

REMOTE-HANDLED LOW-LEVEL WASTE DISPOSAL PROJECT CODE OF RECORD

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Approved by:

A handwritten signature in black ink, appearing to read "GTarbet", with a long horizontal flourish extending to the right.

Gary Tarbet
Design Authority

3/17/2015

Date

ABSTRACT

The Remote-Handled Low-Level Waste (LLW) Disposal Project addresses an anticipated shortfall in remote-handled LLW disposal capability following cessation of operations at the existing facility, which will continue until it is full or until it must be closed in preparation for final remediation of the Subsurface Disposal Area (approximately at the end of Fiscal Year 2020). Development of a new onsite disposal facility will provide necessary remote-handled LLW disposal capability and will ensure continuity of operations that generate remote-handled LLW. This report documents the Code of Record for design of a new LLW disposal capability. The report is owned by the Design Authority, who can authorize revisions and exceptions. This report will be retained for the lifetime of the facility.

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ACRONYMS

ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
AWS	American Welding Society
CFR	Code of Federal Regulations
DOE	Department of Energy
IDAPA	Idaho Administrative Procedures Act
IEEE	Institute of Electrical and Electronics Engineers
INL	Idaho National Laboratory
LLW	low-level waste
NFPA	National Fire Protection Association

Remote-Handled Low Level Waste Disposal Project Code of Record

1. INTRODUCTION

Remote-handled low-level waste (LLW) in the form of activated metals is generated from operations at Idaho National Laboratory's (INL's) Naval Reactors Facility and the Advanced Test Reactor Complex. Activated metals also are planned to be generated from new missions and from segregation and treatment (as necessary) of remote-handled scrap and waste currently stored at the Materials and Fuels Complex. Remote-handled LLW ion-exchange resins are generated from operations at the Naval Reactors Facility and Advanced Test Reactor Complex. Disposal of remote-handled LLW in the disposal vaults of the existing INL waste disposal facility is planned through the first quarter of Fiscal Year 2020. Continued remote-handled LLW disposal capability is critical to continuing the U.S. Department of Energy (DOE) Office of Nuclear Energy, Science, and Technology and Office of Naval Reactors missions conducted at INL. A new onsite disposal facility will be constructed to provide uninterrupted, remote-handled LLW disposal capability.

Consistent with DOE Order 413.3B, DOE Order 420.1C, and DOE-STD-1189 for nuclear facilities, a project Code of Record has been developed. This Code of Record will be maintained throughout the Critical Decision process and for the remainder of the nuclear facility's life-cycle. The Code of Record will serve as the management tool and source for the set of requirements that are used to design, construct, operate and decommission the RH-LLW facility over its lifespan. This Code of Record was initiated during Conceptual Design and revised during the design-build procurement process to reflect updated codes and standards cited in SPC-1437, "Design-Build-Operate Performance Specification for the Remote-Handled Low-Level Waste Disposal Project." The seventh revision of this document reflects the code and standards used during final design of the project.

2. REGULATIONS, EXECUTIVE ORDERS, AND DEPARTMENT OF ENERGY ORDERS

Applicable regulations, executive orders, and DOE orders are summarized in the following subsections.

2.1 Regulations

- 10 CFR 434, 2007, "Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal Buildings," *Code of Federal Regulations*, Office of the Federal Register, December 2007.
- 10 CFR 830, "Nuclear Safety Management," *Code of Federal Regulations*, Office of the Federal Register.
- 10 CFR 835, 2002, "Occupational Radiation Protection," *Code of Federal Regulations*, Office of the Federal Register, February 2002.
- 10 CFR 851, "Worker Safety and Health Program," *Code of Federal Regulations*, Office of the Federal Register.
- 10 CFR Part 860, 2004, "Trespassing on Administration Property," *Code of Federal Regulations*, Office of the Federal Register, March 2004.
- 29 CFR 1910, 2010, "Occupational Safety and Health Standards," *Code of Federal Regulations*, Office of the Federal Register, June 2010.

