements should be assigned for corrective action and follow-up. The program elements to be considered in this evaluation are those identified in the Order and this Guide as Elements III.B-Q	K-I								K-I		K-I																																										
DOE G 433.1-1A	Page 17, section B	B. MAINTENANCE ORGANIZATION AND ADMINISTRATION B.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT B.2.2 Guidelines - Management Involvement B.2.2.5 Feedback Management should set aside time to actively solicit and encourage written or verbal feedback regarding concerns or suggestions for improvement from all affected individuals and organizations including line, staff, support (craft workers, planners, engineers, etc.), and customers regarding performance concerns and opportunities for improvement at all levels of the maintenance organization. Feedback should be evaluated and actions that result in improved maintenance services implemented. The individual providing the feedback should receive a timely response from management that explains the rationale for either no action or alternate action, and indicates status of the suggested action.	M-D L-I K-D								K-I		K-I																				M-D L-D K-D																		L-I										L-D	
DOE G 433.1-1A	Page 24, section D	D Planning D.2.2.1 Planning for Maintenance Activities The planning system should address the following: Reducing human errors	K-I M-D	K-D M-D	K-D M-D	K-D M-D	K-D M-D	K-D M-D	K-D M-D		K-D M-I		K-D																				L-D	L-D M-I			L-D						L-D		L-I	L-I		L-D		L-I	L-I				
DOE G 433.1-1A	Page 26, section D	D Planning D.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT D.2.2 Guideline - Planning D.2.2.6 Supervisor and Worker Responsibilities The first-line supervisor/team leader is accountable to senior management for the quality of work performed in the following areas: • Periodically observing work-in-progress, while providing job-site coordination and supervision;	K-I						M-I L-I K-D		M-D L-D K-D									K-D																					M-D L-D K-D	L-I K-D											
DOE G 433.1-1A	Page 26, section D	D Planning D.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT D.2.2 Guideline - Planning D.2.2.6 Supervisor and Worker Responsibilities Craft workers provide specialized hands-on skills. At the direction of first-line supervisors/team leaders, the workers perform those tasks necessary to preserve or restore the equipment. Craft worker responsibilities are in these general areas • Using and following procedures and work instructions properly; • Stopping work if an unanticipated or unsafe condition is identified.	K-I						M-I L-I K-I								M-I L-D K-D	M-D L-D K-D		M-D L-D K-D																																				
DOE G 433.1-1A	Page 43, section D	D Planning D.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT D.2.7 Guideline -Work Control D.2.7.2 Supervision of Maintenance Activities First-line supervisors should spend the majority of their time in the field. They should monitor work in progress to ensure that maintenance activities are conducted safely in accordance with DOE and facility policies and procedures. Examples of work practices that should be checked include the following: • Pre-job briefings and applicable training (e.g., mockup training); • Worker awareness of their responsibility to immediately notify their supervisor and stop work on any activity that they believe to be unsafe or out of scope, and are to prevent others from performing the activity until appropriate reviews are completed; • Procedure use, including adherence to step-by-step requirements, signoffs, and work hold points; • Proper use of post-job reporting and, when applicable, post-job critiques	M-I L-I K-I	M-I					M-D L-I K-D		M-D L-D K-D				M-I L-I K-D	M-I L-I K-D	K-D	M-D K-D	M-D L-D K-D							M-D L-D K-D							M-D L-D K-D							M-D L-D K-D	K-D											
DOE G 433.1-1A	Page 44, section D	D Planning D.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT D.2.7 Guideline -Work Control D.2.7.5 Control of Non-facility Contractor and Subcontractor Personnel Non-facility contractor and subcontractor personnel should perform maintenance under the same controls as and the same high work standards as facility maintenance personnel. Non-facility contractor and subcontractor managers and supervisors should be held accountable for the work performance of their personnel. Facility supervisors should review the work of these personnel during preparation for work, at the job site, and during post-maintenance testing and acceptance inspections to the extent needed to enforce these requirements.	K-I						M-I K-D		M-D L-I K-D				L-D K-D	L-D K-D	K-D	K-D		K-D						K-D							K-D	M-I								M-I L-I	M-D L-D K-D	M-D L-D K-D	K-D										

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DOE G 433.1-1A	Page 45, section D	D Planning D.2.7.7 Human Performance in Maintenance Errors during the performance of maintenance are more prevalent than during typical operations for some of the following reasons: ▯ It involves removal and replacement of a large numbers of varied components; ▯ Performance is usually under severe time pressure; ▯ Work locations are often cramped and poorly lit spaces; ▯ Can involve the use of unusual or unavailable tools; ▯ Vendor manuals and procedures rarely reflect tasks under real life conditions; ▯ Often those who start the job are not the ones required to finish it; ▯ A number of different groups may work on the same item of equipment; and/or ▯ Equipment troubleshooting requires the use of system knowledge and may require actions beyond routine maintenance instructions. Most maintenance errors have been judged by experience workers as having happened before and likely to happen again. The fact that the same errors keep on happening to different people in different organizations strongly suggests that we should focus our remedial attention more upon the task and the workplace, than upon the presumed psychological inadequacies of those making the errors. Maintenance supervisors, work planners, and workers should anticipate the likelihood of human error as a hazard to maintenance. DOE-HDBK-1028-2009, Human Performance Improvement Handbook discusses numerous factors that impact error-free performance and provide tools that may be utilized to improve maintenance.	K-D M-D	K-D M-D	K-D L-I M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-I	K-D M-I	K-I	K-D	K-D L-D	K-D L-D	L-I	L-I	L-I	K-D L-D						K-D L-D						K-D	K-D L-D	K-D L-D M-I	K-D L-I	K-D							L-D	L-D	L-I				
