

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

**PRESENTATION TO
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

**SUBJECT: OVERVIEW OF ESF DESIGN
CONTROL**

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MARCH 26-27, 1991

OVERVIEW OF ESF DESIGN CONTROL PROCESS

- **DOE IMPLEMENTS A QUALITY ASSURANCE PROGRAM BASED ON THE QARD AND QAPD**

OVERVIEW OF ESF DESIGN CONTROL PROCESS

DESIGN CONTROL

PROCESS OF ASSURING THAT APPLICABLE REGULATORY REQUIREMENTS AND THE DESIGN BASIS FOR APPLICABLE STRUCTURES, SYSTEMS AND COMPONENTS ARE CORRECTLY TRANSLATED INTO SPECIFICATIONS, DRAWINGS, PROCEDURES, AND INSTRUCTIONS

MAJOR DESIGN ACTIVITIES

- **DESIGN INPUT**
 - EXTERNAL
 - INTERNAL

- **DESIGN PROCESS**
 - QA GRADING
 - ENGINEERING PLAN
 - INTERFACE CONTROL
 - DESIGN ANALYSES
 - REVIEWS
 - DESIGN VERIFICATION
 - DESIGN CHANGE CONTROL

- **DESIGN OUTPUTS**
 - ACCEPTANCE BY P.O.

- **QA RECORDS**

DESIGN INPUT

- **EXTERNAL DESIGN INPUTS (IMPOSED ON DESIGN ORGANIZATION BY PROJECT OFFICE)**
 - **ESF SYSTEM REQUIREMENTS (CURRENTLY BEING DEVELOPED)**
 - **DESIGN STUDY CURRENTLY BEING PERFORMED USING EXISTING CONTROLLED REQUIREMENTS DOCUMENTS**
 - 1) **WASTE MANAGEMENT SYSTEM REQUIREMENTS (WMSR) VOLUMES I AND IV**
 - 2) **YMP SYSTEM REQUIREMENTS (YMP-SR) DOCUMENT**
 - 3) **YMP SYSTEM DESCRIPTION (YMP-SD)**
 - 4) **SITE CHARACTERIZATION PROGRAM BASELINE (YMP-SCP)**
 - 5) **YMP REPOSITORY DESIGN REQUIREMENTS DOCUMENT (YMP-RDR)**
 - 6) **EXPLORATORY STUDIES FACILITY DESIGN REQUIREMENTS (YMP-ESFDR) DOCUMENT**
 - **REFERENCE INFORMATION BASE (RIB)**

DESIGN INPUT

(CONTINUED)

- **INTERNAL DESIGN INPUT (ALL DESIGN INPUT USED BY DESIGN ORGANIZATION WHETHER RECEIVED FROM OTHERS OR DEVELOPED INTERNALLY) INCLUDES AS A MINIMUM**
 - **ASSUMPTIONS NECESSARY TO IMPLEMENT EXTERNAL DESIGN REQUIREMENTS**
 - **SUPPLEMENTARY REGULATIONS, DESIGN CODES, AND STANDARDS**
 - **DESIGN MODELS AND METHODS TO BE USED**

- **DESIGN ORGANIZATION REVIEWS AND APPROVES DESIGN INPUT ACCORDING TO ITS PROCEDURES**
 - **FORMALLY NOTIFIES P.O. THAT IT APPROVES ALL APPLICABLE EXTERNAL DESIGN INPUT**

DESIGN INPUT

(CONTINUED)

- **ALL INTERNAL DESIGN INPUT MUST BE UNDER DESIGN ORGANIZATION CHANGE CONTROL**
- **DESIGN INPUT MUST BE FORMALLY CONTROLLED**

DESIGN PROCESS

● QA GRADING

- **PROCESS FOR DETERMINING THE QA MEASURES NECESSARY TO DEVELOP AND MAINTAIN CONFIDENCE IN THE QUALITY OF AN ITEM OR ACTIVITY**
- **PERFORMED FOR ALL WORK, EVEN IF NOT RELATED TO NUCLEAR SAFETY OR WASTE ISOLATION**
- **FOR ESF DESIGN, PREPARER IS DESIGN ORGANIZATION**
- **DESIGN WORK WILL NOT COMMENCE UNTIL QA GRADING FOR THE DESIGN PROCESS HAS BEEN APPROVED BY THE PROJECT QUALITY REVIEW BOARD**

DESIGN PROCESS

(CONTINUED)

● ENGINEERING PLAN

- PREPARED BY DESIGN ORGANIZATION (D.O.) TO DESCRIBE WORK TO BE PERFORMED IN DETAIL
- APPROVED BY P.O.
- CONTAINS AS A MINIMUM
 - * PURPOSE, SCOPE, AND DESCRIPTION OF WORK TO BE PERFORMED
 - * DESIGN METHODS AND PROCEDURES TO BE USED
 - * INTERFACE CONTROLS NEEDED
 - * INTERNAL REVIEWS PLANNED
 - * LIST OF DELIVERABLES (DRAWINGS & SPECS)
 - * APPLICABLE PORTIONS OF QA PROGRAM
 - * SCHEDULE AND BUDGET
 - * ACCEPTANCE CRITERIA