- 29 CFR 1926, 2010, “Safety and Health Regulations for Construction,” *Code of Federal Regulations*, Office of the Federal Register, August 2010.
- 41 CFR Part 101, 2002, “Federal Property Management Regulation,” *Code of Federal Regulations*, Office of the Federal Register, December 2002.
- Executive Order 13423, “Strengthening Federal Environmental, Energy, and Transportation Management,” 2007.
- IDAPA 02.06.22, “Noxious Weed Rules,” *Idaho Administrative Procedures Act*, Idaho Department of Agriculture.
- IDAPA 07.02.06, “Rules Concerning Uniform Plumbing Code,” *Idaho Administrative Procedures Act*, Division of Building Safety.
- IDAPA 07.07.01, “Rules Governing Installation of Heating, Ventilation, and Air Conditioning Systems,” *Idaho Administrative Procedures Act*, Idaho Division of Building Safety.
- IDAPA 58.01.03, 2009, “Individual/Subsurface Sewage Disposal Rules,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality, July 2009.
- IDAPA 58.01.08, “Idaho Rules For Public Drinking Water Systems,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality.
- IDAPA 58.01.16, “Wastewater Rules,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality.
- Public Law 111-380, “Reduction of Lead in Drinking Water Act,” January 2011.

2.2 Department of Energy Directives

- DOE Order 226.1B, “Implementation of Department of Energy Oversight Policy,” U.S. Department of Energy.
- DOE Order 413.3B, “Program and Project Management for the Acquisition of Capital Assets,” U.S. Department of Energy.
- DOE Order 414.1D, Admin Chg. 1, “Quality Assurance,” U.S. Department of Energy.
- DOE Order 420.1C, “Facility Safety,” Approved 12-4-2012, U.S. Department of Energy.
- DOE Order 425.1D, Admin Chg 1, “Verification of Readiness to Start Up or Restart Nuclear Facilities,” U.S. Department of Energy.
- DOE Order 426.2, Admin Chg. 1, “Personnel Selection, Training, and Certification Requirements for DOE Nuclear Facilities,” U.S. Department of Energy.
- DOE Order 433.1B, Admin Chg. 1, “Maintenance Management Program for DOE Nuclear Facilities,” U.S. Department of Energy.
- DOE Order 435.1, Chg. 1 “Radioactive Waste Management”, U.S. Department of Energy.
- DOE Order 436.1, “Departmental Sustainability”, U.S. Department of Energy.
- DOE Order 458.1, Chg.1 and Chg. 2 “Radiation Protection of the Public and the Environment,” U.S. Department of Energy.
- DOE Order 460.1C, “Packaging and Transportation Safety,” U.S. Department of Energy.
- DOE Order 471.6, “Information Security,” U.S. Department of Energy.
- DOE Order 473.3, “Protection Program Operations,” U.S. Department of Energy.

- DOE-STD-1020-2012, “Natural Phenomena Hazards Analysis and Design Criteria for Department of Energy Facilities”, U.S. Department of Energy.
- DOE-STD-1027-92, Chg. 1, “Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports,” U.S. Department of Energy.
- DOE-HDBK-1028-2009, “Human Performance Improvement Handbook, Volume 1 and 2” U.S. Department of Energy.
- DOE HDBK-3010, “Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities,” U.S. Department of Energy, December 1994, Reaffirmed 2013.
- DOE STD 1066-2012, “Fire Protection”, U.S. Department of Energy.
- DOE-STD-1073-03, “Configuration Management Program,” U.S. Department of Energy.
- DOE-STD-1090-11, “Hoisting and Rigging,” U.S. Department of Energy.
- DOE-STD-1189-2008, “Integration of Safety into the Design Process,” U.S. Department of Energy.
- DOE-STD-3009-94, “Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses,” Change Notice 3, U.S. Department of Energy, July 1994 (including Change 1, January 2000; Change 2, April 2002, and Change 3, March 2006).
- DOE-STD-3024-11, “Content of System Design Descriptions,” U.S. Department of Energy.

