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Engineering Change Order Part A

COMPLETED FEB 12 2009 ECO # 12137

1. ECO NUMBER: 12137	2. SYSTEM NUMBER: WH02	3. FACILITY NUMBER: 412	4. EQ.#: n/a	5. PAGE: 1 of 27

6. PROPOSER: Hardip Singh Dhingra EXT. 8524 | 7. COGNIZANT ENGINEER: Clair Ransom EXT. 8107

8. TITLE: Revising Specification D-0101 Rev. 7

9. DESCRIPTION: This ECO covers changes to the D-0101 Specification including the addition of "Procedure for Testing for the Periclase + Lime Content in MgO".

10. ASSOCIATED DOCUMENTS: ECP # 2-WH1109-002

11. SCREENING CONSIDERATIONS
USQ Number 09-003

	ATTACHED	EXCLUDED/EXEMPTED/NEGATIVE	PROCEDURE REFERENCE
			WP 02-AR3001
NEPA	☑	☐	WP 02-EC3801
EC	☑	☐	WP 02-EC3801
ALARA	☑	☐	WP 12-2
HWFP	☑	☐	WP 02-PC3001
CC	☑	☐	WP 02-PC3003

12. MODIFICATION IN PROGRESS? NO ☑ YES ☐ FIELD WORK COMPLETED: _____ / _____
CE NAME (PRINT/SIGN) DATE

TEMPORARY MODIFICATION? NO ☑ YES ☐

TEMPORARY MODIFICATION REMOVED: _____ / _____
CE SIGNATURE DATE

TEMPORARY MODIFICATION TO BE MADE PERMANENT:

_____ / _____ _____ / _____ _____ / _____
COG OPS MGR SIGNATURE DATE | CE SIGNATURE DATE | CM SIGNATURE DATE

ASSOCIATED WORK ORDERS: NONE

13. ADDENDUM SHEETS ADDED:

1 _____ / _____ 2 _____ / _____ 3 _____ / _____ 4 _____ / _____ 5 _____ / _____
EFR Initials Date | EFR Initials Date | EFR Initials Date | EFR Initials Date | EFR Initials Date

14. APPROVAL:

Curtis Clarke / 1-15-09
COGNIZANT MANAGER (PRINT & SIGN) DATE

Clair B. Ransom / Clair B. Ransom / 1-5-2009
COGNIZANT ENGINEER (PRINT & SIGN) DATE

M Feathley / 1/6/2009
OTHER ASSIGNED APPROVAL (PRINT & SIGN) DATE

15. ADMINISTRATIVE DISTRIBUTION COPY TO:

☐ SURFACE FAC OPS _____ ☐ U/G FAC OPS _____
☐ WORK CONTROL _____ ☐ OTHER _____
☐ FPE _____

16. DOCUMENT VALIDATION:

COMPONENT INDICES CHANGE(S) REQUIRED? NO ☒ YES ☐
DATABASE UPDATED:

_____ / _____
SIGNATURE DATE

EFR PERSONNEL Claudia Mazallanes 2/11/09
SIGNATURE DATE

COGNIZANT ENGINEER: Clair B. Ransom 12-12-09
SIGNATURE DATE

CMS DATABASE CHANGE(S) REQUIRED? NO ☒ YES ☐
DATABASE UPDATED:

_____ / _____
SIGNATURE DATE

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ENGINEERING CHANGE ORDER CONTINUATION SHEET

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ENGINEERING CHANGE ORDER

----------> Continued from Page 1, Section 9:

The safety factor for the MgO, used as an engineered barrier at WIPP has been 1.67; however, a safety factor of 1.2 is now acceptable by the EPA as long as the Reactivity (mole % Periclase + Lime) of the MgO is above 96%.

A new test of the MgO was developed by Sandia National Laboratory (SNL) to satisfy EPA requirements to permit dropping the safety factor from 1.67 to 1.2. SNL has determined that the test, which will be titled "Reactivity (mole % Periclase + Lime) Acceptence test", should be added to specification D-0101. The Reactivity test will be performed by an outside laboratory.

After recalculating the past MgO Emplacement Data and substituting a safety factor of 1.2 instead of 1.67, WWIS determined that a combination of 3000 lbs and 4200 lbs nominal weight bags would be most economical and decrease the use of BRTs. WH operations will utilize WWIS calculations to determine which size bag gets emplaced on the top of each waste stack in order to meet the safety factor of 1.2 and minimize the use of BRTs.

The following changes are proposed to the Specification D-0101:

1. Section 3.4.1, instructions to MgO bag filler will be modified to state that WTS will inform the bag filler what size bags are needed i.e. 3000 lbs +/- 50 lbs or 4200 +/- 50 lbs of MgO.

2. Existing Attachment B of Specification D0101 will reflect a title change from "Detailed MgO Reactivity Test Procedure" to "Phosphoric Acid Temperature Rise Procedure". This test is currently and will continue to be performed by Martin Marriatta. The title revision is to avoid confusion with another Reactivity test being added to the specification (see step # 3).

3. Attachment C will be added to the Specification and will be titled "Reactivity (mole % Periclase + Lime) Acceptence Test".

4. Attachment D will be added to the Specification and it will be titled "Sample Analysis Report". This Attachment will explain to the laboratory that will perform the "Reactivity (mole % Periclase + Lime) Acceptence Test", how to report the test results.

