FAS Note: The "Sigma categories" are subsets of nuclear weapons information classified under the Atomic Energy Act that are grouped by subject matter. As of December 2000, there were several new definitions or proposed revisions of some Sigma categories, according to various DOE sources. These are noted below.

SIGMA CATEGORY DEFINITIONS

Sigma categories: Restricted Data and/or Formerly Restricted Data in the following categories which concern the design, manufacture, or utilization of atomic weapons, or utilization of atomic weapons or nuclear explosive devices.

SIGMA	DEFINITION
Sigma 1	Theory of operation (hydrodynamic and nuclear) or complete design of thermonuclear weapons or their unique components. (When access to Sigma 1 is authorized, access to Sigmas 1-10 are approved.)
Sigma 2	Theory of operation or complete design of fission weapons or their unique components. This includes the high explosive system with its detonators and firing unit, pit system, and nuclear initiation system as they pertain to weapon design and theory. (When access to Sigma 2 is authorized, access to Sigmas 2-10 are approved. Do not allow access to Sigma 1 data.)
Sigma 3	Manufacturing and utilization information not comprehensively revealing the theory of operation or design of the physics package. Complete design and operation of nonnuclear components but only information as prescribed below for nuclear components. Utilization information necessary to support the stockpile to target sequence. Information includes: (a) General external weapon configuration, including size, weight, and shape. (b) Environmental behavior, fuzing, ballistics, yields, and effects. (c) Nuclear components or subassemblies which do not reveal theory of operation or significant design features.

	(d) Production and manufacturing techniques relating to nuclear components or subassemblies. (e) Anticipated and actual strike operations. (When access to Sigma 3 is authorized, access to Sigmas 3-10 are approved. Do not allow access to Sigmas 1-2 data.)
Sigma 4	Information inherent in preshot and postshot activities necessary in the testing of atomic weapons or devices. Specifically *excluded* are the theory of operation and the design of such items. Information includes: (a) Logistics, administration, other agency participation. (b) Special construction and equipment. (c) Effects, safety.
Sigma 5 (current)	Production rate and/or stockpile quantities of nuclear weapons and their components.
Sigma 5 (alternate definition)	Purpose of tests, general nature of nuclear explosive tested including expected or actual yields and conclusions derived from tests not to include design features.
Sigma 6 (new category)	Category of sensitive information concerning the design and function of nuclear weapon transportation and nuclear weapon facility physical security design that significantly enhances an adversary's ability to obtain an unauthorized nuclear detonation from a nuclear weapon or device. This includes physical security design information for all facilities, in which nuclear explosive operations are performed.
Sigma 7 (new category)	The category of sensitive information concerning physical security operations and tactics used for the protection of nuclear weapons during transportation and nuclear explosive operations that significantly enhances an adversary's ability to obtain an unauthorized nuclear detonation from a nuclear weapon or device.
Sigma 9	General studies not directly related to the design or performance of specific weapons or weapon systems, e.g., reliability studies, fuzing studies, damage studies, aerodynamic studies, etc.
Sigma 10	Chemistry, metallurgy, and processing of materials peculiar to the field of atomic weapons or nuclear explosive devices. (When Sigmas 4-10 are authorized, access is limited only to the individual Sigma authorized and does not extend to other Sigmas.)
Sigma 11	Information concerning inertial confinement fusion which reveals or is indicative of weapons data.
Sigma 11 Subcategories	Eight (8) additional subcategories of Sigma 11 not included in this list are Secret Restricted Data and refer to laser fusion.
Sigma 12 (New wording, October 2000)	Complete theory of operation, complete design, or partial design information revealing either sensitive design features or how the energy conversion takes place for the nuclear energy converter, energy director or other nuclear directed energy weapon systems or components outside the envelope of the nuclear source but within the

