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**Title 40 CFR Part 191  
Subparts B and C  
Compliance Recertification Application 2019  
for the  
Waste Isolation Pilot Plant  
Engineered Barriers  
(40 CFR 194.44)**



**United States Department of Energy  
Waste Isolation Pilot Plant**

Carlsbad Field Office  
Carlsbad, New Mexico

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**Compliance Recertification Application 2019**  
**Engineered Barriers**  
**(40 CFR 194.44)**

**Table of Contents**

44.0 Engineered Barriers (40 CFR 194.44) ..... 44-1  
    44.1 Requirements ..... 44-1  
    44.2 Background ..... 44-2  
    44.3 Changes or New Information since the CRA-2014 ..... 44-2  
    44.4 References ..... 44-2

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### **Acronyms and Abbreviations**

CCA	Compliance Certification Application
CFR	Code of Federal Regulations
CRA	Compliance Recertification Application
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
WIPP	Waste Isolation Pilot Plant

### **Elements and Chemical Compounds**

MgO	magnesium oxide
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## 44.0 Engineered Barriers (40 CFR 194.44)

### 44.1 Requirements

#### § 194.44 Engineered Barriers

(a) Disposal systems shall incorporate engineered barrier(s) designed to prevent or substantially delay the movement of water or radionuclides toward the accessible environment.

(b) In selecting any engineered barrier(s) for the disposal system, DOE shall evaluate the benefit and detriment of engineered barrier alternatives, including but not limited to: cementation, shredding, supercompaction, incineration, vitrification, improved waste canisters, grout and bentonite backfill, melting of metals, alternative configurations of waste placements in the disposal system, and alternative disposal system dimensions. The results of this evaluation shall be included in any compliance application and shall be used to justify the selection and rejection of each engineered barrier evaluated.

(c)(1) In conducting the evaluation of engineered barrier alternatives, the following shall be considered, to the extent practicable:

(i) The ability of the engineered barrier to prevent or substantially delay the movement of water or waste toward the accessible environment;

(ii) The impact on worker exposure to radiation both during and after incorporation of engineered barriers;

(iii) The increased ease or difficulty of removing the waste from the disposal system;

(iv) The increased or reduced risk of transporting the waste to the disposal system;

(v) The increased or reduced uncertainty in compliance assessment;

(vi) Public comments requesting specific engineered barriers;

(vii) The increased or reduced total system costs;

(viii) The impact, if any, on other waste disposal programs from the incorporation of engineered barriers (e.g., the extent to which the incorporation of engineered barriers affects the volume of waste);

(ix) The effects on mitigating the consequences of human intrusion.

(2) If, after consideration of one or more of the factors in paragraph (c)(1) of this section, DOE concludes that an engineered barrier considered within the scope of the evaluation should be rejected without evaluating the remaining factors in paragraph (c)(1) of this section, then any compliance application shall provide a justification for this rejection explaining why the evaluation of the remaining factors would not alter the conclusion.

(d) In considering the ability of engineered barriers to prevent or substantially delay the movement of water or radionuclides toward the accessible environment, the benefit and detriment of engineered barriers for existing waste already packaged, existing waste not yet packaged, existing waste in need of repackaging, and to-be-generated waste shall be considered separately and described.

(e) The evaluation described in paragraphs (b), (c) and (d) of this section shall consider engineered barriers alone and in combination.

## 44.2 Background

Assurance requirements are included in the disposal standard to provide additional confidence in the performance of the repository. Specifically, 40 CFR 194.44 ([U.S. EPA 1996](#)) implements the assurance requirement of 40 CFR 191.14(d) ([U.S. EPA 1993](#)) by requiring the Waste Isolation Pilot Plant (WIPP) design to include one or more engineered barrier. To meet this requirement, the U.S. Department of Energy (DOE) conducted a study of options for engineered barriers and determined that magnesium oxide (MgO) would be used as an engineered barrier at WIPP (Compliance Certification Application [CCA] Appendix EBS; [U.S. DOE 1996](#)). The WIPP continues to emplace MgO as its sole engineered barrier.

Information and data from previous compliance certification and recertification applications that form the basis of past DOE compliance positions and past U.S. Environmental Protection Agency (EPA) decision documents are found in the 2014 Compliance Recertification Application (CRA-2014) ([U.S. DOE 2014](#)).

## 44.3 Changes or New Information since the CRA-2014

The DOE has not changed the implementation of the MgO engineered barrier in the WIPP repository since the CRA-2014. Information relating to the emplacement of MgO, hydration tests and related experimental studies that have occurred since the CRA-2014 are found in Appendix MgO-2019. The CCA analysis that evaluated the benefit and detriment of engineered barrier alternatives continues to demonstrate compliance with the requirements of 40 CFR 194.44.

## 44.4 References

(\*Indicates a reference that has not been previously submitted.)

U.S. Department of Energy (DOE). 1996. Title 40 CFR Part 191 Compliance Certification Application for the Waste Isolation Pilot Plant (October). 21 vols. Carlsbad, NM: Carlsbad Area Office. DOE/CAO-1996-2184.

U.S. Department of Energy (DOE). 2014. Title 40 CFR Part 191 Subparts B and C. Compliance Recertification Application for the Waste Isolation Pilot Plant (March). Carlsbad, NM: Carlsbad Field Office. DOE/WIPP 2014-3503.\*

U.S. Environmental Protection Agency (EPA). 1993. 40 CFR Part 191 Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes: Final Rule. *Federal Register*, vol. 58 (December 20, 1993): 66398–416.

U.S. Environmental Protection Agency (EPA). 1996. 40 CFR Part 194: Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations: Final Rule. *Federal Register*, vol. 61 (February 9, 1996): 5224–5245.