

Frequently Asked Questions Regarding DOE Order 420.1C, *Facility Safety*, and its supporting directives, DOE G 420.1-1A, *Nonreactor Nuclear Safety Design Criteria for use with DOE O 420.1C, Facility Safety*, DOE-STD-1020-2012, *Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities*, and DOE-STD-1066-2012, *Fire Protection*

Body of Order 420.1C:

Q1: DOE O 420.1C, Sec 3.c.(4), states: *“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.”* – Should this statement be interpreted to give blanket exemption from DOE O 420.1C for facilities with NRC regulation?

A: No, not necessarily. The intent is to preclude dual regulation. DOE orders, regulations, and/or guidelines will apply where the NRC defers to the DOE or does not exercise regulatory authority. This will be clarified in the One-Year Accuracy Review and Update.

Q2: I work at an existing facility. What changes in DOE O 420.1C do I have to be concerned about?

A: DOE O 420.1C, Attachment 2, Chapters II, III, IV, and V have the requirements that are applicable to existing facilities in the operating phase. Attachment 2, Chapter I and Attachment 3 apply to new nuclear facilities and major modifications to the existing nuclear facilities.

Q3: Design Maturity. How do you define Design Maturity in section 3.C.(9) of DOE O 420.1C? *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.*

A: Design Maturity is defined in DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, dated November 29, 2010:

The project design will be considered sufficiently mature when the project has developed a cost estimate and all relevant organizations have a high degree of confidence that it will endure to project completion. In determining the sufficiency of the design level, factors such as project size, duration, and complexity will be considered.

[O 413.3B, App C-4]

Q4: What is HSS's role in the exemption process for DOE O 420.1C requirements?

A: HSS is the Office of Primary Interest (OPI) for DOE O 420.1C. As such, HSS's role in exemptions is to consult with the Program Secretarial Officers (PSOs) as defined in O 251.1C.

Exemptions are the release from one or more requirements in a directive. Unless specified otherwise in the directive, Exemptions are granted, in consultation with the OPI, by the Program Secretarial Officer or their designee, or in the case of the NNSA, by the Administrator or designee, and documented for the OPI in a memorandum. For those directives listed in Attachment 1 of DOE O 410.1, CTA concurrences are required prior to the granting of Exemptions.

[DOE O251.1C - Section 6.a.3.c.2]

In addition, HSS has a role to assist the line in effective implementation and to capture future improvements for O 420.1C.

Q5: Does DOE O 420.1C allow delegation of all responsibilities of the AHJ or Building Code Official to the contractor?

A: No, DOE may not delegate approval of exemptions to DOE Orders and applicable codes and standards. However, DOE field elements may delegate authorities and responsibilities for routine activities to contractors while retaining the ultimate responsibility that these roles are adequately fulfilled.

DOE-STD-1066-2012, *Fire Protection*, provides discussion on delegation of these responsibilities (see Section 5.2.4, *Delegated Authority* of DOE-STD-1066-2012).

Q6: DOE O 420,1C, Sec 5.c.(5) requires the DOE Head of the Field Element to approve contractor's fire protection program. However, DOE O 420.1C, Att 2, Ch II, Fire Protection, does not specify the requirement.

A: Contractor will need to submit the fire protection program for DOE Field Element's review and approval. DOE Field Elements should direct contractors to submit their programs. This will be clarified in the One-Year Accuracy Review and Update.

Order 420.1C, Attachment 1:

Q7: For equivalencies, how do you demonstrate an “equivalent level of safety”?

A: DOE G 420.1-1A provides the following:

Justification of equivalent codes and standards should demonstrate that the proposed design of the SSCs meets, or exceeds, the level of safety (e.g., meets, or exceeds, the level of protection) provided by the normally applied codes and standards. Evaluation of the level of safety should address:

- *Critical safety attributes of the SSCs;*
- *Critical characteristics of the SSCs that are important to design, material, and performance of the SSCs;*
- *The reliability of safety SSCs; and,*
- *The margins of safety to failure of the SSCs (e.g., pressure, temperature, environmental conditions, and other design loads) provided by application of the code.*

For individual components, equivalency should be demonstrated by defining and verifying that the substitute component meets or exceeds these characteristics. Equivalencies should be well documented with a technical basis and should receive peer review by a technically capable and experienced designer.

[DOE G 420.1-1A, Section 5.4.16]

Q8: Are the requirements in the CRD automatically applicable to all DOE Facilities?

A: No. They are not applicable until they are put in the contract.

Q9: DOE O 420.1C, Attachment #1, Section 2, *Relief from Requirements, Codes and Standards*, allows the DOE Field Element to review and approve equivalencies to DOE technical standards and industry codes and standards. Does this allow *de minimis* deviations to the codes and standards requirements without DOE Field Element’s approval?

