Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
1.	1. OBJECTIVES. To establish facility and programmatic safety requirements for Department of Energy (DOE), including the National Nuclear Security Administration (NNSA), for— a. nuclear and explosives safety design criteria, b. fire protection, c. criticality safety, d. natural phenomena hazards (NPH) mitigation, and e. the System Engineer Program.	1. OBJECTIVE. To establish facility and programmatic safety requirements for the Department of Energy(DOE), including the National Nuclear Security Administration (NNSA), for: a. Nuclear safety design criteria; b. Fire protection; c. Criticality safety; d. Natural phenomena hazards (NPH) mitigation; and, e. Cognizant system engineer (CSE) program. Facility safety requirements for explosive, chemical, and industrial hazards are contained in other DOE rules and directives	Objective.
2.	2. CANCELLATION. This Order cancels DOE O 420.1A, Facility *Safety*, dated05-20-02. Cancellation of an Order does not, by itself, modify or otherwise affect any contractual obligation to comply with such an Order. Contractor requirements documents (CRDs) containing directive requirements already incorporated into, or attached to, a contract remain in effect until the contract is modified to eliminate the existing requirement or substitute a new set of requirements.	2. CANCELLATIONS. This Order (O) cancels: DOE O 420.1B, Chg 1, *Facility Safety*, dated 04-19-10; DOE Guide (G) 420.1 2, *Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Nonnuclear Facilities*, dated 03-28-00; and, DOE G 420.1 3, *Implementation Guide for DOE Fire Protection and Emergency Services Programs for Use with DOE O 420.1B, Facility Safety*, dated 09-27-07. Cancellation of a directive does not, by itself, modify, or otherwise, affect any contractual or regulatory obligation to comply with the directive. Contractor Requirements Documents (CRDs) that have been incorporated into a contract remain in effect throughout the term of the contract unless, and until, the contract or regulatory commitment is modified to either eliminate requirements that are no longer applicable or to substitute a new set of requirements.	Cancellations.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
3. 3.a	3. APPLICABILITY. 3.a. DOE Elements. Except for the exclusions in paragraph 3c, this Order applies to all DOE elements with responsibility for DOE-owned or leased facilities. (See Attachment 1 for a complete list of DOE elements as of the date of this Order. This Order automatically applies to DOE elements created after that date.) Except for the exclusions in paragraph 3c, the requirements in this Order apply to the types of DOE facilities established in the applicability paragraphs of each chapter of this Order. The requirements in this Order are applicable to Department employees. Failure to include comparable requirements in contracts does not relieve Department employees of responsibilities in this Order. The NNSA Administrator will ensure that NNSA employees and contractors comply with their respective responsibilities under this Order.	3. APPLICABILITY. a. Departmental Applicability. This Order applies to all DOE elements with responsibility for design, construction, management, operation, decontamination, decommissioning, or demolition of government owned or government leased facilities and onsite contractor leased facilities used for DOE mission purposes. The NNSA Administrator will ensure that NNSA employees comply with their respective responsibilities under this directive. Nothing in this Order will be construed to interfere with the NNSA Administrator's authority under section 3212(d) of Public Law (P.L.) 106 65, *National Defense Authorization Act for Fiscal Year 2000*, to establish Administration specific policies, unless disapproved by the Secretary.	Applicability.
3.b	3.b. DOE Contractors. (1) The CRD (Attachment 2) sets forth requirements that are to be applied to contractors with responsibility for the design, construction, management, operation, decontamination, decommissioning, or the demolition of DOE sites or facilities.	b. DOE Contractors. Except for the equivalencies and exemptions in Section 3.c, the CRD (see Attachment 1 of this Order) sets forth requirements of this Order that will apply to contracts that include the CRD. The CRD, or its requirements, must be inserted into all contracts that require design, construction, management, operation, decontamination, decommissioning, or demolition of government owned and government leased facilities.	Applicability.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	3.b.(2) Once notified, the contracting officer is responsible for incorporating the applicable requirements of the CRD into the laws, regulations, and DOE directives clause of each contract of contractors that perform work at or for any DOE facility affected by the facility safety hazards described in and requirements established by this Order.		Applicability.
	3.b.(3) Regardless of the performer of the work, the contractor is responsible for compliance with the requirements of the CRD that are incorporated in its contract. The prime contractor is responsible for flowing down the requirements of the CRD to subcontractors at any tier to the extent necessary to ensure the contractor's compliance with the requirements and the safe performance of work.		Applicability.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
3.c.(1) 3.c.(2)	6. EQUIVALENCIES AND EXEMPTIONS. 6.a. Exemptions to this Order must follow the process defined for exemptions in DOE O 251.1C, *Departmental Directives Program*, except for the approval authority defined in the responsibilities paragraphs of this Order. 6.b. Exemptions, exclusions, and equivalencies to standards or other documents referenced in this Order should follow the provisions explicitly set forth in those documents; for example: the equivalency, alternative, and modification provisions in the NFPA Code. 6.c. Central Technical Authority (or designee) concurrence is required for both exemptions and equivalencies to this Order for nuclear facilities. Central Technical Authority concurrence is not required for equivalencies requested pursuant to civil design codes (such as building and fire safety codes) that are invoked by this Order or its implementing standards.	c. Equivalencies and Exemptions. (1) Requests for equivalencies and exemptions to the requirements of this Order are processed in accordance with DOE O 251.1C, *Departmental Directives Program*, dated 01-15-09. Central Technical Authority (or designee) concurrence is required for both exemptions and equivalencies to this Order for nuclear facilities. (Note: This includes exemptions to DOE technical standards and industry codes, and standards required by this Order.) (2) Equivalencies to DOE technical standards, as well as industry codes, and standards, determined to be applicable to the facility design or operations must demonstrate an equivalent level of safety (i.e., meets or exceeds the level of protection) and must be approved by the DOE field element. The DOE field element must follow provisions for relief if specified in DOE technical standards and industry codes and standards. (Note: Different codes and standards may use different terminology for relief; e.g., for building code applications, the terms 'modification' or 'alternative' may be substituted for 'equivalency'.)	Applicability.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
3.c.(3)	3. Exclusions 3.c.(2) Pursuant to Executive Order (E.O.) 12344, *Naval Nuclear Propulsion Program, the Director, Naval Nuclear Propulsion Program*, will implement and oversee requirements of this Order for programs under the Director's cognizance as set forth in the Defense Procurement Reform Act of 1984 [Public Law (P.L.) 98-525] and the Military Lands Withdrawal Act of 1999 (P.L. 106-65).	(3) Equivalency. In accordance with the responsibilities and authorities assigned by Executive Order 12344, codified in 50 U.S.C. sections 2406 and 2511, and to ensure consistency through the joint Navy/DOE Naval Nuclear Propulsion Program, the Deputy Administrator for Naval Reactors (Director) will implement and oversee requirements and practices pertaining to this Directive for activities under the Director's cognizance, as deemed appropriate.	Applicability.
3.c.(4)	3.c.(1) Requirements in this Order that overlap or duplicate requirements of the Nuclear Regulatory Commission (NRC) related to radiation protection, nuclear safety, (including quality assurance), and safeguards and security of material, do not apply to the design, construction, operations, and decommissioning of DOE facilities. This exclusion does not apply to requirements for which the NRC defers to DOE or does not exercise regulatory authority.	(4) Exemption. This Order does not apply to activities that are regulated by the Nuclear Regulatory Commission (NRC) or a state under an agreement with the NRC, including activities certified by the NRC under Section 1701 of the Atomic Energy Act.	Applicability.
3.c.(5)	3.c.(3) Requirements of this Order that overlap or duplicate requirements of the Department of Transportation (DOT) do not apply. This exclusion does not apply to requirements for which DOT defers to DOE or does not exercise regulatory authority.	(5) Exemption. This Order does not apply to transportation activities that are regulated by the Department of Transportation.	Applicability.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
3.c.(6)	3.c.(4) Accelerator facilities covered by DOE O 420.2B, *Safety of Accelerator Facilities*, dated 7-23-04, are excluded only from requirements of chapters I, III, and V of this Order.	(6) Exemption. The following portions of this Order do not apply to accelerator facilities that are covered by DOE O 420.2C, *Safety of Accelerator Facilities*, dated 07-1-11: (1) nuclear safety design requirements, and (2) system engineer program requirements.	Applicability.
	3.c. (5) Fusion facilities are excluded from requirements of chapters I, III, and V of this Order.		
3.c.(7)	3.c. (6) Activities under the Nuclear Explosives and Weapons Safety Program for prevention of accidental or unauthorized nuclear detonation are excluded from a requirement of this Order only if the requirement would compromise the effectiveness or safety of those activities.	(7) Exemption. Specific, individual requirements of this Order do not apply to Nuclear Explosive and Weapons Surety Program activities for the prevention of nuclear detonations if application of such specific requirements would compromise the safety and effectiveness of these activities. In the event of such conflicts between specific requirements of this Order and those of DOE O 452.1D, *Nuclear Explosive and Weapon Surety Program*, dated 04-14-09 or DOE O 452.2D, *Nuclear Explosive Safety*, dated 04-1409, the related requirements of these latter weapons and explosives safety directives take precedence.	Applicability.
3.c.(8)	3.c. (7) Requirements of this Order do not apply to the Bonneville Power Administration.	(8) Exemption. This Order does not apply to the Bonneville Power Administration, in accordance with Secretarial Delegation Order Number 00 033.00B to the Bonneville Power Administrator and Chief Executive Officer, dated 07-20-09.	Applicability.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
3.c.(9)		(9) Exemption. The design requirements in this Order do not apply to projects that have reached a high level of design maturity, as determined by the Program Secretarial Offices (PSOs), as of the issuance date of this Order. Examples of projects that have reached a high level of design maturity include projects that have completed the critical decision (CD)-2 milestone or those projects that have completed the CD-1 milestone with a high level of design maturity. This exemption is provided to control project costs; new design requirements in this Order may be considered for inclusion where they provide significant benefits and/or net cost savings.	Applicability.
3.c.(10)		(10) Exemption. This Order does not apply to offsite office facilities that are owned or leased by the General Services Administration.	Applicability.
3.d		d. Government Owned, Government Operated Facilities. The CRD (see Attachment 1 of this Order) sets forth requirements that must also be applied to DOE government owned, government operated facilities. Government operators must comply with the requirements in the CRD, as set forth in Attachment 1 of this Order.	Applicability.
4 4.a.	4. REQUIREMENTS. a. Each chapter of this document defines specific facility or programmatic safety requirements.	4. REQUIREMENTS. DOE must: a. Approve and oversee contractor programs, as specified in Section 5 of this Order;	Version 420.1C clearly delineates top level Federal requirements. DOE has a general requirement to oversee all contractor activities related to implementing the Order. In addition, DOE has a specific requirement to review and approve contractor programs as specified in Section 5 of this Order.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
4.b.		b. Implement the requirements in Attachment 1 of this Order for government owned government operated facilities;	This is a general requirement for DOE Federal personnel at Government Owned Government Operated facilities (GOGOs) to perform the requirements specified in the Contractor Requirements Document (CRD).
4.c.		c. Provide oversight of the contractor CSE program and the operability of safety systems under the purview of the CSE program;	This is part of DOE's general requirement to provide oversight.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	4.b. In complying with this Order, DOE and contractors must ensure that any work done is consistent with any other safety, design, or other analysis or requirements applicable to the affected facility. In particular, work must be performed in accordance with the integrated safety management requirements of 48 Code of Federal Regulations (CFR) 970.5223-1, Integration of Environment, Safety, and Health into Work Planning and Execution, and the quality assurance requirements of either Subpart A of 10 CFR Part 830, Nuclear Safety Management, or DOE O 414.1C, Quality Assurance, dated 6-17-05 or successor document, as applicable. All new construction, or modifications to existing facilities, as a minimum, must comply with the applicable building codes , as amended herein, supplemented in a graded manner[1] with additional safety requirements for the associated hazards in the facility that are not addressed by the codes. [1] The depth of detail required and the magnitude of resources expended is commensurate with the relative importance to safety, environmental compliance, safeguards and surety, programmatic importance, magnitude of hazard, financial impact, and/or other facility-specific requirements (e.g., DOE O 430.1B, *Real Property Asset Management*, dated 9-24-03, DOE O 413.3A Chg 1, *Program and Project Management for the Acquisition of Capital Assets*, dated 11-17-08).		This requirement is captured in section 4.a of 420.1C

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	4.c. DOE implementation guidance and technical standards referenced in this Order are not mandatory; however they must be considered in conjunction with the specific requirements. Such guidance, along with both DOE and industry standards referenced therein, represent acceptable methods to satisfy the provisions of this Order. Alternate methods that satisfy the requirements of this Order are also acceptable. Any implementation method selected must be justified to ensure that an adequate level of safety commensurate with the identified hazards is achieved.		This requirement is addressed in Attachment 3 of 420.1C
4.d.		d. Document any operational responsibilities that are assigned to the contractor regarding the authority having jurisdiction (AHJ) for matters involving fire protection as defined by the National Fire Protection Association (NFPA) codes;	This requirement clarifies that DOE is the authority having jurisdiction (AHJ) for matters involving fire protection but may delegate operational responsibilities to the contractor, provided they are clearly documented.
4.e.		e. Document any authorities associated with the building code official, as defined in DOE Standard (STD)-1066-2012, *Fire Protection*, that are assigned to the contractor; and,	Similarly, this requirement clarifies that DOE is the authority of the building code official but may delegate responsibilities to the contractor, provided they are clearly documented.
4.f.		f. Establish an integrated site wide wild-land fire management plan, consistent with the Federal Wild-land Fire Management Policy.	This is a top level Federal requirement, consistent with the Federal Wild-land Fire Management Policy.
5.	5. RESPONSIBILITIES	5. RESPONSIBILITIES	Responsibilities
5. 5.a. 5.a.(1) 5.a.(2)	5.b. Secretarial Officers (SOs). 5.b.(1) Ensure that requirements of this Order and the CRD are implemented for facilities, activities, or programs under their cognizance.	5. RESPONSIBILITIES. a. Secretarial Officers. (1) Ensure that the requirements of this Order and the CRD are implemented for facilities, activities, or programs under their cognizance.	Responsibilities

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	5.b.(2) Review and approve requests for exemptions from requirements of this Order after resolving comments, if any, from the Chief Health, Safety and Security Officer, or in the case of NNSA, following consideration of comments from the Chief Health, Safety and Security Officer. 5.b.(3) Review and approve implementation plans for nuclear and explosives safety design criteria. 5.b.(4) Ensure that heads of field elements notify contracting officers when contracts are affected by this Order. 5.b.(5) Review and approve implementation methods other than those in referenced implementation guides and standards. 5.b.(6) Review and approve any situations that could result in deviations from the double contingency principle in operations involving criticality hazards. 5.b.(7) Review and approve the basis for exceptions to including multiple physical barriers to prevent or mitigate the unintended release of radioactive materials to the environment as part of the nuclear facility design in the documented safety analysis (DSA).	Review, and where justified, approve requests for equivalencies and exemptions to the requirements of this Order, processed in accordance with DOE O 251.1C. (2) In accordance with Section 3.c.(1) of this Order, approve the basis for not including multiple physical barriers to prevent or mitigate the unintended release of radioactive materials to the environment, as part of the hazard category 1, 2 and 3 nuclear facility designs, where justified by sound technical basis.	
5.b.	5.a. Chief Health, Safety and Security Officer.	b. Chief Health, Safety and Security Officer.	Responsibilities
5.b.(1)	5.a.(1) Develops and maintains policy, requirements, guidance, and technical standards relating to this Order and CRD.	(1) Develop and maintain policy, requirements, guidance, and technical standards relating to this Order and the CRD.	Responsibilities

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
5.b.(2)	5.a.(2) Provides interpretation of DOE safety policy relating to requirements of this Order.	(2) Provide technical advice and assistance on the implementation of policy, requirements, guidance, and technical standards related to this Order and the CRD.	Responsibilities
	5.a.(3) Provides advice and assistance on policy implementation.		Responsibilities
5.b.(3)	5.a.(5) Provides comments on requests for exemptions from requirements of this Order.	(3) Provide comments on requests for exemptions from requirements of this Order.	Responsibilities
5.b.(4)	5.a.(4) Monitors and reviews field element and contractor implementation of the requirements of this Order and CRD.	(4) Plan and conduct independent oversight reviews of implementation of the requirements of this Order and the CRD (see DOE O 226.1B, *Implementation of Department of Energy Oversight Policy*, dated 04-25-11, and DOE O 227.1, *Independent Oversight Program*, dated 08-30-11, for details).	Responsibilities
	5.a.(6) Provides independent health, safety and security oversight for the Department.		Responsibilities
	5.a.(7) Plans and conducts appraisals to determine compliance with requirements of this Order. (See DOE O 470.2B, *Independent Oversight and Performance Assurance Program*, dated 10-31-02.)		Responsibilities
5.c.	c. Heads of Field Elements.	c. Heads of Field Elements.	Responsibilities
5.c.(1)	5.c.(1) Ensure that the facilities, activities, and programs under their purview operate in compliance with the requirements of this Order and the CRD.	(1) Ensure that the facilities, activities, and programs under their purview operate in compliance with the requirements of this Order and the CRD.	Responsibilities

