Assessing Potential Waste Disposal Impacts from Preservative Treated Wood Products

Environmental Impacts of Preservative-Treated Wood

February 8-10, 2003

Tim Townsend, Brajesh Dubey
University of Florida

Helena Solo-Gabriele
University of Miami
Objectives

• Provide an overview of solid waste management and regulations that would apply to treated wood disposal in the US.

• Present a methodology that can be used to assess the relative disposal impact of different preservative treated wood products.
The Challenge of Treated Wood Disposal
Treated Wood in Florida Waste Stream
Home Owner
Construction Debris
Concentrated Demolition
Management of Treated Wood
C&D Debris Recycling Facility
Waste-to-Energy Facility
Production of Landscape Mulch
Evaluating Alternative Treated Wood Products

• Many factors are considered when developing, standardizing and registering different preservative treated wood products.

• Disposal issues should be considered.
Evaluating Alternative Treated Wood Products

• Assessing the true impact or risk is difficult
  – There are still a number of issues regarding CCA-treated wood we do not understand!

• Approach discussed would be helpful for:
  – Developers of new preservatives
  – Comparing different treated wood chemicals
Assessing Potential Impacts of Treated Wood Upon Disposal

• Must examine:
  – Regulatory issues
    • How will the waste be regulated upon disposal?
  – Environmental Issues
    • Will the waste pollute groundwater?
Hazardous Waste Status?

• The regulations define when a solid waste is a hazardous waste.
• Management as a hazardous waste is expensive!
• Because they contain certain toxic chemicals, they may be hazardous wastes because of the toxicity characteristic (TC).
Determination of the Toxicity Characteristic

• To determine whether a solid waste is a TC hazardous waste or not, the *Toxicity Characteristic Leaching Procedure* (TCLP) must be performed.
Solid Waste → Size Reduce to Less Than 1 cm → Leach 100 g for 18 hours at 30 RPM → Filter Solids from Leachate → Analyze Leachate → X mg/L
TCLP Concentrations are Compared to RCRA TC List

- If the concentration of certain pollutants exceed the TC limit, the solid waste is a hazardous waste.
- Note: There are also several organic compounds on the TC compound list as well.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Concentration (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>5.0</td>
</tr>
<tr>
<td>Barium</td>
<td>100.0</td>
</tr>
<tr>
<td>Cadmium</td>
<td>1.0</td>
</tr>
<tr>
<td>Chromium</td>
<td>5.0</td>
</tr>
<tr>
<td>Lead</td>
<td>5.0</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.2</td>
</tr>
<tr>
<td>Selenium</td>
<td>1.0</td>
</tr>
<tr>
<td>Silver</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Typical TCLP Results
(New Wood)

Results Based on Two Pieces of 0.25 pcf CCA-C Dimensional Lumber
California Hazardous Waste Status?

- In addition to the TCLP, must perform another leaching test called the waste extraction test (WET)
- More chemicals must be evaluated (including copper)
- Must also look at the total concentration
Impact on Lined Landfill Leachate Quality?

- Treated wood could potentially have an impact on leachate quality.
- May not be a large environmental risk, but can be a real problem for landfill operators.
- Can use TCLP to assess potential impact on leachate quality.
Leaching in MSW LF Leachate

![Graph showing arsenic levels in TCLP and MSW leachates. The TCLP limit is marked at 5 mg/L.]
Impact on Groundwater at Unlined Landfills?

• Many US states permit disposal of C&D debris in unlined landfills
• Groundwater impact is thus a concern
• A test that is sometimes used to assess impact on groundwater from unlined landfills is the synthetic precipitation leaching procedure (SPLP)
SPLP

• Performed in a similar manner as TCLP, but using a simulated acid rainwater instead

• Compare the results directly to groundwater standards

FL GWCTL: As = 0.05 mg/L, Cr = 0.1 mg/L, Cu = 1 mg/L, B = 0.63 mg/L
Comparing TCLP to SPLP
(typical piece of new CCA-treated wood)

TC Limit = 5 mg/l
DW Limit = 0.05 mg/l

- One Block
- Five Blocks
- Chipped Wood
- Sawdust

Arsenic Concentration (mg/l)
Impact on Combustion Facilities

• Treated wood might be combusted as part of the mixed C&D wood or as bulk loads
• Two issues
  – Impact on air emission
  – Impact on ash quality
CCA-Wood Removed from Service