DESIGN PROCESS

(CONTINUED)

- **INTERFACE CONTROL**
 - INVOLVES IDENTIFYING, DOCUMENTING AND TRACKING THE STATUS OF ALL INTERFACES
 - RESPONSIBILITY OF THE INTERFACE CONTROL WORKING GROUP (ICWG)

- **TWO TYPES OF INTERFACES**
 - **PHYSICAL INTERFACES**
THE PLACE WHERE TWO OR MORE SYSTEMS, STRUCTURES OR COMPONENTS INTERSECT
 - **ORGANIZATIONAL INTERFACES**
THE RELATIONSHIP BETWEEN TWO OR MORE ORGANIZATIONS WORKING ON IMPACTING PHYSICAL ITEM

- **INTERFACES MAY OCCUR SOLELY WITHIN THE D.O. (INTERNAL INTERFACES) OR MAY OCCUR WITH ANOTHER PARTICIPANT (EXTERNAL INTERFACES)**

DESIGN PROCESS

(CONTINUED)

● **DESIGN ANALYSIS**

- **DOCUMENTED RECORD OF HOW DESIGN INPUT IS TRANSLATED INTO DESIGN**
- **DOCUMENTED RECORD OF PROCESS USED IN MAKING ENGINEERING DECISIONS**
- **MAY CONSIST OF CALCULATIONS, TRADE STUDIES OR GENERAL STUDIES**
- **PERFORMED UNDER PARTICIPANTS PROCEDURES**

DESIGN PROCESS

(CONTINUED)

● **REVIEWS**

- **PROGRESS REVIEWS OF THE ESF DESIGN STUDY ARE CONDUCTED ON A WEEKLY BASIS**
- **MANAGEMENT REVIEWS WILL BE PERFORMED BY THE D.O. PRIOR TO THE COMPLETION OF EACH DESIGN PACKAGE**
- **DESIGN REVIEWS WILL BE PERFORMED BY THE D.O. UPON COMPLETION OF EACH DESIGN PACKAGE**

DESIGN PROCESS

(CONTINUED)

● DESIGN VERIFICATION

DESIGN CONTROL MEASURES WHICH ARE APPLIED
TO VERIFY THE ADEQUACY OF DESIGN (DURING TITLE II DESIGN)

ACCOMPLISHED BY ONE OR MORE OF FOUR ACCEPTABLE METHODS

- DESIGN REVIEW

PROPOSED METHOD OF VERIFICATION

- QUALIFICATION TESTS

PHYSICAL TESTING OF SYSTEMS, STRUCTURES OR COMPONENTS
TO VERIFY THE ENGINEERED DESIGN

- ALTERNATE CALCULATIONS AND ANALYSES

NEW CALCULATIONS AND ANALYSES ARE MADE USING ALTERNATE
METHODS TO VERIFY ORIGINAL CALCULATIONS OR ANALYSES

- PEER REVIEW

USED WHEN INDEPENDENT EXPERT JUDGEMENT IS NEEDED TO
VALIDATE TECHNICAL ADEQUACY OF DESIGN OR WHEN DATA OR
CONCLUSIONS CONTAINED IN A REPORT GO BEYOND EXISTING
STATE OF THE ART

DESIGN PROCESS

(CONTINUED)

● **DESIGN CHANGE CONTROL**

- **CHANGES TO DESIGN RELATED DOCUMENTS ARE PROCESSED USING SAME METHODS APPLIED TO PREPARATION OF ORIGINAL DOCUMENT**
- **CHANGES REVIEWED AND APPROVED BY ORGANIZATIONS THAT REVIEWED ORIGINAL DOCUMENT**
- **FIELD CHANGES WILL BE HANDLED BY A FIELD CHANGE CONTROL BOARD (CCB)**

DESIGN OUTPUTS

- **MAIN OUTPUT DOCUMENTS ARE CONSTRUCTION DRAWINGS AND SPECIFICATIONS**
- **AFTER VERIFICATION AND INTERNAL D.O. APPROVAL, THEY ARE TRANSMITTED TO P.O. FOR ACCEPTANCE**
- **FOLLOWING ACCEPTANCE BY P.O. THEY ARE PLACED UNDER PROJECT CHANGE CONTROL**

QA RECORDS

- **DOCUMENTATION TO BE COLLECTED, CONTROLLED, STORED AND MAINTAINED AS QA RECORDS SHALL CONSIST OF**
 - **ALL DESIGN INPUTS AND RELEVANT CORRESPONDENCE**
 - **ANALYSES**
 - **DRAWINGS, INCLUDING AS-BUILT VERSIONS**
 - **SPECIFICATIONS**
 - **APPROVED CHANGES TO DESIGN INPUTS ANALYSES, DRAWINGS AND SPECIFICATIONS**
 - **EVIDENCE OF DESIGN VERIFICATION**
 - **RECORDS CONFIRMING INTERFACE CONTROL**
 - **DOCUMENTATION OF DESIGN REVIEWS**