Dose Potential of Sludge Contaminated and/or TRU Contaminated Waste in B-25s for Tornado and Straight Wind Events

by

C. I. Aponte

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

E. T. Ketusky

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E. T. Ketusky, SAIC for WSRC
C. I. Aponte, WSRC

Edward T. Ketusky Date 2/12/98
E. T. Ketusky, Author
SAIC for CSTE

T. E. Britt Date 2/13/98
T. E. Britt, Technical Reviewer
Concentration, Storage and Transfer Engineering

B J for M.C. Chandler Date 2/13/98
M. C. Chandler, Manager
CSTE Characterization

B J Date 2/13/98
B. L. Lewis, Manager
CSTE Support

V. J. Dickert for Date 2/13/98
T. M. Monahon, Manager
CSTE Engineering

Table of Contents

Attachments ***Page Number***

1.0 INTRODUCTION

F and H Tank Farms generate supernate and sludge contaminated Low Level Waste. The waste is collected, characterized, and packaged for disposal. Before the waste can be disposed of, however, it must be properly characterized. Since the radionuclide distribution in typical supernate is well known, its characterization is relatively straight forward and requires minimal effort.

Non-routine waste, including potentially sludge contaminated, requires much more effort to effectively characterize. The radionuclide distribution must be determined. In some cases the waste can be contaminated by various sludge transfers with unique radionuclide distributions. In these cases, the characterization can require an extensive effort. Even after an extensive characterization effort, the container must still be prepared for shipping. Therefore a significant amount of time may elapse from the time the waste is generated until the time of disposal.

During that time it is possible for a tornado or high wind scenario to occur. The purpose of this report is to determine the effect of a tornado on potential sludge contaminated waste, or Transuranic[1] (TRU) waste in B-25s, to evaluate the potential impact on F and H Tank Farms, and to help establish a B-25 control program for tornado events. An explicit assessment for high-velocity straight winds (non-tornado high winds) is not performed because the natural phenomena evaluation guidance contained in Section 3.2 of Reference 1 concludes that the overall risks from tornadoes bound corresponding overall risks from straight winds and therefore the tornado results can be conservatively applied to straight winds. Also based on analysis, the source term associated with a Performance Category 3 (PC-3) tornado can also be used to bound a vehicle accident.

Supernate contaminated boxes are not a concern and are not addressed in this report because of the volume of the supernate that would be required to exceed the onsite guideline is about 1200 gallons. According to the High Level Waste Characterization of Low Level Waste Certification Manual (U), WSRC-TR-94-0581, each waste box on average contains significantly less than 1 gallon of waste. Therefore all material at risk associated with the 1,200 boxes would have to be released. This is judged to be incredible. Refer to Attachment 1.

2.0 SUMMARY

The methodology used for analysis was based largely on the methodology used to analyze a tornado in the TRU Waste Pads, as found in the Solid Waste Management Facility, Hazard and Accident Analysis, WSRC-SA-22, and supporting calculations (Ref. 2 and 3).

(1) TRU waste is roughly defined as waste with an activity of greater than 100 nanocuries/g from isotopes with an atomic number greater than that of uranium and having a half life of greater than 20 years.

The Liquid Radioactive Waste Handling Facility (LRWHF) is defined as a Hazard Category 2 facility, as are the TRU Waste Pads (Excerpt from Ref. 2 - Attachment 2). A review of DOE-STD-1020-94 and DOE-STD-1021-94 enabled a PC-3 tornado to be used as the bounding high wind (tornado) scenario for the TRU waste pads. The Hazard and Accident Analysis for Solid Waste (SW), WSRC-SA-22 (Ref. 2), analyzed the impact of a PC-3 tornado on B-25s at the TRU waste pad. Based on the categorization, the analysis required the use of a tornado of at least 137 mph winds, with an importance factor of 1.0. However, the actual analysis was not completed, but instead the results of an earlier bounding analysis were used. The earlier analysis was performed in accordance with the previous Department of Energy Guidelines entitled, "Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards, UCRL-15910" for a high hazard facility. The UCRL-15910 analysis determined the impact from a tornado with the fastest wind speed of 137 mph and a corresponding importance factor of 1.35 (or an equivalent wind speed of approximately 190 mph). Since the Hazard Categories of both LRWHF and the SW TRU Waste Pads are the same, the methodology used for the SW analysis can be applied to the LRWHF B-25s. (Refer to Attachment 3 - Selected Excerpts of DOE-STD-1020-94). Any conservatism which existed in the SW analysis will also exist in the LRWHF analysis.

An important difference in the application of the methodology is that the Solid Waste Authorization Basis, WSRC-SA-22 (Ref. 2), accounted for the TRU Waste Pad storage container arrays by only assuming a fraction of the containers were at risk. Since the location of B-25s in the LRWHF is much more random, all containers are assumed to be at risk.

The Solid Waste Authorization Basis, WSRC-SA-22 and supporting calculations (Ref. 2 and 3) assume that the B-25 is positively sealed. This assumption is critical for enabling B-25s at the TRU waste pads to contain TRU waste during the tornado event, as it is for B-25s containing potential sludge contaminated waste in Tank Farms.

To assume positive closure for the Waste Container Safety Implementation the following requirements must be imposed:

- All waste containers not requiring access which contain potential sludge waste and actual sludge contaminated waste as defined in the HLW LLW Program shall be closed and sealed.
- At the onset of a High Wind Warning or Tornado Watch, all waste containers containing potential sludge waste or actual sludge contaminated shall be closed and sealed. To ensure containers can be closed in a timely fashion, a maximum of 10 containers with potential sludge waste or actual sludge waste should remain unclipped within a facility's boundaries.
- An Administrative Control program identifying waste containers requiring closure during Emergency Conditions (High Wind/Tornado Watch) will be maintained.
- B-25s shall be visually inspected periodically and immediately prior to use for potential sludge or actual sludge contaminated waste. The inspection shall verify the following: 1) that the waste boxes contain no visually observable holes, 2) the boxes do not contain excessive rust; and 3) the boxes do not show evidence of excessive gasket wear/damage. Once verified, the boxes should be immediately used for potential sludge or TRU contaminated waste.

3.0 ISOTOPES

Since various isotopic distributions for the waste contamination are possible, the TRU waste actinide (with a half life greater than 20 years) with the highest Effective Dose Equivalent (EDE) inhalation value is used in converting total curies to dose. This is conservative because Am-241 has the higher rem/Ci (5.2E+8) value, while typically the vast majority of the TRU waste that would be generated from CST facilities is from plutonium isotopes which have a slightly lower rem/Ci value. Table 1 lists potential contributors to dose, (conservatively, irrespective of relative availability in Tank Farms; excluding those not expected to be present).

Table 1. EDE Values for TRU Waste Contributors

Isotope	Half Life (years)	EDE (rem/Ci)
Np-237	2.14E+06	4.90E+08
Pu-238	86.4	4.60E+08
Pu-239	24,390	5.10E+08
Pu-240	6580	5.10E+08
Pu-242	3.79E+05	4.80E+08
Pu-244	7.6E+07	4.80E+08
Am-241	458	5.20E+08
Am-242m	152	5.10E+08
Am-243	7.95E+03	5.20E+08
Cm-243	32	3.50E+08
Cm-247	1.6E+07; 4E+07	4.90E+08

Although uranium is excluded from TRU Waste by definition, it emits alpha radiation and hence, are an inhalation hazard. Since the majority of the uranium is U-238 and the EDE is 1.20E+08 rem/Ci, assuming 100% Am-241 (with an EDE of 5.20E+08) ensures conservatism.

It should be noted that throughout this report "Ci" refers to "curies of alpha" or "inhalation curies" and represent equivalent Pu-238 Ci. Although the Am-241 dose/Ci value was used in our calculations, the results still conservatively represent the equivalent Pu-238 dose.

4.0 B-25 DESIGN

The specifications for B-25s are found in "Procurement Specifications for Low Level Waste Boxes (U)", M-SPP-G-00248 (Attachment 9). A review of the previous specification, "Procurement Specification for Low Level Waste Burial Box", M-SPS-G-00012 (Rev. 6), also revealed similar requirements.

B-25s are constructed of 12 or 14 gauge carbon steel. The size is 48" x 48" x 72". The weight of an empty B-25s is currently not less than 460 lb. (In fact, the weight of the B-25s has shown to be gradually increasing and values as high as 622 lb. have been recorded (Ref. 4)). Without an approved deviation request, the maximum weight of a loaded B-25 is restricted to 5000 lb. The top lid of the B-25 contains a gasket and a positive fastening mechanism. Procurement specifications require that the B-25 has

provisions to ensure fast, positive closure of the lid to the box. The closure mechanism is required to achieve twenty percent minimum compression of the gasket between the lid and box after closure.

A standing water test is also performed on representative boxes to ensure leak tightness. A load carrying test of 20,000 lb. with minimal deformation ensures that the boxes are capable of supporting a uniform load and may be stacked (applicable sections of Attachment 9).

Strict adherence to the procurement specification is required by the supplier to assure quality, reliability and integrity of the boxes. The following codes and standards are required to be followed (Attachment 9):

- Title 49 CFR 173.24, Standard Requirements for All Packaging, 1990 revision.
- Title 49 CFR 173.411, General Design Requirements for All Packaging, 1990 revision
- Title 29 CFR 1910, Occupational Safety and Health Standards, 1990 revision
- ASTM A-569, steel, carbon (0.15%) hot-rolled, sheet and strip, commercial quality, "1987 Book of ASTM Standards".
- ASTM D-1056-73, Specification for Flexible Cellular Materials -Sponge or Expanded Rubber, "1975 Book of ASTM Standards".
- AWS D1.1-90, Structural Welding Code - Steel.
- ASTM D-16-84, Type 1, Paint Finish Criteria, "1987 Book of ASTM Standards".
- AISC, American Institute of Steel Construction Handbook
- ASTM A-36, Specification for Structural Grade Carbon Steel, "1987 Book of ASTM Standards".

5.0 INPUT VALUES AND ASSUMPTIONS

5.1 Methodology

The analysis is primarily based on the Sold Waste Safety Analysis Report and supporting calculations (Ref. 2 and 3) of TRU waste containers. These documents have undergone a rigorous review process and have been formally approved and therefore the methodology was not re-validated. As with the SW analysis, the focus is on actinides (inhalation hazards) and therefore is restricted to potential sludge and TRU contaminated waste.

Supernate contaminated boxes are not a concern and are not addressed in this report because the volume of the supernate that would be required to exceed the similar onsite process guidelines is about 1200 gallons. According to the High Level Waste Characterization of Low Level Waste Certification Manual (U), WSRC-TR-94-0581, each waste box on average contains significantly less than 1 gallon of waste. Therefore all material at risk associated with the 1,200 boxes would have to be released. This is judged to be incredible. Refer to Attachment 1.

5.2 Stacking

The SW SAR (Ref. 2) assumed that the second level of B-25 boxes around the perimeter of the pad are susceptible to tipping and free falling to the concrete pad. B-25s are not qualified to withstand a free fall therefore, it is conservatively assumed that they will sustain some damage. In the LRWHF however, B-25s are not stacked on top of each other. Conservatively, based on the SW SAR and Attachment 10, we assume 1% of the B-25s to be damaged from uplift and free fall.