NOTE From CM: This change has been directed by SNL and DOE
attached 1/15/09

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DESIGN DOCUMENT CHANGE SHEET

ECO No.: 12137

Page: 3

1. TITLE AND DOCUMENT NUMBER: Revising Specification D-0101 Rev. 7

REVISION: 8

SYSTEM: WH02

D-0101, Rev. 7

2. ECO SEARCH LIST: None

3. DESCRIPTION:

Page i: Change the title of Attachment B from "Detailed MgO Reactivity Acceptance Test Procedure" to "Phosphoric Acid Temperature Rise Procedure"

Page i: Add Attachment C, title which is "Reactivity (mole % Periclase + Lime) Acceptance Test"

Page i: Add Attachment D, title which is "Sample Analysis Report"

Page 2: Paragraph 3.3.1 C, should read "Backfill material shall be tested as outlined in Attachment B, and shall meet the temperature rise listed in the test procedure."

Page 3: Paragraph 3.4.1 should read "The supplier shall provide backfill containers which comply with the requirements for super sacks as outlined in section 3.3.2 above. Depending upon the needs of WIPP, the super sack shall be filled with either 3000 +/- 50 or 4200 +/- 50 pounds of backfill material as specified in section 3.3.1 above".

Page 6: Change the title from "Detailed MgO Reactivity Acceptance Test Procedure" to "Phosphoric Acid Temperature Rise Procedure"

Page 8: Add procedure with title "Reactivity (mole % Periclase + Lime) Acceptance Test"

Page 10: Add procedure with title "Sample Analysis Report".

4. DOCUMENT CE APPROVAL: Claire B. Ransom DATE: 1-5-2009

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NEPA Checklist	
Activity/Project Title and Number: Upgrading of D-0101, ECP 2-WH09-002	Originating Department/Manager: IWHE
Cognizant Individual: Hardip Singh Dhingra	Extension: 8524
Attachment Documentation Type:	

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SEC NEPA/ER Coordinator: Complete this checklist for proposals that are not listed in Attachment 1 and do not screen negative on the Environmental Review form, or those which are brought to the attention of the NEPA/ER Coordinator as not directly supporting the WIPP mission. Retain in office files and provide to the CBFO NCO upon request.

SEC NEPA/ER Signature — Date: 12/22/06

POSSIBLE ENVIRONMENTAL IMPACT(S)	Yes	No
1. Does the proposal change the impact of WIPP operations* on biological resources, other natural resources, or land use?		✓
2. Does the proposal change the impact of WIPP operations on surface or subsurface water resources or water quality?		✓
3. Does the proposal change the impact of WIPP operations on air quality?		✓
4. Does the proposal change the impact of WIPP operations on human health (including accident impacts and long-term performance of the repository)?		✓
5. Does the proposal change the impact of WIPP operations on waste generation and disposal?		✓
6. Does the proposal change the impact of WIPP operations on socioeconomic conditions?		✓
7. Does the proposal change the impact of WIPP operations on cultural, archeological, or historic resources?		✓
8. Does the proposal change the impact of WIPP operations on noise levels?		✓

* The term "WIPP operations" in the above table includes not only operation of the WIPP site but also waste transportation and characterization activities conducted by the DOE at the generator sites.

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Environmental Review Form		
Activity/Project Title and Number: 2-WH09-002, Upgrading of D-0101 Rev. 7 Spec.	Originating Department/Manager: IWHE	
Cognizant Individual: Hardip Singh Dhingra		Extension: 8524
Purpose for activity/project: The purpose of this ECP is to cover changes in D-0101 spec. to include the addition of Periclase + Lime Test		

Cognizant Individual, evaluate the proposed action as follows:

Environmental Concern	Yes	No
1. Will the activity be performed outside of the WIPP Property Protection Area? (NOTE: Land Use Request Required if "yes")		✓
2. Will the project/activity be performed to support an action that is not directly related to supporting the WIPP mission (e.g., a request from an outside entity to perform experiments at WIPP)?		✓
3. Will the project/activity result in the sustained emission into the atmosphere of fugitive dust, or gases other than (other than O_2, N_2, or CO_2)?		✓
4. Will the action require the construction or installation of any fuel combustion equipment such as a diesel generator, even on a temporary basis?		✓
5. Will the action/project require use of any of the storage tanks currently on-site or the installation of new storage tanks?		✓
6. Will the action/project introduce additional process equipment that will contain radioactive material or involve managing/processing radioactive material?		✓
7. Will the action involve construction of new facilities or demolition of existing facilities?		✓
8. Will the action/project involve construction on, or modification of, a wastewater treatment system?		✓
9. Will the action/project involve the discharge of water (this includes collected storm water in an excavation[s])?		✓
10. Will the action/project occur in or around any catch basin(s) or sewage lagoon(s)?		✓
11. Will this action/project potentially result in impacts to groundwater?		✓
12. Will the action/project involve asbestos removal(s) (this includes trailer insulation)?		✓
13. Will the action involve the use of chemicals, pesticides, or herbicides that are not applied by a licensed contractor, or that are not already available at the WIPP site with an approved Material Safety Data Sheet?		✓
14. Will this action/project generate waste that is **NOT** listed in Attachment 3 of WP 02-EC3801? If "yes," enter the waste types, provide forecast quantities or each waste type (volume, weight, etc.) and how the waste will be handled (e.g., stored or shipped off-site).		✓

If all of the questions above were answered "no," sign below, mark N/A across page 2, and transmit a copy of this page to the NEPA/ER Coordinator.

