

**U.S. Department of Energy
Oak Ridge Office
Office of Environmental Management
Procedure**

Code of Record for EM Nuclear Facilities

**EM-3.4
Revision 0**

Prepared by: Donna M. Perez
Donna M. Perez
Document Owner

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Date

Approved by: John R. Eschenberg
John R. Eschenberg
Assistant Manager for Environmental Management

1/18/10
Date



EM Environmental Management

safety ♦ performance ♦ cleanup ♦ closure

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ACRONYMS LIST

AMEM	Assistant Manager Environmental Management
CFR	Code of Federal Regulations
CofR	Code of Record
CRD	Contractor Requirements Document
CTA	Central Technical Authority
DEAR	DOE Acquisition Regulations
DOE	Department of Energy
EM	Environmental Management
IBC	International Building Code
NFPA	National Fire Protection Association
ORO	Oak Ridge Operations
SMS	Safety Management System
S/RID	Standards/Requirements Identification Document
SSC	Structure, System, or Component
WSS	Work Smart Standards

1.0 PURPOSE

This procedure establishes the process to be used by the Department of Energy (DOE) Oak Ridge Office (ORO) Office of Environmental Management (EM) to fulfill the DOE Field Element responsibilities with respect to the DOE interim policy for establishment and maintenance of a Code of Record (CofR) for EM nuclear facilities. The CofR serves as a management tool and source for the set of requirements that are used to design, construct, operate, and decommission a nuclear facility over its lifespan. Attachment 7.1 presents a schematic representation of the set of requirements comprising the CofR.

2.0 SCOPE

This procedure applies to all ORO EM divisions, programs, and projects.

It is EM policy to establish a CofR for its nuclear facilities early in the design phase and to maintain the CofR through the Critical Decision (CD) process and the remainder of the facility's lifecycle. This policy applies to all new EM nuclear facilities and major modifications to existing nuclear facilities. It may also be applied to other facilities, at the discretion of the DOE Assistant Secretary for Environmental Management and the ORO Manager, where warranted by cost or program risks.

3.0 REFERENCES AND DEFINITIONS

3.1 References

- 3.1.1 10 CFR 820, *Procedural Rules for DOE Nuclear Activities*
- 3.1.2 10 CFR 830, *Nuclear Safety Management*
- 3.1.3 10 CFR 830 Subpart A, *Quality Assurance Requirements*
- 3.1.4 10 CFR 830 Subpart B, *Safety Basis Requirements*
- 3.1.5 10 CFR 835, *Occupational Radiation Protection*
- 3.1.6 10 CFR 851, *Worker Safety and Health Program*
- 3.1.7 10 CFR 708, *DOE Contractor Employee Protection Program*
- 3.1.8 29 CFR 1910.119, *Occupational Safety and Health Standards – Process Safety Management of Highly Hazardous Chemicals*
- 3.1.9 DOE DEAR, 48 CFR 970.5204-2, *Laws, Regulations, and DOE Directives*
- 3.1.10 DOE DEAR, 48 CFR 970.5223-1, *DOE Management and Operating Contracts, Integration of Environment, Safety, and Health into Work Planning and Execution*
- 3.1.11 DOE O 410.1, *Central Technical Authority Responsibilities Regarding Nuclear Safety Requirements*
- 3.1.12 DOE O 410.2, *Management of Nuclear Materials*
- 3.1.13 DOE O 413.3A, *Program and Project Management for the Acquisition of Capital Assets*