5.3 Missile Strikes

For conservatism, missiles are assumed to strike **every** potential sludge, actual sludge and TRU box, and is independent of the 1% which suffer from uplift. This assumption is equivalent to assuming that each box is a separate facility. This is conservative as the TRU pad SAR assumes a single missile strike per pad. (Note: This was assumed because unlike SW, there is no set configuration requirement for the location of the boxes.) This assumption will more than compensate for any potential rolling effect from the tornadic angular momentum which causes the boxes to roll. This conservatism assumes that the net effect of an object hitting a box is the same as a box hitting an object, thereby encompassing rolling.

5.4 Release Period

It is assumed that 100% of the radiological material susceptible to aerodynamic entertainment would be released over a 24 hour period.

5.5 Positively Sealed

In the SW analyses, the boxes are positively sealed and weigh in excess of the 350 lb, compared to 460 lb. Currently, at a minimum, the boxes used in the LRWHF are greater than or equal to 460 lb. (Ref. 4).

Adequate controls ensure that the positively closure mechanism adequately works and that positive closure remains possible.

5.6 Material At Risk

The material at risk (MAR) was determined for each defined box. The boxes were characterized as sludge boxes (potential and actual) or TRU boxes. The number of curies in each sludge box was arbitrarily set at the TRU Threshold limit.

5.6.1 Sludge Box Material At Risk

Sludge boxes contain 0.23 Ci of TRU radionuclides (The TRU Threshold limit) (Refer to Attachment 11). This value, based on the TRU Waste Threshold Value and maximum waste weight allowed, was **arbitrarily chosen** to represent the maximized contents of all sludge boxes. The value represents the maximum curies which could be in a box before being considered as TRU waste.

5.6.2 TRU Box Material At Risk

Conservatively, a TRU waste B-25 box from Tank Farms does not have greater than 100 Ci of MAR of Transuranic Waste per container. This value is based on process knowledge, Reference 8 (the 299-H Inventory Control Program) and flushing requirements. Also about 9 gallons of the current worst case sludge waste would be required to achieve this activity. In reality, all known TRU Waste is placed into a known TRU Waste Container. {This value exceeds the value used in the EPHA HAD for F and H Tank Farms. The value used here is bounding and is not representative of an actual potential value.}

5.7 Boxes at Risk

Since there are few controls on where the boxes may be placed (the location for storage of the boxes is not designated as in the TRU Waste Pads), all boxes were assumed to be at risk. This conservatively deviates from Reference 2 where only a fraction of the boxes were designated as at risk.

5.8 Overall Dose

The dose must be calculated by determining the impact of all containers during a tornado scenario. It is likely that if a Sludge box or TRU box was struck by the tornado, there would be some release associated supernate boxes. The supernate contaminated boxes, however, are not a concern and are not addressed in this report because of the volume of the supernate that would be required to exceed the onsite guideline is about 1200 gallons. According to the High Level Waste Characterization of Low Level Waste Certification Manual (U), WSRC-TR-94-0581, each waste box on average contains significantly less than 1 gallon of waste. Therefore all material at risk associated with the 1,200 boxes would have to be released. This is judged to be incredible. Refer to Attachment 1.

5.9 Controls

The B-25s are adequately controlled and inspected immediately prior to use to ensure leak tightness (positive seal) and potential leak tightness (free from rust or unpainted metal surfaces) capabilities. The inspection should consists of visually verifying that the waste boxes contain no visually observable holes, do not contain excessive rust, and show no evidence of excessive gasket wear/damage. Once verified the boxes can be immediately used for potential sludge or TRU contaminated waste.

Since the impact of supernate contaminated waste boxes has been shown to negligible, boxes which do not pass the visual inspection may be considered for use with supernate contaminated waste.

6.0 SOURCE TERM

The source term is the amount of radioactive material, in mass or activity (curies), released to the air. The initial source term is the amount of radioactive material driven airborne at the accident source. The initial restorable source term, a subset of the initial source term, is the amount of radioactive material driven airborne at the accident source that is effectively inhalable. Lesser source terms are determined by applying filtration or deposition factors to the initial source term.

6.1 General Five Factor Formula

The source term is calculated using a variation of the five factor formula, as given below:

ST = MAR x DR x ARF x LPF x RF

MAR = Material at Risk - The amount of radionuclides (curies) available to be acted on by a given stress. For facilities, processes, and activities, the MAR is a value representing some maximum quantity of radionuclide present in a discreet physical location that are separated from other radionuclide bearing areas by adequate distance or physical barriers so that the areas do not interact during the postulated accident conditions.

DR = Damage ratio - The fraction of MAR impacted by the accident-generated conditions. (A degree of interdependence exists between the definitions of MAR and DR.) The DR is estimated based upon engineering analysis of the response of structural materials and materials-of-construction for containment to the type and level of stress/force generated by the event. Standard engineering approximations are typically used. These approximations often include a degree of conservatism due to simplification of phenomena to obtain a useable model, but the purpose of the approximation is to obtain, to the degree possible, a realistic understanding of potential effects.

ARF = Airborne Release Fraction (or Airborne Release Rate) - The Airborne Release fraction is the coefficient used to estimate the amount of a radioactive or hazardous material than can be suspended in air as an aerosol and is available for transport under a specific set of accident conditions. Airborne Release Rate is the coefficient used to estimate the amount of a radioactive or hazardous material that can be suspended in air by continuously acting mechanisms such as aerodynamic entertainment/resuspension.

LPF = Leak Path Factor - The fraction of airborne materials transported from containment by the existing flow via the pathway configuration under evaluation. There can be many LPFs for some accident conditions (e.g., the fraction transported from the package, such as a shipping container, to the cell or enclosure; the fraction leaked from the enclosure, cell, or glovebox to the operating area around the enclosure or room; the fraction leaked from the room to the building-atmosphere interface). When multiple leakpaths are involved, their cumulative effect is normally expressed as one value that is the product of all leakpaths. The LPF is a calculated or standard value based upon the established relationships between size of the particulate material, airborne transport mechanisms, and losses by deposition mechanisms, or specified filtration efficiencies.

RF = Respirable Factor - The fraction of airborne radionuclides as particles that can be transported through air and inhaled into the human respiratory system. These particles are commonly assumed to be 10 μm AED and less. (Aerodynamic Equivalent Diameter - the diameter of a sphere on density 1 g/cm^3 that exhibits the same terminal velocity as the particle in question.)

6.2 Modified Source Term Formula

Reference 3 modified the above formula to be:

ST = number x CD x CI x MRF x ARF x RF x LPF

Where:

number - the total number of potential sludge and/or TRU B-25s per facility = this number is calculated to determine the number of boxes allowed.

CD - represents the ratio of potential sludge and /or TRU B-25s damaged = As discussed above this value is 1% for uplift and conservatively assumed to be 1.0 for missile penetration. (Note: The CD for uplift and missile damage are completely independent.)

CI - represents the container inventory = This value is calculated from the TRU threshold for sludge boxes (0.23 Ci alpha) and conservatively assumed to be 100 Ci alpha for potentially TRU contaminated boxes. Also refer to Section 5.6.1 and 5.6.2.

MRF - represents the material released from a damaged container = The value listed in Reference 5 is 1.0E-01. This value is also used for our determination.

The relationship of terms in the five factor formula to the modified formula is as follows:

MAR = number x CI
DR = CD
$(LPF)_{total}$ = MRF x LPF

6.2.1 Number

For the LRWHF analysis, all the applicable potential sludge and potential TRU boxes in the facility are assumed to be at risk. This is conservatively different than the SW SAR analysis which only assumed a fraction of the total were at risk. As noted in Section 5.1 and 5.8, supernate boxes are not considered.

6.2.2 Container Damage (CD)

References 2 and 3 considered damage from container uplift, missile penetration, atmospheric pressure change (APC) and tornado wind/container roll. Each are discussed in detail in the following paragraphs. The references concluded that B-25 boxes would fail under certain stresses and storage configurations such as stacked B-25s, while large boxes and concrete culverts would not fail. Applying the values from References 2 and 3 is conservative.

6.2.2.1 Uplift

The tornado wind uplift of the containers is based on wind speed, container orientation, and lift and drag coefficients. Tornado wind forces were estimated using computer programs and codes to determine if the containers receive a net positive upward force (Ref. 3). Containers which receive net positive upward force, or are lifted, are assumed to fail by perforation or some breaching mechanism. For the uplift/fallback model 1% of the at risk B-25 boxes were calculated to fail (Ref. 2 and 3).

The approximation that 1% of the boxes fail is based on the weight of a B-25 being 350 lb., however B-25s currently weigh at least 460 lb. (empty). Since the vertical force for a B-25 caused by a PC-3 tornado is 554 lb. (Ref. 3, Page 111--also see Attachment 9 and 10), and the weight of the waste must also be taken into account, the 1% approximation is very conservative. Also refer to Section 8.0.

6.2.2.2 Missile Penetration

Five missiles were analyzed in Reference 3, including a two by four timber, a 3 in diameter steel pipe, an automobile, a TRU pad cover frame, and a 55 gallon drum. According to Reference 3, the timber weighs 15 pounds and travels at a speed of 150 mph horizontally or 100 mph vertically. The 3 in diameter steel pipe travels at a speed of 75 mph horizontally or 50 mph vertically. Conservatively, in our calculation, each B-25 is assumed to be hit by a missile. This assumption will more than compensate for any potential rolling effect. This conservatism assumes that the net effect of an object hitting a box is the same as a box hitting an object, thereby encompassing rolling.

6.2.2.3 Atmospheric Pressure Change (APC)

This calculation assumes that the B-25s which potentially contain TRU waste are sealed and do not fail during APC. This is consistent with Reference 2 and 3.

6.2.2.4 Rolling

Rolling is not explicitly addressed in this analysis. The SW SAR did not credit rolling as a possible release mechanism for B-25s. However, in this analysis it was conservatively estimated that any potential effect from rolling caused by the tornadic angular momentum rolling these boxes is more than compensated for by assuming that the total box population is hit by individual missiles. See missile penetration above.

6.2.3 Container Inventory (CI)

The amount of TRU waste per container can vary due to processes and concentration. However, known TRU waste must be placed into an approved TRU waste container. Therefore, in reality our concern is waste which has a potential to be TRU once segregated from the non-TRU portion during the Waste Characterization. For a maximum weight (5000 lb.) B-25 the TRU Threshold is about 0.23 Ci. (Refer to Attachment 11). For conservatism for a B-25 containing TRU waste we assumed a MAR of 100 Ci. {As noted in Section 5.6.2, this value is bounding and does not represent a foreseeable realistic number of a releasable material, but represents a conservatively bounding number.}

6.2.4 Material Release Fraction (MRF)

Since the SW SAR looked at B-25s during a PC-3 tornado, the same value is used for the LRWHF. Consistent with Reference 3, a MRF of 0.1 is applied. (A similar box with the same forces acting on it will result in a similar fraction of the overall material released.)

6.2.5 Airborne Release Fraction (ARF)

A value of 2E-04 is used in Reference 5 and will be applied to this scenario.
{Note: The Respirable Fraction (RF) value is not explicitly discussed in Reference 5. However, a value of 1.0 can be implied, and therefore will also be used for this scenario.}

6.3 OTHER RELEASE FRACTIONS

It should be noted that the TRU Waste Pad Section of the SW SAR did not analyze removed HEPA filters. Any effect from a removed HEPA filter release in a B-25 could consider the additional ARF factor which would further minimize the amount of material released. DOE-HDBK-3010-94 states that "Dislodging all of the contaminant is difficult since much of it penetrates into the medium." Conservatively, for the purpose of this analysis, no attempt has been made to further evaluate HEPA filters or quantify this statement. (Note: Not crediting the confinement capability/additional release fraction associated with a HEPA filter in a HEPA filter scenario may result in undue conservatism.)

