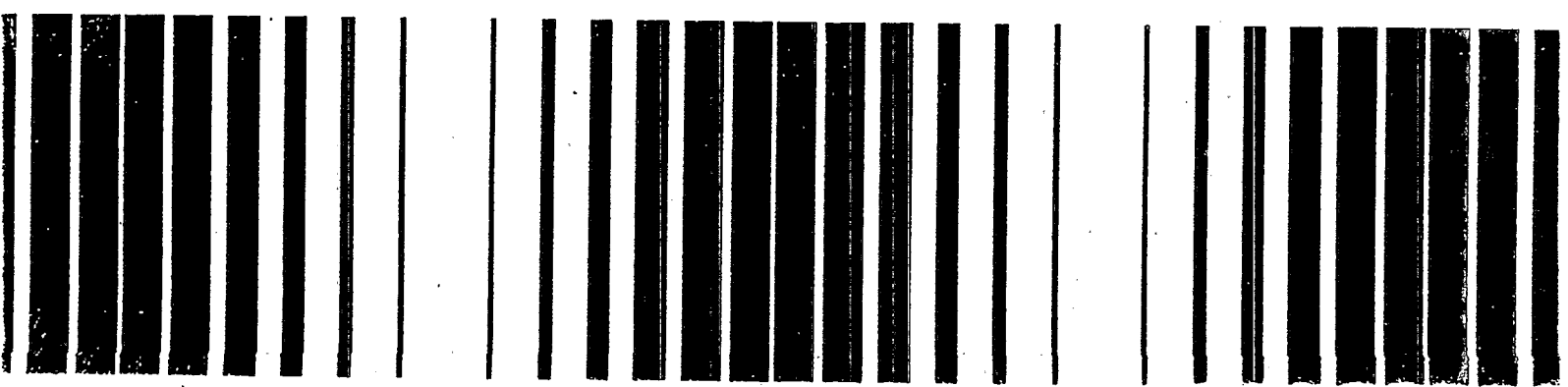




Seminar on the Use of Treatability Guidelines in Site Remediation Stabilization/Solidification





Superfund Policy Guidance: Immobilization

- Inappropriate for Volatile Organics
- Appropriate Only for Materials Containing Inorganics and sometimes Semi-Volatile Organics and Non-Volatile Organics

A



Superfund Policy Guidance: Immobilization

- Use of Immobilization for Semi-Volatile and Non-Volatile Organics Requires Either Site-Specific Treatability Studies OR Non-Site-Specific Treatability Study Data for "Similar Waste"
- "Similar Waste" is Defined in Terms of the Contaminants, Concentrations, and Waste Matrix
- Total Waste Analysis (TWA)

B



Solidification/Stabilization Applicability

- Soils
- Sediments
- Sludges

C

**GUIDE FOR CONDUCTING
TREATABILITY STUDIES
UNDER CERCLA:
Solidification/Stabilization**

A

Presentation Outline

- Introduction
- Technology Description
- Role of Treatability Studies
- Process Parameter Development
- Treatability Tiers
- Sampling Issues and Other Considerations

B

**Regulatory Basis for the Use
of Solidification/Stabilization**

- National Oil and Hazardous Substances Contingency Plan (NCP)
- Draft ROD Policy Guidance (OSWER Directive No. 9200.5-220)

C



Identify Problems of Waste Handling

- Debris
- Mixing
- Emissions
- Analyses

A



Assess Waste Uniformity

- Multiple Wastes
- Homogeneous or
Heterogeneous Waste
- Worst Case Concentrations
vs. Average Case
Concentrations

B



Measure Volume Increase Associated with Processing

- Space Available for
Disposal
- Other Limitations

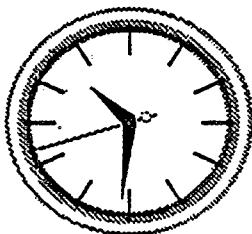
C

Solidification/Stabilization Process

- In-Situ
- Excavation

A

When to Perform Treatability Testing



As Soon As Possible

B

Potential Goals for Treatability Studies

- Identify Problems in Waste Handling
- Assess Waste Uniformity
- Measure Volume Increase Associated with Processing
- Develop Processing Parameters and Achievable Treatment Levels

