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### **KEY=ANSI - ZAYDEN DECKER**

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### **AMERICAN NATIONAL STANDARD ANSI/HPS N13.11-2009 (R2015)**

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### **PERSONNEL DOSIMETRY PERFORMANCE : CRITERIA FOR TESTING**

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### **ANSI/HPS STANDARD N13.3 DOSIMETRY FOR CRITICALITY ACCIDENTS**

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### **ASSESSMENT OF THE GROUP 3-4 (HV-S1, HV-S2, IHLW-S1) STACK SAMPLING PROBE LOCATIONS FOR COMPLIANCE WITH ANSI/HPS N13.1-1999**

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### **ASSESSMENT OF THE GROUP 5-6 (LB C2, LB S2, LV S1) STACK SAMPLING PROBE LOCATIONS FOR COMPLIANCE WITH ANSI/HPS N13.1 1999**

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This document reports on a series of tests to assess the proposed air sampling locations for the Hanford Tank Waste Treatment and Immobilization Plant (WTP) Group 5-6 exhaust stacks with respect to the applicable criteria regarding the placement of an air sampling probe. The LB-C2, LV-S1, and LB S2 exhaust stacks were tested together as a group (Test Group 5-6) because the common factor in their design is that the last significant flow disturbance upstream of the air sampling probe is a reduction in duct diameter. Federal regulations() require that a sampling probe be located in the exhaust stack according to the criteria of the American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities. These criteria address the capability of the sampling probe to extract a sample that represents the effluent stream. The testing on scale models of the stacks conducted for this project was part of the River Protection Project-Waste Treatment Plant Support Program under Contract No. DE-AC05-76RL01830 according to the statement of work issued by Bechtel National Inc. (BNI, 24590-QL-SRA-W000-00101, N13.1-1999 Stack Monitor Scale Model Testing and Qualification, Revision 1, 9/12/2007) and Work Authorization 09 of Memorandum of Agreement 24590-QL-HC9-WA49-00001. The internal Pacific Northwest National Laboratory (PNNL) project for this task is 53024, Work for Hanford Contractors Stack Monitoring. The testing described in this document was further guided by the Test Plan Scale Model Testing the Waste Treatment Plant LB-C2, LB-S2, and LV-S1 (Test Group 5-6) Stack Air Sampling Positions (TP-RPP-WTP-594). The tests conducted by PNNL during 2009 and 2010 on the Group 5-6 scale model systems are described in this report. The series of tests consists of various measurements taken over a grid of points in the duct cross-section at the designed sampling probe locations and at five duct diameters up and downstream from the design location to accommodate potential construction variability. The tests were done only at the design sampling probe location on the scale model of LB-S2 because that ductwork was already constructed. The ANSI/HPS N13.1-1999 criteria and the corresponding results of the test series on the scale models are summarized in this report.

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### **ASSESSMENT OF THE WASTE TREATMENT PLANT LAB C3V (LB-S1) STACK SAMPLING PROBE LOCATION FOR COMPLIANCE WITH ANSI/HPS N13.1-1999**

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### **ASSESSMENT OF THE LV-S2 & LV-S3 STACK SAMPLING PROBE LOCATIONS FOR COMPLIANCE WITH ANSI/HPS N13.1-1999**

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This document reports on a series of tests conducted to assess the proposed air sampling locations for the Hanford Tank Waste Treatment and Immobilization Plant (WTP) Group 1-2A exhaust stacks with respect to the applicable criteria regarding the placement of an air sampling probe. The LV-C2, LV-S2, and LV-S3 exhaust stacks were tested together as a group (Test Group 1-2A). This report only covers the results of LV-S2 and LV-S3; LV-C2 will be reported on separately. Federal regulations<sup>1</sup> require that a sampling probe be located in the exhaust stack according to the criteria established by the American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1-1999, Sampling and Monitoring

Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities. 2 These criteria address the capability of the sampling probe to extract a sample that represents the effluent stream.

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### **ASSESSMENT OF THE PROPOSED INTEC CPP 666 STACK MONITORING SITE FOR COMPLIANCE WITH ANSI/HPS N13.1 1999**

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This document reports on a series of tests to determine whether the proposed new location for air sampling probes in the CPP-666 heating, ventilation and air conditioning (HVAC) exhaust duct would meet the applicable regulatory criteria regarding the placement of an air sampling probe. Federal regulations() require that a sampling probe be located in the exhaust stack according to the criteria of the American National Standards Institute/Health Physical Society (ANSI/HPS) N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities. These criteria address the capability of the sampling probe to extract a sample that is representative of the effluent stream.