7.0 DISPERSION

The dispersion factors (X/Q) and breathing rates are based on worst case information provided in Reference 6. The Reference 6 X/Q of 6.7E-7 min/m^3 uses 95% adverse dispersion conditions (95% worst case meteorology) for the LRWHF. Note, these values were chosen over using those in the Hazard and Accident Analyses for the Liquid Radioactive Waste Handling Facilities (U), Ref. 7. Reference 7 states

a value of 6E-7 sec/m^3 for an F2 tornado at any receptor. Changing the units in Reference 7 results in a value of 1E-8 min/m^3 compared to an offsite value of 6.7E-7 min/m^3 used in this analysis.

Supporting the use of the more conservative dispersion factor is UCRL-15910 which uses an approximate wind speed of 190 mph. This means that the analyzed tornado was approximately an F3 tornado based on listed windspeeds. Therefore, to account for any potential inconsistencies, the more conservative value was chosen. (Also note: An onsite X/Q was applied based on Reference 6. This approach is also extremely conservative since for natural phenomena events, onsite consequences are not frequently determined.)

8.0 WEIGHT

Waste weights of 90 lb. are required to ensure that no uplift will occur. Although no controls are required to ensure this limit, filling B-25 containers with less than 90 lb. of waste is not practical and not expected to occur. Conservatively 1% of the B-25s are assumed to suffer uplift. This is conservative because based on the 1995, 1996, and 1997 certification reports, all B-25s with waste contained significantly greater than 90 lb. of waste.

9.0 RESULTS

The TRU Waste Pads and the LRWHF are both Hazard Category Two Facilities. The SW analysis of tornado events hitting TRU B-25s has been applied to potential sludge boxes and potential TRU boxes in the LRWHF. The results are calculated in Attachment 4-8 and shown in Table 1.

Table 1 Curies allowed before Offsite Limits/Onsite Guidelines Exceeded

Closure Method	Ci Threshold for Onsite Guideline[1] (Eq. α Ci)	Ci Threshold for Offsite Limit [2] (Eq. αCi)
Positive Closure (Sealed)	4.4E+05 *(Sludge=1.96E+06 B-25s*)* *(TRU=4.44E+03 B-25s**)*	8.8E+05 *(Sludge= 3.9E+06 B-25s*)* *(TRU=8.88E+03 B-25s**)*
Non-positive Closure (unsealed/chained)	8.8 *(Sludge=39 B-25s*)* *(TRU= 0.01 B-25s**)*	18 *(Sludge = [illegible] B-25s*)* *(TRU=0.18 B-25s**)*

Note * Represents the number of potential sludge B-25s loaded to 0.23 Ci of alpha. See Section 5.6.1.
Note ** Represents the number of potential TRU B-25s loaded to 100 Ci of alpha. See Section 5.6.2.
Note (1) Extremely conservative because for natural phenomena events only offsite consequences are normally determined.
Note (2) Because analysis analyzed a 190 mph wind, conservative X/Q applied (Ref. 6 vs. Ref. 7) and results conservative.

The results show that significantly less than one non-positively sealed B-25 containing 100 Ci of TRU waste could cause the Offsite/Onsite Limits and Guidelines to be exceeded, while if positively closed in excess of 4000 boxes would be required. For boxes defined as sludge boxes, greater than 30 unsealed boxes could cause the Offsite/Onsite Limits and Guidelines to be exceeded, while if positively closed, in excess of 1.5E+06 would be required.

10.0 CONCLUSION

Known TRU waste should always be placed directly into approved TRU Waste Containers. Any TRU waste scenario which looks at the impact of a tornado on a 55 gallon drum requires an additional leak factor associated with rolling (and therefore the resultant values should not be directly applied to drums).

Based on Reference 2 and 3 and the results calculated, it is recommended that B-25s which may contain potential sludge waste or potential TRU waste and are full (or no other waste will be place into them) must be closed and positively sealed (clipped) as designed and allowed by the 1S manual.

As part of this control it is necessary that an B-25s be visually inspected periodically and immediately prior to use for potential sludge or TRU contaminated waste. The inspection shall verify the following:

- That the waste boxes contain no visually observable holes
- The boxes do not contain excessive rust
- The boxes do not show evidence of excessive gasket wear/damage

Once verified the boxes can be immediately used for potential sludge or TRU contaminated waste. Any boxes that fail the inspection should be potentially considered for supernate contaminated waste.

As a good practice, full containers should be characterized and transported for disposal in a timely fashion.

Procedures should ensure the following:

- All full B-25s are clipped and that the only open B-25s are those to which waste is currently being added.

As a good practice and to ensure adequate control and the ability to respond to all conditions within a timely fashion, it is recommended that a maximum of 10 containers with potential sludge waste or TRU waste remain unclipped within a facility's boundaries.

Controls should be required that upon ***High Wind/ Tornado Watch:***

- B-25s which contain potential sludge waste and potential TRU waste that are not closed or positively sealed should be sealed as designed and allowed by the 1S Manual.

As part of this control, an Administrative Control Program will be required identifying containers requiring closure during Emergency Conditions.

11.0 References

1. Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities, DOE-STD-1020-94, U.S. Department of Energy, Washington, DC April 1994.

2. Safety Analysis Report, Solid Waste Management Facility Chapter 3, Hazard and Accident Analysis, WSRC-SA-22, Rev. 0, December 1996.

3. Tornado Evaluation of the SWMF TRU Waste Storage Pads (U), S-CLC-E-00027, Rev. 0, 3/31/95.

4. Waste Inventory Logsheet, FT14003928, Page 1 (Tare Weight)

5. DOE Handbook, Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities, October 1994.

6. Emergency Preparedness Hazard Assessment for the F and H Tank Farms, Rev. 0, 12/16/96.

7. Hazard and Accident Analyses for the Liquid Radioactive Waste Handling Facilities (U), WSRC-TR-96-0102, Rev. 2, 12/13/96.

8. Inventory Control Program for the 299-H Facility, WSRC-TR-97-00342, Rev. 0, 12/18/97.

The Onsite Guideline can be exceeded									
based on Section 9.0 with 8.8 Ci									
Therefore									
	Ci Limit	g/Ci of Pu-238	g of Pu-238	con	sol	con			
	A	B	C=A/B	1000mg/g	1L/0.1mg	gal/3.785L			
	8.8	17.15	0.51311953	513.1195	5131.195	1355.666			
Conservatively, we can say roughly 1200 gallons are required.									
Since on average less than 1 gallon is associated with a B-25 ,we can conclude 1200 boxes would be required									
and all would have to be released.									
Note: 8.8 Ci was calculated in Attachment 8A and 8B.									

Attachment 2

WSRC-SA-22
Rev. 0

Hazard Classification Table

Facility	Radiological Hazard Classification	Chemical Hazard Classification	Facility Hazard Classification
Old Burial Grounds	2	3	2
TRU Waste Storage Pads	2	2	2
Greater Confinement Disposal Facility	3	NA	3
Used Equipment Storage Area	3	NA	3
Naval Reactor Component Storage Area	3	NA	3
Engineered Low-Level Trenches	2	2	2
Solvent Storage Tanks	3	General Use	3
Mixed Waste Storage Buildings	3	3	3
Mixed Waste Management Facility	2	2	2
N Area	3	3	3
Hazardous Waste Storage Building	NA	3	3
E-Area Low-Activity Waste Vaults	3	NA	3
E-Area Intermediate-Level Non-Tritium Vaults	3	NA	3
E-Area Intermediate-Level Tritium Vaults	3	NA	3
E-Area Long-Lived Waste Storage Building	3	NA	3
Waste Certification Facility	3	3	3
Compactor Building	3	NA	3

Attachment 3

DOE-STD-1020-94

Recommended Basic Wind Speeds for DOE Sites, in miles per hour

Performance Category	Fastest-Mile Wind Speeds at 10m Height					
	1	2	3		4	
	Wind	Wind	Wind	Tornado[4]	Wind	Tornado[4]
DOE PROJECT SITES	$2x10^{-2}$	$2x10^{-2}$	$1x10^{-3}$	$2x10^{-5}$	$1x10^{-4}$	$2x10^{-6}$
Kansas City Plant, MO	72	72	--	144	--	198
Los Alamos National Laboratory, NM	77	77	93	--	107	--
Mound Laboratory, OH	73	73	--	136	--	188
Pantex Plant, TX	78	78	--	132	--	182
Rocky Flats Plant, CO	109	109	138	(3)	161	(3)
Sandia National Laboratories, NM	78	78	93	--	107	--
Sandia National Laboratories, CA	72	72	96	--	113	--
Pinellas Plant, FL	93	93	130	--	150	--
Argonne National Laboratory--East, IL	70[1]	70[1]	--	142	--	196
Argonne National Laboratory--West, ID	70[1]	70[1]	83	--	95	--
Brookhaven National Laboratory, NY	70[1]	70[1]	--	95[2]	--	145
Princeton Plasma Physics Laboratory, NJ	70[1]	70[1]	--	103	--	150
Idaho National Engineering Laboratory	70[1]	70[1]	84	--	95	--
Feed Materials Production Center, OH	70[1]	70[1]	--	139	--	192
Oak Ridge, X-10, K-25, and Y-12, TN	70[1]	70[1]	--	113	--	173
Paducah Gaseous Diffusion Plant, KY	70[1]	70[1]	--	144	--	198
Portsmouth Gaseous Diffusion Plant, OH	70[1]	70[1]	--	110	--	166
Nevada Test Site, NV	72	72	87	--	100	--
Hanford Project Site, WA	70[1]	70[1]	80[1]	--	90[1]	--
Lawrence Berkeley Laboratory, CA	72	72	95	--	111	--
Lawrence Livermore National Lab., CA	72	72	96	--	113	--
LLNL, Site 300, CA	80	80	104	--	125	--
Energy Technology & Engineering Center, CA	70[1]	70[1]	--	95[2]	--	111
Stanford Linear Accelerator Center, CA	72	72	95	--	112	--
Savannah River Site, SC	78	78	--	137	--	192

NOTES:

(1) Minimum straight wind speed.

(2) Minimum tornado speed.

(3) Although straight winds govern at Rocky Flats, because the potential for a tornado strike is high, it is recommended that facilities be designed for tornado missiles. APC need not be considered.

