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**Civilian Radioactive Waste Management System
Management and Operating Contractor**

M & D S
DESIGN PROCESS GUIDELINES MANUAL

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1. PURPOSE

The purpose of this Design Process Manual is threefold.

First, to provide a roadmap of the Mined Geologic Disposal System (MGDS) design process to be used by the Design Organizations as well as others within the Management and Operating (M&O) Contractors having a management, oversight, control or support interface with the design process. The objective of this document is to describe the process, in sufficient detail, keyed to governing directives, so it can serve as a ready reference for anyone performing a design task or working in a design related function.

Second, to provide an accurate and self explanatory description of the MGDS design process to external organizations and agencies. It will describe the process and related governing directives in sufficient detail to serve as objective evidence that the Design Organization is:

- following a well understood, integrated and disciplined approach to design
- approaching this task in a structured manner, governed by the Quality Assurance Requirements and Description (QARD) and the baseline control process
- providing adequate design review and verification.

Third, to provide a basis for an internal training program to indoctrinate and refresh members of the Design Organization staff as well as any supporting the design effort. This manual provides a top level overview of the MGDS design process. The top level view is supported by detailed flowcharts and descriptions of each of the principle components in the subsequent sections, and will provide a simple tutorial on any given subset of the process.

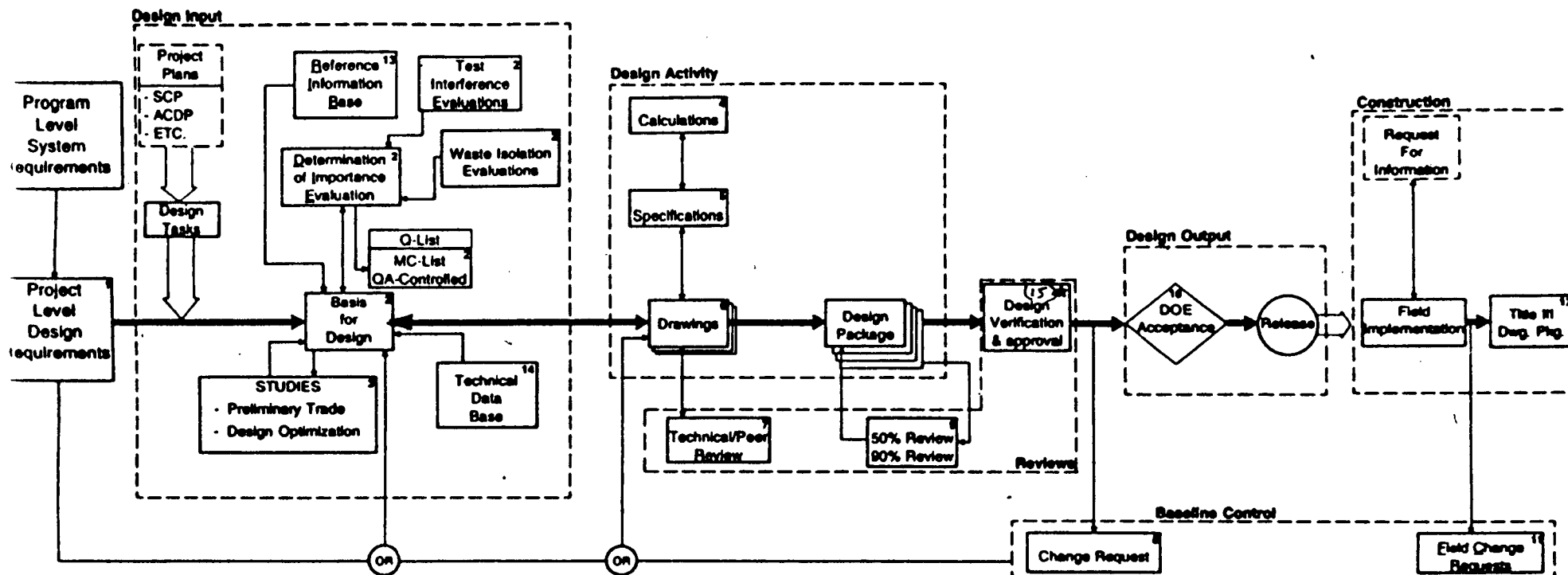
2. SCOPE

The scope of this manual is limited to the MGDS design process. It is specific in describing the process as it is actually performed, in depicting the relationships between the steps of the process, and in tracing each step to the documents that govern the performance of the task.

It is general in the sense that it describes, for MGDS design, "the way we do business." In that context it is applicable not only to the current Exploratory Studies Facility (ESF) design effort that is underway, but will be used for Repository, Waste Package, and Engineered Barrier System (EBS) designs as well.

This manual is not intended to replace the Quality Assurance Procedures (QAP) manual. Any discrepancies between these two manuals will defer to the QAP.

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS			
(1)	QAP-3-1, QAP-3-5, AP-6.1Q	(8)	QAP-3-4
(2)	QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6.17Q, YMP/82-1	(9)	QAP-3-1, QAP-3-14
(3)	QAP-3-5	(10)	AP-3.3Q, AP-6.1Q, BTP-EDD-002, OMP-03-08, YMP/83-08
(4)	QAP-3-9, QAP-6-1, QAP-17-1	(11)	AP-3.5Q, NLP-3-10
(5)	QAP-6-1, QAP-17-1, QAP-3-11	(12)	AP-3.3Q, AP-3-7Q, AP-5.24Q, OMP-03-08, AP-5.21Q
(6)	QAP-3-10, QAP-6-1, QAP-17-1	(13)	AP-5.3
(7)	QAP-3-1, QAP-3-3	(14)	AP-5.2Q
		(15)	QAP-3-2

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Currently QAP's 3-8, 3-10, & 3-11. Will be incorporated in QAP-3-2, October 88

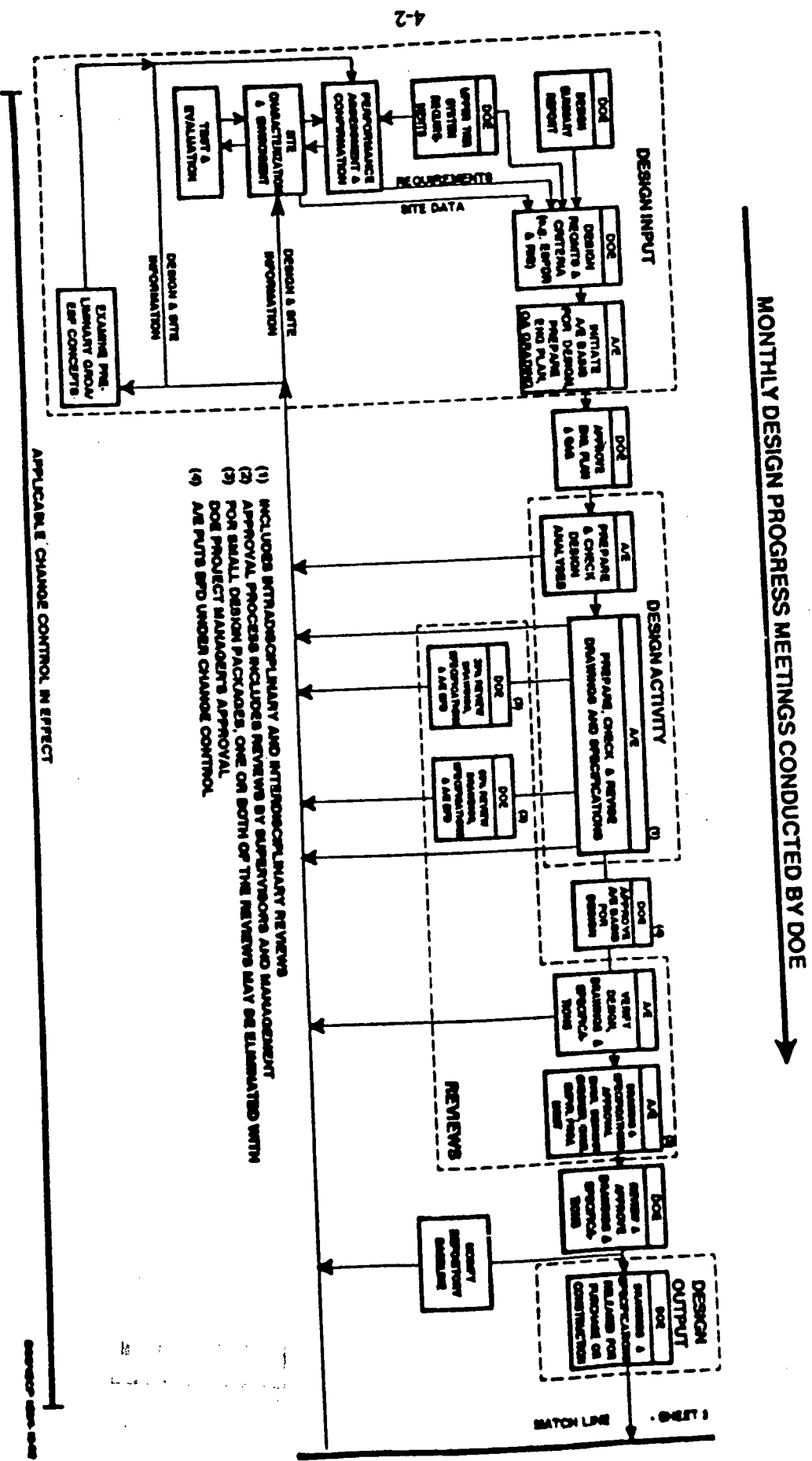


Figure 4-1. ESF Design Process Descriptions (sheet 1 of 2).