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### **OVER 200 U.S. DEPARTMENT OF ENERGY MANUALS COMBINED: CLASSICAL PHYSICS; ELECTRICAL SCIENCE; THERMODYNAMICS, HEAT TRANSFER AND FLUID FUNDAMENTALS; INSTRUMENTATION AND CONTROL; MATHEMATICS; CHEMISTRY; ENGINEERING SYMBOLOGY; MATERIAL SCIENCE; MECHANICAL SCIENCE; AND NUCLEAR PHYSICS AND REACTOR THEORY**

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Jeffrey Frank Jones Over 19,000 total pages ... Public Domain U.S. Government published manual: Numerous illustrations and matrices. Published in the 1990s and after 2000. **TITLES and CONTENTS:** **ELECTRICAL SCIENCES** - Contains the following manuals: Electrical Science, Vol 1 - Electrical Science, Vol 2 - Electrical Science, Vol 3 - Electrical Science, Vol 4 - Thermodynamics, Heat Transfer, And Fluid Flow, Vol 1 - Thermodynamics, Heat Transfer, And Fluid Flow, Vol 2 - Thermodynamics, Heat Transfer, And Fluid Flow, Vol 3 - Instrumentation And Control, Vol 1 - Instrumentation And Control, Vol 2 Mathematics, Vol 1 - Mathematics, Vol 2 - Chemistry, Vol 1 - Chemistry, Vol 2 - Engineering Symbology, Prints, And Drawings, Vol 1 - Engineering Symbology, Prints, And Drawings, Vol 2 - Material Science, Vol 1 - Material Science, Vol 2 - Mechanical Science, Vol 1 - Mechanical Science, Vol 2 - Nuclear Physics And Reactor Theory, Vol 1 - Nuclear Physics And Reactor Theory, Vol 2. **CLASSICAL PHYSICS** - The Classical Physics Fundamentals includes information on the units used to measure physical properties; vectors, and how they are used to show the net effect of various forces; Newton's Laws of motion, and how to use these laws in force and motion applications; and the concepts of energy, work, and power, and how to measure and calculate the energy involved in various applications. \* Scalar And Vector Quantities \* Vector Identification \* Vectors: Resultants And Components \* Graphic Method Of Vector Addition \* Component Addition Method \* Analytical Method Of Vector Addition \* Newton's Laws Of Motion \* Momentum Principles \* Force And Weight \* Free-Body Diagrams \* Force Equilibrium \* Types Of Force \* Energy And Work \* Law Of Conservation Of Energy \* Power - **ELECTRICAL SCIENCE:** The Electrical Science Fundamentals Handbook includes information on alternating current (AC) and direct current (DC) theory, circuits, motors, and generators; AC power and reactive components; batteries; AC and DC voltage regulators; transformers; and electrical test instruments and measuring devices. \* Atom And Its Forces \* Electrical Terminology \* Units Of Electrical Measurement \* Methods Of Producing Voltage (Electricity) \* Magnetism \* Magnetic Circuits \* Electrical Symbols \* DC Sources \* DC Circuit Terminology \* Basic DC Circuit Calculations \* Voltage Polarity And Current Direction \* Kirchhoff's Laws \* DC Circuit Analysis \* DC Circuit Faults \* Inductance \* Capacitance \* Battery Terminology \* Battery Theory \* Battery Operations \* Types Of Batteries \* Battery Hazards \* DC Equipment Terminology \* DC Equipment Construction \* DC Generator Theory \* DC Generator Construction \* DC Motor Theory \* Types Of DC Motors \* DC Motor Operation \* AC Generation \* AC Generation Analysis \* Inductance \* Capacitance \* Impedance \* Resonance \* Power Triangle \* Three-Phase Circuits \* AC Generator Components \* AC Generator Theory \* AC Generator Operation \* Voltage Regulators \* AC Motor Theory \* AC Motor Types \* Transformer Theory \* Transformer Types \* Meter Movements \* Voltmeters \* Ammeters \* Ohm Meters \* Wattmeters \* Other Electrical Measuring Devices \* Test Equipment \* System Components And Protection Devices \* Circuit Breakers \* Motor Controllers \* Wiring Schemes And Grounding **THERMODYNAMICS, HEAT TRANSFER AND FLUID FUNDAMENTALS.** The Thermodynamics, Heat Transfer, and Fluid Flow Fundamentals Handbook includes information on thermodynamics and the properties of fluids; the three modes of heat transfer - conduction, convection, and radiation; and fluid flow, and the energy relationships in fluid systems. \* Thermodynamic Properties \* Temperature And Pressure Measurements \* Energy, Work, And Heat \* Thermodynamic Systems And Processes \* Change Of Phase \* Property Diagrams And Steam Tables \* First Law Of Thermodynamics \* Second Law Of Thermodynamics \* Compression Processes \* Heat Transfer Terminology \* Conduction Heat Transfer \* Convection Heat Transfer \* Radiant Heat Transfer \* Heat Exchangers \* Boiling Heat Transfer \* Heat Generation \* Decay Heat \* Continuity Equation \* Laminar And Turbulent Flow \* Bernoulli's Equation \* Head Loss \* Natural Circulation \* Two-Phase Fluid Flow \* Centrifugal Pumps **INSTRUMENTATION AND CONTROL.** The Instrumentation and Control Fundamentals Handbook includes information on temperature, pressure, flow, and level detection systems; position indication systems; process control systems; and radiation detection principles. \* Resistance Temperature Detectors (Rtds) \* Thermocouples \* Functional Uses Of Temperature Detectors \* Temperature Detection Circuitry \* Pressure Detectors \* Pressure Detector Functional Uses \* Pressure Detection Circuitry \* Level Detectors \* Density