(4) Tornado speed includes rotational and translational effects

(5) Hurricane effects adjustments as per Table 3-1

	A	B	C	D	E	F	G	H	I	J	K
1	Sludge Offsite Tornado										
2											
3	**UNSEALED (NO POSITIVE CLOSURE)**										
4	TRU Limit activity per box		1.00E-07	Ci/g							
5	TRU limit per box		2.27E-01	Ci							
6	Number of B-25s		7.74E+01								
7											
8							offsite				
9		EDE	MAR	Tornado			2 hr. X/Q	BR	Offsite dose		
10		[rem/Ci]	[Ci]	ARF	RF	LPF	[min/m3]	[m3/min]	[rem]		
11											
12	Sludge	5.2E+08	2.3E-01	1.0E+00	1	1.0E+00	1.2E-07	2.3E-02	2.50E+01		
13											
14	Notes:										
15		Tornados bound straight winds									
16		Frequency of a tornado is assumed to be 2E-5 or 3E-5 which is consistant with a PC3 tornado.									
17	Note: For calculations "goal seek" was used to calculate the number of boxes by setting the dose equal to the limit based on the tornado frequency.										
18											
19	**SEALED (POSITIVE CLOSURE)**										
20	TRU Limit activity per box		1.00E-07	Ci/g							
21	TRU limit per box		2.27E-01	Ci							
22	Number of B-25s		3.91E+06								
23											
24											
25		EDE						2 hr. X/Q	BR	Offsite dose	
26		[rem/Ci]	CI	Number	CD	MRF	Total ARF	[min/m3]	[m3/min]	[rem]	
27	Uplift	5.2E+08	2.3E-01	3.91E+06	0.01	1.00E-01	2.0E-04	1.2E-07	2.28E-02	0.24752	
28	Missile	5.2E+08	2.3E-01	3.91E+06	1	1.00E-01	2.0E-04	1.2E-07	2.28E-02	24.7523	
29	Roll	5.2E+08	2.3E-01	3.91E+06	0	1.00E-01	2.0E-04	1.2E-07	2.28E-02	0	
30	APC	5.2E+08	2.3E-01	3.91E+06	0	1.00E-01	2.0E-04	1.2E-07	2.28E-02	0	
31					from S-CLC-E-00027					25	
32					with missile exception						
33	Notes:	Assumes positive closure									
34		Assumes B-25s are not stacked on each other									
35		Conservatively all B-25s hit by missiles and damaged									
36		Since B-25s are not stacked, if tipped, no resulting release (WSRC-SA-22)									
37		APC not a viable release mechanism per (WSRC-SA-22)									
38		X/Q value used (Ref. 6) is conservative than that in Ref. 7									
39											
40											
41	Note: For calculations "goal seek" was used to calculate the number of boxes by setting the dose equal to the limit based on the tornado frequency.										

WSRC-TR-98-00052

Attachment 4 - Sludge Dose from a PC-3 Tornado, Offsite (CALC)

	A	B	C	D	E	F	G	H	I	J
1	Sludge Offsite Tornado									
2										
3	UNSEALED (NO POSITIVE CLOS									
4	TRU Limit activity per box		0.0000001	Ci/g						
5	TRU limit per box		0.227	Ci						
6	Number of B-25s		77.4095806555811							
7										
8							offsite			
9		EDE	MAR	Tornado			2 np. Σ/Θ	BR	Offsite dose	
10		[rem/Ci]	[Ci]	ARF	RF	LPF	[min/m3]	[m3/min]	[rem]	
11										
12	supernate	520000000	=C5	1	1	1	0.00000012	0.0228	=G12*H12*F12*E1	
13										
14	Notes:									
15		Tornados bo								
16		Frequency of								
17	Note: For calculations "goal seek" w									
18										
19	SEALED (POSITIVE CLOSURE)									
20	TRU Limit activity per box		0.0000001	Ci/g						
21	TRU limit per box		0.227	Ci						
22	Number of B-25s		3910336							
23										
24										
25		EDE						2 hr. X/Q	BR	Offsite dose
26		[rem/Ci]	CI	Number	CD	MRF	Total ARF	[min/m3]	[m3/min]	[rem]
27	Uptilt	520000000	=C21	=C22	=1/100	0.1	0.000196	0.00000012	0.0228	=B27*C27*D27*E27*F27*G27*H27*I27
28	Missile	520000000	=C21	=C22	1	0.1	0.000196	0.00000012	0.0228	=B28*C28*D28*E28*F28*G28*H28*I28
29	Roll	520000000	=C21	=C22	0	0.1	0.000196	0.00000012	0.0228	=B29*C29*D29*E29*F29*G29*H29*I29
30	APC	520000000	=C21	=C22	0	0.1	0.000196	0.00000012	0.0228	=B30*C30*D30*E30*F30*G30*H30*I30
31										=SUM(J27:J30)
32										
33	Notes:									
34										
35										
36	Formula sheet									
37	of previous page									
38										
39										
40										
41										

USRC-TR-98-00050

Sludge Onsite Tornado											
UNSEALED {NO POSITIVE CLOSURE}											
TRU Limit activity per box		1.00E-07	Ci/g	Based on Definition of TRU							
TRU limit per box		2.27E-01	Ci	Based on Maximum weight allowed in B-25							
Number of B-25s		3.89E+01									
						onsite					
	EDE	MAR	Tornado			2 hr. X/Q	BR	nsite dose			
	[rem/Ci]	[Ci]	ARF	RF	LPF	[min/m^3]	[m^3/min]	[rem]			
supernate	5.2E+08	2.3E-01	1.0E+00	1	1.0E+00	9.55E-07	2.3E-02	1.00E+02			
Notes:											
	Frequency of a tornado is assumed to be 2E-5 or 3E-5 which is consistant with a PC3 tornado.										
Note: For calculations "goal seek" was used to calculate the number of boxes by setting the dose equal to the limit based on the tornado frequency.											
SEALED {POSITIVE CLOSURE}											
TRU Limit activity per box		1.00E-07	Ci/g	Based on Definition of TRU							
TRU limit per box		2.27E-01	Ci	Based on Maximum weight allowed in B-25							
Number of B-25s		1.96E+06									
	EDE						2 hr. X/Q	BR	nsite dose		
	[rem/Ci]	CI	Number	CD	MRF	Total ARF	[min/m^3]	[m^3/min]	[rem]		
Uplift	5.2E+08	2.3E-01	2.0E+06	0.01	0.1	1.96E-04	9.6E-07	2.3E-02	9.90E-01		
Missile	5.2E+08	2.3E-01	2.0E+06	1	0.1	1.96E-04	9.6E-07	2.3E-02	9.90E+01		
Roll	5.2E+08	2.3E-01	2.0E+06	0	0.1	1.96E-04	9.6E-07	2.3E-02	0.00E+00		
APC	5.2E+08	2.3E-01	2.0E+06	0	0.1	1.96E-04	9.6E-07	2.3E-02	0.00E+00		
				from S-CLC-E-00027					1.00E+02		
				with missile exception							
Notes:	Assumes positive closure										
	Assumes B-25s are not stacked on each other										
	Conservatively all B-25s hit by missiles and damaged										
	Since B-25s are not stacked, if tipped, no resulting release (WSRC-SA-22)										
	APC not a viable release mechanism per (WSRC-SA-22)										
	Natural Phenomena normally evaluated for offsite dose										
	X/Q used extremely conservative (based on Ref. 6); could use offsite										
Note: For calculations "goal seek" was used to calculate the number of boxes by setting the dose equal to the limit based on the tornado frequency.											

Attachment 5 - Sludge Dose from a PC-3 Tornado, Onsite (CALC)

	A	B	C	D	E	F	G	H	I	J
1	Sludge Onsite Tornado									
2										
3	UNSEALED (NO POSITIVE CLO									
4	TRU Limit activity per box		0.0000001	Ci/g						
5	TRU limit per box		=C4*454*5000	Ci						
6	Number of B-25s		38.9074332090879							
7										
8							onsite			
9		EDE	MAR	Tornado			2 hr. X/Q	BR	Onsite dose	
10		[rem/Ci]	[Ci]	ARF	RF	LPF	[min/m3]	[m3/min]	[rem]	
11										
12	supernate	520000000	=C5	1	1	1	0.000000955	0.0228	=B12*C12*D12*E12*F12*G12*H12*	
13										
14	Notes:									
15	*									
16	Note: For calculations "goal seek"									
17										
18	SEALED (POSITIVE CLOSURE)									
19	TRU Limit activity per box		0.0000001	Ci/g						
20	TRU limit per box		=C19*454*5000	Ci	Maximum weight allow					
21	Number of B-25s		1955182.37663117							
22										
23										
24		EDE						2 hr. C/Q	BR	Onsite dose
25		[rem/Ci]	CI	Number	CD	MRF	Total ARF	[min/m3]	[m3/min]	[rem]
26	Uplift	520000000	=C20	=C21	=1/100	0.1	=(0.001*0.1)+(0.00000	0.00000096	0.0228	=B26*C26*D26*E26*F26*G26*H26*I26
27	Missile	520000000	=C20	=C21	1	0.1	=(0.001*0.1)+(0.00000	0.00000096	0.0228	=B27*C27*D27*E27*F27*G27*H27*I27
28	Roll	520000000	=C20	=C21	0	0.1	=(0.001*0.1)+(0.00000	0.00000096	0.0228	=B28*C28*D28*E28*F28*G28*H28*I28
29	APC	520000000	=C20	=C21	0	0.1	=(0.001*0.1)+(0.00000	0.00000096	0.0228	=B29*C29*D29*E29*F29*G29*H29*I29
30					from S-CLC-E-00027					=SUM(J26:J29)
31					with missile exception					
32	Notes:									
33										
34	Formula sheet									
35	of previous page									
36										
37	Note For calculations "goal seek"									

Potential TRU Waste												
POSITIVE CLOSURE REQUIRED												
Number of TRU Containers Allowed if Positively Sealed						8.88E+03						
	EDE						2 hr. X/Q	BR	ffsite dose			
	[rem/Ci]	CI	Number	CD	MRF	Total ARF	[min/m^3]	[m^3/min]	[rem]			
Uplift	5.2E+08	1.0E+02	8.9E+03	0.01	0.1	1.96E-04	1.2E-07	2.3E-02	2.48E-01			
Missile	5.2E+08	1.0E+02	8.9E+03	1	0.1	1.96E-04	1.2E-07	2.3E-02	2.48E+01			
Roll	5.2E+08	1.0E+02	8.9E+03	0	0.1	1.96E-04	1.2E-07	2.3E-02	0.00E+00			
APC	5.2E+08	1.0E+02	8.9E+03	0	0.1	1.96E-04	1.2E-07	2.3E-02	0.00E+00			
				from S-CLC-E-00027					2.50E+01			
				with missile exception								
Notes:	Assumes positive closure											
	Assumes B-25s are not stacked on each other											
	Conservatively all B-25s hit by missiles and damaged											
	Since B-25s are not stacked, if tipped, no resulting release (WSRC-SA-22)											
	APC not a viable release mechanism per (WSRC-SA-22)											
	X/Q value used (Ref. 6) is conservative than that in Ref. 7											
Note: For calculations "goal seek" was used to calculate the number of boxes by setting the dose equal to the limit based on the tornado frequency.												

