5/29
Topic 3
Meller

Essential Elements of a Viable Quality Assurance Program

Presented By:
Russell Meller
Yankee Atomic Environmental Laboratory

YANKEE

QUALITY ASSURANCE

A PLANNED, SYSTEMATIC, AND DOCUMENTED

SERIES OF ACTIONS NECESSARY TO PROVIDE

ADEQUATE CONFIDENCE IN THE RESULTS PRODUCED

BY A MEASUREMENT SYSTEM OR SERVICE.

YANKEE

QUALITY CONTROL

THE APPLICATION OF SIMPLE, REASONABLE TESTS, WHICH ARE BASED ON A COMMON SENSE ANALYSIS OF THE MEASUREMENT SYSTEM OR SERVICE, AND THE RESULTS OF WHICH ARE UTILIZED TO VERIFY THE QUALITY OF DATA GENERATED BY THE SYSTEM OR SERVICE.

YANKEE

KEY ELEMENTS IN THE IMPLEMENTATION A VIABLE QUALITY ASSURANCE PROGRAM

I. Selection of (Key) Personnel

II. Facility Design

III. Awareness of Exposure Parameters

IV. Selection of Analytical Techniques

V. Selection of analytical Equipment

VI. Selection and Training of Analytical Staff

VII. Establishment of Chain of Custody

VIII. Establishment of Quality Control Criteria

YANKEE

I. Selection of Key Personnel

A. Quality Begets Quality

B. Knowledgeable about Dosimetry Needs

C. Aware of Complex Interactions Required in Functional Dosimetry Program

D. Responsible for Delineation of Entire Program

II. Facility Design

A. Direct Bearing on Quality

B. Large enough to Accomodate Planned Quantity of Dosimetry Processing

C. Each Separate Area Must Have Adequate:

1. Space
2. Lighting
3. Heating and Ventillation
4. Temperature Control

YANKEE

III. Awareness of Exposure Parameters

A. Type of Radiation to be Measured

B. Energy Spectrum for Each Type

C. Expected Exposure Levels

IV. Selection of Analytical Techniques

A. Balanced Blend of Quality and Quantity

B. Utilize Well Known and Well Documented Techniques

C. Must have Working Knowledge of the Measurement System

D. Understanding of Technique Uncertainties

E. Comparision of Expected Accuracy and Precision for Various Anticipated Methodologies

V. Selection of Analytical Equipment

A. Partially Governed by Choice of Analytical Methodology

B. Several Points to Investigate when Choosing Instrumentation

1. Suitable for Measuring Required Quantity
2. Reliability
3. Reproducibility
4. Operating Parameters
5. Maintenance Required
6. Availability of Equipment
7. List of Users
8. User Oriented

VI. Selection and Training of Analtyical Staff

A. Degree of Experience Dependent on Program Needs

B. Training

1. Initial

a. Technique Familiarization to Include Theoretical Considerations

b. Processing Routine Matrices

c. Replicate Irradiated Unknowns

d. Processing of Submitted Dosimetry

2. Retraining

VII. Establishment of Chain of Custody

A. "Lost" Dosimetry or Data is Indicative of Problems within a Measurement Program

1. Blunders
2. Irretrievable Results.

B. Establishes a Knowledge of Dosimetry Location at all Times

1. Establish the Normal Flow of Dosimeters for the Measurement Process
2. Establish a System for issuing and receiving Dosimeters
3. Notification to Contractee of Missing Dosimetry.

VIII. Establishment of Quality Control Criteria

A. Adequate Criteria Must be Established

B. Recognize Key Parameters

1. Accuracy
2. Precision

C. How Accurate or Precise?

1. Pure Guess
2. Educated Estimate
3. Estimates based on Total Knowledge of Measurement-System and Related Uncertainties.

D. Choosing an Operating Criteria

1. Criteria Vary from Facility to Facility
2. Utilize an Existing Criteria from another Facility?
3. Evaluate Current Measurement Processes
4. Modify Criteria to Meet Needs

YANKEE

MAINTAINING SATISFACTORY PERFORMANCE WITHIN ESTABLISHED CRITERIA

I. Determine the Major Uncertainties for the Measurement Process

II. Maintain Uncertainties Below Estimated Upper Boundaries

III. Establish Checks to Ensure Quality of Data (day to day workings of a viable quality control program)

YANKEE

ESSENTIAL ELEMENTS OF A QUALITY CONTROL PROGRAM

1. ESTABLISH THE EMPHASIS ON QUALITY AMONG ALL STAFF MEMBERS.

2. ESTABLISH AND MAINTAIN A THOROUGH PROCEDURE MANUAL DEALING WITH ALL ASPECTS OF THE MEASUREMENT PROCESS.

3. UTILIZE WELL KNOWN OR PROVEN METHODOLOGIES. IF THE METHODOLOGIES ARE DEVELOPED IN-HOUSE, ALL FACETS OF THE METHOD MUST BE TESTED, VERIFIED, AND DOCUMENTED.

4. ESTABLISH AND MAINTAIN A VIABLE TRAINING PROGRAM WHICH WILL INCLUDE INITIAL TRAINING AND SUBSEQUENT RETRAINING.

5. THE ANALYTICAL STAFF MUST BE THOROUGHLY FAMILIAR WITH THE DOSIMETRY MEASUREMENT SYSTEMS BEING UTILIZED AND BE ABLE TO RECOGNIZE AND CORRECT INADEQUATE PERFORMANCE.

6. MAINTAIN A CALIBRATION SCHEDULE AND CALIBRATION DOCUMENTATION.

7. PERFORM INSTRUMENTATION CALIBRATION CHECKS UTILIZING WELL CHARACTERIZED DOSIMETERS AND RADIATION SOURCES THE MEASUREMENT OF WHICH TRULY REFLECTS THE OPERATION OF THE SYSTEM UNDER CONSIDERATION.