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
5.c.(2)	5.c.(2) Notify contracting officers when contracts are affected by this Order.	(2) Identify contracts to which the CRD applies and notify contracting officers when contracts are affected by this Order.	Responsibilities
5.c.(3)	5.c.(3) Coordinate with contracting officers the revision of contracts to comply with requirements of this Order and require contractors to appropriately flow down requirements to subcontractors.	(3) Review and, where justified, approve equivalencies to DOE technical standards and industry codes and standards determined to be applicable to the facility design or operations.	Responsibilities
5.c.(4)	5.c.(4) Ensure that procurement requests include applicable requirements in the CRD for this Order to be applied to awards or sub awards.	(4) Approve contractors' emergency services organization baseline needs assessments (BNAs) that meet the requirements in Attachment 2, Chapter II, Section 3.e.(1) of this Order.	Responsibilities
5.c.(5)	5.c.(5) If delegated by the SO, review and approve exemption requests after resolving comments, if any, from the Chief Health, Safety and Security Officer for non-NNSA facilities and after considering requests for NNSA facilities. If not delegated, forward requests for exemption to SO.	(5) Approve contractors' fire protection program (this may be accomplished in conjunction with 10 Code of Federal Regulations (C.F.R.) Part 851, *Worker Health and Safety Program*).	Responsibilities
	5.c.(6) Conduct comprehensive self assessments and assessments of contractor fire protection programs and criticality safety programs (CSPs).[2] [2] See DOE-STD-156-2002, Self-Assessment Standard for DOE Contractor Criticality Safety Programs, for information on assessments of CSPs.		Responsibilities

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
5.c.(6) 5.c.(7) 5.c.(8) 5.c.(9) 5.c.(10) 5.c.(11) 5.c.(12)	5.c.(7) Specify the frequency of the contractor's periodic facility assessment for fire protection.	(6) Fulfill the roles and responsibilities for the AHJ formatters involving fire protection, as defined by the NFPA, including documentation of any delegation or assignment of related responsibilities. (7) Fulfill the roles and responsibilities for the building code official, as defined in DOE-STD-1066-2012, including documentation of any delegation or assignment of related responsibilities. (8) Perform responsibilities of 'owner', or other equivalent term in the application of DOE technical standards or industry codes and standards, unless delegated. (9) Approve the contractors' criticality safety program documentation, ensure that it meets requirements in Chapter III of Attachment 2 of this Order. (This may be accomplished through the safety basis documentation approval process.) (10) Approve periodic NPH assessment evaluations, any recommended update actions, and any recommended upgrade plans, in accordance with Chapter IV of Attachment 2 of this Order. (11) Provide oversight for contractor CSE programs and the operability of associated safety systems. (12) Consistent with DOE O 226.1B, establish and implement an appropriate self assessment and oversight program for the elements of this Order.	Responsibilities

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	5.c.(8) Review and approve— (a) fire department baseline needs assessments, where applicable; (b) CSP description documents; (c) plans for upgrades to correct deficiencies in natural phenomena hazards mitigation for existing structures, systems, and components; (d) recommendations to update NPH assessments; (e) the qualification program for criticality safety staff[3]; (f) shipping containers for off-site shipment that are used to exclude materials from the requirement for a criticality alarm system (CAS) or a criticality detection system (CDS); and (g) the method for preparing criticality safety evaluations.[4] [3] Unless the qualification program complies with DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineering Training and Qualification*. [4] Unless they are conducted in accordance with DOE-SYD-3007 and evaluated in accordance with DOE-STD-1134, *Review Guide for Criticality Safety Evaluation*.		
	5.c.(9) Ensure that all procurement requests for work within the scope of this Order, including work requests to be performed through subcontracts, include the appropriate requirements of the attached CRD.		Responsibilities

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	5.c.(10) Unless otherwise directed by the Secretarial Officer fulfill the role and responsibilities for the authority having jurisdiction (AHJ) for matters involving fire protection as defined by the National Fire Protection Association (NFPA) codes and standards. Ensure any comments from designated fire protection subject matter experts (SMEs) are appropriately addressed.		
5.d.	5.d. Contracting Officers. 5.d.(1) Incorporate the CRD into affected contracts in a timely manner when notified.	d. Contracting Officers. Incorporate the CRD, or its requirements, into affected contracts and procurement requests in a timely manner when notified.	Responsibilities
5.e. 5.e.(1) 5.e.(2)	5.d. (2) Ensure applicable building code and NFPA codes and standards are incorporated in contracts and other procurement documents.	e. Central Technical Authorities. (1) Review and, where justified, concur on requests for equivalencies and exemptions to the requirements of this Order, processed in accordance with DOE O 251.1C. (2) Provide support, as requested by the DOE field element, on review of equivalencies to DOE technical standards and industry codes and standards determined to be applicable to the facility design or operations.	Responsibilities
6.	7. REFERENCES. The following documents are expressly referenced in the body of this Order and should be considered when implementing this Order and the associated CRD in the context in which they are referenced in the document. 8. ACRONYMS.	6. REFERENCES AND ACRONYMS. References and acronyms can be found in Attachment 4 of this Order.	References and Acronyms

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, dated 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
7.	9. CONTACT. Address inquiries to the Office of Health, Safety and Security; Office of Nuclear Safety Policy and Assistance, 301-903-1408.	7. CONTACT. Address inquiries to the Office of Health, Safety and Security; Office of Nuclear Safety, 301-903-3331.	Contact Number
	Chapters I –V (Not Attachment 2, Chapters I-V)		These chapters provided DOE requirements in topical areas. These chapters were eliminated because most of these requirements were contractor requirements that are adequately captured in the CRD. All contents of these chapters were carefully reviewed in establishing appropriate DOE requirements and responsibilities in DOE O 420.1C.
Chapters I through V have been modified into the requirements in Section 4.			

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Attachment 1. CONTRACTOR REQUIREMENTS DOCUMENT			

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	Attachment 1 DOE O 420.1B, FACILITY SAFETY, IS APPLICABLE Office of the Secretary National Nuclear Security Administration Office of Civilian Radioactive Waste Management Office of Energy Efficiency and Renewable Energy Office of Environmental Management Office of Fossil Energy Office of Health, Safety and Security Office of Legacy Management Office of Nuclear Energy Office of Science Southeastern Power Administration Southwestern Power Administration Western Area Power Administration		This is covered in the applicability section (Section 3) of O 420.1C. The Attachment 1 table is no longer required.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 1 1. 1.a.	Attachment 2 CONTRACTOR REQUIREMENTS DOCUMENT DOE 420.1B, *FACILITY SAFETY* Regardless of the performer of the work, the contractor is responsible for complying with requirements of this Contractor Requirements Document (CRD). The contractor is responsible for flowing down the requirements to subcontractors at any tier to the extent necessary to ensure the contractor's compliance with the requirements and the safe performance of work. In doing so, the contractor must not flow down requirements to subcontractors unnecessarily or imprudently.	This contractor requirements document (CRD) includes requirements outlined in Attachments 2 and 3 of Department of Energy (DOE) Order (O) 420.1C, *Facility Safety*, referenced in and made a part of this CRD, and which provides program requirements and/or information applicable to contracts in which this CRD is inserted. 1. GENERAL REQUIREMENTS. a. This CRD establishes facility safety requirements for design, construction, operation, management, decontamination, decommissioning and demolition of DOE sites or facilities. Regardless of the performer of the work, the contractors are responsible for complying with the requirements of this CRD. The contractors are responsible for flowing down the requirements of this CRD to subcontractors at any tier, to the extent necessary, to ensure the contractors' compliance with the requirements.	Flow down provisions. No significant change.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 1, 1.b.	Attachment 2 1. REQUIREMENTS. a. This CRD establishes facility safety requirements for Department of Energy (DOE) and National Nuclear Security Administration (NNSA) contractors responsible for design, construction, operation, management, decontamination or decommissioning of DOE sites or facilities. Contractors must comply with the CRD requirements to the extent set forth in their contracts. Contractors should refer to corresponding requirements in DOE O 420.1B, *Facility Safety*, dated 12-22-05, and all referenced rules, guidance, and standards when implementing the requirements of this CRD. b. Chapters of the CRD may have general and specific requirements. In complying with the CRD, contractors must determine acceptability of design and operations based on a comparison with available safety basis information.	b. Contractors must satisfy the requirements set forth in Attachments 2 and 3 of DOE O 420.1C.	Scope of CRD. Attachment 3 is added to scope to address design criteria for SSCs.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 1,1.c.	Attachment 2 c. In complying with this CRD, contractors must ensure that any work done is consistent with any other safety, design, or other analysis or requirements applicable to the affected facility. In particular, work must be performed in accordance with the integrated safety management requirements of Title 48 Code of Federal Regulations (CFR) 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution*, and the quality assurance requirements of either Subpart A of 10 CFR Part 830, *Nuclear Safety Management*, or DOE O 414.1C, *Quality Assurance*, dated 6-17-05, or successor document, as applicable. All new construction, as a minimum, must comply with national consensus industry standards and the model building codes applicable for the state or region supplemented in a graded manner[1] with additional safety requirements for the associated hazards in the facility that are not addressed by the codes. 1 The depth of detail required and the magnitude of resources expended is commensurate with the relative importance, magnitude of hazard, financial impact, and/or othe facility-specific requirements (e.g., DOE O 430.1B, *Real Property Asset Management*, dated 9-24-03), DOE O 413.3A Chg 1, *Program and Project Management for the Acquisition of Capital Assets*, 11-17-08.	c. All design and construction, at a minimum, must comply with applicable national consensus industry codes and standards, the International Building Code (IBC) and other requirements as documented in DOE O 420.1C. If approved by the responsible field element manager, state, regional, and local building codes may be used in lieu of the IBC upon contractor submission of a report that demonstrates that implementation of the substituted code for the specific application will meet or exceed the level of protection that would have been provided by the IBC. Additionally, DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, dated 11-29-10, requires nuclear projects to establish and maintain a Code of Record (COR) early in project design for identifying applicable industry codes and standards.	Use of codes and standards. No significant change.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 1, 1.d.	Attachment 2 d. DOE implementation guidance and technical standards referenced in this CRD are not mandatory; however they must be considered in conjunction with the specific requirements. Such guidance, along with both DOE and industry standards referenced therein, represent acceptable methods to satisfy the provisions of this CRD. Alternate methods that satisfy the requirements of this CRD are also acceptable. Any implementation method selected must be justified to ensure that an adequate level of safety commensurate with the identified hazards is achieved.	d. Contractors must satisfy the requirements (i.e., mandatory statements) in DOE technical standards and industry codes and standards identified as applicable, unless relief is approved in accordance with Section 2, below.	Attachment 3 describes the required method for determining applicable DOE technical standards and industry codes and standards. Order 420.1C clarifies that the applicable codes and standards must be identified and applied, except where relief is granted.
Att. 1, 2. 2.a.	Attachment 2 2. EXEMPTIONS. a. Exemptions to this CRD must follow the process defined for exemptions in DOE O 420.1B, *Facility Safety*. b. DOE O 251.1C, *Departmental Directives Program*, provides information on the process for requesting and justifying a request for exemption to the requirements of DOE directives, including CRDs. c. Specific DOE exemption responsibilities and authorities are defined in the Order.	2. RELIEF FROM REQUIREMENTS, CODES AND STANDARDS. a. Requests for equivalencies and exemptions to the requirements of this attachment are processed in accordance with DOE O 251.1C, *Departmental Directives Program*, dated 01-15-09. Requests for equivalencies and exemptions must be provided to the responsible contracting officer for further processing. This includes exemptions to applicable requirements in DOE technical standards and industry codes and standards required by DOE O 420.1C.	No significant change

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 1, 2.b.	Attachment 2 2.d. Exemptions, exclusions, and equivalencies to standards or other documents referenced in this CRD should follow the provisions explicitly set forth in those documents; for example: the equivalency, alternative, and modification provisions in the NFPA Code.	b. Equivalencies to DOE technical standards and industry codes and standards determined to be applicable to the facility design or operations must demonstrate an equivalent level of safety (e.g., meets or exceeds the level of protection) and be approved by the DOE field element.	This requirement clarifies that equivalencies must be approved by DOE and must demonstrate an equivalent level of safety. DOE may delegate provisional responsibilities to the contractors, with clearly defined documentation requirements. DOE's ultimate review and approval of facility design may be used for approval of the individual equivalencies where they are clearly identified and justified.
Att. 1, 3.	Attachment 2, Section 3, References	3. REFERENCES. Attachment 4 of DOE O 420.1C provides a list of reference documents: rules, directives, guidance, DOE technical standards, and industry codes and standards.	References

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Attachment 2, Chapter I - NUCLEAR SAFETY DESIGN CRITERIA			
Att. 2		FACILITY SAFETY REQUIREMENTS This attachment provides information and/or requirements associated with the Department of Energy (DOE) Order (O) 420.1C, Facility Safety, as well as information and/or requirements applicable to contracts into which the associated Contractor Requirements Document (CRD), (see Attachment 1 of DOE O 420.1C) is inserted.	Introduction
Att. 2, Ch I. Ch I, 1.	Attachment 2, CHAPTER 1. NUCLEAR AND EXPLOSIVES SAFETY DESIGN CRITERIA 1.OBJECTIVES. a. Nuclear Safety.[1] (1) To ensure that new DOE hazard category 1, 2, and 3 nuclear facilities are designed and constructed in a manner that ensures adequate protection to the public, workers, and the environment from nuclear hazards. [1] The requirements of this chapter complement the requirements for hazard category 1, 2, and 3 nuclear facilities in 10 CFR Part 830, Subpart B, and establish approved design criteria to meet the provisions of 10 CFR 830.206.	CHAPTER I. NUCLEAR SAFETY DESIGN CRITERIA 1. OBJECTIVE. To establish requirements for safety design of DOE hazard category 1, 2, and 3 nuclear facilities to support implementation of DOE Policy (P) 420.1, *Department of Energy Nuclear Safety Policy*, dated 02-08-11[1.]	Objective
Att. 2, Ch I, 1.	Attachment 2, Chapter 1 (2) To ensure that major modifications to hazard category 1, 2, and 3 nuclear facilities comply with the design and construction requirements for new hazard category 1, 2,	The requirements of this chapter (and the criteria in Attachment 3 of DOE O 420.1C) support implementation of the requirements for hazard category 1, 2 and 3 nuclear facilities in 10 Code of Federal Regulations (C.F.R.) Part 830, *Nuclear Safety Management*, Subpart B, *Safety Basis*	Objective

[1]DOE's nuclear safety policy (DOE P 420.1) is to design, construct, operate, and decommission its nuclear facilities in a manner that ensures adequate protection of workers, the public, and the environment.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	and 3 nuclear facilities.	*Requirements*.	
	Attachment 2, Chapter 1 (3) To ensure that new DOE nuclear reactors comply with the requirements of this CRD and the design requirements of DOE O 5480.30, *Nuclear Reactor Safety Design Criteria*.		Objective
	Attachment 2, Chapter 1 b. Explosives Safety. To establish mandatory design and construction standards for safety in new DOE explosives facilities and for major modifications to such facilities. Explosives facilities include facilities and locations used for storage or operations with explosives or ammunition.[2] [2] Facilities or locations used for storage or operations with explosives or ammunition.		DOE-STD-1212-2012, *Explosives Safety*, addresses explosives safety requirements.
Att. 2 Ch I, 2. Ch I, 2.a.	Attachment 2, Chapter 1 2. APPLICABILITY. a. This chapter applies to DOE contractors that are responsible for the design and construction of—	2. APPLICABILITY. a. This chapter applies to the design and construction of:	Applicability
Att. 2 Ch I, 2.a.(1)	Attachment 2, Chapter 1 2.a.(1) new hazard category 1, 2, and 3 nuclear facilities as defined by 10 CFR Part 830;	(1) New hazard category1, 2, and 3 nuclear facilities, as defined by10 C.F.R. Part 830; and,	Applicability
	Attachment 2, Chapter 1 2.a.(2) new explosives facilities[3]; and [3] For explosives facilities that are also nuclear facilities, requirements for nuclear safety design also apply.		DOE-STD-1212-2012, *Explosives Safety*, addresses explosives safety requirements.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 2 Ch I, 2.a.(2)	Attachment 2, Chapter 1 2.a. (3) major modifications to such facilities that could substantially change the approved facility safety analysis.[4] [4] See 10 CFR Part 830 and associated guidance and DOE-STD-1189 for additional information on major modification to hazard category 1, 2, and 3 nuclear facilities.	(2) Major modifications to hazard category1, 2, and 3 nuclear facilities, as defined in 10 C.F.R. Part 830, that could substantially change the facility safety basis (Note: See DOE Standard (STD)-1189-2008, *Integration of Safety into the Design Process*, for criteria and discussion on major modifications).	Applicability
Att. 2, Ch I, 2.b.	Attachment 2, Chapter 1 2.b. This chapter does not impose requirements on existing facilities, except for major modifications to those facilities, but it can be used as a standard for comparison when judging the adequacy of existing facilities.	b. This chapter does not impose requirements on existing facilities, except for major modifications[2] to those facilities. The requirements of this chapter may be used to develop comparisons of existing facilities to the requirements for new facilities, as one aide to judgment when evaluating the costs and benefits of non mandatory upgrades to existing facilities.	Applicability
Att. 2, Ch I, 2.c.	Attachment 2, Chapter 1 2.c. This chapter does not apply to nuclear deactivation or decontamination and decommissioning activities at end-of-facility-life if the safety analysis demonstrates that adequate protection is provided consistent with the requirements of 10 CFR Part 830 through alternate means and it is not cost beneficial to apply the provisions of this chapter for the limited remaining life of the activity.	c. Except for the requirements of Section 3.b.(3), this chapter does not apply to nuclear deactivation or decontamination and decommissioning activities at end of facility life if the safety analysis demonstrates that adequate protection is provided consistent with the requirements of 10 C.F.R. Part 830 through alternate means and it is not cost beneficial to apply the provisions of this chapter for the limited remaining life of the activity.	Section 3.b.(3) provides the requirements for confinement of radioactive materials. This Section applies to nuclear deactivation or decontamination and decommissioning activities.
Att. 2, Ch I, 3.	Attachment 2, Chapter 1 3.<u>REQUIREMENTS.</u>	3. <u>REQUIREMENTS</u>.	Requirements
Att. 2,	Attachment 2, Chapter 1	a. <u>Integration of Safety with Design.</u>	No significant change. DOE-STD-1189-