3. DESIGN CODE OR RECORD

The Remote-Handled LLW Project design criteria for facility modifications or new construction are summarized in the following subsections. Edition dates are based on a Fiscal Year 2013 design schedule. If design is delayed, edition dates should reflect the latest current edition date at the start of preliminary or final design. Additional codes and standards may be mandated by higher-level documents and are not listed. This report was reviewed and revised during final design to assess required updates or changes and document codes and standards that were actually used based on the final scope of the project.

3.1 General Design

- International Building Code, 2012 Edition.
- National Fire Protection Association (NFPA) 101, “Life Safety Code,” 2012 Edition.
- International Mechanical Code (IMC), 2012 Edition.
- INL-STD-139, “INL Engineering Standards,” Idaho National Laboratory.
- DOE Order 420.1C, “Facility Safety,” Approved 12-04-2012, U.S. Department of Energy.
- DOE Order 436.1, “Departmental Sustainability,” U.S. Department of Energy.
- DOE Order 460.1C, “Packaging and Transportation Safety,” U.S. Department of Energy.
- DOE Order 473.3, “Protection Program Operations,” U.S. Department of Energy.
- DOE Order 471.6, “Information Security,” U.S. Department of Energy.
- ASME NQA-1-2008, 1a-2009, Addenda, “Quality Assurance Requirements for Nuclear Facility Applications,” American Society of Mechanical Engineers.

3.2 Civil, Structural, and Architectural

- AASHTO VLVLR-1, “Guidelines for Geometric Design of Very Low-Volume Local Roads,” American Association of State Highway Transportation Officials, First Edition.
- SSHC, “Standard Specifications for Highway Construction,” State of Idaho Transportation Department, Division of Highways, 2004 Edition.
- DOE Order 420.1C, “Facility Safety,” Approved 12-4-2012, U.S. Department of Energy.
- DOE Order 436.1, “Departmental Sustainability,” U.S. Department of Energy.
- DOE-STD-1020-2012, “Natural Phenomena Hazards Analysis and Design Criteria for Department of Energy Facilities,” U.S. Department of Energy.
- INL Welding Manual, latest updates through 2-1-2013.
- International Building Code, 2012 Edition.
- ADAAG, “Americans with Disabilities Act Accessibility Guidelines,” 2004 Edition.
- American Concrete Institute (ACI) 201.2R, “Guide to Durable Concrete,” 2008 Edition.
- ACI 301-10, “Specifications for Structural Concrete,” 2010 Edition.
- ACI 318-11, “Building Code Requirements for Structural Concrete,” 2011 Edition.
- ACI 349-06, “Code Requirements for Nuclear Safety Related Concrete Structures,” 2006 Edition.
- AISC 325, American Institute of Steel Construction (AISC) SCM, “Steel Construction Manual,” Thirteenth Edition.
- AISC 360, “Specification for Structural Steel Buildings,” 2010 Edition.
- American Iron and Steel Institute (AISI) S100, ERTA “North American Specification for the Design of Cold-formed Steel Structural Members,” 2007 Edition.
- American National Standards Institute (ANSI)/American Nuclear Society 2.26, “Categorization of Nuclear Facility Structures, Systems and Components for Seismic Design,” 2004 Edition, Reaffirmed 2010.
- ASCE 7, “Minimum Design Loads for Buildings and Other Structures,” 2010 Edition.
- American Society for Testing Materials (ASTM) C 857, “Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures,” 2012 Edition.
- ASTM C 1562, “Standard Guide for Evaluation of Materials Used in Extended Service of Interim Spent Nuclear Fuel Dry Storage Systems,” 2010 Edition.
- American Water Works Association, “Cross Connection Control Manual, Accepted Procedure and Practice,” Pacific Northwest Section of American Water Works Association.
- American Welding Society (AWS) D1.1, “Structural Welding Code – Steel,” 2004 Edition.
- AWS D1.3, “Structural Welding Code – Sheet Steel,” 1998 Edition.
- AWS D1.4, “Structural Welding Code – Reinforcing Steel,” 1998 Edition.