3.1.14 DOE O 420.1B, *Facility Safety*

3.1.15 DOE P 450.4, *Safety Management System Policy*

3.1.16 DOE-STD-1189-2008, *Integration of Safety into the Design Process*

3.2 Definitions

- 3.2.1 **Backfit** – The modification of, or addition to, systems, structures, or components (SSC) of a facility; or to the administrative controls, procedures, analyses, or organization required to design, construct or operate a facility; any of which may result from new or amended requirements in the Code of Record.
- 3.2.2 **Code of Record** – The set of Federal and state laws and regulations, DOE requirements, codes, standards, and design criteria which govern a DOE EM nuclear facility. The CofR is established for a nuclear facility during the conceptual design phase and is maintained under configuration control through the Critical Decision process and the remainder of the facility’s lifecycle. The CofR includes all requirements that directly affect public, worker, environmental, or nuclear safety; engineering disciplines, including civil, structural, mechanical, electrical, instrumentation and control, piping, and fire protection; and management systems including safety, security, and quality assurance. The CofR is conceptually similar to the set of requirements previously identified under the DOE Standards/Requirements Identification Document (S/RID) and Work Smart Standards (WSS) processes, and represents an update to those processes for EM nuclear facilities.
- 3.2.3 **Major Modification** – Defined per DOE-STD-1189-2008: “Modification to a DOE nuclear facility that is completed on or after April 9, 2001, that substantially changes the existing safety basis for the facility.” [Note: DOE-STD-1189-2008 provides extensive guidance for evaluation of major modifications.]
- 3.2.4 **Nuclear Facility** – Defined per 10 CFR 830.3: “Nuclear facility means a reactor or nonreactor nuclear facility where an activity is conducted for or on behalf of DOE and includes any related area, structure, facility, or activity to the extent necessary to ensure proper implementation of this Part.” [Note: This definition in 10 CFR 830 addresses both reactor and nonreactor nuclear facilities. Below Hazard Category 3 (“Radiological”) facilities as well as Hazard Category 1, 2, and 3 facilities (as defined in DOE-STD-1027-92) all fit the definition of a nuclear facility.]
- 3.2.5 **Standards/Requirements Identification Document** – A document that lists the set of standards and requirements that apply to conducting the day-to-day mission of a facility in a manner that protects the health and safety of workers and the public and the environment throughout the facility lifecycle. Sources of appropriate standards/requirements include applicable Federal, state, and local laws and regulations; DOE directives; relevant industry (consensus) codes and standards; and other relevant standards and guidance (e.g., international standards,

established plant safety practices, etc.). S/RIDs are living documents that are revised as needed based on changes in the mission or configuration of the facility, a change in the facility's lifecycle phase, or changes to standards/requirements. The S/RID concept was developed by DOE in the early 1990's in response to a Defense Nuclear Facilities Safety Board (DNFSB) recommendation (90-2) that DOE should develop a more rigorous process for identifying which specific standards are applicable to a given scope of work at a facility.

- 3.2.6 **Work Smart Standards** – The set of environment, safety, and health (ES&H) laws, regulations and other requirements that have been specifically selected for applicability and appropriateness for a particular scope of work. The WSS set is selected to provide adequate protection (when properly implemented) against the hazards associated with that particular scope of work. The WSS were previously known as the Necessary and Sufficient Sets of standards prior to a name change directed by the Secretary of Energy in 1996. The WSS set may include Federal and state laws and regulations, DOE and other Federal agency directives, national and international technical standards, codes of conduct, and other appropriate requirements. The WSS set is identified by the contractor and approved by DOE prior to authorization for the commencement of work. A WSS set for a particular scope of work replaces the previously established S/RID (if any) for that scope.

4.0 RESPONSIBILITIES

4.1 Assistant Manager for Environmental Management (AMEM)

- 4.1.1 Responsible for implementation of the CofR program for DOE-ORO EM facilities and provides resources for program execution.
- 4.1.2 Determines applicable EM nuclear facilities (all new EM nuclear facilities and major modifications to existing EM nuclear facilities) for which the CofR must be established and maintained. Makes recommendations to the DOE Assistant Secretary for Environmental Management and the ORO Manager regarding other EM facilities where a CofR may be warranted by cost or program risks.

4.2 Federal Project Directors

- 4.2.1 Identify to AMEM any facilities under his/her area of responsibility for which a CofR may be required (i.e., all new EM nuclear facilities and major modifications to existing EM nuclear facilities, and other facilities where warranted by cost or program risks).
- 4.2.2 Ensure submittal of CofR for each applicable facility under his/her area of responsibility from the responsible contractor for DOE review and approval.
- 4.2.3 Assign staff members to evaluate contractor CofR documentation and evaluate proposed actions and new and revised requirements for potential backfits.