C&D Debris

Processed Wood

Wood Fuel Facility

WTE Facility

C&D Landfill

Separated CCA-Treated Wood

Land Application
Impact on Air Emissions

• Can be difficult to evaluate without trial burns

• Basic chemical and thermodynamic data can be used to assess emission potential
Impact on Ash Quality

• Inorganic preservative concentrations will be enhanced
• May cause the ash to be a hazardous waste
• May limit reuse options via land application
Metal Concentrations are Magnified

Initial Wood Concentration
= 2,000 mg/kg; 5% Ash
Impact on Land Application?

• If the wood mulch or ash is land applied, its potential impact must be evaluated.
• Conduct SPLP and compare to groundwater standards.
• Measure total pollutant concentration and compare to risk-based direct exposure concentrations.

**FL SCTL:** As = 0.8 mg/kg, Cr = 210 mg/kg, Cu = 110 mg/kg, B = 7,000 mg/kg
Example Evaluation

Four treated wood products

• CCA: \(\text{As} = 1,710 \text{ mg/kg}, \text{Cu} = 1,100 \text{ mg/kg}, \text{Cr} = 1,710 \text{ mg/kg}\)

• ACQ: \(\text{Cu} = 3,800 \text{ mg/kg}, \text{B} = 480 \text{ mg/kg}\)

• Silicoborate: \(\text{B} = 1,000 \text{ mg/kg}\)

• Silver-based preservative: \(\text{Ag} = 1,000 \text{ mg/kg}\)
## US Hazardous Waste

<table>
<thead>
<tr>
<th>Material</th>
<th>Status</th>
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<tbody>
<tr>
<td>CCA</td>
<td>No - Exempt</td>
</tr>
<tr>
<td>ACQ</td>
<td>No</td>
</tr>
<tr>
<td>Borosilicate</td>
<td>No</td>
</tr>
<tr>
<td>Silver-based</td>
<td>Maybe</td>
</tr>
</tbody>
</table>
## California Hazardous Waste

<table>
<thead>
<tr>
<th>Material</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCA</td>
<td>Yes **</td>
</tr>
<tr>
<td>ACQ</td>
<td>Yes</td>
</tr>
<tr>
<td>Borosilicate</td>
<td>No</td>
</tr>
<tr>
<td>Silver-based</td>
<td>Yes</td>
</tr>
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</table>
If 5% Leaches, Ratio to Groundwater Criteria

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CCA</td>
<td>As = 86</td>
</tr>
<tr>
<td>ACQ</td>
<td>Cu = 9.5</td>
</tr>
<tr>
<td>Borosilicate</td>
<td>B = 4.2</td>
</tr>
<tr>
<td>Silver-based</td>
<td>Ag = 25</td>
</tr>
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Impact on Lined Landfills

• Based on TCLP, would expect As, Cr, and Cu to leach
• Simulated landfill data indicate that As and Cr leaching may be reflective of TCLP, but not Cu
• B and Ag leaching issues unknown
If 10% Treated Wood in Mulch, Ratio to Clean Soil Criteria

<table>
<thead>
<tr>
<th>Material</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>CCA</td>
<td>As = 213</td>
</tr>
<tr>
<td>ACQ</td>
<td>Cu = 3.5</td>
</tr>
<tr>
<td>Borosilicate</td>
<td>B = 0.014</td>
</tr>
<tr>
<td>Silver-based</td>
<td>Ag = 0.26</td>
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</table>
If 10% Treated Wood in Fuel, 5% Remaining as Ash, Ratio to Clean Soil Criteria

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Ratio Value</th>
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<tbody>
<tr>
<td>CCA</td>
<td>As = 4,275</td>
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<tr>
<td>ACQ</td>
<td>Cu = 69</td>
</tr>
<tr>
<td>Borosilicate</td>
<td>B = 0.28</td>
</tr>
<tr>
<td>Silver-based</td>
<td>Ag = 5.1</td>
</tr>
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</table>
Summary

- Waste disposal issues should be considered when evaluated treated wood products.
- Even without data, a general assessment can be made. Most useful for comparing relative impact of multiple products.
- Current data suggest that copper-based products will have much less of an impact on waste disposal systems compared to CCA.