DOE G 433.1-1A	Page 61, section F	F. MAINTENANCE PROCEDURES F.1 ORDER IMPLEMENTATION GUIDANCE In accordance with DOE O 433.1B, the NMMP must include the process for developing and implementing documented and approved work instructions for work on safety SSCs (i.e., work packages, procedures, work instructions, and drawings). In meeting this requirement, maintenance procedures should be prepared and used to provide appropriate work direction and to ensure that maintenance is performed in a safe, efficient, and consistent manner. Maintenance procedures should be technically accurate, complete, up to date, and presented in a clear, concise, and consistent manner to minimize human error. DOE-STD-1029-92, Chg. 1, provides information on maintenance procedures.	K-I	K-D M-D	K-D L-I	K-D L-D	K-D L-D	K-D L-D	K-D L-D M-D	K-I	K-D	K-I	K-I						K-D L-D M-D						K-D																		L-I			L-D	L-D	L-I	L-I			
DOE G 433.1-1A	Page 61, section F	F. MAINTENANCE PROCEDURES F.1 ORDER IMPLEMENTATION GUIDANCE The NMMP should address the following: • A process governing the development of procedures which includes: - Ensuring procedures are clear, concise, and contain adequate information for users to understand and perform their activities effectively; - Verifying technical details such as set points, control logic, and equipment numbers are consistent among procedures, drawings, valve lineup sheets, and system descriptions; - Including hold-points such as quality and radiological protection checks in procedures, as needed; - Incorporating human performance factors into procedures to promote error-free performance;	K-I	K-D L-I M-D	K-D L-I	K-D L-D	K-D L-D	K-D L-I	K-D L-D M-D	K-I	K-D	K-I	K-D						K-D M-D		L-I		L-D			L-I	L-I		L-I														L-I			L-D	L-D	L-I			
DOE G 433.1-1A	Page 63, section F	F. MAINTENANCE PROCEDURES F.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT F.2.5 Guidelines - Procedure Use A process should be in place to ensure the worker has the most current procedure prior to performing work. Management should establish and reinforce clear expectations and requirements for the use of procedures to perform maintenance activities. Management should ensure procedure use requirements are understood and met by the workers. Normally, three levels of procedure use are defined: - Continuous Use - Reference Use - Information Use	K-I			K-D		K-D	L-I K-D		K-D		K-I						M-D L-D K-D																																
DOE G 433.1-1A	Page 97 section O	O. PERFORMANCE MEASURES O.2 ADDITIONAL BACKGROUND/ GUIDANCE SUPPORTING IMPLEMENTATION AND PROCEDURE DEVELOPMENT O.2.1 Identifying Performance Indicators O.2.2 Measuring Performance Indicators O.2.3 Analyzing Performance Indicators O.2.4 Performance Improvement	K-I								M-D L-I K-D		K-I																														M-D L-D K-D										
DOE G 450.4-1C	Page 5, Section 6	6.4 SAFETY CULTURE A positive safety culture is an integral aspect of an effective ISM system. DOE's commitment to a positive safety culture is expressed in DOE P 450.4A:	M-D L-D K-D	K-D						M-D L-D K-D	K-D	K-D	K-I																																								
DOE G 450.4-1C	Page 21, Attachment 1, section 1	Attachment 1 Guiding Principles 1. Line Management Responsibility for Safety 7th bullet: Line managers are skilled in responding to employee questions in an open, honest manner. They encourage and appreciate the reporting of safety issues and errors. They do not discipline employees for reporting errors. They encourage a vigorous questioning attitude toward safety, as well as constructive dialogues and discussions on safety matters.	K-D L-D M-D	K-D L-D M-D	K-D L-D	K-D	K-D	K-D	K-D M-D	K-D	K-D L-D M-D	K-D L-D	K-I L-D	K-D	K-D	K-D L-D M-D	L-D		L-I				K-D																		L-I			L-D	L-I		L-D M-D	L-D	L-D			

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DOE G 450.4-1C	Page 21, Attachment 1, page 5	Attachment 1 Guiding Principles 1. Line Management Responsibility for Safety 4th bullet: Line managers spend time on the floor. Line managers practice visible leadership in the field by placing —eyes on the problem, ll coaching, mentoring, and reinforcing standards and positive behaviors. Deviations from expectations are corrected promptly and, when appropriate, analyzed to understand why the behaviors occurred.	M-D L-I K-D	M-D K-D		K-D	K-I	K-D	M-D L-I K-D	K-D	M-D L-D K-D	K-D	K-I			M-D																												L-I K-I			K-D				
DOE G 450.4-1C	Page 21, Attachment 1, page 5	Attachment 1 Guiding Principles 1. Line Management Responsibility for Safety 5h bullet: Line managers maintain a strong focus on the safe conduct of work activities. Line managers maintain awareness of key performance indicators related to safe work accomplishment, watch carefully for adverse trends or indications, and take prompt action to understand adverse trends and anomalies.	M-D L-D K-D						M-D	K-I	M-D L-D K-D		K-I			M-D L-I K-I																										M-D K-D			L-I				
DOE G 450.4-1C	Page 21, Attachment 1, section 1	Attachment 1 Guiding Principles 1. Line Management Responsibility for Safety 8th bullet: Credibility and trust are present and continuously nurtured. Line managers reinforce perishable values of trust, credibility, and attentiveness. The organization is just – that is, the line managers demonstrate an understanding that humans are fallible and when mistakes are made, the organization seeks first to learn rather than to blame. The system of rewards and sanctions is aligned with strong safety policies and reinforces the desired behaviors and outcomes.	K-D L-I M-D	K-D L-I	K-D L-D M-D	K-D L-D M-D	K-D	K-D	K-D	K-D L-D	K-D L-D	K-D L-D	K-I L-D																														L-D			L-D	L-D			
DOE G 450.4-1C	Page 26, Attachment 1, page 6	Attachment 1 Guiding Principles 5. Identification of Safety Standards and Requirements 9th bullet: Willful violations of requirements are rare, and personnel and organizations are held strictly accountable in the context of a just culture. Unintended failures to follow requirements are promptly reported, and personnel and organizations are given credit for self-identification and reporting of errors	M-D L-D K-D	K-I	M-D K-D					M-D K-D	M-D L-I K-D	M-D L-D K-D	K-I																																L-D K-D			M-D L-D K-D				
DOE G 450.4-1C	Page 26, Attachment 1, page 6	Attachment 1 Guiding Principles 5. Identification of Safety Standards and Requirements 10th bullet: The organization actively seeks continuous improvement in safety standards and requirements through identification and sharing of effective practices, lessons learned, and applicable safety research. The organization is committed to continuously rising standards of excellence.	M-D L-D K-D	L-I K-I						L-D K-D	M-D K-D	K-D	K-I																											L-I K-I					L-I	M-D L-D K-D					
DOE G 450.4-1C	Page 27, Attachment 1, section 6	Attachment 1 Guiding Principles 6. Hazard Controls Tailored to Work Being Performed Last bullet: Hazard controls are designed with an understanding of the potential for human error. Error-likely situations are identified, eliminated, or mitigated. The existence of known error-likely situations is communicated to workers prior to commencing work, along with planned mechanisms to assure worker safety.	K-D L-I M-D	K-D L-I M-D	K-D L-D	K-D L-D M-D	K-D	K-D L-D M-D	K-D L-D M-D	K-I L-I	K-D	K-I	K-I	K-D L-D	K-D L-D	L-I			L-D				K-D						L-I											L-I K-I				L-I	L-I		L-I				