- 4.2.4 Provide recommendations to AMEM regarding results of evaluations of contractor CofR documentation and any potential modifications or backfits.
- 4.2.5 Ensure that each CofR is reviewed by the applicable contractor at least annually to identify any new or revised requirements and/or facility changes that could impact the CofR, and ensure that any potential needs for CofR revision are entered into the DOE action tracking system.
- 4.2.6 Ensure that documentation of DOE EM review for each contractor CofR submittal is maintained in the ORO EM records management system.

5.0 PROCEDURE

5.1 Code of Record Requirements for New EM Nuclear Facilities

A CofR shall be established for each new EM nuclear facility in accordance with the requirements outlined below. The CofR shall serve as a management tool and source for the set of requirements used to design, construct, operate, and decommission the EM nuclear facility over its lifecycle. The CofR shall include Federal and state laws and regulations, DOE requirements, and design criteria defined by national codes and standards and by state and local building codes that directly affect public, worker, environmental, or nuclear safety.

- 5.1.1 The CofR shall be initiated during the conceptual design phase for any new EM nuclear facility and must be submitted by the contractor for DOE review and approval prior to EM approval of Critical Decision-1. An example letter to the contractor requiring submittal of the CofR is presented in Attachment 7.1. The CofR shall include applicable Federal and state laws and regulations and DOE directives identified in applicable contract documents, Standards/Requirements Identification Documents, and Work Smart Standards. Construction of new facilities shall be in accordance with current codes and standards as well as design criteria specified by DOE directives. Approval of the CofR shall be communicated to the contractor by the applicable Contracting Officer upon the recommendation of the applicable Federal Project Director.
- 5.1.2 Beginning with the initial submittal and DOE approval, the contractor shall maintain the CofR under a DOE-approved configuration control process throughout the lifecycle of the facility.
- 5.1.3 The CofR shall be updated to include more detailed design requirements during preliminary design and the revised CofR shall be submitted by the contractor for DOE review and approval prior to EM approval of Critical Decision-2. Approval for any proposed revision to the CofR shall be communicated to the contractor by the applicable Contracting Officer upon the recommendation of the applicable Federal Project Director.

- 5.1.4 During final design and construction of the facility, any new requirements (e.g., requirements resulting from new laws or regulations, codes or standards, or DOE directives) or revisions to requirements previously identified in the CofR shall be identified by the contractor or by DOE. Any such new or revised requirements shall be evaluated to determine their impact on project safety, cost, and schedule before a decision is taken to revise the CofR. Decision logic for this evaluation is depicted in Figure 5.1. New or modified requirements shall be implemented if technical evaluations determine that there is a substantial increase in the overall protection of the worker, public, or environment, and that the direct and indirect costs of implementation are justified in view of this increased protection. Approval for any changes to the CofR shall be communicated to the contractor by the applicable Contracting Officer upon the recommendation of the responsible Federal Project Director and Contracting Officer's Representative.

Figure 5.1 - Decision Logic for Evaluation of New or Revised Requirements

1. Identify the new or revised requirement(s), including the authority for the change and the applicability of the requirement to the facility.
2. Review the existing CofR, Authorization Basis, and Technical Baseline for the facility.
3. Prepare a gap analysis to identify the difference between the current CofR for the facility and the new or revised requirement.
4. Conduct technical evaluation to identify costs and benefits that would result from implementation of the new or revised requirement for this facility.
 - a. If new or revised requirement does not impose adverse cost or schedule impacts, update CofR to incorporate requirement. Adverse schedule impacts should be considered significant only if it results in an unacceptable delay to the project.
 - b. If new or revised requirement would result in adverse cost or schedule impacts:
 - i. Update the CofR to incorporate the requirement, where the change would result in increased protection of worker or public safety or the environment that is commensurate with the adverse impacts.
 - ii. Do not update CofR to incorporate the requirement, where the change would not result in increased protection of worker or public safety or the environment commensurate with the adverse impacts.
5. Before revising CofR to incorporate the new or revised requirement, confirm that proposed CofR is consistent with the Authorization Basis for the facility and revise as needed.