Compensation \* Level Detection Circuitry \* Head Flow Meters \* Other Flow Meters \* Steam Flow Detection \* Flow Circuitry \* Synchro Equipment \* Switches \* Variable Output Devices \* Position Indication Circuitry \* Radiation Detection Terminology \* Radiation Types \* Gas-Filled Detector \* Detector Voltage \* Proportional Counter \* Proportional Counter Circuitry \* Ionization Chamber \* Compensated Ion Chamber \* Electroscopie Ionization Chamber \* Geiger-Müller Detector \* Scintillation Counter \* Gamma Spectroscopy \* Miscellaneous Detectors \* Circuitry And Circuit Elements \* Source Range Nuclear Instrumentation \* Intermediate Range Nuclear Instrumentation \* Power Range Nuclear Instrumentation \* Principles Of Control Systems \* Control Loop Diagrams \* Two Position Control Systems \* Proportional Control Systems \* Reset (Integral) Control Systems \* Proportional Plus Reset Control Systems \* Proportional Plus Rate Control Systems \* Proportional-Integral-Derivative Control Systems \* Controllers \* Valve Actuators

**MATHEMATICS** The Mathematics Fundamentals Handbook includes a review of introductory mathematics and the concepts and functional use of algebra, geometry, trigonometry, and calculus. Word problems, equations, calculations, and practical exercises that require the use of each of the mathematical concepts are also presented. \* Calculator Operations \* Four Basic Arithmetic Operations \* Averages \* Fractions \* Decimals \* Signed Numbers \* Significant Digits \* Percentages \* Exponents \* Scientific Notation \* Radicals \* Algebraic Laws \* Linear Equations \* Quadratic Equations \* Simultaneous Equations \* Word Problems \* Graphing \* Slopes \* Interpolation And Extrapolation \* Basic Concepts Of Geometry \* Shapes And Figures Of Plane Geometry \* Solid Geometric Figures \* Pythagorean Theorem \* Trigonometric Functions \* Radians \* Statistics \* Imaginary And Complex Numbers \* Matrices And Determinants \* Calculus

**CHEMISTRY** The Chemistry Handbook includes information on the atomic structure of matter; chemical bonding; chemical equations; chemical interactions involved with corrosion processes; water chemistry control, including the principles of water treatment; the hazards of chemicals and gases, and basic gaseous diffusion processes. \* Characteristics Of Atoms \* The Periodic Table \* Chemical Bonding \* Chemical Equations \* Acids, Bases, Salts, And Ph \* Converters \* Corrosion Theory \* General Corrosion \* Crud And Galvanic Corrosion \* Specialized Corrosion \* Effects Of Radiation On Water Chemistry (Synthesis) \* Chemistry Parameters \* Purpose Of Water Treatment \* Water Treatment Processes \* Dissolved Gases, Suspended Solids, And Ph Control \* Water Purity \* Corrosives (Acids And Alkalies) \* Toxic Compound \* Compressed Gases \* Flammable And Combustible Liquids

**ENGINEERING SYMBOLOGY.** The Engineering Symbology, Prints, and Drawings Handbook includes information on engineering fluid drawings and prints; piping and instrument drawings; major symbols and conventions; electronic diagrams and schematics; logic circuits and diagrams; and fabrication, construction, and architectural drawings. \* Introduction To Print Reading \* Introduction To The Types Of Drawings, Views, And Perspectives \* Engineering Fluids Diagrams And Prints \* Reading Engineering P&IDs \* P&ID Print Reading Example \* Fluid Power P&IDs \* Electrical Diagrams And Schematics \* Electrical Wiring And Schematic Diagram Reading Examples \* Electronic Diagrams And Schematics \* Examples \* Engineering Logic Diagrams \* Truth Tables And Exercises \* Engineering Fabrication, Construction, And Architectural Drawings \* Engineering Fabrication, Construction, And Architectural Drawing, Examples

**MATERIAL SCIENCE.** The Material Science Handbook includes information on the structure and properties of metals, stress mechanisms in metals, failure modes, and the characteristics of metals that are commonly used in DOE nuclear facilities. \* Bonding \* Common Lattice Types \* Grain Structure And Boundary \* Polymorphism \* Alloys \* Imperfections In Metals \* Stress \* Strain \* Young's Modulus \* Stress-Strain Relationship \* Physical Properties \* Working Of Metals \* Corrosion \* Hydrogen Embrittlement \* Tritium/Material Compatibility \* Thermal Stress \* Pressurized Thermal Shock \* Brittle Fracture Mechanism \* Minimum Pressurization-Temperature Curves \* Heatup And Cooldown Rate Limits \* Properties Considered \* When Selecting Materials \* Fuel Materials \* Cladding And Reflectors \* Control Materials \* Shielding Materials \* Nuclear Reactor Core Problems \* Plant Material Problems \* Atomic Displacement Due To Irradiation \* Thermal And Displacement Spikes \* Due To Irradiation \* Effect Due To Neutron Capture \* Radiation Effects In Organic Compounds \* Reactor Use Of Aluminum

**MECHANICAL SCIENCE.** The Mechanical Science Handbook includes information on diesel engines, heat exchangers, pumps, valves, and miscellaneous mechanical components. \* Diesel Engines \* Fundamentals Of The Diesel Cycle \* Diesel Engine Speed, Fuel Controls, And Protection \* Types Of Heat Exchangers \* Heat Exchanger Applications \* Centrifugal Pumps \* Centrifugal Pump Operation \* Positive Displacement Pumps \* Valve Functions And Basic Parts \* Types Of Valves \* Valve Actuators \* Air Compressors \* Hydraulics \* Boilers \* Cooling Towers \* Demineralizers \* Pressurizers \* Steam Traps \* Filters And Strainers