CI Signature — Date: 12/2/08

My signature certifies that I understand the environmental concern questions as they relate to the proposed activity/project, and that I have completed this form accurately.

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ALARA SCREENING CHECKLIST

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This checklist will be completed if the ECP or ECO impacts the waste handling facilities/ equipment/processes, current and future waste disposal circuits, and exhaust (including the exhaust filter building and associated fans and ducts). This checklist need not be completed for documentation changes (e.g., prints, SDDs) for ECPs/ECOs that have received an ALARA screening or for changes that do not impact operating characteristics of a component/system.

Design Document No.: ECP 2-WH09-002

Design Document Title/Description:
Upgrading of Specification D-0101 MgO Safety factor

		Yes	No
1.	Work or modification affecting a current or future Radiological Area?		✓
2.	Radiation monitoring or sampling systems, or modifications that may result in the need to alter or add such systems?		✓
3.	Work or modifications on a ventilation system affecting a radiological area?		✓

Cognizant Engineer: Clair Ransom (Printed Name) Clair B. Ransom (Signature) 12-1-2008 (Date)

Maintain a copy this checklist with the ECP/ECO. Forward the original checklist to the ALARA Coordinator.

The following to be completed by ALARA Coordinator.

WP 12-2 Attachment 2 sections to be completed as part of review:

[X] No further review is required
[ ] A Access Control and Radiological Boundaries
[ ] B Shielding, and Other Means of Dose Rate Reduction
[ ] C Control of Airborne Radioactivity
[ ] D Isolation and Decontamination
[ ] E Sampling and Radiation Monitoring
[ ] F Accessibility
[ ] G Industrial Safety/Hygiene Issues
[ ] H Other Exposure-Reduction Features
[ ] I Optimization and Exposure of the Public and Environment

ALARA Committee Review Required [ ] Yes [X] No (Section 7.2)

Remarks Does not impact radiological conditions

Tom Cuff 12/2/08 OS TEG 1/14/09
ALARA Coordinator Date

Tom Cuff N/A 12/2/08 OS TEG 1/12/09
ALARA Committee Chairperson Date

Remarks Attached [ ] Yes [X] No

Original
If Stamp color is Blue

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ECP# 2-WH09-002

WIPP HWFP Screen Sheet

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Proposed Activity Number: ECP 2-WH09-002
(e.g., document number with Rev. number, ECP number, etc.)

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Proposed Activity Title: Upgrading of D-0101 Rev. 7 Spec.
(e.g., change title, ECP title, ECO number, etc.)

Section A

ANSWER ALL QUESTIONS 1 THROUGH 4	YES	NO
1. Will this action change the facilities, equipment, systems, or components described in the HWFP? If **YES**, indicate the facility, equipment, system, or component number(s).		✓
2. Will this action change implementation of work processes described in the HWFP? If **YES**, briefly describe the processes.		✓
3. Will this action change or affect a procedure, PM, or controlled document listed in or referenced by the HWFP; or will it change or affect a section of a procedure, PM, or other controlled document that implements HWFP requirements? If **YES**, indicate procedure, PM, or controlled document number(s) and title(s).		✓
4. Will this action change a Training Program described in the HWFP? If **YES**, indicate the HWFP Training Program(s) and section(s).		✓

Section A Completion

	YES	NO
If ANY answer above is **YES**, check YES, mark the signature block **N/A**, and **GO TO** Section B. If **NO**, check NO and sign the certification statement below. I certify that the proposed change will have no impact on HWFP compliance.		✓

HWFP Permit Screener: 12/2/08 (Date) Steven Travis (Printed Name) (Signature)

The Manager's approval of the "Proposed Activity" constitutes approval of HWFP screen.

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WIPP HWFP Screen Sheet

Section B		
1. Will the action change facilities, equipment, systems, or components described in the HWFP change in such a manner that the HWFP description would no longer be accurate? If **YES**, indicate the HWFP section(s), page number(s), drawing or figure number(s), and title(s).	YES	NO ✓
2. Will the proposal change any work process described in the HWFP such that the HWFP description would no longer be accurate? If **YES**, indicate the HWFP section(s), and page number(s).	YES	NO ✓
3.a Will procedures, PMs, or other controlled documents that are listed in the HWFP be changed such that the listing or content would no longer be accurate? If **YES**, indicate the HWFP section(s), and page number(s).	YES	NO ✓
3.b Will procedures, PMs, or other controlled documents that implement HWFP requirements change such that there is no longer an implementing mechanism in place to assure the requirements will be met? If **YES**, indicate the HWFP section(s), and page number(s).	YES	NO ✓
4. Will training programs described in the HWFP change such that the training program would no longer be consistent with the content and description in the HWFP? If **YES**, indicate the HWFP training program(s) and section(s).	YES	NO ✓

Section B Completion

Will the proposed change be inconsistent with, or impact compliance with, the HWFP? If **NO**, check NO and enter approvals below. If **YES**, check YES; SEC make recommendations to begin an HWFP modification per WP 02-PC3002.	YES	NO ✓

	Date	Printed Name	Signature
HWFP Permit Screener:	12/12/08	Stan Travis	
SEC	12/12/08	"	

The Manager's approval of the "Proposed Activity" constitutes approval of HWFP screen. The SEC signature indicates either agreement that the proposal may proceed without further HWFP activity (indicated by the "No" box being checked); or agreement that an HWFP modification must be obtained prior to the proposal being implemented (indicated by the "Yes" box being checked).