Attachment 6 - TRU Dose from a PC-3 Tornado, Offsite (CALC)

	A	B	C	D	E	F	G	H	I	J
1	Potential TRU Waste									
2	POSITIVE CLOSURE REQUIR									
3										
4										
5										
6	Number of TRU Containers Allo						8876.52798990549			
7										
8		EDE						2 hr. X/Q	BR	Offsite dose
9		[rem/Ci]	Ci	Num	CD	MRF	Total ARF	[min/m3]	[m3/min]	[rem]
10	Uplift	520000000	100	=G8	=1/100	0.1	=(0.001*0.1)+(0.000004*1*24	0.0000001	0.0228	=B10*C10*D10*E10*F10*G10*H
11	Missile	520000000	100	=G8	1	0.1	=(0.001*0.1)+(0.000004*1*24	0.0000001	0.0228	=B11*C11*D11*E11*F11*G11*H
12	Roll	520000000	100	=G8	0	0.1	=(0.001*0.1)+(0.000004*1*24	0.0000001	0.0228	=B12*C12*D12*E12*F12*G12*H
13	APC	520000000	100	=G8	0	0.1	=(0.001*0.1)+(0.000004*1*24	0.0000001	0.0228	=B13*C13*D13*E13*F13*G13*H
14										=SUM(J10:J13)
15										
16	Notes:									
17										
18	Formula sheet									
19	of previous page									
20										

Attachment 7- TRU Dose from a PC-3 Tornado, Onsite

Potential TRU Waste												
POSITIVE CLOSURE REQUIRED												
Number of TRU Containers Allowed if Positively Sealed						4.44E+03						
	EDE						2 hr. X/Q	BR	nsite dose			
	[rem/Ci]	CI	Number	CD	MRF	Total ARF	[min/m^3]	[m^3/min]	[rem]			
Uplift	5.2E+08	1.0E+02	4.4E+03	0.01	0.1	1.96E-04	9.6E-07	2.3E-02	9.90E-01			
Missile	5.2E+08	1.0E+02	4.4E+03	1	0.1	1.96E-04	9.6E-07	2.3E-02	9.90E+01			
Roll	5.2E+08	1.0E+02	4.4E+03	0	0.1	1.96E-04	9.6E-07	2.3E-02	0.00E+00			
APC	5.2E+08	1.0E+02	4.4E+03	0	0.1	1.96E-04	9.6E-07	2.3E-02	0.00E+00			
				from S-CLC-E-00027					1.00E+02			
				with missile exception								
Notes:	Assumes positive closure											
	Assumes B-25s are not stacked on each other											
	Conservatively all B-25s hit by missiles and damaged											
	Since B-25s are not stacked, if tipped, no resulting release (WSRC-SA-22)											
	APC not a viable release mechanism per (WSRC-SA-22)											
	Natural Phenomena normally evaluated for offsite dose											
	X/Q used extremely conservative (based on Ref. 6); could use offsite											
Note: For calculations "goal seek" was used to calculate the number of boxes by setting the dose equal to the limit based on the tornado frequency.												

WSRC-TR-98-00050.

Attachment 7 - TRU Dose from a PC-3 Tornado, Onsite (CALC)

	A	B	C	D	E	F	G	H	I	J
1	Potential TRU Waste									
2	POSITIVE CLOSURE REQUIRED									
3										
4										
5										
6	Number of TRU Containers Allowed if Positive!						4438.26399495275			
7										
8		EDE						2 hr. X/Q	BR	Onsite dose
9		[rem/Ci]	Ci	Number	CD	MRF	Total ARF	[min/m3]	[m3/min]	[rem]
10	Uplift	520000000	100	=G6	=1/100	0.1	=(0.001*0.1)+(0.000004*1*24)	0.00000096	0.0228	=B10*C10*D10*E10*F10*G10*H10*I10
11	Missile	520000000	100	=G6	1	0.1	=(0.001*0.1)+(0.000004*1*24)	0.00000096	0.0228	=B11*C11*D11*E11*F11*G11*H11*I11
12	Roll	520000000	100	=G6	0	0.1	=(0.001*0.1)+(0.000004*1*24)	0.00000096	0.0228	=B12*C12*D12*E12*F12*G12*H12*I12
13	APC	520000000	100	=G6	0	0.1	=(0.001*0.1)+(0.000004*1*24)	0.00000096	0.0228	=B13*C13*D13*E13*F13*G13*H13*I13
14										=SUM(J10:J13)
15										
16	Notes:									
17										
18										
19										
20										
21										
22	Note:									
23										
24										
25	Formula sheet of previous page									

TRU Ci Offsite Tornado									
UNSEALED {NO POSITIVE CLOSURE}									
Allowed unsealed TRU Ci		1.76E+01							
							offsite		
	EDE	MAR	Tornado				2 hr. X/Q	BR	ffsite dose
	[rem/Ci]	[Ci]	ARF	RF		LPF	[min/m^3]	[m^3/min]	[rem]
supernate	5.2E+08	1.8E+01	1.0E+00	1		1.0E+00	1.2E-07	2.3E-02	2.50E+01
Notes:									
	Frequency of a tornado is assumed to be 2E-5 or 3E-5 which is consistant with a PC3 tornado.								
	Tornados bound straight winds								
	X/Q value used (Ref. 6) is conservative than that in Ref. 7								
TRU Ci Onsite Tornado									
UNSEALED {NO POSITIVE CLOSURE}									
Allowed unsealed TRU Ci		8.79E+00							
							onsite		
	EDE	MAR	Tornado				2 hr. X/Q	BR	nsite Dose
	[rem/Ci]	[Ci]	ARF	RF		LPF	[min/m^3]	[m^3/min]	[rem]
supernate	5.2E+08	8.8E+00	1.0E+00	1		1.0E+00	9.6E-07	2.3E-02	1.00E+02
Notes:									
	Frequency of a tornado is assumed to be 2E-5 or 3E-5 which is consistant with a PC3 tornado.								
	Tornados bound straight winds								
	Natural Phenomena normally evaluated for offsite dose								
	X/Q used extremely conservative (based on Ref. 6); could use offsite								

Attachment 9

GOCO

PROCUREMENT SPECIFICATION FOR
Low Level Waste Boxes (U)

Specification No.: M-SPP-G-00248		Revision: 2
Procurement Level: 2	Design Class: FS	Page: 1a of 23
Department: SW		Division: SWER

INFORMATION ONLY

Prepared by _____ Date 5.10.96
Name: V. B. Shambri, 705-3C
Title: Senior Engineer
Dept./Section: Solid Waste/Engineering

Verified by _____ Date 5/28/96
Name: B. A. Daugherty, 705-3C
Title: Manager
Dept./Section: Solid Waste/Program Integration

Approved by _____ Date 5/29/96
Name: W. T. Goldston, 705-3C
Title: Manager
Dept./Section: Solid Waste/Engineering

CQF _____ Date 05/22/96
Name: C. M. McGee, 705-3C
Title: Engineer
Dept./Section: Solid Waste/Quality Assurance

Facility Manager _____ Date 7-1-96
Name: G. W. Faulk, 724-7E
Title: Manager
Dept./Section: Solid Waste/Operations

Savannah River Site
Aiken, SC 29802

Attachment 9 (Continued)

GOCO Westinghouse Savannah River Company	PROCUREMENT SPECIFICATION FOR Low Level Waste Boxes (U)		
	Specification No.: M-SPP-G-00248		Revision: 2
	Procurement Level: 2	Design Class: PS	Page: 1bof 23
	Department: SW		Division: SWER

GOCO Representative: _____ Date 7/5/96
Name: J. W. French, 705-3C
Title: Area Manager Solid Waste Management
Company: Westinghouse Savannah River Company

Savannah River Site
Aiken, S. C. 29802

Attachment 9 (Continued)

GOCO

West Valley Nuclear Services

PROCUREMENT SPECIFICATION FOR
Low Level Waste Boxes (U)

Specification No.: M-SPP-G-00248			Revision: 2
Procurement Level: 2	Design Class: PS		Page: 1c of 23
Department: SW		Division: SWER	

GOCO Representative: [signature] for DHK Date 7/15/96
Name: D. H. Kurasch
Title: Manager
Company: West Valley Nuclear Services
Address: P. O. Box 191
West Valley, New York 14171

Attachment 9 (Continued)

GOCO

Westinghouse Hanford Company

PROCUREMENT SPECIFICATION FOR
Low Level Waste Boxes (U)

Specification No.: M-SPP-G-00248			Revision: 2
Procurement Level: 2	Design Class: PS		Page: 1 of 23
Department: SW		Division: SWER	

GOCO Representative: [signature] for WHH Date 7/15/96
Name: W. H. Hamilton, Jr.
Title: Manager
Company: Westinghouse Hanford Company
Address: P. O. Box 1970
Richland, Washington 99352

WSRC-TR-98-00050
Revision 0
February 10, 1998
Page 29 of 55

Attachment 9 (Continued)

Procurement Specification for
Low Level Waste Box

Specification No.: M-SPP-G-00248
Revision No.: 2
Page 2 of 23
Date: May 10, 1996

Table of Contents

Attachment 9 (Continued)

SPECIFICATION FOR PROCUREMENT OF

LOW LEVEL WASTE BOXES

Specification No. M-SPP-G-00248

REVISIONS

Revision Date	Revision Number	Affected Sections and Paragraphs	Description of Changes
5/10/96	2	6.1.2	Deleted the "suggested method shall be to use bands", in the second sentence. Deleted third sentence. These statements had resulted in confusion in the past with the requirements of the paragraph. Replaced "sealing" by "closure" for consistency.
5/10/96	2	6.1.5	Replaced "will" by "shall". Deleted extraneous part of the note "--first before-- lifting lugs are used."
5/10/96	2	7.2.1	Reworded to be consistent with the requirements of 6.1.4. for a load test to be performed for gross weight of four boxes stacked on the box (payload + weight of boxes/lids).
5/10/96	2	7.2.2	Deleted the word "suggested" from the second sentence as it is in appropriate with the "shall" requirement.
5/10/96	2	11.1.1	Removed the requirement of placing one copy of the documents in each box shipped.
5/10/96	2	11.1.2	Deleted "/ or". Supplier correspondence shall carry P. O. No. and Release no.
5/10/96	2	Attachment 13.3	Revised load test load to be consistent with the requirements of 6.1.4 and 7.2.1. Added note to require that future load tests be performed for gross weight. Allows acceptance of previously load tested boxes for Rev. 1 of the specification.

Attachment 9 (Continued)

1.0 Scope

Design, fabricate, assemble and deliver strong-tight (DOT Type 7A for Option 4) B-25 container boxes for storage packaging, and transporting of Low Level, Solid, Radioactive Waste of several GOCO sites.

1.1 Deliverable Items

The supplier shall provide evidence of compliance to this specification to the GOCO Site Ordering Boxes at the time of delivery. Strict adherence to this spec. is required to assure quality, reliability and integrity of the boxes to prevent the possibility of spreading contamination during transport or movement.

1.2 Responsibility for Materials and Items

The supplier shall be responsible for providing fabrication and test procedures used to manufacturer the Strong-Tight (DOT Type 7A per Option 4) container specified herein. They shall also be responsible for fabrication and testing of the container while maintaining a level of quality comparable to the conditions specified in Section 4.0 over the entire life of the contract. As a minumum, yearly audits shall be performed by one or all GOCO Sites to verify compliance. All materials used in fabrication shall be certified new and unused. The supplier will submit drawings, procedures, and test reports to the releasing GOCO Site for approval prior to fabrication start.

1.2.1 Responsibility for Releases

WSRC GOCO Site shall initiate the requisition, Spec. and award the contract. Subsequent releases of container requests shall be through the individual point of contact(s) of each participating GOCO Site. Releases shall be 30 days prior to required delivery date. Emergency releases shall be 15 days prior to required delivery date.

1.3 Definitions

- **AAC** — After Award of Contract.
- **AISC** — American Institute of Steel Construction.
- **AWS** — AmericanWelding Society
- **ASTM** — American Society of Testing and Materials.
- **GOCO** — Government Owned Contractor Operated.
- **HOLD POINT** — A designated point in the manufacture or processing of an item beyond which activities may not continue without the presence of inspection or surveillance personnel.

