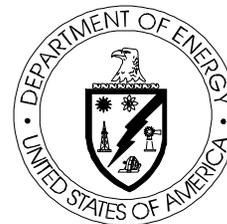


U.S. Department of Energy



*Subject Area Indicators
and
Key Word List
for*

*Restricted
Data and
Formerly
Restricted
Data*

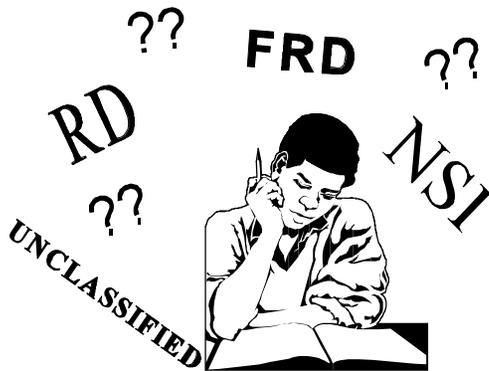
Office of Declassification
Outreach Program
(301) 903-7567

Purpose of this Booklet

This booklet is intended to assist the many Government and industry personnel who generate or review classified documents. Its purpose is to help you detect the possible presence of classified nuclear information in documents. Classified nuclear information follows different rules than other, more familiar kinds of classified information. Classified nuclear information should be marked as “**Restricted Data**” (RD) or “**Formerly Restricted Data**” (FRD). However, the Department of Energy (DOE) has found that many documents with classified nuclear information (particularly historical documents) are not marked to indicate that they contain RD or FRD. Consequently, DOE is concerned that these documents may not receive proper safeguarding and might be improperly declassified and released.

The principal goal of this booklet is to increase awareness concerning this issue during a heightened time of declassification activity and to provide initial assistance in handling collections that contain or may contain RD or FRD information. If your organization is involved in declassification activity, the DOE encourages you to request additional training and assistance. DOE provides a one and a half hour briefing for the recognition of RD and FRD and can provide other assistance as needed. Note that this booklet is unclassified and is necessarily limited in its effort to identify classified nuclear information.

This booklet is not a classification guide and does not provide the authority to declassify RD or FRD, but is intended only as an awareness tool to assist in identifying unmarked RD or FRD.



Restricted Data (RD) and Formerly Restricted Data (FRD)

Since their introduction at the end of World War II, nuclear weapons have been seen as so radically different from other weaponry, so uniquely destructive, that extraordinary measures are needed to slow their spread. To this end, the Congress enacted the Atomic Energy Act to assure firm government control over all aspects of nuclear technology relating to the creation, design, production, or use of nuclear weapons.

The term “**Restricted Data**” means all data concerning (1) design, manufacture, or utilization of atomic weapons; (2) the production of special nuclear material; or (3) the use of special nuclear material in the production of nuclear energy, but shall not include data declassified or removed from the Restricted Data category pursuant to section 142 of the Atomic Energy Act.

The term “**Formerly Restricted Data**” means classified information which has been removed from the Restricted Data category after DOE and the Department of Defense (DOD) have jointly determined that it relates primarily to the military utilization of atomic weapons, and can be adequately safeguarded as national security information.

RD and FRD are different than other types of classified information

The Atomic Energy Act protects nuclear weapons-related information by providing it with a unique system of classification. This statute-based system operates outside of the system established by Executive Order (EO) 12958 for all other government classified information. **RD is specifically exempted from all provisions of EO 12958. In particular, RD is never subject to automatic declassification but can only be declassified by the Secretary of Energy or delegated DOE authority.** RD is generally technical. Some of it has enduring value so long as it is not compromised. In the hands of an adversary a nuclear weapon based on a 40-year old design would be as great a threat as a modern weapon.

What to do if you have documents with RD or FRD

Historical Documents. Documents which are marked as RD or FRD which are 25 years old or older and determined to be permanently valuable records shall not be automatically declassified. If you have RD or FRD historical documents, you should separate and remove them from other classified documents to ensure that they are not inadvertently declassified and released under EO 12958.

Current Documents. If you are generating documents which may contain RD or FRD, you should have current classification guides to assist you. We recommend that you contact your local classification or security officer to obtain these guides. If you need further assistance, please contact the DOE Office of Declassification.

