

## DEVELOPMENT OF THE WIPP WASTE ACCEPTANCE CRITERIA (WAC) AND THE EVOLUTION OF "NEW" REQUIREMENTS AND CRITERIA

Dan Standiford and Ken Mikus  
Westinghouse Electric Corp.  
Waste Isolation Division  
Carlsbad, NM 88220

Hal Davis  
U. S. Department of Energy  
WIPP Project Site Office  
Carlsbad, NM 88220

### ABSTRACT

The Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC) were developed to provide performance requirements to ensure the public health and safety, and the safe handling of waste at WIPP. Initially, the WAC were written to address only WIPP Operations and Safety Criteria. Numerous new requirements and criteria have since evolved from other aspects of the WIPP program, which precipitated a recent WAC revision. The evolution of the WAC has enhanced the WIPP objective of ensuring the public health and safety, and the safe handling and storage of waste.

### INTRODUCTION

The Department of Energy (DOE) Waste Isolation Pilot Plant is a mined geologic repository, located in southeastern New Mexico, designed to demonstrate the safe disposal of defense related transuranic (TRU) waste in bedded salt 655 m (2150 ft) underground. Shipments of TRU waste will originate from ten DOE TRU waste generator/storage sites. These DOE sites must comply with the requirements in the Waste Acceptance Criteria (WAC) in order to certify their TRU waste for shipment and disposal at WIPP.

The Waste Acceptance Criteria Certification Committee (WACCC), a standing committee within the DOE Albuquerque Operations Office, is responsible for conducting WAC certification and compliance audits at the DOE sites. Upon successful completion of these audits, the WACCC can grant certification authority to the DOE sites for certification of TRU waste for future shipment to WIPP. The WIPP has started the project test phase and is scheduled to receive the first test waste this year. Through the evolution of the WAC the DOE can provide reasonable assurance that operational safety is maintained, that wastes will be safely packaged and transported, and that all environmental standards are fully complied with.

### HISTORICAL BACKGROUND

The Waste Acceptance Criteria (WAC) for the Waste Isolation Pilot Plant were initially developed by a DOE steering committee in 1978 and 1979, which generated the first version of the WAC, WIPP-DOE-069, in May 1980. This original version was followed by a series of revisions that included the results of ongoing project activities and reviewer comments.

Revision 1 was published in September 1981, and was a result of consultations between the Environmental Evaluation Group (EEG) and the DOE Albuquerque Operations Office WIPP Project. The EEG is an independent organization chartered with evaluation of safety and health related aspects of the WIPP. Revision 2, September 1985, resulted from continued interactions with the EEG and other WIPP program participants. The first DOE generator/storage site WAC certification programs were approved to Revision 2, in 1985.

Revision 3 was issued in January 1989. These early revisions dealt only with the WIPP site specific criteria for the safe handling and disposal of waste. For example, these requirements included the restrictions on the amount of liquids and particulate in the waste.

Numerous other program documents were prepared to address other requirements (Table I), such as those resulting from the Resource Conservation and Recovery Act (RCRA) administered by the EPA and the Transuranic Package Transporter-II (TRUPACT-II) Certificate of Compliance (C of C) issued by the U.S. Nuclear Regulatory Commission (NRC).

### KEY DEVELOPMENTS IN THE WIPP PROGRAM

Several key developments in the WIPP Program have occurred since revision 3 of the WAC. Among the most significant of these development are:

- August 1989, the NRC issued the initial Certificate of Compliance (C of C) (Rev. 0) for the TRUPACT-II package to be used in transportation of contact-handled (CH) waste. The current revision of the C of C was issued in August 1991 (Rev. 3).
- April 1990, the DOE issued the "WIPP Test Phase Plan: Performance Assessment".
- November 1990, the EPA granted a No Migration Determination for WIPP.
- October 1991, the responsibilities of the DOE WIPP Project Office (WPO) were distributed between two new offices, the DOE WIPP Project Integration Office (WPIO) and the DOE WIPP Project Site Office (WPSO).
- November 1992, the WIPP RCRA Part B Permit Application was revised and submitted to the New Mexico Environment Department (NMED) for review and approval. The Secretary of the NMED expects to complete the approval process for the RCRA Part B Permit by October 1993 (Espinosa 1992).