Attachment 4 - Compliance Certification/Recertification and PCB Screening and Evaluation Worksheet

Compliance Certification/Recertification and PCB Screening and Evaluation Worksheet	
Procedure or Document Number and Title: Upgrading of specification D-0101, ECP 2-WH09-002	
Will this activity result in a change to any of the documents listed in Attachment 2 of this procedure?	Yes X No
Will this activity result in a facility modification or expansion?	Yes No X
Will this activity result in a new PCB/TRU storage area?	Yes No X
Will this activity result in a change to facility or repository design?	Yes No X
Will this activity result in a change in waste characterization?	Yes No X
Will this activity result in a change to one of the following monitoring programs; Geomechanical Monitoring, Waste Characterization Monitoring, Groundwater Surveillance, Subsidence Monitoring, Delaware Basin Monitoring, or Environmental Monitoring? Note: This includes plans and procedures.	Yes No X
Will this activity result in a change to the waste emplacement or Mg0 emplacement process?	Yes No X
Will this activity result in a change to Quality Assurance requirements, as described in 40 CFR §194.22, "Quality Assurance Program Requirements for Nuclear Facilities" (NQA-1-1989), ASME's "Quality Assurance Requirements of Computer Software for Nuclear Facility Applications" (Part 2.7 of NQA-2a-1990 addendum to ASME NQA-2-1989), or ASME's "Quality Assurance Requirements for the Collection of Scientific and Technical Information on Site Characterization of High-Level Nuclear Waste Repositories" (NQA-3-1989 edition), excluding Sections 2.1(b), 2.1(c), and 17.1?	Yes No X
Will this activity involve any experimental work in the WIPP underground?	Yes No X

SCREENER: Hardip Singh Dhingra H.S. Dhingra 01/05/09

Print Name Signature Date

This section is only completed if one of the above questions is answered yes.

EPA Compliance Programs Evaluator Approved X Disapproved

Larry Madl Larry J. Madl 12/17/2008

Print Name Signature Date

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Title: ECO 12137, Revising Specification D-0101 Rev. 7

Scope: Specification D-0101 is the specification for prepackaged MgO backfill. The safety factor of MgO is changed 1.67 to 1.2 with the development, by Sandia National Laboratory, of the "Reactivity (mole % +Periclase + Lime) Acceptance Test." The development of the new tests resulted in the following changes to Specification D-0101; the addition of a new weight of a super sack of MgO (in addition to the 4200 ± 50 lbs. super sack of MgO, a 3000 ±50 lbs super sack of MgO can now be used), changing the title and content of Attachment B from "Detailed MgO Reactivity Test Procedure" to "Phosphoric Acid Temperature Rise Procedure", adding Attachment C, "Reactivity (mole % Periclase + Lime) Acceptance Test', and the addition of Attachment D which will describe how the new test, Reactivity (mole % Periclase + Lime) Acceptance Test, is performed and how to report the test results.

Description: Specification D-0101 identifies the design requirements of MgO super sacks, including the functional requirements, material requirements, fabrication requirements, the packaging and shipping requirements, and the QA requirements and receipt inspections. MgO super sacks are used in the underground, with a super sack placed on the top of each CH waste stack. MgO is not associated with or used with RH waste disposal.

Safety Basis Documentation Reviewed:

DOE/WIPP-07-3372, Rev. 0, WIPP DSA
DOE/WIPP-07-3373, Rev. 0, WIPP TSRs
DOE/WIPP 95-2065, Rev. 10, CH DSA, w/approved page changes
DOE/WIPP 95-2125, Rev. 10, CH TSRs, w/approved page changes
WP 02-AR3001, Revision 7, Unreviewed Safety Question Determination

Other References:
NONE

1. Does the proposed activity or PISA increase the probability of occurrence of an accident previously evaluated in the existing safety basis?

   [X] No [ ] Yes/Maybe

   Basis: Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO do not increase the probability of occurrence of an accident previously evaluated in the existing safety basis. Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO are not accident initiators, do not change the equipment important to safety (EIS) or the frequency of use of the EIS as evaluated in the CH and the WIPP DSAs, do not change the CH waste handing process as described in the CH and the WIPP DSAs, and do not change the material at risk (MAR) of any accident as evaluated in the CH and the WIPP DSAs. Therefore, there is no increase in the probability of occurrence of an accident previously evaluated in the CH or the WIPP DSAs.

2. Does the proposed activity or PISA increase the consequences of an accident previously evaluated in the existing safety basis?

   [X] No [ ] Yes/Maybe

   Basis: Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO do not increase the consequences of an accident previously evaluated in the existing safety basis. Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO are not accident initiators, do not change the EIS or frequency of use of EIS, and do not change the material at risk (MAR) in the underground as evaluated in the CH and WIPP DSAs. Therefore, there is no increase in consequences of any accident previously evaluated in the CH or the WIPP DSAs.