DOE G 450.4-1C	Page 45, Attachment 5	Attachment 5 Relationship of Major Improvement Initiatives to ISM The Department adopts and encourages DOE Secretarial offices, field offices, and contractors to implement the principles and functions of a variety of processes and initiatives aimed at improving organizational and individual performance. Many tools and mechanisms are available, and most have been or are being used in one form or another in DOE and contractor organizations. A non-inclusive list of performance improvement programs or processes follows: - Human performance improvement (HPI)	K-I L-D M-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-I L-D	K-D L-D	K-I L-D	K-D																																							
DOE G 450.4-1C	Page 60, Attachment 7, section 7	Attachment 7 Development of ISMS System Descriptions Organizations with safety management responsibilities should establish and maintain implementing mechanisms, including processes, policies, protocols, procedures, documentation, and training, to translate ISM system expectations into implementation activities and desired human behaviors. These mechanisms need to consider all active and applicable program and facility life-cycle phases, including design, construction, operation, maintenance, research and development, and D&D..	K-D M-D	K-D	K-D	K-D L-D	K-D	K-D	K-D	K-I	K-D	K-I M-D	K-D M-D																																						
DOE G 450.4-1C	Page 60, Attachment 10	Attachment 10 Safety Culture Focus Areas and Associated Attributes	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D	K-D L-D																																						
DOE G 450.4-1C	Page 95, Attachment 12, page 1	Attachment 12, Changing Values and Behaviors In many cases, implementing organizations will find that the desired ISM system requires changes in existing employee values and behaviors. - Identify any actions or changes on the part of senior leadership to achieve the desired behaviors, and obtain their buy-in to these actions. - Identify existing organizational processes and behaviors that may be counter to the desired behaviors, and develop actions to align existing processes and behaviors with new desired behaviors; take actions to eliminate or minimize the influence of forces that may be restraining achievement of the desired behaviors.	M-D L-D K-D	M-D L-D K-D	L-I K-I					K-I	M-D L-D K-D	M-D L-I K-D	K-I																																M-D L-I K-D							
DOE G 450.4-1C	Page 97, Attachment 13, page 3	Attachment 13, Safety Performance Objectives, Measures, and Commitments Performance measures are used to track progress and monitor achievement of performance objectives and commitments. The most useful performance measures provide information that directly reflects how safely the operational work is being performed. A combination of leading (process or behavioral) and lagging (outcome or results) indicators is desirable. The measures are changed as necessary to address the performance objectives, significant identified weaknesses, and areas for improvement. Annual performance expectations should be established for most of these measures. The following are sample performance objectives: - Fully integrate HPI initiatives into ISM systems.	M-D L-D K-D	M-D L-D K-D					M-D L-D K-D		M-D L-D K-D		K-I																																L-D K-D							

			Volume 1: Concepts and Principles										Volume 2: HPI Tools for Individual															Volume 2: HPI Tools for Work Teams															Volume 2: HPI Tools for Management													
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DOE G 450.4-1C	Page 98, Attachment 13, page 4	Attachment 13, Safety Performance Objectives, Measures, and Commitments Performance measures are used to track progress and monitor achievement of performance objectives and commitments. The most useful performance measures provide information that directly reflects how safely the operational work is being performed. A combination of leading (process or behavioral) and lagging (outcome or results) indicators is desirable. The measures are changed as necessary to address the performance objectives, significant identified weaknesses, and areas for improvement. Annual performance expectations should be established for most of these measures. The following are sample performance measures: - Error-likely situations are identified and controlled - A line manager walk-around program is implemented such that line managers spend at least 100 hours individually in the field each year.	M-D L-D K-D	M-D L-D K-I				M-D K-D	M-D L-D K-D		M-D L-D K-D		K-I																												M-D K-D		L-D K-D											
DOE G 450.4-1C	Page 98, Attachment 13, page 4	Attachment 13, Safety Performance Objectives, Measures, and Commitments Performance measures are used to track progress and monitor achievement of performance objectives and commitments. The most useful performance measures provide information that directly reflects how safely the operational work is being performed. A combination of leading (process or behavioral) and lagging (outcome or results) indicators is desirable. The measures are changed as necessary to address the performance objectives, significant identified weaknesses, and areas for improvement. Annual performance expectations should be established for most of these measures. Performance measures can also be developed to address various parameters such as: - Behavioral and process measures such as the number of near-misses, the number of error reports, the number of behavioral observations, the number of safe acts, etc. - Procedure compliance rates	M-D L-D K-D	M-D L-D K-I					M-D L-D K-D		M-D L-D K-D		K-I						M-D L-D																						M-D K-D	M-D L-I K-D	M-D L-D K-D					M-D L-I K-I						
DOE G 450.4-1C	Page 99, Attachment 13, page 5	Attachment 13, Safety Performance Objectives, Measures, and Commitments Performance measures are used to track progress and monitor achievement of performance objectives and commitments. The most useful performance measures provide information that directly reflects how safely the operational work is being performed. A combination of leading (process or behavioral) and lagging (outcome or results) indicators is desirable. The measures are changed as necessary to address the performance objectives, significant identified weaknesses, and areas for improvement. Annual performance expectations should be established for most of these measures. The following are sample performance commitments: - Initiate two HPI projects	M-D L-I K-I	M-I L-I K-I								M-D K-D		K-I						M-D																							K-D												