**NUCLEAR PHYSICS AND REACTOR THEORY.** The Nuclear Physics and Reactor Theory Handbook includes information on atomic and nuclear physics; neutron characteristics; reactor theory and nuclear parameters; and the theory of reactor operation. \* Atomic Nature Of Matter \* Chart Of The Nuclides \* Mass Defect And Binding Energy \* Modes Of Radioactive Decay \* Radioactivity \* Neutron Interactions \* Nuclear Fission \* Energy Release From Fission \* Interaction Of Radiation With Matter \* Neutron Sources \* Nuclear Cross Sections And Neutron Flux \* Reaction Rates \* Neutron Moderation \* Prompt And Delayed Neutrons \* Neutron Flux Spectrum \* Neutron Life Cycle \* Reactivity \* Reactivity Coefficients \* Neutron Poisons \* Xenon \* Samarium And Other Fission Product Poisons \* Control Rods \* Subcritical Multiplication \* Reactor Kinetics \* Reactor

### **ASSESSMENT OF THE NATIONAL RESEARCH UNIVERSAL REACTOR PROPOSED NEW STACK SAMPLING PROBE LOCATION FOR COMPLIANCE WITH ANSI/HPS N13.1-1999**

This document reports on a series of tests conducted to assess the proposed air sampling location for the National Research Universal reactor (NRU) complex exhaust stack, located in Chalk River, Ontario, Canada, with respect to the applicable criteria regarding the placement of an air sampling probe. Due to the age of the equipment in the existing monitoring system, and the increasing difficulty in acquiring replacement parts to maintain this equipment, a more up-to-date system is planned to replace the current effluent monitoring

system, and a new monitoring location has been proposed. The new sampling probe should be located within the exhaust stack according to the criteria established by the American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities. These criteria address the capability of the sampling probe to extract a sample that represents the effluent stream. The internal Pacific Northwest National Laboratory (PNNL) project for this task was 65167, Atomic Energy Canada Ltd. Chalk River Effluent Duct Flow Qualification. The testing described in this document was guided by the Test Plan: Testing of the NRU Stack Air Sampling Position (TP-STMON-032).

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## **IONIZING RADIATION DOSIMETRY**

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### **ASSESSMENT OF THE LV-C2 STACK SAMPLING PROBE LOCATION FOR COMPLIANCE WITH ANSI/HPS N13.1-1999**

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This document reports on a series of tests conducted to assess the proposed air sampling location for the Hanford Tank Waste Treatment and Immobilization Plant (WTP) Low-Activity Waste (LAW) C2V (LV-C2) exhaust stack with respect to the applicable criteria regarding the placement of an air sampling probe. Federal regulations require that a sampling probe be located in the exhaust stack according to the criteria established by the American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities. These criteria address the capability of the sampling probe to extract a sample that represents the effluent stream. The testing on the scale model stack conducted for this project was part of the River Protection Project--Waste Treatment Plant Support Program under Contract No. DE-AC05-76RL01830 according to the statement of work issued by Bechtel National, Inc. (BNI, 24590-QL-SRA-W000-00101, N13.1 1999 Stack Monitor Scale Model Testing and Qualification, Revision 1, 9/12/2007) and Work Authorization 09 of Memorandum of Agreement 24590-QL-HC9-WA49-00001. The internal Pacific Northwest National Laboratory (PNNL) project for this task is 53024, Work for Hanford Contractors Stack Monitoring. The testing described in this document was further guided by the Test Plan Air Sampling Probe Location Remedial Tests for Waste Treatment Plant LAW LV-C2 Air Exhaust System (TP-WTPSP-130). The tests conducted by PNNL during 2013, 2014 and 2015 on the LV-C2 scale model system are described in this report. The series of tests consists of various measurements taken over a grid of points in the duct cross section at the designed sampling probe locations. The ANSI/HPS N13.1-1999 qualification criteria concern the following properties of the air flowing through the ducts where the air sampling probes are to be located.

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## **NIST HANDBOOK**

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### **NUCLEAR DECOMMISSIONING CASE STUDIES**

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#### **SAFETY, ENVIRONMENTAL AND SECURITY RULES**

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*Academic Press* **Nuclear Decommissioning Case Studies: Safety, Environmental and Security Rules, Volume Four** in Michele Laraia's series that presents a selection of global case studies on different aspects of Nuclear Decommissioning, focuses on the people side, including public perception, public relations and human factors. The book presents a selection of case studies on stakeholders, socioeconomics and more, providing readers with a guide on how to deal with common, often contentious, challenges. The events covered in this publication range from safety factors, stakeholder motivation and involvement and leadership adequacies. Decommissioning experts, including regulators, operators, waste managers, researchers and academics will find this book to be suitable supplementary material to Michele Laraia's reference works on the theory and applications of nuclear decommissioning. Presents a selection of global case studies which focus on the people side of nuclear decommissioning, specifically public perception, stakeholder management and human factors Highlights important sustainability and socioeconomic factors Assists the reader in developing robust, people-related plans and strategies based on experience and lessons learned

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## **CODE OF FEDERAL REGULATIONS**

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### **2000-**

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Special edition of the Federal Register, containing a codification of documents of general applicability and future effect ... with ancillaries.