3. Does the proposed activity or PISA increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the existing safety basis?

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[X] No [ ] Yes/Maybe

Basis: Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO do not increase the probability of occurrence of a malfunction of EIS previously evaluated in the CH or the WIPP DSAs. Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO are not accident initiators, do not change the EIS or increase the frequency of use of any EIS evaluated in the CH or WIPP DSAs.

4. Does the proposed activity or PISA increase the consequences of a malfunction of equipment important to safety previously evaluated in the existing safety basis?

[X] No [ ] Yes/Maybe

Basis: Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO does not increase the consequences of a malfunction of EIS previously evaluated in the CH DSA or the WIPP DSA. Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO are not accident initiators, do not change the EIS or the frequency of use of EIS as described in the CH or WIPP DSAs, do not change the material at risk (MAR) or container(s) damage ratio of any accident evaluated in the CH or WIPP DSAs. Therefore, there is no increase in consequences of a malfunction of EIS previously evaluated in the existing CH or WIPP DSAs.

5. Does the proposed activity or PISA create the possibility of an accident of a different type than any previously evaluated in the existing safety basis?

[X] No [ ] Yes/Maybe

Basis: Revising the MgO Specification D-0101 and allowing the use of 3000 ±50 lbs super sacks of MgO do not create the possibility of an accident of a different type than any previously evaluated in the CH or the WIPP DSAs. Because the use of super sacks of MgO will remain the same as described in the CH and the WIPP DSAs, the EIS or frequency of use of EIS remains the same as evaluated in the CH and the WIPP DSAs, there is no change to the CH waste handling process, or the types of accidents evaluated in the CH or the WIPP DSAs.

6. Does the proposed activity or PISA create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in the existing safety basis?

[X] No [ ] Yes/Maybe

Basis: Revising the MgO Specification D0101 and allowing the use of 3000 ±50 lbs super sacks of MgO do not create any new accident initiators or change the EIS or the frequency of use of any EIS as evaluated in the CH or the WIPP DSAs. The proposed activity will not create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in the CH DSA or the WIPP DSA.

7. Does the proposed activity or PISA reduce a margin of safety?

[X] No [ ] Yes/Maybe

Basis: Revising the MgO Specification D0101 and allowing the use of 3000 ±50 lbs super sacks of MgO will not reduce the margin of safety because there is no change in the analyzed accidents in the CH or WIPP DSAs, and there is no change in the CH or WIPP TSRs controls, or their bases.

Conclusion:

[X]All questions above were answered "No"; therefore, no USQ exists.

[ ] One or more of the above questions was answered "Yes"; therefore, DOE approval is required prior to

performing the proposed activity. ECO # 12137 PAGE 12	
Safety basis change required?	[X] No[ ] Yes, change number
Summary of change required: The addition of the 3000 ±50 lbs super sack of MgO and its allowed use will require revising section 2.4.5.7 of the CH DSA (DOE/WIPP 95-2065) and section 2.4.4.5 of the WIPP DSA (DOE/WIPP-07-3372) to include its description.	

USQ Evaluator #1	**USQ Evaluator #2 (Independent Reviewer)**
(Print Name) Wayne Patton	(Print Name) Patty Hollen
Wayne Patton 01-13-2008	Patty Hollen 01-13-2008
Signature Date	Signature Date

NRB REVIEW (If Required)

Meeting No.:		Date:	
NRB Chairman Concurrence:		Date:	
	Signature		

OTHER REVIEW (If Required)

Print and Sign:		Date:	

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HSD 1/14/09

Specification D-0101
Revision Number ~~7~~ 8
Revision Date ~~05/12/05~~ 01/05/09
ECO Number ~~11280~~ 12137

SPECIFICATION
FOR
PREPACKAGED MgO BACKFILL

U.S. DEPARTMENT OF ENERGY
WASTE ISOLATION PILOT PLANT

WASHINGTON TRU SOLUTIONS LLC
CARLSBAD, NEW MEXICO

Cognizant Engineer ~~Curtis Chester~~ Clair Ransom / 05/12/05
Approved for Use Date

Cognizant Manager ~~Randy D. Elmore~~ Curtis Chester / 05/12/05
Approved for Use Date

U. S. DEPARTMENT OF ENERGY
WASTE ISOLATION PILOT PLANT

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MSD 1/14/09

SPECIFICATION D-0101
Prepackaged MgO Backfill

Table of Contents

SPECIFICATION D-0101 RECORD OF REVISION

ECO/REV#/DATE	PAGES AFFECTED	REVISION DESCRIPTION
8613 Rev. 0 5-23-97	All	Specification Created
8852 Rev. 1 12-18-97	2	Revised 3.3.1.3; deleted CAA test and reaction time, added reference to Attachment 1.
	5	Added 3.5.3.4 to require marking date of fill on sacks. Deleted text and title of 5.1 and 5.1.1 requiring a QA program complying with NQA-1, moved 5.2 Submittals to 5.1.
	10 & 11	Added Attachment 1, specifying the reactivity test equipment and procedure.
9724 Rev. 2 03-08-00	2, 3, 4, 6, Attachment A & B	Reduced the min bulk density to 87 lb/ft^3, increased the super sack height from 24.5 to 25.5 inches, and increased the super sack weight from 4,100 to 4,200 lb.
9753 Rev. 3 04-04-00	2	Clarify material requirements.
10,182; Add. 1 Rev. 4 12-18-02	All	Remove minisacks - approved by EPA All sections reformatted Figure 3.2 deleted since no longer referenced. Subsequent figures re-numbered.
10874; Rev. 5 10-31-03	Cover page	Changed company name to Washington TRU Solutions LLC and changed Cog Eng
11168, Rev. 6 12-16-04	1 4	Removed WP 13-1 section references. Updated 3.5.3, added 3.5.3E, and 5.1.4.
11282, Rev.7 05/09/05	1 through 7	Updated 1.0 Scope. Updated 3.2.3, 3.3.1B, 3.3.1D, 3.3.2E, and 4.1. Delete Figures 3.1, 3.2, and 3.3.

