

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Occupational and Environmental Radiation Protection Continuing
Education Course
Project No. 20.06002.01.011
AI 20.06002.01.011.044

DATE/PLACE: April 24–27, 2006
Harvard School of Public Health
Boston, Massachusetts

AUTHOR: Lane Howard, Center for Nuclear Waste Regulatory Analyses

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ATTACHMENT: Course Agenda

PERSONS PRESENT:

Thirty-four attendees from various organizations, such as the U.S. Nuclear Regulatory Commission (NRC), Defense Nuclear Facilities Safety Board, Department of Defense, academic institutions and industry were present. The instructors are listed in the attached course agenda, but the lead instructors were Drs. Dade Moeller and Jacob Shapiro.

BACKGROUND AND PURPOSE OF TRIP:

The purpose of the trip was to obtain continuing education and professional development training in occupational and environmental radiation protection. Specific program objectives included

- Identifying how to meet regulatory requirements from both a technical and administrative point of view
- Developing effective methods for meeting information needs through both published and online resources
- Applying basic principles of radiation safety in an effective manner to problems encountered in the field
- Ensuring any doses received by workers or the public will be as low as reasonably achievable
- Providing professional associates as well as the public with perspective on the importance of various radiation sources and the effectiveness of control methods in occupational areas and the environment

SUMMARY OF PERTINENT POINTS AND ACTIVITIES:

The course agenda, which lists the topics covered and instructors, is attached to this report. The course consisted of four days of training on an 8 a.m. to 5 p.m. schedule at the Harvard School of Public Health facilities.

Lectures on the first day addressed dose, radiation protection, and radiation detection instrumentation with a focus on meeting radiation safety regulatory requirements. This included a detailed discussion on the physics of personnel and environmental radiation dosimetry and detectors.

Lectures on the second day addressed environmental transport and monitoring and continued discussion on radiation detection instrumentation. This day also included a breakout session on the current state of research and technology in the biological effects of radiation exposure and the linear non-threshold (LNT) dose model. In this model the effects of radiation are directly proportional to the dose down to zero dose.

Lectures on the third day addressed natural background radiation and radiation standards for workers and the public. These topics provided for detailed discussion on current radiation protection programs in the university, medical, and industry setting, and the management and disposal of low-level radioactive waste.

Lectures on the fourth day addressed a number of nuclear industry topics, but of noteworthy were discussions from Dr. Dade Moeller on the status of the potential Yucca Mountain repository and John Kinneman (NRC) on NRC Region 1 licensee regulation and inspection, and public communications. The lecture by Dr. Moeller was derived from his many years of experience in the waste management field and his recent U.S. Senate Committee testimony on the potential repository.

IMPRESSIONS AND CONCLUSIONS:

The course lectures and handouts were very informative. The course materials included hard copies of numerous relevant publications and guidance documents. Course materials also included the latest editions of the book, *Environmental Health*, by Dr. Moeller and the book *Radiation Protection—A Guide for Scientists, Regulators, and Physicians* by Dr. Shapiro, both of which are considered primary references in the field. The longstanding service of Dr. Moeller on both the Advisory Committee on Reactor Safeguards and the Advisory Committee on Nuclear Waste (chairman) makes him an outstanding instructor in his fields of specialty, which include radiation protection, waste management, and environmental monitoring. The course was well-organized and taught by outstanding instructors. Overall, I would rate this course as an excellent training opportunity for any staff who could attend.

PROBLEMS ENCOUNTERED:

None.

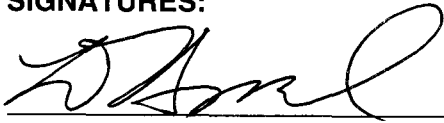
PENDING ACTIONS:

None.

RECOMMENDATIONS:

This course is highly recommended for staff members looking to build their knowledge base in the environmental engineering and radiation protection fields.