8. PERFORM STANDARD MEASUREMENTS DURING EACH SERIES OF EXPOSURE DETERMINATIONS.

9. UTILIZE CONTROL CHARTS OR TABLES FOR RECORDING INSTRUMENT STATUS CHECKS. CRITERIA FOR ACCEPTABILITY SHOULD BE CLEARLY APPARENT.

YANKEE

10. Establish a "chain of custody" system for the tracking of dosimeters throughout the issuing/processing cycle.

11. Establish a record keeping system which will lend itself to ease of use and data retrievability. This system should be capable of checking the validity of key data inputs from the analytical calculations. Remember - in all production type endeavors in which quality plays an important consideration - record keeping will occupy 40 to 50 percent of the work effort.

12. Document and validate all aspects of the computer programs. Verify a percentage of all calculations.

13. Maintain a complete instrument history on the instrumentation utilized in the laboratory.

14. Mandatory data review by individuals knowledgeable of the dosimetry measurement program.

15. Expedite data review for quality control dosimetry as soon as known data is available.

16. Perform appropriate actions based upon the acceptance or rejection of quality control data when compared to established criteria.

POTENTIAL SOURCES OF ERROR IN THERMOLUMINESCENT DOSIMETRY SYSTEMS

1. INCORRECT PHOSPHOR POSITION OR TYPE; E.G., ^{6}LiF PRESENT OR NOT PRESENT IN CORRECT CONFIGURATION FOR NEUTRON MONITORING.

2. IMPROPERLY SUPPLIED ATTENUATOR FOR NEUTRON MONITORING.

3. VARIATIONS IN RESPONSE OF INDIVIDUAL TL PHOSPHORS OUTSIDE MANUFACTURER SPECIFICATIONS.

4. LACK OF REPRODUCIBLE RESPONSE OF INDIVIDUAL TL PHOSPHOR OUTSIDE MANUFACTURER SPECIFICATIONS.

5. INDIVIDUAL TL RESPONSE FACTORS SHOULD BE DETERMINED AND UTILIZED.

6. LOSS OF TL SENSITIVITY WITH INCREASING NUMBER OF READOUTS.

7. FADE CHARACTERISTICS MUST BE QUANTIZED FOR ACCURATE EXPOSURE RESULTS.

8. LOSS OF TL DATA DUE TO MECHANICAL MALFUNCTION OF DOSIMETER OR EQUIPMENT.

9. UTILIZATION OF A POORLY CHARACTERIZED IRRADIATION SOURCE(S) FOR MEASUREMENT SYSTEM CALIBRATION.

10. LACK OF KNOWLEDGE OF RADIATION ENVIRONMENT IN WHICH THE DOSIMETER WILL BE UTILIZED.

YANKEE

TYPES OF QUALITY CONTROL DOSIMETRY

I. Intralaboratory Process Checks

A. Known Levels

B. Prepared in-house

C. Agreement with established criteria immediately known

D. Does not indicate system bias

II. Replicate Irradiation Program

A. Excellent indicator of precision for truly replicate irradiations.

B. Preferrably controlled by the contractee.

C. Require notification of all results (acceptable and unacceptable)

III. Interlaboratory Comparisions

A. Independent third party objectivity

B. Agreement with criteria not immediately known

C. Measurement of system bias

D. National program prefferable

E. Informal programs should be encouraged

IV. Control Dosimeters

A. Dosimeters processed which reflect intransit and storage dose evaluations during issue period.

B. Utilize viable percentage

C. Processed with each exposure processing

D. Irradiated controls may be viable

V. System Background Checks

A. Check of well characterized background level

B. Maintain system integrity

ACCURACY

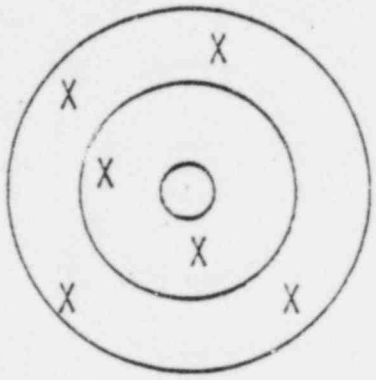
A MEASURE OF THE DEVIATION OF A RESULT FROM THE TRUE OR CORRECT VALUE. THE RESULT MAY BE A SINGLE OBSERVATION, OR THE MEAN OF A SERIES OF OBSERVATIONS.

PRECISION

A MEASURE OF THE ABILITY OF AN OBSERVATION TO BE FAITHFULLY REPRODUCED.

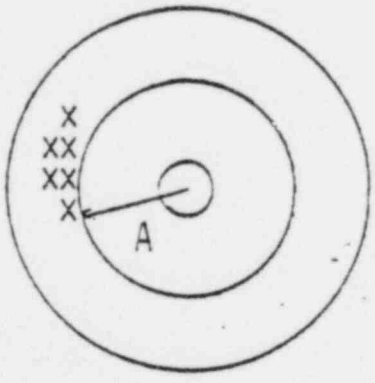
ACCURACY AND PRECISION

INACCURATE



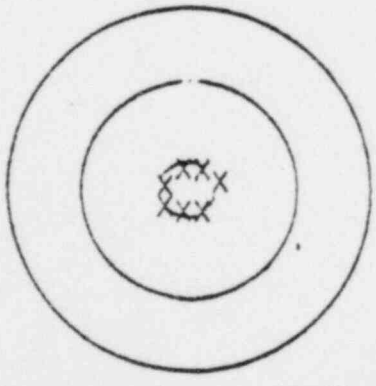
IMPRECISE

INACCURATE



PRECISE

ACCURATE



PRECISE

WHERE A REPRESENTS AN ACCEPTABLE RANGE FOR THE MEASURED VALUES.