1.0 SCOPE

This specification covers the definition of the pre-packaged backfill material to be emplaced in the underground areas at the Waste Isolation Pilot Plant (WIPP). The backfill material will be Magnesium Oxide (MgO), furnished in one bulk package configuration; a super sack. The super sack shall be shipped on a support sheet and racks. The support sheet and rack are supplied by the purchaser.

2.0 APPLICABLE DOCUMENTS

The requirements of this specification have precedence over all referenced documents. Where this specification appears to conflict with the requirements of a referenced document, such conflicts shall be brought to the attention of the purchaser for resolution.

2.1 References

The codes, specifications, and standards referred to by number or title form a part of this specification. They are not furnished with the contract documents.

Code of Federal Regulations:

Title 29, Part 1910 (29 CFR 1910)	Occupational Safety and Health Standards
Title 30, Part 57 (30 CFR 57)	Safety and Health Standards - Metal and Non-Metal Underground Mines

Waste Isolation Pilot Plant, Washington TRU Solutions LLC

WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description

3.0 PRODUCT AND DESIGN REQUIREMENTS

3.1 General Requirements

3.1.1 The materials and packaging shall conform to this specification. The packaging shall be capable of transporting the backfill material without breaking or a loss of contents.

3.1.2 The vendor shall provide an Material Safety Data Sheet (MSDS) and a certified material composition analysis for each lot of MgO material. This submittal is only required when a new lot of MgO is introduced.

3.1.3 The vendor shall provide an MSDS and flame spread, smoke generation, and decomposition product information for the super sack bag material. This submittal is only required when a new bag material is introduced.

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3.2 Functional Requirements

3.2.1 Supplier filled super sacks will be handled during transportation to the WIPP, at receipt and during material handling operations on support sheets.

3.2.2 Supplier filled super sacks are to be placed on a support sheet suitable for the application.

3.2.3 The filled super sack must be able to retain its contents for a period of two years after emplacement without rupturing from its own weight.

3.3 Material Requirements

3.3.1 Backfill Material Requirements

A. The sum of magnesium oxide (MgO) plus calcium oxide (CaO) shall be a minimum of 95%, with MgO being no less than 90%. The remainder of the material shall not contain any items considered hazardous to people or the environment.

B. Backfill material shall be of a dry granular form, which shall contain less than 0.5% particles which would be retained on a ASTM E11-04 9.5mm (3/8 inch) sieve (3/8" x down).

C. Backfill material shall be tested ~~for reactivity~~ as outlined in Attachment B, and shall meet the temperature rise listed in the test procedure.

D. The backfill material shall have a minimum loose bulk density of 87 lb/ft^3 (± 5 lb/ft^3).

3.3.2 Backfill Super Sack Material Requirements

A. The super sack shall be constructed of woven polypropylene material, with a minimum weight of 8.0 ounces per square yard, coated or uncoated. Assembly shall be by normal bag fabrication methods (i.e., sewing, gluing, etc. Alternate materials and/or fabrication methods are acceptable subject to approval by WTS Engineering prior to shipment). Poly Vinyl Chloride (PVC) material is not acceptable.

B. The assembled (empty) dimensions of the super sack shall be a hexagon which is nominally 61 inches across the flats (a 61-inch inscribed circle) and nominally 25.50 inches high (47.6 ft^3). The super sack shall be constructed such that it retains its shape well enough to not deform beyond a 65-inch hexagon with 12-inch radius corners after filling and shipping.

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C. The assembled super sack shall have the capacity to transport a minimum of 4,250 pounds of a material with a loose bulk density as specified in Section 3.3.1D. The super sack shall be designed to comply with the requirements of the Flexible Intermediate Bulk Container Association (FIBCA), including a safety factor of five to one (5:1) on the working load.

D. Any fill opening shall be closed to prevent leakage of material during shipping and handling. No discharge opening is required.

E. The super sack shall function as a barrier to atmospheric moisture and carbon dioxide (CO_2) which is equivalent to or better than that provided by a standard commercial cement bag. If required, an independent liner may be added. The liner may be a separate part or attached to the super sack at the manufacturer's option.

3.4 Fabrication Requirements

depending upon the needs of WIPP

3.4.1 The supplier shall provide backfill containers which comply with the requirements for super sacks as outlined in Sections 3.3.2 above. The super sack shall be filled with 4,200 ± 50 pounds of backfill material as specified in Section 3.3.1 above either 3000 +/- 50 pounds or

3.5 Packaging and Shipping Requirements

3.5.1 Filled backfill containers shall be delivered to the WIPP site by commercial carrier. Shipment racks and containers will be provided by the purchaser. These will be in the form of stackable/collapsible racks for the super sacks (one per rack).