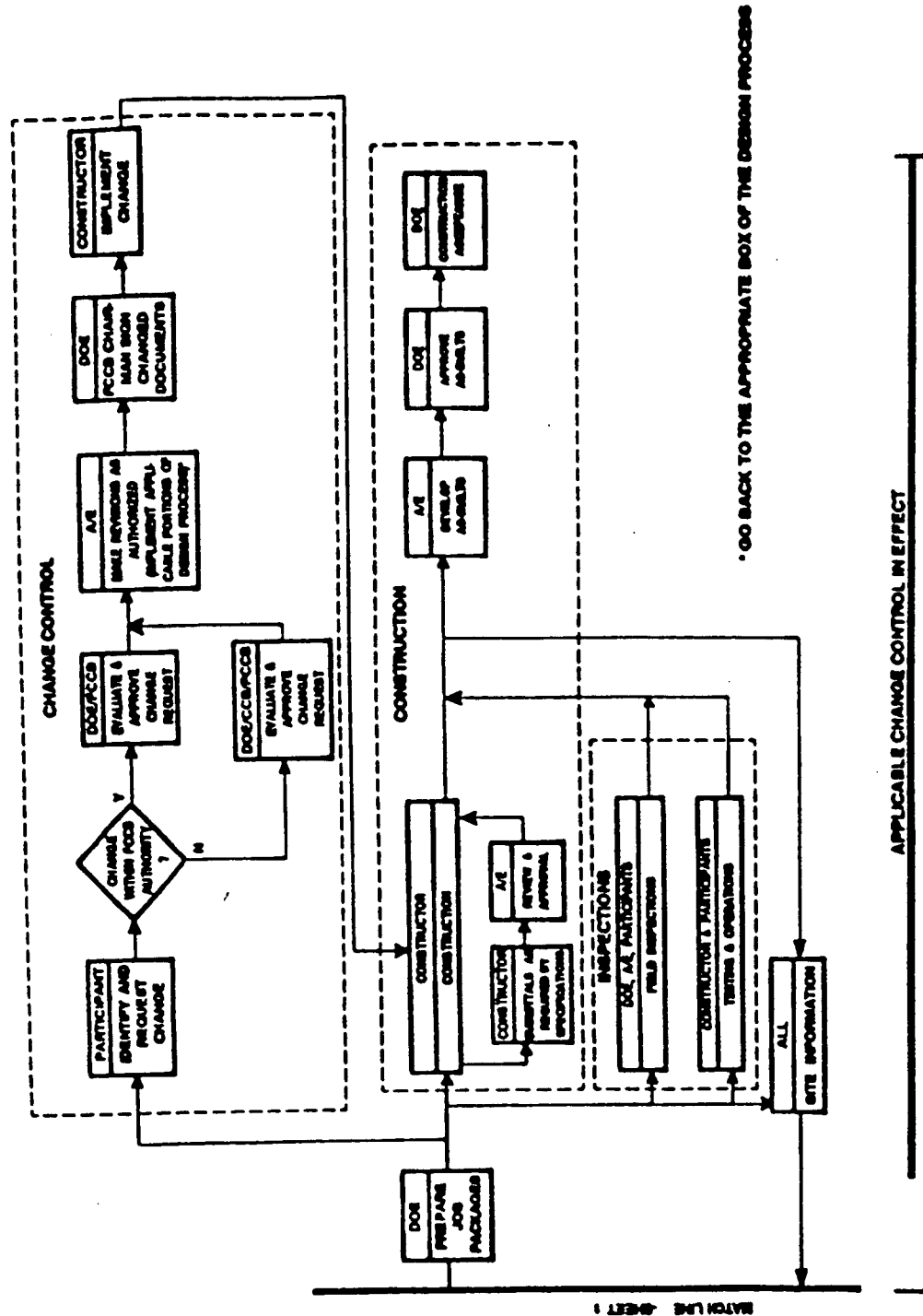
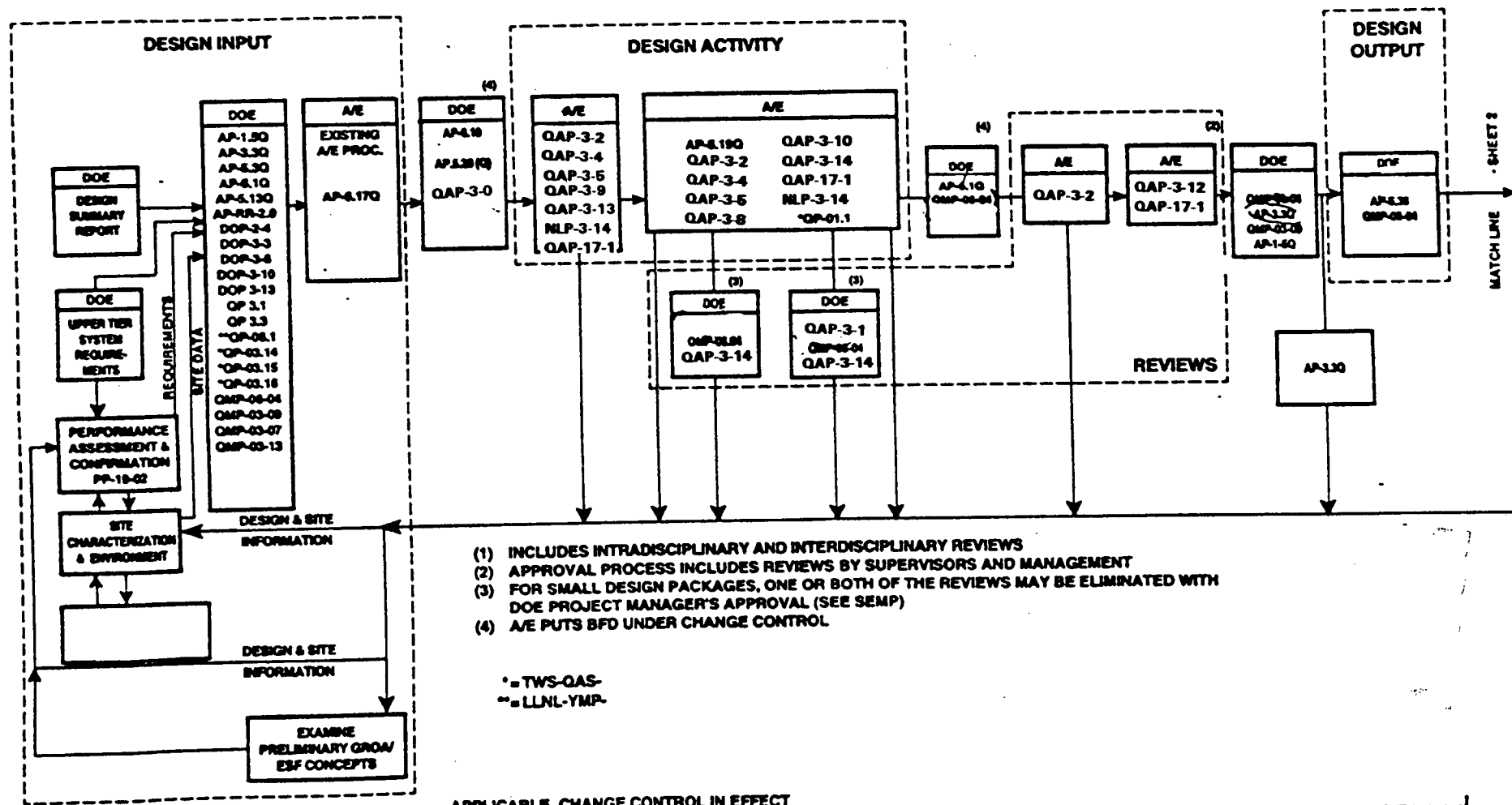


Figure 4-1. ESF Design Process Descriptions (sheet 2 of 2).