Attachment 9 (Continued)

- ICQR — Independently Contracted Quality Representative.
- LOT — A negotiated point between each representative and the vendor which is descriptive of a break in the fabrication/delivery process for boxes to identify a quantity of boxes for QA purposes, i.e., either based on the materials of fabrication, the vendor's approved process or the number of boxes transported in each truckload, etc.
- SWE — Solid Waste Engineering.
- WITNESS POINT — A designated point in the manufacturing or processing of an item which requires the supplier to notify the ICQR sufficiently in advance to allow for scheduling and performance of witness test activities. The witness point maybe waved by the designated representative providing the activity can be witnessed on future runs of material and the ICQR reviews the documentation for the previous activity.
- WSRC — Westinghouse Savannah River Company.

2.0 Service Conditions

These boxes are to be used for the packaging, transport and storage of low level solid, radioactive waste (with not more than one percent (1%) liquid by weight) generated at each of the GOCO sites.

3.0 Reference Documents

The supplier shall ensure that the boxes meet the following codes and standards.

3.1 Codes and Regulations (For DOT Type 7A containers see Option 4)

- Code of Federal Regulations, Title 29 CFR 1910, Occupational Safety and Health Standards , 1990 revision.
- Code of Federal Regulations, Title 49 CFR 173.24, Standard Requirements for All Packaging, 1990 revision.
- Code of Federal Regulations, Title 49 CFR 173.411, General Design Requirements for All Packaging, 1990 revision.

3.2 Standards

- ASTM A-569, steel, carbon (0.15%) hot-rolled, sheet and strip, commercial quality, "1987 Book of ASTM Standards".
- ASTM D-1056-73, Specification for Flexible Cellular Materials - Sponge or Expanded Rubber, "1975 Book of ASTM Standards".
- AWS D1.1-90, Structural Welding Code - Steel.
- ASTM D-16-84, Type I, Paint Finish Criteria, "1987 Book of ASTM Standards".

Attachment 9 (Continued)

- AISC, American Institute of Steel Construction Handbook.
- ASTM A-36, Specification for Structural Grade Carbon Steel, "1987 Book of ASTM Standards".

3.3 SRS Documents

Savannah River Site Sketch (Attachment 13.1)

Reference Sketch:

Low Level Waste Burial Box Sketch 1, revision 0, 11/19/92

Note: The qualifying vendor shall submit box detail designs or drawings as well as fabrication and inspection procedures for approval by participating GOCO. The attached sketch and Options Page are provided for reference and informational purposes (see Section 13.1 and 13.2).

4.0 Supplier QA Program

THESE CONTAINERS WILL BE PURCHASED AS A LEVEL 2 PROCUREMENT. They will be required to meet all requirements in Sections 3.1, 3.2, and 3.3. In addition these packages shall be inspected, at the facilty, by an ICQR as noted here within this specification.

5.0 Personnel Qualifications/Certifications

Personnel performing activities shall be qualified or certified in accordance with the supplier's approved Quality Assurance Program. Welders shall be qualified per Section V of AWS D1.1-90 Structural Welding Code and all subsequent addenda. Training records and certifications shall be maintained by the vendor for all personnel to demonstrate their employees qualifications to perform the work expected herein. (See Section 11.2)

6.0 Technical Requirements

6.1 Required Items and Performance

6.1.1 The vendor shall submit box design for approval to the releasing GOCO Site. Attachment 13.1 is provided for information and reference.

6.1.2 Provisions shall be made to ensure fast, positive closure of the lid to the box. The closure mechanism shall achieve twenty percent minimum compression of the gasket between the lid and box after closure. It is the responsibility of the vendor to identify these methods and present their findings for consideration to each of participating facilities. The vendor's lid/box closure design shall be submitted for approval to all sites. The closure mechanism shall not interfere with the box stacking capabilities. The lid/box closure mechanism shall be one of the items to be approved by GOCO.

6.1.3 Each box shall have capacity of holding five-thousand pounds (5,000 lbs) of solid waste (with not more than one percent (1%) liquid by weight).

6.1.4 Each box shall be capable of being stacked five (5) high. The bottom box shall support 20,000 pounds payload plus box/lid weight with minimal distortion of the sidewall.

6.1.5 Each box shall be configured to allow for complete manipulation of the box with a forktruck. The lid shall be configured to allow lifting of the lid off the box by hand. Both configurations shall not interfere with the stacking capabilities of the box.

Note: **Removable eyes and/or lifting lugs shall not be considered as a viable alternative to manipulate these boxes in this specification. If a crane is required; spreader bars, slings, wire straps, etc., shall be considered.**

6.1.6 Options are in Section 13.2. Supplier to provide optional design upon GOCO Site Release.

6.1.7 A minimum dry film thickness of 2.6 mils (.0026 inches) shall be provided on the outer surfaces of all boxes. The finish coating shall comply with ASTM D-16-84, Type I standards. Colors shall be identified on Option 1 Section 13.2.

6.2 Design Conditions

Other than the conditions mentioned in Sections 3.0, 6.1.1 and 13.1, no special design conditions shall exist due to internal differences between each of the participating GOCOs.

6.3 Materials of Construction

All equipment, material, and articles incorporated in the work covered by this specification shall be new and unused. Other than what is mentioned in Sections 3.0, 6.1.1 and 13.1, all materials shall be free from defects that would adversely affect the performance or maintainability of individual components across the overall assembly of this box. Materials not specified herein shall be of the same quality as materials used for the intended purpose in commercial practice.

6.4 Fabrication and Assembly

Other than what is requested in this specification, all standard methods or practices used to fabricate these boxes by the approved supplier shall be acceptable.

6.4.1 Steel Fabrication

The steel used shall be free from kinks, sharp bends, and other conditions that would be deleterious to the finished product. The manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. The manufacturing process shall be neat and accurate. All bends shall be made by controlled means to ensure uniformity of size and shape.

6.4.2 Bolted Connections

Bolt holes shall be accurately punched or drilled, with all burrs removed. Washers or lock washers shall be provided in accordance with good commercial practices. All nuts and screws installed on the box shall be tight. All loose bolts, nuts and screws be boxed and placed inside the box for future use.

Attachment 9 (Continued)

6.4.3 **Riveted Connections**

Rivet holes shall be accurately punched or drilled, with all burrs removed. Rivets shall be driven with pressure tools and shall completely fill the holes they were intend for. When not countersunk or flattened, all rivet heads shall have the appropriate shape and size intended for a rivet. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member it is holding together.

6.4.4 **Welding**

Welding procedures shall be in accordance with AWS D.1.1-90, Structural Welding Code and all subsequent addenda. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Welds shall be of sufficient size and shape to develop the full strength of the parts connected by the weld. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof and service loading.

6.5 **Cleaning**

The standard cleaning practices used by the approved supplier shall be acceptable.

6.6 **Other**

All boxes shall be of standard quality workmanship consistent with industry-wide practices free from internal and external imperfections detrimental to their intended use.

7.0 Inspection, Testing, and Surveillance

7.1 Inspection

7.1.1 It shall be the vendor's responsibility through their own administrative control system, to perform inspections necessary to assure conformance with this specification. Once determined, a fabrication and an inspection procedure shall be submitted for approval by all participating facilities. Once approved, any changes shall be submitted, in writing, by the vendor to each representative for disposition. Written approval must be given prior to implementation of any changes.

Attachment 9 (Continued)

7.1.2 Non-conforming items shall be identified and segregated (when practical) by the supplier or subtier supplier. A SDDR shall be written for each box dispositioned "use-as-is" or "repair" and submitted to the appropriate facility placing the order for approval. A copy of the approved SDDR accompany the box when it is shipped to the requesting site. It is the responsibility of the vendor to assure that each site placing an order approves the SDDR(s) for "use-as-is" or "repair" boxes within that order.

Note: No site, other than the site placing the order, shall be held accountable for an SDDR approved by any other site.

7.1.3 Each GOCO shall reserve the right to have access to the supplier's facilities, including their subtier suppliers, vendors and subcontractors facility for the purpose of review, audit, surveillance, witnessing inspection, and testing activities.

7.1.4 Each GOCO shall reserve the right to perform inspections and/or surveillance of manufactured products being made during fabrication, assembly and testing. The ICQR shall review and perform checks to verify that the boxes have been manufactured in accordance with the approved procedure.

Note: No site shall have the authority to change, alter or modify any materials, procedures, or contract(s) generated for this purchase without approval of all sites. If any site wants to propose a change, the appropriate representative may submit, in writing, to the other representatives for determination. Written approval of the change to the vendor must be received from all sites prior to implementation.

7.1.5 The following requirements shall be witnessed by the ICQR and/or GOCO representatives during each visit to the vendor for inspection reasons:

- Verify by review of documentation that welders and procedures used were qualified per AWSD 1.1-90 Section V.
- Verify that documentation is being maintained per section 11.2. of this specification.
- Check the boxes for general dimensions and trial fit of the lid.
- Verify materials (e.g. - 14 gauge, 0.075" carbon steel, per ASTM A-569, gasket per ASTM D-1056, etc.).
- Inspect box interior for distortions greater than two inches (2").
- Verify that sharp edges and burrs are removed from the interior and exterior of the box, lid, and lid handles.
- Review surface preparation and painting requirements. Paint/primer shall have a uniform cover over the entire box surface.
- Review the sealing technique and effectiveness.

- Check the boxes to assure that the lid can be removed without the gasket material adhering to the box rim. Neither lid, box, rim, nor gasket material shall show damage during this procedure.

7.2 Testing

7.2.1 The supplier shall be required to perform at least one uniform load test per box design. For safety reasons, the supplier shall move the box to an independent testing area. This test shall be witnessed by the ICQR and/or GOCO representative requesting the box for authenticity.

Note: The ICQR may waive this test only if permission is given by the appropriate GOCO making the order, and only if the design has demonstrated passing this test during previous visits.

A test procedure shall be provided by the supplier to demonstrate that a box, half full of sand or water is capable of supporting a uniform load of twenty-thousand pounds plus box/lid weight of four boxes (20,000 ÷ 4 x – 500 = 22,000 ± 300 lbs) on the top surface (lid) of the box for a minimum of four hours (4 hrs ± 5 min.) with less than three-eighth inch (0.325 ± 0.125") deformation in the side walls. This procedure shall be submitted, in writing and approved by the ordering site prior to use. As a minimum, the results of this procedure shall be documented in a report titled "Low Level Waste Burial Box Load Test Report" with key witness points provided (see Attachment 13.3). The supplier may choose to use his own form, but shall use as minimum the data shown in the attachment.

If failure occurs during testing, the vendor shall stop fabrication, determine the problem cause, document the problem cause, propose changes, communicate the changes, and wait for written approval. The vendor shall not continue production until all changes have been approved. The ICQR shall verify that all changes have been implemented and communicate such to each GOCO representative.

7.2.2 The supplier shall perform at least one lid/box seal test per box design. For safety reasons, the supplier shall move the box to an independent testing area. This test shall be witnessed by the ICQR and/or GOCO representative requesting the box for authenticity.

A test procedure shall be provided by the supplier to demonstrate a fast, positive sealing approach. A gasket compression of twenty percent minimum shall be achieved. This procedure shall be submitted, in writing and approved by GOCO representative prior to use. The ICQR shall be empowered to perform this test as they deem necessary, with one exception. Anytime a design change occurs, this test shall be repeated and witnessed by the ICQR automatically.