A: DOE O 420.1C, Attachment 1, Sec 2b states: “*Equivalencies to DOE technical 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.*”

A *de minimis* deviation, defined as a deviation from the requirement of an applicable DOE technical standard or industry code and standard that has no direct or immediate relationship to safety, may be exempt from individual DOE field element’s approval, provided that the DOE field element approves this approach. In such cases, DOE should require that *de minimis* deviations be documented and periodically reviewed by the DOE field element.

Order 420.1C, Attachment 2, Chapter I

Q10: What does the following mean regarding the use of the DOE G 420.1-1A, *Nonreactor Nuclear Safety Design Criteria for use with DOE O 420.1C, Facility Safety*? 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.

[DOE O 420.1C, Attachment 2, Chapter I, Section 3.b.(8)]

A: “Justify” means to document a defensible technical basis for any alternative approach to the requirements and methods of the Order and its guidance documents; DOE Order 251.1C, *Departmental Directives Program*, dated January 15, 2009, states:

(1) Provide an acceptable, but not mandatory means for complying with requirements of an Order or rule. Note: Alternate methods that satisfy the requirements of an Order are also acceptable. However, any implementation selected must be justified to ensure that an adequate level of safety commensurate with the identified hazards is achieved.

[DOE O 251.1C, Section 5.d]

Adequate level of safety is equivalent to "adequate protection," which is defined as those measures that permit a facility to operate safely for its workers and the surrounding community (see Deputy Secretary Poneman letter, July 19, 2012). Adequate protection is achieved when all necessary measures are being taken in a manner that is consistent with applicable requirements and regulatory process. Adequate protection in design is achieved by meeting Departmental requirements with regard to the design of engineered safety systems and controls, which protect workers and the public from normal operations and possible accidents.

Q11: Is DOE-STD-1189-2008, *Integration of Safety into the Design Process*, required by this Order?

A: Yes, DOE O 420.1C, like its predecessor, clearly invokes the use of DOE-STD-1189 for design of Hazard Category 1, 2, and 3 nuclear facilities and associated major modifications:

Safety must be integrated into the design early in, and throughout, the design process through the use of DOE-STD-1189-2008.

[DOE O 420.1C, Attachment 2, Chapter I]

In addition to O 420.1C, DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, dated November 29, 2010, also clearly requires implementation of DOE-STD-1189:

For projects that are Hazard Category 1, 2, and 3 nuclear facilities or include major modifications thereto (as defined in 10 CFR Part 830), the requirements in DOE-STD-1189, as amended, shall be fully implemented.

[DOE O 413.3B, Attachment 1, Section 13]

Some parts of DOE-STD-1189-2008 are not written as requirements, but rather as recommendations. For example, Appendix B in DOE-STD-1189-2008 regarding chemical hazard evaluation is provided as guidance, not requirements.

Q12: What does *Very High Assurance* mean in the following passage regarding confinement ventilation?

An active confinement ventilation system as the preferred design approach for nuclear facilities with potential for radiological release. 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.”

[DOE O 420.1C, Attachment 2, Chapter I, Section 3.b.(3).(c)]

A: Alternate approaches to an active confinement ventilation system are containment and passive confinement. A containment approach differs from a confinement approach in that the goal of containment is 100% containment of radioactive materials. In reality, even a containment approach results in some level of leakage but this is managed to an absolute minimum by code compliance which requires periodic penetration leak rate tests and full building leak rate tests (ANS 56.8, *Containment System Leakage Testing Requirements*).

Passive confinement involves dependence on minimization of paths of leakage of hazardous materials when a ventilation system is not running. The DOE Toolbox Code MELCOR provides a tool for analyzing a building leak path factor (LPF). Very high assurance of adequate confinement under passive confinement conditions means a technically defensible analysis of the LPF and comparison of the results with applicable dose limits under normal and accident conditions. See *MELCOR Computer Code Application Guidance for Leak Path Factor in Documented Safety Analysis*, May 2004.

Leak path Factor (LPF)

For mitigated analysis, analytical tools used in calculating the LPF shall be appropriate to the physical conditions being modeled, including the use of conservative parameters, such that the overall LPF would be conservative.[DOE-STD-3009-(DRAFT), *DSA Preparation Guide*]

Q13: DOE-STD-3009 is currently being reviewed in DOE RevCom. What is the impact of revision to DOE-STD-3009 on DOE O 420.1C?

A: There is no significant impact. DOE-STD-3009 is a safe harbor method to satisfy 10 CFR 830 requirements for safety analysis. DOE O 420.1C is focused on facility design rather than facility safety analysis.