These developments in the WIPP Program precipitated the changes in the requirements and criteria forming the WAC. Revision 4, is the most current revision of the WAC

**TABLE I**  
Regulations Governing Tru Waste Disposal at the WIPP

Regulation	Issue	Regulatory Agency	Applicable Document
WIPP Operations and Safety 10 CFR Part 71	Waste Acceptance at WIPP Packaging and Transportation	WACCC NRC <sup>1</sup>	WIPP-WAC Revision 4 TRUPACT-II <sup>2</sup> SARP <sup>3</sup> and Certificate of Compliance
40 CFR Part 191 Subpart A	Management and Storage of TRU Waste Prior to Disposal	EPA-ORP <sup>4</sup>	Bin-Scale and Other Test Plans and Associated Documents
40 CFR Part 191 Subpart B	Disposal of TRU Waste	EPA-ORP	
40 CFR Part 264	Standards for Owners and Operators of Hazardous Waste TSD <sup>7</sup> Facilities Interim Standards for Owners and Operators of Hazardous Waste TSD Facilities Land Disposal Restrictions	NMED <sup>5</sup>	WIPP RCRA <sup>6</sup> Part A and Part B Permit Applications
40 CFR Part 265		NMED	
40 CFR Part 268		EPA-OSW <sup>8</sup> and EPA Region VI	
49 CFR Part 173 Subpart I	Transportation	DOT <sup>9</sup>	TRUPACT-II SARP

1. Nuclear Regulatory Commission  
2. Transuranic Package Transporter model II  
3. Safety Analysis Report for Packaging  
4. Environmental Protection Agency - Office of Radiation Protection  
5. New Mexico Environment Department  
6. Resource Conservation and Recovery Act  
7. Treatment Storage and Disposal  
8. Environmental Protection Agency - Office of Solid Waste  
9. Department of Transportation

and includes additional WIPP Operations and Safety Criteria; waste package requirements for transportation; RCRA requirements; and Performance Assessment criteria. A summary of the WAC, Revision 4 for Contact Handled (CH) TRU waste is provided in Table II. This latest revision clarifies existing criteria and requirements, consolidates the numerous applicable criteria into one document, identifies limiting requirements, reflects the existing WIPP program, and generally creates an easier to use document. This revision does not invalidate existing certification of waste at the DOE sites using Revision 3 of the WAC, but rather builds upon existing certification programs to include test phase input, TRUPACT-II shipping, and waste characterization requirements for generator/storage sites participating in the WIPP Test Program.

#### MAJOR CHANGES IN THE WAC REVISION 4

There were several major changes in the WAC from revision 3 to revision 4. The purpose of most of these changes was to clarify existing criteria, rather than adding new criteria.

The following criteria are among the major changes in revision 4.

- The criteria on allowable free liquids in TRU waste has been revised to provide more specific guidance to the DOE sites. The terms "residual liquids" and "well-drained container" are defined.
- The criteria on corrosives has been revised to require treatment of corrosive wastes for removal of the hazardous characteristic. This change complies with more restrictive transportation criteria and precludes packaging of untreated corrosive materials for emplacement at WIPP.
- Criteria requiring a 20 year design waste container design life from the date of certification, has been deleted. The new criteria states that waste containers must meet and maintain a United States Department of Transportation (DOT) Type A packaging specification from the time of certification to emplacement in WIPP.

- QA programs submitted for approval to the WACCC, must now meet the minimum requirements of DOE Order 5700.6C.

These changes to the WAC have enhanced the overall WIPP objective of ensuring the public health and safety, and the safe handling of waste at WIPP. As the WAC continues to evolve, criteria will be revised or added to meet new requirements for waste shipped to WIPP.

#### WASTE CERTIFICATION PROCESS FOR REVISION 4

The waste certification process described in Revision 4 of the WAC is two-stage. The first stage consists of certification of each TRU waste container. This certification involves requirements from the WIPP Operations and Safety Criteria, and transportation waste package requirements.

Waste stream specific certification is the second stage of the certification process. This certification is based on the waste stream, waste content code, and item description code (IDC) (TRUCON 1991). Requirements for waste stream certification include RCRA requirements (including the WIPP No Migration Determination), and Performance Assessment Criteria. Not all of the requirements for the second stage are known at present. As more data is collected prior to the WIPP disposal phase, many of these unknown requirements will be developed.

DOE sites not immediately involved in the test phase are advised to work toward waste package certification at the present with emphasis on documenting process knowledge of newly generated waste. The current WIPP Waste Character-

ization Program Plan (WCPP) has been revised to provide the sites with guidance on this second stage certification.