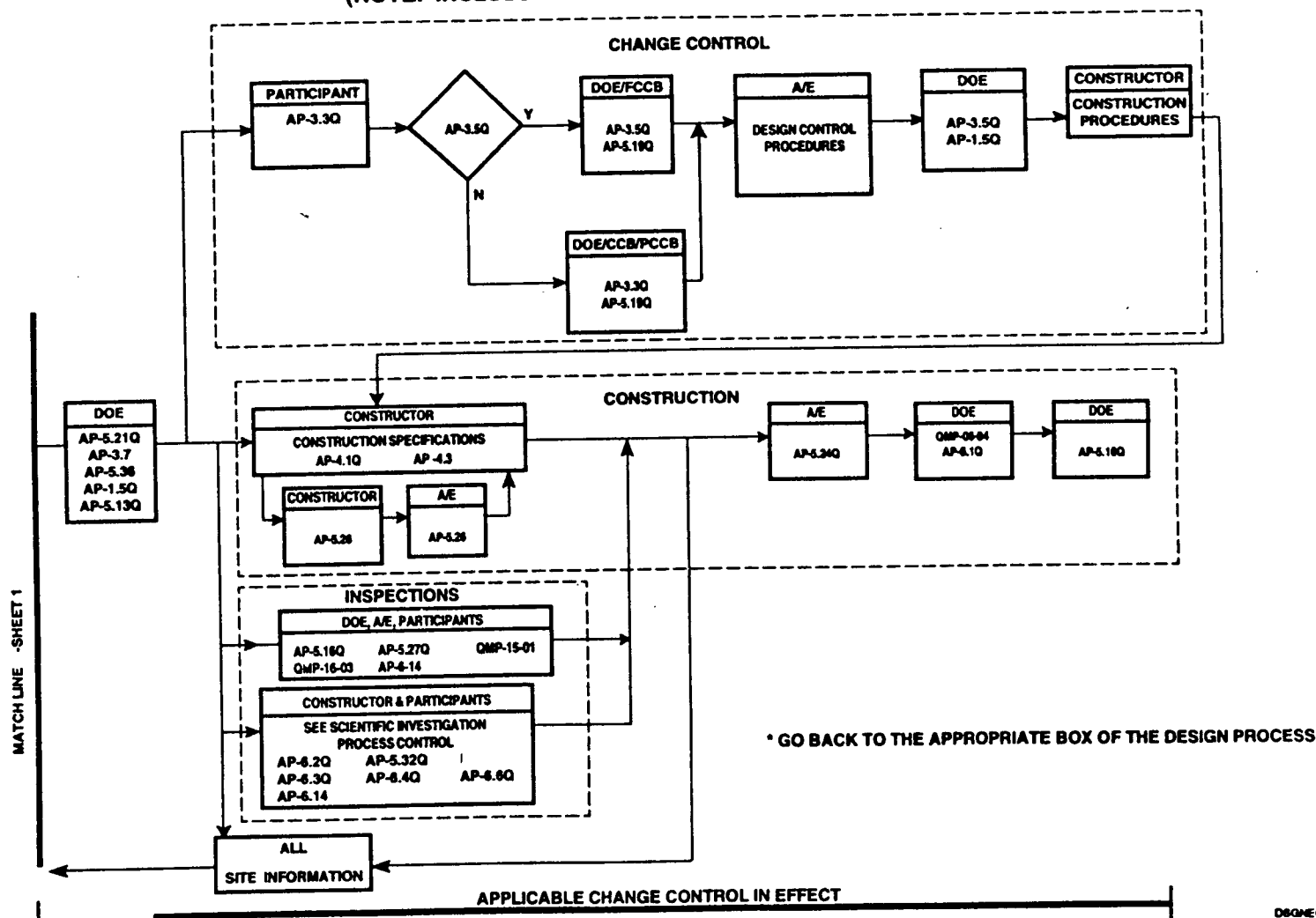
ESF TITLE II DESIGN PROCESS AS OF 9/91

MONTHLY DESIGN PROGRESS MEETINGS CONDUCTED BY DOE



ESF TITLE II DESIGN PROCESS

(NOTE: INCLUDES TITLE III & CONSTRUCTION ACTIVITIES)



3. ORGANIZATIONAL RESPONSIBILITIES AND INTERFACES

The MGDS Development (MGDS) organization is comprised of three major design groups; Subsurface Design, Surface Design and Waste Package Development. The MGDS organization has direct and indirect interfaces with several organizations on the project including the U.S. Department of Energy (DOE), Reynolds Electrical and Engineering, Company, Inc. (REECo), Systems Engineering, Configuration Management, Construction Management, Project Engineering and Quality Assurance.

The organization charts and responsibilities for the three design organizations are included as Attachments 3.1-3.5. Each chart provides a work scope breakdown and identifies primary and support responsibilities for Advanced Conceptual Design (ACD) and ESF. The responsibilities for License Application Design (LAD) will be similar as those for ACD.

Interfaces with DOE occur on a regular basis in a normal client/contractor arrangement. The Project Engineering group integrates this interface when issues involve multiple participants.

Interfaces with REECo are more indirect, usually integrated by Project Engineering and/or Construction Management.

Systems Engineering supports MGDS in the areas of Determination of Importance Evaluation (DIE) and specialty engineering functions. Systems Engineering identifies the requirements for the MGDS design in the requirements documents and work with the design organization to ensure all requirements are included. The MGDS engineers and designers must work directly with systems engineering personnel.

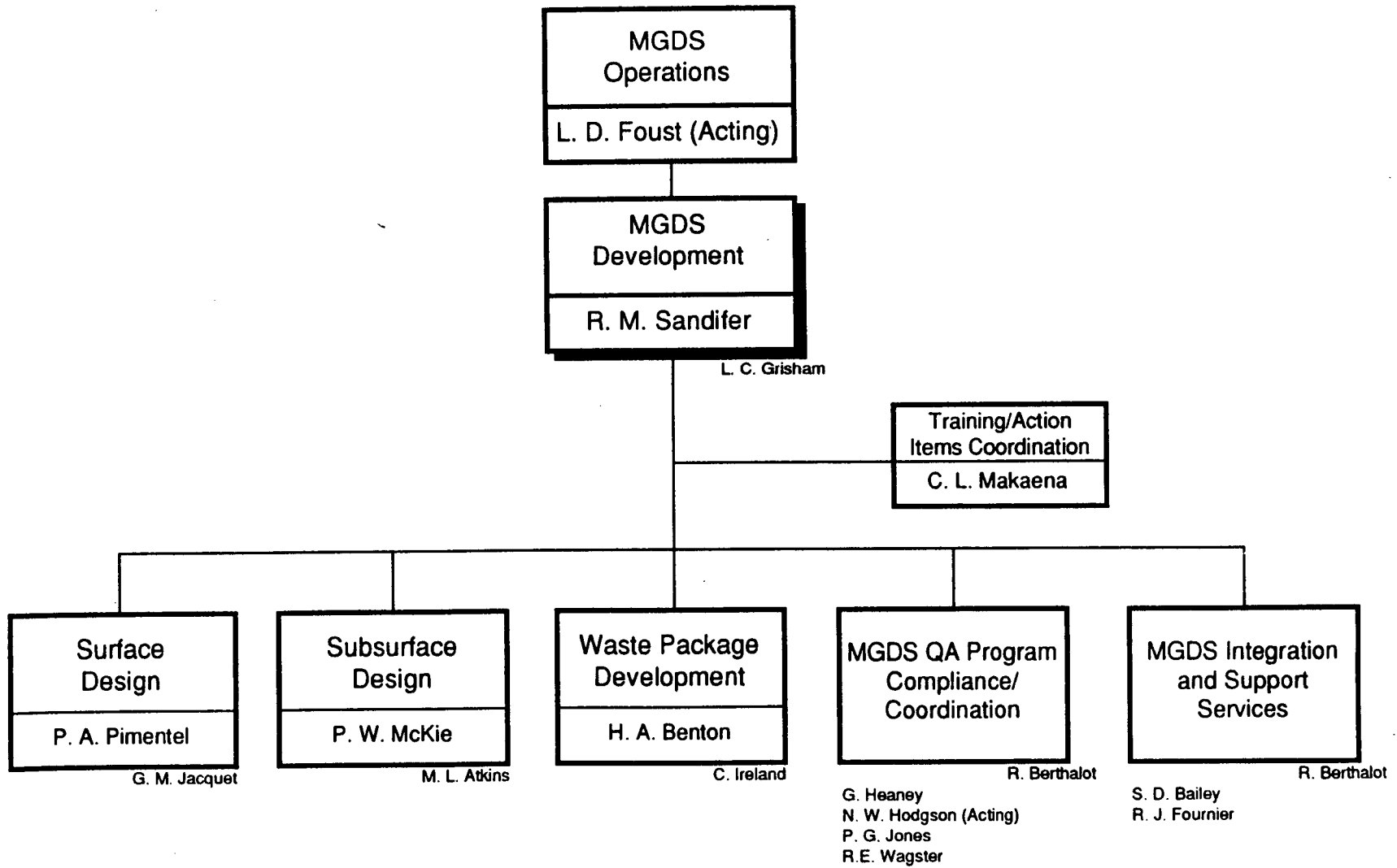
Configuration Management assists MGDS in baseline control, including Change Control Board (CCB) and Field Change Control Board (FCCB) actions. The baseline control is for both Level 2 (Yucca Mountain Site Characterization Project (YMP)) and Level 3 (M&O) documents. QAP-3-4, YMP Procedures AP-3.3Q and AP-3.5Q, address configuration management.

Quality Assurance (QA) performs surveillances and audits of the work performed by MGDS. QA also reviews and approves design documents prepared by MGDS. Verbatim compliance with the QA program is mandatory, therefore, the MGDS design organization must work closely with QA throughout the design process.