	envelope of the nuclear directed energy weapon. (When access to Sigma 12 is authorized, access to Sigma 13 is also approved.)
Sigma 13	Manufacturing and utilization information and output characteristics for nuclear energy converters, directors or other nuclear directed energy weapon systems or components outside the envelope of the nuclear source, not comprehensively revealing the theory of operation, sensitive design features of the nuclear directed energy weapon or how the energy conversion takes place. Information includes: (a) General, external weapon configuration and weapon environmental behavior characteristics, yields, and effects. (b) Component or subassembly design that does not reveal theory of operation or sensitive design features of nuclear directed energy weapon systems categorized as Sigmas 1, 2, or 12. (c) Production and manufacturing techniques for components or subassemblies of nuclear directed energy weapons that do not reveal information categorized as Sigmas 1, 2, or 12. (Authorization for Sigma 13 only does not include access to Sigma 12.)
Sigma 14 (Existing)	Category of information concerning the vulnerability of nuclear weapons to a deliberate unauthorized nuclear detonation.
Sigma 14 (New Proposed Wording, October 2000)	The category of sensitive information concerning the vulnerability of nuclear weapons and weapon systems to deliberate unauthorized nuclear detonation that significantly enhances an adversary's ability to obtain an unauthorized nuclear detonation from a nuclear weapon or device. (When access to Sigma 14 is authorized, access to Sigma 15 is approved.)
Sigma 15 (Existing)	Category of information concerning design and function of nuclear weapons use control systems, features, and components. This includes use control information for passive and active systems.
Sigma 15 (New Proposed Wording, October 2000)	The category of sensitive information concerning the design and function of nuclear weapons and weapon systems use control systems, features, and their components that significantly enhances an adversary's ability to obtain an unauthorized nuclear detonation from a nuclear weapon or device. This includes use control information for passive and active systems. (Authorization for Sigma 15 only does not include access to Sigma 14.)
Sigma 16 (New Wording, October 2000)	Category of weapon data revealing the theory of operation or design of the components of a thermonuclear or fission nuclear weapon, or test device. Sigma 1 and Sigma 2 generally, but not completely, equate to Sigma 16 information. Specifically excluded is information concerning:

	(a) arming, fuzing and firing systems. (b) limited life components. (c) total contained quantities of fissionable, fusionable, and high explosive materials by type. (d) components which military personnel set, maintain, operate, test, or replace.
Sigma 16 (New Proposed Wording, December 2000)	The December 2000 "Report of the Joint Policy Group for the Protection of Nuclear Weapons Design and Use Control Information" proposes the following definition of Sigma 16: a. Design specifications that permit the reproduction and function of the complete nuclear assembly system or the primary and/or the secondary of a nuclear weapon. 1. Examples of Sigma 16 documents: The bomb book for a nuclear test (record of assembly). Design specifications of nuclear weapon nuclear assembly systems, primaries and/or secondaries in digital format when placed on removable media, when those specifications are accurate descriptions of (1) the U.S. stockpile; (2) successfully tested devices; or (3) validated models of potential proliferant non-state nuclear weapons. Final released engineering drawings that depict the design specifications of the nuclear assembly system, primary and/or secondary of weapons (past and present). 2. Examples of documents *excluded* from Sigma 16: --Generic illustrations, and --Engineering models used to define the interface between the physics package and other weapon components but which do not reveal internal design specifications of a primary or secondary. b. A document that contains an aggregation of design information regarding a single or multiple nuclear assembly system and that provides comprehensive insight into nuclear weapon capabilities, vulnerabilities, or design philosophies. Proposed documents will be reviewed and designated by a joint DoD/DOE group for a determination of Sigma 16 protection. This category may include, but is not limited to the following documents: "Biennial Weapons Program Report" Some final weapon development reports (complete not executive summary or synopsis versions), or

	Some weapon baselining or dual revalidation reports (complete, not executive summary or synopsis versions).

Sources:

Sigmas Categories Information Update, Charles H. Davis, Los Alamos National Laboratory, October 1999.
Sigma Category Definitions, DOE Headquarters document, October 10, 2000.
Report of the Joint Policy Group for the Protection of Nuclear Weapons Design and Use Control Information, December 1, 2000.