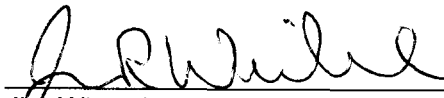
SIGNATURES:



Lane Howard
Senior Research Engineer

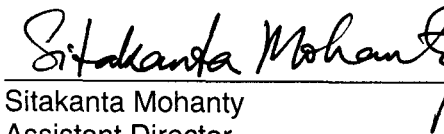
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Date

CONCURRENCE:



Jim Winterle
Manager
Performance Assessment

5/22/2006
Date



Sitakanta Mohanty
Assistant Director
Engineering and Assessment Systems

5/22/2006
Date



HARVARD SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF ENVIRONMENTAL HEALTH AND
CENTER FOR CONTINUING PROFESSIONAL EDUCATION

OCCUPATIONAL AND ENVIRONMENTAL RADIATION PROTECTION

APRIL 24 – 27, 2006

DAILY AGENDA

MONDAY, APRIL 24, 2006

- 7:30 – 8:00 A.M. **Registration and Continental Breakfast**
- 8:30 – 9:00 A.M. **Welcome and Review of Program Objectives, Reference Materials**
Dade W. Moeller, PhD, CHP
Chairman of the Board
Dade Moeller & Associates, Inc.
- 9:00 – 10:00 A.M. **Atomic Structure and Radioactive Materials**
Dade W. Moeller, PhD, CHP
*(EH: 295-297, 303-306) (RP: 1-8)**
- 10:00 – 10:15 A.M. *Refreshment Break*
- 10:15 – 11:30 A.M. **External Radiation Protection**
Jacob Shapiro, PhD, CHP
Radiation Protection Officer, Emeritus;
Lecturer on Biophysics, Department of Environmental Health
Harvard School of Public Health
(RP: 9-60; Problems 1-9)
(Review Article, Health Physics Journal)
- 11:30 – 12:15 P.M. **Units of Activity and Dose: Part I**
Dade W. Moeller, PhD, CHP
(EH: 306-308) (RP: 60-72; 77-82)
- 12:15 – 1:00 P.M. *Lunch*
- 1:00 – 1:45 P.M. **Units of Activity and Dose: Part II**
Video: "The Roentgen"
Dade W. Moeller, PhD, CHP
(EH: 306-308) (RP: 60-72; 77-82)
- 1:45 – 3:15 P.M. **Physics of Radiation Detectors, Including Personnel Dosimetry**
Keith H. Dinger, MS, CHP
Instructor in Environmental Science and Engineering,
Department of Environmental Health
Harvard School of Public Health
(RP: 250-263, 279-283)
- 3:15 – 3:30 P.M. *Refreshment Break*



DAILY AGENDA

MONDAY, APRIL 24, 2006 (CONTINUED)

3:30 – 5:00 P.M. **Laboratory and Field Instrumentation**

Keith H. Dinger, MS, CHP
(RP: 283-302)

5:00 P.M. Sessions End

TUESDAY, APRIL 25, 2006

7:30 – 8:00 A.M. *Continental Breakfast*

8:00 – 9:00 A.M. **Environmental Radionuclide Transport and Monitoring**

Dade W. Moeller, PhD, CHP
(EH: 408-438) (Review Article, Health Physics Journal)

9:00 – 10:15 A.M. **Internal Dosimetry**

Jacob Shapiro, PhD, CHP
(RP: 167-191; Problems 10-16)

10:15 – 10:30 A.M. *Refreshment Break*

10:30 – 11:30 A.M. **Biological Effects of Ionizing Radiation**

David E. Drum, MD, PhD, CHP
Associate Professor of Radiology
Harvard Medical School
(EH: 308-312, 314-315) (RP: 417-453)
(Review Article, Health Physics Journal)

11:30 – 12:15 P.M. **Case Study - Incident re: Ingestion of ³²P**

Jacob Shapiro, PhD, CHP

12:15 – 1:00 P.M. *Lunch*

1:00 – 2:15 P.M. **Gamma Spectroscopy in Occupational and Environmental
Radiation Protection**

Dade W. Moeller, PhD, CHP
Jacob Shapiro, PhD, CHP
(RP: 263-279)

2:15 – 2:30 P.M. *Refreshment Break*



DAILY AGENDA

TUESDAY, APRIL 25, 2006 (continued)

- 2:30 – 4:00 P.M. **Calibration and Use of Portable Radiation Monitoring Instruments**
Jacob Shapiro, PhD, CHP
(RP: 178-182, 250-263, 283-296; Problems 17, 18, 21)
- 4:00 – 4:15 P.M. *Break*
- 4:15 – 5:00 P.M. **Breakout Sessions**
Group #1: Dose, Biological Effects & LNT
David E. Drum, MD, PhD, CHP
Dade W. Moeller, PhD, CHP
- Group #2: Instrumentation & External Dosimetry**
Jacob Shapiro, PhD, CHP
Keith H. Dinger, MS, CHP
- 5:00 P.M. Sessions End