YANKEE

QUALITY ASSURANCE ASPECTS OF DOSIMETRY

U S ARMY DOSIMETRY PROGRAM

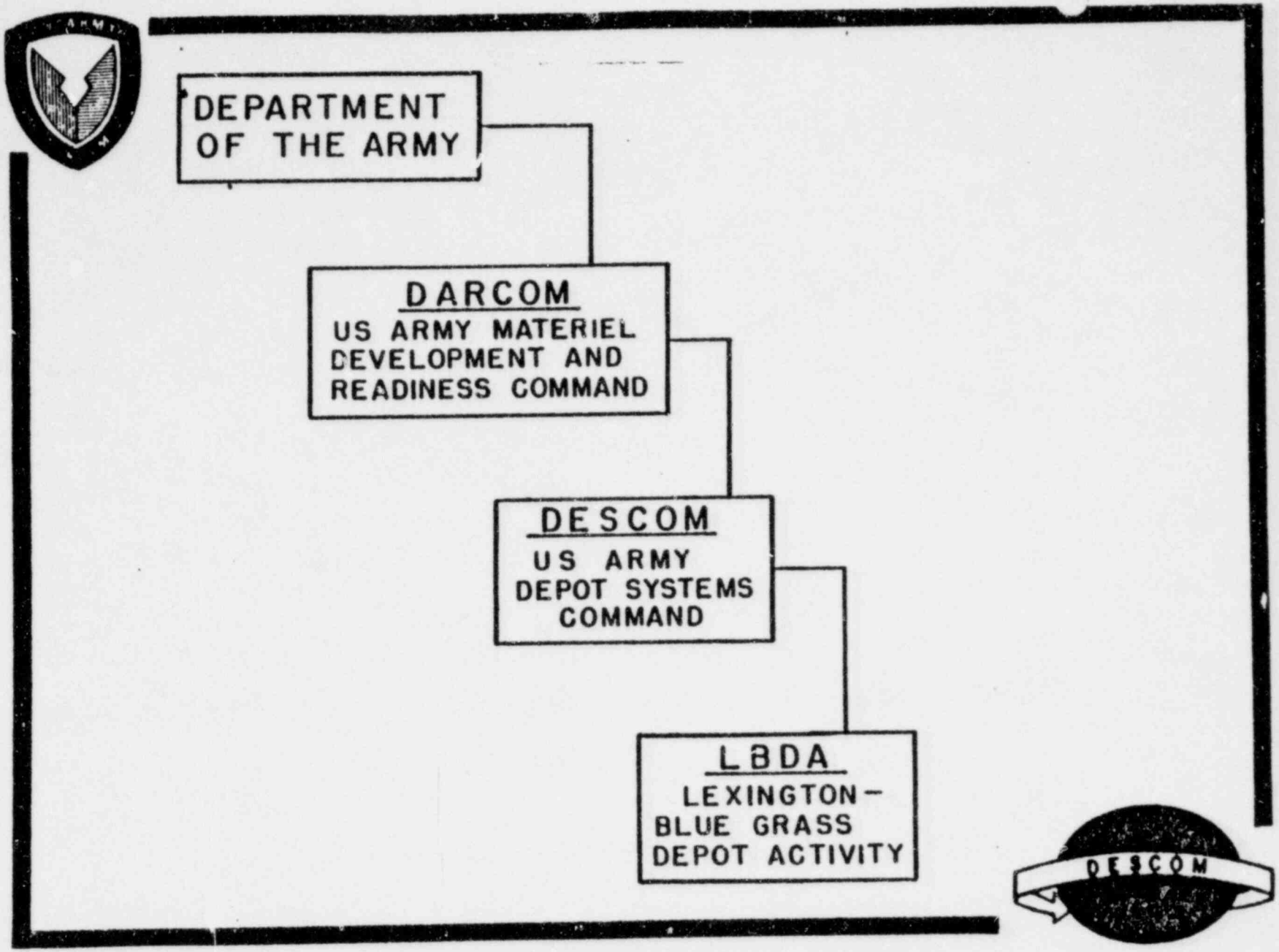
LEXINGTON-BLUE GRASS DEPOT ACTIVITY

DESCOM

Phillip Judson presentation 9/29/82

Slide 1

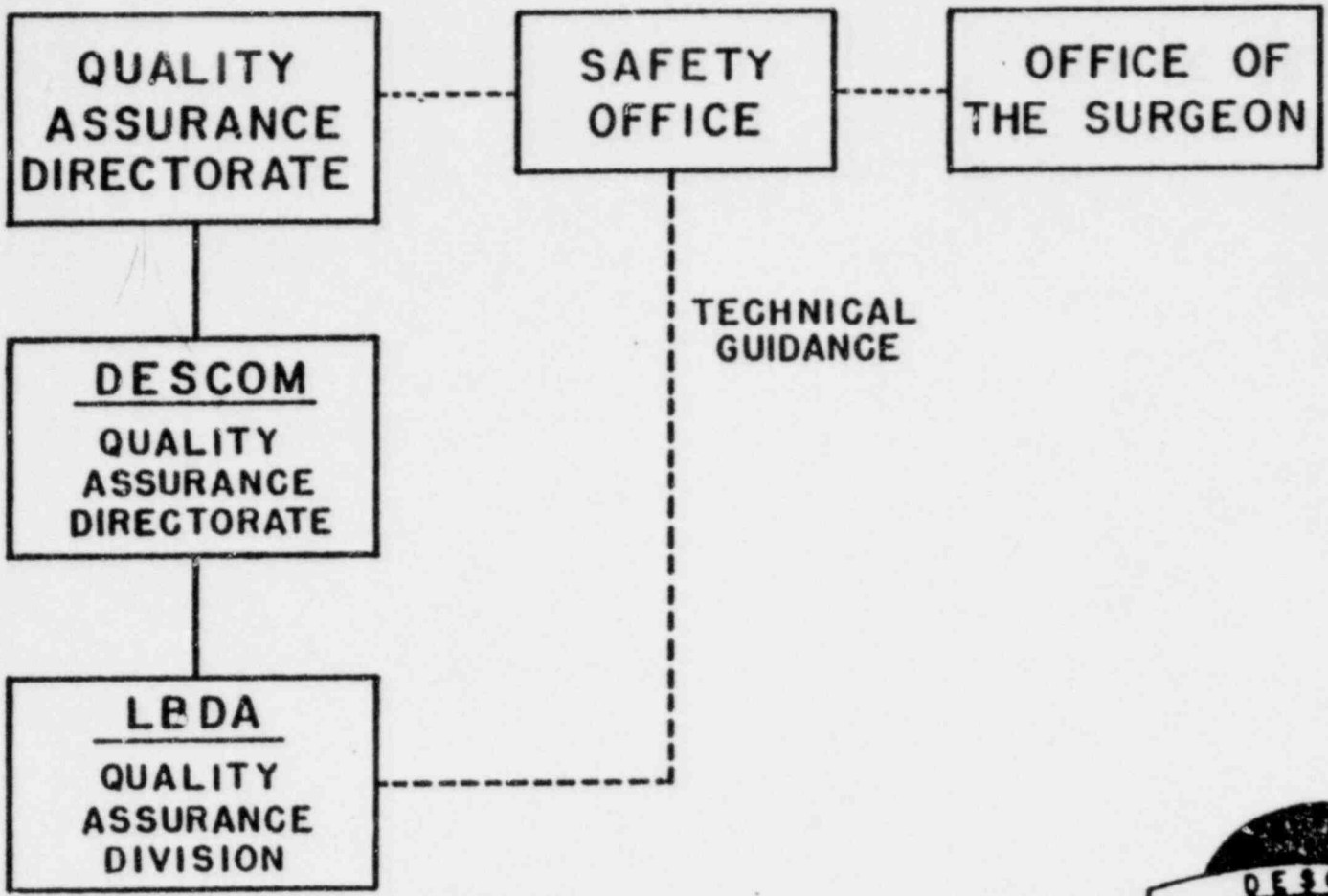
CHART 1 - LADIES AND GENTLEMEN, I AM VERY PLEASED TO HAVE THE OPPORTUNITY TO REPRESENT THE U. S. ARMY AND DEPARTMENT OF DEFENSE AT THIS MEETING, AND TO DISCUSS WITH YOU SOME OF THE QUALITY ASSURANCE ASPECTS UTILIZED BY LEXINGTON-BLUE GRASS DEPOT ACTIVITY IN PROVIDING PERSONNEL DOSIMETRY TO CIVILIAN AND MILITARY PERSONNEL OF THE U. S. ARMY.


DEPARTMENT OF THE ARMY
DARCOM
US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
DESCOM
US ARMY DEPOT SYSTEMS COMMAND
LBDA
LEXINGTON-BLUE GRASS DEPOT ACTIVITY
DESCOM

Slide 2

CHART 2 - TO GIVE YOU A BETTER PICTURE OF WHERE WE FIT IN THE ARMY STRUCTURE, THIS SLIDE SHOWS THE ORGANIZATION AS IT EXISTS TODAY. OVER THE YEARS THERE HAVE BEEN MANY NAME CHANGES. THE ORIGINAL ORGANIZATION AT THE BEGINNING OF THE ARMY PHOTODOSIMETRY SERVICE WAS THE U. S. ARMY SIGNAL CORPS LOCATED AT FORT MONMOUTH WITH