3.5.2 All items shall be packaged as required to provide protection from damage during shipping and handling.

3.5.3 Each individual backfill container shall be clearly labeled with the following information and a copy of the label shall be supplied to the WIPP Waste Handling Operations representative at delivery:

A. The backfill material name as it appears on the MSDS.

B. All applicable hazard warnings.

C. The backfill material manufacturer's name and address. If the vendor supplying the filled backfill containers is not the backfill material manufacturer, then both the backfill material vendor's name and address, and the name and address of the vendor supplying the filled containers shall also appear on each container.

D. The date the backfill container was filled with backfill material.

E. The weight of the super sack as indicated on the calibrated scale at the time of filling.

4.0 FIELD EXECUTION

4.1 Inspection

All shipments of backfill containers will undergo random receiving inspection at the WIPP. Containers shall be inspected for:

- Shipping damage.
- Proper markings per 3.5.3.

There are no inspections required other than receiving inspection at the WIPP, as outlined above.

5.0 QUALITY ASSURANCE REQUIREMENTS

5.1 Submittals

5.1.1 The supplier shall provide a certified material composition analysis and an MSDS when introducing a new lot of MgO.

5.1.2 The supplier shall provide an MSDS, flame spread, smoke generation, and decomposition information for the bag material when changing the approved bag material.

5.1.3 The supplier shall provide a certificate of compliance stating that the filled containers meet this specification with each shipment.

5.1.4 The vendor shall supply the scale calibration data, including make, model, and calibration records once every calibration period at the time of calibration (at a minimum).

DOCUMENT SUBMITTAL REQUIREMENTS

SUBMIT DOCUMENTS PRIOR TO THE POINTS INDICATED BY THE CODE BELOW:

F – FABRICATION
T – TESTING
S – SHIPMENT
C – FILLING CONTAINERS
A – FINAL ACCEPTANCE

Document Requirements	See Paragraph	For Approval	For Record
1. MSDS, flame spread, smoke generation, and decomposition information for Bag Material (only required for change in approved bag material).	3.1.3	F	
2. MSDS for MgO Material (only required when introducing a new lot of MgO).	3.1.2	C	
3. MgO certified material composition analysis (only required when introducing a new lot of MgO).	5.1.1	C	
4. Certificate of Compliance (required for each shipment).	5.1.2		A
5. Scale calibration documentation.	5.1.4		A

Equipment Needed:

1. A drying oven able to sustain a temperature of approximately 100°C.

2. An NIST-traceable partial-immersion thermometer (or electronic equivalent) able to measure temperatures from 20°C to at least 55°C, with increments of 0.1°C, for measuring MgO solution temperature rise. A second NIST-traceable full-immersion thermometer (or electronic equivalent) with increments of 1°C for measuring room air temperature. A third NIST-traceable full- or partial-immersion thermometer, depending on oven configuration (or electronic equivalent) with increments of 1° for measuring oven air temperature.

3. A means of supporting the thermometer in a 400 mL beaker so that the fluid level will be at the immersion mark on the thermometer.

4. An analytic balance accurate to within ± 0.01 g, calibrated with NIST traceable standards.

5. A plastic-coated magnetic stir bar 1-3 inches in length and a stir plate to drive it.

6. A source of deionized water.

7. A source of ACS Reagent Grade 85% phosphoric acid.

8. 400-mL glass beakers.

9. Stopwatch (optional).

10. Scientific notebook (or suitable alternative which provides permanent archiving of recorded information).

Procedure:

1. Mix one liter of 20% ± 0.1% phosphoric acid (by weight) from deionized water and reagent grade 85% phosphoric acid. After mixing, allow the temperature to return to within 3°C of room temperature (20 to 30°C).

2. Dry at least 60 g of as-received MgO pellets. The sample should be either dried overnight or until it is verified that the center of the MgO mass has been at approximately 100°C for at least half an hour. Verify the drying temperatures using an NIST-traceable thermometer. Pellets should be at room temperature (20 to 30°C) before being tested.

3. Weigh 300 ± 0.5 g of 20% phosphoric acid into a glass 400 mL beaker. Record the weight in the scientific notebook (or suitable alternative).

4. Place a piece of insulating cardboard on the stir plate and then place the beaker on the cardboard. Put a stir bar in the solution and initiate stirring so that a dimple about 1-2 cm deep forms in the center of the beaker.

5. Put the thermometer in the phosphoric acid to the immersion line and fix it in this position so that it cannot change during the remainder of the test.

6. Note the temperature and do not proceed until it has stabilized (e.g.,does not change by more than 1°C in two minutes). Record the temperature once it has stabilized.

7. Weigh 18.00 ± 0.1 g of pre-dried as-received MgO pellets. Record the weight in the scientific notebook (or suitable alternative).

8. Add the MgO to the phosphoric acid and note the starting time of the experiment to the nearest second. Alternatively, start the stopwatch.

9. At one-minute intervals, record the temperature in the scientific notebook (or suitable alternative). Continue taking temperature measurements until the temperature starts to fall (about 30-35 minutes).

10. Perform three replicates of this procedure.

    To be acceptable, the average maximum temperature rise observed in the three replicates must be at least 20°C.