- 5.1.5 The CofR shall be included as part of the turnover documentation from a design and construction phase contractor to the operating phase contractor; from an operating phase contractor to the decommissioning phase contractor; and when a change of contractor occurs during any single lifecycle phase. To facilitate such transfers, the CofR and its supporting documents (e.g., as-built drawings, design documents) shall be organized in a manner that supports accessibility, traceability, and maintainability.

- 5.1.6 The CofR shall be controlled and maintained current after Critical Decision-4, and for facilities that are operating or undergoing decommissioning. The CofR shall be maintained under configuration control to review and evaluate new and revised requirements and EM-approved exemptions from, or equivalencies to, requirements. The review shall determine the impact of the new or revised requirements on project safety, cost, and schedule before a decision is made to revise the CofR. New or modified requirements shall be implemented if the technical evaluations determine that there is a substantial increase in the overall protection of the worker, public, or environment, and that the direct and indirect costs of implementation are justified in view of the increased protection (see Figure 5.1). Any proposed backfit to the facility to implement the revised CofR shall be supported by technical evaluations as described in Section 5.3 below.

5.2 Code of Record Requirements for Major Modifications of Existing EM Facilities

A CofR shall be established for any major modification to an existing EM nuclear facility that affects the authorization basis or safety basis in accordance with the requirements below. The CofR shall serve as a management tool and source for the set of requirements used to design and construct the proposed modification of the EM nuclear facility, and to operate and decommission the EM nuclear facility over its remaining lifecycle.

- 5.2.1 The CofR shall be established for major modifications of existing EM nuclear facilities, where a CofR has not been previously established, during the design phase for the proposed modifications and must be submitted by the contractor for DOE review and approval. The existing Design Basis and Authorization Basis for the facility shall be evaluated in comparison to current Federal and state laws and regulations, codes and standards, and DOE directives to identify any significant changes that may need to be incorporated into the CofR for the proposed modification. Decision logic for this evaluation is described in Figure 5.2. Approval of the CofR shall be communicated to the contractor by the applicable Contracting Officer upon the recommendation of the applicable Federal Project Director.
- 5.2.2 Following the submittal and DOE approval of the CofR for the facility modification, the contractor shall maintain the CofR under a DOE-approved configuration control process throughout the lifecycle of the facility.
- 5.2.3 After the CofR is established and prior to construction of the facility modifications, any new requirements (e.g., requirements resulting from new laws or regulations, codes or standards, or DOE directives) or revisions to requirements previously identified in the CofR shall be evaluated to determine their impact on project safety, cost, and schedule. New or modified requirements shall be implemented and incorporated into the CofR if technical evaluations determine that there is a substantial increase in the overall protection of the worker, public, or environment, and that the direct and indirect costs of implementation are justified in view of this increased protection (see Figure 5.1). Approval for any changes to the CofR shall be communicated to the contractor by the applicable

Figure 5.2 – COR Decision Logic for Modifications to Existing EM Nuclear Facilities

1. Review the existing Design Basis and Authorization Basis for the facility. This would include the CofR, if previously approved for this facility.
2. Identify the set of current Federal and state laws and regulations, codes and standards, and DOE requirements that are applicable to the proposed facility modification.
3. Prepare a gap analysis to identify the difference between the existing Design Basis and Authorization Basis for the facility and the current set of requirements. Identify any incompatibilities between the existing design basis and the current standards.
4. Conduct technical evaluation to identify costs and benefits that would result from implementation of the current set of requirements (CofR) for this facility modification.
 - a. If use of the current set of requirements does not impose adverse cost or schedule impacts, these requirements should be documented as the CofR for the facility modification.
 - b. If use of the current set of requirements would result in adverse cost or schedule impacts:
 - i. Establish the CofR based on the current set of requirements, where use of the current requirements would result in increased protection of worker or public safety or the environment that is commensurate with the adverse impacts.
 - ii. Establish the CofR based on the design basis requirements, where use of the current requirements would not result in increased protection of worker or public safety or the environment commensurate with the adverse impacts.
5. Confirm that proposed CofR is consistent with the Authorization Basis for the facility and identify any revisions needed.