Mismarked Documents. If you come across classified documents which are not marked as RD or FRD but contain nuclear-related information described in this booklet, you should advise your local classification or security officer or seek assistance from the DOE Office of Declassification.



Questions???

The Office of Declassification is undertaking a focused effort to reach Government and industry personnel with access to DOE classified information. If you have questions, need assistance, or would like more information on RD or FRD, please contact the Office of Declassification Outreach Hotline at (301) 903-7567.

Subject areas that are likely to contain RD or FRD

This section describes the subject areas that are **most likely** to contain classified nuclear information, but keep in mind that these subject areas and the key word list that follows are **not all inclusive**.



Nuclear weapon design, fabrication, and utilization.

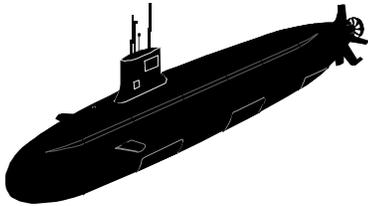
Nuclear weapons apply the physical phenomenon of nuclear fission—the splitting of a heavy atomic nucleus by absorption of a neutron—to cause the explosion of kilogram quantities of uranium or plutonium and the release of explosive energy ("yield") many orders of magnitude greater than would be possible from a similar amount of ordinary high explosives. The two basic designs of these fission type weapons are the gun-assembled weapon like the Little Boy which was dropped on Hiroshima during World War II, and the implosion-assembled weapon like the Fat Man which was dropped on Nagasaki.

Some nuclear weapons also use the process of thermonuclear fusion—the joining together of light nuclei at very high temperatures. In a boosted implosion weapon, the fusion reaction is used to produce additional neutrons and enhance (boost) the fission yield. In a thermonuclear (staged) weapon, the energy released by the fusion reaction is a significant part of the yield.

Information revealing weapon configurations, design principles and details, mode of operation, tests, yields, methods for command/control (use control), targeting information, disablement, stockpile information (storage locations, theater allocations, and maintenance information), and vulnerabilities to sabotage or countermeasures usually is classified as RD or FRD. RD or FRD (but not bearing RD or FRD markings) is perhaps most likely to be found in documents dealing with weapon delivery systems such as missiles or aircraft, or with defense against such systems.

Inertial confinement fusion.

This laboratory-scale research attempts to use certain directed power sources—typically very large lasers but also accelerator-produced particle beams—to compress and heat a tiny target containing small quantities of fusion fuel (deuterium and tritium) to thermonuclear ignition conditions. The resulting "microexplosion" resembles a miniaturized thermonuclear weapon. Therefore, target design and operation information judged to be particularly revealing of related nuclear weapons technology is classified as RD.

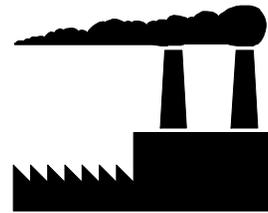


Military nuclear reactors.

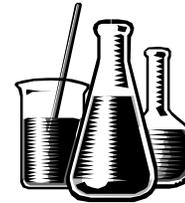
Nuclear reactors use the fission reaction to generate energy for conversion to electric power or other application, but in a much slower, controlled manner than occurs in a nuclear explosion. Information in this area that is still classified as RD includes design, development, testing, and operation of reactor power systems for military purposes, especially for naval nuclear propulsion, and information concerning capabilities and vulnerabilities. The emphasis here is on "military" or "naval" since all aspects of civilian nuclear power (e.g., commercial electric power generation) are unclassified.

Nuclear material production.

The most certain way to discourage the proliferation of nuclear weapons is to deny access to critical materials needed for nuclear weapon production. Numerous materials are needed; however, the most costly and technically difficult materials to produce are the most important. These include fissile materials such as plutonium-239 (Pu-239) and uranium-235 (U-235) as well as tritium, an isotope of hydrogen. The costly and elaborate methods developed to produce these materials are still classified as RD. Generally, there are two main methods used to produce these materials: **production reactors** and **isotopic enrichment**.



Production Reactors. Plutonium does not occur naturally but must be produced in specially designed nuclear reactors (production reactors). The hydrogen isotope tritium required for boosting fission weapons is also made in such reactors. Information describing the nuclear fuel and "target" elements used in the reactors and other detailed features of the production process may be classified as RD. Vacuum furnace operations, chemical separation, and isotope enrichment are all used in producing the final products from these reactors and details about these operations may be classified as RD.



