[From: "Death's Twilight Kingdom: The Secret World of U.S. Nuclear Weapon 'Design Data' "
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Known Weights of Plutonium and U235 in A-Bomb & H-Bomb Primary Weapon Cores

"Restricted Data — Category Sigma 2": The Keys to the Kingdom

"Whenever we encounter such a purely evil Outside,
we should gather the courage to endorse the Hegelian
lesson: in this pure Outside, we should recognize
the distilled version of our own essence."

-- "Welcome to the Desert of the Real" (2002)
Slajov Zizek

"Why has government been instituted at all? Because
the passions of men will not conform to the dictates
of reason and justice without constraint."

-- "The Federalist Papers" (1787)
Alexander Hamilton

"Restricted Data": includes data related to the physics, construction, and components of nuclear weapons.

"Formerly Restricted Data": includes data primarily related to the military utilization of nuclear weapons, such as yields, bomb or warhead total weights, outer dimensions, storage and deployment locations, and numbers of stockpiled weapons, and nuclear target CEP.

δ-Pu = delta-plutonium^{239} (15.8 g/cm^3)

α-Pu = alpha-plutonium^{239} (lower with impurities, but ideally19.86 g/cm^3)

Oy = Oralloy = 93.5% or 93.2% Uranium^{235} (18.8 g/cm^3) (with the rest (~7%) U^{238})

Core Material and Mass	**Dimensions and Form**	**Yield, Test Event & Other Details**
6.19 kg δ-Pu (with **1.35% Pu240** contaminant)	3.6" diameter solid core with an Urchin neutron initiator at the core's	Fat Man 21 kt yield (19% fission efficiency; about 1.9x

	center; core surrounded by a 2.9" thick natural U238 reflector/tamper, with a final outer aluminum shell for a total pit dia. of 18"; thin boron-plastic shell between U238 and Al shells to absorb slow neutrons; 18" thick HE layer	compression, making 3 crits of Pu) [RDD-7 (2001)] [LA-3861 (1967)]; 3 tests and 1 bombing: 1945 Trinity test, 1945 Nagasaki bombing, & 1946 Operation Crossroads, Events Able and Baker
64 kg Oy	Gun assembly weapon; **60 wt%** solid cylinder projectile **and 40 wt%** hollow, blind cylinder target (consisting of a stack of 4 rings)**,** which gave a final fired core assembly of a **6.5" dia. x 6.5" high solid cylinder**; core surrounded by a WC (tungsten carbide) reflector/tamper	Little Boy 13 kt yield [Straton, p. 28 (1989)] [LA-13638, p. 77 (2000)]; less than 2.6 crits of Oy; 1945 Hiroshima bombing
6.2 kg δ-Pu + 12.6 kg Oy ("composite") solid core	3.6" dia. Fat Man Pu core, surrounded by 0.7" thick Oy shell (5" total core diameter); surrounded by a **2.25" thick U238** reflector/ tamper	**37 kt** 1948 Operation Sandstone, Event X-Ray; proof-test of Mark 4 bomb, already being stockpiled starting in 1947; core dia. equivalent to 20 kg Oy [LA-1875 (1955)] [LA-5930-MS (1975)] [LA-685 (1948)] [Hansen, II-98 (1994)]; Oy used in composite core had 40% the efficiency of the higher yield Pu
35 kg Oy solid core	6" dia. core	**49 kt** 1948 Operation Sandstone, Event Yoke; showed Oy used alone in a large implosion core to be 40% as efficient in yield as Pu
8.175 kg Oy hollow core	**4.15" O.D., 2.75" I.D.**; first levitated and first "fractional crit" design (fractional crit only used to reduce the effect of the constant neutron sources, and determine the yield increase by the use of a hollow core)	**18 kt** 1948 Operation Sandstone, Event Zebra; 13% fission efficiency [LA-1299 (1951)], increasing the yield 1.7x over a solid core (making the solid core Oy to be 40% as efficient in yield as Pu); initiated using 4 steady, constant, external neutron sources

