



American National Standard
ANSI/HPS N13.45-2024

Incineration of Low-Level Radioactive Waste

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American National Standards Institute, Inc.



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This standard was developed under the authority of the Health Physics Society Accredited Standards Committee (ASC) N13, *Radiation Protection*. The Working Group responsible for this N13.45 standard had the following members:

Rodican P. Reed, Chair
(Health Physics Consultant)

Hans Arlt
(US NRC)

Kara Beharry
(AECOM)

Britt Edquist
(Idaho Cleanup Project)

Glenn M. Sturchio
(Mayo Clinic)

Mark A. Tries
(University of Massachusetts Lowell)

Christopher D. Vanderpool
(Hopewell Designs, Inc.)

The following Consultant also participated in the development of this standard:

Brian Parsons
(Energy Solutions)

The Working Group wishes to acknowledge the members of previous working groups, whose work we are continuing, and without whose efforts the current standard would not exist.

Vincent P. Williams

Michael J. Drzyzga

Robert D. Forrest

George W. MacDurmon

Oversight for this action was provided by the ANSI/HPS Accredited Standards Committee (ASC) N13, Radiation Protection, which had the following members on 02 January 2024:

Chairperson	J. Matthew Barnett
Vice Chairperson	Charles A. "Gus" Potter
Environmental Section Manager	David P. Fuehne
Internal Dosimetry Section Manager	Cheryl Antonio
External Dosimetry Section Manager	Gladys A. Klemic
Medical and Operational Health Physics Section Manager	David C. Medich
Instrumentation Section Manager	Peter F. Caracappa
Secretariat/Standards Coordinator	Amy Wride-Graney



This standard was consensus balloted and approved by members of the ANSI/HPS N13 Committee on 02 January 2024. At the time of balloting, the committee had the following membership:

Chairperson	J. Matthew Barnett
Vice Chairperson	Charles “Gus” Potter
American Association of Physicians in Medicine (AAPM)	Lawrence Dauer
American College of Occupational and Environmental Medicine	James Seward
American Industrial Hygiene Association (AIHA)	James Lewis
American Iron and Steel Institute	Anthony LaMastra
American Nuclear Insurers	Laura Williams
	Marcia Anderson (alternate)
American Nuclear Society (ANS)	Jarvis Caffery
Conference of Radiation Control Program Directors (CRCPD)	Earl Fordham
Council on Ionizing Radiation Measurements and Standards (CIRMS)	Matthew Mille
Council on Radionuclides and Radiopharmaceuticals, Inc. (CORAR)	Manual Diaz
Health Physics Society (HPS)	Antonio Triventi
	David Bytwerk (alternate)
Institute of Electrical and Electronic Engineers (IEEE)	Leticia Pibida
Institute of Nuclear Materials Management (INMM)	William Duffy
National Council on Radiation Protection and Measurements (NCRP)	Christine Donahue
National Mining Association	Scott C. Munson
National Registry of Radiation Protection Technologists (NRRPT)	Dwaine Brown
Nuclear Energy Institute (NEI)	Micheal Smith
U.S. Department of Commerce	Francis Boateng
U.S. Department of Defense	Tim Mikulski
	Aaron Thompson (alternate)
U.S. Department of Energy	George Chiu
	David Pugh (alternate)
U.S. Department of Homeland Security	Shinkyu (David) Park
	Mark Wolfmeyer (alternate)
U.S. Environmental Protection Agency	Jonathan Walsh
	Lowell Ralston (alternate)
U.S. Nuclear Regulatory Commission	Cindy Flannery
U.S. Navy	Gregory Fairchild
Individual member	J. Matthew Barnett
Individual member	Eric Darois
Individual member	Greg Komp
Individual member	Sander C. Perle
Individual member	Charles “Gus” Potter
Individual member	Toshihide Ushino

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Foreword

(This foreword is not part of American National Standard ANSI/HPS N13.45-2024.)

This American National Standard is intended to provide minimum requirements for incineration of low-level radioactive waste that is generated at facilities such as medical centers, universities, and research institutions. It describes the identification and characterization of wastes, selection and siting of incineration equipment, licensing and permitting requirements, control and monitoring, disposal of residues, documentation, and decontamination and decommissioning.