Q14: DOE-STD-1189-2008 is committed for revision in the 2013-2014 timeframe. What is the impact of revision to DOE-STD-1189-2008 on DOE O 420.1C?

A: DOE O 420.1C invokes DOE-STD-1189-2008. If this standard is revised or updated, the new version is not self-invoking. A change to DOE O 420.1C would be necessary to invoke a new version of DOE-STD-1189. The specific scope of potential changes to DOE-STD-1189 has not been established at this time, and will be addressed in the Project Justification Statement in accordance with the Technical Standards Program when the revision is initiated.

Q15: **Are there any exemptions to the DOE O 420.1C, Attachment 2, Chapter I, Nuclear Safety Design Criteria, Section 3.b.(7), which require application of single point failure criteria for active safety class (SC) systems?**

A: ANSI/ANS-58.9-1981 (R2002), *Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems*, provides guidance for exemptions. It states in Section 4, “*Where the proper active function of a component can be demonstrated despite any credible condition, then the component may be considered exempt from active failure. Examples of such component functions may include opening of code safety valves and certain swing check valves. Where such exemption is taken, the basis for the exemption shall be documented in the single failure analysis.*”

IEEE Std 379-2000, *Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems*, also provides guidance for exemptions. It states in Section 6.3.2, “*A probabilistic assessment shall not be used in lieu of the single-failure analysis. However, reliability analysis, probability assessment, operating experience, engineering judgment, or a combination thereof, may be used to establish a basis for excluding a particular failure from the single-failure analysis. For further guidance in performing reliability analyses and probabilistic assessments, see IEEE Std 352-1987 and IEEE Std 577-1976.*”

Order 420.1C, Attachment 2, Chapter II

Q16: O 420.1C, Attachment 2, Chapter II, Fire Protection, Sec. 3.c.(2)(c) states, “*Automatic fire suppression systems must be provided throughout facilities in which the following conditions exist:*” Does this statement apply to new facilities, existing facilities, major modifications, or combination thereof?

A: Yes, it applies to new facilities, existing facilities, major modifications, or combination thereof. Sec 3.c.(2).(c).4 and 5 apply to modifications, whereas Sec 3.c.(2).(c).1, 2 and 3 apply to new and/or existing facilities. The intent is to comply with DOE’s Highly Protected Risk (HPR) philosophy. This will be clarified in the One-Year Accuracy Review and Update.

Q17: Is DOE-STD-1066-2012, *Fire Protection*, required by DOE O 420.1C?

A: It is not required by the Order 420.1C, but the Order does require that any alternate approach must provide an equivalent level of safety. The burden is on the contractor to demonstrate that the alternate approach provides an equivalent level of safety. DOE O 420.1C states:

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.

[DOE O 420.1C, Attachment 2, Chapter II, 3.h]

However DOE-STD-1066-2012 is applicable for all 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. DOE-STD-1066-2012 was specifically written to support effective implementation of Order 420.1C Attachment 2, Chapter II and the Order indicates that it provides acceptable methods for implementation.

Alternative approach to DOE STD 1066 may be documented as a part of the fire protection program documentation that needs to be approved by the Head of the DOE Field Element. Such documentation would describe all the program attributes that apply to the site as delineated in DOE O 420.1C. Any alternative approach must document a defensible technical basis to the requirements and methods of the Order and its supporting language in DOE STD 1066.

DOE Order 251.1C, *Departmental Directives Program*, dated January 15, 2009, states:

(1) Provide an acceptable, but not mandatory means for complying with requirements of an Order or rule. Note: Alternate methods that satisfy the requirements of an Order are also acceptable. However, any implementation selected must be justified to ensure that an adequate level of safety commensurate with the identified hazards is achieved.

[DOE O 251.1C, Section 5.d]

Adequate level of safety is equivalent to "adequate protection," which is defined as those measures that permit a facility to operate safely for its workers and the surrounding community (see Deputy Secretary Poneman letter, July 19, 2012). Adequate protection is achieved when all necessary measures are being taken in a manner that is consistent with applicable requirements and regulatory process. Adequate protection in design is achieved by meeting Departmental requirements with regard to the design of engineered safety systems and controls, which protect workers and the public from normal operations and possible accidents.

Q18: What is the relationship between 10 CFR 851 and DOE O 420.1C and DOE-STD-1066-2012?

A: 10 CFR 851 is focused on worker safety whereas DOE 420.1C is focused on facility safety. One area where these two topics overlap is fire safety (addressed in O 420.1C, Attachment 2, Chapter II and DOE-STD-1066-2012) because some fire safety measures are aimed at worker protection and others are aimed at property protection.