2.6 kg δ-Pu + 7.5 kg Oy composite solid core	Central δ-Pu part of core 2.68" in dia., & cast in Y3 magnesium oxide (MgO) ceramic crucible [LA-1875 (1955)] [LA-2104, p. 12 (1956)]	**22 kt** 1951 Operation Ranger, Event Fox; composite core designed to be equivalent in yield to the Pu-only, 21 kt Fat Man core [LA-685 (1948)] [Hansen, II-86 (1994)]; Oy was 50% as efficient in yield as Pu
4.5 kg δ-Pu + 5.5 kg Oy composite solid core		**21 kt**; core weights calculated from early Pu and Oy production quantities, combined with Mk 4 bomb stockpile no. [RDD-7 (2001)]; Oy was 30% as efficient in yield as Pu
2.6 kg δ-Pu + 14 kg Oy composite solid core	2.68" dia. Pu core, surrounded by 1" thick Oy shell; total core dia. 4.7"; Pu cast in Y3 MgO crucible	**32 kt** [LA-1875 (1955)] [LA-2104, p. 12 (1956)]; Oy was 50% as efficient in yield as Pu
3.5 kg δ-Pu + 7 kg Oy Levitated composite core		**50 kt;** CIA estimate of Soviet "Joe-3" core (1951); half the diameter and two-thirds the weight of Fat Man; 35% efficiency of Pu burn [Cochran, p. 336, 349 (1989)] [Zaloga, p. 94 (1993)] [Holloway, p. 219 (1994)] [Reed (1996)]

7 kg δ-Pu solid core	**54" O.D. HE**	**35 kt** [U.K. TNA PRO documents DEFE 7/2208 & 32/3 (1957)]
5 kg δ-Pu solid core	**54" O.D. HE**	**15 kt** [U.K. TNA DEFE 7/2208 & 32/3 (1957)]
4.5 kg δ-Pu solid core	**54" O.D. HE**	**10 kt**; "Blue Danube" A-bomb [U.K. TNA AIR 8/2469 (1957)]
4.5 kg δ-Pu + 12 kg Oy composite split-levitated core		**42 kt** [U.K. TNA document (1957)]
3 kg δ-Pu + 12 kg Oy composite split-levitated core	**externally initiated**; **30" O.D. HE**; 1:4 Pu:Oy weight ratio in U.K. composite cores (higher Oy ratios in U.S. cores)	**60 kt**; "Red Beard" A-bomb [U.K. TNA AIR 8/2458 (1957)]
5 kg Pu hollow core; ~5" O.D.		[HW-74289 (1963)]
4.5 kg Pu hollow core		[HW-74639 (1962)]
3.3 kg Pu hollow core		[HW-75642 (1962)]

117 kg Oy, 12" O.D., 10" I.D. hollow core	**1.75" thick, natural uranium reflector,** surrounded by **19.25" thick HE shell**	**550 kt**; 1952 Operation Ivy King, Mk 18 S.O.B (Super Oralloy Bomb) [LA-1623 (1953)] [LA-9865-H, p. 19 (1983)] [WT-630, p. 20 (1952)] [LA-10902-MS, p. 1 (1987)]
14 kg total core weight	~5" in diameter	[LA-1299 (1951)]
--	4" in diameter	CaO casting crucible A-313 [LA-1720 (1954)]
Hollow (3.5" I.D.?)**, spherical composite core; 32 kg Oy-equivalent**	**Cadmium outer plating of core; 2" thick HE shell**; 13.5" total O.D.?	Manufactured 1955 - 1956 at RFP [LA-2930-MS (1975)] [RFP-59 (1956)]
25 & 30 kg Oy	Just less than 6" dia. for 30 kg Oy	[RFP-51 (1955)]
4.8 kg Pu	1.2 kg/button	[HW-81500 (1957)]
6.2 kg δ-Pu	7" dia. x 0.25" thick disc; formed into a hemishell, then 2 put together to create a **4" O.D., 3.5" I.D.** hollow core sphere	[LA-2315 (1960)] [LA-2426 (1960)]