The standard is not intended to address non-radiological issues associated with incineration; however, it is not feasible to separate them completely. The low-level radioactive waste that would be a candidate for incineration would have a composition of materials that affect the incineration. To properly operate a combustion device, the other pollutants of interest need to be controlled as well, and many of the radionuclides would hopefully be captured in the process. It is also recognized the incineration process and the flue gas cleaning process are both crucial elements of the incineration process and maintaining compliance.

This standard incorporates contemporary information and is intended to be consistent with current U.S. regulatory requirements or guidance. The process of licensing and permitting an incinerator will require a thorough knowledge of state and local regulations that may be more stringent than this standard. Institutions may wish to refer to this standard when discussing licensing or permitting requirements with regulators.

Suggestions for improvement of this standard are welcome. Send suggestions to the Health Physics Society, 950 Herndon Parkway, Suite 450, Herndon, VA 20170; or by email to: awride-graney@burkinc.com.

Incineration of Low-Level Radioactive Waste

1.0 Scope

This standard provides guidelines for incineration of combustible forms of low-level radioactive waste. It addresses the siting, licensing and permitting, operation and monitoring of the incinerator operation, disposal of residues, and decontamination and decommissioning. This standard may be applied to incineration of mixed wastes (i.e., radioactive wastes that contain other hazardous components as defined by federal or state agencies), provided consideration is given to additional design features and regulatory permitting required by the hazardous nature of the wastes.

For purposes of this standard, incineration is considered a treatment or volume-reduction technique rather than a disposal mechanism. Other volume-reduction techniques have been described previously, such as in "Solid Radioactive Waste Processing Systems for Light-Water-Cooled Reactor Plants," ANSI/ANS 55.1-2021.

2.0 Definitions

2.1 Limitations

This standard does not address non-radiological hazards associated with incineration. Additionally, the decision of whether specific waste items (e.g., plastics containing PVC) are acceptable for incineration is beyond the scope of this standard.

The definitions that follow are of a restricted nature for purposes of this document.

2.2 Glossary of terms

Aerodynamic Downwash: The downward movement of a plume associated with the turbulence created when air passes over a structure.

Agreement State: Any state with which the U.S. Nuclear Regulatory Commission has entered into an agreement to allow that state to assume regulatory authority over certain radioactive materials.

As Low As is Reasonably Achievable (ALARA): The practice of making every reasonable effort to keep exposure to ionizing radiation as far below established limits as is practical, where economic, technological, and social factors are taken into account.

Ash: Solid residue that results from the incineration process, which includes bottom ash from the primary chamber and any fly ash collected from the emissions stack, scrubber, or filter train.

Batch Burn: The process of charging an incinerator, completing the incineration cycle for that charge, allowing the combustion chamber to cool down, and removing the ash residue prior to introduction of another charge. If the average radioactivity concentration in ash makes it necessary to collect such ash, then separate batch burns will be required for radioactive waste.

NOTE: there is a possible variant on batch burn that maintains the firing of the burners and does not cool the system down between batches but removes the material and reloads a new charge. Cooling an

incinerator down all the way takes at least a couple of days, maybe longer; heating it up to operating temperature might take 8-12 hours, maybe longer. Not only does that impact the system's throughput, but it imposes wear and tear on the system, reducing its lifespan. Batches can be changed without completely shutting the system down.

Biological Waste: A substance of biological origin that is destined for disposal, or any material that has been exposed to biological substances. The biological waste may be non-hazardous or may contain infectious agents or other biologic substances that are considered to be hazardous.

Biohazardous Waste: Biological waste that contains infectious or potentially infectious agents or other biological substances that are considered to be hazardous.

British Thermal Unit (BTU): The quantity of thermal energy required to raise the temperature of one pound of water by 1°F at, or near, its point of maximum density (39.1°F). A quantity of thermal energy equal to 1,055 joules (J).

Burn Parameters: A set of physical properties, (e.g., temperature in primary chamber and charge rate) whose values determine the efficient treatment of low-level radioactive waste by incineration.

Calorie: The amount of thermal energy required to raise the temperature of 1 g of water by 1 °C. A quantity of thermal energy equal to 4.187 J.

Charge (noun): A term describing waste that is introduced into an incinerator.

Charge (verb): The process of introducing waste into an incinerator.

Combustibility: The level of oxidation that occurs during incineration.

Concentration Limit: The maximum concentration of a radionuclide that may be released to air or sanitary sewer.