



**APPENDIX C5**  
**APPLICABILITY OF REAL-TIME RADIOGRAPHY**

## APPENDIX C5 APPLICABILITY OF REAL-TIME RADIOGRAPHY (RTR) <sup>a</sup>

Summary Category Group	Waste Category	Applicable RTR Codes <sup>b</sup>	Waste Description
Homogeneous Solids S3000	Cation and Anion Exchange Resin	A, B, E, G	<ul style="list-style-type: none"> <li>Anion and cation exchange resins washed with hot HNO<sub>3</sub> and water then mixed with water and portland cement to form solid mass. Resins are a polystyrene and divinylbenzene copolymer.</li> </ul>
Homogeneous Solids S3000	Inorganic Waste Water Treatment Sludge	A, B, E, G, H	<ul style="list-style-type: none"> <li>Solidified aqueous waste generated by vacuum filtration of precipitated solids from pretreated aqueous slurry. Filter medium is diatomaceous earth. Wet sludge is solidified with portland cement.</li> <li>Wet sludge from chemical treatment and mixed with absorbents (i.e., portland cement and Oil-Dn<sup>®</sup> to absorb free liquid).</li> <li>Sludges removed from tanks that collected liquid effluent from floor drains; sludge consists of dirt, sand, gravel, floor sweepings, and similar materials; sludges mixed with portland cement.</li> <li>Sludges removed from tanks that collected liquid effluent from the laundry; sludge consists of lint, spent detergent, and dirt mixed with portland cement.</li> <li>Cemented inorganic process solids; waste is filter sludge, grit, and firebrick fines, solidified in portland cement.</li> <li>Cemented or solidified process solids (i.e., grit, firebrick fines, filter sludges, and resins).</li> </ul>
Homogeneous Solids S3000	Organic Liquid and Sludge	A, B, E, G	<ul style="list-style-type: none"> <li>Waste organic liquid (oil and/or solvents) mixed with gypsum cement (Envirostone<sup>®</sup>); oils are machining oil and lathe coolant.</li> <li>Waste organic liquid (oil and/or solvents) mixed with gypsum cement (Envirostone<sup>®</sup>); oils are machining oil and lathe coolant.</li> </ul>

Refer to footnotes at end of table.

**APPENDIX C5 (CONTINUED)  
APPLICABILITY OF RTR**

Summary Category Group	Waste Category	Applicable RTR Codes <sup>b</sup>	Waste Description
Homogeneous Solids S3000	Pyrochemical Salt	A, B, E, G	<ul style="list-style-type: none"> <li>Spent chloride salt (combinations of cesium, calcium, magnesium, potassium, and NaCl) from pyrochemical operations.</li> </ul>
		A, B, E, F	<ul style="list-style-type: none"> <li>Fused halide salt mixtures of NaCl, KCl, and/or CaCl<sub>2</sub>; some salts also contain MgCl<sub>2</sub>, CaF<sub>2</sub>, CaO.</li> </ul>
Homogeneous Solids S3000	Solidified Liquid	A, B, E, G	<ul style="list-style-type: none"> <li>Aqueous laboratory wastes that are not compatible with primary aqueous treatment system; waste contains organic acids. Wastes are pH adjusted and solidified by mixing with portland and magnesia cement.</li> </ul>
		A, B, E, G, H	<ul style="list-style-type: none"> <li>Waste consists of solidified organics that contain plutonium complexing chemicals (i.e., alcohols, organic acids, and chelating agents (EDTA). Liquids mixed with portland cement and magnesia cement.</li> </ul>
Solids/Gravel S4000	Soils/Gravel	A, B, C, E, G	<ul style="list-style-type: none"> <li>Soil and gravel waste that comprises more than 50% of the waste volume.</li> </ul>
Debris Waste S5000	Benelex <sup>®</sup> and Plexiglas <sup>™</sup>	A, B, E, G	<ul style="list-style-type: none"> <li>Organic solid waste that is noncombustible. Benelex<sup>®</sup>/Plexiglas<sup>™</sup> neutron shielding, black top, concrete, dirt, and sand.</li> <li>Benelex<sup>®</sup> and Plexiglas<sup>™</sup> glovebox windows. Benelex<sup>®</sup> (dense laminated, lignocellulose hardboard made from wood chips and particles). Benelex<sup>®</sup> usually coated with fire retardant paint sometimes had lead sheeting attached to it. Also, leaded glass may be present.</li> </ul>
Debris Waste S5000	Combustibles	A, B, C, D	<ul style="list-style-type: none"> <li>Solid combustible waste, including paper, rags, cloth, coveralls, plastic, rubber, wood, and other similar material.</li> </ul>

Refer to footnotes at end of table.