C

Evaluate Physical Characteristics

- Unconfined Compressive Strength (UCS) (ASTM D1633-34)
- Permeability (TMSWC-13)
- Wet/Dry (ASTM D4843-88)
- Freeze/Thaw (ASTM D4842-90)

A

Other Parameters to Evaluate During Curing

- Off Gassing
- Curing Temperature
- Moisture Content
- Additive Ratios


B

Percent Reduction Calculation

$$\left(1 - \frac{\text{Additive Ratio}}{1 + \text{Additive Ratio}}\right) \times \frac{\text{Treated Concentration}}{\text{Raw Concentration}} \times 100$$

Where Additive Ratio = $\frac{\text{Weight of Additives}}{\text{Weight of Waste}}$

C



Develop Processing Parameters and the Level of Processing Control

A

- Perform Tiered Treatability Testing
- Evaluate Chemical Characteristics
- Evaluate Physical Characteristics
- Estimate Treatment Costs



Perform Treatability Testing

B

- Representative Number of Samples
- Homogenization of Raw Waste Samples
- Multi-Tier Treated Sample Evaluation

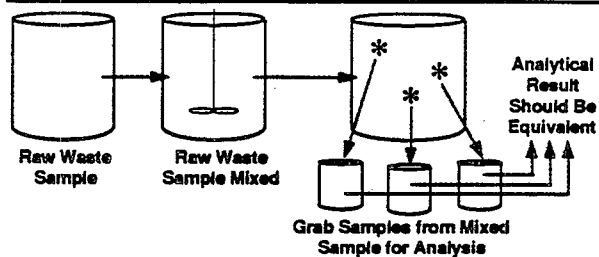


Evaluate Chemical Characteristics

C

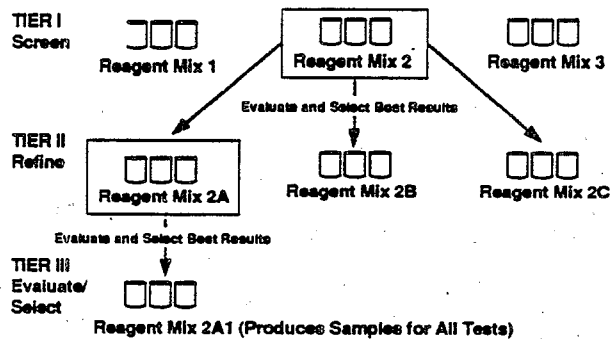
- Toxicity Characteristic Leaching Procedure (TCLP 55FR26986 June 1990)
- Toxicity Characteristic Leaching Procedure – Distilled H₂O
- Total Waste Analysis – Semi-Volatile Organics (EPA Method SW 846-8270)
- Total Waste Analysis – Volatile Organics (EPA Method SW 846-8240)

Homogenized Raw Waste Sample Evaluation



A

Multi-Tiered Treated Sample Evaluation



B

Additional Considerations

- Chain-of-Custody of Raw, Treated, and Reserve Samples
- Direct Observation of Mixing and Castings
- Independent Qualified Analysis
- Final Report
- Vendor Field Tests

C

**Time Line Required for
Treatability Tests**

Tier I -- Treat and Screen

- Cure 14-28 Days
- Analyze Treated Samples 21 Days
- Interpret Results and Reformulate 7 Days

A

**Time Line Required for
Treatability Tests**

Tier II -- Refine and Retreat

- Cure 14-28 Days
- Analyze Treated Samples 21 Days
- Interpret Results and Reformulate 7 Days

B

**Time Line Required for
Treatability Tests**

Tier III -- Evaluate/Select Remedy

- Cure 28 Days
- Analyze Treated Samples 21 Days
- Interpret Results and Report 14 Days

