Waste Volume Definitions Used For TRU Waste

V_i Initial Waste Volume. The volume of the waste container retrieved from the earthen covered berm or if retrieved from the type II storage modules, the volume of the waste container at time of waste transfer to BNFL. If the volume of the waste container is unknown the container will be measured and the volumes identified in Table 8-1 of INEL-95/0412[1] will be used were applicable. The exception is cargo containers whose primary purpose is to contain drums. In this instance, the initial volume is the volume of the drums or other waste containers found in the cargo container. The Initial Waste Volume for a 4ftx4ftx7ft box is 3.17m^3 (4x4x7x0.0283 m^3/ft^3) and for a 55-gallon drum is 0.212m^3 (0.208 m^3 was used by the 3100 project). The 0.212 m^3 is the volume of a 55-gallon drum used in the *Waste Description Information for Transuranically-Contaminated Wastes Stored at the Idaho National Engineering Laboratory* (INEL-95/0412) referenced in the AMWTP contract. All numbers in the WIPP Waste Information System (WWIS) are rounded to 2 decimals thus WIPP reports 0.21m^3 for a 55-gallon drum when determining Disposed Waste Volume. Initial Waste Volume is the measure that is used for payment in the AMWTP contract.

V_t Treated Waste Volume. The volume of waste after treatment but prior to packaging for disposal. Super-compaction where utilized (i.e. debris waste) is anticipated to result in a volume reduction of approximately 75%. Although each drum will vary, a 55-gallon drum of waste after compaction will have on the average a Treated Waste Volume of approximately 0.05m^3. Treated waste volume is used in the computation for "volume reduction" in the AMWTP contract.

V_p Packaged Waste Volume. The amount of space occupied by the waste disposal package. This volume takes into account the total space consumed including all packaging. One configuration for shipping and disposal is to package 55-gallon drums into 2 shrink-wrapped packages of 7 drums each with one package stacked on top of the other. This configuration has a Packaged Waste Volume (V_p) of approximately 4.5m^3. Another configuration is to package waste in a Ten Drum Overpack (TDOP) or Standard Waste Box (SWB). In both cases the Packaged Waste Volume is the volume of the TDOP (4.5m^3) or the SWB (1.9m^3) irrespective of the amount of waste contained within. Packaged Waste Volume is a measure of the amount of space taken up in WIPP, regardless of the amount of waste disposed of.

V_d Disposed Waste Volume. This is the volume of the waste disposal containers placed in WIPP. This number may not account for volume associated with packaging. Using the 14-pack disposal configuration described in V_p above, if only 10 of the 14 drums actually contained waste (i.e. 4 of the drums were dunnage for package spacing) the Disposed Waste Volume (V_d) would be 2.1m^3 (10 x 0.21m^3-volume used by WIPP for a 55-gallon drum) as compared to the V_p of 4.5m^3. For other disposal containers (i.e. 100 gallon puck drums, TDOP and SWB) $V_d = V_p$. There is no accounting for dunnage drums within these containers. Nor is there an accounting for the compacted waste. This definition of volume is used by WIPP to track compliance to permits and the Land Withdrawal Act and by DOE Environmental Management to track waste shipments to WIPP (i.e. "Gold Chart").

[1] INEL-95/0412, Waste Description Information for Transuranically-Contaminated Wastes Stored at the Idaho National Engineering Laboratory, December 1995.

Container Volume Definitions

Container Type	Container Volume
30 gallon drum	0.114 m^3
55 gallon drum	0.212 m^3
83/85 gallon drum	0.32 m^3
100/110 gallon drum	0.38 m^3
Box (4 X 4 X 7 ft)	3.17 m^3
BR-90 Box	2.55 m^3
Bin (4.2 X 4.9 X 6 ft) (MIII Bin)	3.50 m^3
AMWTP Shredder Box	3.62 m^3
Standard Large Box (SLB-2)	8.96 m^3
Standard Waste Box (SWB)	1.88 m^3
Ten Drum Overpack (TDOP)	4.50 m^3
Removable Lid Canister (RLC)	1.05 m^3
Cargo Container	36.25 m^3
HFEF-5 Canister	0.10 m^3
SLSF Canister (HFEF-14 Cask)	0.10 m^3
Large Liner (24 inch Liner)	0.10 m^3
ANLE Canister	0.10 m^3
Other non-standard containers	Volume will be calculated based upon external container measurements

Below are examples of volume measurements that show the relationships between the waste volume definitions provided above. In the examples provided Disposed Waste Volume and Packaged Waste Volume are the same**.**

	Initial Waste Vol (m^3)	**Treated Waste Vol (m^3)**	**Disposed Waste Vol (m^3)**
TDOP containing 10, 55 gallon drums retrieved from storage	2.12	N/A	4.5
TDOP containing 6, 83 gallon drums retrieved from storage	1.92	N/A	4.5
TDOP containing 10, 55 gallon drums but 2 are dunnage	1.696	N/A	4.5
100 gallon puck drum containing 3 pucks	0.636	0.15	0.38
100 gallon puck drum containing 4 pucks	0.848	0.20	0.38
100 gallon puck drum containing 5 pucks	1.06	0.25	0.38
Standard Waste Box (SWB) containing 4, 55 gallon drums	0.848	N/A	1.88
Box resulting in 8 compactable 55 gallon drums put into 2 100 gallon puck drums and 4 non-compactable 55 gallon drums put into an SWB	3.17	1.24	2.64
A non-standard box (3 X 4 X 6 ft) that results in 8 55 gallon drums of waste shipped in 2 SWBs	2.04	1.68	3.76
An HFEF-5 Canister that is packaged into 5 30 gallon drums shipped in 2 RLCs with 1 dunnage drum	0.10	0.57	2.1