WEDNESDAY, APRIL 26, 2006

- 7:30 – 8:00 A.M. *Continental Breakfast*
- 8:00 – 9:00 A.M. **Natural Background Radiation**
Dade W. Moeller, PhD, CHP
(EH: 312-316) (RP: 453-464)
- 9:00 – 10:15 A.M. **Radiation Standards for Workers and the General Public**
Dade W. Moeller, PhD, CHP
(EH: 390-405)
- 10:15 – 10:30 A.M. *Refreshment Break*
- 10:30 – 12:00 P.M. **Exposure Assessment Workshop: Simple Calculations**
**Lung dose from radon, skin dose from hot particles,
release of radiopharmaceutical patients, laboratory
accidents and media responses**
Jacob Shapiro, PhD, CHP
(RP: 191-249)
- 12:00 – 12:45 P.M. *Lunch*



DAILY AGENDA

WEDNESDAY, APRIL 26, 2006 (continued)

- 12:45 – 2:00 P.M. **University, Medical, Research, and Industry Radiation Protection**
Joseph P. Ring, PhD, CHP
Radiation Safety Officer
Associate Director, Radiological Services
Environmental Health and Safety, Harvard University
Harvard University
(RP: 322-396; Problems 19, 20)
- 2:00 – 2:15 P.M. *Break*
- 2:15 – 3:30 P.M. **Management and Disposal of Low-Level Radioactive Waste:
Basic Principles**
Joseph P. Ring, PhD, CHP
(EH: 238-243)
- 3:30 – 3:45 P.M. *Refreshment Break*
- 3:45 – 5:00 P.M. **Breakout Sessions**
**Group #1: Sources of Information, Units, Standard, & Environmental
Monitoring**
Dade W. Moeller, PhD, CHP
- Group #2: Internal Dosimetry and Program Management**
Jacob Shapiro, PhD, CHP
Joseph P. Ring, PhD, CHP
(EH: 238-243)
- 5:00 P.M. Sessions End

THURSDAY, APRIL 27, 2006

- 7:30 – 8:00 A.M. *Continental Breakfast*
- 8:00 – 9:00 A.M. **Medical and Dental X Rays**
Dade W. Moeller, PhD, CHP
(EH: 317-320) (RP: 94-152, 464-467)
(Review Article, Health Physics Journal)
- 9:00 – 9:45 A.M. **Nuclear Power Plants and Nuclear Safety**
Dade W. Moeller, PhD, CHP
(EH: 322-324, 476-477, 484-493)



DAILY AGENDA

THURSDAY, APRIL 27, 2006 (continued)

- 9:45 – 10:00 A.M. *Refreshment Break*
- 10:00 – 11:15 A.M. **Radon: New Information and Insights**
Dade W. Moeller, PhD, CHP
- 11:15 – 12:00 P.M. **Status of Proposed Yucca Mountain Repository**
Dade W. Moeller, PhD, CHP
- 12:00 – 12:45 P.M. *Lunch*
- 12:45 – 1:45 P.M. **USNRC and Agreement State Regulations**
John Kinneman, MS, CHP
Acting Deputy Director Division of Nuclear Material Safety,
Division of Radiation Safety and Safeguards
US Nuclear Regulatory Commission Region 1
- 1:45 – 2:00 P.M. *Refreshment Break*
- 2:00 – 3:15 P.M. **Licensee Inspections: Lessons Learned**
John Kinneman, MS, CHP
- 3:15 – 3:45 P.M. **Panel Session: Regulation of Licensees and Public Communications**
John Kinneman, MS, CHP
Dade W. Moeller, PhD, CH
Jacob Shapiro, PhD, CHP
- 3:45 – 4:30 P.M. **Nuclear War and Nuclear Terrorism; Other Items Suggested by Participants**
Jacob Shapiro, PhD, CHP
Dade W. Moeller, PhD, CHP
- 4:30 P.M. **Program Evaluation and Closing**
Dade W. Moeller, PhD, CHP
Jacob Shapiro, PhD, CHP
-

*EH: Moeller, Dade W., Environmental Health, Harvard University Press, Cambridge, MA
(Third Edition, 2006).

*RP: Shapiro, Jacob, Radiation Protection – A Guide for Scientists and Physicians, Harvard University Press,
Cambridge, MA (Fourth Edition, 2002).