3.3 Mechanical; Heating, Ventilating, and Air Conditioning; Piping

3.3.1 General

- INL Welding Manual, latest updates through 2-1-2013.

- IMC, “International Mechanical Code,” 2012 Edition.
- IBC, “International Building Code,” 2012 Edition.
- 10 CFR 434, “Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory Energy Conservation” *Code of Federal Regulations*, Office of the Federal Register, December 2007.
- DOE Order 436.1, “Departmental Sustainability,” U.S. Department of Energy.
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) 90.1, ANSI/IESNA Standard 90.1-2007, “Energy Standard for Buildings Except Low-Rise Residential Buildings,” 2007 Edition.

3.3.2 Building Service Piping

- American Society of Mechanical Engineers B31.9, “Building Service Piping,” 2008.
- IDAPA 07.02.06, “Rules Concerning Uniform Plumbing Code,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality, Division of Building Safety.
- IDAPA 07.07.01, “Rules Governing Installation of Heating, Ventilation, and Air Conditioning Systems,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality, Division of Building Safety.
- IDAPA 58.01.08, “Idaho Rules for Public Drinking Water Systems,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality.
- IDAPA 58.01.16, “Wastewater Rules,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality.
- Public Law 111-380, “Reduction of Lead in Drinking Water Act,” January 2011.
- Uniform Plumbing Code, 2003 Edition.

3.3.3 Potable Water and Sewer

- IDAPA 58.01.03, 2009, “Individual/Subsurface Sewage Disposal Rules,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality, July 2009.
- IDAPA 58.01.08, “Idaho Rules for Public Drinking Water Systems,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality.
- Memorandum of Understanding (MOU) between the Idaho Department of Environmental Quality and the Idaho Division of Building Safety Plumbing Bureau, April 2013.
- Public Law 111-380, “Reduction of Lead in Drinking Water Act,” January 2011.
- Uniform Plumbing Code, 2003 Edition.

3.3.4 Heating, Ventilating, and Air Conditioning and Ducting

- ASHRAE 90.1, “Energy Standard for Buildings Except Low-Rise Residential Buildings,” 2007 Edition.
- ASHRAE 55, “Thermal Environmental Conditions for Human Occupancy,” 2004 Edition.
- ASHRAE 62.1, “Ventilation for Acceptable Indoor Air Quality,” 2010 Edition.
- ASHRAE Handbook, “Fundamentals,” 2009 Edition.
- ASME B31.5, “Refrigeration Piping and Heat Transfer Components,” 2013 Edition.
- NFPA 90A, “Standard for the Installation of Air Conditioning and Ventilating Systems,” 2009 Edition.

- IDAPA 07.07.01, “Rules Governing Installation of Heating, Ventilation, and Air Conditioning Systems, Division of Building Safety,” *Idaho Administrative Procedures Act*, Idaho Department of Environmental Quality.