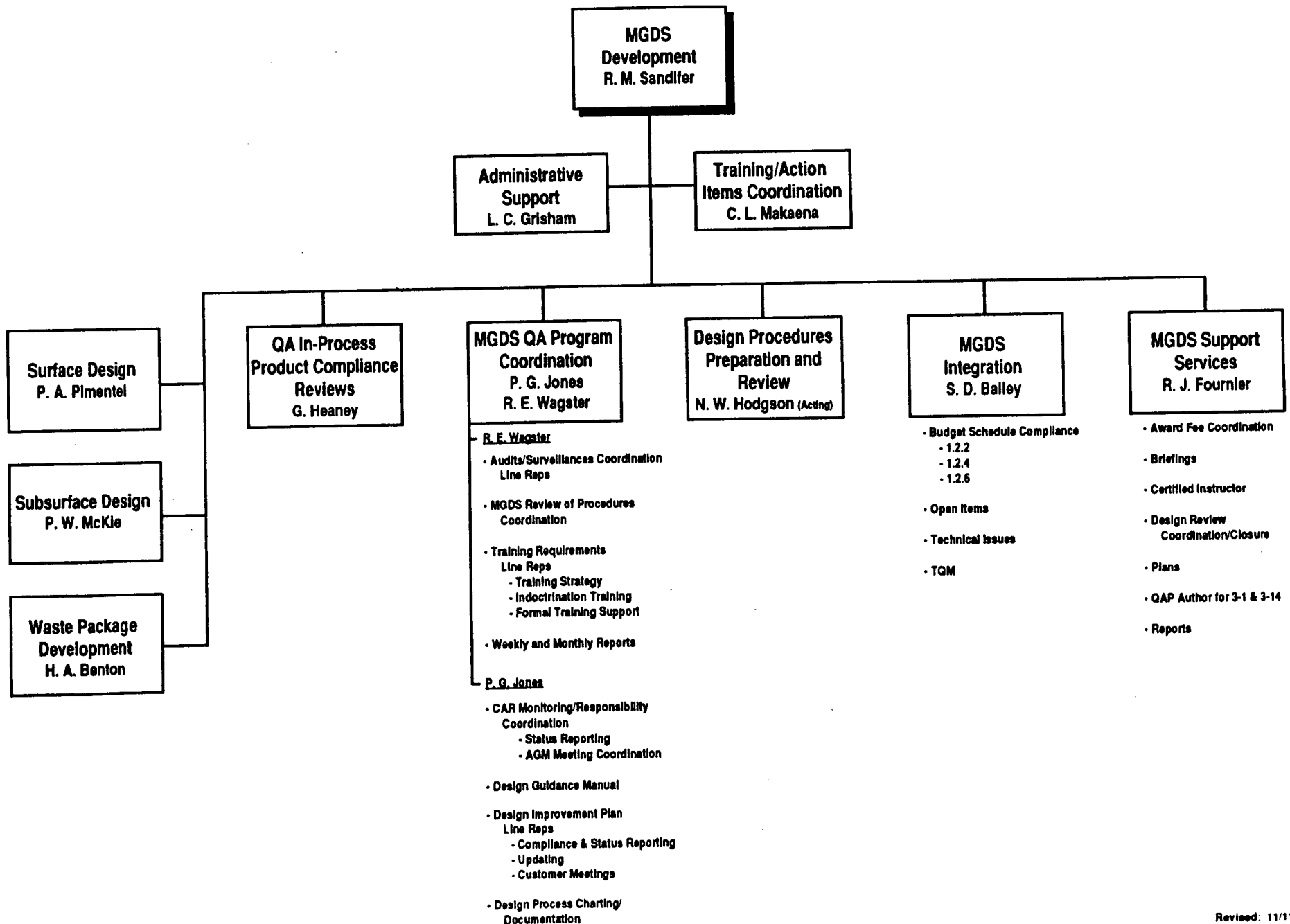
Construction Management provides a linkage between MGDS and the constructor. The two groups work closely together to integrate schedules and verify estimates for work to be accomplished.

Project Engineering provides the integration for work that affects multiple participants. MGDS is a participant, similar to Los Alamos National Laboratory. Project Engineering essentially is an extension for the DOE YMP organization.

MGDS DEVELOPMENT



MGDS Development Responsibilities



A. The major responsibilities and ACD work scope of the Waste Package Design team are as follows:

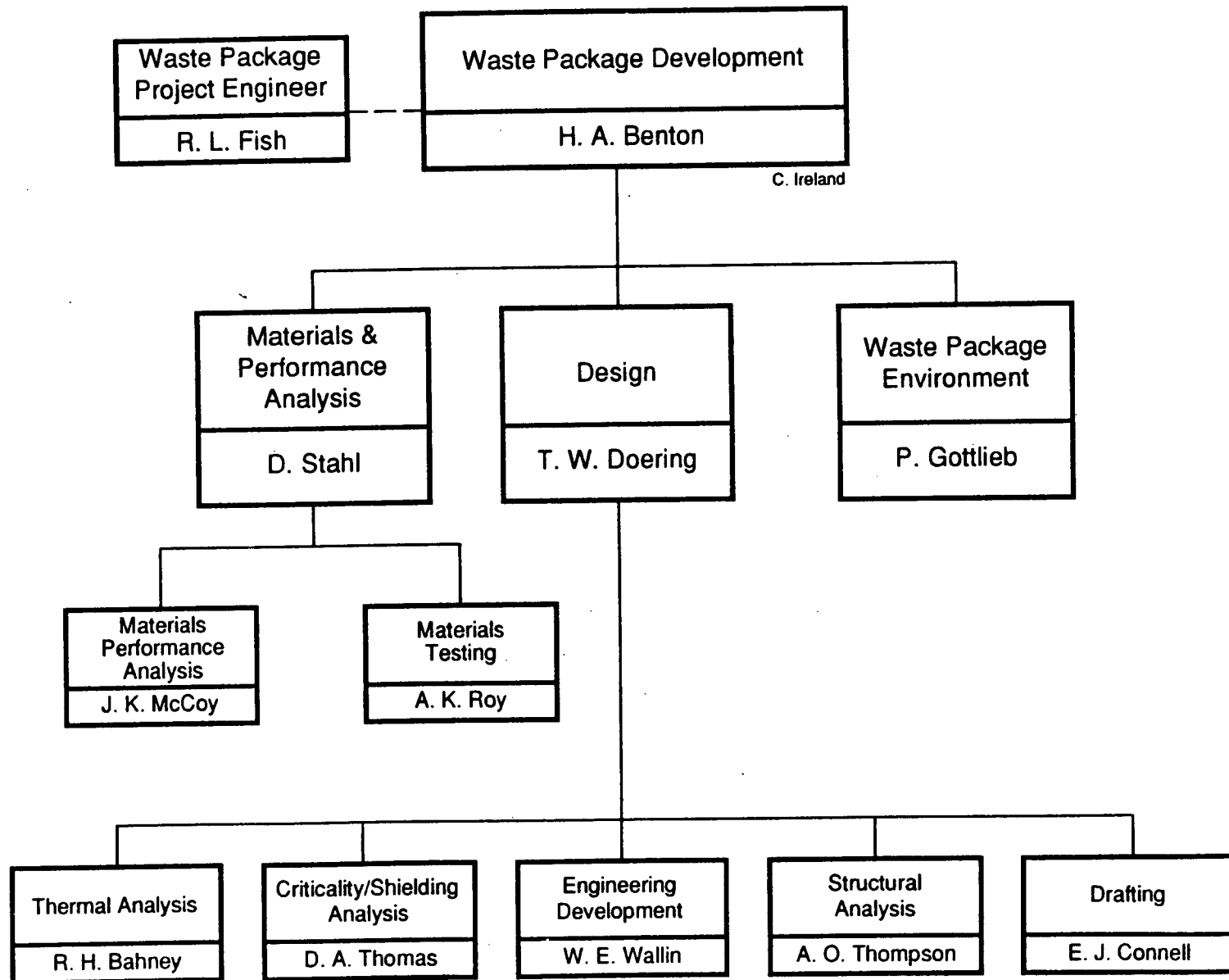
- Waste Package design
- Development of the criteria for sealing (including welding) and testing
- Analyses and evaluations of metallic and non-metallic materials testing for waste package
- Specification of Waste Package requirements for the near-field environment
- Waste form
- Analyses of performance of Waste Package components after emplacement.

WASTE PACKAGE DESIGN

S = Surface/SS = Subsurface

<u>Analyses of Waste Package Design concepts</u>	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
Thermal	WP	SS	
Criticality	WP		
Shielding	WP	S	SS
Structural	WP	S	SS
Capacity	WP	S	SS
Weight/Size	WP	S	SS
Material Selection	WP	S	SS
Container Closure Methods	WP	S	
NDE methods	WP	S	
Component Fabrication	WP		
Testing of Components	WP	S	
Testing of Prototypes	WP	S	SS
Equipment/Facility Design Lead for Testing	S	WP	
Interface Analyses	WP	S	SS

WASTE PACKAGE ORGANIZATION



SITE DEVELOPMENT

S = Surface/SS = Subsurface

Central Surface Facilities

	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
Access Roads	S	SS	
Site Preparation and Improvements	S		
Staging Areas	S		
Parking Areas	S		
Material Storage Areas	S		
Railroad Spurs	S	SS	
Site Drainage and Flood Control	S		
Temporary Facilities	S	SS	
Excavated Material Storage Site	S	SS	

Offsite

Helipad	SS		
Roads	SS	S	
Railroads	SS	S	

UTILITIES

Central Surface Facilities

Power Distribution	S	SS	
Water Distribution	S	SS	
Sanitary System	S		
Communication System	S	SS	
Compressed Air System	S		

Offsite

Power Supply	SS	S	
Water Supply	SS	S	
Communications	SS	S	

B. The major responsibilities and ACD work scope of the Repository Surface Design team are as follows:

- Surface facilities, equipment, layouts, and site improvements within the Geologic Repository Operations Area (GROA), the General Support Facilities Area (GSFA), and the Waste Receiving and Inspection Area (WRIA)
- Utilities within the Central Surface Facilities (includes the GROA, GSFA, and WRIA)
- Facilities and equipment for receiving waste, packaging waste in waste packages, sealing waste packages, and loading waste packages on transporter.

SURFACE FACILITIES DESIGN

S = Surface/SS = Subsurface

<u>Geologic Repository Operations Area</u>	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
Waste Handling Building	S	WP	
Performance Confirmation Building	S	WP	
Waste Treatment Building	S		
Decontamination Building	S		
Waste Operations Area Garage	S		
Security and Health Physics Stations	S		
Vehicle Wash Facility	S		
Site Arrangement	S		

S = Surface/SS = Subsurface

General Support Facilities Area

	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
Central Warehouse	S		
Mock-up Building	S		
Medical Center	S		
Fire Station	S		
Utility Electrical Substation	S	SS	
Administration/Cafeteria/Training Building	S		
Computer Building	S		
Motor Pool and Service Station	S		
Machine/Maintenance Shops	S		
Main Electrical Substation and Standby Generator Building	S	SS	
Security Station	S		
Visitors Center	S		
Site Arrangement	S		

Waste Receiving and Inspection Area

Security Station	S
Site Arrangement	S

C. The major responsibilities and ACD work scope of the Repository Subsurface Design team are as follows:

- All subsurface facilities and subsurface layouts
- Roads, railroads, and site improvements outside the Central Surface Facilities
- Utilities outside the Central Surface Facilities
- Subsurface related surface facilities (i.e., mine warehouse, mine shops, mined waste disposal)
- Waste Package transport and retrieval equipment
- Backfill and Seals.