DOE -STD-1029-92 CH1 ARCHIVED		ARCHIVED Rev 1 - In 2010, the Procedure Professionals Association (PPA) assumed ownership and maintenance responsibilities for AP-907-001, Procedure Process Description, and AP-907-005, Procedure Writers' Manual. PPA is an industry working group for procedure related interests and is composed of subject matter experts from the U.S. commercial nuclear field, the U.S. Department of Energy, and other similar business interests. PPA is an open forum for procedure related issues and accepts membership from a variety of business entities. Rev 2 - In 2012…Additional minor changes were made to align this standard with Department of Energy (DOE) document needs in support of cancellation of DOE-STD-1029-92. DOE adopted PPA AP-907-001 and PPA AP-907-005 as the writing standards for DOE in conjunction with cancellation of DOE-STD-1029-92 in July of 2015																																																					
DOE -STD-1029-92 CH1 ARCHIVED	Page 6, section 2.4	**2.4 Process Analysis** After completing the research and planning process, determining the procedure requirements, and reviewing the facility configuration, perform an analysis of the activities that make up the process. A process analysis identifies the requirements of the activity and the functions that must be accomplished to meet the process objectives. While performing a process analysis, consider the rationale behind the activities, activity frequency and complexity, the consequences of an error, and the relationship of training to successful performance of the activity. The activities are translated into action steps in the performance sections of the procedure. Analyze the process while developing the process and activities of a procedure (see "Develop the Process and Activities" in this section).	K-I	K-D	K-D M-I	K-D M-I	K-D	K-D	K-D L-D M-D		K-D		K-I						M-I																										L-I	L-I										
DOE -STD-1029-92 CH1 ARCHIVED	Page 46, section 4.8	**4.8 Repeated Steps** [2] If it is important to know the number of times the sequence is repeated, provide placekeeping (see Section 4, "Placekeeping")	K-I	K-D	K-D M-I	K-D M-I	K-D	K-D	K-D M-D		K-D		K-I					L-I	L-I	K-D L-I M-D					K-D L-D												L-D																	
DOE -STD-1029-92 CH1 ARCHIVED	Page 47, section 4.9	**4.9 Action Steps Containing Verifications, Checks, Notifications, and Data Recording** [4] Specify required independent verification and inspection action steps (the number of independent verification and inspection action steps increase as the consequences of performance error increase).	K-I	K-D	K-D M-I	K-D L-D M-I	K-D	K-D	K-D M-D		K-D		K-I				L-I	L-I	L-I	K-D L-I M-D	L-I					L-I	L-I	L-D	K-D L-D M-D		L-I																													
DOE -STD-1029-92 CH1 ARCHIVED	Page 48, Section 4.10.1	**4.10.1 Warnings and Cautions** Warnings and cautions attract attention to information that is essential to safe performance; they usually consist of the conditions, design limitations, practices, and procedures to be complied with to avoid loss of life, personal injury, health hazards, or damage to equipment. An industry study of significant events attributed one-fourth of all human performance events to a failure to provide proper warnings and cautions	K-I	K-D	K-D M-I	K-D L-D M-I	K-D	K-D L-I	K-D M-D		K-D		K-I			L-I	L-I		L-D M-D							L-I																		K-D		K-D										
DOE -STD-1029-92 CH1 ARCHIVED	Page 54, section 4.13.1	**4.13.1 Placekeeping** Placekeeping helps users to keep track of their progress in a procedure and reduces the probability of omitting or duplicating action steps. The placekeeping mechanism typically consists of checkoff boxes.	K-I	K-D	K-D M-I	K-D M-I	K-D	K-D	K-D M-D		K-D		K-I			L-I	L-I		K-D L-I M-D						K-D L-D												L-D																	
DOE -STD-1029-92 CH1 ARCHIVED	Page 54, section 4.13.2	**4.13.2 Sign Offs** Written responses for action steps that require independent verification, inspection, data recording, or documentation of completion can also be placekeeping devices. The use of signatures, initials, check marks, and "N/A" should be defined in site-specific administrative procedures.	K-I	K-D	K-D M-I	K-D M-I	K-D	K-D	K-D M-D		K-D		K-I			L-I	L-I		K-D L-D M-D	L-I	K-D L-D				K-D L-D	L-I	L-D	L-D	K-D L-D M-D	L-I	L-D																											

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DOE-STD-1030-96	page 17, section 4.4	4.4.1 Procedures for Lockout/Tagout Facilities are required to use administrative procedures to ensure uniformity in applying their lockout/tagout program. In addition, each lockout/tagout, unless exempted in accordance with Section 4.1.4 of this guide, requires a specific written technical procedure in which the isolation points and other instructions for installing and removing tags are identified.	K-I	K-I	K-D	K-D	K-D	K-D	K-D M-D		K-I		K-I				L-I		K-D L-D M-I		L-D					L-I	L-I	L-D	L-D	L-I																								
DOE-STD-1030-96	page 18, section 4.4.1	4.4.1 Requirements for Lockout/Tagout Procedures 4th bullet: Provide clear instructions for verifying the effectiveness of the lockout/-tagout. The verification should be performed by qualified personnel who were not involved in isolating the work area or installing the locks and tags. DOE Guide to Good Practices for Independent Verification can provide useful guidelines for carrying out an independent verification of a lockout/-tagout	K-I	K-I	K-D	K-D	K-D	K-D	K-D M-D		K-I		K-I				L-I		K-D L-D M-I		L-D					L-I	L-I	L-D	K-D L-D M-D	L-I																								
DOE-STD-1031-92 (CH-1)	Page 5, Section 3	3. Discussion Communication problems have caused many adverse situations in Department of Energy (DOE) facilities. Inadequate communication can be identified as a causal or contributing factor in human performance-related events. Principal areas in which poor communications can cause problems include shift turnover, pre-job briefings, and during job performance. Facilities can reduce the contribution to adverse situations by ensuring that verbal communications are conducted in a formal and disciplined manner and that communication systems are properly used. Formality in communication is especially important when personnel safety is involved or complex evolutions are performed.	K-I M-I	K-D M-I	K-D	K-D L-I M-I	K-D	K-D L-I	K-D M-I		K-I		K-D	K-D	K-D				L-I			K-D/I L-D M-I	K-D L-D M-I		L-I	K-D					K-D													K-D			K-D									
DOE-STD-1031-92 (CH-1)	Page 9, section 4.1.2.3	4.1.2.3 Repeat back In operational communications, the receiver should repeat the message back to the sender. This is especially important when receiving instructions involving operation of facility equipment to assure the sender that the instruction is correctly understood. A verbatim repeat back is preferred, although paraphrasing may be used as long as the intent of the message is clearly stated. If notations of equipment, numbers, and positions were made during the original transmission, the repeat back should contain the same information. Example: "Control Area, this is the Building Operator. Understand, open Cooling Water Suction Valve, Foxtrot two five." The sender must listen carefully to repeated messages to ensure the receiver understands the message. If the receiver repeats the message incorrectly, the sender should immediately correct the receiver by saying "Wrong" and repeat the message until properly received.	K-I M-I	K-D M-I	K-D	K-D L-I M-I	K-D	K-D L-I	K-D M-I		K-I		K-I				L-I			K-D L-D M-D	K-D L-D				K-D/I																												