4.2 kg δ-Pu hollow core	Assembled from 2 hemishells	[RFP-248 (1961)]
4.8 kg α-Pu hollow core		[Hanford "GE-312" (1961)]; "SHA2400" = Shell, Hemi, Alpha-Pu, 2,400 grams
4.0 kg Pu hollow core		[Showalter (1962)]
0.75 kg δ-Pu + 8 kg Oy composite hollow core	**5" thick HE shell**; 7.4" pit dia.	1.7 kt, 17.4" dia. W-25 (1957) [DASAST (1962)]
1.5 kg δ-Pu + 6.0 kg Oy hollow core	Be-reflected; **10" total O.D.** boosted Primary for 20" O.D. **Mk 28** H-bomb introduced in 1958	[Eriksson (2002)]
4.5 kg α-Pu hollow core	**8 kt, 17" O.D.** boosted H-Bomb Primary assembled from 2 Pu hemishells; **3.5" thick HE** layer	For the 1.85 MT **Mk 27**; manufactured from 3/58 – 4/59 at Hanford
47 kg Oy	**0.5" thick Be-reflected cylinder (5.25" dia. x 7" high)** with a critical mass of 41.35 kg**; gun assembly** weapon	**1 kt W-33,** 8" dia. artillery shell [INL/CON-06-11657 (2007)] [cost data; see below]
4.4 kg α-Pu; cylindrical, Be clad	Pit of 6" dia. W-48?	15 watts per pit; 2.63 mW/g [ANRCP-1999-30 (1999)] [UCRL-ID-114164 (1993)]

		[Appendix I] [LA-12907 (1995)]
4.7 kg α-Pu cylinder	**3" high x 2.5" dia.**; unboosted	**80 ton yield**, 6" dia. W-48 artillery shell [JCAE (1973)] [cost data: see below]
3 kg α-Pu	Pu **cylinder,** boosted **1.8" tall x 2.6" dia.; 1.5" thick** HMX PBX **with 0.22" air gap between HE and Pu;** Total Primary core dimensions are 5.7" dia. x 5.3" high	**W-59 Primary core** for Minuteman I ICBM (1962) [Kolar (1976)] [Appendix D]
4 kg α-Pu		[LA-12907]; comparison of temp. vs. weight Pu, with value for W-48 known] **W-68** Poseidon
3 kg α-Pu		[LA-12907]; comparison of temp. vs. weight Pu, with value for W-48 known]; **W-70** Lance missile warhead
6.8 kg δ-Pu	Cast **(cylindrical) ingot**; Primary core	[RFP-2506 (1980) Atomic Weapon Data Sigma 2]
3.1 kg α-Pu	Pu cylinder, boosted	Total weight of Plutonium stockpile (66 Metric Tons) divided by 21,0000 nuclear weapon stockpile. [RDD-4 (1998)] ["Pu: The First 50 Years" (1994)]

3.1 kg α-Pu	3" dia. x 0.125" thick Pu "slice", each cylindrical, and weighing 282 g; 11 stacked weighs 3.1 kg. Cylinder 3" dia. x 1.4" tall.	[HW-72662 (1962)]
2 kg α-Pu	cylindrical	[UCRL-50234, p. 29 (1967)] [RFP-248 (1962)]; probably minimum quantity for cylindrical implosion.
1.5 – 1.75 kg α-Pu	spherical implosion	[Francis (1995)]; spherical implosion uses significantly less Pu than cylindrical implosion.
α-Pu	4" dia. spherical assembly, including HE.	[DoE/AL/65030-9505 (1995)]