SUBSURFACE FACILITIES DESIGN

S = Surface/SS = Subsurface

<u>Shaft and Ramp Facilities</u>	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
Waste Ramp	SS		
Tuff Ramp	SS		
Men and Materials Shaft	SS		
Ventilation Shafts	SS		
<u>Other Facilities</u>			
Waste Emplacement Area Shop	SS		
Development Area Shop	SS		
Training Area	SS		
Performance Confirmation Area	SS		
<u>Subsurface Equipment</u>			
Subsurface Development	SS		
Subsurface Operation	SS		
Waste Transport, Emplacement, and Retrieval	SS	WP	
Backfill and Closure	SS	WP	
<u>Subsurface Facilities</u>	SS	WP	
Emplacement Drifts and Boreholes	SS	WP	

SUBSURFACE FACILITIES DESIGN

S = Surface/SSSubsurface

	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
<u>Subsurface Backfilling and Sealing</u>	SS	WP	
<u>Support Systems</u>			
Power Distribution	SS	S	
Communications	SS	S	
Lighting	SS	S	
Subsurface Ventilation	SS	S	
Water Distribution	SS	S	
Subsurface Waste Water Collection System	SS	S	
Compressed Air Distribution	SS	S	
Fire Protection	SS	S	
Rock Handling	SS	S	
Sanitary Facilities	SS	S	
Monitoring and Warning System	SS	S	
Integrated Data System	S	SS	

D. The responsibilities of the ~~Surface and~~ Subsurface ESF Design Groups are as follows:

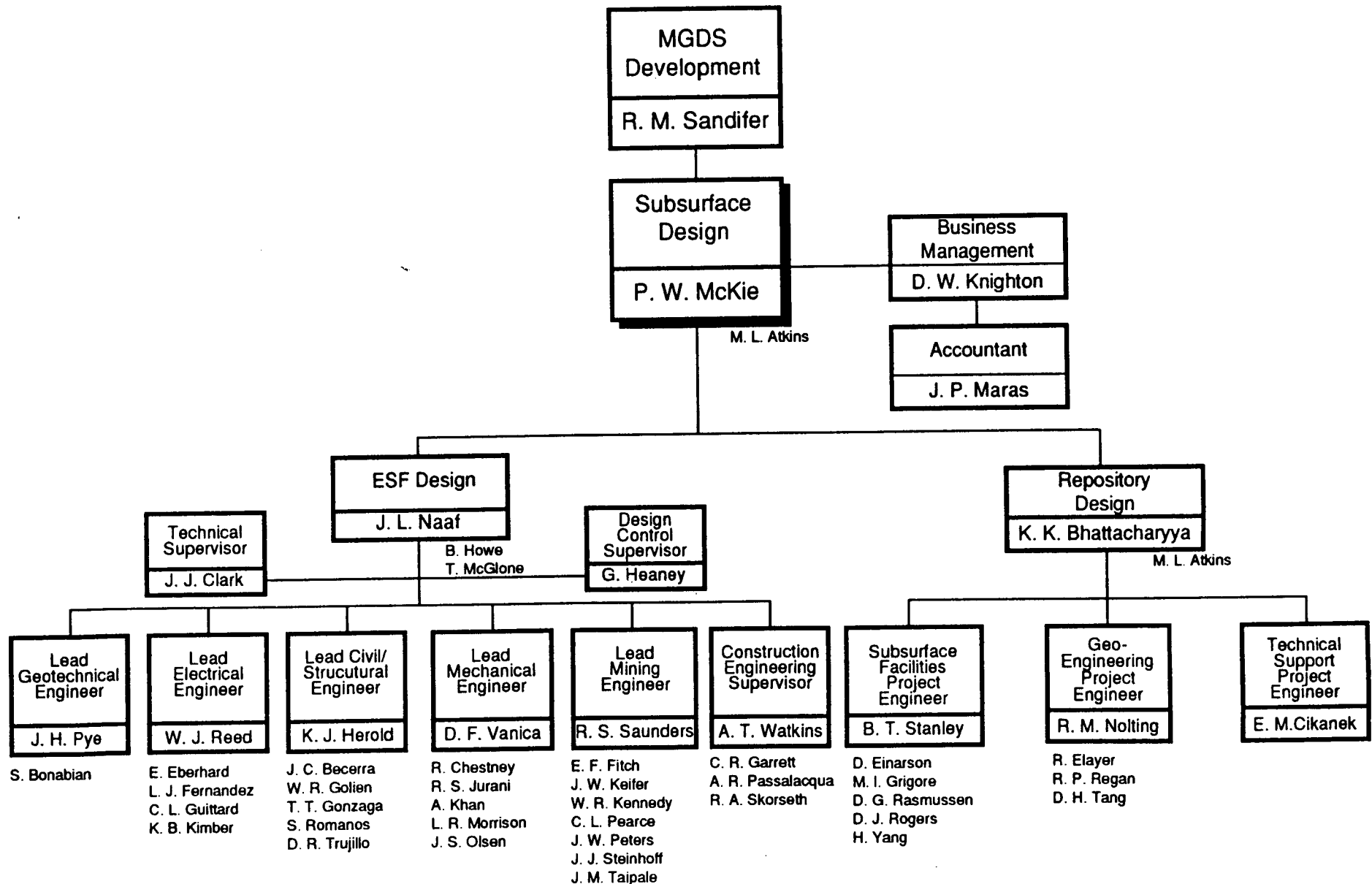
- ~~Surface Design Organization~~
 - ~~Surface facilities within the GROA and surface facilities boundary~~
 - ~~Overall surface layout within the GROA and surface facilities boundary~~
 - ~~Utilities for subsurface systems from supply to the prime consumer (i.e., motor, distribution system)~~
- Subsurface Design Organization
 - All subsurface facilities and subsurface layouts
 - Surface facilities in support of subsurface through consumer
 - Roads, railroads, utilities outside the GROA and surface facilities boundary

SITE PREPARATION

S = Surface/SS = Subsurface

<u>Access Roads</u>	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
TS North Portal Access Road (Drill Hole Wash Road)	S		
South Portal Access Road	S		
Optional Shaft Collar Site Access Road	S		
Explosives Storage Road	S	SS	
Excavated Materials (rock) Conveyor Service Road	S	SS	
Water Tank Access Raods	S		
<u>Main and Auxiliary Sites</u>			
TS North Portal Main Site	S		
TS South Portal Main Site	S		
Optional Shaft Collar Site	S		
Auxiliary Sites			
Booster Pump Station Site	S		
Batch Plant and Aggregate Stockpile Site	S		
Topsoil Storage Site	S		
Excavated Materials (rock) Stockpile Site	S	SS	
Explosives Storage Site	S	SS	
Water Tanks Sites	S		
<u>Site Drainage</u>	S		

SUBSURFACE DESIGN



D. The responsibilities of the Surface ~~and Subsurface~~ ESF Design Groups are as follows:

- Surface Design Organization
 - Surface facilities within the GROA and surface facilities boundary
 - Overall surface layout within the GROA and surface facilities boundary
 - Utilities for subsurface systems from supply to the prime consumer (i.e., motor, distribution system)
- ~~• Subsurface Design Organization

 - All subsurface facilities and subsurface layouts
 - Surface facilities in support of subsurface through consumer
 - Roads, railroads, utilities outside the GROA and surface facilities boundary~~

SITE PREPARATION

S = Surface/SS = Subsurface

<u>Access Roads</u>	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
TS North Portal Access Road (Drill Hole Wash Road)	S		
South Portal Access Road	S		
Optional Shaft Collar Site Access Road	S		
Explosives Storage Road	S	SS	
Excavated Materials (rock) Conveyor Service Road	S	SS	
Water Tank Access Raods	S		
<u>Main and Auxiliary Sites</u>			
TS North Portal Main Site	S		
TS South Portal Main Site	S		
Optional Shaft Collar Site	S		
Auxiliary Sites			
Booster Pump Station Site	S		
Batch Plant and Aggregate Stockpile Site	S		
Topsoil Storage Site	S		
Excavated Materials (rock) Stockpile Site	S	SS	
Explosives Storage Site	S	SS	
Water Tanks Sites	S		
<u>Site Drainage</u>	S		

SURFACE FACILITIES

S = Surface/SS = Subsurface

	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
<u>Ventilation System</u>	S		
<u>TS North Portal</u>			
Test Support Building	S		
Change House	S		
Shop/Warehouse	S		
Main Warehouse	S		
Surface Data Building	S		
Portal Control Center	S		
Electrical Substation Control Building	S		
Electrical Switchgear Building	S		
Microwave Tower Building	S		
Conveyor Transfer Tower	SS	S	
<u>TS South Portal</u>			
Change House	S		
Shop/Warehouse	S		
Portal Control Center	S		
Electrical Substation Control Building	S		
Electrical Switchgear Building	S		
Airlock Building	SS		
Conveyor Drive and Transfer Building	SS	S	
Microwave Tower Building	S		
Ventilation Fan Hydraulic Control Building	SS	S	
<u>Optional Shaft Collar</u>			
Change House	S		
Hoist House	SS		
Headframe	SS		
Trailer Office Facility	S		

SURFACE FACILITIES

S = Surface/SS = Subsurface

	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
Electrical Substation Control Building (Combined with Electrical Switchgear Building)	S		
Microwave Tower Building	S		
<u>Miscellaneous Facilities</u>			
Temporary Facilities	S		
Material Storage Areas	S		
Staging Areas	S		
Parking Areas	S		
Site Security	S		