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**THE CODE OF FEDERAL REGULATIONS OF THE UNITED STATES OF AMERICA**

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The Code of Federal Regulations is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

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**CODE OF FEDERAL REGULATIONS, TITLE 40, PROTECTION OF ENVIRONMENT, PT. 61-62, REVISED AS OF JULY 1, 2010**

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Government Printing Office

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**LOW-LEVEL RADIOACTIVE WASTE**

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**HEARING BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES, UNITED STATES SENATE, ONE HUNDRED EIGHTH CONGRESS, SECOND SESSION, TO RECEIVE TESTIMONY REGARDING ISSUES RELATED TO LOW-LEVEL RADIOACTIVE WASTE, SEPTEMBER 30, 2004**

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**CODE OF FEDERAL REGULATIONS, TITLE 40, PROTECTION OF ENVIRONMENT, PT. 61 TO 62, REVISED AS OF JULY 1, 2012**

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Government Printing Office

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**THE DISPOSITION DILEMMA**

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**CONTROLLING THE RELEASE OF SOLID MATERIALS FROM NUCLEAR REGULATORY COMMISSION-LICENSED FACILITIES**

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National Academies Press The U.S. Nuclear Regulatory Commission (USNRC) and its predecessor, the U.S. Atomic Energy Commission (AEC), have attempted since the 1970s to give greater uniformity to the policy and regulatory framework that addresses the disposition of slightly radioactive solid material. The issue remains unresolved and controversial. The USNRC has tried to issue policy statements and standards for the release of slightly radioactive solid material from regulatory control, while such material has been released and continues to be released under existing practices. In 1980 the USNRC proposed regulatory changes to deregulate contaminated metal alloys but withdrew them in 1986 and began work with the Environmental Protection Agency (EPA) to develop more broadly applicable federal guidance. In 1990 the USNRC issued a more sweeping policy, as directed by the Low Level Radioactive Waste Policy Amendments Act of 1985 (LLWPAA), declaring materials with low concentrations of radioactivity contamination "below regulatory concern" (BRC) and hence deregulated. Congress intervened to set aside the BRC policy in the Energy Policy Act of 1992, after the USNRC's own suspension of the policy. Subsequent attempts by USNRC staff to build consensus among stakeholder groups as a basis for future policy articulations were met by boycotts of stakeholder meetings, both in the immediate aftermath of the BRC policy and again in 1999 during public hearings on a new examination of the disposition of such materials. The only USNRC standard addressing the disposition of slightly radioactive solid material is a guidance document published in June 1974 by the AEC, whose regulatory authority over civilian nuclear facilities the USNRC assumed upon its creation a few months later in January 1975. In August 2000, with another examination of this issue under way, the USNRC requested that the National Research Council form a committee to provide advice in a written report. The National Research Council established the Committee on Alternatives for Controlling the Release of Solid Materials from Nuclear Regulatory Commission-Licensed Facilities to address this task. The committee's task involved evaluating and providing recommendations on the history of the technical bases and policies and precedents for managing slightly radioactive solid material from USNRC-licensed facilities; the sufficiency of technical bases needed to establish standards for release of solid materials from regulatory control ("clearance standards") and the adequacy of measurement technologies; the concerns of stakeholders and how the USNRC should incorporate them; and the efforts of international organizations on clearance standards. The committee was also asked to examine the current system for release of slightly radioactive solid material from regulatory control, to recommend whether the USNRC should continue to use this system and to recommend changes if appropriate. The committee's fact-finding process included two site visits to waste brokering facilities and nearly 40 invited presentations from the USNRC, the U.S. Department of Energy (DOE), and EPA staff; stakeholder organizations; nuclear industry organizations; and other interested parties. In conducting its study, the committee first examined the current system of standards, guidance, and practices used by the USNRC and agreement states to determine whether to release slightly radioactive solid material from further regulatory control under the Atomic Energy Act. The committee found that the current, workable system allows licensees to release material according to pre-established criteria but contains inconsistencies such that nuclear reactor licensees can release materials only if there is no detectable radioactivity (above background levels), whereas materials licensees can do so if small detectable levels are

found. The committee evaluated technical analyses of the estimated doses of the final disposition of slightly radioactive solid materials. These analyses were conducted by federal agencies and international organizations, including the International Atomic Energy Agency (IAEA), the European Commission, and other groups. The Disposition Dilemma: Controlling the Release of Solid Materials from Nuclear Regulatory Commission-Licensed Facilities explains the committee's findings and recommendations.