[2] DOE-STD-1189-2008 provides definition and examples of major modifications.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Ch I, 3.a. Ch I, 3.a.(1) Ch I, 3.a.(2) Ch I, 3.a.(1)(a) Ch I, 3.a.(1)(b) Ch I, 3.a.(1)(c)	3.a. Integration of Design with Safety. (1) Safety analyses must be used to establish— (a) the identity and functions of safety class and safety significant structures, systems, and components (SSCs)[5] and (b) the significance to safety of functions (2) Safety analyses must address— (a) hazards inherent to the facility and its activities, (b) Natural phenomena hazards (NPH),[6] and (c) external man-induced hazards, (factors such as proximity to airports, pipelines, hazardous traffic on roads or waterways, and adjacent facilities). (3) Safety must be integrated into design early and throughout the design process consistent with DOE-STD-1189, *Integration of Safety into the Design Process*.[7] [5] See definitions for these and other terms in this chapter in 10 CFR 830.3. [6] See Chapter IV and associated guidance for additional information on NPH. [7] DOE O 413.3A also requires implementation of DOE-STD-1189 for applicable nuclear projects.	(1) Safety must be integrated into the design early in, and throughout, the design process through use of DOE-STD-1189-2008. (2) Safety analyses must be used to: (a) identify safety class and safety significant structures, systems and components (SSCs) needed to fulfill the safety functions in order to prevent and/or mitigate design basis accidents, including natural and man induced hazards and events; (b) identify the safety functional requirements of the safety class and safety significant SSCs; and, (c) identify specific administrative controls (SACs) needed to fulfill safety functions. (Note: See DOE-STD-1186-2004, *Specific Administrative Controls*, for details on specific administrative controls.	2008 is invoked as the required method for integrating safety into design.
Att. 2 Ch I, 3.b.(1)	Attachment 2, Chapter 1 3.b. Nuclear Facility Design. 3.b.(1) Nuclear facility design objectives must include multiple layers of protection to prevent or mitigate the unintended release of radioactive materials to the environment, otherwise known as defense in depth. These multiple layers must include	b. Nuclear Facility Design (1) The nuclear facility design must include multiple layers of protection (as part of the design defense in depth) to prevent or mitigate the unintended release of radioactive materials into the environment.	No significant change.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	multiple physical barriers unless the basis for not including multiple physical barriers is documented in the DSA and approved by DOE.		
Att. 2, Ch I, 3.b.(2) Ch I, 3.b.(2)(a) Ch I, 3.b.(2)(b) Ch I, 3.b.(2)(c) Ch I, 3.b.(2)(d) Ch I, 3.b.(2)(e) Ch I, 3.b.(2)(f) Ch I, 3.b.(2)(g) Ch I, 3.b.(2)(h) Ch I, 3.b.(2)(i)	Attachment 2, Chapter 1 3.b.(2) Defense in depth must include all of the following— (a) choosing an appropriate site; (b) minimizing the quantity of material at risk; (c) applying conservative design margins and quality assurance; (d) using successive physical barriers for protection against radioactive releases; (e) using multiple means to ensure critical safety functions needed to— 1 control processes, 2 maintain processes in safe status, and 3 confine and mitigate the potential for accidents with radiological releases; (f) using equipment and administrative controls[8] that— 1 restrict deviation from normal operations, 2 monitor facility conditions during and after an event, and 3 provide for response to accidents to achieve a safe condition; (g) providing means to monitor accident releases as required for emergency response[9]; and (h) establishing emergency plans for	(2) Defense in depth must include all of the following: (a) choosing an appropriate site; (b) minimizing the quantity of material at risk; (c) applying conservative design margins; (d) applying quality assurance; (e) using successive/multiple physical barriers for protection against radioactive releases (Note: If an exemption to having multiple barriers is required, it is the Secretarial Officer's responsibility to approve, or disapprove, the exemption for not including multiple physical barriers); (f) using multiple means to ensure safety functions are met by— 1 controlling processes; 2 maintaining processes in safe status; 3 providing preventive and/or mitigative controls for accidents with the potential for radiological releases; and, 4 providing means for monitoring facility conditions to support recovery from upset or accident conditions; (g) using equipment in combination with administrative controls that— 1 restrict deviation from normal operations; 2 monitor facility conditions during and	No significant change.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	minimizing the effects of an accident. [8] See Appendix A Section G of 10 CFR Part 830 Subpart B and Associated guidance for additional information on administrative controls for Technical Safety Requirements. [9] See DOE O 151.1C, *Comprehensive Emergency Management System*.	after an event; and, 3 provide for response to accidents to achieve a safe condition; (h) providing means to monitor accident releases as required for emergency response (see DOE O 151.1C, *Comprehensive Emergency Management System*, dated 11-02-05, for detailed requirements); and, (i) establishing emergency plans for minimizing the effects of an accident (see DOE O 151.1C for detailed requirements).	
	Attachment 2, Chapter 1 3.b.(3) Hazard category 1, 2, and 3 nuclear facilities must be sited, designed, and constructed in a manner that ensures adequate protection of the health and safety of the public, workers, and the environment from the effects of accidents involving radioactive materials release.		This general requirement is implicit in the specific requirements of this Order and does not need to be restated.
Att. 2 Ch I, 3.b.(3)	Attachment 2, Chapter 1 3.b.(4) Hazard category 1, 2, and 3 nuclear facilities with uncontained radioactive material (as opposed to material determined by safety analysis to be adequately contained within drums, grout, or vitrified materials) must have the means to confine the uncontained radioactive materials to minimize their potential release in facility effluents during normal operations and during and following accidents. Confinement design considerations must include:	(3) Hazard category1, 2, and 3 nuclear facilities with uncontained radioactive materials (as opposed to materials determined by safety analyses to be adequately contained within qualified drums, grout, or vitrified materials) must have the means to confine the uncontained radioactive materials to minimize their potential release in facility effluents during normal operations and during and following accidents, up to and including design basis accidents (DBAs). Confinement design must include the following:	No significant change.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 2 Ch I, 3.b.(3)(a)	Attachment 2, Chapter 1 3.b.(4)(a) for a specific nuclear facility, the number, arrangement, and characteristics of confinement barriers as determined on a case-by-case basis;	(a) For a specific nuclear facility, the number, arrangement, and characteristics of confinement barriers as determined on a case by case basis.	No significant change.
Att. 2 Ch I, 3.b.(3)(b)	Attachment 2, Chapter 1 3.b.(4)(b) the type, quantity, form, and conditions for dispersing the radioactive material in the confinement system design;	(b) The type, quantity, form, and conditions for dispersing the radioactive material in the confinement system design.	No significant change.
Att. 2 Ch I, 3.b.(3)(c)	Attachment 2, Chapter 1 3.b.(4)(c) use of engineering evaluations, tradeoffs, and experience to develop practical designs that achieve confinement system objectives; and	(c) An active confinement ventilation system as the preferred design approach for nuclear facilities with potential for radiological release.[3] Alternate confinement approaches may be acceptable if a technical evaluation demonstrates that the alternate confinement approach results in very high assurance of the confinement of radioactive materials. The guidance for confinement ventilation systems and evaluation of the alternatives, is provided in DOE Guide (G) 420.1 1A, *Nonreactor Nuclear Safety Design Guide for Use with DOE O 420.1C, Facility Safety*.	This change reflects the Department's approach to confinement ventilation, as described in the Secretary's Response and Implementation Plan for DNFSB Recommendation 2004-2.

[3] The safety classification (if any) of the ventilation system is determined by the facility documented safety analysis.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 2, Ch I, 3.b.(3)(d)	Attachment 2, Chapter 1 3.b.(4)(d) the adequacy of confinement systems to perform required functions as documented and accepted through the safety in design process as described in DOE-STD-1189.[10] [10] DOE O 413.3A also requires implementation of DOE-STD-1189 for applicable nuclear projects.	(d) Documentation of the adequacy of confinement systems consistent with the safety in design process as described in DOE-STD-1189-2008.	No significant change.
Att. 2, Ch I, 3.b.(4) Ch I, 3.b.(4)(a)	Attachment 2, Chapter 1 3.b.(5) Hazard Category 1, 2, and 3 nuclear facilities must be designed to— 3.b.(5)(a) facilitate safe deactivation, decommissioning, and decontamination at the end of facility life, including incorporation of design considerations during the operational period that facilitate future decontamination and decommissioning;	(4) Hazard category1, 2, and 3 nuclear facilities must be designed to: (a) facilitate safe deactivation, decommissioning, decontamination, and demolition at the end of facility life, including incorporation of design considerations during the operational period that facilitate future decontamination and decommissioning;	No significant change.
Att. 2, Ch I, 3.b.(4)(b)	Attachment 2, Chapter 1 3.b.(5)(b) facilitate inspections, testing, maintenance, repair, and replacement of safety SSCs as part of a reliability, availability, and maintainability program with the objective that the facility is maintained in a safe state; and	(b) facilitate inspections, testing, maintenance, repair, and replacement of safety SSCs as part of a reliability, maintainability, and availability program with the objective of maintaining the facility in a safe state;	No significant change.
Att. 2, Ch I, 3.b.(4)(c)	Attachment 2, Chapter 1 3.b.(5)(c) keep occupational radiation exposures within statutory limits and as low as reasonably achievable	(c) keep occupational radiation exposures within regulatory limits, and as low as reasonably achievable;	No significant change.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	(ALARA).		
Att. 2, Ch I, 3.b.(4)(d)		(d) provide controls consistent with the hierarchy described in DOE-STD-1189-2008; and,	This provides emphasis on hierarchy of controls. STD-1189 was required in O 420.1B.
Att. 2, Ch I, 3.b.(4)(e)		(e) protect against chemical hazards and toxicological hazards consistent with DOE-STD-1189-2008 and direction from the responsible program office. Appendix B of DOE-STD-1189-2008 provides additional guidance for protection against chemical hazards and toxicological hazards.	10 CFR 830 requires identification and control of all hazards at nuclear facilities. DOE-STD-1189-2008 provides guidance for protection against chemical hazards and toxicological hazards.
Att. 2, Ch I, 3.b.(5)	Attachment 2, Chapter 1 3.b.(6) Facility process systems must be designed to minimize waste production and mixing of radioactive and non radioactive wastes.	(5) Facility process systems must be designed to minimize waste production and mixing of radioactive and non radioactive wastes.	No significant change.
Att. 2, Ch I, 3.b.(6)	Attachment 2, Chapter 1 3.b.(7) Safety SSCs and safety software must be designed, commensurate with the importance of the safety functions performed, to perform their safety functions when called upon and to meet the quality assurance program requirements of either 10 CFR 830, Subpart A, or DOE O 414.1C, *Quality Assurance*, as applicable.	(6) Safety-SSCs and safety software must be designed to perform their safety functions when called upon.	No significant change.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
Att. 2, Ch I, 3.b.(7)	Attachment 2, Chapter 1 3.b.(8) Safety class electrical systems must be designed to preclude single point failure.[11] [11] See the basic approach in section 5.2.(Electrical) of DOE 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for Use with DOE O 420.1, Facility*, dated 3-28-00, with appropriate consideration and application of the natural electrical codes and standards.	(7) Active safety class systems must be designed to meet single point failure[4] criterion.	No significant change.
Att. 2, Ch I, 3.b.(8)		(8) DOE G 420.1-1A provides an acceptable method to meet the requirements stated in this chapter. DOE O 251.1C requires that any implementation selected must be justified to ensure that an adequate level of safety commensurate with the identified hazards is achieved.	This describes the expected use of DOE G 420.1-1A.
Att. 2, Ch I, 3.b.(9)	Attachment 2, Chapter 1 3.b.(9) New DOE nuclear reactors must comply with the requirements of this CRD, as well as the design requirements of DOE O 5480.30, *Nuclear Reactor Safety Design Criteria.*	(9) New DOE nuclear reactors must comply with the requirements of this attachment, as well as the design requirements of DOE O 5480.30 Chg 1, *Nuclear Reactor Safety Design Criteria*, dated 01-19-93.	No significant change.
Att. 2 Ch I, 3.b.(10)		(10) Critical experiments facilities must be designed and operated in accordance with American National Standards Institute (ANSI) and the American Nuclear Society (ANS) standards, ANSI/ANS-1-2000, *Conduct of Critical Experiments*, or ANSI/ANS-14.1-2004, *Operation of*	This reiterates an existing expectation for critical experiment facilities.

[4] IEEE-STD-379-2000, *IEEE Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems*, provides a definition of single point failure criterion.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
		Fast Pulse Reactors.	
Att. 2 Ch I, 3.b.(11)		(11) Facility design must also be integrated with other design requirements, as applicable, including explosive safety, industrial safety, and nuclear explosive safety (if applicable).	This is a general requirement to integrate nuclear design requirements with other applicable design requirements so that they all may be satisfied.
	Attachment 2, Chapter 1 3.c. Explosives Safety Design. (1) New DOE explosives facilities and all modifications to existing explosives facilities must be designed consistent with the DOE explosives safety requirements established in DOE M 440.1 1A, *DOE Explosives Safety Manual*, dated 1-9-06 and technical standards referenced in that manual. In particular, they must be designed in accordance with— (a) DoD TM5-1300, Structural Design of Facilities to Resist the Effects of Accidental Explosions (1990); (b) DOE/TIC 11268, Manual for the Prediction of Blast and Fragment Loading for Structures (July 1992); and (c) the following DoD Explosives Safety Board (DDESB) technical papers: 1 DDESB Technical Paper 12, *Fragment and Debris Hazards*, July 1975. 2 DDESB Technical Paper 13, Prediction of Building Debris for Quantity-Distance Siting, April		This is addressed in DOE-STD-1212-2012, which is invoked in DOE O 440.1B Chg 1, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees.*

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	1991. 3 DDESB Technical Paper 15, *Approved Protective Construction*, June 2004. 4 DDESB Technical Paper 16, Methodologies for Calculating Primary Fragment Characteristics, dated December 1, 2003. 5 DDESB Technical Paper 17, DDESB Blast Effects Computer Version 5.0 User's Manual and Documentation, with accompanying program entitled DDESB Blast Effects Computer (BEC), Version 6.1.		
	Attachment 2, Chapter 1 3.c.(2) Blast resistant design to protect personnel and facilities must be based on the TNT equivalency of the maximum quantity of explosives and propellants permitted, increased by 20 percent in accordance with DoD TM5-1300.		This is addressed in DOE-STD-1212-2012, which is invoked in DOE O 440.1B Chg 1, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees.*
	Attachment 2, Chapter 1 3.d. Implementation. (1) For new nuclear facilities subject to this Order, a Safety Design Strategy in accordance with DOE-STD-1189 must be submitted to the responsible SO or designee describing the process for ensuring that facility design and construction will be in compliance with the nuclear facility safety requirements of this Order and the requirements of DOE-STD-1189.		This Requirement is addressed in Attachment 2, Chapter 1, Section 3(a) of the Order 420.1C.

Citation (420.1C)	Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)	Revised Requirement (O 420.1C, 12-04-2012)	Comments
	Attachment 2, Chapter 1 3.d.(2) Deviations/exemptions from requirements must be appropriately documented, justified, and approved by DOE in accordance with the provisions stated in this Order.		This requirement is stated in Attachment 1, section 2 of Order 420.1C.

