

WAM-B.2 OVERVIEW OF NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS REPORT 176 ON RADIATION SAFETY ASPECTS OF NANOTECHNOLOGY

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The National Council on Radiation Protection and Measurements (NCRP) has created NCRP Report 176 on the Radiation Safety Aspects of Nanotechnology. This Report describes the state of knowledge relating to nanotechnology that is relevant to radiation safety programs. Nanotechnology is the understanding and control of matter at the nanoscale, where unique phenomena enable novel applications. Nanomaterials are considered to consist of particles of a size having at least in one dimension between about 1 and 100 nm. Nanoparticles occur naturally in sources such as sea spray, volcanic emissions, the smoke from forest fires, and the decay of radon gas into nongaseous radon decay products. In recent years, engineered nanoparticles, including those that are radioactive, have been developed and incorporated into a wide variety of engineered nanomaterials for use in a broad and expanding range of medical, industrial, educational, and consumer products. The Report considers operational health physics practices that may need to be modified when nanotechnology is involved and those that can continue to be performed in the traditional manner. Specifically, the Report provides guidance on contamination control, engineered and administrative controls, personal protective equipment including respiratory protection, training, waste disposal, and emergency response. Specific guidance is provided for conducting internal dosimetry programs if nanomaterials are being handled. Knowledge gaps are identified that should be filled in order to more effectively implement a comprehensive radiation safety program that includes nanotechnology. Because exposure control and internal dosimetry in particular are best accomplished through the use of material-

specific particle size and biochemical parameters for the actual materials being encountered, it will be important to measure and understand existing gaps in knowledge about both current and emerging nanomaterials.

WAM-B.3 OPERATIONAL HEALTH PHYSICS CONSIDERATIONS FOR WORKING WITH RADIOACTIVE NANOMATERIALS: GUIDANCE FROM NCRP REPORT 176

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The majority of current operational health physics guidance for handling dispersible radioactive materials is based on micrometer-sized particles. Specific guidance relating to the handling of radioactive nanomaterials has been lacking. Many of the elements of a standard radiation safety program for handling radioactive materials (e.g., ALARA, external dosimetry, the use of HEPA filtration, shielding, and administrative controls) are directly applicable, or are applicable with minor modification, to handling radioactive nanomaterials. However, there are some radiation safety program elements that may require additional consideration including contamination control, air sampling, the use of protective clothing, respirator fitting, the use of hoods for local ventilation, and internal dosimetry. In addition to the potential radiological hazard associated with radioactive nanomaterials, the potential physicochemical toxicity of the nanomaterials (e.g., carbon nanotubes) needs to be considered as they may lead to exposure limits that are lower than those associated with the radioactivity alone. This presentation provides a summary of the radiation safety program elements that are applicable to working with radioactive nanomaterials, as well as the operational guidance for specific program elements that may need to be modified.