As a minimum, the results of this procedure shall be documented in a report titled "Box Lid Seal Test Report" with key witness points provided (see Attachment 13.4). The supplier may choose to use his own form, but shall use as a minimum the data shown in the attachment.

If failure occurs during testing, the vendor shall stop fabrication, determine the

problem cause, document the problem cause, propose changes, communicate the changes, and wait for written approval. The vendor shall not continue production until all changes have been approved. The ICQR shall verify that all changes have been implemented and communicate such to each representative.

7.2.3 The vendor shall perform a standing water test on five percent (5%) of each lot of the boxes manufactured. This test shall be witnessed by the ICQR and/or GOCO representative requesting the box. The boxes tested shall be chosen by random pick. For safety reasons, the supplier shall move the boxes to an independent testing area. The test shall be no longer than four hours (4 hrs ± 5 minutes) in duration. The test shall cause the box to be filled to within one inch (1") from the top of the box with water. No leaks shall be permitted. If leaks are found, ten percent (10%) of the boxes within that lot shall be tested. If any leaks are found in the 10%, then 100% of the boxes in that lot will be tested. Any leaking boxes shall be repaired and retested by the vendor at no-charge. The vendor's test procedure shall be submitted for review and approval of all sites.

As a minimum, the results of this test shall be documented in a report titled "Hydrostatic Pressure/Leakage Test Report" with key witness points provided (see Attachment 13.5). The supplier may choose to use his own form, but shall use as a minimum the data shown in the attachment.

If failure occurs during testing, the vendor shall stop fabrication, determine the problem cause, document the problem cause, propose changes, communicate the changes, and wait for written approval. The vendor shall not continue production until all changes have been approved. The ICQR shall verify that all changes have been implemented and communicate such to each representative.

7.2.4 Before shipment of boxes is made, the ICQR and/or GOCO REP shall inspect and witness testing of all boxes for acceptance at the vendor site. Acceptance shall be based upon verifying that the items mentioned in Sections 7.1.4 , 7.2.1, 7.2.2, and 7.2.3 have been completed and signed.

Note: It is the responsibility of the vendor to coordinate a schedule whereby the ICQR minimizes trips to the vendor's facility.

7.2.5 Within fifteen (15) days of his visit to the vendors site, the ICQR and/or GOCO REP shall issue a memo stating whether acceptance has been granted per the inspections and tests specified in Section 7.1.4, 7.2.1., 7.2.2 and 7.2.3.

7.3 Surveillance

7.3.1 The supplier shall notify the SQSS (Supplier Quality Surveillance Services) group no less than forty-eight hours (48 hrs) before inspection is required. Inspection shall be performed by the ICQR. Every time the ICQR visits the vendors site, as a minumum the ICQR shall witness Section 7.1.4 and perform the following:

Note: Any GOCO shall reserve the right to waive inspection on their portion of this order. Under no circumstance shall one GOCO be able to waive or approve the inspection of another GOCO.

- The ICQR and/or GOCO REP shall pick and witness the uniform load test (see Section 7.2.1). After the inspection is complete, the ICQR or GOCO REP shall review and initial key points on the Low Level Waste Burial Box Load Test Report. This report shall be submitted as documentation per Section 11.0 of this specification.

- The ICQR and/or GOCO REP shall pick and witness the box/lid seal test (see Section 7.2.2). After the inspection is complete, the ICQR or GOCO REP shall review and initial key points on the Box /Lid Seal Test Report. This report shall be submitted as documentation per Section 11.0 of this specification.

- The ICQR and/or GOCO REP shall pick and witness the hydrostatic leak test of as a minimum at least five percent (5%) of each lot of boxes manufactured (see Section 7.2.3). After the inspection is complete, the ICQR or GOCO REP shall review and initial key points on the Hydrostatic Pressure/Leakage Test Report. This report shall be submitted as documentation per Section 11.0 of this specification.

7.3.2 Inspection results shall be documented by the vendor and signed by the ICQR. The inspection results shall list the identification number of the box inspected. The supplier shall maintain a copy of the ICQR signed inspection reports with the quality assurance documentation as-well-as include a copy of the report with each shipment.

7.3.3 Individuals as authorized by GOCO, shall have access to the vendor's facility or area where the contracted services are in process. This accessibility requirement is also applicable to the vendor's subtier suppliers when he contracts the services of others to produce items, services, or parts thereof. Accessibility includes reviewing, monitoring, and auditing of contracted in-process work, including associated documentation.

7.3.4 Any item which does not meet this specification shall be replaced by the manufacturer free of charge.

7.3.5 The quality assurance requirements for this project shall be designated as Category 2 per QAP 7-1 of the Quality Assurance Manual (WSRC - 1Q). This category is where the ICQR and/or his representative shall witness and verify all functional testing of the equipment at the manufacturer's facility before the equipment is released for shipment.

7.4 Final Acceptance Methods

7.4.1 Final acceptance of equipment shall be based upon the satisfactory completion of the "Receiving Instructions For Inspection " (see Section 13.6). Non-conforming item(s) discovered through inspection at the destination, shall be returned at the vendor's expense unless written agreement is received from the GOCO requesting the shipment to "accept-as-is" or unless agreement is made whereby the vendor shall be permitted to repair the item at the GOCO.

8.0 Installation

Not Applicable

Attachment 9 (Continued)

9.0 Packaging, Shipping, Storage, and Handling

9.1 The packaging, shipping, storage, and handling shall be designated as Level D, per WSRC/GOCO standards. The supplier shall be responsible for meeting all Level D requirements. Level D requirements shall be as shown below:

9.1.1 Prior to packaging an item, dirt, oil residue, water, metal chips, or other forms of contaminates shall be removed.

9.1.2 Items shall be properly packaged in containers, crates or other means as appropriate. All loose items shall be boxed, blocked, anchored, braced, and cushioned to prevent physical damage. In addition, items shall be stored on cribbing, dunnage or pallets for air circulation and to avoid trapping water.

9.1.3 These boxes may be stored outdoors in a well drained area.

9.2 The boxes shall not be shipped without approval of the representative. The vendor shall be held responsible for notifying the appropriate representative at least ten (10) business days prior to the shipment date.

9.3 Final Shipment of all the boxes and documentation shall be identified on the purchase order.

10.0 Marking/Identification

Each box shall be uniquely identified by providing the following information on a secure, durable, steel tag(s) welded in the upper right corner of the long side of the box or by stenciling with paint. (Note: *joint shall be made in such a fashion as to minimize corrosion beneath the tag.*) This tag shall be prepared and painted in the same fashion as box. Any stenciling made on the box shall be with paint of contrasting color and shall be compatible with the exterior box final protective coating:

- Release number, and numbering sequence for the container (for example, KX123456-02, indicating the second box of order KX123456).
- The following shall be stenciled on both long sides of the box on the upper 2/3 per the attached sketch (see Section 13.7):

Empty Weight	(for example, 350 lbs.)
Volume	(for example, 90 ft^3)
Pay Load	(for example, 5000 lbs.)
Total Gross Wt.	(for example, 5350 lbs.)

11.0 Supplier Documentation

11.1 Submittals

11.1.1 The vendor shall prepare two (2) complete sets of documentation for each shipment of boxes. One set shall be placed in the vendor's quality assurance files, and another set shall be placed in an envelope marked "Receipt Inspection Documentation". Each sheet shall list the purchase order number and piece numbers for identification. Each set shall contain a document inventory transmittal sheet (listing all documents and number of pages attached) and one or more of the attached documents:

Attachment 9 (Continued)

- A certificate of conformance signed by an executive officer of the supplier (referencing that the box is a strong tight container per 49 CFR 173).
- The Low Level Waste Box Load Test Report or equivalent initialed by the ICQR.
- The Box/Lid Seal Test Report or equivalent initialed by the ICQR.
- The Hydrostatic Pressure/Leakage Test Report or equivalent initialed by the ICQR.

11.1.2 All correspondence shall carry the following references:

- Purchase Order Number and release number.
- Project No. GOCO 1

11.2 Supplier Records

11.2.1 The following records generated in association with this specification, shall be maintained by the vendor in an Underwriter's Laboratory approved fire resistant safe or fire resistant locking file cabinet for the length of contract plus any extensions.

- A copy of this specification with any revisions and the awarded contract with any revisions.
- Any approved non-conformance reports for:
  - Incoming raw materials.
  - Finished products.
  - Instrumentation.
  - Procedure deviations
- Product deviations.
- Any corrective action reports.
- Any procedures used to fabricate, inspect, and test.
- A quality assurance manual documenting the vendors quality assurance program.
- Any training certifications records for welders and other personnel performing critical functions affecting product quality.
- Any documentation generated that certifies product quality, i.e., material mill test reports, etc.

Attachment 9 (Continued)

Note: These records shall be made available to the ICOR and/or GOCO REP, during every visit and when authorized representatives request them.

12.0 Supplier Exceptions

Not Applicable

13.0 Attachments

13.1 Sketch 1, Revision 0 of the Low Level Waste Burial Box

13.2 Options 1 thru 4 (3 pages)

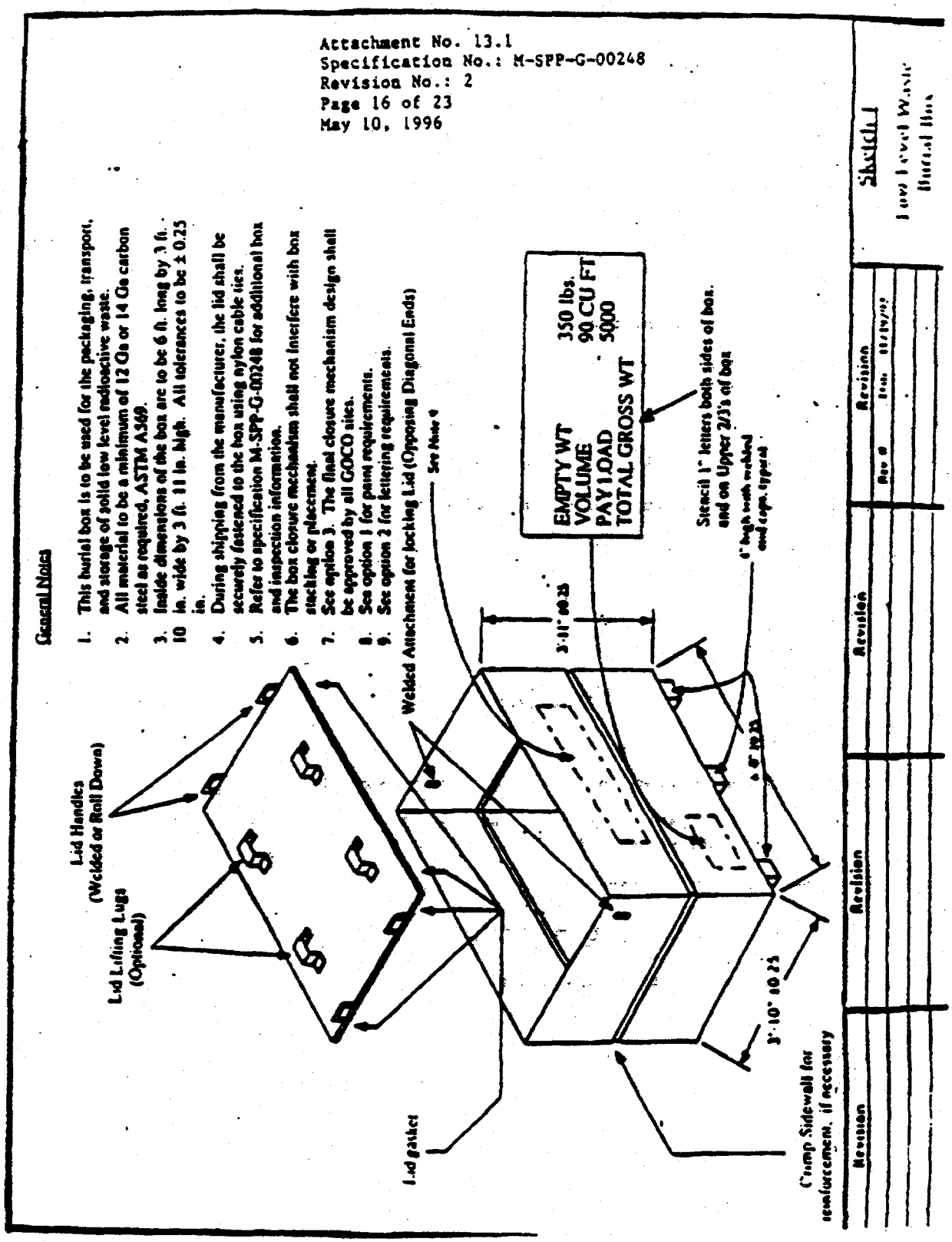
13.3 Low Level Waste Burial Box Load Test Report