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch II, 1. Ch II, 1.a. Ch II, 1.b. Ch II, 1.c.	Attachment 2, Chapter II CHAPTER II. FIRE PROTECTION 1. OBJECTIVES. To establish requirements[1] for a comprehensive fire protection program for DOE sites, facilities, and emergency service organizations to minimize the potential for— a. Occurrence of a fire or related event; b. Fires that cause an unacceptable onsite or offsite release of hazardous or radiological material that could impact the health and safety of employees, the public, or the environment; c. Unacceptable interruption of vital DOE programs as a result of fire and related hazards; d. Property loss from fire exceeding limits established by DOE; and e. Fire damage to critical process controls and safety class SSCs (as documented by appropriate safety analysis). 3.a. General. Fire protection for DOE facilities, sites, activities, design, and construction must— (1) provide a level of safety sufficient to fulfill requirements for highly protected risk (HPR),[3] (2) prevent loss of safety functions and safety systems as determined by safety analysis and provide defense-in-depth, and [1] See also worker fire protection requirements in DOE O 440.1, *Worker Protection Management for DOE Federal and Contractor Employees*, and guidance in DOE G 420.1-	CHAPTER II. FIRE PROTECTION 1. OBJECTIVE. To establish requirements for comprehensive fire protection programs for DOE facilities and emergency response organizations to: a. Minimize the likelihood of occurrence of a fire related event; b. Minimize the consequence of a fire related event affecting the public, workers, environment, property and missions; and, c. Provide a level of safety protection consistent with the “highly protected risk” class of industrial risks.	No significant change. Note: Chapter II was rearranged primarily to better mirror the structure of DOE-STD-1066-2012.

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	3, *Implementation Guide for DOE Fire Protection for Use with DOE O 420.1B, Facility Safety*. [3] The facility as characterized by a level of fire protection design, systems, and management controls to fulfill requirements for the best-protected class of industrial risks. The term "risk" as it is used in this Order is consistent with the use in the insurance industry as the "property" that qualifies for preferred insurance premium status.		
Att. 2, Ch II, 2.	Attachment 2, Chapter II APPLICABILITY. This chapter applies to both fire protection programs and facility safety design for DOE nuclear, non nuclear, and weapons facilities.[2] [2] Activities within weapons facilities relating to accidental or unauthorized nuclear detonation are subject also to requirements of the 452 series of DOE Directives (see references).	2. APPLICABILITY. This chapter applies to organizations that have responsibility for the design, construction, maintenance, or operation of government-owned or government-leased facilities and on site contractor-leased facilities used for DOE mission purposes. For leased facilities that are not nuclear hazard category 1, 2, or 3 facilities, the design requirements of Section 3.c of this chapter apply to the extent determined by the field element. (Note: DOE-STD-1066-2012, *Fire Protection*, provides guidance on a graded approach to fire protection for leased facilities.)	The applicability for leased facilities is clarified.
Att. 2, Ch II, 3. Ch II, 3.a. Ch II, 3.a.(1)	Attachment 2, Chapter II 3. REQUIREMENTS. 3.b.(1) A policy statement that— (a) incorporates fire protection requirements from this CRD; related DOE directives; and other applicable Federal, state, and local requirements; and (b) affirms contractor's commitment to fire protection and fire suppression capabilities sufficient to minimize losses from fire and related hazards consistent with highly protected risk status in private industry.	3. REQUIREMENTS. a. General Fire Protection Program Requirements. (1) Policy Statement. A policy must be established that affirms the contractor's commitment to provide a comprehensive fire protection and emergency response program that meets the requirements of this chapter, related DOE directives, and other applicable requirements.	No significant change

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch II, 3.a.(2) Ch II, 3.a.(2)(a) Ch II, 3.a.(2)(b) Ch II, 3.a.(2)(c)	Attachment 2, Chapter II 3.a.(3) meet or exceed applicable building codes for the region and NFPA codes and standards as follows:[4] (a) Facilities or modifications thereto must be constructed to meet codes and standards in effect, when design criteria are approved, otherwise known as the Code of Record (COR). (b) Provisions of subsequent editions of codes or standards (promulgated after the COR) must be met to the extent that they are explicitly stated to be applicable to existing facilities. Other provisions of updated codes and standards must be applied to existing facilities when a construction modification takes place or when a potential for immediate risk to life safety or health has been identified through either the facility assessment or fire hazards analysis (FHA) review process, or during the construction review or permitting process. 3.c.(2) Noncombustible construction materials for facilities exceeding the size limits established by DOE (See DOE-STD-1066-99, *Fire Protection Design Criteria*, for information on size limitations). [4] The provisions of the applicable state/regional model building codes take precedence over the Building Construction and Safety Code (NFPA 5000®: *Building Construction and Safety Code*®, 2003 Edition).	(2) Codes and Standards. Fire protection and emergency response programs must meet, or exceed, the applicable building code and National Fire Protection Association (NFPA) codes and standards. (a) Facilities and major modifications thereto, must be constructed to meet codes and standards in effect when design criteria are approved (otherwise known as the code of record, or COR). Other facility changes must meet the most recent applicable codes and standards to the extent determined by the authority having jurisdiction (AHJ). (b) Provisions of subsequent editions of codes or standards (promulgated after the COR is established) are mandatory only to the extent that they are explicitly stated to be applicable to existing facilities. (c) Conflicts between DOE O 420.1C, NFPA codes and standards, and the applicable building code must be resolved as follows: 1 Requirements of DOE O 420.1C take precedence over all NFPA and building code requirements and are subject to the relief requirements of DOE O 420.1C. 2 Conflicts between NFPA requirements and the applicable building code requirements are resolved by the head of the field element following consultation with designated building code and fire protection subject matter experts.	Clarified resolution of conflicts among governing documents.

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch II, 3.b. Ch II, 3.b.(1)	Attachment 2, Chapter II 3.b. Fire Protection Program. An acceptable fire protection program must be developed, implemented, and maintained by the contractor, which includes the following elements and requirements.	b. Fire Protection Program Administration. (1) Documentation. A documented fire protection program that includes the elements and requirements identified in this chapter for design, operations, emergency response, fire analysis and assessments, wild land fire, and specific fire protection program criteria must be developed, implemented, and maintained by the contractor.	No significant change
Att. 2, Ch II, 3.b.(2)	Attachment 2, Chapter II 3.b.(13) A documented comprehensive fire protection self assessment program performed every 3 years.	(2) Self Assessments. A documented comprehensive self assessment of the fire protection program must be performed at least every three years, or at a frequency with appropriate justification approved by the DOE head of field element.	No significant change
Att. 2, Ch II, 3.c. Ch II, 3.c.(1)	3.c. Fire Protection Design. A comprehensive fire protection design program for facilities and supporting systems must be developed, implemented, and maintained to include the following elements: 3.b.(3) A system to ensure that fire protection program requirements are documented and incorporated in plans and specifications for new facilities and significant modifications to existing facilities.	c. Design. (1) Design Process. A process must be established to ensure that fire protection program requirements are documented and incorporated into plans and specifications for design of new facilities and modifications to existing facilities.	No significant change
Att. 2, Ch II, 3.c.(2)(a) Ch II, 3.c.(2)(b)	Attachment 2, Chapter II 3.c.(4) Automatic fire extinguishing systems throughout all significant facilities and in all facilities and areas with potential for loss of safety class systems (other than	(2) Protection Thresholds. (a) New facilities (non relocatable) exceeding 5,000 sq ft of floor area must be of Type I or Type II construction, as defined in the	These are the requirements brought forward from DOE-STD-1066-99.

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Ch II, 3.c.(2)(c) Ch II, 3.c.(2)(d) Ch II, 3.c.(2)(e)	fire protection systems), significant life safety hazards, unacceptable program interruption, or fire loss potential in excess of limits defined by DOE (See DOE-STD-1066-99). 3.c.(5) Redundant fire protection systems in areas where— (a) safety class systems are vulnerable to fire damage, and no redundant safety capability exists outside of the fire area of interest, or (b) the maximum possible fire loss (MPFL) exceeds limits established by DOE.	applicable building codes. (b) Automatic fire suppression systems must be provided throughout new facilities exceeding 5,000 sq. ft. of floor area or where a maximum possible fire loss exceeds $5 million, unless the NFPA code(s) allow for specific relief within the facility. (c) Automatic fire suppression systems must be provided throughout facilities in which any of the following conditions exist: 1 where required by safety basis document (for example, to prevent loss of safety functions or provide defense in depth); 2 significant life safety hazards; 3 where fire may cause unacceptable mission or program interruption if automatic fire suppression systems are not provided; 4 where a modification to a facility would cause the maximum possible fire loss (MPFL) to exceed $5 million; or, 5 where a modification causes a facility to exceed 5,000 sq. ft. of floor area. (d) For property protection, multiple fire protection approaches, such as a fire suppression system and a fire detection and alarm system, must be	

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
		provided in areas where the MPFL exceeds $150 million (refer to DOE-STD-1066-2012). (e) For property protection, fire areas must be established such that the MPFL for each fire area does not exceed $350 million. Fire area walls or other separation approaches may be used to meet this requirement.	
Att. 2, Ch II, 3.c.(3) Ch II, 3.c.(3)(a)	Attachment 2, Chapter II 3.c.(12) Fire protection systems designed such that their inadvertent operation, inactivation, or failure of structural stability will not result in the loss of vital safety functions or inoperability of safety class systems as determined by the DSA.	(3) Fire Protection and Life Safety Systems. (a) Fire Suppression. The inadvertent operation or failure of fire suppression systems must not result in the loss of function of safety class or safety significant systems. (Note: This requirement addresses proper design of the fire suppression system to ensure it does not impact safety systems and is not intended to drive need for redundancy in safety significant system design.)	No significant change
Att. 2, Ch II, 3.c.(3)(b)	Attachment 2, Chapter II 3.c.(3) Complete fire-rated construction and barriers, commensurate with the applicable codes and fire hazards, to isolate hazardous areas and minimize fire spread and loss potential consistent with limits as defined by DOE (See DOE-STD-1066-99).	(b) Fire Barriers. Complete fire rated construction and barriers, commensurate with the applicable code sand/or safety basis requirements, must be provided to isolate hazardous areas and minimize fire spread and loss potential consistent with limits as established in this chapter. Fire barrier locations and construction must be documented.	No significant change

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch II, 3.c.(3)(c)		(c) Fire Detection. Automatic fire detection must be provided to the extent required by applicable industry codes and standards.	This requirement is consistent with the general requirement related to the International Building Code and NFPA codes and standards. This was added for emphasis.
Att. 2, Ch II, 3.c.(3)(d)	Attachment 2, Chapter II 3.c.(8) Emergency egress and illumination for safe facility evacuation in the event of fire as required by applicable codes or fire hazard analysis.	(d) Life Safety. Requirements for life safety and means of egress are provided in 10 C.F.R. Part 851, W*orker Health and Safety Program*. Other codes and standards, such as the International Building Code, and NFPA 101, *Life Safety Code*, may also be applicable.	No significant change
Att. 2, Ch II, 3.c.(3)(e)	Attachment 2, Chapter II 3.c.(1) A reliable and adequate supply of water for fire suppression.	(e) Water Supply and Distribution. A reliable and adequate water supply and distribution system must be provided for fire suppression, as documented through appropriate analysis.	No significant change
Att. 2, Ch II, 3.c.(3)(f)	Attachment 2, Chapter II 3.c.(7) A means (e.g., fire alarm or signaling system) to notify emergency responders and building occupants of a fire.	(f) Emergency Notification. A means to notify responders and building occupants of a fire must be provided (e.g., fire alarm signaling system and/or site wide mass notification capabilities for major incidents affecting the site).	No significant change
Att. 2, Ch II, 3.c.(4)	Attachment 2, Chapter II 3.c.(11) A means to address fire and related hazards that are unique to DOE and not addressed by industry codes and standards. Mitigation features may consist of isolation, segregation or the use of special	(4) Special Hazards. Fire protection systems or features, and appropriate procedures to address fire and related hazards that are special or unique to DOE and not addressed by industry codes and standards, must be established.	No significant change

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	fire control systems (water mist, clean agent, or other special suppression systems) as determined by the FHA.		
Att. 2, Ch II, 3.d. Ch II, 3.d.(1) Ch II, 3.d.(1)(a) Ch II, 3.d.(1)(b) Ch II, 3.d.(1)(c) Ch II, 3.d.(1)(d) Ch II, 3.d.(1)(e) Ch II, 3.d.(1)(f) Ch II, 3.d.(1)(g) Ch II, 3.d.(1)(h) Ch II, 3.d.(1)(i) Ch II, 3.d.(1)(j)	Attachment 2, Chapter II 3.b.(2) Comprehensive, written fire protection criteria or procedures that include— (a) site-specific requirements; (b) staff organization, training, and responsibilities; (c) administrative responsibilities; (d) design, installation, operability, inspection, maintenance, and testing requirements; (e) use and storage of combustible, flammable, radioactive, and hazardous materials to minimize risk from fire; (f) fire protection system impairments; (g) smoking and hot work; (h) safe operation of process equipment; and (i) prevention measures that decrease fire risk. 3.b.(14) Periodic facility assessments on a schedule as directed by DOE.	d. <u>Operations.</u> (1) <u>Criteria and Procedures</u>. Comprehensive, written fire protection criteria and procedures must be established to implement the fire protection program requirements that include: (a) site specific requirements; (b) staff organization, resources, training, roles and responsibilities; (c) inspection, testing, and maintenance of fire protection systems; (d) use and storage of combustible, flammable, radioactive, and hazardous materials; (e) a “hot work” control program; (f) identification and tracking of fire protection system impairments; (g) fire prevention measures (e.g., combustible loading, hot work, and ignition source controls); (h) facility and fire hazard analysis (FHA) assessment programs; (i) design and construction oversight; and, (j) equivalencies, exemptions, modifications, and variances processes.	Note that an explicit requirement is added for procedures for equivalencies, exemptions, modifications, and variances.

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch II, 3.d.(2) Ch II, 3.d.(2)(a)	Attachment 2, Chapter II 3.b.(7) Access to qualified, trained fire protection staff that includes fire protection engineers, technicians, and fire fighting personnel to implement the requirements of this CRD.	(2) Implementation. To ensure effective implementation of these requirements, the following elements must be addressed. (a) Staffing. The contractor must ensure it has access to qualified, trained fire protection staff (that includes fire protection engineers, technicians, and fire fighting personnel) needed to implement the requirements of this chapter.	No significant change
Att. 2, Ch II, 3.d.(2)(b)	Attachment 2, Chapter II 3.b.(4) Documented review of plans, specifications, procedures, and acceptance tests by a qualified fire protection engineer.	(b) Design Review. Documented review of plans, specifications, procedures, and acceptance tests must be conducted by a fire protection engineer (FPE) (Note: A definition for FPE is provided in DOE STD 1066 2012).A process must be established to oversee fire protection related activities from conceptual design to final acceptance.	No significant change
Att. 2, Ch II, 3.d.(2)(c)	3.b.(16) A process for reviewing and recommending approval of fire safety equivalencies to any fire protection code or standard requirements to the DOE.	(c) Equivalencies and Exemptions. A process must be established for developing and requesting DOE AHJ approval of fire protection equivalencies and exemptions to fire protection requirements. Records of technical justification must be maintained and reevaluated for appropriateness as activities or operations change.	No significant change
Att. 2, Ch II, 3.d.(2)(d)		(d) Assigned Authority. If assigned, the contractor must document the level of authority to execute the duties and	This contractor requirement clarifies implementation of assignment of AHJ

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
		responsibilities of the AHJ, in accordance with the contractor's overall fire protection and emergency response programs.	duties.
Att. 2, Ch II, 3.e. Ch II, 3.e.(1) Ch II, 3.e.(1)(a) Ch II, 3.e.(1)(b) Ch II, 3.e.(1)(c) Ch II, 3.e.(1)(d) Ch II, 3.e.(1)(e)	Attachment 2, Chapter II 3.b.(8) A baseline needs assessment (BNA) of the fire protection emergency response organization that— (a) establishes the site fire fighting capabilities to provide— 1 effective response to suppress all fires; 2 emergency medical and hazardous materials response capabilities; and 3 staffing, apparatus, facilities, equipment, training, pre plans, offsite assistance, and procedures; (b) reflects applicable NFPA codes and standards; and (c) is updated at least every 3 years and in accordance with applicable NFPA code provisions and whenever a significant new hazard is introduced that is not covered by the current BNA. 3.b.(9) Site emergency plans, FHAs, and DSAs that incorporate BNA information.	e. Emergency Response. Provide emergency response capabilities, as necessary, to meet site needs as established by the baseline needs assessment (BNA), safety basis requirements, and applicable regulations, codes and standards. (1) Baseline Needs Assessment. A BNA of the fire protection and emergency response organization must be conducted and the BNA must: (a) establish capabilities to provide: 1 effective response to extinguish fires; 2 emergency medical, rescue and hazardous materials response; and, 3 staffing, apparatus, facilities, equipment, training, pre incident plans, mutual aid, and procedures. (b) reflect applicable requirements of NFPA codes and standards, and DOE direction; (c) be submitted to the DOE field element for approval; (d) be reviewed at least every three years, or whenever a significant new hazard that is not covered by the	No significant change