#### SUMMARY

Revision 4 of the WIPP Waste Acceptance Criteria (WAC) has been written to address changes in regulations and criteria affecting TRU waste destined for disposal at WIPP. The WAC has been revised to include key developments in the WIPP program. Ten DOE sites will comply with WAC requirements to ship and certify TRU wastes to WIPP for disposal. The WACCC waste certification process is two-stage, including TRU package and waste stream specific certification. The evolution of the WAC has enhanced the WIPP objective of ensuring the public health and safety, and the safe handling and storage of waste.

#### REFERENCES

1. U.S. Department of Energy. "Waste Acceptance Criteria for the Waste Isolation Pilot Plant," DOE/WIPP-069, Revision 4, December 1991
2. ESPINOSA, J. M., Secretary of the New Mexico Environment Department, Speaker at the "Fundamentals of New Mexico Environmental Law Compliance Course," December 10, 1991, Albuquerque, NM
3. U.S. Department of Energy. "TRUPACT-II Content Codes (TRUCON)," DOE/WIPP 89-004, Revision 5, April 1991

**TABLE II**  
Summary of WAC Limiting Parameters for CH-TRU Waste

<b>WASTE CONTAINER REQUIREMENTS/CRITERIA</b>		
Criterion/Requirement and Section	Limiting Parameter(s)	Sources of Limits
Waste Containers 3.2.1	Containers shall be noncombustible and meet Department of Transportation (DOT) Type A packaging requirements.	1
	Current Transuranic Package Transporter model II (TRUPACT-II) requirements limit acceptable containers to 208-liter (55-gallon drums), standard waste boxes (SWBs), or SWB overpack of 208-liter (55-gallon) drums or test bins.	2
Waste Package Size 3.2.3	Current TRUPACT-II limits are 208-liter (55-gallon drums) in two seven-packs, or two SWBs.	2
Waste Package Handling 3.2.3	All packages shall be configured as specified in the TRUPACT-II Safety Analysis Report for Packaging (SARP) (see 3.2.2 above).	2
<b>WASTE FORM REQUIREMENTS/CRITERIA</b>		
Immobilization 3.3.1	Waste materials shall be immobilized if > 1% by weight is particulate material < 10 microns in diameter, or if > 15% by weight is particulate material < 200 microns in diameter.	1
Liquids 3.3.2	Only residual liquids; as a guideline, residual liquid in well-drained internal containers to be restricted to approximately 1 volume % of the internal container; aggregate amount of residual liquid < 1 volume % of external container.	1
Pyrophoric Materials 3.3.3	No non-radionuclide pyrophorics permitted. Radionuclides in pyrophoric form are limited to < 1% by weight in each waste package.	2,3
Explosives and Compressed Gases 3.3.4	No explosives (49 CFR Part 173, Subpart C) are permitted. No compressed gases are permitted.	1,2,3 2
TRU Mixed Wastes 3.3.5	Transuranic (TRU) wastes shall contain no hazardous wastes unless they exist as co-contaminants with transuranics. Waste generators must determine if their waste is regulated by the Resource Conservation and Recovery Act (RCRA), and meet the requirements in the WIPP RCRA Part A and Part B Permit Applications.	1 3
TRU Mixed Wastes 3.3.5	Generators must document procedures for sampling, analytical protocols, QA/QC guidelines, and other information called for in 40 CFR 264.13 and 265.13 in site-specific Quality Assurance Project Plan (QAPJP).	3
	Characteristic ignitable (D001), corrosive (D002), and reactive (D003) wastes are not acceptable at WIPP.	1,2,3
	Any waste container sent to WIPP or loaded into a bin destined for WIPP must meet the two times (2X) the maximum comparability requirement for 5 nonflammable volatile organic compounds (VOCs) as specified in the no migration determination (NMD).	3
	Any waste container sent to WIPP must meet the ten times (10X) the average comparability requirement for nonflammable VOCs as specified in the NMD.	3
	Sludges shall be analyzed for total VOCs and toxic metals specified in the NMD.	3
Specific Activity of Waste 3.3.6	Waste shall be greater than 100 nanocuries of TRU per gram of waste, exclusive of added shielding, rigid liners, and the waste containers, including alpha contaminated wastes handled as TRU under DOE Order 5820.2A.	3
<b>WASTE PACKAGE REQUIREMENTS/CRITERIA</b>		