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#### **2018 CFR ANNUAL PRINT TITLE 40 PROTECTION OF ENVIRONMENT - PARTS 61 TO 62**

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IntraWEB, LLC and Claitor's Law Publishing **Title 40 Protection of Environment - Parts 61 to 62**

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#### **TITLE 40 PROTECTION OF ENVIRONMENT PARTS 61 TO 62 (REVISED AS OF JULY 1, 2013)**

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#### **40-CFR-VOL-9**

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IntraWEB, LLC and Claitor's Law Publishing **40 CFR Protection of Environment**

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#### **REVIEW OF THE PHYSICAL SCIENCE FACILITY STACK AIR SAMPLING PROBE LOCATIONS**

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#### **ADVANCED RADIATION PROTECTION DOSIMETRY**

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CRC Press Although many radiation protection scientists and engineers use dose coefficients, few know the origin of those dose coefficients. This is the first book in over 40 years to address the topic of radiation protection dosimetry in intimate detail. Advanced Radiation Protection Dosimetry covers all methods used in radiation protection dosimetry, including advanced external and internal radiation dosimetry concepts and regulatory applications. This book is an ideal reference for both scientists and practitioners in radiation protection and students in graduate health physics and medical physics courses. Features: A much-needed book filling a gap in the market in a rapidly expanding area Contains the history, evolution, and the most up-to-date computational dosimetry models Authored and edited by internationally recognized authorities and subject area specialists Interrogates both the origins and methodologies of dose coefficient calculation Incorporates the latest international guidance for radiation dosimetry and protection

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#### **2017 CFR ANNUAL PRINT TITLE 40 PROTECTION OF ENVIRONMENT - PARTS 61 TO 62**

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IntraWEB, LLC and Claitor's Law Publishing

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#### **NUCLEAR SAFETY**

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#### **OPTICALLY STIMULATED LUMINESCENCE**

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#### **FUNDAMENTALS AND APPLICATIONS**

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John Wiley & Sons Optically stimulated luminescence has developed into one of the leading optical techniques for the measurement and detection of ionizing radiation. This text covers, in a readable manner, advanced modern applications of the technique, how it can play a useful role in different areas of dosimetry and how to approach the challenges presented when working with optically stimulated luminescence. The six chapters are as follows: Introduction, including a short history of OSL and details of successful applications Theory and Practical Aspects Personal Dosimetry Space Dosimetry Medical Dosimetry Other Applications and Concepts, including retrospective and accident dosimetry, environmental monitoring and UV dosimetry Throughout the book, the underlying theory is discussed on an as-needed basis for a complete understanding of the phenomena, but with an emphasis of the practical applications of the technique. The authors also give background information and relevant key references on each method, inviting the reader to explore deeper into the subject independently. Postgraduates, researchers, and those involved with radiation dosimetry will find this book particularly useful. The material is both relevant and accessible for both specialists and those new to the field, therefore is fundamental to any academic interested in modern advances of the subject.

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#### **PACIFIC NORTHWEST NATIONAL LABORATORY POTENTIAL IMPACT CATEGORIES FOR RADIOLOGICAL AIR EMISSION MONITORING**

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In 2002, the EPA amended 40 CFR 61 Subpart H and 40 CFR 61 Appendix B Method 114 to include requirements from ANSI/HPS N13.1-1999 Sampling and Monitoring Releases of

Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities for major emission points. Additionally, the WDOH amended the Washington Administrative Code (WAC) 246-247 Radiation protection-air emissions to include ANSI/HPS N13.1-1999 requirements for major and minor emission points when new permitting actions are approved. A result of the amended regulations is the requirement to prepare a written technical basis for the radiological air emission sampling and monitoring program. A key component of the technical basis is the Potential Impact Category (PIC) assigned to an emission point. This paper discusses the PIC assignments for the Pacific Northwest National Laboratory (PNNL) Integrated Laboratory emission units; this revision includes five PIC categories.

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### **EMERGENCY PLANNING FOR NUCLEAR POWER PLANTS**

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CRC Press This book provides a history of emergency planning with respect to nuclear power plant accidents from the 1950's to the 2000's. It gives an overview of essential concepts that a working emergency planner should know, including brief overviews of the health physics and plant engineering that applies to emergency planning. Each chapter covers topics unique to radiological planning that distinguish it from planning for natural disasters. Some of the topics include processes that damage fuel, reactor source terms, basic dispersion theory, protective measures for the public and emergency worker, environmental surveys, and the essential elements of a drill and exercise program. Emergency Planning for Nuclear Power Plants is not intended as a guide to meeting regulatory requirements but provides an understanding of the essential concepts and language of radiological planning, so the planner can apply those concepts to their particular situation.

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### **ASSESSMENT OF THE IDAHO NATIONAL LABORATORY HOT FUEL EXAMINATION FACILITY STACK MONITORING SITE FOR COMPLIANCE WITH ANSI**

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This document reports on a series of tests to determine whether the location of the air sampling probe in the Hot Fuels Examination Facility (HFEF) heating, ventilation and air conditioning (HVAC) exhaust duct meets the applicable regulatory criteria regarding the placement of an air sampling probe. Federal regulations require that a sampling probe be located in the exhaust stack according to the criteria of the ANSI/HPS N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities. These criteria address the capability of the sampling probe to extract a sample that is representative of the effluent stream. The tests conducted by PNNL during July 2010 on the HFEF system are described in this report. The sampling probe location is approximately 20 feet from the base of the stack. The stack base is in the second floor of the HFEF, and has a building ventilation stream (limited potential radioactive effluent) as well as a process stream (potential radioactive effluent, but HEPA-filtered) that feeds into it. The tests conducted on the duct indicate that the process stream is insufficiently mixed with the building ventilation stream. As a result, the air sampling probe location does not meet the criteria of the N13.1-1999 standard. The series of tests consists of various measurements taken over a grid of points in the duct cross section at the proposed sampling-probe location. The results of the test series on the HFEF exhaust duct as it relates to the criteria from ANSI/HPS N13.1-1999 are described in this report. Based on these tests, the location of the air sampling probe does not meet the requirements of the ANSI/HPS N13.1-1999 standard, and modifications must be made to either the HVAC system or the air sampling probe for compliance. The recommended approaches are discussed and vary from sampling probe modifications to modifying the junction of the two air exhaust streams.