Isotope Separation. Unlike plutonium, uranium occurs naturally and is relatively plentiful. However, only the lighter isotope U-235, which makes up only 0.7% of the natural element, is useful for a fission explosion. Extracting this isotope from natural uranium requires a process that can separate the U-235 from the slightly heavier but much more common isotope U-238. This has been done by diffusion techniques (gaseous diffusion), which exploit slight thermal speed differences between gas molecules containing the different isotopes; by centrifuge, which exploits the difference in inertial mass; and by laser separation techniques, which exploit isotopic differences in atomic spectra. Information potentially classified as RD includes process and design details of these different isotope separation methods, and the amounts and specifications of material prepared for the weapons program. Of particular concern for the gaseous diffusion method of separation is the protection of barrier technology which refers to specialized "barriers" through which the gas diffuses.

Key words or phrases that might indicate RD or FRD

■ Atomic or nuclear device, weapon, explosive, or warhead

active protection
automatic disablement
anti-tampering device
boosted, boosting
casing material
chain reaction (fission)
circular-error probability (CEP)
channel, radiation channel
critical mass
D-T gas
deployments
detonator, detonation system, detonator cables
(implosion assembled)
deuterium (D, ^2H)
device
dial-a-yield, selectable yields
dimensions, weights
disablement, command disablement
enhanced radiation
event (nuclear weapon test)
Fat Man (Trinity test, Nagasaki combat drop)
firing set
first stage or primary
fission/fission chain reaction
fusion, thermonuclear fusion
fuze
gun-assembled (GA)
hardening
height-of-burst (HOB)
highly enriched uranium (HEU)
hydrogen weapon, hydrogen bomb
implosion
implosion-assembled (IA) weapon
initiator, initiation, pre-initiation
initiator/nuclear weapon initiator types:
 alpha-n initiator
 internal initiator
 neutron generator

Key Words or Phrases (continued)

insensitive high explosive (IHE)
interstage coupling
interval time
Joint Task Force (JTF)
limited-life component (boosted nuclear weapon)
lithium, lithium deuteride, lithium-6, or Li-6
Little Boy (Hiroshima combat drop)
neutron
neutron generator
nuclear test, test series
one-point safe
oralloy
permissive action link, PAL
pit, sealed pit, weapon pit
Plowshare Program
plutonium, plutonium-239, Pu-239, or any of its other isotopes
(Pu-238, Pu-240, etc.)
primary
production quantities of weapons
Project Matterhorn
Project Whitney
pusher
radiating fuze
radiation flow
radiation implosion
radiation case
radius of damage
reflectors, reflector material
release codes
reservoir, gas reservoir, tritium reservoir
retirement, reuse
safing
salvage fuze
secondary
staged, second stage, thermonuclear weapon
stockpile, stockpile quantity information
 theater allocation
 subcategorization
 numbers/types/locations
subcritical mass
supercritical mass

Key Words or Phrases (continued)

tamper
thermonuclear (TN) reaction/weapon
Trinity
tritium (T, T-3, or H-3)
tuballoy
uranium, uranium-235, or any of its other isotopes
(U-233, U-234, etc.)
weapons-grade [material]
X-unit
yield (kilotons (KT), megatons (MT))
yield-to-weight

■ **Weapon configurations**

Schematic depictions of nuclear weapons may be found in classified documents that are lacking RD markings. Virtually all weapons schematics are classified as RD. Determining the classification of figures and drawings is difficult, so all such drawings should remain classified or should be referred to DOE for review.

■ **Nuclear weapon effects**

blast
blackout, radar blackout
damage radius
effects test
electromagnetic radiation
electromagnetic pulse (EMP)
enhanced radiation, rays
fallout
fireball
gamma radiation
hardening
line-of-sight pipe
neutron, neutron radiation, neutron spectrum, neutron bomb
radiation, especially prompt radiation or radiation dose
radiochemical tracer
tailored outputs/tailored weapons
vulnerability
x-ray spectrum

Key Words or Phrases (continued)

■ **Inertial confinement fusion (ICF)**

direct drive
hohlraum
ICF target
indirect drive
laser fusion
particle-beam (light ion, heavy ion) fusion