C

11. Schiegel, R. 1989. Residues from High Temperature Rotary Kilns and Their Leachability. Presented at the Forum on Innovative Hazardous Waste Treatment Technologies: Domestic and International, W&E Environmental Systems, Germany. June 19-22.
12. Sell, N.J. et al. 1992. Solidification and Stabilization of Phenol and Chlorinated Phenol Contaminated Soils, 2nd Volume. ASTM STP 1123. T.M. Gilliam and C.C. Wiles, Eds, ASTM Philadelphia, PA, p. 73-85.
13. Sims, R.C. 1990. Soil Remediation Techniques at Uncontrolled Hazardous Waste Sites: A Critical Review. Journal of the Air and Waste Management Association Reprint Series, No. RS-15, Air and Waste Management Association, Pittsburgh, PA, 43 p.
14. U.S. Environmental Protection Agency. 1991. The Superfund Innovative Technology/Evaluation Program: Technology Profiles, Fourth Edition. EPA/540/5-91/008, OSWER and ORD, Washington, D.C.
15. U.S. Environmental Protection Agency. 1989. Immobilization Technology Seminar: Speaker Slide Copies and Supporting Information. CERL-89-222. Center for Environmental Research, Cincinnati, OH.
16. U.S. Environmental Protection Agency. 1989. Generic Treatability Protocol for Solidification/Stabilization Treatment for Contaminated Soils.
17. U.S. Environmental Protection Agency. 1989. Stabilization/Solidification of CERCLA and RCRA Wastes: Physical Tests, Chemical Testing Procedures, Technology Screening, and Field Activities, Report No. EPA/625/6-89/022, Center for Environmental Research Information, Cincinnati, Ohio, 82 p.
18. U.S. Environmental Protection Agency. 1989. Technology Evaluation Report: SITE Program Demonstration Test, In Situ Stabilization/Solidification, Hialeah, Florida, Vol. I. Report No. EPA/540/5-89/004a, Center for Environmental Research Information, Cincinnati, Ohio.
19. U.S. Environmental Protection Agency. 1989. Soil Sampling Quality Assurance User's Guide. Second Edition, EPA/600/8-89/046. March
20. U.S. Environmental Protection Agency. 1986. Handbook for Stabilization/Solidification of Hazardous Wastes. EPA/540/2-86/001. Hazardous Waste Engineering Research Laboratory, Cincinnati, OH.
21. Weitzman, L. et al. 1989. Volatile Organic Emissions from Stabilized Hazardous Waste. Final Report. U.S. EPA Contract #68-02-3994.

REFERENCES FOR STABILIZATION/SOLIDIFICATION GUIDE

1. Barth, E.F. and R.M. McCandless et al. 1989. General Guide for Treatability Assessment: Draft S/S Technology Information Bulletin for the USEPA Engineering Forum. USEPA Risk Reduction Engineering Laboratory, Cincinnati, Ohio, July.
2. Barth, E.F. and C. Wiles. 1989. Technical and Regulatory Status of Solidification/Stabilization in the United States. Proceedings on the Application of U.S. Control Technology in Korea. Seoul, Korea.
3. Cartledge, F.K. et al. 1989. A Study of the Morphology and Microchemistry of Solidified/Stabilized Hazardous Waste Systems. Final Report for U.S. EPA #CR-812318.
4. Conner, J.R. 1990. Chemical Fixation and Solidification of Hazardous Wastes. Van Nostrand Reinhold, New York, 692 p.
5. Cullinane, J.M. and L.W. Jones. 1989. Handbook for Solidification/Stabilization of Hazardous Wastes, Final Report, Interagency agreement AD-96-F-2-A145 between the EPA and the U.S. Army Corp. of Engineers, Waterways Experimental Station, Vicksburg, MI.
6. Eschenbach, R.C. et al. 1989. Process Description and Initial Test Results with the Plasma Centrifugal Reactor. Presented at the Forum on Innovative Hazardous Waste Treatment Technologies: Domestic and International, June 19-22. Retech, Inc., Ukiah, California.
7. Geosafe Corporation. 1989. In Situ Vitrification for Permanent Treatment of Hazardous Wastes. Presented at Advances in Separations: A Focus on Electrotechnologies for Products and Wastes, April 11-12. GSC 1903, Geosafe Corporation, Kirkland, Washington.
8. Geosafe Corporation. 1989. Application and Evaluation Considerations for In Situ Vitrification Technology: a Treatment Process for Destruction and/or Permanent Immobilization of Hazardous Materials. GSC 1901, Geosafe Corporation, Kirkland, Washington.
9. Keller, D.J. 1989. Construction Quality Assurance for Stabilization/Solidification. Draft Final Report, W.A. #2-17. USEPA Risk Reduction Engineering Laboratory, Cincinnati, Ohio, August 31.
10. Kingsbury, G., P. Hoffman and B. Lesnik. The Liquid Release Test (LRT). Proceedings of the Fifth Annual Waste Testing and Quality Assurance Symposium, American Chemical Society. July 24-28. Year