THE LEXINGTON SIGNAL DEPOT AT LEXINGTON, KENTUCKY, PROVIDING THE SERVICE UNDER THE GUIDANCE OF THE OFFICE OF THE CHIEF SIGNAL OFFICER LOCATED IN WASHINGTON, D. C.

TECHNICAL CONTROL AND GUIDANCE
DARCOM



Slide 3

CHART 3 - THIS CHART DEPICTS THE ACTUAL GUIDANCE CHANNELS FROM DARCOM THROUGH DESCOM LOCATED AT LETTERKENNY ARMY DEPOT, CHAMBERSBURG,PENNSYLVANIA, TO LBDA. THE DARCOM SAFETY OFFICE (MR. DARWIN TARAS) IN COORDINATION WITH THE DARCOM SURGEON PROVIDES TECHNICAL GUIDANCE AND DIRECTION.

LBDA

MISSION

- PROVIDES PHOTODOSIMETRY SERVICES TO ALL ARMY AREAS WORLD WIDE.

Slide 4

CHART 4 - THE MISSION STATEMENT FOR THE ARMY DOSIMETRY SERVICE ASSIGNED TO LBDA. THE DETAILS ARE LEFT TO US.

OUTLINE ••

- BACKGROUND
- QUALITY CONTROLS

CHART 5 - TWO AREAS RELATING TO THE ARMY DOSIMETRY PROGRAM WILL BE COVERED IN MY BRIEFING TODAY.

BACKGROUND ••

- HISTORY OF ARMY DOSIMETRY PROGRAM
- CURRENT PROGRAM

CHART 6 - THE FIRST SUBJECT IS A BRIEF BACKGROUND OF THE PROGRAM TO BETTER HELP YOU UNDERSTAND OUR INVOLVEMENT AT LBDA, AND THE PART THAT WE PLAY IN THE OVERALL DOSIMETRY PROGRAM.