13.4 Box/Lid Seal Test Report

13.5 Hydrostatic Pressure/ Leakage Test Report

13.6 Receiving Instructions for Inspection of the B-25 Type Boxes

Attachment 9 (Continued)



Attachment 9 (Continued)

Option 1

Painting requirements:

1. No zincphosphate or equivalent primer used on interior or exterior surfaces of the box.
2. No zincphosphate or equivalent primer used on the interior surface of the box. Zinc chromate primer used on the exterior surface of the box.
3. Zinc phosphate or equivalent primer used on the interior and exterior surfaces of the box.
4. Paint the interior and exterior surfaces of the box using an alkyd enamel finish.
5. Paint only the outside surface of the box with an alkyd enamel finish.
6. The final finish colors are as follows:
   - White
   - Black
   - Yellow
   - Magenta

Option 2

Lettering Requirements:

1. Stencil the following in one and one-half inch (1.5") letters on each side of the box:

   DO NOT PLACE HAZARDOUS MATERIALS INCLUDING
   LEAD, CADMIUM OR MERCURY IN THIS BOX

2. Do not stencil anything in this area.

Option 3

Sealing Alternatives for closure of the container with the lid:

1. Banding.
2. Bolting.
3. Welding.
4. Tabs and wedges which are tack welded.

Option 4

DOT Type 7A Container

. Codes and Regulations:

In addition to the codes and regulations listed in section 3.1 of this specification, the following codes and regulations will apply to DOT Type 7A containers:

- Code of Federal Regulations, Title 49 CFR 173.412, Additional Design Requirements for Type A Packaging, 1990 revision.
- Code of Federal Regulations, Title 49 CFR 173.415(a), Authorized Type A Packaging, 1990 revision.
- Code of Federal Regulations, Title 49 CFR 173.461, Demonstration of Compliance with Tests, 1990 revision.
- Code of Federal Regulations, Title 49 CFR 173. 462, Preparation of Specimen for Testing, 1990 revision.
- Code of Federal Regulations , Title 49 CFR 173.463, Packaging and Shielding - Testing for Integrity, 1990 revision.
- Code of Federal Regulations, Title 49 CFR 173.465, Type A Packaging Tests:
  - Water Spray Test
  - Free Drop Test
  - Compression Test
  - Penetretion Test
- Code of Federal Regulations, Title 49 CFR 178.350, Specification 7A, General Packaging, Type A, 1990 revision.

Testing:

In addtion to the tests listed in section 7.2 of this specification, the following tests will apply to DOT Type 7A containers:

- The supplier will be required to perform at least one Free Drop test per box design using Code of Federal Regulations, Title 49 CFR 173.465, Type A Packaging Test. The test has to be performed with all five waste forms.

Attachment 9 (Continued)

General Requirements:

. All material to be a minimum of 12 Ga carbon steel, ASTM A-569, U O S.

Attachment 9 (Continued)

Procurement Specification for
Low Level Waste Box

Attachment No. 13 3
Specification No.: M-SPP-G-00248
Revision No.. 2
Page 20 of 23
Date: May 10, 1996

Low Level Waste Burial Box Load Test Report

NOTE: **THE VENDOR MAY USE AN EQUIVALENT FORM AS LONG AS THE MINIMUM INFORMATION SHOWN BELOW IS INCLUDED.**

Manufacturing Supplier _____

Product Tested _____

Purchase Order Number _____

Date Product Manufactured _____

Date of last Box Load Test _____

Date of this Box Load Test _____

Test Requirements

NOTE: **The supplier's procedure for box uniform load testing must be reviewed and approved for use by all GOCO.**

The supplier shall perform at least one box load test for each design of manufactured Low Level Waste Burial Boxes. The test shall demonstrate that a box that is half full of sand or water is capable of supporting a uniform load of twenty-two thousand pounds (22,000 ± 300 lbs.) on the top surface (lid) for a minimum of four hours (4) hrs ± 5 min.) with less than three-eighths inch (0.325" ± 0.125") deformation.

Note: **The revised loading to address gross weight applies to new load tests. Boxes previously qualified to the net load per Rev. 1 of this specification are exempt from the revised loading test.**

Test #	Lot I.D. #	Test Results/Comments
1	_____	_____
2	_____	_____
3	_____	_____

I certify that all boxes were in accordance with the above described test and an approved GOCO Procedure and that the test sample passed the test in all respects.

Vendor QA Inspector _____ Date _____

ICQR or GOCO REP Witnessed _____ Date _____

Low Level Waste Burial Box
Box/Lid Seal Test Report

NOTE: THE VENDOR MAY USE AN EQUIVALENT FORM AS LONG AS THE MINIMUM INFORMATION SHOWN BELOW IS INCLUDED.

Manufacturing Supplier _____

Product Tested _____

Purchase Order Number _____

Date Product Manufactured _____

Date of last Box Load Test _____

Date of this Box Load Test _____

NOTE: The supplier's procedure for box/lid seal testing must be reviewed and approved for use by all GOCO.

The supplier shall perform at least one box/lid seal test for each design of manufactured Low Level Waste Burial Boxes. The test shall demonstrate the effectiveness of the lid gasket sealing capability. Gasket compression of a minimum twenty percent shall be achieved.

Test #	Lot I.D. #	Test Results/Comments
1	_____	_____
2	_____	_____
3	_____	_____

I certify that all boxes tested were in accordance with the above described test and an approved GOCO Procedure and that the test sample passed the test in all respects.

Vendor QA Inspector _____ Date _____

ICQR or GOCO REP Witnessed _____ Date _____

Low Level Waste Burial Box
Hydrostatic pressure/Leakage Test Report

NOTE: **THE VENDOR MAY USE AN EQUIVALENT FORM AS LONG AS THE MINIMUM INFORMATION SHOWN BELOW IS INCLUDED.**

Manufacturing Supplier _____

Product Tested _____

Purchase Order Number _____

Date Product Manufactured _____

Date of last Hydro/Leak Test _____

Date of this Hydro/Leak Test _____

NOTE: **The supplier's procedure for box leakage testing must be reviewed and approved for use by all GOCO.**

The supplier shall take a random sample of five percent (5%) of the boxes from each lot of Low Level Waste Burial Boxes manufactured and test for water leakage. The box shall be filled to within one inch (1") from the top of the box with water and allow it to stand for four hours (4 hrs ± 5 min.). At the end of this period, check the box for leaks. If any leaks are found, then perform this leak test on ten percent (10%) of the boxes from that lot of boxes manufactured. If any leaks are found, then test 100% of the lot. Any leaking boxes shall be repaired and re-tested by the supplier at no cost to GOCO.

Test #	Lot I.D. #	Test Results/Comments
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____

I certify that all boxes tested were in accordance with the above described test and an approved GOCO Procedure and that the test sample passed the test in all respects.

Vendor QA Inspector _____ Date _____

ICQR or GOCO REP Witnessed _____ Date _____

Attachment 9 (Continued)

Receiving Instructions for Inspecting the Low Level Waste Burial Box

PURPOSE

These instructions are to be used in conducting and documenting the receipt inspection required by WSRC QAP 7-2, when a shipment of Low Level Waste Burial Boxes are received. NOTE: All received containers are to be inspected.

RESPONSIBILITY

The materials coordinator for the receiving department/division or his delegate will be responsible for this inspection.

INSPECTION PROCEDURE

1. Record the purchase order number, or release number, and unique identification numbers and the receiving date for this shipment. AX/KX _____; ID #'s_____; Date _____.

2. Verify that the number of boxes in the shipment agrees with the number of boxes shipped per the shipping papers.
   Initial _____.

3. Verify that no boxes are damaged to the extent that the integrity or usefulness of the box is compromised. As a guide, dents less than one-half inch (0.5") and small scratches less than one square inch (1 in^2) of exposed metal may be accepted. If damage causes suspicion that the lid will not seal or that the box containment is affected, the box shall be rejected, segregated, and tagged ("Do Not Operate"), and an NCR shall be written.
   Initial _____.

4. Verify that the box has a lid
   Initial _____.

5. Verify that the vendor's inspection documentation, signed by the ICQR or GOCO REP., has been received for this shipment.
   Initial _____.

6. Initiate a non conformance report (NCR) for any box which does not pass this inspection. Send a copy of the NCR to the Department/Division material custodian responsible for waste box procurement. Record data:
   Number of boxes inspected: _____; ID number of failed box(es): _____
   _____; NCR Number: _____.

7. Send a copy of this document to the department/division material custodian.
   Initial _____.

Inspector's signature _____; Badge Number _____; Date _____.

Attachment 10 - Vertical Uplift

B-25 Specification								
460	lbs; weight of B-25							
48	inches; height of B-25							
48	inches; width of B-25							
72	inches; length of B-25							
Vertical windspeed at 10 feet elevation				(Ref. 3 page 111)				
< 0.5	of Vmax			(Ref. 3 page 111)				
190	mph; windspeed 1.35 x 1.35							
Pvert = .00256 x V2		(lb/ft2)		(Ref. 3 page 111)				
Pvert =	23.104	(lb/ft2)						
Bottom Surface Area of B-25								
48	x	72	=	3456	sq inch			
3456	sq inch	sq ft	=	24	sq ft			
144	sq inch							
Fvert	=	Pvert	x	SA				
		23.104		24				
	=	554.496	lbs					
	Therefore uplift could occur on container with less than about 90 - 95 lbs of waste.							

Attachment 11 - Max weight, TRU Loading

100	nCi/g: TRU Threshold				
1.00E-07	Ci/g				
4540	lb.:max waste weight				
5000	g/lb: conv				
22700000	g: max waste weight				
	The number of Ci can therefore be calculated as				
	Threshold x max weight				
2.27	Ci				

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