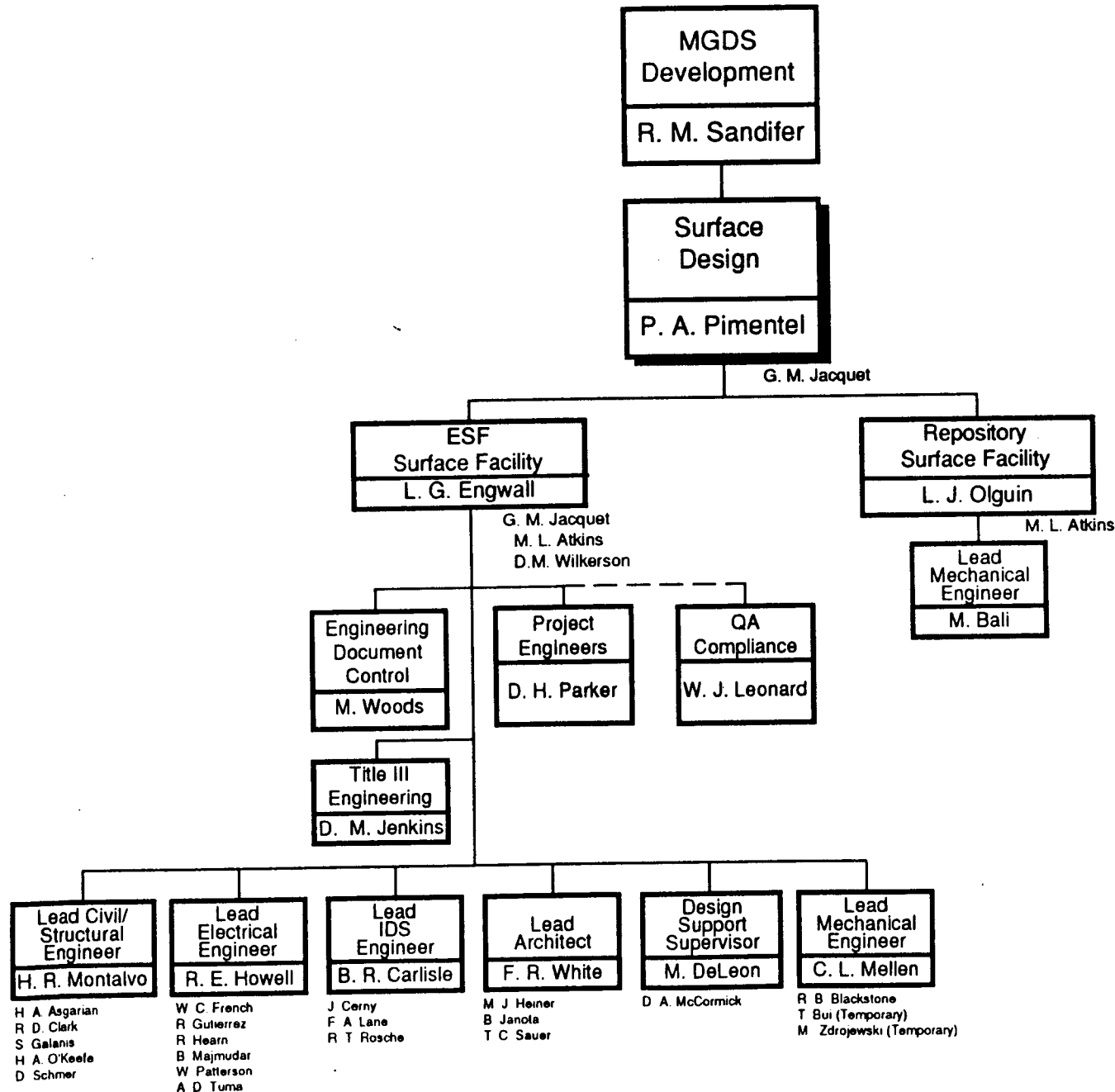
SURFACE UTILITIES

<u>Power Distribution</u>	S		
<u>Water Distribution</u>	S		
<u>Sanitary System</u>	S		
<u>Communication System</u>	S		
<u>Waste Water Disposal System</u>	S		
<u>Compressed Air System</u>	S		

OFFSITE UTILITY/TRANSPORTATION SUPPLY (REPOSITORY)

<u>Power</u>	SS		
<u>Water</u>	SS		
<u>Communications</u>	SS		
<u>Etc.</u>	SS		
<u>Roads/Railroads</u>	SS	S	

SURFACE DESIGN



SURFACE FACILITIES

S = Surface/SS = Subsurface

	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
Electrical Substation Control Building (Combined with Electrical Switchgear Building)	S		
Microwave Tower Building	S		
<u>Miscellaneous Facilities</u>			
Temporary Facilities	S		
Material Storage Areas	S		
Staging Areas	S		
Parking Areas	S		
Site Security	S		

SURFACE UTILITIES

<u>Power Distribution</u>	S
<u>Water Distribution</u>	S
<u>Sanitary System</u>	S
<u>Communication System</u>	S
<u>Waste Water Disposal System</u>	S
<u>Compressed Air System</u>	S

OFFSITE UTILITY/TRANSPORTATION SUPPLY (REPOSITORY)

<u>Power</u>	SS	
<u>Water</u>	SS	
<u>Communications</u>	SS	
<u>Etc.</u>	SS	
<u>Roads/Railroads</u>	SS	S

ESF RAMP ACCESS

S = Surface/SS = Subsurface

TS North Portal

Lead

Interfaces

Support

Rock Support/Ramp Reinforcement	SS
TS North Ramp Stations	SS
TS North Ramp Roadways (In Ramp)	SS
TS North Ramp Furnishings	SS
TBM Excavation, TS or CH North Ramp	SS

TS South Portal

Rock Support/Ramp Reinforcement	SS
TS South Ramp Stations	SS
TS South Ramp Roadways	SS
TS South Ramp Furnishings	SS
TBM Excavation, TS or CH South Ramp	SS

OPTIONAL SHAFT

SS

UNDERGROUND EXCAVATIONS

Ramps

SS

TS/CH Intersections

SS

TS Level

TS Main Drift	SS
TS Main Test Area	SS
TS Exploratory Drifts	SS

CH Level

CH Main Drift	SS
CH Exploratory Drifts	SS
CH Level Underground Operations	SS

UNDERGROUND SUPPORT SYSTEMS

S = Surface/SS = Subsurface

	<u>Lead</u>	<u>Interfaces</u>	<u>Support</u>
<u>Power Distribution Systems</u>	SS	S	
<u>Communications Systems</u>			
Life Safety Monitoring and Alarm Systems	SS	S	
Environmental Monitoring and Alarm System	SS	S	
Conduit and Cable Tray Arrangement	SS	S	
<u>Lighting System</u>	SS	S	

UG SUPPORT

Ventilation Distribution System

Airflow and Distribution	SS	S
Primary and Auxiliary Fans	SS	S
Dust Control	SS	S
Heating and Cooling	SS	S
Control and Monitoring	SS	S
Temporary Ventilation During Early Development	SS	S
Preliminary Acceptance Test	SS	S

Water Distribution

SS S

Underground Waste Water Collection System

SS S

Compressed Air Distribution System

SS S

Fire Protection System

SS S

Rock Handling System

SS S

Sanitary Facilities

SS S

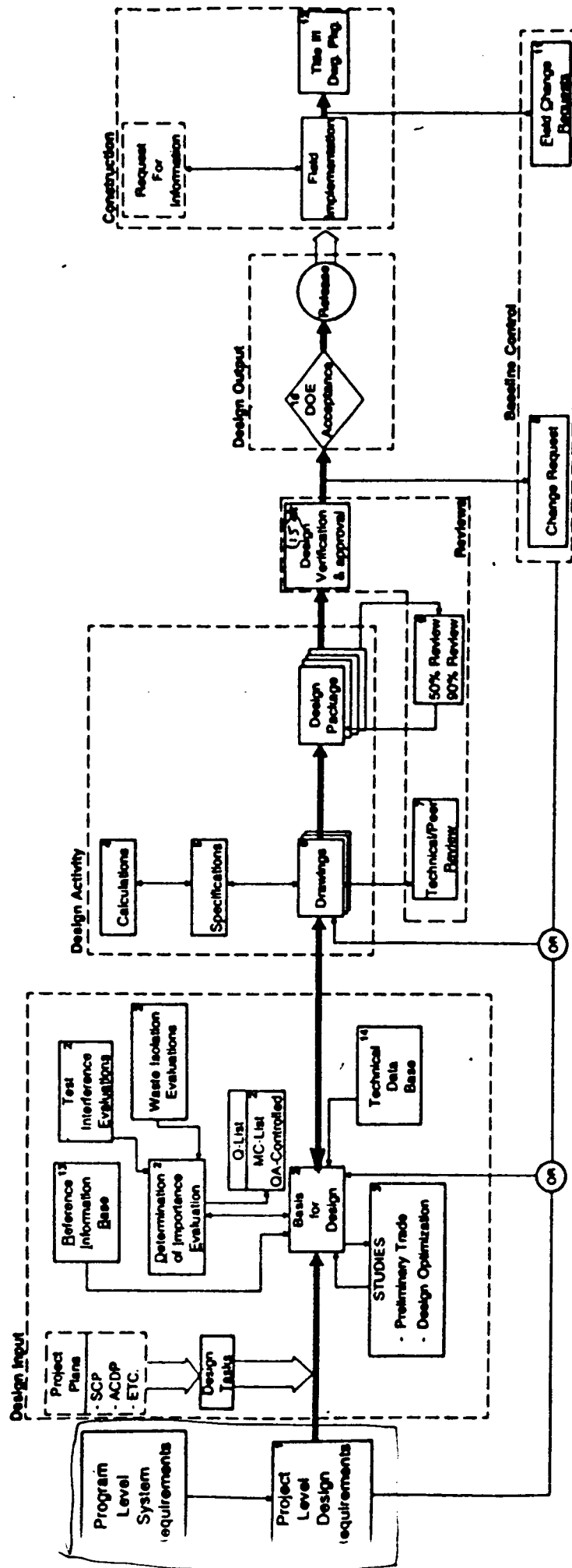
Monitoring and Warning System

SS S

Integrated Data System (IDS)

S SS

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS

(1)	QAP-3-1, QAP-3-5, AP-6-10	(8)	QAP-3-4
(2)	QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6-17Q, YMP/R2-1	(9)	QAP-3-1, QAP-3-14
(3)	QAP-3-6	(10)	AP-3-3Q, AP-6-10, BTP-EDD-002, OMP-03-09, YMP/R2-08
(4)	QAP-3-9, QAP-6-1, QAP-17-1	(11)	AP-3-5Q, NLP-3-10
(5)	QAP-6-1, QAP-17-1, QAP-3-11	(12)	AP-3-3Q, AP-3-7Q, AP-6-24Q, OMP-03-09, AP-5-21Q
(6)	QAP-3-10, QAP-6-1, QAP-17-1	(13)	AP-5-3
(7)	QAP-3-1, QAP-3-3	(14)	AP-5-2Q
★		(15)	QAP-3-2

Currently QAP's 3-9, 3-10, & 3-11. Will be incorporated in QAP-3-2, October 88.