THE FIRST FILM BADGE OPERATION IN THE ARMY ORIGINATED AT THE SIGNAL LABS, FT. MONMOUTH IN THE EARLY 1950'S. AS THE LAB BEGAN PROCESSING THEIR OWN BADGES, OTHER ARMY ELEMENTS REQUESTED THAT THE SIGNAL LABS ALSO PROCESS BADGES FOR THEIR PERSONNEL WHO WERE WORKING WITH SOURCES OF IONIZING RADIATION. IN EARLY 1954, THE SIGNAL CORPS ASSIGNED RESPONSIBILITY

FOR PROVIDING FILM BADGE SERVICE TO THE LEXINGTON SIGNAL DEPOT. FROM 1958 TO 1977, SACRAMENTO ARMY DEPOT PROVIDED A PORTION OF THE ARMY SERVICE; HOWEVER, LEXINGTON IS NOW THE ONLY SOURCE OF THE SERVICE FOR THE ARMY.

THIS PROGRAM HAS BEEN IN OPERATION AT LEXINGTON NOW FOR ABOUT 26 YEARS. THERE HAVE BEEN MANY IMPROVEMENTS IN EQUIPMENT, FILM, PROCEDURES AND TECHNIQUES OVER THE YEARS. MANY OF THESE WILL BE MENTIONED IN MY DISCUSSION OF THE QUALITY CONTROLS ASSOCIATED WITH THE DOSIMETRY PROGRAM AT LBDA.

QUALITY CONTROL

- CALIBRATION
- DOSE CONTROLS
- PROCESSING CONTROLS
- EVALUATION CONTROLS
- QUALITY AUDITS

CHART 7 - FOR PURPOSES OF THIS DISCUSSION, I HAVE BROKEN THE QUALITY CONTROL ELEMENTS DOWN INTO THE FIVE AREAS THAT YOU SEE LISTED HERE.

CALIBRATION

- STANDARDS
  R-METERS — SHONKA CHAMBERS

- SOURCES
  CO-60, CS-137, RA-226, SR-Y-90,
  NATURAL URANIUM, X-RAY,
  PU-BE NEUTRONS

DESCOM

Slide 8

CHART 8 - <u>CALIBRATION</u>. FILMS ARE PURCHASED FOR APPROXIMATELY SIX MONTHS OPERATIONS WITH THE CONTRACT SPECIFYING THAT ALL FILMS FOR THAT GROUP BE OF THE SAME EMULSION. EACH NEW FILM EMULSION IS CALIBRATED BY SELECTING SAMPLES OF FILM AND EXPOSING TO DOSES OF RADIATION MEASURED BY NBS TRACEABLE/CALIBRATED R-METERS, SHONKA CHAMBERS, OR SOURCES. STANDARDS AND EQUIPMENT ARE CALIBRATED PERIODICALLY BY THE NUCLEONICS PRIMARY REFERENCE LAB LOCATED AT LBDA WHICH IS THE HIGHEST LEVEL LAB IN THE ARMY CALIBRATION SYSTEM. COBALT-60, CESIUM 137, RADIUM 226, NATURAL URANIUM, STRONTIUM/YTTRIUM 90 AND THE VARIOUS

NBS STANDARD X-RAY TECHNIQUES ARE AVAILABLE FOR USE. UNMODERATED PLUTONIUM BERYLLIUM NEUTRONS ARE USED FOR NEUTRON FILM CALIBRATION. WE HAVE ALWAYS PERFORMED THE CALIBRATIONS IN FREE AIR; HOWEVER, WE DO NOT FORESEE ANY PROBLEM WITH CONVERTING TO PHANTOM CALIBRATIONS IF THE PROPOSED STANDARD IS ADOPTED.

DOSE CONTROLS

- FILM SELECTION
- EXPOSURE
- PROCESSING

Slide 9

CHART 9 - <u>DOSE CONTROLS</u>. A CUSTOMER'S FILM SHIPMENT IS SELECTED FROM CONSECUTIVE FILMS FROM ONE BOX. A MINIMUM OF TWO ADDITIONAL FILMS FROM THE SAME BOX ARE SELECTED AND RETAIN AT THE LABORATORY TO SERVE AS QUALITY CONTROL CHECKS. ONE OF THE QUALITY CONTROL FILMS IS EXPOSED TO A DOSE WHICH PRODUCES A GOOD RESPONSE ON THE LOW RANGE FILM COMPONENT OF THE FILM PACKET WHILE THE OTHER QUALITY CONTROL FILM IS EXPOSED TO A DOSE WHICH PRODUCES A MID RANGE RESPONSE ON THE HIGH RANGE COMPONENT. THE EXPOSURES OF THE QUALITY CONTROL FILMS ARE MADE AT THE MID POINT OF THE WEARING

PERIOD OF THE FILMS WHICH THEY CONTROL. WHEN THE PERSONNEL FILMS ARE RETURNED FOR PROCESSING, THE QUALITY CONTROL FILMS ARE PLACED WITH THEM AND ARE PROCESSED IN THE SAME PROCESSING RACK. THE DATA OBTAINED FROM THE QUALITY CONTROL FILMS IS THEN USED TO ADJUST THE CALIBRATION DATA TO COMPENSATE FOR MINOR VARIATIONS OF FILM BATCH SENSITIVITIES AND FILM DEVELOPING PROCEDURES.

PROCESSING CONTROLS

- PROCESSOR MACHINE
- CHEMICALS
- TEMPERATURE CONTROLS
- AGING (NEUTRON FILMS)

CHART 10 - <u>PROCESSING CONTROLS</u>. THE PROCESSING MACHINE UTILIZED IN THE DOSIMETRY PROGRAM AUTOMATICALLY TIMES THE STAY IN EACH PROCESSING SEQUENCE TO ASSURE UNIFORMITY. PROCESSING CHEMICALS ARE CHANGED AFTER APPROXIMATELY 4000 FILMS HAVE BEEN PROCESSED. NEW CHEMICALS ARE "SHOCKED" BY PROCESSING UNUSED EXCESS FILM TO STABLIZE THE CHEMICALS BEFORE PERSONNEL FILMS ARE PROCESSED. THE CHEMICALS ARE HELD AT A CONSTANT TEMPERATURE $\pm$ .1 DEGREE F BY A WATER CIRCULATION SYSTEM. NEUTRON FILMS ARE NOT PROCESSED UNTIL THE CHEMICALS ARE "AGED" BY PROCESSING A MINIMUM OF 1,000 BETA-GAMMA FILMS.