3.4 Fire Protection

3.4.1 National Fire Protection Association

- Factory Mutual (FM) 2-0, “Installation Guide for Automatic Sprinklers,” 2011.
- DOE STD 1066-2012, “Fire Protection”, U.S. Department of Energy.
- FM 2-8, “Earthquake Protection for Water-Based Fire Protection Systems,” 2010.
- FM 3-10, “Installation/Maintenance of Fire Service Mains,” 2000
- FM 3-26, “Fire Protection Water Demand for Nonstorage Sprinklered Properties,” 2012.
- NFPA 1, “Fire Prevention Code,” 2012 Edition.
- NFPA 10, “Standard for Portable Fire Extinguishers,” 2013 Edition.
- NFPA 13, “Standard for the Installation of Sprinkler Systems,” 2013 Edition.
- NFPA 24, “Standard for the Installation of Private Fire Service Mains and Their Appurtenances,” 2013 Edition.
- NFPA 25, “Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems,” 2014 Edition.
- NFPA 55, “Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, and Tanks,” 2010 Edition.
- NFPA 72, “National Fire Alarm and Signaling Code,” 2013 Edition.
- NFPA 80A, “Recommended Practice for Protection of Buildings from Exterior Fire Exposures,” 2012 Edition.
- NFPA 90A, “Standard for the Installation of Air-Conditioning and Ventilating Systems,” 2012 Edition.
- NFPA 90B, “Standard for the Installation of Warm Air Heating and Air-Conditioning Systems,” 2012 Edition.
- NFPA 220, “Standard on Types of Building Construction,” 2012 Edition.
- NFPA 801, “Standard for Fire Protection for Facilities Handling Radioactive Materials,” 2014 Edition.
- NFPA 1144, “Standard for Reducing Structure Ignition Hazards from Wildland Fire,” 2013 Edition.

3.5 Electrical

3.5.1 General Facility Electrical Codes and Standards

- NFPA 70, “National Electric Code (NEC),” 2011 Edition.
- NFPA 70E, “Electrical Safety Requirements for Employee Workplaces,” 2009 Edition.
- Institute of Electrical and Electronics Engineers (IEEE)-C2, “National Electrical Safety Code,” 2012 Edition.
- DOE-HDBK-1092, DOE Handbook, “Electrical Safety,” 2004 Edition.

- DOE-HDBK-1132, DOE Handbook, “Design Considerations,” 1999 Edition.

3.5.2 Normal Power System Codes and Standards

- IEEE-STD 141, “IEEE Recommended Practice for Electric Power Distribution for Industrial Plants,” Red Book, 1993 Edition (R1999).
- IEEE-STD 242, “IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power,” Buff Book, 2001 Edition with Errata.
- IEEE-STD 493, “IEEE Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems,” Gold Book, 2007 Edition.
- IEEE-STD C57.12.01, “General Requirements for Dry-Type Distribution and Power Transformers,” 2015.
- UL-508, “UL Standard for Safety Industrial Control Equipment,” 1999 Edition with Revision.
- UL-508A, “UL Standard for Safety Industrial Control Panels,” 2001 Edition with Revision.

3.5.3 Lighting System Codes and Standards

- IESNA, “Lighting Handbook,” 2011 Edition.
- ASHRAE 90.1, “Energy Standard for Buildings,” 2007 Edition.
- AASHTO LTS-4-M, “Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic signals, 4th edition, 2001.

3.5.4 Grounding System Codes and Standards

- IEEE-STD 142, “Recommended Practice for Grounding of Industrial and Commercial Power Systems,” Green Book, 2007 Edition.

3.5.5 Lightning Protection System Codes and Standards

- NFPA 780, “Standard for the Installation of Lightning Protection Systems,” 2011 Edition.
- UL-96A, “Installation Requirements for Lightning Protection Systems,” 2007 Edition.

3.5.6 Telephone System Codes and Standards

- ANSI/TIA/EIA 568 C.0, “Generic Telecommunications Cabling for Customer Premises,” 2010 Edition.
- ANSI/TIA/EIA 568 C.1, “Commercial Building Telecommunications Cabling Standard,” 2010 Edition.
- ANSI/TIA/EIA 568 B.2, “Twisted Pair Cabling Components Standard,” 2009 Edition.
- ANSI/TIA/EIA 568 B.3, “Optical Fiber Cabling Components Standard,” 2008 Edition.
- ANSI/TIA/EIA 569 B, “Commercial Building Standard for Telecommunications Pathways and Spaces,” 2004 Edition.
- ANSI/TIA/EIA J-STD-607, “Commercial Building Grounding and Bonding Requirements for Telecommunications,” 2002 Edition.
- IEEE-802.3an, “Standard for Information Technology,” 2006
- STD-170, “Information Management Infrastructure Standards,” Idaho National Laboratory, 2011.