

WEDNESDAY

WPM-B – AEROSOL MEASUREMENTS

Wednesday, 18 July 2018

Room 3

2:30 – 5:30 p.m.

Chair(s): Morgan Cox, Ed Walker

WPM-B.1 ANSI N42 AND IEC STANDARDS FOR NUCLEAR REACTOR APPLICATIONS

Cox M, Consultant

morgancx@swcp.com

The ANSI N42 standards applicable for nuclear reactor applications are: 1) ANSI N42.54, “Instrumentation and Systems for Airborne Radioactivity Measurements” replacing ANSI N42.17, Performance Specifications for Health Physics Instrumentation for Occupational Airborne Radioactivity Monitoring; ANSI N42.18, Specifications and Performance for On-site Radioactivity in Effluents (airborne only); ANSI N42.30, Performance Specification for Tritium Monitors; and ANSI N323C, Test and Calibration- Air Monitoring Instruments. 2) ANSI N320, Performance Specifications for Reactor Emergency Radiological Monitoring Instrumentation. 3) ANSI N323D, Installed Radiation Detection Instrumentation. The IEC Technical Committee 45 standards for reactor applications are: 1) IEC 60861, Equipment for Monitoring Radioactive Materials in Liquid Effluents and Surface Waters; 2) IEC 60951 in five parts: a) Radiation Monitoring Systems for Accident/Post-accident Conditions; b) Monitoring Gaseous Effluents and Ventilation Air; c) High Range g Monitoring; d) Equipment for Continuous In-line or On-line Monitoring of Process Stream; 3) IEC 61559, Central Continuous Monitoring for Levels of Radiation/Radioactivity for Reactors; 4) IEC 60761, Equipment for Continuous Monitoring of Radioactive Gaseous Effluents; a) General Requirements; b) Specific Requirements for Radioactive Aerosol Monitoring Including Transuranic Radionuclides; c) Specific Requirements for Radioactive Noble Gas Monitors: d) Specific

Requirements for Radioactive Iodine Monitors; and e) Specific Requirements for Tritium Monitors.

WPM-B.2 ASTM COMMITTEE D22 AIR QUALITY

Walker E; Consultant

eewijk@yahoo.com

ASTM Committee D22 on air quality has produced numerous standards on the measurement and assessment of airborne material activity. There are no standards specific to radiation measurement; however, many of the standards produced by Committee D22 involve systems, components, and methods used at nuclear facilities to monitor and evaluate radioactive material releases. Committee D22 is divided into subcommittees specific to workplace monitoring, facility duct and stack monitoring, and atmospheric transport and assessment. Additionally, there are two subcommittees for asbestos and mold measurement. These conditions are significant during nuclear facility maintenance and decommissioning activities. This presentation will provide a brief description of these standards that are relevant to nuclear facility safety.

WPM-B.3 PLUTONIUM AEROSOL INFORMATICS: UPDATE ON UNDERSTANDING, COMMUNICATING, AND MANAGING RADIATION SAFETY IN PLUTONIUM SCIENCE

Hoover MD, Cash LJ; National Institute for Occupational Safety and Health; Los Alamos National Laboratory

mhoover1@cdc.gov

Recent work to create a second edition of the classic Plutonium Handbook includes a new chapter on Plutonium Aerosol Characterization and Safety Issues. The chapter features a “plutonium aerosol informatics approach” that is defined as the science and practice of determining which information is relevant to meeting the safety, health, well-being, and productivity objectives of the plutonium science and engineering community, and then developing and implementing effective

mechanisms for collecting, validating, storing, sharing, analyzing, modeling, and applying the information; confirming that appropriate decisions were made and that desired mission outcomes were achieved as a result of that information; and finally conveying experience to the broader community, contributing to generalized knowledge, and updating standards and training. Key aerosol concepts are that: Airborne materials can exist in a range of forms; a range of mechanisms influence particle motion and collection; inertia dominates the larger particle behavior, while diffusion dominates ultrafine particle behavior; a range of mechanisms influence particle suspension from surfaces; "dustiness" is a concept for understanding the condition-dependent dispersibility of particles; thermodynamic and aerodynamic equivalent diameters are related and can both be used to characterize particle deposition in the respiratory tract; regional deposition in the respiratory tract is strongly dependent on particle size; airborne particle number concentrations of concern depend on the material of concern; the probability of particle inhalation for materials of high specific activity can be very low at airborne particle number concentrations of concern; a combination of factors influence the total probability of aerosol dispersion and health consequences; and aerosol dispersion parameters are best addressed as probability distributions. These concepts will be discussed along with some practical illustrative examples.

WPM-B.4 A TOTAL UNCERTAINTY ANALYSIS FOR A RADON REFERENCE LABORATORY *Jenkins PH, Bowser-Morner, Inc.*

phjenkins@aol.com

The radon reference laboratory at Bowser-Morner, Inc., is one of three such laboratories certified by the National Radon Proficiency Program (NRPP) as "secondary" radon references. This certification requires successful participation, using scintillation cells, in an intercomparison with the "primary" radon reference provided by the EPA's National

Analytical Environmental Radiation Laboratory (NAREL) in Montgomery, Alabama. The results of the intercomparison are used to calibrate or verify the calibration of the scintillation cells, which then become "secondary" or "transfer" standards. All further measurements of radon concentration in the Bowser-Morner laboratory trace to the transfer standards and thus to the primary reference. As part of the QA program at the Bowser-Morner laboratory, I performed an analysis of total uncertainty for a radon exposure in one of our radon chambers. The starting point of the analysis is the total uncertainty of the primary reference concentration provided by NAREL personnel, which was 0.74% expressed as a coefficient of variation (CV). Propagation yielded the total uncertainties associated with the following steps in the process: 1) calibration of the transfer standards based on intercomparing with the primary reference; 2) measurements from the chamber using the transfer standard cells; 3) calibration of the continuous monitoring system of the radon chamber based on intercomparisons with measurements of the transfer standard cells; 4) the measurement of the average radon concentration in the radon chamber during a period of time. Each step necessarily leads to an increase in the total uncertainty; however, efforts are made to keep these increases as small as practicable. The example calculation yielded a total uncertainty of approximately 2%, expressed as a CV, for the average concentration in a radon chamber under the conditions typically used at Bowser-Morner for calibrating a continuous radon monitor; specifically, a concentration of approximately 925 Bq m⁻³ over a period of 48 h. The process can be used to calculate the total uncertainty for any other exposure in the radon chambers at Bowser-Morner or elsewhere. Exposures at lower concentrations would be expected to yield greater uncertainties. Exposures for longer durations would be expected to yield smaller uncertainties, but depending on the radon