

Evaluation of Design and Operation Basis of the Smear Test Station

by

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DEFENSE WASTE PROCESSING FACILITY
EVALUATION OF DESIGN AND OPERATION
BASIS OF THE SMEAR TEST SYSTEM (U)

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Introduction

The Smear Test Stations (STS) provide the means for measuring the effectiveness of the canister decontamination process. This is accomplished by collecting remotely smeared samples of the canister's exterior to verify that radioactive contamination is below Department of Energy prescribed limits which are based on the Department of Transportation wipe limits (49 CFR, 173.443). The DOE/DOT requirements prescribe a 300 square centimeter area of an object's surface be wiped which is a representative sample of the object. This standard applies to external surfaces of shipping casks. While the canister is not exposed to the environment like a shipping cask, this standard was applied to provide conservative limits for onsite storage (*alpha radiation is less than: 220 dpm/100 square centimeters, beta & gamma radiation is less than: 2200 dpm/100 square centimeters*). It has been demonstrated that the STS remote smearing technique, using a Master-Slave Manipulator and a smear tool, is equivalent to, if not better than, the traditional hand smearing technique (WSRC-RP-91-598, "Smearing DWPF Waste Glass Canisters - II, Results and Recommendations"). Each STS will smear 1000 square centimeters of the canister surface area. Therefore, the STS method for smearing is adequate and in accordance with 49 CFR, 173.443.

The canisters undergo two separate smear tests: one after the canister decontamination process (Canister Decontamination Cell Smear Test Station, or CDC/STS); and the other after the final canister closure weld (Weld Test Cell Smear Test Station, or WTC/STS). The purpose of the CDC/STS is to ensure the effectiveness of the canister decontamination process and to limit the potential spread of transferable contamination. The purpose of the WTC/STS is to provide final verification that the external canister surface is free of transferable contamination before transporting the canister to the Glass Waste Storage Building for onsite storage.

The smear test equipment at each Station consists of:

- a canister turntable which provides both lift and rotation, and is controlled by separate Local Control Station (LCS) located next to the respective Station's shielded window;
- a pair of Master-Slave Manipulators (MSMs) which Operations uses to perform the smearing of the canister surface;
- a shielded window for remote viewing of the smearing operation;

- a pneumatic transfer system, using pressurized air as the motive force, for transferring new smears into the Stations from the radio bench hood, and used smears out of the Stations back to the radio bench hood for isotopic contamination counting (these transfer systems are controlled by two LCSs contained in one console located next to the radio bench hood);
- a set of smear tools which are designed both to allow the MSMs to conduct a smear with 3 to 10 pounds of force to a standard 1¹/₄" diameter smear pad affixed to foam-backed tape, and to travel in the pneumatic transfer systems while protecting the smear pad; and
- a radio bench hood which services both Stations and provides a controlled environment both to receive used smears from the Stations for gross beta-gamma counting, and to perform subsequent packaging for more accurate counting by the Radiation Control Operations.

In addition, the CDC/STS also contains a trolley to move the canister from the STS turntable to the pedestal, located at the north end of the CDC/STS tunnel, for retrieval by the WTC crane. This trolley is also controlled by the same LCS which controls the CDC/STS turntable.

Each station will take a minimum of 5 smears per canister. These smears will be taken such that all decon chamber blast zones will be checked (See figure A1 attached).

The first smear will be taken across the bottom of the canister while it is suspended above the smear test station by the in-cell crane. This smear is to cover both the concave portion of the canister bottom as well as the edge (approximately 200 cm², see Figure A1, Smear #1). If the smear exceeds DOE/DOT requirements, then separate 100 cm² smears will be taken on the bottom concave and edge (See figures A1, Smears #1A, #1B).

The second smear will be taken with the turntable in the raised position and will be taken from the lowest point reachable by the MSM to the approximate center line of the canister. This will cover blast zones 6 and 7 (See figure A1 attached) and will be approximately 200 cm². If the smear exceeds the DOE/DOT requirements, a separate 100 cm² smear will be taken on each blast zone (See Figure A1, Smears #2A, #2B) and compared to the DOE/DOT requirements. This information will determine which canister decontamination system blast zone may require maintenance before the canister is reblasted.

Smear three is similar to smear two with the exception that the turntable will be fully lowered so that blast zones 4 and 5 can be checked. This smear will include the canister side label (See Figure A1, Smears #3, #3A, #3B).

The fourth smear (approximately 200 cm²) will be taken across the canister shoulder, shoulder label, neck and under the flange of the canister (blast zones 2 and 3). If this smear exceeds the DOE/DOT limits, separate 100 cm² smears will be taken on the shoulder, neck and under the flange of the canister (See Figure A1, Smears #4, #4A, #4B, #4C).

The final (fifth) smear will be a 100 cm² smear taken on top of the canister (See Figure A1, Smear #5).

Radiological Controls personnel (RCO) will count all smears to determine if the smears are less than the DOE/DOT limits (220 dpm/100 cm² alpha and 2200 dpm/100 cm² beta gamma). The canister will not be allowed to proceed until RCO has determined that all smears are less than these limits.

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FIGURE A1