DOE-STD-1031-92 (CH-1)	Page 9, section 4.1.2.4	4.1.2.4 Confirmation After the repeat back, the sender should confirm or correct the receiver. The absence of the confirmation step may result in miscommunication because the receiver may have misheard the instructions and repeated erroneous information. A lack of response by the sender may be misinterpreted as silent confirmation that the repeated message was correct. However, the receiver should not carry out the action until confirmation is received. Example: "Building Operator, this is the Control Area Operator. That is correct."	K-I M-I	K-D M-I	K-D	K-D L-I M-I	K-D	K-D L-I	K-D M-I		K-I		K-I				L-I			K-D L-D M-D	K-D L-D	L-I			K-D/I																												
DOE-STD-1031-92 (CH-1)	Page A-3	Appendix A Phonetic Alphabet To minimize misinterpretation, use the phonetic alphabet when alphanumeric information is being communicated:	M-I	K-I M-I	K-D	K-D L-I M-I	K-D	K-D L-I	K-D M-D				K-I				L-I			L-D	K-D M-D L-D	L-I																																
DOE-STD-1036-93	Page ix, Definitions	Concurrent Dual Verification A method of checking an operation, an act of positioning, or a calculation, in which the verifier independently observes and/or confirms the operation or calculation.	K-I M-I	K-I M-I	K-D	K-D M-I	K-D	K-D	K-D M-I		K-I		K-I				L-I	L-I	L-D	L-I	L-I					L-I	K-D L-D M-D	L-D	L-I																								
DOE-STD-1036-93	Page ix, Definitions	Independent Verification The act of checking, by a separate qualified person, that a given operation, or the position of a component, conforms to established criteria	K-I M-I	K-I M-I	K-D	K-D M-I	K-D	K-D	K-D M-I		K-I		K-I				L-I	L-I	L-D	L-I	L-I					L-I	L-D	K-D L-D M-D	L-I																								
DOE-STD-1036-93	Page 3, Section 2	2. Objective Independent verification activities are implemented by appropriate policies and procedures to ensure correct operation of facility equipment, and aid in the control of equipment and system status. Criteria: a. Components critical to safe, reliable operation of the facility are identified as to their requirements for independent verification. b. Occasions requiring independent verification are identified through appropriate policies and procedures. c. Independent verification techniques are identified consistent with facility equipment and operational requirements.	K-I M-I	K-I M-I	K-D	K-D M-I	K-D	K-D	K-D M-I		K-I		K-I				L-I	L-I	K-D L-D	L-I	L-I					L-I	L-D	K-D L-D M-D	L-I																								
DOE-STD-1036-93	Page 3, Section 3	3. Discussion Independent verification compensates for the human element in facility operation. It recognizes that any operator, no matter how proficient, can make a mistake. However, the chance that two operators will independently make the same mistake is unlikely. Therefore, independent verification provides an extra measure of safety and reliability to facility operations. Industry experience shows that verifying, or double-checking, important operating parameters and component alignments reduces the occurrence of unintended operational events (shutdowns, environmental violations, etc.).	K-I M-I	K-I M-I	K-D	K-D M-I	K-D	K-D	K-D M-I		K-I		K-I				L-I	L-I	L-D	L-I	L-I					L-I	L-D	K-D L-D M-D	L-I																								
DOE-STD-1038-93	Page viii, Definitions	Turnover (Operations Shift Turnover) The process of formally transferring duties and responsibilities from one person to another.	K-I M-I	K-I M-I	K-I	K-D	K-D	K-D	K-D M-I		K-D		K-I		L-D											L-I					K-D L-D M-D																								
DOE-STD-1038-93	Page 1, section 1	1. Introduction "Operations Turnover" is an element of an effective Conduct of Operations program. The complexity and array of activities performed in DOE facilities dictate the necessity for a formal operations turnover program to promote safe and efficient operations.	K-I M-I	K-I M-I	K-I	K-D	K-D	K-D	K-D M-I		K-D		K-I		L-D											L-I					K-D L-D M-D																								

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DOE-STD-1038-93	Page 3, section 2	2. Objective Turnovers that provide on-coming personnel with an accurate status of their work stations are systematically performed	K-I M-I	K-I M-I	K-I	K-D	K-D	K-D	K-D M-I		K-D		K-I		L-D											L-I						K-D L-D M-D																				
DOE-STD-1038-93	Page 3, section 3	2. Discussion An operations shift turnover (turnover) is the process of transferring duties and responsibilities of facility job positions between personnel. Thorough turnovers are crucial to the safety of DOE facility operation. Turnover activities ensure that on-coming personnel have an accurate picture of current facility status and provides a review of past and scheduled operations. The information obtained by on-coming personnel during turnovers promotes safe, efficient, and continuous operation. To ensure the most efficient and productive transfer of facility information, the turnover should be strictly focused on the work station status and operation.	K-I M-I	K-I M-I	K-I	K-D	K-D	K-D	K-D M-I		K-D		K-I		L-D											L-I						K-D L-D M-D																				
DOE-STD-1038-93	Page 16, section 3	4 GOOD PRACTICE 4.2 Document Review	K-I						K-I					M-D L-I					L-D K-D													L-D K-D																				
DOE-STD-1038-93	Page 16, section 3	4 GOOD PRACTICE 4.3 Pre-Shift Walkdowns	K-I						K-I					M-D L-D K-D	M-D L-D K-D																	L-D K-D																				
DOE-STD-1038-93	Page 16, section 3	4 GOOD PRACTICE 4.4 Information Exchange and Responsibility Transfer	K-I						K-I																							M-D L-D K-D																				
DOE-STD-1038-93	Page 16, section 3	4 GOOD PRACTICE 4.5 Personnel Briefing	K-I						K-I					M-I K-I	M-I L-I K-I											M-D L-D K-D						L-D K-D																				
DOE-STD-1186	page 4, section 1.6	1.6 SELECTION AND HIERARCHY OF CONTROLS While SACs can provide acceptable and effective controls, they should only be used if adequate engineered controls are not readily available. In general, SSCs are preferable to SACs due to the uncertainty of human performance inherent in implementation of SACs.	K-I M-D	K-D	K-D M-D	K-D M-D	K-D	K-D	K-D M-D	K-I	K-I	K-I	K-D																																							
DOE-STD-1186	page 7, section 2.2	2.2 FORMULATION OF SACS If a SAC relies on operator actions to perform its safety function, a human factors analysis should be performed as part of the SAC formulation to: (1) validate the dependability of a SAC, (2) identify any weaknesses in the proposed approach for implementing the SAC, and (3) suggest additional measures to improve the overall dependability. Formal engineering calculations may be necessary to ensure that plant operators have adequate time and resources to carry out required tasks.	K-I M-D	K-D M-D	K-D	K-D M-D	K-D	K-D	K-D M-D	K-I	K-I	K-I	K-D	M-I																																						
