BENEFICIAL USE OF COAL–COMBUSTION BYPRODUCTS

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WORKSHOP ON GREEN CONSTRUCTION MATERIALS USING COAL-COMBUSTION PRODUCTS
MAY 1-2, 2008
MILWAUKEE, WISCONSIN
LAWS AND REGULATIONS

• WISCONSIN STATE STATUTES - ENVIRONMENTAL PROTECTION

• WISCONSIN ADMINISTRATIVE RULE - SOLID WASTE MANAGEMENT REQUIREMENTS

• NR 538 – BENEFICIAL USE OF INDUSTRIAL BYPRODUCTS
NR 538 CODE SUMMARY

- NR 538.01 PURPOSE
- NR 538.02 APPLICABILITY
- NR 538.03 DEFINITIONS
- NR 538.04 PERFORMANCE AND STANDARDS
- NR 538.05 SOLID WASTE RULE EXEMPTION
- NR 538.06 INDUSTRIAL BYPRODUCT CHARACTERIZATION
- NR 538.08 INDUSTRIAL BYPRODUCT CATEGORIES
- NR 538.10 BENEFICIAL USES
- NR 538.12 BENEFICIAL USES FOR SPECIFIC CATEGORIES
- NR 538.14 REPORTING
- NR 538.16 STORAGE AND TRANSPORTATION
- NR 538.18 PUBLIC PARTICIPATION
- NR 538.20 ENVIRONMENTAL MONITORING
- NR 538.22 PROPERTY OWNER NOTIFICATION
PERFORMANCE STANDARDS

1- A significant adverse impact on wetlands.

2- A take of an endangered or threatened species or other activity prohibited under s. 29.604, Stats.

3- A detrimental effect on any surface water.

4- A detrimental effect on groundwater quality.

5- The migration and concentration of explosive gases.

6- The emissions of any hazardous air contaminant exceeding the limitations for those substances contained in s. NR 445.03.
NR 538 PROGRAM ELEMENTS

- Initial characterization - Recharacterization
- Mostly self implementing
- Five categories of industrial byproducts
- Beneficial uses allowed for each category
- Notification of WDNR for larger projects
- Annual reports on use to the WDNR
- Property owner notification for geotechnical fill projects
<table>
<thead>
<tr>
<th>INDUSTRY</th>
<th>BYPRODUCT</th>
<th>BYPRODUCT STREAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECTRIC UTILITY</td>
<td>COAL ASH</td>
<td>FLY ASH</td>
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<td></td>
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<td>BOTTOM ASH</td>
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<td></td>
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<td>FGD-GYPSUM</td>
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<tr>
<td>FOUNDRY</td>
<td>FERROUS FOUNDRY PROCESS WASTE</td>
<td>EXCESS SYSTEM SAND</td>
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<td></td>
<td></td>
<td>SLAG</td>
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<tr>
<td>PAPER MILLS</td>
<td>SLUDGE</td>
<td></td>
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<tr>
<td>OTHERS</td>
<td>INDUSTRIAL BYPRODUCTS</td>
<td>SLAG</td>
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<tr>
<td></td>
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<td>LIME KILN DUST</td>
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BOTTOM ASH USES

• CONFINED GEOTECHNICAL FILL- non-residential
  – BASE COURSE, SUBBASE OR SUBGRADE FILL FOR:
    • COMMERCIAL AND INDUSTRIAL BUILDINGS
    • CONCRETE OR ASPHALT PAVED LOT
    • PAVED FEDERAL, STATE, MUNICIPAL ROADWAY
  – UTILITY TRENCH BACKFILL
  – BRIDGE ABUTMENT BACKFILL
• FULLY ENCAPSULATED WDOT EMBANKMENTS
• CLAY CAPPED WDOT EMBANKMENTS
• UNCONFINED GEOTECHNICAL FILL
• UNBOUNDED SURFACE COURSE
• BONDED SURFACE COURSE
• COLD WEATHER ROAD ABRASIVE
FLY ASH USES

• RAW MATERIALS FOR MANUFACTURING OF PRODUCT
• AGENTS FOR PHYSICAL OR CHEMICAL STABILIZATION OR SOLIDIFICATION
• CONFINED GEOTECHNICAL FILL
  – FLOWABLE FILL
  – ABANDONMENT OF TANKS, VAULTS, TUNNELS
  – SLABJACKING MATERIAL
FLUE GAS DESULFURIZATION
GYPSUM

• WET SYSTEMS
  – WALL BOARD
  – AGRICULTURAL - MARCH 20, 2008

• SEMI-DRY SYSTEMS

• DRY SYSTEMS
GEOTECHNICAL FILL RESTRICTIONS

• RESIDENTIAL BUILDINGS
• COVER BYPRODUCTS AS SOON AS PRACTICAL
• WRITTEN NOTIFICATION FOR >5000 CUBIC YARDS
• EXTEND < 4 FEET FROM THE FROST WALL OR PAVED AREAS
• BELOW THE WATER TABLE
• PERMANENT STANDING WATER
• DEWATERING
• 200 FEET FROM PRIVATE AND PUBLIC WATER WELL
• GENERALLY ACCEPTED ENGINEERING PRACTICES
• WINDBLOWN DUST, ODOR, COLOR, TRACKING AND SPILLAGE
BENEFITS

• SAVE VIRGIN MATERIAL
• PRESERVE NATURAL LANDSCAPE
• SAVE ENERGY
• SAVE MONEY
• REDUCE GLOBAL WARMING
• MINIMIZE ENVIRONMENTAL IMPACT

  – CEMENT MANUFACTURING
  – VIRGIN MATERIAL EXCAVATION
  – MATERIAL HANDLING

• SAVE LANDFILL SPACE
BENEFICIAL USE RATE

• COAL ASH 72%----92%

• FOUNDRY SAND AND SLAG 40%----95%

• PAPERMILL SLUDGE 63%----66%
<table>
<thead>
<tr>
<th>Byproduct Type</th>
<th>Recycling Rate</th>
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<tbody>
<tr>
<td>Class C Fly Ash</td>
<td>80 - 90%</td>
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<tr>
<td>Class F Fly Ash</td>
<td>10 - 20%</td>
</tr>
<tr>
<td>Off Spec. Class C</td>
<td>50 - 60%</td>
</tr>
<tr>
<td>Bottom Ash</td>
<td>80-110%</td>
</tr>
<tr>
<td>Cyclone Boiler BA</td>
<td>80-100%</td>
</tr>
<tr>
<td>FGD-Gypsum</td>
<td>100%</td>
</tr>
<tr>
<td>FGD-Dry</td>
<td>0%</td>
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</tbody>
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GUIDANCE AND CASE BY CASE APPROVALS

• GUIDANCE:
  - BENEFICIAL USE OF FORMER LANDFILLED MATERIAL
  - EXCAVATION GUIDELINES FOR PROJECTS CONDUCTED UNDER NR 538 APPROVALS
  - SUBGRADE STABILIZATION USING FLY ASH

• CASE-BY-CASE APPROVALS
  - FLOWABLE FILL
  - AGRICULTURAL USE OF GYPSUM
  - SOIL STABILIZATION IN RESIDENTIAL AREAS
CONTACT INFORMATION

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