EVALUATION CONTROLS

- ROUTINE EXPOSURES
- UNIQUE EXPOSURES
- HIGH EXPOSURES

CHART 11 - <u>EVALUATION CONTROLS</u>. OUR EXPERIENCE HAS INDICATED THAT PERSONNEL FILMS CANNOT BE ACCURATELY EVALUATED BY MACHINE METHODS ALONE BECAUSE MOST EXPOSURES OCCUR AT VARIOUS ANGLES OR THE BADGE HAS BEEN PARTIALLY SHIELDED. WE HAVE FOUND THAT THE ONLY SATISFACTORY METHOD OF EVALUATION IS TO HAVE EXPERIENCED TECHNICIANS VISUALLY ANALYZE THE EXPOSURE GEOMETRIES INVOLVED AND APPLY HUMAN JUDGEMENT ALONG WITH THE MACHINE MEASURED DENSITY READINGS TO DETERMINE THE BEST DOSE DETERMINATION. UNIQUE OR QUESTIONABLE EXPOSURES AND HIGH LEVEL EXPOSURES ARE REVIEWED BY A QUALIFIED PHYSICIST.

QUALITY AUDITS

- TECHNICAL
- PROCEDURAL

CHART 12 - <u>QUALITY AUDITS</u>. ONE OF THE MOST IMPORTANT ASPECTS OF THE QUALITY PROGRAM FOR DOSIMETRY IS THE AUDIT OF THE TECHNICAL AND PROCEDURAL OPERATIONS. AUDITS OF THE DOSIMETRY OPERATIONS ARE PERFORMED ON AN UNANNOUNCED BASIS BY ELEMENTS OF THE QUALITY ASSURANCE DIVISION WHO CHECK FOR COMPLIANCE WITH APPLICABLE REGULATIONS AND SOP'S. OTHER AUDITS ARE PERFORMED BY SUCH AGENCIES AS OFFICE OF THE INSPECTOR GENERAL, ARMY ENVIRONMENTAL HYGIENE AGENCY, AND THE DARCOM FIELD SAFETY OFFICE.

IN ADDITION TO THE PROCEDURAL AUDITS, PERIODIC CHECKS ARE MADE ON THE ACCURACY OF THE DOSIMETRY PROGRAM BY EXPOSING TEST FILM TO KNOWN DOSES OF RADIATION AND SENDING THEM THROUGH THE NORMAL PROCESSING AND EVALUATION OPERATIONS. RESULTS ARE COMPARED AND ANALYZED TO DETERMINE REASON FOR VARIATIONS.

ONE QUALITY CHECK THAT WE DO NOT RECOMMEND, BUT HAVE NOT BEEN ABLE TO AVOID COMPLETELY IS THE TEST BY THE CUSTOMER OF THE SERVICE. MANY PERSONS APPARENTLY DO NOT BELIEVE IN THE EFFECTIVENESS OF THE FILM BADGE AND ARE DETERMINED TO TEST TO SEE IF IT WORKS.

QUALITY ASSURANCE OVERVIEW
DOE PERSONNEL DOSIMETRY

Jack Selby

Pacific Northwest Laboratory

DOE LABORATORY STUDIES

- LABORATORY SPECIFIC
- PROGRAM ORIENTED
- TIME DEPENDENT

QUALITY ASSURANCE

- MORE THAN QUALITY CONTROL
- SUPPORTING FIELD DATA
- DOE CENTRAL LABORATORY(S)

DOE HEADQUARTERS STUDIES

- OCCUPATIONAL DOSE LIMIT IMPACT (DOE-EV-0045)
- NEUTRON DOSIMETRY METHODS AT DOE FACILITIES (PNL-3213)
- PERSONNEL DOSIMETRY CALIBRATION PROCEDURES
- OCCUPATIONAL RECORDS REPOSITORY

DOE PERSONNEL DOSIMETRY

- DIVERSE PROGRAMS
- MIXED RADIATION FIELDS
- SPECIFIC DOSIMETRIC CONSIDERATIONS
- FIELD MEASUREMENTS

HANFORD PERSONNEL DOSIMETRY SYSTEM QUALITY ASSURANCE

Jack Fix

Pacific Northwest Laboratory

QUALITY ASSURANCE

- DOSIMETER ACCEPTANCE
- DOSIMETER CALIBRATION
- DOSIMETER READOUT
- DOSE AUDITS

DOSIMETER ACCEPTANCE

- NEW CHIPS ARE MATCHED WITH EXISTING CHIPS
- ALL NEW DOSIMETERS UNIQUELY LABELED
- LOW LEVEL GAMMA AND NEUTRON IRRADIATION
- ALL DOSIMETERS READ BEFORE USE
- HOLDERS CHECKED FOR PROPER PLACEMENT OF FILTERS

DOSIMETER CALIBRATION

- CALIBRATION PROCEDURES
- NBS TRACEABLE SOURCE CALIBRATION
- DIRECT MONITORING
- PHOTON CALIBRATION
- LOG OF EACH DOSIMETER IRRADIATION AND MONITOR READING