Order 420.1C, Attachment 2, Chapter IV

Q19: Do I have to follow DOE-STD-1020-2012, *Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities*?

A: Yes, DOE STD-1020-2012 is clearly invoked in the Order 420.1C. DOE O 420.1C provides requirements for exemptions and equivalencies to the provisions of DOE-STD-1020-2012.

Order 420.1C, Attachment 3

Q20: For existing facilities how do I determine the list of applicable design codes and standards?

A: For existing facilities the code of record (i.e. those codes and standards in effect at the time that the facility was designed) is the list of applicable design codes and standards. In the case of major modifications to existing facilities, the design codes and standards of O 420.1C apply.

Q21: In reference to Att 3, Sec 3.a.(5).(b) - Is it the intent of the Order to apply IEEE 384, *IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits*, to the design of Safety Significant (SS) electrical and instrumentation & control (I&C) systems?

A: IEEE 384 sets forth criteria for the independence that can be achieved by physical separation and electrical isolation for circuits and equipment that are redundant. Safety class (SC) circuits (i.e., electrical and I&C systems) are designed with redundancy and IEEE 384 or other applicable standard requirements must be met.

Safety significant (SS) circuits are generally not designed with redundancy. Instead, the reliability of SS circuits is achieved by implementing robust design, procurement, quality assurance, and maintenance processes.

In the event the SS circuits are associated with non-safety circuits (i.e. non-safety circuits are not physically separated or electrically isolated from SS circuits by an acceptable separation distance, or isolation devices), analysis and/or testing shall be done to demonstrate that the absence of separation and/or isolation cannot degrade the SS circuits below an acceptable level.

Should the design require the SS electrical and I&C systems to be protected against fire, seismic events, etc., redundancy and diversity of the design including separation requirements (as specified in IEEE 384) may be warranted.

DOE-STD-1066, Fire Protection

Q22: Section 2.2.2 of DOE-STD-1066-2012 states: “2.2.2 Building code. *The acquisition and construction of new facilities and significant modifications of existing facilities shall meet the applicable parts of the latest edition of the International Building Code (IBC), NFPA standards, and other nationally recognized consensus standards for electrical, fire, and life safety.*” Does this mean that the latest published IBC is required regardless of whether it has been adopted into law by the local state or community?

A: The design authority is required to determine the applicable codes and standards for new facilities or major modifications. The general practice is to review and adopt the current version of codes and standards. In many cases, however, the design authority could select other versions, if deemed justified in view of safety and design specific requirements. Use of local and state adopted codes and standards (which in many cases are older versions) can also be justified and has been anticipated by 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.”

[DOE O 420.1C, Attachment 1, Page 1, 1(c)]

Q-23: DOE O 420.1C, Attachments 1, 2 & 3 identify a number of DOE standards and industry codes and standards by date. What is an acceptable process to identify a successor code or standard as applicable with respect to the implementation of the Order?

A: (1) Some of the DOE standards and national codes and standards are invoked by the Order. The following is a list of those standards that are invoked/mandated:

DOE-STD-1020-2012, DOE-STD-1189-2008, DOE-STD-3007-2007, IEEE 379-2000, ANS-1-2000, ANS 14.1-2004, NFPA 1143-2014

Successor editions of the codes and standards listed by date or edition that are invoked must be approved by determining that the successor editions are equivalent to the edition listed in the Order. The process for establishing the equivalency of successor codes and standards for these invoked DOE standards and national codes& standards is provided in Attachment 1, Section 2, Relief from Requirements, Codes and Standards.

(2) For those codes and standards that are listed by date or edition but not invoked by the Order, the contractor can submit a request to their local DOE Field Element for a change to their Code of Record (COR), which identifies successor DOE technical standards and/or industry codes and standards as applicable in whole or in part.

See Attachment 3, Section 3.b.

“...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...”

The DOE Field Element can approve a change to the COR which recognizes the contractor’s determination of the applicability of successor DOE technical standards or industry codes and standard(s) in lieu of those listed, but not invoked, in the Order.

Exemptions and Equivalencies Approval Process		
	Exemption	Equivalency
DOE O 420.1C Requirements (“Must” statements)	Approved at PSO level; requires CTA concurrence and OPI consultation. [DOE O 251.1C]	Approved at PSO level; requires CTA concurrence and OPI consultation. [DOE O 251.1C]
Requirements of Applicable Codes & Standards and DOE Technical Standards	Approved at PSO level; requires CTA concurrence and OPI consultation. [DOE O 251.1C]	Approved at the field level; must demonstrate an equivalent level of safety