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
		current BNA is introduced, and be updated as appropriate (Note: If no update is necessary, this result must be documented following the review); and, (e) be incorporated into site emergency plans, FHAs, and safety basis documentation.	
Att. 2, Ch II, 3.e.(2)	Attachment 2, Chapter II 3.b.(10) Pre fire strategies, plans, and standard operating procedures to enhance the effectiveness of site fire fighting personnel.	(2) Pre Incident Plans. Pre incident strategies, plans, and standard operating procedures must be established to enhance the effectiveness of manual fire suppression activities, including areas within or adjacent to, moderator controlled areas. The criticality safety staff must review pre incident plans and procedures related to moderator controlled areas.	No significant change

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch II, 3.e.(3) Ch II, 3.e.(3)(a) Ch II, 3.e.(3)(b) Ch II, 3.e.(3)(c) Ch II, 3.e.(3)(d)	Attachment 2, Chapter II 3.c.(9) Physical access and appropriate equipment that is accessible for effective fire department intervention (e.g., interior standpipe systems in multi-story or large, complex facilities). 3.b.(11) Procedures governing the use of fire fighting water or other neutron moderating materials to suppress fire within or adjacent to moderation controlled areas. 3.b.(12) Where no alternative exists to criticality safety restrictions on the use of water for fire suppression, the need for such restrictions is fully documented with written technical justification. 3.b.(17) Procedures governing firefighting techniques to be used during deactivation, decontamination, and demolition phases, when applicable.	(3) Manual Fire Suppression Activities. (a) Physical access and appropriate equipment that is accessible for effective manual fire fighting intervention must be provided. (b) Procedures governing the use of fire fighting water or other neutron moderating materials to suppress fire within, or adjacent to, moderation controlled areas must be established and reviewed by a criticality subject matter expert prior to release. (c) Procedures governing fire fighting techniques to be used during deactivation, decontamination, and demolition phases, must be established, when applicable. (d) Where no alternative exists to criticality safety restrictions on the use of water for fire suppression, the need for such restrictions must be fully documented with written technical justification.	No significant change
Att. 2, Ch II, 3.f. Ch II, 3.f.(1) Ch II, 3.f.(1)(a) Ch II, 3.f.(1)(b) Ch II, 3.f.(1)(c) Ch II, 3.f.(1)(d)	Attachment 2, Chapter II 3.b.(5) Fire hazard analyses (FHAs) using a graded approach conducted for hazard category 1, 2 and 3 nuclear facilities, significant new facilities, and facilities that represent unique fire safety risks. The FHAs must be— (a) performed under the direction of a qualified fire protection engineer;	f. Fire Hazard Analyses and Building Assessments. (1) Fire Hazards Analyses. FHAs, using a graded approach, must be conducted for the following cases: (1) all hazard category1, 2, and 3 nuclear facilities and major modifications thereto; (2) facilities that represent unique fire safety risks; (3) new facilities or modifications to existing facilities with value greater than $150	No significant change

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	(b) reviewed every 3 years; and (c) revised when— 1 changes to the annual DSA updates impact the contents in the FHA, 2 a modification to an associated facility poses a significant new fire safety risk, or 3 the 3 year review identifies the need for changes. 3.b.(6) FHA conclusions incorporated into the DSA and integrated into design basis and beyond design basis accident conditions.	million; and (4) when directed by the responsible DOE authority. The FHAs must be: (a) performed under the direction of an FPE; (b) reviewed every three years by an FPE and revised as appropriate (Note: If no revision is necessary, this result must be documented following the review); (c) revised when- 1 changes to the facility structure or layout, processes, occupancy, safety basis documentation or BNA impacts the analysis in the FHA; 2 a modification to an associated facility or process adds a significant new fire safety risk; or, 3 the periodic (three year) review identifies the need for changes; (d) integrated into safety basis documentation.	
Att. 2, Ch II, 3.f.(2) Ch II, 3.f.(2)(a) Ch II, 3.f.(2)(b)	3.b.(14) Periodic facility assessments on a schedule as directed by DOE.	(2) Building Assessments. Fire protection building assessments must be conducted: (a) annually, or at a frequency with appropriate justification approved by the DOE head of field element, for buildings with are placement value in excess of $100 million, facilities considered a high hazard, or those in	Schedule expectations clarified.

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
		which vital programs are involved, as defined by the responsible DOE authority; and, (b) at least every three years, or at a frequency with appropriate justification approved by the DOE head of field element, for remaining low and ordinary hazard facilities.	
Att. 2, Ch II, 3.g.		g. Wild land Fire. An integrated site wide wild land fire management plan, consistent with the *Federal Wild land Fire Management Policy*, must be established and implemented in accordance with NFPA 1143, *Standard for Wild land Fire Management*, 2009.	This requirement is consistent with the general requirement related to NFPA codes and standards. This was added for emphasis, and in response to the Cerro Grande Fire. Note that DOE G 450.1-4 was recently cancelled and this replaces that method.
Att. 2, Ch II, 3.h.		h. Specific Fire Protection Program Criteria. DOE-STD-1066-2012 provides acceptable methods for implementing the requirements in DOE O 420.1C; other methods may be acceptable. Any alternate approach must provide an equivalent level of safety.	This requirement relates to the use of DOE-STD-1066-2012. While DOE-STD-1066-2012 is not a required method, contractors are required to justify (i.e. evaluate and document) that any alternate approach adopted provides an equivalent level of safety. Note that DOE-STD-1066-2012 is required to be evaluated for applicability in Attachment 3.
	Attachment 2, Chapter II 3.b.(15) Processes to prioritize and monitor the status of fire protection assessment findings, recommendations, and corrective actions until final resolution.		This requirement was removed as redundant. This general requirement flows from Quality Assurance requirements for assessments and corrective actions and does not need to be repeated.

ATTACHMENT 2, CHAPTER II, FIRE PROTECTION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	Attachment 2, Chapter II 3.c.(6) In new facilities, redundant safety class systems (other than fire protection systems) must be located in separate fire areas.		This requirement was removed from Attachment 2, Chapter II. This requirement is covered in Attachment 3, Paragraph 3.a.(6).
	Attachment 2, Chapter II 3.c.(10) A means to prevent the accidental release of significant quantities of contaminated products of combustion and fire fighting water to the environment, such as ventilation control and filter systems, and curbs and dikes. Such features would only be necessary if required by the FHA or DSA in conjunction with other facility or site environmental protection measures.		This requirement was removed as redundant. Provision of control of contaminated products would flow from individual FHA or DSA processes, which are governed by appropriate DOE requirements and standards including Attachment 2, Chapter 1 of this Order.

CHAPTER III NUCLEAR CRITICALITY SAFETY			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, dated 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch III, Ch III, 1.	1. OBJECTIVES. a. To establish requirements for developing and implementing nuclear criticality safety programs (CSPs) for hazard category 1 and 2 nuclear facilities and activities, including materials transportation activities. b. To provide adequate protection to the public, workers, and the environment.	CHAPTER III. NUCLEAR CRITICALITY SAFETY 1. OBJECTIVE. To establish requirements for developing and implementing nuclear criticality safety programs (CSPs) for nuclear facilities and activities, including materials transportation activities, which provide adequate protection to the public, workers, and the environment.	No significant change
Att. 2, Ch III, 2.	2. APPLICABILITY. This chapter is applicable to nuclear facilities and activities that involve or will potentially involve nuclides in such quantities that are equal to or greater than the single parameter limits for fissionable materials listed in the ANSI/ANS-8.1 and 8.15.[1] [1] See paragraph 3.b.(2) of this chapter for applicable revision.	2. APPLICABILITY. This chapter is applicable to DOE elements and DOE contractors with responsibility for nuclear facilities and activities that involve or will potentially involve radio nuclides in such quantities that are equal to or greater than the single parameter limits for fissionable materials listed in ANSI/ANS 8.1-1998, *Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors*, and ANSI/ANS 8.15-1981, *Nuclear Criticality Control of Special Actinide Elements*. These limits must be adjusted where process conditions could credibly involve moderators or reflectors that are more effective than light water.	No significant change

CHAPTER III NUCLEAR CRITICALITY SAFETY			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, dated 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch III, 3. Ch III, 3.a.	3. REQUIREMENTS. a. General. (1) CSPs must be implemented to ensure that fissionable material operations will be evaluated and documented to demonstrate that operations will be sub-critical under both normal and credible abnormal conditions. (2) No single credible event or failure can result in a criticality. (3) The CSP description document must describe how the contractor will implement the requirements in the CRD including the standards invoked by this Chapter. The program description must be approved by DOE and implemented as approved. (4) CSPs must include the following: (a) Criticality safety evaluations for fissionable materials operations that document parameters, limits, and controls required to maintain sub-criticality for all normal and credible abnormal conditions; (b) The preferred order of controls must be passive engineered controls, active engineered controls, followed by administrative controls; (c) Provisions for implementation of limits and controls identified by the criticality safety evaluations;	3. REQUIREMENTS. a. A CSP document must be developed and maintained that describes how the contractor will implement the requirements in this chapter, including the standards invoked by this chapter.	Requirements streamlined.

CHAPTER III NUCLEAR CRITICALITY SAFETY			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, dated 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	(d) Periodic reviews of operations and conditions to ensure that—implemented, and 1 limits and controls are effectively implemented, and 2 process conditions have not been altered resulting in compromise of safety limits and controls; and (e) Assessment of the need for installation of criticality accident alarm and detection systems where appropriate to conform with paragraphs 3b(2) and 3b(3) of this chapter. (5) Nuclear criticality safety staff responsible for implementing the CSP must be trained and qualified in accordance with a qualification program approved by DOE, unless the qualification program is consistent with DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineering Training and Qualification*.		

CHAPTER III NUCLEAR CRITICALITY SAFETY			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, dated 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att 2 Ch III, 3.b.	3.b. Specific Requirements. (1) CSPs must apply to facilities and activities with fissionable materials operations as defined in section 2 of the chapter and conditions that have potential for criticality accidents. (2) CSPs must satisfy the requirements of the revisions to consensus nuclear criticality safety standards of the American National Standards Institute (ANSI)/American Nuclear Society (ANS)8 in effect as of the date of the Order, unless otherwise modified or approved by DOE. (3) All recommendations in applicable ANSI/ANS standards must be considered and a explanation provided to DOE through the CSP description document whenever a recommendation is not implemented.	b. The CSP document must describe how the contractor will satisfy the requirements of the ANSI/ANS 8 consensus nuclear criticality safety standards in effect as of the date of DOE O 420.1C, unless otherwise modified or approved by DOE. The CSP document must include an explanation as to why any recommendation in applicable ANSI/ANS 8 standards is not implemented.	No significant change
Att 2 Ch III, 3.c.	3.a.(3) The program description must be approved by DOE and implemented as approved.	c. The CSP document must be submitted to and approved by DOE.	No significant change

CHAPTER III NUCLEAR CRITICALITY SAFETY			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, dated 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att 2 Ch III, 3.d.	3.b.(5) The methodology for conducting criticality safety evaluations must be approved by DOE, unless the evaluations are conducted in accordance with the DOE-STD-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities*, or successor document and evaluated in accordance with DOE-STD-1134-1999, *Review Guide for Criticality Safety Evaluations*, or successor document.	d. Criticality safety evaluations must be conducted in accordance with DOE-STD-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non Reactor Nuclear Facilities*, or by other documented methods approved by DOE.	No significant change
Att 2 Ch III, 3.e.	3.b.(6) Facilities that conduct operations using fissionable material in a form that could inadvertently accumulate in significant quantities must include a program and procedures for detecting and characterizing accumulations.	e. Fissile Material Accumulation Control. Facilities that conduct operations using fission able material in a form that could inadvertently accumulate in significant quantities must include procedures for detecting and characterizing accumulations. The following national standards provide relevant guidance for procedure development: ASTM C1455, *Standard Test Method for Nondestructive Assay of Special Nuclear Material Holdup Using Gamma Ray Spectroscopic Methods*; and any other nondestructive assay consensus or DOE standards applicable to the measurement technique selected.	No significant change

CHAPTER III NUCLEAR CRITICALITY SAFETY			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, dated 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att 2 Ch III, 3.f.	3.b.(4) The double contingency principle defined in ANSI/ANS 8.1, *Nuclear Criticality Safety in Operations with Fissionable Material outside Reactors*, is a requirement that must be implemented for all fissionable material processes, operations, and facility designs within the scope of this chapter unless the deviation is documented, justified, and approved by DOE.	f. Criticality safety evaluations must show that entire processes involving fissionable materials will remain subcritical under normal and credible abnormal conditions, including those initiated by design basis events.	No significant change
Att 2 Ch III, 3.g.	3.b.(7) Guidelines for firefighting must be established for areas within or adjacent to moderator-controlled areas. The criteria and process for developing the guidelines must be documented in the CSP description document.	g. The criteria and process for developing the guidelines for fire fighting in areas within or adjacent to moderator controlled areas must be coordinated with fire fighting pre incident plans and procedures.	No significant change

ATTACHMENT 2, CHAPTER IV - NATURAL PHENOMENA HAZARDS MITIGATION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch IV Ch IV, 1.	Attachment 2, Chapter IV CHAPTER IV. NATURAL PHENOMENA HAZARDS MITIGATION 1. OBJECTIVES. To establish requirements for DOE facility design, construction, and operations that protect the public, workers, and the environment from the impact of all NPH events (e.g., earthquake, wind, flood, and lightning).	CHAPTER IV. NATURAL PHENOMENA HAZARDS MITIGATION 1. OBJECTIVE. To establish requirements for DOE facility design, construction, and operations to protect the public, workers, and the environment from the impact of natural phenomena hazards (NPH) events (e.g., earthquake, wind, flood, lightning, snow and volcanic eruption).	No significant change
Att. 2, Ch IV, 2.	Attachment 2, Chapter IV 2. APPLICABILITY. Requirements in this chapter apply to all DOE facilities and sites.[1] [1] Activities within weapons facilities relating to accidental or unauthorized nuclear detonation are subject to requirements of the 452 series of DOE Directives (see reference).	2. APPLICABILITY. Requirements in this chapter apply to all government owned and government leased nuclear and non-nuclear facilities and sites. Design requirements (Sections 3.a, 3.b, and 3.c, below) apply to new facilities, major modifications, and modifications that may be warranted based on periodic NPH assessment and upgrade requirements.	No significant change

ATTACHMENT 2, CHAPTER IV - NATURAL PHENOMENA HAZARDS MITIGATION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch IV, 3. Ch IV, 3.a. Ch IV, 3.a.(1) Ch IV, 3.a.(2) Ch IV, 3.a.(3) Ch IV, 3.a.(4) Ch IV, 3.a.(5)	Attachment 2, Chapter IV 3. REQUIREMENTS. DOE facilities and operations must be analyzed to ensure that structures, systems, and components (SSCs) and personnel will be able to perform their intended safety functions effectively under the effects of NPH. Where no specific requirements are identified, model building codes or national consensus industry standards must be used consistent with the intended SSC functions.[2] a. Natural Phenomena Mitigation Design. (1) Facility SSCs must be designed, constructed, and operated by contractors to withstand NPH and ensure— (a) confinement of hazardous materials; (b) protection of occupants of the facility, as well as members of the public; (c) continued operation of essential facilities; and (d) protection of government property. [2] See DOE G 420.1-2, *Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Nonnuclear Facilities*, for guidance on implementing NPH requirements and DOE-STD-1189, *Integration of Safety into the Design Process* (Appendix A).	3. REQUIREMENTS. a. General. Facilities must be designed, constructed, maintained, and operated to ensure that SSCs will be able to perform their intended safety functions effectively under the combined effects of NPH and normal loads defined in the applicable building codes contained in facilities' CORs. Nuclear facility safety functions that the SSCs must perform during an NPH must be defined in the facility's safety basis documentation. Safety functions include: (1) confinement/containment of hazardous materials; (2) protection of occupants and co located workers of the facility and the public; (3) continued operation of essential facilities and equipment; (4) safe shutdown of hazardous facilities and equipment; and, (5) maintenance of personnel access to areas needed for responding to accidents during NPH events.	No significant change