Contracting Officer upon the recommendation of the responsible Federal Project Director and Contracting Officer's Representative.

- 5.2.4 New requirements or changes to requirements previously identified in the CofR that are identified either by the contractor or by DOE after construction of the facility modification is completed, shall be evaluated to determine their impact on project safety, cost, and schedule. Such new or modified requirements shall be implemented and incorporated into the revised CofR if technical evaluations determine that there is a substantial increase in the overall protection of the worker, public, or environment, and that the direct and indirect costs of implementation are justified in view of this increased protection (Figure 5.1).
- 5.2.5 The CofR shall be included as part of the turnover documentation whenever there is a contractor change during the remaining lifecycle of the facility. To facilitate such transfers, the CofR and its supporting documents (e.g., as-build drawings, design calculations) shall be organized in a manner that supports accessibility, traceability, and maintainability.

5.2.6 The CofR shall be controlled and maintained current throughout the remainder of the facility lifecycle, and shall be maintained under configuration control to review and evaluate new and revised requirements and EM-approved exemptions from, or equivalencies to, requirements. New or revised requirements shall be identified and evaluated under the process outlined in Figure 5.1, and any proposed backfit to the facility to implement the revised CofR shall be supported by technical evaluations as described in Section 5.3 below.

5.3 Backfit Analysis Process

Over the lifecycle of any project or facility, requirements that pertain to the design, construction, and operation (e.g., Federal and state laws and regulations, DOE requirements, national codes and standards, state and local building codes) may change. Such changes in requirements for ORO EM nuclear facilities shall be evaluated with respect to impacts on project safety, cost, and schedule, to identify potential needs for a backfit. Backfit decisions for ORO EM nuclear facilities in response to new or revised requirements shall be made and documented in accordance with the following process.

5.3.1 Whenever a new or revised requirement is identified that has the potential to impact the CofR for an EM nuclear facility, the applicable Federal Project Director shall assign an appropriate staff person to conduct a preliminary evaluation of the change. The evaluation shall include: a determination of the applicability of the new or revised requirement to the EM facility; a gap analysis to identify the difference between the current CofR for the facility and the new or revised requirement; and an initial qualitative impact assessment of the potential impact of the new or revised requirement on safety, cost, and schedule. Based on the results of this preliminary evaluation, the analyst will make a recommendation to the Federal Project Director whether a more rigorous requirements analysis is appropriate.

5.3.2 Where a requirements analysis is determined to be appropriate, the Federal Project Director shall appoint a Backfit Review Committee to conduct the requirements analysis. The Backfit Review Committee shall be led by a qualified DOE lead reviewer and may include DOE staff, contractor staff, and technical consultants as appropriate. The backfit requirements analysis shall include the following elements:

- Identification of the new or revised requirements and the authority for the change.
- Description of the significance of the new or revised requirement for the particular EM nuclear facility and the need to consider a backfit.
- An alternatives analysis that identifies potential approaches to backfit the facility to meet the revised requirements. The alternatives analysis shall include a “no-backfit” alternative, in which no changes are made to the facility or its engineering and administrative controls, in order to provide a baseline for the cost-benefit analysis. A cost-benefit analysis will be prepared

to compare the relative costs and benefits of each alternative, with the level of detail in the analysis graded commensurate with the complexity of the proposed change and the magnitude of the associated costs and benefits.

