IAEA/ANL
Interregional Training Course

Technical and Administrative Preparations Required for Shipment of Research Reactor Spent Fuel to Its Country of Origin

Argonne National Laboratory
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Lecture L.9.1

Training

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MODULE 9

L.9.1

TRAINING

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T R A I N I N G

SOURCE MATERIAL

NUCLEAR POWER PLANT PERSONNEL TRAINING AND ITS EVALUATION, A Guidebook, IAEA 1996

US CODE OF FEDERAL REGULATIONS, 10 C F R 55

SYSTEMS APPROACH TO TRAINING

A. SYSTEMATIC ANALYSIS OF JOBS TO BE PERFORMED TO IDENTIFY INDIVIDUAL TASKS

JOB CLASSIFY FUEL ASSEMBLIES

WHAT TASKS MUST BE PERFORMED ?

1. DETERMINE PHYSICAL CONDITION OF FUEL ASSEMBLY.

2. DETERMINE IRRADIATION HISTORY OF FUEL ASSEMBLIES.

3. CALCULATE HEAT GENERATION.

4. CALCULATE ACTIVITY.

5. CALCULATE DOSE RATE.

6. DETERMINE CONSTRUCTION MATERIALS.

7. DETERMINE GEOMETRIC MEASUREMENTS OF FUEL ASSEMBLIES.

8. CALCULATE MASS OF COMPONENTS OF FUEL ASSEMBLIES.

9. CALCULATE FISSILE CONTENT.

10. CALCULATE SELECTED ISOTOPIC CONTENT.

B. ANALYSIS OF THESE TASKS IN TERMS OF KNOWLEDGE, SKILLS AND ATTITUDES REQUIRED TO PERFORM THE TASKS WELL

TASK

1. OBSERVANT - THOROUGH - SAFETY MINDED - KNOWLEDGE OF CORROSION, PITTING - ABILITY TO PERFORM A SIPPING TEST - SKILLS OF SENIOR REACTOR OPERATOR - ETC.

2. ABILITY TO READ AND INTERPRET OPERATIONS LOG BOOK - UNDERSTANDING OF POWER DISTRIBUTION IN THE CORE.

3, 4, 5. ABILITY TO READ GRAPHS - ABILITY TO CALCULATE USING CALCULUS - UNDERSTANDING OF RELATIONSHIPS BETWEEN HEAT GENERATION, ACTIVITY, AND DOSE RATE.

6, 7, 8. ABILITY TO INTERPRET ENGINEERING DRAWINGS.-.PERFORM SIMPLE ALGEBRAIC CALCULATIONS.

9, 10. UNDERSTANDING OF SOME NEUTRON PHYSICS INCLUDING THE FISSION PROCESS, CROSS SECTIONS.

C) COMPILATION OF LEARNING OBJECTIVES DERIVED FROM THE ANALYSES WHICH DESCRIBE THE DESIRED PERFORMANCE AFTER TRAINING.

TASK

1 THROUGH 10.

THE DESIRED PERFORMANCE AFTER TRAINING IS TO PERFORM THE TASKS IN A ABOVE WELL.

THE LEARNING OBJECTIVE IS TO ACQUIRE THE KNOWLEDGE, SKILLS AND ATTITUDES DESCRIBED IN B ABOVE. SOME MAY BE CONSIDERED “SKILLS OF THE TRADE” OR PREREQUISITES AND NEED NOT BE TAUGHT. SOME MAY HAVE BEEN COVERED IN OTHER COURSES SUCH AS OPERATOR TRAINING.

D) TRAINING DESIGN AND IMPLEMENTATION IS BASED ON THESE LEARNING OBJECTIVES AND THE BASIC EDUCATIONAL AND EXPERIENCE REQUIREMENTS FOR ENTRY INTO TRAINING.

TASK

1 THROUGH 10.

DETERMINE THE PREREQUISITES FOR ENTRY INTO THE PROGRAM. *FOR EXAMPLE, ONLY LICENSED OPERATORS WILL BE TRAINED FOR PERFORMING SIPPING TESTS. ONLY LICENSED SENIOR OPERATORS WITH ENGINEERING DEGREES WILL BE TRAINED FOR TASKS 9 AND 10.*

DETERMINE WHAT IS BEST TRAINED IN THE CLASSROOM AND WHAT IS BEST TRAINED ON THE JOB. *FOR EXAMPLE ITEMS 1 THROUGH 10 IN B ABOVE ARE BEST TRAINED IN THE CLASS ROOM EXCEPT FOR A SIPPING TEST WHICH IS BEST TRAINED ON THE JOB.*

E) DEVELOPMENT OF TRAINING MATERIAL AS WELL AS TRAINING EQUIPMENT.