DOSIMETER READOUT

- EACH RUN CALIBRATED
- CHECK DOSIMETERS
- COMPUTER INTERROGATION
- AUDIT DOSIMETERS

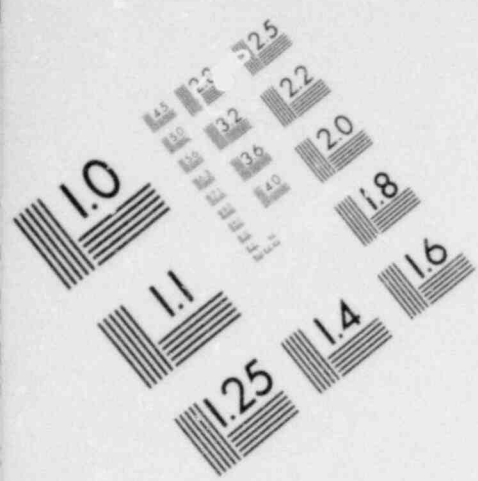
DOSE AUDITS

- CALIBRATION AND CHECK DOSIMETERS
- AUDIT DOSIMETERS
- DOE CONTRACTURAL ACCEPTANCE
- DOE CONTRACTOR REVIEW

PERSONNEL DOSIMETER CALIBRATIONS AND ITS ROLE IN DOSIMETRY PERFORMANCE

CRAIG YODER

PACIFIC NORTHWEST LABORATORY



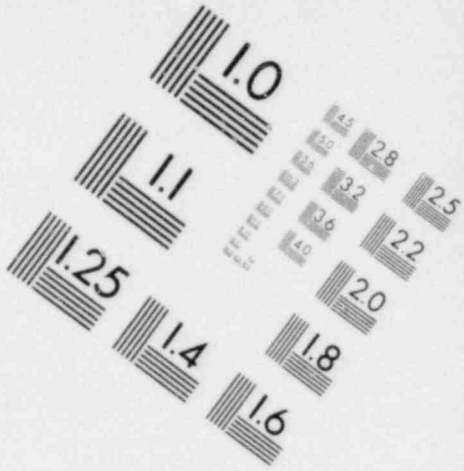
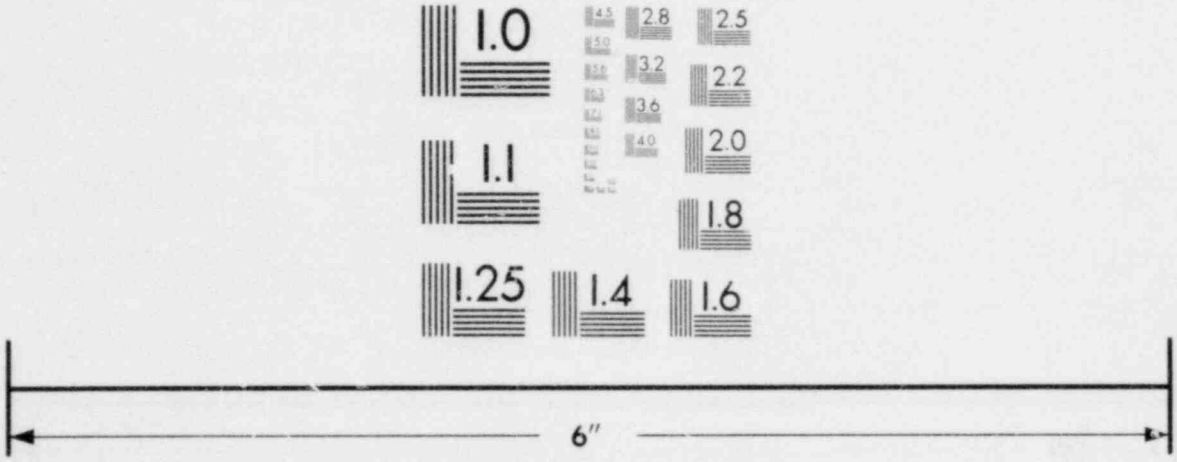
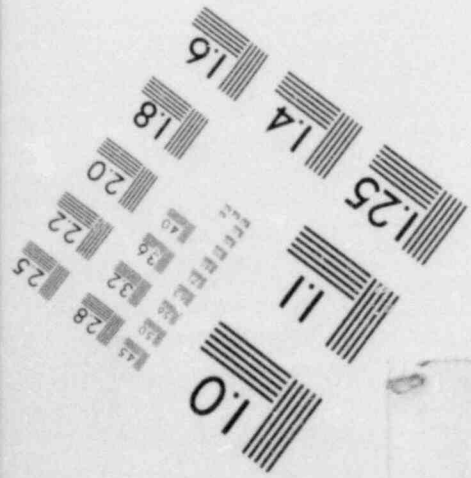
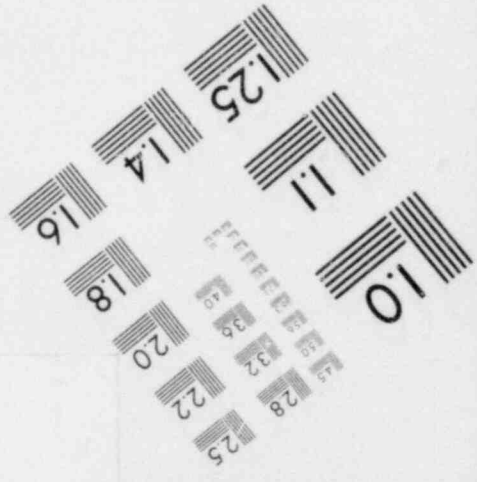


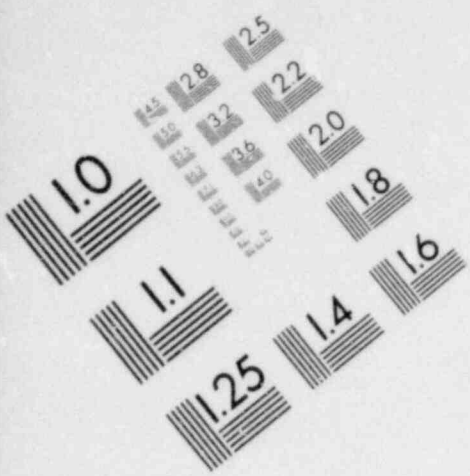
IMAGE EVALUATION
TEST TARGET (MT-3)