**TABLE II (CONT.)**  
Summary of WAC Limiting Parameters for CH-TRU Waste

	TRUPACT-II payload is limited to 3,295 kg (7265 lbs).	2
	TRUPACT-II is limited to 8,730 kg (19,250 lbs) total gross weight, with a total shipment gross vehicle weight (GVW) of 36,281 kg (80,000 lbs).	2
Nuclear Criticality (Pu-239 FGE) 3.4.2	Accepted package limits, including two times the error, are: < 200g/208 liter (55-gallon drum) < 325g/SWB	2
	The sum of the fissile gram equivalent (FGE) of all packages in a TRUPACT-II payload shall be < 325g.	2
Pu-239 Equivalent Activity 3.4.3	Waste packages shall not exceed 1,000 Ci of Pu-239 equivalent activity (PE-Ci).	1
Surface Dose Rate 3.4.4	Drums or SWBs shall not exceed 200 mrem/hr surface reading, or 10 mrem/hr at 2 m.	1,2
	Shielded containers are allowed for ALARA purposes only.	2
	Neutron contributions of > 20 mrem/hr shall be separately documented.	1
	External dose rates on the loaded TRUPACT-II shall not exceed 200 mrem/hr surface, or 10 mrem/hr at 2 m.	2
Removable Surface Contamination 3.4.5	Removable package surface contamination shall not be > 50 pCi/100 cm <sup>2</sup> alpha, and not > 450 Pci/100 cm <sup>2</sup> beta/gamma.	1
Thermal Power 3.4.6	Thermal (wattage) limits for individual waste packages, including the error, are contained in the TRUPACT-II SARP.	2
	TRUPACT-II load limits are contained in the TRUPACT-II SARP.	2
	TRUPACT-II design limit is 40 watts.	2
Gas Generation 3.4.7	All confinement layers, such as bags, shall be closed only by a twist-and-tape or fold-and-tape method.	2
	No sealed containers > 3.8 liters (1 gallon) may be in the waste.	2
	The maximum number of confinement layers shall be known.	2
	Waste packages emplaced in WIPP during the experimental period shall not exceed 50% of the lower explosive limit in any layer of confinement for hydrogen and methane.	3
	Total flammable VOCs are limited to 500 ppm in the headspace gas of waste packages.	2
	Total flammable VOCs are > 500 ppm in headspace, a flame test must be performed prior to emplacement in the WIPP.	3
	If total flammable VOCs are > 500 ppm in headspace, a Le Chatelier calculation is necessary.	3
	All chemicals/materials > 1% by weight must be evaluated for compatibility within the waste form and with TRUPACT-II materials of construction.	2
	Trace chemicals (< 1 weight % limit) must total < 5% by weight of the waste in any package.	2
	Cemicals/materials present in concentrations greater than one weight percent, shall conform to the allowable chemicals in each waste material type.	2
	Real-time radiography (RTR) or equivalent examination.	4
	Visual characterization of solid waste for 10 waste material categories listed in the Quality Assurance Program Plan (QAPP).	4

**TABLE II (CONT.)**  
Summary of WAC Limiting Parameters for CH-TRU Waste

Gas Generation 3.4.7	Analysis of sludges for pH and major cations and anions listed in the Quality Assurance Program Plan (QAPP).	4
	Total alpha activity of waste on a container basis using methodology listed in the QAPP.	4
	All waste packages shipped in TRUPACT-II shall be vented with one or more filters that meet specifications listed in the TRUPACT-II SARP.	2
	All rigid liners shall be punctured or vented.	2
Labeling 3.4.8	A unique identification barcode label reasonably expected to last 10 years shall be affixed.	1,2
	Each package shall have appropriate DOT labels.	1,2,3
	Each package shall be marked with the shipping category.	2
<b>DATA PACKAGE REQUIREMENTS/CRITERIA</b>		
Data Package/ Certification 3.5.1	A data package with certification shall be transmitted prior to shipment.	1
	Documentation for certification of individual packages or a group of packages for shipment in each TRUPACT-II unit shall be submitted.	2
	A hazardous waste manifest shall be utilized for each shipment of TRU mixed waste.	3
	Information required by the Waste Characterization Program Plan (WCPP) shall be provided.	4
<b>OTHER REQUIREMENTS/CRITERIA</b>		
Additional Requirements 3.6.1	All packages in a single TRUPACT- II shall belong to the same shipping category.	2
	Each package shipped shall belong to one of the content codes defined in the TRUPACT-II Content Codes (TRUCON).	2
	Retrievably stored waste that has been unvented shall be vented and aspirated per the TRUPACT-II SARP.	2
	Payload control procedures outlined in Section 7.4.3 of the TRUPACT-II SARP shall be followed.	2
Source(s) of Limit(s):		
1. WIPP Operations and Safety Criteria		
2. Transportation: Waste Package Requirements: TRAMPAC		
3. RCRA Requirements		
4. Performance Assessment Criteria		