TASK

1 THROUGH 10.

DEVELOPMENT OF TRAINING MATERIAL AND EQUIPMENT IS PERFORMED BY SUBJECT MATTER EXPERTS. IN SOME CASES IT MAY BE NECESSARY TO UTILIZE CONSULTANTS FROM OUTSIDE THE OPERATING ORGANIZATION. HELPFUL. *FOR EXAMPLE, THE DOCUMENTS FROM ARGONNE ARE HELPFUL AS TRAINING MATERIAL FOR ITEMS 3, 4, 5, 9 AND 10. THE GUIDELINES DOCUMENT INCLUDING APPENDIX A IS ALSO USEFUL. IF SIPPING TESTS ARE TO BE PERFORMED, IT WILL BE NECESSARY TO DEVELOP EQUIPMENT AND THEN TRAIN ON EQUIPMENT.*

F) SCHEDULING AND PERFORMING THE TRAINING IN CLASSROOM, WORKSHOP AND ON THE JOB STRUCTURED SETTINGS.

TASK

1 THROUGH 10.

FOR INFREQUENTLY PERFORMED TASKS, TRAINING MAY BE DELAYED UNTIL TASK NEEDS TO BE PERFORMED. THIS “JUST IN TIME TRAINING” MAY ALSO BE USED FOR DIFFICULT OR COMPLICATED TASKS.

ON THE JOB STRUCTURED TRAINING (OJT) PRECLUDES INFORMAL TRAINING. WRITTEN OUTLINES SHOULD BE PREPARED TO ASSURE THAT ALL ASPECTS OF TRAINING ARE COVERED.

G) EVALUATION OF THE RESULTS. THAT IS, AN EVALUATION OF TRAINEE MASTERY OF THE OBJECTIVES THROUGH FORMAL EXAMINATIONS EITHER WRITTEN, ORAL OR PERFORMANCE.

TASK

1 THROUGH 10.

PERFORMANCE EVALUATIONS (SOMETIMES CALLED ON THE JOB EVALUATIONS, OJE) SHOULD BE FORMAL WITH EVALUATOR WORKING FROM A PREPARED OUTLINE OF IMPORTANT POINTS. THERE SHOULD BE NO COACHING BY EVALUATOR. EVALUATION SHOULD BE COMPLETELY SEPARATE FROM TRAINING AND, IF POSSIBLE BY A DIFFERENT PERSON.

H) EVALUATION AND REVISION OF THE TRAINING BASED ON THE PERFORMANCE OF TRAINED PERSONNEL IN THE JOB SETTING.

TASK

1 THROUGH 10.

THIS IS OBVIOUS. IF THE TRAINED INDIVIDUALS CANNOT PERFORM TASKS FOR WHICH THEY HAVE BEEN TRAINED, EITHER THE TRAINING IS BAD OR THE INDIVIDUALS FOR TRAINING HAVE BEEN POORLY SELECTED.

I) REVIEW OF AND CHANGES IN THE TRAINING PROGRAM BASED ON MODIFICATIONS IN THE INSTALLATION INCLUDING PROCEDURES AND REGULATORY REQUIREMENTS AND INCORPORATION OF LESSONS LEARNED FROM HUMAN ERRORS, OPERATIONAL INCIDENTS, FAILURE OF COMPONENTS AND EXPERIENCES AT SIMILAR FACILITIES.

TASK

1 THROUGH 10.

THIS CATEGORY IS NOT LIKELY TO BE IMPORTANT FOR THESE TEN TASKS.
HOWEVER, FOR OTHER JOBS ASSOCIATED WITH THE SHIPMENT OF IRRADIATED FUEL, THIS CATEGORY WILL BE IMPORTANT. *FOR EXAMPLE, MANY OF THE LECTURES AT THIS COURSE WILL RESULT IN MATERIAL FOR INCORPORATION INTO TRAINING.*

J) TRAINING SO AS TO ENHANCE SAFETY CULTURE.

TASK

1 THROUGH 10.

PERSONAL OPINION

SYSTEMS APPROACH TO TRAINING WHICH EMPHASIZES ROTE* PERFORMANCE OF TASK TENDS TO DECREASE SAFETY CULTURE IN THAT INDIVIDUALS MAY PERFORM OPERATIONS WITHOUT KNOWING WHY OR WITHOUT CONSIDERING THE RESULT. SAFETY CULTURE IS NOT ENHANCED IF THE STAFF PERFORMS AS ROBOTS.

THIS IS RARELY A PROBLEM AT RESEARCH REACTORS WHERE IN-DEPTH TRAINING PREDOMINATES.

* ROTE FROM DICTIONARY MEANS *THE USE OF MEMORY WITH LITTLE INTELLIGENCE: ROUTINE OR REPETITION CARRIED OUT MECHANICALLY OR UNTHINKINGLY*.