ATTACHMENT 2, CHAPTER IV - NATURAL PHENOMENA HAZARDS MITIGATION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch IV, 3.b.	Attachment 2, Chapter IV 3a.(2) The design and construction of new facilities and major modifications[3] to existing facilities and SSCs must address— [3] Major modifications are those which could substantially change the safety basis. See 10 CFR Part 830 and associated guidance for additional information on major modifications to hazard category 1, 2, and 3 nuclear facilities and DOE-STD-1189, *Integration of Safety into the Design Process* (Chapter 8).	b. NPH Design Criteria. All new facilities must satisfy the applicable requirements and criteria contained in DOE-STD-1020-2012, *Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities*. The facilities must also satisfy the building codes for design to mitigate NPH events mandated by the local, city, county, and state regulatory authorities. If there is any conflict between the requirements in these building codes versus those in DOE-STD-1020-2012,the requirements that result in more conservative design must be used. (Note: Requirements for non-nuclear facilities are described in Section 2.1 of DOE-STD-1020-2012.)	The new DOE-STD-1020-2012 is invoked through this order. The applicable requirements and criteria are contained in DOE-STD-1020-2012.
Att. 2, Ch IV, 3.c. Ch IV, 3.c.(1) Ch IV, 3.c.(2)	Attachment 2, Chapter IV 3.a.(2)(a) potential damage to and failure of SSCs resulting from both direct and indirect NPH events; 3.a.(2)(b) common cause/effect and interactions resulting from failures of other SSCs; and	c. NPH Accident Analysis. The NPH analysis supporting design and construction of facilities and safety-SSCs must be documented and include evaluation of: (1) potential damage to and failure of safety-SSCs resulting from both direct and indirect NPH events; and, (2) common cause/effect and interactions resulting from failures of other nearby facilities or other SSCs in the same facility caused by or induced by an NPH event.	No significant change

ATTACHMENT 2, CHAPTER IV - NATURAL PHENOMENA HAZARDS MITIGATION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	Attachment 2, Chapter IV 3.a.(2)(c) compliance with seismic requirements of E.O. 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction (as amended by E.O. 13286, Amendment of Executive Orders, and Other Actions, in Connection With the Transfer of Certain Functions to the Secretary of Homeland Security, January 5, 1990).		The required method is covered in DOE-STD-1020-2012
	Attachment 2, Chapter IV 3.a.(3) Additions and modifications to existing DOE facilities must not degrade SSC performance during an NPH occurrence.		The required method is covered in DOE-STD-1020-2012

ATTACHMENT 2, CHAPTER IV - NATURAL PHENOMENA HAZARDS MITIGATION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	Attachment 2, Chapter IV 3.b. Evaluation and Upgrade Requirements for Existing DOE Facilities. (1) SSCs in existing DOE facilities must be evaluated when there is a significant degradation[4] in the facility safety basis. Evaluations must address the safety significance of the SSCs and the seismic requirements of E.O. 12941, Seismic Safety of Existing Federally Owned or Leased Buildings (December 1, 1994). 3.b. (2) If the evaluation of existing SSCs identifies NPH mitigation deficiencies, an upgrade plan must be implemented on a prioritized schedule based on the safety significance of the upgrades, time or funding constraints, and mission requirements. [4] See DOE G 420.1-2 for additional guidance on significant degradation.		Requirements related to E.O. 12941 have been implemented.

ATTACHMENT 2, CHAPTER IV - NATURAL PHENOMENA HAZARDS MITIGATION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch IV, 3.d. Ch IV, 3.d.(1) Ch IV, 3.d.(2)	Attachment 2, Chapter IV 3.c. NPH Assessment. 3.c.(1) Both facility design and evaluation criteria must address the potential types of NPH occurrences. The NPH assessment must use a graded approach commensurate with the potential hazard of the facility. 3.c.(2) NPH assessment for new facilities must use a graded approach that considers the consequences of all types of NPHs. Site wide information may be considered when appropriate. 3.c.(3) NPH assessments must be reviewed and upgraded as necessary for existing sites/facilities following significant changes in NPH assessment methodology or site-specific information. 3.c.(4) An NPH assessment review must be conducted at least every 10 years and must include recommendations to DOE for updating the existing assessments based on significant changes found in methods or data. If no change is warranted from the earlier assessment, then this only needs to be documented.	d. Review and Upgrade Requirements for Existing DOE Facilities. (1) Existing facility or site NPH assessments must be reviewed at least every 10 years for any significant changes in data, criteria, and assessment methods that would warrant updating the assessments. Section 9.2 of DOE-STD-1020 2012 contains criteria and guidance for performing these reviews. The review results, along with any recommended update actions, must be submitted to the head of the field element. If no update is necessary, this result must be documented following the review. (2) If a new assessment of NPH demands indicates deficiencies in existing SSC design, a plan for upgrades must be developed and implemented on a prioritized schedule, based on the safety significance of the upgrades, time or funding constraints, and mission requirements. Section 9.3 of DOE-STD-1020-2012 contains guidance on performing upgrade evaluations.	No significant change. DOE-STD-1020-2012 provides criteria and guidance for implementing these requirements.
Att. 2, Ch IV, 3.e.	Attachment 2, Chapter IV 3.d. Seismic Detection. Facilities or sites with hazardous materials must have instrumentation or other means to detect and record the occurrence and severity of seismic events.	e. Seismic Detection. DOE sites with nuclear or hazardous materials must have instrumentation or other means to detect and record the occurrence and severity of seismic events.	No significant change

ATTACHMENT 2, CHAPTER IV - NATURAL PHENOMENA HAZARDS MITIGATION			
Citation (420.1C)	**Original Requirement (O 420.1B, Chg 1, Dt 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch IV, 3.f.	Attachment 2, Chapter IV 3.e. Post-Natural Phenomena Procedure. Facilities or sites with hazardous materials must have procedures for inspecting facilities for damage from severe NPH events and placing a facility into a safe configuration when damage has occurred.	f. Post Natural Phenomena Procedures. Facilities or sites with hazardous materials must have procedures for inspecting facilities for damage from severe NPH events and placing a facility into a safe configuration when damage has occurred.	No significant change

ATTACHMENT II - CHAPTER V. - COGNIZANT **SYSTEM ENGINEER PROGRAM**			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att 2, Ch V Ch V, 1.	Attachment 2, Chapter V 1. OBJECTIVES. To establish requirements for a System Engineer Program for hazard category 1, 2, and 3 nuclear facilities and to ensure continued operational readiness of the systems within its scope.	CHAPTER V. COGNIZANT SYSTEM ENGINEER PROGRAM 1. OBJECTIVE. To establish requirements for a cognizant system engineer (CSE) program for hazard category1, 2,and 3 nuclear facilities and to ensure continued operational readiness of the systems within its scope. A key element of the CSE program is the designation of CSEs who are responsible for maintaining over all cognizance of assigned systems, providing systems engineering support for operations and maintenance, and technical support of line management safety responsibilities for ensuring continued system operational readiness.	No significant change
Att 2, Ch V, 2. Ch V, 2.a. Ch V, 2.b.	Attachment 2, Chapter V 2. APPLICABILITY. a. Requirements of this chapter apply to all hazard category 1, 2, and 3 nuclear facilities. b. The System Engineer Program must be applied to active safety class and safety significant SSCs as defined in the facility's DOE approved safety basis, as well as to other active systems that perform important defense-in-depth functions, as designated by facility line management.	2. APPLICABILITY. Requirements of this chapter apply to all hazard category1, 2,and 3 nuclear facilities that have attained operational status (such as achieving Critical Decision 4 (CD 4) per DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, dated 11-29-10) and have: a. Active safety class or safety significant SSCs, as defined in the facility's DOE approved safety basis documentation; or, b. Other active systems that perform important defense in depth functions, as designated by facility line management. Note: This chapter does not apply to passive systems or design features. Facility management should consider establishing CSE programs before CD-4 to ensure their stability and operation at CD-4. CSE programs should remain in place as long as the	No significant change

ATTACHMENT II - CHAPTER V. - COGNIZANT **SYSTEM ENGINEER PROGRAM**			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
		covered systems are credited in the safety basis or designated by facility line management.	
Att. 2, Ch V, 3. Ch V, 3.a. Ch V, 3.a.(1) Ch V, 3.a.(2) Ch V, 3.a.(3) Ch V, 3.a.(4)	Attachment 2, Chapter V 3. REQUIREMENTS. a. General. (1) Hazard category 1, 2, and 3 nuclear facilities must have a System Engineer Program, as well as a qualified cognizant system engineer (CSE) assigned to each system within the scope of the Program. (2) System Engineer Programs must be incorporated into the Integrated Safety Management System (ISMS),[1] must flow down from site and facility implementing procedures, and must define CSE functions, responsibilities, and authorities. (3) A graded approach must be used in applying the requirements of the System Engineer Program. 1 See 48 CFR 970.5223-1, Integration of Environmental, Safety and Health into Work Planning and Execution.	3. REQUIREMENTS. a. General. The protocols for implementing the site or facility CSE program must be documented, must include the functions, responsibilities and authorities of CSEs, and must address the following elements: (1) Identification of systems covered by the CSE program and identification of systems assigned for coverage; (2) Configuration management; (3) Support for operations and maintenance; and, (4) Training and qualifications of CSEs.	No significant changes. Chapter V was restructured.
Att. 2, Ch V, 3.b. Ch V, 3.b.(1)	Attachment 2, Chapter V 3.b. Program Elements. The program elements must include and integrate the identification of systems within its scope, configuration management, and CSE support for operations and maintenance.	b. CSE Program Coverage. (1) The CSE program must be applied to active safety class and safety significant systems, as defined in the facility's DOE approved safety basis, as well as to other active systems that perform important defense in depth functions, as designated by facility line management. The designated systems and the rationale for assignment of CSEs in a graded approach	No significant change

ATTACHMENT II - CHAPTER V. - COGNIZANT **SYSTEM ENGINEER PROGRAM**			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
		(see below) must be documented.	
Att. 2, Ch V, 3.b.(2) Ch V, 3.b.(2)(a) Ch V, 3.b.(2)(b)	Attachment 2, Chapter V 3.e. **Graded Approach**. Implementation of System Engineer Program requirements should be tailored to facility hazards and the systems relied upon to prevent or mitigate those hazards. This should be done by using a graded approach that considers the following factors. (1) Remaining Facility Lifetime and the Safety Significance of Remaining Operations. Facilities undergoing deactivation, decontamination and/or decommissioning, may be undergoing frequent changes, modifications, and in some cases, removal of systems no longer needed to support the safety basis of those operations. System Engineer Programs may require more attention in these operations than when the facility was in normal operations. After deactivation or when a facility is in long-term surveillance and maintenance, there may be less need for attention (2) Safety Importance of the System. Not all systems are equal as measured by the likelihood and consequences of the hazard and the accidents that they prevent or mitigate. The level of system documentation detail in configuration management should be tailored to the importance of the system.	(2) A graded approach must be used in applying the requirements of the CSE program. The program must be tailored to facility hazards and the systems relied upon to prevent or mitigate those hazards, considering: (a) Remaining Facility Lifetime and the Safety Significance of Remaining Operations. Facilities undergoing deactivation or decontamination/ decommissioning may undergo frequent changes, modifications, or removal of systems no longer needed to support the safety basis of those operations. CSE programs may require more CSE attention in these operations than during normal operations. After deactivation, or when a facility is in long term surveillance and maintenance, there maybe less need for CSE attention. (b) Safety Importance of the System. Not all systems are equal as measured by the likelihood and consequences of the hazard and the accidents that they prevent or mitigate. The level of system documentation detail in configuration management should be tailored to the importance of the system.	No significant change
Att. 2,		(3) A qualified CSE must be assigned to each active system within the scope of	Clarification of this expectation.

ATTACHMENT II - CHAPTER V. - COGNIZANT **SYSTEM ENGINEER PROGRAM**			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Ch V, 3.b.(3)		the program. Consistent with the graded approach, large, complex, or very important systems may require assignment of more than one CSE. Conversely, a single individual maybe assigned to be the CSE for more than one system.	
Att. 2, Ch V, 3.c. Ch V, 3.c.(1) Ch V, 3.c.(1)(a) Ch V, 3.c.(1)(b) Ch V, 3.c.(1)(c) Ch V, 3.c.(1)(d) Ch V, 3.c.(1)(e)	Attachment 2, Chapter V 3.c. Configuration Management.[2] An objective of the System Engineer Program is to ensure operational readiness of the systems within its scope. To achieve this, the principles of configuration management must be applied to these systems. Consequently, the following requirements are considered integral parts of the Systems Engineer Program. (1) Configuration management must be used to develop and maintain consistency among system requirements and performance criteria, documentation, and physical configuration for the SSCs within the scope of the Program. (2) Configuration management must integrate the elements of system requirements and performance criteria, system assessments, change control, work control, and documentation control. [2] See DOE-STD-1073-2003, Configuration Management, for guidance on implementing configuration management.	c. Configuration Management. (1) A documented configuration management program must be established and implemented that ensures consistency among system requirements and performance criteria, system documentation, and physical configuration of the systems within the scope of the program. DOE-STD-1073-2003, *Configuration Management Program*, describes an acceptable methodology for establishing configuration management programs. The configuration management program must address: (a) system design documentation; (b) system assessments; (c) control of maintenance; (d) change control; and, (e) obsolescence.	No significant change

ATTACHMENT II - CHAPTER V. - COGNIZANT **SYSTEM ENGINEER PROGRAM**			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 2, Ch V, 3.c.(2) Ch V, 3.c.(2)(a) Ch V, 3.c.(2)(b) Ch V, 3.c.(2)(c)	Attachment 2, Chapter V 3.c.(3) System design basis documentation and supporting documents must be compiled and kept current using formal change control and work control processes, or when design basis information is not available, documentation must include— (a) system requirements and performance criteria essential to performance of the system's safety functions, (b) the basis for system requirements, and (c) a description of how the current system configuration satisfies the requirements and performance criteria.	(2) System design documents and supporting documents must be identified and kept current using formal change control and work control processes.DOE-STD-3024-2011, *Content of System Design Descriptions*, describes an acceptable methodology to achieve this function. Design documentation must include: (a) system requirements and performance criteria essential to performance of the system's safety functions; (b) the basis for system requirements; and, (c) a description of how the current system configuration satisfies the requirements and performance criteria.	No significant change
	3.c.(4) Key design documents must be identified and consolidated to support facility safety basis development and documentation.		Not a CSE-related function.
Att. 2, Ch V, 3.c.(3) Ch V, 3.c.(3)(a) Ch V, 3.c.(3)(b) Ch V, 3.c.(3)(b)	Attachment 2, Chapter V 3.c.(5) System assessments must include periodic review of system operability, reliability, and material condition. [4] Reviews must assess the system for— (a) ability to perform design and safety functions, (b) physical configuration as compared	(3) System assessments must include periodic reviews of system operability, reliability, and material condition. Reviews must assess the system for: (a) the ability to perform design and safety functions; (b) physical configuration as compared to system documentation; and, (c) system and component performance	No significant change

ATTACHMENT II - CHAPTER V. - COGNIZANT **SYSTEM ENGINEER PROGRAM**			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	to system documentation, and (c) system and component performance in comparison to established performance criteria. 4 Periodic system assessments are also required by as required by DOE 422.1, Maintenance Mangement Program for DOE Nuclear Facilities.	in comparison to established performance criteria.	
Att 2, Ch V, 3.c.(4)	Attachment 2, Chapter V 3.c.(6) System maintenance and repair must be controlled through a formal change control process to ensure that changes are not inadvertently introduced and that required system performance is not compromised. 3.c.(7) Systems must be tested after modification to ensure continued capability to fulfill system requirements.	(4) System maintenance and repair and modification must be controlled through a formal change control process to ensure that changes are not inadvertently introduced and that required system performance is not compromised. Post maintenance or modification testing must be conducted to confirm continued capability to fulfill system requirements.	No significant change
Att. 2, Ch V, 3.d. Ch V, 3.d.(1) Ch V, 3.d.(2) Ch V, 3.d.(3) Ch V, 3.d.(4) Ch V, 3.d.(5) Ch V, 3.d.(6) Ch V, 3.d.(7)	Attachment 2, Chapter V 3.d. <u>System Engineer Support for Operations and Maintenance</u>. (1) The functions of a System Engineer Program are required to maintain the integrity of a facility's safety basis. System Engineer Program functions are typically accomplished by various parts of a program's operating organization. This organization must designate one person as the CSE for each system to which the System Engineer Program applies (See paragraph 2 of this chapter). The CSE	d. <u>CSE Support for Operations and Maintenance.</u> The CSE must: (1) ensure that system configuration is being managed effectively (see Section 3.c of this chapter); (2) remain apprised of operational status and ongoing modification activities; (3) assist operations review of key system parameters and evaluate system performance; (4) initiate actions to correct problems;	No significant change

ATTACHMENT II - CHAPTER V. - COGNIZANT SYSTEM ENGINEER PROGRAM			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Ch V, 3.d.(8) Ch V, 3.d.(9) Ch V, 3.d.(10)	must maintain overall cognizance of the system and be responsible for system engineering support for operations and maintenance. The CSE must provide technical assistance in support of line management safety responsibilities and ensure continued system operational readiness. (2) The CSE must— (a) ensure that system configuration is being managed effectively (See paragraph 3c of this chapter); (b) remain apprised of operational status and ongoing modification activities; (c) assist operations review of key system parameters and evaluate system performance; (d) initiate actions to correct problems; (e) remain cognizant of system-specific maintenance and operations history and industry operating experience, as well as manufacturer and vendor recommendations and any product warnings regarding safety SSCs in their assigned systems; (f) identify trends from operations; (g) provide assistance in determining operability, correcting out-of-specification conditions, and evaluating questionable data; (h) provide or support analysis when the system is suspected of inoperability or degradation; (i) review and concur with design changes; and (j) provide input to development of	(5) remain cognizant of system specific maintenance and operations history and industry operating experience, as well as manufacturer and vendor recommendations and any product warnings regarding their assigned systems; (6) identify trends from operations and maintenance; (7) provide assistance in determining operability, correcting out of specification conditions, and evaluating questionable data; (8) provide or support analysis when the system is suspected of inoperability or degradation; (9) review and concur with design changes, use as is, equivalency, and commercial grade dedication determinations; and, (10) review, and provide input into the development of, and concur on operating, maintenance, and test procedures related to their assigned systems.	