**APPENDIX C5 (CONTINUED)  
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Debris Waste S5000	Combustibles	A, B, C, E, F	<ul style="list-style-type: none"> <li>Combustible solids (dry, damp, or moist), including paper, rags, plastic, surgeon's gloves, coveralls and booties, cardboard, wood, plywood sheeting, filter frames, ladders, bottles, laundry lint, Kimwipes<sup>®</sup>, canvas, sample vials, respirator face masks, etc.; some waste coated with paint and some contain trace levels of HNO<sub>3</sub>.</li> </ul>
Debris Waste S5000	Combustibles and Noncombustibles	A, B, C, E, F	<ul style="list-style-type: none"> <li>Combustible and noncombustible solids, i.e., dissolved lab samples, absorbed in Oil-Dri<sup>®</sup>, uranium pellets, plutonium sources, glassware, gloves, Kimwipes<sup>®</sup>, and used equipment.</li> <li>Piping, flanges, valves, tools, glasswares, filters, polyethylene bottles, glovebox gloves, paper, and plastics.</li> </ul>
Debris Waste S5000	Filters	A, B, C, D  OR A, B, E, G	<ul style="list-style-type: none"> <li>Frames of filters made of wood or metal and medium is fiberglass or Nomex<sup>®</sup>-type material. Fulflo<sup>®</sup> filter cartridges consist of polypropylene plastic. Some filter wastes are processed by the addition of portland cement.</li> </ul>
		A, B, C, D	<ul style="list-style-type: none"> <li>Absolute filters, high-efficiency particulate air (HEPA) filters, chemical warfare service (CWS) filters, fiberglass and asbestos filter media, asbestos pipe insulation, and asbestos gloves and fire blankets. Filter frames are wood, particle board, or aluminum; filter media either fiberglass or asbestos.</li> </ul>
Debris Waste S5000	Firebrick and Ceramic Crucibles	A, B, E, G	<ul style="list-style-type: none"> <li>Firebrick, clay absorbent (Oil-Dri<sup>®</sup>), and insulation.</li> <li>Leco crucible waste: silicate-based ceramic crucibles and caps. Some contain an accelerator (Fe, Sn, Cu, Ti, stainless steel).</li> <li>Firebrick wastes consisting of whole or broken pieces of construction bricks, cinderblocks, and incinerator firebrick. Firebrick (high-aluminum/high-strength) composition: Al<sub>2</sub>O<sub>3</sub>, CaO, Fe<sub>2</sub>O<sub>3</sub>, MgO, SiO<sub>2</sub>, TiO<sub>2</sub>, and alkalis.</li> </ul>

Refer to footnotes at end of table.

**APPENDIX C5 (CONTINUED)  
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Summary Category Group	Waste Category	Applicable RTR Codes <sup>b</sup>	Waste Description
Debris Waste S5000	Glass	A, B, C, E, F	<ul style="list-style-type: none"> <li>Glass and ceramic waste including leached Raschig rings, ceramic crucibles, glovebox windows, lab glassware, process equipment, and empty containers.</li> </ul>
Debris Waste S5000	Glass (Oil Residue)	A, B, C, E, F	<ul style="list-style-type: none"> <li>Unleached glass neutron-absorbing Raschig rings.</li> </ul>
Debris Waste S5000	Graphite	A, B, C, E, F	<ul style="list-style-type: none"> <li>Broken graphite molds and graphite furnace equipment or graphite chunks and pieces from mold cleaning and declassification. Also discarded lab equipment.</li> </ul>
Debris Waste S5000	Leaded Rubber	A, B, C, E, F	<ul style="list-style-type: none"> <li>Leaded gloves and aprons comprised of layers of Hypalon<sup>®</sup> rubber and PbO-impregnated neoprene. Limited amounts of unleaded gloves, lead bricks, and lead sheeting may be included.</li> </ul>
Debris Waste S5000	Metal	A, B, C, E, F	<ul style="list-style-type: none"> <li>Nonpyrophoric waste metals (iron, copper, aluminum, stainless steel, tungsten, lead, and tantalum).</li> <li>Beryllium chips.</li> <li>Billets of Zn-Mg alloy.</li> <li>Noncompressible and noncombustible items (i.e., filters, metal equipment, furnace brick, metal crucibles, and funnels). Metals are tantalum, tungsten, platinum, and lead.</li> <li>Metals from small hand tools, valves, trays, clamps, pipes, gloveboxes, furnaces, tanks, respirator filters, control panels, etc.</li> </ul>

\*Remote-handled (RH) transuranic (TRU) waste characterization data requirements will provide the same types of information to the extent that this is consistent with RH TRU waste forms.

<sup>b</sup>Real-Time Radiography (RTR) codes:

- A Verification of compliance with packaging requirements.
- B Verification of physical waste form identification.
- C Verification of Waste Matrix Code.

Refer to footnotes at end of table.

## APPENDIX C5 (CONTINUED) APPLICABILITY OF RTR

- D** Verification of absence of noncompliant items, including free liquids and compressed gases throughout the volume of the container.
- E** Verification of absence of free liquids around the perimeter of the container (between drum/liner, liner/poly bag, and poly bag/waste).
- F** Verification of absence of noncompliant items, including free liquids and compressed gases throughout the volume of the container, conditional on the physical geometry of the waste and the resulting package density (variable void volume).
- G** Density of the waste may negate RTR examination of the entire container.
- H** Process knowledge is well defined and precludes introduction of extraneous materials, such as pressure vessels.

*NOTE: The use of trade names or brand names in this table does not constitute endorsement by the DOE or its contractors.*