- Benefits shall include any safety, cost, and schedule factors that would be favorably impacted by the backfit alternative. Factors to be considered include: the safety of facility workers, co-located workers, the public and the environment during normal operations and accident conditions; risk of property damage to this facility and other facilities; the performance, availability, and reliability of the facility operations; and the cost and schedule impacts related to facility construction, operation, maintenance and oversight.
- Costs shall include any safety, cost, and schedule factors that would be adversely impacted by the backfit alternative. In addition to the non-monetary factors noted above under benefits, monetary cost factors should include: the costs associated with implementing the facility design modifications; costs associated with developing and implementing new programs, processes or procedures; and costs associated with increases in recordkeeping and documentation.
- The degree of each benefit and cost factor identified shall be characterized in a comparative manner to facilitate the comparison of alternatives. Uncertainties in the cost-benefit analysis also shall be identified.
- A recommendation of the backfit alternative that best balances safety, cost, and schedule impacts, consistent with the facility mission. The rationale for the recommended alternative shall be presented based on the cost-benefit analysis.

5.3.3 The Backfit Review Committee shall provide the results of their evaluation and the recommended backfit alternative to the Federal Project Director for consideration. The Federal Project Director shall communicate the recommendation to the AMEM and other appropriate DOE authorities.

- Where the backfit analysis results in a decision to modify the facility design or operation and the facility CofR, the Backfit Review Committee shall prepare a description of the DOE-directed changes to the CofR to conform to the backfit decision for transmittal to the contractor by the responsible Contracting Officer's Representative. The contractor shall be required to prepare an implementation plan to document the actions required to implement the backfit decision and the budget and schedule impacts associated with those actions.
- Where the backfit analysis results in a decision that does not require changes to the facility design or operation, or to the facility CofR, the Backfit Review Committee shall develop a plan to complete any DOE exemption, exception, or variance process that may be applicable to the requirement evaluated.