ATTACHMENT II - CHAPTER V. - COGNIZANT **SYSTEM ENGINEER PROGRAM**			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	special operating/test procedures.		
Att. 2, Ch V, 3.e. Ch V, 3.e.(1) Ch V, 3.e.(2) Ch V, 3.e.(3) Ch V, 3.e.(4) Ch V, 3.e.(5) Ch V, 3.e.(6) Ch V, 3.e.(7)	3.d.(3) Qualification requirements for CSEs must be consistent with those defined for technical positions described in DOE O 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, dated 11-15-94, chapter II, paragraph 2c, "Technical Staff for Reactor Facilities," and chapter IV, paragraph 2f, "Technical Staff for Non Reactor Nuclear Facilities." (4) The requirements of this chapter must be incorporated into contractor training programs also required by DOE O 5480.20A. (5) Development plans for CSEs should be part of overall training and development programs. (6) Qualification and training requirements must include knowledge of— (a) related facility safety basis including any relationship to specific administrative controls; (b) system functional classification and basis; (c) applicable codes and standards; (d) system design, procurement, replacement, and related quality assurance requirements; (e) the existing condition of the system; (f) a working knowledge of the	e. <u>CSE Qualification Requirements.</u> Qualification requirements for CSEs must be consistent with those defined for Technical Support personnel in DOE O 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, dated 04-21-10 (see associated CRD), as applicable. Qualification requirements must include knowledge of: (1) related facility safety bases including safety system functions, safety system performance criteria, and any relationship to specific administrative controls; (2) system functional classification and bases; (3) codes and standards applicable to assigned systems; (4) system design, procurement, replacement, and related quality assurance requirements; (5) the existing condition of the systems; (6) related facility operations; and, (7) vendor manuals, product warnings, and updates related to assigned systems, available (in print or online).	No significant change

ATTACHMENT II - CHAPTER V. - COGNIZANT **SYSTEM ENGINEER PROGRAM**			
Citation (420.1c)	**Original Requirement (O 420.1B, Chg 1, Date 4-19-10)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	facility's operation; and (g) vendor recommendations, manuals, and any product warnings. (7) Evaluation of a CSE's qualifications should include formal education, prior training, and work experience as described in chapter I, paragraph 13 of DOE O 5480.20A. Consistent with the graded approach, large, complex, or very important systems may require assignment of more than one technical level CSE while small, simple, less important systems may only require assignment of a technician. Conversely, a single individual may be assigned to be the CSE for more than one system.		

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 3, 1.	**Note: For crosswalk of attachment 3, the source of the original text was G 420.1-1, Section 5, which was invoked as a requirement by DOE-STD-1189-2008.** **G 420.1-1, 5. SUPPLEMENTARY DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS** This section provides supplementary guidance for the design and construction of safety SSCs to ensure reliable performance of their safety function under those conditions and events for which they are intended. Design methods and criteria commonly used to ensure required availability are discussed in Section 5.1, General Requirements, of this Guide. Discipline-specific consensus codes and standards (e.g., electrical, mechanical, and structural) are presented in Section 5.2, Specific Criteria, of this Guide. These design methods, design criteria, and consensus codes and standards are the minimum set of requirements that must be applied when designing safety SSCs.	DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS This attachment provides requirements for the design and construction of safety structures, systems and components (SSCs). 1. OBJECTIVE. To establish requirements for the design and construction of safety SSCs, both safety class and safety significant, by identifying an applicable set of industry codes and standards, as well as Department of Energy (DOE) design criteria, standards and directives (listed in Attachment 4 of DOE Order (O) 420.1C, *Facility Safety*). Compliance with these requirements will ensure reliable performance of the safety function of safety SSCs under those conditions and events for which they are intended.	This attachment is new to Order 420.1C. However, the requirements in this attachment previously existed in Guide 420.1-1, which was invoked as a requirement in DOE –STD-1189-2008, which was invoked as a requirement in both DOE Order 420.1B and DOE Order 413.3B. Placement of this material into DOE Order 420.1C removes confusion regarding required actions.
Att. 3, 2. 2.a.(1) 2.a.(2) 2.b. 2.c.		2. APPLICABILITY. a. This attachment applies to the design and construction of: (1) new hazard category 1, 2, and 3 nuclear facilities as defined by 10 Code of Federal Regulations (C.F.R.) Part 830, *Nuclear Safety Management*; and, (2) major modifications to hazard category 1, 2, and 3 nuclear facilities, as defined in 10 C.F.R. Part 830, that substantially	This Attachment applies to nuclear facilities.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
		change the facility safety basis. b. This attachment does not impose requirements on existing facilities, except for major modifications to those facilities. The requirements of this attachment may be used to develop comparisons of existing facilities to the requirements for new facilities. c. This attachment does not apply to nuclear deactivation or decontamination and decommissioning activities at end of facility life, if the safety analysis demonstrates that adequate protection is provided consistent with the requirements of 10 C.F.R. Part 830 through alternate means and it is not cost beneficial to apply the provisions of this attachment for the limited remaining life of the activity.	
Att. 3, 3.	**G 420.1-1, 5.1 General Requirements** Safety SSCs and their associated support systems must be designed, fabricated, erected, and tested to standards and quality requirements commensurate with their importance to safety. An acceptable level of assurance that the safety SSCs will perform their intended safety function can be achieved by meeting the requirements contained within the following sections.	3. REQUIREMENTS. Safety-SSCs must be designed, commensurate with the importance of the safety functions performed, to perform their safety functions when called upon, as determined by the safety analysis.	This top level design requirement assures that intended safety functions are achieved.
Att. 3, 3.a. 3.a.(1)	**G 420.1-1, 5.1.1.1 Conservative Design Features** Safety SSCs must be designed to withstand all design basis loadings with an appropriate margin of safety. The design should incorporate, commensurate with the importance of the safety function, multiple levels of protection against normal, anticipated, and accident conditions. For example, while built-in process controls may maintain pressure within a conservative	a. General Design Criteria. (1) Conservative Design Margin. Safety-SSCs must be designed with appropriate margins of safety, as defined in applicable DOE or industry codes and standards.	Conservative design margin is necessary element of defense–in-depth. Appropriate application of codes and standards and design analysis should establish sufficient design margin for safety applications.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	limit, the design may also require provisions for relief valves, automatic shutdown capability, or other preventive features. The design of safety-class SSCs must incorporate suitably conservative criteria contained in applicable DOE Orders and Standards addressing safety functions (e.g., natural phenomena design mitigation).		
Att. 3, 3.a.(2) 3.a.(2)(a)	**G 420.1-1, 5.1.1.2 Design Against Single-Point Failure** The facility and its systems must be designed to perform all safety functions with the reliability indicated by the safety analysis. The single-point failure criterion, requirements, and design analysis identified in ANSI/IEEE 379 must be applied during the design process as the primary method of achieving this reliability.	(2) System Reliability. (a) The single failure criterion, requirements, and design analysis identified in Institute of Electrical and Electronics Engineers (IEEE) standard (Std) 379-2000, *IEEE Standard Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems*, must be applied to safety class SSCs during the design process as the primary method of achieving reliability. American National Standards Institute (ANSI)/American Nuclear Society (ANS) 58.9, Single Failure Criteria for Light Water Reactor Safety Related Fluid Systems, may be used in defining the scope of active safety class mechanical SSCs.	Application of the single failure criteria for safety SSCs has a long tradition in the nuclear industry to account for potential random failures in safety systems while still assuring that safety system functions are achieved. ANSI/ANS 58.9 was introduced as a useful reference.
Att. 3, 3.a.(2)(b)	**G 420.1-1, 5.1.1 Assurance of Safety Function** Safety SSCs must be designed to reliably perform their safety function under those conditions and events for which their safety function is intended. The following subsections must be applied to the design of safety SSCs to most effectively enhance system	(b) Safety significant SSCs must be designed to reliably perform all their safety functions. This can be achieved through a number of means, including use of redundant systems/components, increased	This requirement ensures that reliability of safety significant SSCs is considered and provided. Multiple means of assuring reliability are available including application of DOE-STD-1195-2011 where appropriate.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	availability and provide for robust design. Further design guidance can be found in IAEA Standard No. 50-P-1 and ANSI/IEEE 603.	testing frequency, high reliability components, and diagnostic coverage (e.g., on line testing, monitoring of component and system performance, and monitoring of various failure modes). DOE-STD-1195-2011, *Design of Safety Significant Safety Instrumented Systems Used at DOE Nonreactor Nuclear Facilities*, provides an acceptable method for achieving high reliability of safety significant safety instrumented systems.	
Att. 3, 3.a.(3) 3.a.(3)(a) 3.a.(3)(b)	**G 420.1-1, 5.1.1.3 Environmental Qualification** Environmental qualification must be used to ensure that safety-class SSCs can perform all safety functions, as determined by the safety analysis, with no failure mechanism that could lead to common cause failures under postulated service conditions. The requirements from ANSI/IEEE 323 for mild environmental qualification must be used unless the environment in which the SSC is located changes significantly as a result of the DBAs. In general, qualification for mild environments should consist of two elements: • Ensuring that all equipment is selected for application to the specific service conditions based on sound engineering practices and manufacturers' recommendations. • Ensuring that the system documentation includes controls that will preserve the relationship between equipment application and service conditions.	(3) *Environmental Qualification.* (a) Safety-class SSCs must be designed to perform all safety functions with no failure mechanism that could lead to common cause failures under postulated service conditions. The requirements of IEEE Std-323-2003, *IEEE Standard Criteria for Qualifying Class IE Equipment for Nuclear Power Generating Stations*, or other applicable standards, must be used to ensure environmental qualifications of safety-class SSCs. (b) Safety significant SSCs located in a harsh environment must be evaluated to establish qualified life. This may be accomplished using manufacturers' recommendations or other appropriate methods.	Application of environmental qualification requirements for safety SSCs has a long tradition in the nuclear industry to account for potential common cause environmental failures in safety systems while still assuring that safety system functions are achieved. The last requirement ensures that environmental qualification of safety significant SSCs is considered and provided for applications in harsh environments.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 3, 3.a.(4)	**G 420.1-1, 5.1.1.4 Safe Failure Modes** The facility design must provide reliable safe conditions and sufficient confinement of hazardous material during and after all DBAs. At both the facility and SSC level, the design must ensure that more probable modes of failure (e.g., fail to open versus fail to close) will increase the likelihood of a safe condition.	(4) Safe Failure Modes. The facility design must provide reliable safe conditions and sufficient confinement of hazardous material during and after all design basis accidents. At both the facility-- and SSC-level, the design must ensure that most probable modes of failure (e.g., failure to open versus failure to close) will increase the likelihood of a safe condition.	This requirement ensures that safe failure modes are considered and provided. Process design must consider failure mode of the system.
Att. 3, 3.a.(5) 3.a.(5)(a)	**G 420.1-1, 5.1.2 Support System and Interface Design** Safety SSCs often rely upon other SSCs to support their operation. Therefore, it is important to identify these support systems and the associated interfaces between safety and non-safety SSCs. The following subsections address the design considerations for these related systems. **G 420.1-1, 5.1.2.1 Support Systems** In some cases, safety SSCs rely upon supporting SSCs to perform their intended safety function. These support SSCs may be classified as safety-class or safety-significant SSCs. For example, a safety-class designation may be appropriate for an instrumentation and control (I&C) system that supports a tritium containment system if it can be demonstrated that failure of the I&C support system can lead to either failure or reduced availability of the safety-class containment barrier. In general, the following classification criteria apply. • Support SSCs to safety-class SSCs must be classified as safety class if their failures can prevent a safety-class SSC from performing its safety functions.	(5) Support System and Interface Design. (a) Support SSCs must be designed as safety-class or safety-significant SSCs if their failures prevent safety-SSCs or specific administrative controls from performing their safety functions.	Support SSCs that are essential for safety SSC performance are required to be designed to the same pedigree. For example, supports SSCs such as the air start system or the lubrication oil system are essential for operation of the diesel generator system.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	• Support SSCs to safety-significant SSCs that mitigate or prevent accidents with the potential for significant onsite consequences should be classified as safety-significant if their failures prevent a safety-significant SSC from performing its safety functions. • Support SSCs to safety-significant SSCs that mitigate or prevent accidents with the potential for significant localized consequences need not be classified as safety significant.		
Att. 3, 3.a.(5)(b)	**G 420.1-1, 5.1.2.2 Interface Design** A nuclear safety design goal is to minimize interfaces between safety-class, safety-significant, and non-safety SSCs. Ideally, safety SSCs should not have any interfaces; however, this is not always practical. Interfaces, such as pressure retention boundaries, integrity of fluid systems, electrical equipment, I&C, and mechanical and support systems, exist between safety SSCs and between safety SSCs and non-safety SSCs. These interfaces must be evaluated to identify SSC failures that would prevent the safety SSCs from performing their intended safety function. For these SSC failures, isolation devices, interface barriers, or design class upgrades should be provided to ensure safety SSC protection and reliability. In many cases, systems may consist of a group of subsystems, where each subsystem supports the operation of the whole system. For example, an auxiliary power diesel generator system may consist of lubricating oil, fuel oil, diesel engine, jacket cooling, and room ventilation subsystems. System interface evaluations should clearly define these boundaries. In all instances, a case-by-case evaluation should be performed.	(b) Interfaces, such as pressure retention boundaries, electrical supply, instrumentation, cooling water, and other support systems may exist between safety-SSCs and non-safety-SSCs. These interfaces must be evaluated to identify SSC failures that would prevent safety SSCs from performing their intended safety function. IEEE-Std-384-2008, *IEEE Standard Criteria for Independence of Class IE Equipment and Circuits*, or other applicable standards must be used for physical and electrical separation methods, including the use of separation distance, barriers, electrical isolation devices, or any combination thereof. This includes a design to ensure that both direct and indirect impacts of design basis accidents (e.g., fire, seismic) will not cause failure of safety functions.	Interface design that are essential to prevent failure of safety SSCs from common cause events are required to be designed to preserve safety functions. For example, physical separation distance between the cable trays to common cause failure from a fire event. Another example would be isolation of safety process systems from non safety systems.
Att. 3,		(6) <u>Protection Against Fire</u>. Safety-class systems must be designed with redundancy or other means, such that	Fires in DOE facilities are considered to be one of the most significant hazards that must be protected against because they

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
3.a.(6)		safety function is maintained for any postulated fire events that credit the safety-class systems.	have the potential for significant and unpredictable common cause failures of safety SSCs. Safety class fire protection was the topic of DNFSB recommendation 2008-1.
Att. 3, 3.a.(7)	**G 420.1-1, 5.1.3 Quality Assurance** The QA requirements for the design, fabrication, construction, and modification of safety SSCs are developed using the facility safety analysis. At the earliest stages of the design, a hazard analysis, which identifies the functional requirements of safety SSCs, should be used as a basis for determining appropriate QA requirements. As the design progresses, more detailed safety analyses will be performed to develop the basis for safety SSCs performance requirements. Once the safety SSCs and their performance requirements are identified, a set of detailed QA requirements can then be specified. As part of the safety analysis, a list of all safety-class SSCs must be prepared and maintained for the life of the project through decommissioning. This listing must identify the functions, performance requirements, and natural phenomena design requirements for each safety-class SSC and the associated QA requirements. These detailed component-specific requirements are typically contained in consensus codes and standards (e.g., ANSI/IEEE). A similar listing of all safety significant SSCs should also be prepared. In most cases, components used in DOE nonreactor nuclear facilities will be “off the shelf”; that is, they will not be subjected to the rigorous Nuclear Quality Assurance (NQA)-1-based requirements for “nuclear-	(7) Quality Assurance. A quality assurance program must be established that satisfies 10 C.F.R. Part 830, Subpart A, *Quality Assurance Requirements*, and DOE O 414.1D, *Quality Assurance*, dated 04-25-11, early in the project, such that safety-SSCs and their associated support systems are designed, procured, fabricated, erected, and tested to standards and quality requirements commensurate with their importance to safety.	Quality Assurance is necessary element of defense–in-depth. This requirement reiterates application of existing quality assurance requirements to the design process.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	grade" components. Therefore, safety SSC quality standards can either be design based or achieved through testing, vendor control, and inspection. However, the requirements of 10 CFR 830.120 still apply to safety SSCs.		