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### **RADIATION PROTECTION AT LIGHT WATER REACTORS**

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Springer Science & Business Media This book is aimed at Health Physicists wishing to gain a better understanding of the principles and practices associated with a light water reactor (LWR) radiation protection program. The role of key program elements is presented in sufficient detail to assist practicing radiation protection professionals in improving and strengthening their current program. Details related to daily operation and discipline areas vital to maintaining an effective LWR radiation protection program are presented. Programmatic areas and functions important in preventing, responding to, and minimizing radiological incidents and the importance of performing effective incident evaluations and investigations are described. Elements that are integral in ensuring continuous program improvements are emphasized throughout the text.

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### **FIRST DRAFT, LETTERS, AND A CHART RELATIVE TO MRS. PRATT'S BOOK CENTRAL AMERICAN ROUNDABOUT**

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### **RADIATION PROTECTION**

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### **A GUIDE FOR SCIENTISTS, REGULATORS, AND PHYSICIANS**

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La Editorial, UPR This highly successful manual has served for nearly three decades as the definitive guide to the safe use of radioactive materials. Completely revised and updated,

the fourth edition presents a new dimension by adding coverage of nonionizing radiation, and is thus concerned with the entire field of radiation protection. The author takes the novel approach of introducing the whole range of energies possessed by particles and electromagnetic waves at the beginning of the text, thus integrating coverage of ionizing and nonionizing radiation rather than considering them as two separate disciplines. He goes on to cover the entire spectrum of radiation sources, including radionuclides, x-ray machines, accelerators, nuclear reactors, power lines, microwave towers, and cellular phones. With its expanded coverage, including a broader focus on public health issues, this new volume will serve as an important training and reference resource, not only for research scientists, physicians, and engineers, but for regulatory officials, attorneys, engineers, and environmental health and safety professionals. The breadth of citations alone makes this resource invaluable.

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## **WEEKLY INFORMATION REPORT**

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## **HANDBOOK OF RADIOACTIVITY ANALYSIS**

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**Academic Press & Bull; Describes much practical information for radioactivity monitoring, spectrometric analysis, and radiation dosimetry & bull; Covers state-of-the-art high sample throughput microplate analysis techniques and multi-detector scintillation proximity analysis & bull; Presents the latest methods of rapid electronic radionuclide imaging & bull; Written by twenty-five experts from eight countries & bull; Over 2,000 cited works from the journal references** Why This Title? This updated and much expanded Second Edition is a proven authoritative handbook providing the reader with the principles, practical techniques, and procedures for the accurate measurement of radioactivity from the very low levels encountered in the environment to higher levels measured in radioisotope research, clinical laboratories, biological sciences, radionuclide standardization, nuclear medicine, nuclear power, fuel cycle facilities, and the implementation of nuclear safeguards.-

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## **RADIOACTIVE AIR SAMPLING METHODS**

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**CRC Press** Although the field of radioactive air sampling has matured and evolved over decades, it has lacked a single resource that assimilates technical and background information on its many facets. Edited by experts and with contributions from top practitioners and researchers, Radioactive Air Sampling Methods provides authoritative guidance on measuring airborne radioactivity from industrial, research, and nuclear power operations, as well as naturally occurring radioactivity in the environment. Designed for industrial hygienists, air quality experts, and health physicists, the book delves into the applied research advancing and transforming practice with improvements to measurement equipment, human dose modeling of inhaled radioactivity, and radiation safety regulations. To present a wide picture of the field, it covers the international and national standards that guide the quality of air sampling measurements and equipment. It discusses emergency response issues, including radioactive fallout and the assets used to assess airborne radioactive emergencies. The book includes a comprehensive series of air sampling methods for commonly encountered radioactive isotopes in the industrial environment that detail the steps to conducting a proper air sampling study. With coverage of fundamental air sampling techniques and practical knowledge, the book provides insight into the contemporary thinking of experts, the maturity of the field, and its deep literature base. Building a bridge between the science behind air sampling and its practice, it supplies the know-how required to achieve technically rigorous air sampling data.