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Reactivity (mole % Periclase + Lime) Acceptence Test Procedure

Quantitative weight measurements should be performed accurately to 0.1 mg. Balances should be calibrated or cal checked daily or before use, using non-expired masses that have been cal-checked against NIST traceable masses. Temperature tolerances are given in the procedure. Thermocouples with their associated meters must be calibrated or cal checked with a frequency that is not less than the manufacturer's recommendation, against non-expired NIST traceable temperature standards.

1 SAMPLE ACCEPTANCE AND CHAIN OF CUSTODY

1. Inspect sample. The color should be white to off-white. The material should be hard and granular. There should be no signs of adulteration. The sample must come with the Analysis of Shipment sheet provided by the manufacturer.
2. If the sample is acceptable, fill out the chain of custody form. A copy of this form will be transmitted to the WIPP contract Site Technical Representative (STR) with the analysis report within 48 hours of sample acceptance.
3. If the sample is not acceptable, the sample should be rejected and the WIPP contract STR must be contacted within 2 hours of the determination to obtain another sample or arrange for a new sample to be taken.

2 COMPOSITING SAMPLES

1. Remove 10-10.01 g (weighed accurately to 0.01 g) from each of the samples that the WIPP contract STR has specified to be composited. Mix well and place into a new container, appropriately labeled, before proceeding.

3 HYDRATION AT 245 °C

1. Place 10 ml of DI water and 1 g to 1.1 g (weighed accurately to 0.1 g) of MgO into a Parr Acid Digestion Bomb.
2. Stir contents with a stir rod to ensure the MgO is wetted. Remove stir rod making sure that significant quantities of solid or liquid are not lost.
3. Close vessel.
4. Repeat steps 1-3 to produce 3 separate samples.
5. Place Parr Bombs into a furnace. Heat the bombs in furnace to a temperature of between 245 - 250 °C.

6. Maintain furnace at 245 - 250 °C for 2 hours, measured from the time when the furnace reaches its set point. One hour after the furnace reaches its set point check and record the furnace temperature.
7. Remove Parr Bombs from furnace and cool until bombs are able to be safely handled.
8. If a Parr Bomb is dry upon opening, the sample will be discarded. Replacement samples for the dry bomb(s) will be prepared if more than 1 bomb is dry upon opening.

4 LOSS ON IGNITION

1. Have crucibles available that have been previously ignited for 1 hour at 800-810 °C and placed in a desiccator.
2. Remove hydrated MgO samples from furnace in Section 3. Cool until the material can be safely handled.
3. Filter MgO using vacuum filtration and Whatman 40 (or equivalent) filter paper. Rinse the solid sample with DI water several times.
4. Remove ignited crucibles from desiccator and weigh each crucible to an accuracy of 0.1 mg. Record crucible mass ($Mass_{DC}$).
5. Place each hydrated MgO sample (without the filter paper) into an individual crucible from step 4.
6. Place crucibles into a furnace.
7. Heat crucibles in furnace to 200-210 °C, maintain at 200-210 °C for 1 hour.
8. Remove crucibles from oven.
9. Allow crucibles to cool (~ ½ hour) in a desiccator.
10. Measure and record the crucibles mass ($Mass_{200C}$) to 0.1 mg accuracy.
11. Place crucibles back into furnace kept at 200 °C.
12. Heat furnace to 800-810 °C at a rate not more than 15 °C/min.
13. Hold furnace at 800-810 °C for 20 minutes. Check and record furnace temperature.
14. Allow furnace to cool to a temperature at which the crucibles can be safely removed (about 500 °C).
15. Remove crucibles from oven, allow to cool (~ ½ hour) in desiccator.
16. Measure and record crucible masses ($Mass_{800C}$) to 0.1 mg accuracy.
17. Enter the masses $Mass_{DC}$, $Mass_{200C}$, and $Mass_{800C}$ into cells B4 through D6, and the chemical-compositional analysis into cells B16 through C19 for this lot on the attached Excel analysis worksheet template. Transmit the worksheet to the WIPP contract STR within 48 hours of sample acceptance.

Attachment D

Sample Analysis Report

LOI results **Lot Number:** s34f **Date Shipped:** 12/10/2008

Sample ID	Mass DC (g)	Mass 200 C (g)	Mass 800 C (g)	Weight loss %	Notebook	Notebook pg
1	32.9	33.72	33.475	29.87804878		
2	32.9	33.73	33.475	30.72289157		
3	32.9	33.72	33.475	29.87804878		

Average weight loss % 30.15966304

Notes: Hello

Standard deviation % 0.48777021

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Sample Analysis Report

Chemical Analysis

	wt %	uncertainty (wt %)
CaO	1	1
SiO2	1	0.5089107
Al2O3	1	0.0566613
Fe2O3	1	0.04337461

Molecular formulas	**Mineral Names**	**MW (g/mol)**
Al2O3		101.9602
Fe2O3		159.6922
SiO2		60.0843
Ca(OH)2	Portlandite	74.0926
H2O		18.01528
Mg(OH)2	Brucite	58.31968
MgO	periclase	40.3044
CaO	lime	56.0774

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Sample Analysis Report

Mole fraction periclase + lime

	Average	Standard Deviation
Mole % periclase + lime	**97.9**	**5.8**
wt % periclase + lime	96.9	3.3

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