5. REQUIREMENTS DEVELOPMENT

The technical document hierarchy for the MGDS has been established in the OCRWM Program Management System Manual (PMSM). It includes the hierarchy of technical documents, including requirements documents, that address the variety of CRWMS technical requirements that are found in various Federal regulations, DOE directives, and other government documentation. These requirements documents establish the design basis for definition of MGDS by completing the requirements allocation and specification process by allocating requirements to these segments: Site, Repository, and Engineered Barrier.

The MGDS requirements document hierarchy consists of the following documents, with the indicated hierarchy (Attachment 5.1):

- Mined Geologic Disposal System Requirements Document (MGDSRD)
- Repository Design Requirements Document (RDRD)
- Engineered Barrier Design Requirements Document (EBDRD)
- Site Design and Test Requirements Document (SDTRD)
- Exploratory Studies Facility Design Requirements Document (ESFDRD)
- Surface-Based Testing Facilities Requirements Document (SDTFRD)

5.1 REQUIREMENTS DOCUMENTS

5.1.1 The MGDSRD

The MGDSRD describes the functions to be performed by, and the requirements for the MGDS for the permanent disposal of high-level nuclear waste. This requirements document defines the system-level requirements for the design of the Repository, Engineered Barrier, and Site segments. These requirements include design, operation, and decommissioning requirements to the extent they impact the physical development of the MGDS. The MGDSRD also presents an overall description of the MGDS, its functions, its segments, the requirements allocated to the segments. Additionally, the program-level interface requirements of the MGDS are identified.

5.1.2 The RDRD

The RDRD defines the project-level requirements for the design of a repository segment consistent with the MGDSRD. These requirements include design, operation, and decommissioning requirements to the extent that they impact the physical design and development of the repository. The RDRD also presents an overall description of the repository segment and its functions. Additionally, the project-level interfaces of the repository segment are identified. The RDRD provides the technical baseline for the repository design which must be consistent with the requirements in the RDRD.

5.1.3 The EBDRD

The EBDRD describes the functions to be performed and establishes the requirements for the engineered barrier segment, whose primary function is to isolate waste, first by containing waste within the waste package and then, together with the geologic setting, isolating high-level waste from the accessible environment. The requirements for the engineered barrier segment are derived from the requirements contained in the MGDSRD. The EBDRD allocates the requirements from the MGDSRD, expands and interprets those requirements, and defines the segment/component level requirements for the design of the engineered barrier segment. In addition, the interface requirements of the engineered barrier segment to geologic setting, site segment, repository segment, waste acceptance, and transportation are defined.

5.1.4 The SDTRD

The SDTRD establishes the functional descriptions and performance requirements for all site characterization activities. The SDTRD presents an overall description of the site segment and its function, based on the functional analysis documented by the MGDSRD. The site characterization program requirements for investigations, studies, and activities are established and presented in the form of objectives. Design requirements for test support and other facilities are established in this document and are allocated to the ESF and the Surface-Based Testing Facilities (SBTD) in the ESFDRD and the SBTFRD. The SDTRD is also the parent document for the Test Requirements Document (TRD), whose scope and contents are to be determined. Additionally, the interface requirements of the site segment to the engineered barrier segment, site segment, and repository segment are defined.

5.1.5 The ESFDRD

The ESFDRD establishes requirements and constraints imposed on the development of the design for the ESF. This requirements document establishes the design requirements for facilities, underground openings, utilities, and services required by the ESF to support the subsurface *in situ* tests specified in the SDTRD. The ESFDRD includes requirements for both surface and underground construction, utilities, and services.

5.1.6 The SBTFRD

The SBTFRD establishes the requirements and basic constraints imposed on the development of the SBTD in support of site characterization at Yucca Mountain. The surface-based testing activities will include sampling and testing to be carried out on the ground surface. This document identifies requirements for facilities needed to support these activities, as well as any other surface-based activity that may affect the geologic or waste isolation characteristics of the site. This document also presents a description of the SBTF, its functions, its subsystems/components, and the requirements for the subsystems.

5.2 REQUIREMENTS DOCUMENT DEVELOPMENT

The development of the requirements document is subject to QA requirements, and several QA procedures are used during design requirements documents development. Following functional and requirements analyses activities, QAP 3.5, Technical Document Preparation, is used for the initial document development. As required by QAP 3.5, a technical document preparation plan (TDPP) is created to guide the development of the technical requirements documents. The TDPP specifies the objective and scope of the requirements document, provides a description of the requirements document, and provides a schedule for the preparation, review, and issuance of the requirements document.

Review of the requirements documents is governed by YMP QAP 6.2, Document Review, which provides a process for the review of the technical documents and resolution of review comments. This procedure provides guidelines for initiating the review process, performing the review, obtaining comment resolution, selection of reviewers, and supporting the CCB review.

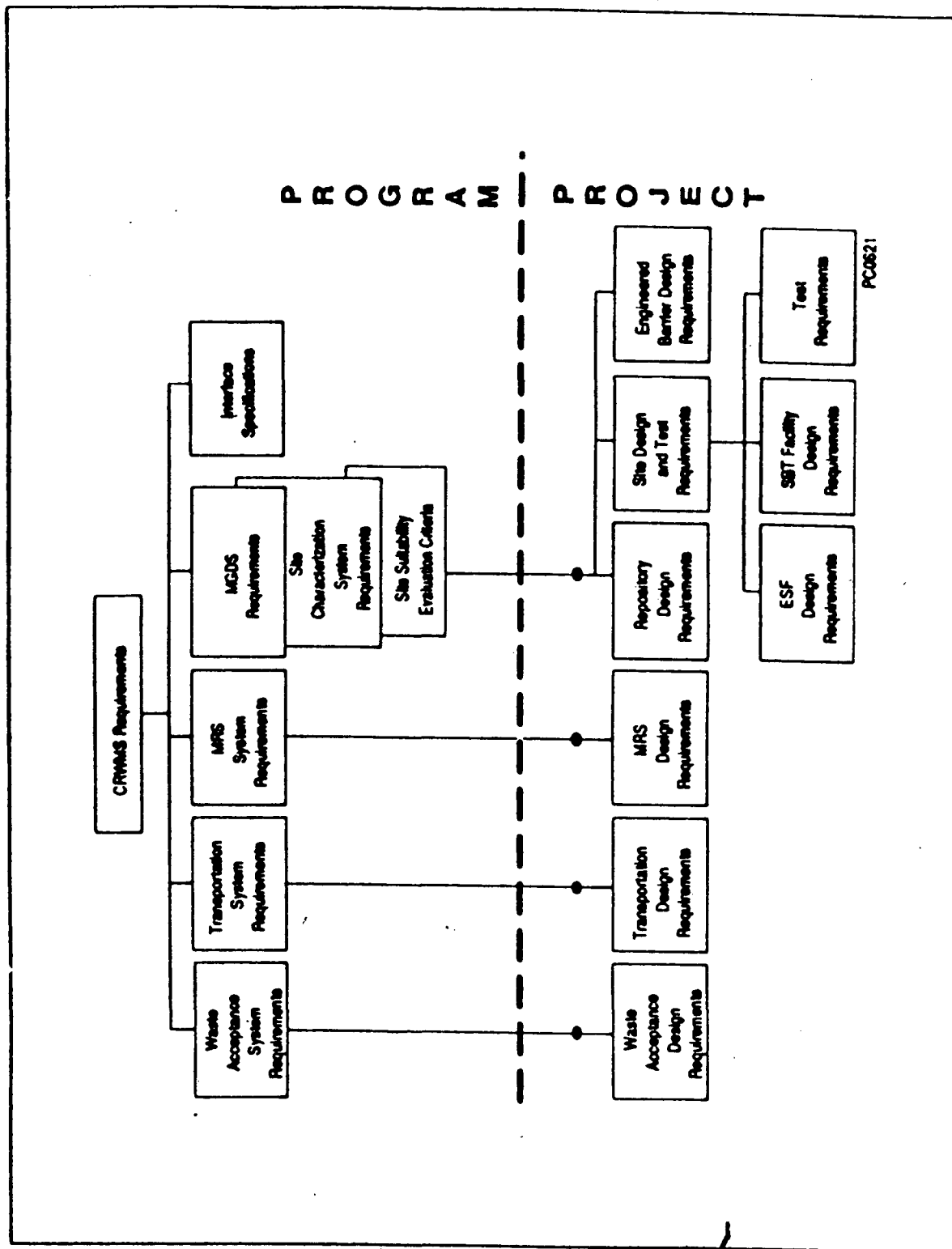
Submittal of the approved requirements as official records is governed by YMP AP-1.18Q, Records Management: Las Vegas Record Source Responsibilities. This procedure establishes the steps necessary for records identification, record package preparation, storage, and submittal, and the resolution of record discrepancies.