■ **Military nuclear reactors/ test and other reactors**

chain reaction
cladding (fuel)
coolant pump
coolant inlet and outlet nozzles
control rod/control rod drive mechanism (CRDM)
fission
fuel cell
quieting
directed nuclear energy
inlet plenum
Multihundred Watt (MHW) radioisotope generators
neutron
naval reactors
naval nuclear propulsion
outlet plenum
pressure vessel
pressurizer
Pressurized Water Reactor (PWR)
primary system
reactor vessel
scram (automatic shutdown)
steam generator
space power reactor (SPR)
shield, shielding
thermal electric converters
thermal shield
tube bundle

Key Words or Phrases (continued)

■ **Reactor production of special nuclear materials (SNM)**

chain reaction (fission)
deuterium
fuel reprocessing
Hanford reactors
lithium, lithium-6, or Li-6
nuclear material
N-reactor
palladium diffusion
plutonium production
production information
 production rates of nuclear materials
 production quantities of nuclear materials
 weapons program allocations of nuclear materials
production reactor
PUREX process
Savannah River reactors
special nuclear material (SNM)
target/target technology/target materials
thermal cycling and absorption process (TCAP)
tritium production
vacuum furnace

■ **Isotope separation (gaseous diffusion, gas centrifuge, other methods)**

assay (isotope enrichment)
atomic vapor laser isotope separation (AVLIS)
barrier/barrier technology
bundle
cascade
centrifuge machine
compressor nozzles
calutrons/cyclotrons (electromagnetic isotope separation)
deuterium production
diffuser/diffusion stage
diffusion barrier
electromagnetic isotope separation -- Calutron

Key Words or Phrases (continued)

enrichment
 highly enriched (HE)
 isotopic enrichment
 very highly enriched (VHE)
gas centrifuge
gaseous diffusion
laser isotope separation
lithium enrichment
molecular laser isotope separation (MLIS)
seal/seal technology
stage(d) gaseous diffusion/gaseous centrifuge
thermal diffusion
uranium hexafluoride
uranium enrichment

Sites or organizations associated with RD or FRD

Key sites and organizations that may be found in conjunction with nuclear information and potential RD:

Albuquerque Operations Office (ALO)
ACF Industries
Air Force Office - Atomic Testing (AFOAT)
Air Force Special Weapons Center (AFSWC)
Air Force Tactical Applications Center (AFTAC)
Allied Signal Kansas City
Amchitka
Armed Forces Special Weapons Project (AFSWP)
Ashtabula
Assistant to the Secretary of Defense, Atomic Energy (ATSD-AE)
Atomic Energy Commission (AEC)
Atomic Weapons Establishment (AWE), UK
Atomic Weapons Research Establishment (AWRE), UK
Bendix Kansas City
Bethe Panel
Bettis Atomic Power Laboratory
Bikini, Bikini Atoll
Burlington Industries
Christmas Island
Clinton Engineer Works (Oak Ridge)
Defense Atomic Support Agency (DASA)
Defense Nuclear Agency (DNA)
Division of Military Application (DMA)
Energy Research and Development Administration (ERDA)
Eniwetok, Eniwetak, Enewetak
Fernald
GE Pinellas
Hanford
Hiroshima
Johnston Island
Joint Committee on Atomic Energy (JCAE)
Knolls Atomic Power Laboratory
Kwajalein
Lawrence Radiation Laboratory (LRL)
Lawrence Livermore National Laboratory (LLNL)
Los Alamos National Laboratory (LANL)
Los Alamos Scientific Laboratory (LASL)

Sites or organizations (continued)

Manhattan Project, Manhattan Engineering District (MED)
Military Liaison Committee (MLC)
Mound Laboratories
Nagasaki
Nevada Operations Office (NVO)
Nevada Test Site (NTS)
Nuclear weapons complex
Oak Ridge Gaseous Diffusion Plant
Oak Ridge Y-12 Plant
Oak Ridge K-25 Site
Pacific Test Range
Pantex
Paducah Site or Gaseous Diffusion Plant
Pittsburgh Naval Reactors Office
Portsmouth Site or Gaseous Diffusion Plant
Richland
Rocky Flats
S-50 Thermal Diffusion Plant
Sandia National Laboratory (SNL)
Sandia Laboratories (SL)
Savannah River
University of California Radiation Laboratory (UCRL)
X-10 Plutonium Production Reactor
Z-Plant Plutonium Separation Facility, Hanford
100-B Plutonium Production Reactor, Hanford