DOE-STD-1186	page 9 , section 2.2	2.2 FORMULATION OF SACS Validation. The formulation of SACs should include a process to ensure that required tasks in a SAC can be performed by facility operators within the timeframes assumed in the safety basis. If a SAC requires operator action, an evaluation that addresses the following human factors shall be completed, on a graded approach: • Adequacy and clarity of the description of required SAC actions; • Level of difficulty of the SAC actions; • Ergonomic design of equipment needed by the operators, such as indicators and alarms; • Time available to do the task and to recover from errors; Stress caused by noise, heat, light, protective clothing, and time constraints; and • Potentially hazardous conditions that could exist in an area requiring action under a SAC.	K-D	K-D M-D	K-D	K-D	K-D	K-D	K-D M-D	K-I	K-I	K-I	K-D	M-I	M-I					M-D																																		
DOE-STD-1186	page 11, section 3.1	3.1 HUMAN ACTIONS AS SAFETY CONTROLS SACs, by their very nature, require human actions, and human actions tend to be less reliable than automatic systems, especially under stressful conditions. To ensure that SACs are reliable, it is important to reduce the human error rate as much as possible. The following measures, taken singly or in combination, can be used to minimize the effect of human error on SACs. • Reader/worker/checker systems; • Independent verification; • Positive feedback systems; • Interlocks; • Warning signs and barriers; • Alarms and monitors; • Human factors analysis; • Operator training and certification; • Continuing training and re-qualification; • Abnormal event response drills; • Ergonomic considerations in procedures; • Dry runs for non-routine operations; • Double staffing; Direct supervision of hazardous operations; and Human Reliability Assessment	K-D	K-D M-D	K-D M-D	K-D M-D	K-D	K-D	K-D M-D	K-I	K-I	K-I	K-D																																							

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DOE-STD-1186	page 12, section 3.2.1	3.2.1 Independent Verification SACs should be included in the facility's independent verification program. Verification methods should be identified explicitly in facility procedures or other controlled documents. DOE O 422.1 (Section 2.j of Attachment 2) provides the following specific requirements on Independent Verification Programs: "The operator must establish and implement operations practices to verify that critical equipment configuration is in accordance with controlling documents, addressing the following elements: (1) structures, systems, components, operations, and programs requiring independent verification; (2) situations requiring independent verification; (3) methods for performing and documenting independent verification; (4) situations, if any, allowing concurrent dual verification; and (5) methods for performing concurrent dual verification, if used." Independent verifications in support of SACs should be conducted in a manner so that the relevant components are identified and verified and the relevant actions or conditions are verified to conform with the established SAC. Verification should be performed by a different qualified person than the one performing the SAC.	M-D K-I	M-I	M-I	M-I K-D	M-I K-I	M-I K-D	M-D K-D		K-I		K-I					L-I	L-I	K-D	K-D						M-I L-I	M-I L-D K-D	M-D L-D K-D	M-I L-I																									
DOE-STD-1186	page 14, section 3.3.1	3.3.1 DOE O 426.2 Job Task Analysis: The formulation of SACs should include a thorough job task analysis (JTA). A JTA will identify the required plant instrumentation, physical controls, operator skills and abilities, and other important variables necessary to successfully perform the task. The JTA should include or incorporate the appropriate human factors considerations in developing the controls.	K-I	K-D M-D	K-D M-I	K-D M-I	K-D M-I	K-D M-I	K-D M-D	K-I	K-I	K-I	K-D	M-D	M-D																																									
DOE-STD-1186	page 19, section 5.2	5.2 INVESTIGATION AND REPORTING OF SAC VIOLATIONS Identifying the causes for SAC violations is often difficult. The identification of human error as a root or contributing cause of violations provides little information about how to prevent similar problems from recurring. Recognizing human performance problems when they occur and accurately identifying their causes are necessary first steps to developing effective corrective actions. The investigators should be experts in both human performance and the process or facility involved.	K-I	K-D	K-D	K-D	K-D	K-D	K-D	K-I	K-D M-D	K-D	K-D																																	M-D	M-I		M-I								
(NFPA) 70E	Article 110.1 (H)	Article 110.1 (H) This new article explores the "human error concept" added to both job safety analysis and job planning in Annex Q. When filling out a JSA or a job safety plan, a new "human error concept" is to be applied to workplace electrical safety under the concept of a human performance factor. Studies have indicated that human error often is a root cause of incidents, which is why the addition is of high value.	K-D M-D	K-D L-I M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-I L-I	K-D L-I	K-I L-I	K-D															L-I			L-I	L-I			K-D L-I					L-I				K-D		L-I	K-I L-I	L-I		
(NFPA) 70E	Annex Q, Human Performance and Workplace Electrical Safety:	Annex Q, Human Performance and Workplace Electrical Safety: This new annex addresses how the concept of human performance can be applied to workplace safety. Studies by high-risk industries indicate human error is often a cause of incidents. The premise of this annex is that human error is a frequent cause of electrical incidents.	K-D M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-D L-D M-D	K-I L-I	K-D L-I	K-I L-I	K-D	M-D	M-D	M-I	M-D	M-D	M-D	M-I		M-D	M-D		M-D	L-D M-D	M-I	M-I	L-I M-I	L-D M-D		M-D	K-D L-I					L-I				K-D		L-I	K-I L-I	L-I		
PPA AP-907-001	Page 7	3 Definitions 15. Error Trap: Procedure format or content that challenges the users' ability to successfully perform a task.				K-D		M-I K-D	K-I										K-D																																		LK: n/a
PPA AP-907-001	Page 7	3 Definitions 16. Human Performance: The system of processes, values, behaviors, and their ultimate results that determine performance.	K-I	K-D	M-I K-D																																																LK: n/a
PPA AP-907-001	Page 7	3 Definitions 32. Procedure: A controlled document designed to improve human performance by clearly providing the purpose, specific intent, and sequenced direction for an activity or process				K-D		K-D	K-I										M-I K-D																																		LK: n/a
