



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

AUG 1 1980

MEMORANDUM FOR: Harold R. Denton, Director  
Office of Nuclear Reactor Regulation

FROM: Thomas E. Murley, Acting Director  
Office of Nuclear Regulatory Research

SUBJECT: RESEARCH INFORMATION LETTER # 99 - DOSE-RATE CONVERSION  
FACTORS FOR EXTERNAL EXPOSURE TO PHOTON AND ELECTRON RADIATION

This memorandum transmits a compilation of dose-rate conversion factors for use in calculating external exposure to photon and electron radiation for 240 radionuclides of potential importance in routine releases from nuclear fuel cycle facilities. This work was performed by the Health and Safety Research Division of the Oak Ridge National Laboratory under the direction of the Environmental Effects Research Branch of the Office of Nuclear Regulatory Research (RES).

Research Request NRR-78-5, "Confirmatory Research Programs in Radiation Dose Estimation," stated that NRR staff estimations of radiation exposure to man required a broadly applicable, documented, state-of-the-art dose estimation methodology. The computer code DOSFACTER was written to calculate dose-rate conversion factors for photon and electron radiation for immersion in contaminated air, immersion in contaminated water, and exposure to a contaminated ground surface. For a given radionuclide the code calculates body-surface dose-rate factors for photons and electrons and organ dose-rate factors for photons for 22 body organs. The dose-rate factors are calculated in units of mrem/yr per microcurie/cm<sup>3</sup> for immersion in contaminated air and water, and in units of mrem/yr per microcurie/cm<sup>2</sup> for exposure to a contaminated ground surface.

The models and assumptions used to obtain the dose-rate factors are described in detail in the report entitled "Dose-Rate Conversion Factors for External Exposure to Photon and Electron Radiation from Radionuclides Occurring in Routine Releases from Nuclear Fuel Cycle Facilities," (NUREG/CR-0494). The calculations assume that the contaminated air, water, and ground surface are infinite in extent and that the radionuclide concentration is uniform throughout the exposure medium. For immersion in contaminated air and water, the calculations are based on the requirement that all of the energy of the photons and electrons emitted in the radioactive decay process is absorbed in the infinite medium itself in the absence of an exposed individual. For ground-surface exposure, the dose-rate factors are calculated for a reference position located one meter above a smooth, infinite plane using the point-kernel integration method and known specific absorbed fractions for photons and electrons in air.

We recommend that the dose-rate conversion factors presented in NUREG/CR-0494 be used by your office in calculating doses to man resulting from external

Harold R. Denton, Director

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exposure to radionuclides. If you have any questions with regard to this report, please contact Dr. Judith D. Foulke (427-4358).



Thomas E. Murley, Acting Director  
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Original Signed by  
T. E. Murley

Thomas E. Murley, Acting Director  
Office of Nuclear Regulatory Research

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