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## **DECOMMISSIONING HEALTH PHYSICS**

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## **A HANDBOOK FOR MARSSIM USERS, SECOND EDITION**

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**CRC Press** Experienced Guidance on the Technical Issues of Decommissioning Projects Written by one of the original MARSSIM authors, Decommissioning Health Physics: A Handbook for MARSSIM Users, Second Edition is the only book to incorporate all of the requisite technical aspects of planning and executing radiological surveys in support of decommissioning. Extensively revised and updated, it covers survey instrumentation, detection sensitivity, statistics, dose modeling, survey procedures, and release criteria. New to the Second Edition Chapter on hot spot assessment that recognizes appropriate dosimetric significance of hot spots when designing surveys and includes a new approach for establishing hot spot limits Chapter on the clearance or release of materials, highlighting aspects of the MARSAME manual Revised chapter on characterization survey design to reflect guidance in ANSI N13.59 on the value of data quality objectives (DQOs) Updated regulations and guidance documents throughout Updated survey instrumentation used to support decontamination and decommissioning (D&D) surveys, including expanded coverage of in situ gamma spectrometers Revised statistics chapter that includes an introduction to Bayesian statistics and additional double sampling and ranked set sampling statistical approaches More case studies and examples throughout Implement the Surveys Effectively and Avoid Common Pitfalls With more than 20 years of experience as a practitioner in the decommissioning survey field, author Eric W. Abelquist prepares you for the technical



challenges associated with planning and executing MARSSIM surveys. He discusses the application of statistics for survey design and data reduction and addresses the selection of survey instrumentation and detection sensitivity. He presents final status survey procedures and covers pathway modeling to translate release criteria to measurable quantities. He also offers solutions for navigating the complexity inherent in designing and implementing MARSSIM and MARSAME surveys. Detailed derivations, thorough discussions of technical bases, and real-world examples and case studies illustrate effective strategies for demonstrating to regulators and stakeholders that contaminated sites can be released for other beneficial uses.

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### **WILEY HANDBOOK OF SCIENCE AND TECHNOLOGY FOR HOMELAND SECURITY, 4 VOLUME SET**

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John Wiley & Sons The Wiley Handbook of Science and Technology for Homeland Security is an essential and timely collection of resources designed to support the effective communication of homeland security research across all disciplines and institutional boundaries. Truly a unique work this 4 volume set focuses on the science behind safety, security, and recovery from both man-made and natural disasters has a broad scope and international focus. The Handbook: Educates researchers in the critical needs of the homeland security and intelligence communities and the potential contributions of their own disciplines Emphasizes the role of fundamental science in creating novel technological solutions Details the international dimensions of homeland security and counterterrorism research Provides guidance on technology diffusion from the laboratory to the field Supports cross-disciplinary dialogue in this field between operational, R&D and consumer communities

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### **RADIATION PROTECTION AND MEASUREMENT ISSUES RELATED TO CARGO SCANNING WITH ACCELERATOR PRODUCED HIGH-ENERGY X RAYS**

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### **RECOMMENDATIONS OF THE NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS : DECEMBER 5, 2007**

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National Council on Radiation As part of its series of publications related to countermeasures against nuclear and radiological terrorism, the National Council on Radiation Protection and Measurements has prepared three commentaries on subjects related to the radiation protection and measurement aspects of security surveillance systems. This commentary, sponsored by the DHS Domestic Nuclear Detection Office, focuses on the application of high-energy X-rays, produced by accelerators, in the detection of weapons and radioactive material at US border crossings. It provides an in-depth evaluation of two main aspects of Cargo Advanced Automated Radiography Systems (CAARS) operations. The first aspect involves the consideration of all aspects of CAARS radiation safety, including accelerator safety controls, a radiation protection plan for system operators, and an analysis of the range of doses that could be received. The second major area of discussion in the commentary involves CAARS radiation measurement techniques, instrumentation, and dosimetry. In addition, the primary elements of a CAARS quality assurance program are described. B&w photos and images are included. The commentary was prepared by Scientific Committee 6-5 on Radiation Protection and Measurement Issues Related to Cargo Scanning with High- Energy X-rays Produced by Accelerators. There is no subject index.

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### **ENVIRONMENTAL HEALTH**

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### **FOURTH EDITION**

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Harvard University Press Dramatic changes in the field of environmental health since the Third Edition was published in 2004 demand a new, radically updated version of this essential textbook. Based on the recommendations of advisory bodies and federal agency regulations, as well as a thorough review of the scientific literature, Dade W. Moeller's Fourth Edition is the only fully current text in this burgeoning field. It features new tables and figures and revisions of those retained from previous editions. Environmental Health is also enriched with the knowledge and insights of professionals who are deeply involved in "real world" aspects of each subject covered. In eighteen chapters, students receive a complete but manageable introduction to the complex nature of the environment, how humans interact with it, and the mutual impact between people and the environments where they work or live. This new edition emphasizes the challenges students will face in the field: the local and global implications of environmental health initiatives, their short- and long-range effects, their importance to both developing and developed nations, and the roles individuals can play in helping to resolve these problems. Whether discussing toxicology, injury prevention, risk assessment, and ionizing and non-ionizing radiation, or more traditional subjects like the management and control of air, water, and food, Moeller emphasizes the need for a systems approach to analyzing new projects prior to their construction and operation. Environmental Health is indispensable reading for practitioners, students, and anyone considering a career in public health.

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**MANAGING POTENTIALLY RADIOACTIVE SCRAP METAL**

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**RECOMMENDATIONS OF THE NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS**

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National Council on Radiation **Annotation** This report identifies the sources, inventories, and characteristics of potentially radioactive scrap metal, outlines management considerations concerning its handling, discusses the development of release standards, and offers its own recommendations. Specific consideration is given to issues of radiation protection and protection against orphan source contamination. Appendices examine metal-making technology and the detection and surveillance of radiation. A glossary defines key terms and lists relevant acronyms and abbreviations. Annotation c. Book News, Inc., Portland, OR (booknews.com)