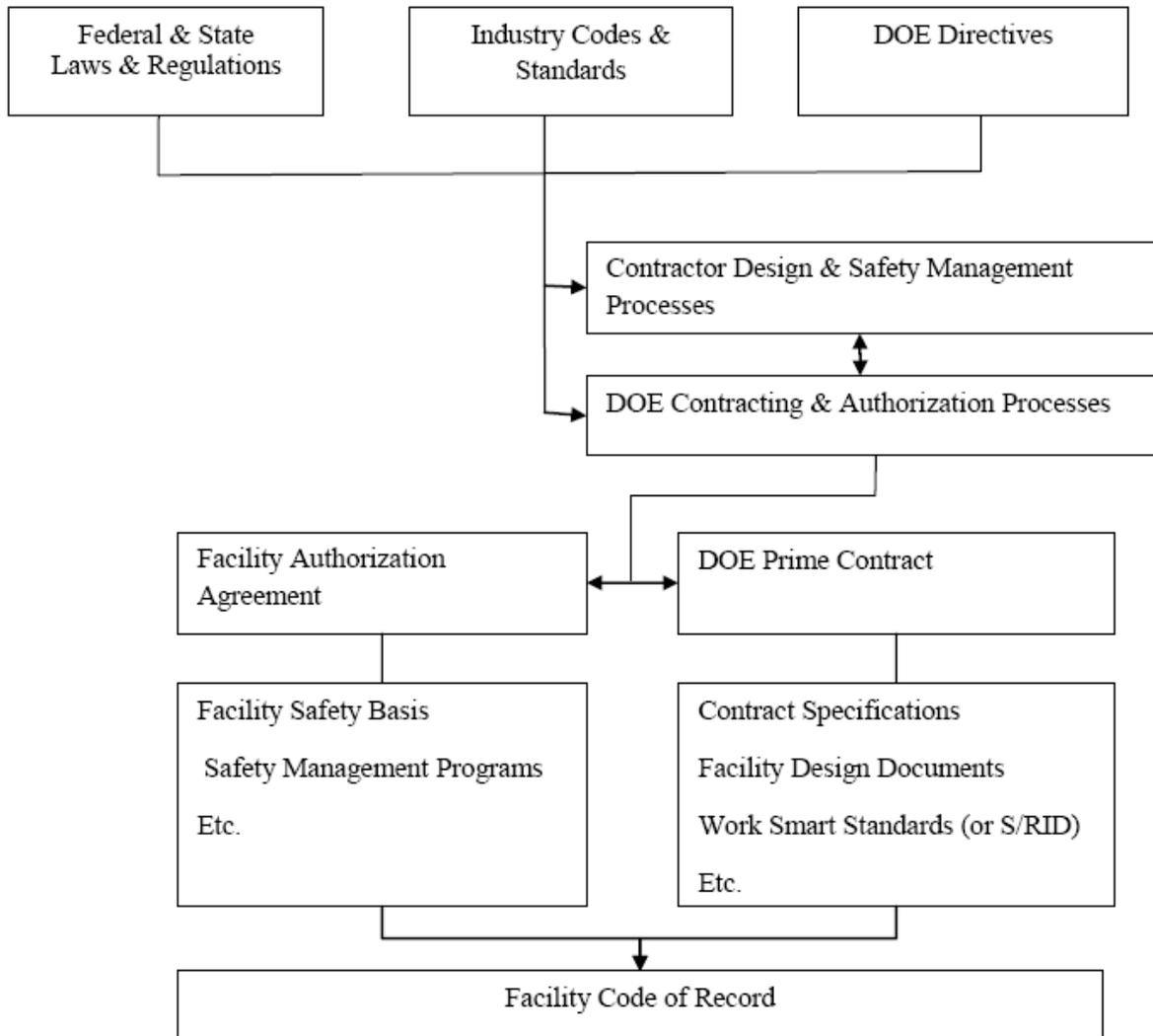
6.0 RECORDS

- 6.1 Records for contractor CofR submittals and DOE evaluation and review of each submittal, and for backfit decisions in response to new or revised requirements impacting the CofR for an applicable EM nuclear facility, shall be maintained in accordance with the established ORO EM records management system.

7.0 ATTACHMENTS

- 7.1 Code of Record Components
- 7.2 Example Code of Record Letter to Contractors

Attachment 7.1 – Code of Record Components



Attachment 7.2 – Example Code of Record Transmittal Letter

Contractor Name
& Address

Dear Mr. (Contractor):

CODE OF RECORD FOR EM NUCLEAR FACILITY (XXX)

The U. S. Department of Energy (DOE) Office of Environmental Management (EM) policy requires that a Code of Record must be established for all new EM nuclear facilities, for major modifications to existing EM nuclear facilities, and for other EM facilities identified by the DOE Assistant Secretary for Environmental Management and Field Office Managers where warranted by cost or program risks. The Code of Record is the set of Federal and state laws and requirements, DOE requirements, codes, standards, design documents, and other criteria that govern an EM nuclear facility. The Code of Record must be maintained current throughout the lifecycle of the EM nuclear facility, and must be evaluated on a regular basis to determine any new or revised requirements that may impact the Code of Record. New or revised requirements must be evaluated to determine their impact on project safety, cost, and schedule, before a decision is made whether to implement these changes at the EM nuclear facility and revise the Code of Record. Changes will be implemented where they result in a substantial increase in the overall protection of the worker, public or environment, and where the direct and indirect costs of implementation are justified in view of this increased protection.

Please submit the proposed Code of Record for the *(EM Nuclear Facility Name)* to me by *(date 30 days from date of this letter)*. Upon approval of the Code of Record by DOE, you are required to maintain the Code of Record under an approved configuration control program. Proposed updates to the Code of Record must be submitted at least annually, and whenever a change in a requirement is identified that may have a significant impact on the safety of the facility.

This letter is not considered to constitute a change to the contract. In the event the Contractor disagrees with this interpretation, it must immediately notify the Contracting Officer and otherwise comply with the requirements of the *Technical Direction* contract clause.

If you have any questions or if we can be of any further assistance, please contact me at *(xxx-xxxx)*.

Sincerely,

(Name of DOE COR)
Contracting Officer's Representative for
(Contractor)