PPA AP-907-001	Page 16	4.3.3 Identify Applicable Internal and External Operating Experience 1. The writer reviews applicable operating experience that addresses issues related to the validated procedure alteration task. 2. To be effective, the writer's review considers not only the event but the error-likely situation and its precursors for applicability. • Carefully reviewed operating experience can be used to identify error precursors and their associated organizational weaknesses. • This review can take the form of a facilitated discussion of operating event precursors, flawed defenses, and the use of jobsite tools to prevent the event. • Any gaps indicate a need for modified or additional tools	M-I L-I	M-I K-D	K-I	M-I L-D K-D	K-D	M-D L-D K-D	M-D L-D K-D	K-D	K-I	K-I	K-I							K-D																						K-D			K-D		K-I	M-D L-D K-D				
PPA AP-907-001	Page 18	4.3.7 Evaluate Human Performance Challenges 1. The writer identifies and develops defenses to human performance challenges, including the identification of latent weaknesses and potential error traps such as those listed in Attachment 2, Error Traps. 2. The writer considers that administrative and technical procedures have different purposes and thus contain different error potentials. a. Administrative procedures have the potential to contain embedded latent organizational weaknesses. These weaknesses may be difficult to identify from a cursory glance and may require an extensive evaluation of the procedure's intent and content. b. Technical procedures direct activities at the man-machine interface. As such, they can directly impact human performance, and are more susceptible to error traps.	M-I L-I	M-D	M-D L-D	M-D L-D	L-D	M-D L-D	M-D L-D							L-I			M-I L-I																																		

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PPA AP-907-001	Page 25	4.6 Finalize and Implement Change Management Plan 4.6.1 Process Summary 4.6.2 Evaluate Need for Change Management 4.6.3 Develop Final Change Management Plan 4.6.4 Implement Change Management Plan	K-I	K-D	K-I						K-D		K-D																																		M-D L-D K-D				
PPA AP-907-001	Page 26, Attachment 2	Error Traps (Specific to procedures) EXAMPLE: In-field decisions without clear guidance Terms such as IF necessary and IF applicable shift the worker to the knowledge-based performance mode and a higher error rate. Instead, provide sufficient detail to support consistently good decisions.		M-I	M-I L-I	M-D L-D		M-D	M-D L-D					M-I					M-I L-I																														
PPA AP-907-005	All pages	Procedure Writer's Manual	L-I	M-I L-D K-I					M-D L-D K-D				K-I						M-D L-D K-D																														
PPA AP-907-005	Page 8	3.0 DEFINITIONS 14. Concurrent Verification: A series of actions by two individuals working together at the same time and place to separately confirm the condition of a component before, during, and after an action, when the consequences of an incorrect action would lead to immediate and possibly irreversible harm to the plant or personnel.				K-D		K-D	M-D K-D										M-I								M-D K-D	K-D																			LK: N/A
PPA AP-907-005	Page 9	3.0 DEFINITIONS 20. Independent Verification: A series of actions by two individuals working independently to confirm the condition of a component after the original act that placed it in that condition (see INPO 06-002, Human Performance Tools for Workers).				K-D		K-D	M-D K-D										M-I								K-D	M-D K-D																			LK: N/A
PPA AP-907-005	Page 9	3.0 DEFINITIONS 25. Procedure: A controlled document designed to improve human performance by clearly providing the purpose, specific intent, and sequenced direction for an activity, program, or process.		M-I		K-D		K-D	M-D K-D										M-D K-D									M-D																				LK: N/A
PPA AP-907-005	Page 31	4.14 Supplemental Information 1. For human performance reasons, supplemental information such as illustrations, graphs, forms, tables, and flow charts should be placed within the procedure body.		M-D L-I		M-D L-D K-D		K-D	M-D L-D K-D				K-D						M-D L-D K-D																														
PPA AP-907-005	Page 41	4.17 Signoffs and Placekeeping 1. White space should be reserved at the left or right margin for any signoffs and placekeeping. All examples in this document use white space in the right margin for signoffs and placekeeping				K-I		K-D	M-D L-I K-D										M-D L-D		M-D L-D K-D			K-D																								
PPA AP-907-005	Page 43	4.18 Hold Points 1. Clearly identify action steps requiring hold points				K-I		K-D	M-D L-I K-D										M-D L-D K-D		M-D L-D K-D																												
PPA AP-907-005	Page 52	4.28 Level of Detail 1. Provide a level of detail that takes into account the following variables: • Consequence of Error - The level of detail should increase as the risk of personal injury, equipment damage, reduction in effectiveness of safety related systems, and potential regulatory challenge increases.		M-I L-I K-I		M-D L-D K-D			M-D L-D K-D		K-I		K-I						M-D L-D K-D																														
PPA AP-907-001-001	Page 5	1.0 PURPOSE 1. This standard establishes a risk based set of Procedure Program Key Performance Indicators (KPIs) and Key Performance Measures (KPMs) in support of efficiently developing and maintaining quality procedures	K-I	M-I L-I K-D							M-I L-I K-D		K-D						K-D																						M-D L-D K-D															
DOE-STD-1027-2018 (cn1)	Page 15	3.2.1 Hazard Analysis to Support Final Hazard Categorization Hazard Evaluation As part of the hazard evaluation, an unmitigated hazard scenario shall be evaluated for each initiating event by assuming the absence of preventive and mitigative controls. Operational events shall be evaluated unless not plausible based on the following criteria: A process deviation that consists of a sequence of many unlikely human actions or errors for which there is no reason or motive. In evaluating this criterion, a wide range of possible motives, short of intent to cause harm, should be considered; or		L-I M-I	L-D M-D	L-D M-D	L-I M-I																																								
DOE-STD-1104-2016	Page 5	3.3 PLANNING A review plan should be used to define the extent and details of the review process appropriate to a specific safety basis document review and preparation of the associated SER or letter providing the review conclusions. - Review team preparation and process coordination (e.g., briefings, training on review plan and review criteria, facility walkthroughs);		M-I					M-D						M-D										M-D																								
DOE-STD-1104-2016	Page 7	3.4 INTERACTIONS It is important to maintain a balance in the interaction of the review and preparation processes. The SBRT should be careful to remain independent of the development of the safety basis documents to ensure independence in the review of those documents. To the extent practicable, the SBRT should not include team members responsible for management or oversight of the design of the facility.																								L-I M-I	M-D																		L-D M-D				