MICROCOPY RESOLUTION TEST CHART







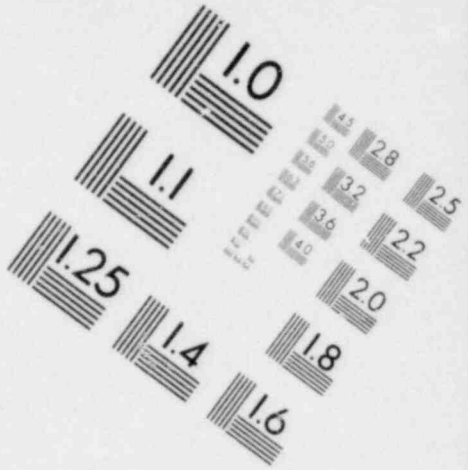
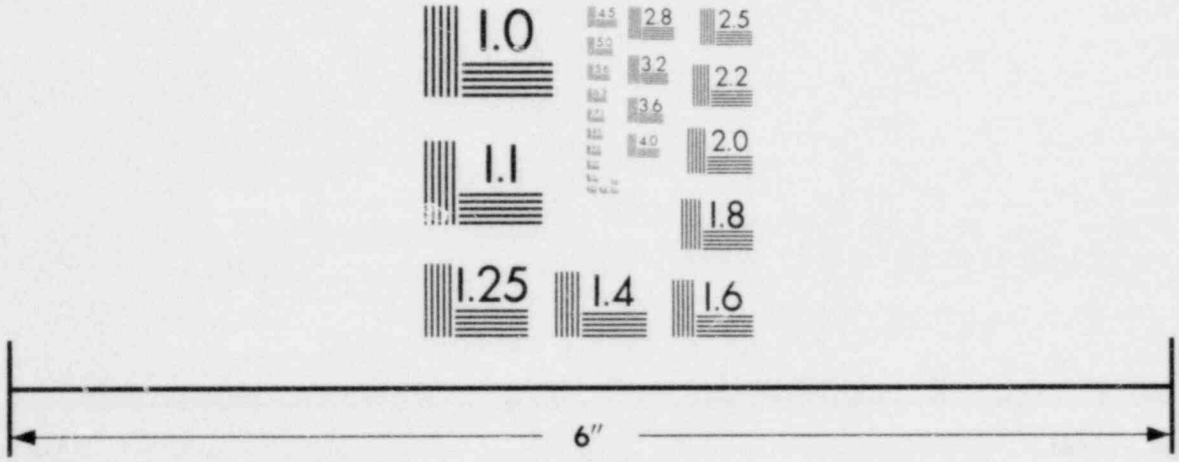
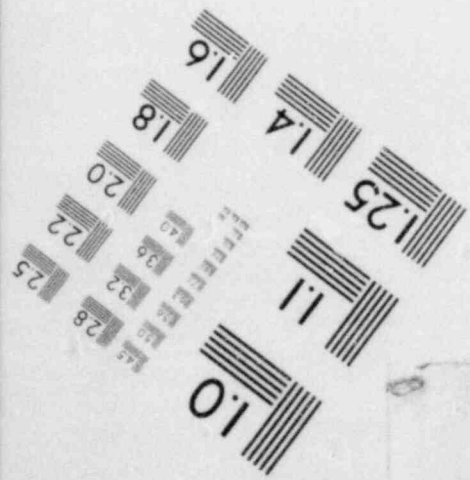
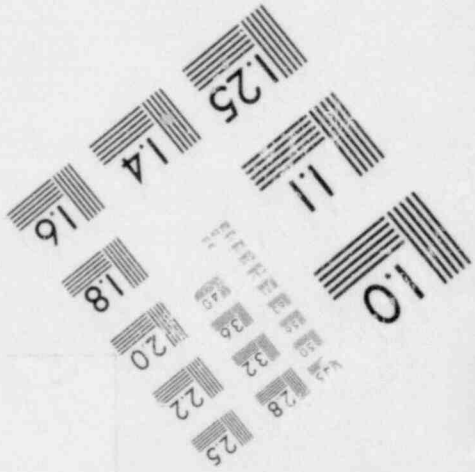


IMAGE EVALUATION
TEST TARGET (MT-3)



MICROCOPY RESOLUTION TEST CHART





PURPOSES OF CALIBRATIONS

CORRELATE DOSIMETER RESPONSE TO ABSORBED DOSE

PROVIDE AN ELEMENT OF QUALITY ASSURANCE

OBJECTIVES OF CALIBRATIONS

IMITATE FIELD CONDITIONS IN THE LABORATORY

PROVIDE CONSISTENT REPRODUCIBLE INFORMATION - STANDARDIZATION

TECHNICAL GUIDELINES FOR PERSONNEL DOSIMETRY CALIBRATIONS

CALIBRATION VARIABILITY

CALIBRATION PROCEDURES

INTERCOMPARISON

CALIBRATION VARIABILITY

RADIATION SOURCES

EXPOSURE GEOMETRY

SCATTER

ADAPTATIONS

CALIBRATION PROCEDURES

UNIFORMITY OF APPROACH

TECHNICAL BASIS FOR ACTIONS

INTERCOMPARISONS

ASSURE PROCEDURES PROPERLY IMPLEMENTED

IDENTIFY INTANGIBLE FACTORS

AVENUE FOR TECHNICAL DISCUSSION

POTENTIAL INFLUENCES OF DOSIMETRY PERFORMANCE STANDARD

CALIBRATION APPROACHES AND METHODS

TECHNICAL EMPHASIS

ADAPTABILITY

OVERALL FOCUS