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
Att. 3, 3.b.	**G 420.1-1, 5.2 Specific Criteria** The application of design criteria to safety SSCs entails the selection of appropriate and relevant criteria commensurate with the levels of safety. A purely prescriptive approach to the use of national codes and standards may fail to provide the appropriate level of safety. While national codes and standards will provide guidance and the basic design criteria for most systems, blanket application of such individual codes and standards or collections thereof is not necessary. It is necessary to tailor selections of codes and standards for each specific application based on the required safety function. Note that the safety analysis conducted in accordance with DOE-STD-3009-94 that results in a particular safety classification is also the same analysis used to identify and define design criteria. Safety analyses identify the functions that must be performed and the conditions under which these functions must perform. These analyses will then result in both the functional safety classification and the identification of the appropriate and relevant criteria to ensure the prescribed safety functions can be performed. Categorization and listing of design codes and standards as a portion of the design criteria process are performed to ensure that a correct and appropriate level of engineering design detail and attention are used for each safety classification. The intent is to specify the design codes and standards that will ensure that each safety SSC will perform its required safety function, including due consideration of the intangible areas of influence.	b. <u>Specific Design Criteria and Use of National Codes and Standards</u>. The selection and use of an appropriate set of applicable codes and standards establishes design criteria to provide assurance that the SSCs are designed to reliably perform their intended functions. The DOE technical standards and industry codes and standards identified in the following sections must be evaluated for applicability. DOE technical standards and industry codes and standards are considered applicable when they provide relevant design requirements for the safety SSCs that are being designed (i.e., they provide design requirements that are needed to ensure that desired SSC functions are achieved, and these requirements are appropriate for the design materials, configuration, and service conditions). Further, the use of specific codes and standards may be directed by the DOE field element. (Note: The stated applicability of industry codes and standards (e.g., for nuclear reactors) should not be used to narrowly interpret relevancy for SSC design.) Before using these codes and standards, their application to specific DOE design(s) must be reviewed. Once a code or standard is identified as applicable, the applicable requirements (i.e., mandatory statements) must be applied in the design. The process for obtaining relief from requirements in applicable DOE technical standards and industry codes and standards is described in	The DOE technical standards and industry codes and standards identified in the following sections are commonly used in DOE nuclear facility design. While not all inclusive this list represents a good starting point for identifying applicable codes and standards. DOE relief is only required for applicable requirements in applicable codes and standards that will not be implemented as written. DOE O 413.3B requires establishment and control of the code of record. The requirement in Attachment 3 to identify the complete set of codes and standards for safety SSC design supports the timely and transparent fulfillment of the Order 413.3B code of record requirement for safety SSCs.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	The national codes and standards listed in the following sections provide guidance on the minimum aggregation of codes, standards, and standard practices that should be considered in identifying the design criteria and other considerations for each specific SSC commensurate with its function. Additional design criteria may be applied as necessary to perform the safety function. Specific design criteria for safety SSCs often relate to a confinement function. Generally, three confinement systems are used to achieve the complete confinement system objective. The terms confinement and confinement barriers used in the following sections are used in the context of the three types of confinement: primary, secondary, and tertiary (as defined in the glossary).	Attachment 1 of DOE O 420.1C. The set of codes and standards identified below is not meant to be all inclusive. It is expected that design of SSCs will require selection of additional codes and standards beyond those identified below. For example, unique design features, detailed design considerations, and release of advancements may drive selection of additional codes and standards. Facility designers must identify the complete set of codes and standards necessary to meet the general design criteria identified above (see also Attachment 4 of DOE O 420.1C for additional codes and standards).	
Att. 3, 3.b.(1)	**G 420.1-1, 5.2.1 Structural** Structures classified as safety class or safety significant normally provide a passive confinement barrier and do not require redundancy in their design. The design of safety-significant and safety-class structures must ensure satisfaction of the functional requirements for the specific confinement system of which they are a part. In addition, safety-class confinement barriers must be designed to withstand likely secondary events as well as primary events with an appropriate margin of safety. Potential secondary events might be fire, explosion, or nuclear criticality caused by the primary event. Likely secondary events are those with a probability greater than 0.1, given the primary event. See Table 5.1 for the relevant codes and refer to Section 4.4 of DOE O 420.1 and Section 3.3 of this Guide for additional natural phenomena	(1) Structural. Table 1 provides relevant codes and standards. Attachment 2, Chapter IV of DOE O 420.1C provides additional natural phenomena hazards design requirements.	This table provides a list of commonly used and generally relevant codes and standards.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	hazards design guidance information.		
Att. 3, Table 1	**G 420.1-1, Table 5.1. Codes for Safety-Significant and Safety-Class Structures.**	**Table 1:** Codes for Safety Significant and Safety Class Structures (see table in DOE O 420.1C, Attachment 3)	The table was updated to current revisions of codes and standards and to include newly issued applicable codes and standards,
Att. 3, 3.b.(2)	**G 420.1-1, 5.2.2 Mechanical** Mechanical equipment classified as safety significant or safety class provides both passive and active safety functions. The redundancy criteria as described in Section 5.1.1.2 of this Guide must be applied to the design of safety-class SSCs that provide an active safety function. The redundancy criteria should be considered in the design of safety-significant SSCs that provide an active safety function. Redundancy criteria are generally not applied to the design of safety SSCs that provide a passive safety function. **G 420.1-1, 5.2.2.2 Process Equipment** The usual safety function of process equipment is to provide primary confinement and prevent or mitigate radioactive and/or hazardous material releases to the environment. Process equipment that would be required to provide primary confinement includes the following: piping, tanks, pressure vessels, pumps, valves, and gloveboxes. These examples represent process system components that could be used to contain radioactive or toxic materials directly. Process equipment for some applications can provide secondary confinement. Examples include doublewalled piping systems, double-walled tanks, and gloveboxes. Safety-class and safety-significant process equipment providing passive confinement (piping, tanks, holding vessels, etc.) must be designed to suitably	(2) Mechanical and Process Equipment. Table 2 provides relevant codes and standards.	This table provides a list of commonly used and generally relevant codes and standards.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	conservative criteria; redundancy in their design is not required. The redundancy criteria as described in Section 5.1.1.2 of this Guide must be applied to the design of safety-class SSCs that involve active confinement process equipment (pumps, valves, etc.). The redundancy criteria should be considered in the design of safety-significant SSCs that involve active confinement process equipment. See Table 5.3 for the relevant codes.		
Att. 3, Table 2	**G 420.1-1, Table 5.3. Codes for Safety-Significant and Safety-Class Process Equipment.**	**Table 2:** Codes for Safety Significant and Safety Class Process Equipment (see table in DOE O 420.1C, Attachment 3)	The table was updated to current revisions of codes and standards and to include newly issued applicable codes and standards,
Att. 3, 3.b.(3)	**G 420.1-1, 5.2.2.1 Ventilation** In general, the safety function of ventilation and offgas systems is to provide confinement integrity and to filter exhaust, thereby preventing or mitigating uncontrolled releases of radioactive and/or hazardous materials to the environment. Ventilation and offgas systems are included as a vital part of the primary and secondary confinement design. The need for redundancy and the degree of redundancy in these systems must be determined by the safety analysis process and maintenance concerns for both active and passive components. Designs must provide for periodic maintenance, inspection, and testing of components. Adequate shielding must be included in the design of filters, absorbers, scrubbers, and other air treatment components to ensure that occupational exposure limits are not exceeded during maintenance and inspection activities. Safety-significant and safety-class ventilation system designs must include adequate instrumentation to monitor and assess performance with necessary alarms	(3) Ventilation. Table 3 provides relevant codes and standards. Appendix A of DOE Guide (G) 420.1 1A, *Nonreactor Nuclear Safety Design Criteria for use with DOE O 420.1C, Facility Safety*, and DOE Handbook 1169 2003, *Nuclear Air Cleaning Handbook*, provide guidance for confinement ventilation systems design and performance criteria. Alternate methods must be approved by DOE field elements.	Alternate methods for confinement ventilation codes and standards require DOE approval to ensure appropriate visibility and consideration.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	for annunciation of abnormal or unacceptable operation. Manual or automatic protective control features must be provided to prevent or mitigate an uncontrolled release of radioactive and/or hazardous material to the environment and to minimize the spread of contamination within the facility. Vent streams potentially containing significant concentrations of radioactive and/or hazardous materials must be processed through an offgas cleanup system before being exhausted to the environment. Cleanup systems are to remove particulates and noxious chemicals and control the release of gaseous radionuclides. The design of safety-significant and safety-class offgas systems must be commensurate with the sources and characteristics of the radioactive and chemical components of the offgas air stream to prevent or mitigate the uncontrolled releases of radioactive and/or hazardous materials to the environment. See Table 5.2 for the relevant codes.		
Att. 3, Table 3	**G 420.1-1, Table 5.2. Codes for Safety-Significant and Safety-Class Ventilation System Components.**	**Table 3**: Codes for Safety Significant and Safety Class Ventilation System Components (see table in DOE O 420.1C, Attachment 3)	The table was updated to current revisions of codes and standards and to include newly issued applicable codes and standards,
3.b.(4)	**G 420.1-1, 5.2.2.3 Mechanical Handling Equipment** Safety-significant and safety-class handling equipment (cranes, manipulators, etc.) will only be classified as such if their failure would create a radiological material release exceeding the guidelines for either classification. The safety-significant classification, as a defense-in-depth provision, will be the more common classification for remote material handling equipment. Failure modes for mechanical handling equipment	(4) Mechanical Handling Equipment. Table 4 provides relevant codes and standards.	This table provides a list of commonly used and generally relevant codes and standards.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	used to move radioactive materials must address mid-operational failures, and designs must include recovery methods for such occurrences. Designs must accommodate periodic maintenance and inspection. See Table 5.4 for the relevant codes.		
Att. 3, Table 4	**Table 5.4. Codes for Safety-Significant and Safety-Class Handling Equipment.**	**Table 4**: Codes for Safety Significant and Safety Class Handling Equipment (see table in DOE O 420.1C, Attachment 3)	The table was updated to current revisions of codes and standards and to include newly issued applicable codes and standards,
Att. 3, 3.b.(5)	**5.2.3 Electrical** The safety function of an electrical power system is to provide power to systems and components that require electrical power in order to perform their safety functions. A safety-significant or safety-class electrical power system is defined as the system or component that provides actuation or motive force to safety equipment. These systems consist of onsite AC/DC power supply systems and associated distribution systems and components (e.g., conduits, wiring, cable trays, etc.). Safety-class electrical power must be designed against single-point failure in accordance with the criteria in Section 5.1.1.2 of this Guide. Redundancy requirements for electrical systems pertain to normal and alternative power sources and should be analyzed on a case-by-case basis. For safety-significant systems, redundancy is not required if it can be shown that there is sufficient response time to provide an alternative source of electrical power. Environmental capability of safety-class electrical equipment must be demonstrated by testing, analysis, and operating experience, or a combination of these methods in accordance with Section 5.1.3 of this	(5) Electrical. Tables 5 and 6 provide relevant codes and standards. Note: ANSI/IEEE standards, below, define requirements for the manufacturing, installation, and testing of commercial reactor Safety Class 1E electrical systems and components. While these requirements may not be directly applicable to nonreactor nuclear facilities, these standards contain useful and significant information that should be considered.	These tables provide a list of commonly used and generally relevant codes and standards.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	Guide. For the commercial nuclear industry, a multitude of ANSI/IEEE Standards define the requirements for the manufacture, installation, and testing of reactor Safety Class 1E electrical systems and components. The Safety Class 1E requirements may not be directly applicable to the safety-class category defined for nonreactor nuclear facilities. These standards, however, contain useful and significant information that should be considered. Table 5.5 lists a minimal set of national codes and standards that should be addressed for safety-significant and safety-class electrical systems, keeping in perspective the applicable use of ANSI/IEEE standards for Safety Class 1E components. Table 5.6 presents a list of ANSI/IEEE standards that can be used for guidance in specific applications. Before using these standards, their applicability to the design(s) being considered should be reviewed.		
Att. 3, Table 5	**G 420.1-1, Table 5.5. Codes for Safety-Significant and Safety-Class Electrical Systems.**	**Table 5:** Codes for Safety Significant and Safety Class Electrical Systems (see table in DOE O 420.1C, Attachment 3)	The table was updated to current revisions of codes and standards and to include newly issued applicable codes and standards,
Att. 3, Table 6	**G 420.1-1, Table 5.6. ANSI/IEEE Standards to be Used as Guidance for Both Safety-Significant and Safety-Class Electrical Systems, as Appropriate.**	**Table 6**: IEEE Standards used for Both Safety Significant and Safety Class Electrical Systems, as appropriate (see table in DOE O 420.1C, Attachment 3)	The table was updated to current revisions of codes and standards and to include newly issued applicable codes and standards,
Att. 3, 3.b.(6)	**G 420.1-1, 5.2.4 Instrumentation, Control, and Alarm Systems** The safety functions of instrumentation, control, and alarm systems are to provide information on out-of-tolerance conditions/abnormal conditions; ensure the capability for manual or automatic actuation of safety	(6) Instrumentation, Control, and Alarm Systems. The design of safety class instrumentation and control systems must incorporate sufficient independence, redundancy, diversity, and separation to	By the nature of application of instrumentation and control systems for system reliability and availability it is necessary to ensure sufficient independence, redundancy, diversity, and

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	systems and components; ensure safety systems have the means to achieve and maintain a fail-safe shutdown condition on demand under normal or abnormal conditions; and/or actuate alarms to reduce public or site-personnel risk (e.g., effluent monitoring components and systems). The design of safety-class and safety-significant instrumentation and control systems must incorporate sufficient independence, redundancy, diversity, and separation to ensure that all safety-related functions associated with such equipment can be performed under postulated accident conditions as identified in the safety analysis. Safety-significant components should be evaluated as to the need for redundancy on a case-by-case basis. Under all circumstances, safety class instrumentation, controls, and alarms must be designed so that failure of non-safety equipment will not prevent the former from performing their safety functions. Safety-significant and safety-class instrumentation, control, and alarm-system designs must ensure accessibility for inspection, maintenance, calibration, repair, or replacement. Safety-class instrumentation, control, and alarm systems must provide the operators sufficient time, information, and control capabilities to perform the following safety functions: • Readily determine the status of critical facility parameters to ensure compliance with the limits specified in the Technical Safety Requirements. • Initiate automatic or manual safety functions. • Determine the status of safety systems required to	ensure that all safety related functions associated with such equipment can be performed. Safety significant components must be evaluated as to the need for redundancy on a case by case basis.DOE-STD-1195-2011provides an acceptable method for achieving high reliability of safety significant safety instrumented systems. **Table 7** provides relevant codes and standards. The codes and standards for electrical systems (in Tables 5 and 6) may also be applicable to design of instrumentation and control systems and need to be evaluated in this context.	separation.

ATTACHMENT 3 - **DESIGN CRITERIA FOR SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS**			
Citation (420.1C)	**Original Requirement (G 420.1-1, Section 5, 3-28-00)**	**Revised Requirement (O 420.1C, 12-04-2012)**	**Comments**
	ensure proper mitigation of the consequences of postulated accident conditions and/or to safely shut down the facility. ANSI/IEEE standards contain design, installation, and testing requirements that should be considered for instrumentation, control, and alarm components without invoking all of the Safety Class 1E requirements. See Table 5.7 for the relevant codes.		
Att. 3, Table 7	**G 420.1-1, Table 5.7. Codes for Safety-Significant and Safety-Class Instrumentation, Control, and Alarm Components.**	**Table 7:** Codes for Safety Significant and Safety Class Instrumentation, Control, and Alarm Components. (see table in DOE O 420.1C, Attachment 3)	Table 7 provides a list of commonly used and generally relevant codes and standards. The table was updated to current revisions of codes and standards and to include newly issued applicable codes and standards.
Att. 3, 3.b.(7)		(7) Fire Protection Systems. DOE-STD-1066-2012, *Fire Protection*, provides acceptable methods for the design of fire protection systems, including safety-class and safety-significant fire barriers, water supplies, and wet pipe sprinkler systems (see Appendix A of DOE-STD-1066-2012). Fire protection system designs are also required to address the applicable design requirements for similar safety systems provided in this attachment (e.g., the fire detection and alarm system would be designed consistent with safety-related instrumentation and control systems).	DOE-STD-1066-2012 is required to be evaluated for applicability. Attachment 2, Chapter II requires that alternate approaches must provide an equivalent level of safety.

If questions or comments, please contact Pranab Guha, DOE HS-31, at 301/903-7089 or pranab.guha@hq.doe.gov