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DOE-STD-1104-2016	Page 8	3.5 ISSUE ORIGINATION AND RESOLUTION A significant issue is a problem or concern that affects the utility or validity of the safety basis documentation. Such issues generally involve: (1) release of energy and/or hazardous materials with significant consequences to the public, worker, or environment; (2) selection of safety structures, systems, and components (SSCs) and specific administrative controls (SACs), and ability of these safety controls to perform their intended safety functions; (3) technical errors that invalidate major conclusions relevant to the safety basis; or (4) failure to cover topical material required by DOE regulations, directives, and guidance on safety basis . .						M-I																						M-D	L-D M-D	L-D M-D	M-D																				
DOE-STD-1104-2016	Page 9	3.5 ISSUE ORIGINATION AND RESOLUTION Safety basis documents are expected to be technically accurate. Technical errors and inaccuracies that are identified by review team members should be transmitted as issues for resolution. Multiple technical errors and significant technical errors can readily rise to the level of a significant issue that requires resolution.						M-I																							L-D M-D	L-D M-D																				
DOE-STD-1104-2016	Page 15	4.4 DEFENSE-IN-DEPTH Defense-in-depth is the next aspect of hazard controls to be reviewed. Defense-in-depth is a fundamental approach to hazard control for nuclear facilities that is based on having several layers of protection to prevent the release of radiological or hazardous materials to the environment. These protective layers are normally redundant and independent of each other to compensate for unavoidable human and mechanical failures, so that no single layer is exclusively relied upon. The layers of defense could consist of safety class or safety significant controls that are protected by a TSR, administrative controls, safety management programs, and other SSCs.							L-D M-D																																													
DOE-STD-1104-2016	Page 21	4.11 REJECTION OF A DSA The following are examples of issues that would preclude DOE approval of the DSA and hence should not be addressed through conditions of approval: • The hazard analysis is incomplete or has significant errors (e.g., there are missing hazards; the response is incomplete, unavailable, or misapplied). • The accident analysis is incomplete or has significant errors (e.g., a scenario does not bound the hazard from the hazard analysis; there are incorrect calculations supporting the accident analysis conclusions).							L-D M-D																										M-I																M-I								L-D M-I								
DOE-STD-3009-2014	Page 8	3.1.3.1 General In special situations requiring detailed analysis of one or more specific hazardous conditions of concern, higher-level techniques such as Fault Tree Analysis, Event Tree Analysis, and Human Reliability Analysis should be considered. The rationale supporting the selected hazard evaluation techniques) shall be discussed and justified in the DSA.		L-D M-I	L-D	L-D M-I	L-D	L-D M-D																																															
DOE-STD-3009-2014	Page 15	3.2.1 Design/Evaluation Basis Accident Selection An operational event is not considered plausible if it is either - A process deviation that consists of a sequence of many unlikely human actions or errors for which there is no reason or motive. In evaluating this criterion, a wide range of possible motives, short of intent to cause harm, should be considered. Necessarily, no such sequence of events may ever have actually happened in any nonreactor nuclear facility; or - A process deviation for which there is a convincing argument, given physical laws, that they are not possible. The criterion cannot be used if the argument depends on any feature of the design or materials controlled by the facility's safety features or administrative controls(ACs).		L-I M-I	L-D	L-D M-D	L-I						M-I																																										
DOE-STD-3009-2014	Page 18	3.2.2 Unmitigated Analysis The following guidance should be used to support a determination of the accident likelihood as required in the unmitigated analysis of plausible accident scenarios defined in Section 3.2.1: - If an accident is caused by failures associated with human errors, the unmitigated likelihood generally should be assumed to be anticipated unless a rationale for supporting a lower estimate is provided (for example, the accident requires multiple independent errors of commission or omission or the activity in which the error occurs is rarely performed).		L-I M-I	L-D M-D	L-D M-D	L-I M-I																																																
DOE-STD-3009-2014	Page 59	[4.5.X.4] SAC Evaluation <u>Performance Evaluation</u> The formulation of SACs includes a process to validate that plant operators can perform the task(s) called for within the timeframes assumed in the safety analysis. If SACs require operator action, a human factors evaluation is carried out that examines: - Adequacy of the description of the task in facility procedures; - Level of difficulty of the task; - Design of the equipment and feedback (e.g., indicators and alarms); - Time available to do the task or recover from an error; and - Stress caused by noise, heat, light, protective clothing, and similar factors.						L-D M-D	M-I																																																	
DOE-STD-3009-2014	Page 86 (a-9)	A.9 Defense-in-Depth Defense-in-depth is a fundamental approach to hazard control for nuclear facilities that is based on several layers of protection to prevent the release of radioactive or other hazardous material to the environment. These protective layers are generally redundant and independent of each other to compensate for unavoidable human and mechanical failures so that no single layer, no matter how robust, is exclusively relied upon			L-D	L-D	L-D	L-D	M-D																																															

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DOE-STD-3009-2014	Page 89 (A-12)	A.12 Specific Administrative Controls SACs are ACs identified in the safety analysis as a control needed to prevent or mitigate an accident scenario, and has a safety function that would be SS or SC if the function were provided by an SSC. SACs have safety importance equivalent to engineered controls that would be classified as SC or SS if the engineered controls were available and selected. DOE-STD-1186-2004, Specific Administrative Controls, provides an acceptable methodology for development and use of SACs. In general, SSCs are preferable to ACs or SACs due to the inherent uncertainty of human performance.	L-I	L-I	L-I M-I	L-I	L-I	L-I	L-I M-D																																							