5.3 DESIGN REQUIREMENTS TRACEABILITY

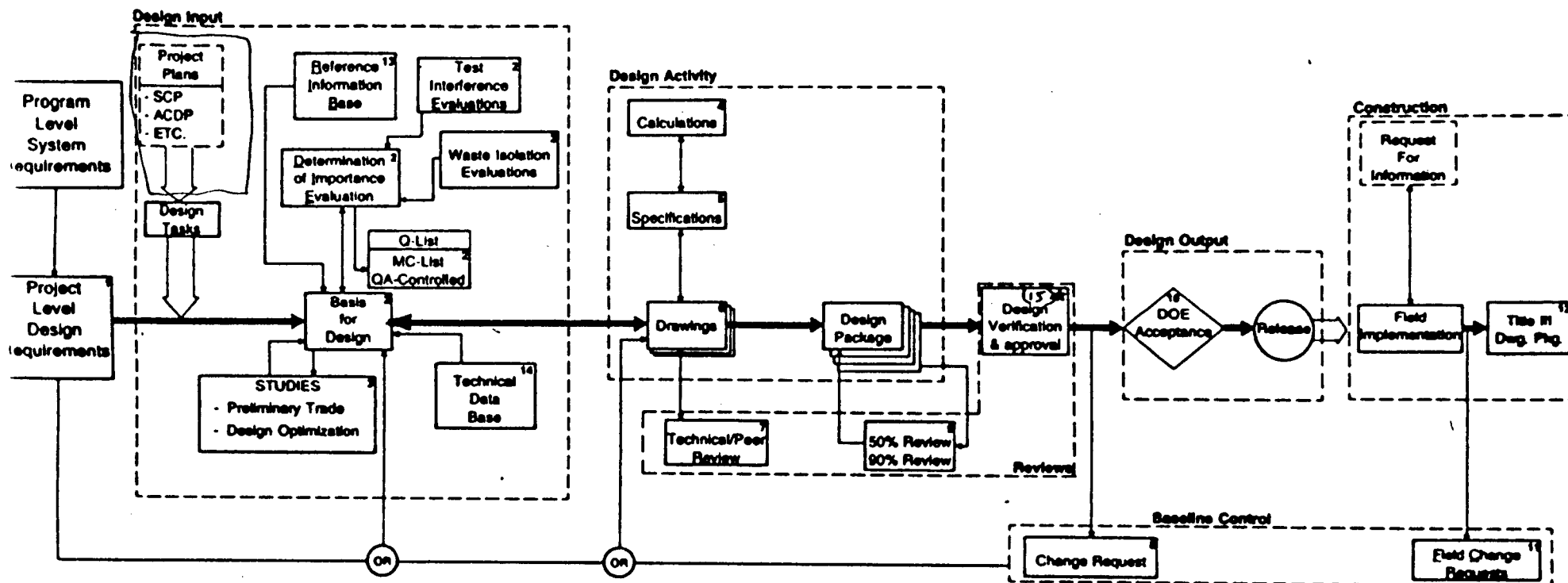
Once the requirements have been identified in the requirements documents, these documents form the technical baseline for MGDS (in accordance with DOE Order 4700.1). These technical baseline documents incorporate the requirements from the various government (state and federal) regulations that govern the disposal of nuclear waste. The technical design of each MGDS segment must be consistent with the baseline established in the requirements documents, and this consistency is obtained through the use of the Basis for Design (BFD) document. The BFD provides the venue to establish the correct design criteria in response to the requirements established in the design requirements and other design input.

It is this relationship between the system-level requirements documents, project-level design requirements documents, and the BFD documents that help to establish the requirements traceability needed for the eventual application and granting of the license required to operate the MGDS. It must be demonstrated to governing authoritative agencies that a clear, consistent design control process that addresses the multitude of applicable requirements has been implemented in the design of the MGDS. Additionally, it must be shown that the methods by which the requirements are developed and controlled allow changes in the requirements, and hence, the design, to occur in a controlled manner that ensures the successful integration of the MGDS effort. The traceability of requirements is contained in the Automated Requirements Management System (ARMS).

Attachment 5.1
Hierarchy of Top Tier Design Inputs



MGDS DESIGN PROCESS



GOVERNING DOCUMENTS			
(1)	QAP-3-1, QAP-3-5, AP-6.10	(8)	QAP-3-4
(2)	QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6.17Q, YMP/82-1	(9)	QAP-3-1, QAP-3-14
(3)	QAP-3-5	(10)	AP-3.30, AP-6.10, BTP-ED0-002, OMP-03-09, YMP/83-08
(4)	QAP-3-9, QAP-6-1, QAP-17-1	(11)	AP-3.50, NLP-3-10
(5)	QAP-6-1, QAP-17-1, QAP-3-11	(12)	AP-3.30, AP-3-7Q, AP-6.24Q, OMP-03-09, AP-5.21Q
(6)	QAP-3-10, QAP-6-1, QAP-17-1	(13)	AP-5.3
(7)	QAP-3-1, QAP-3-3	(14)	AP-5.2Q
		(15)	QAP-3-2

★

Currently QAP's 3-8, 3-10, & 3-11. Will be incorporated in QAP-6-2, October 88

Civilian Radioactive Waste
Management System

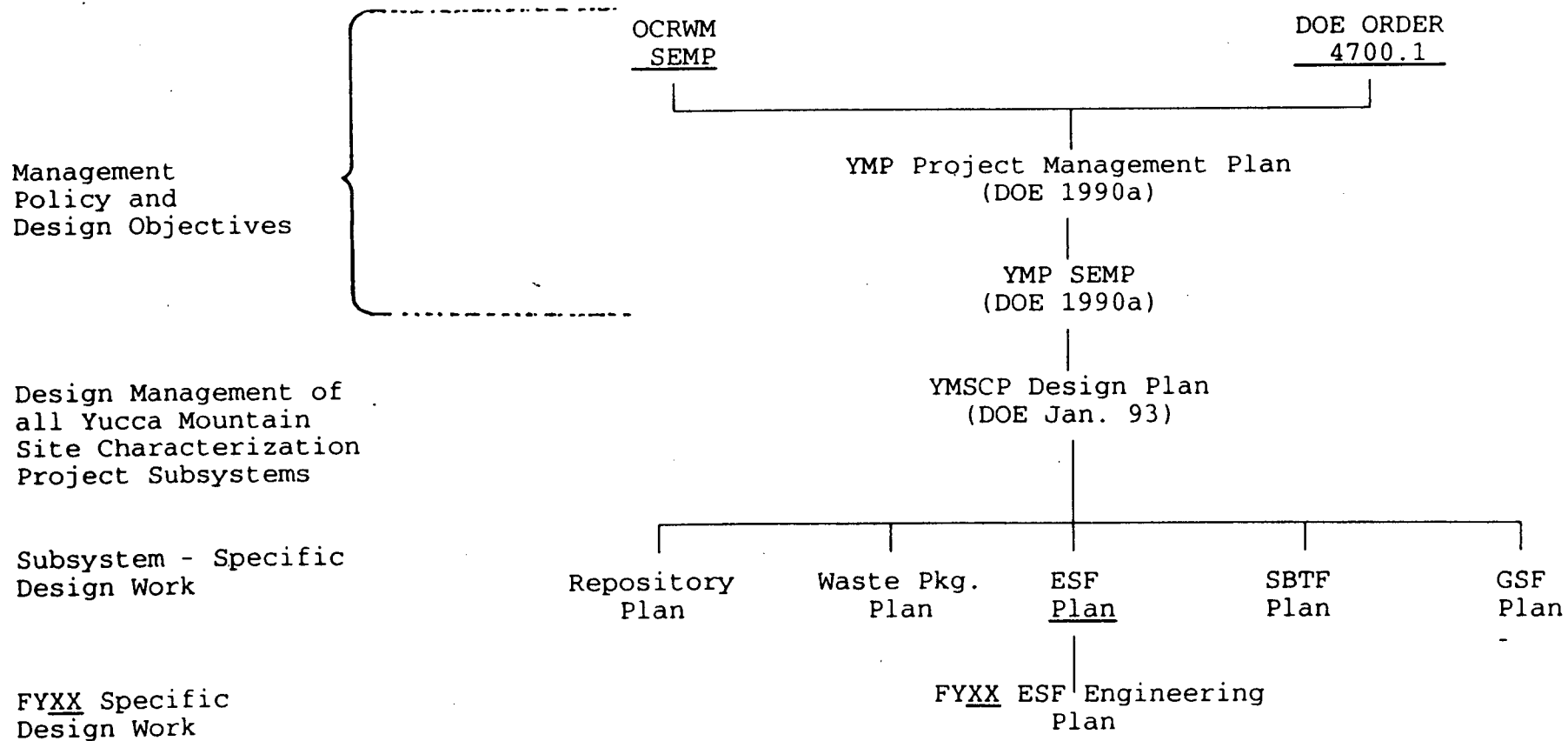
Management & Operating

4. ENGINEERING PLANS

4.1 INTRODUCTION

The requirement for design plans for a Major System Acquisition/Major Project has its roots in DOE Order 4700.1 which establishes the requirement for both a Program Management Plan (PMP) and a Systems Engineering Management Plan (SEMP) as part of the programmatic document hierarchy. The SEMP in turn establishes the requirement for plans which detail how the design activities will be conducted. In addition, the Yucca Mountain Site Characterization Project Office (YMPO) has developed a YMP Document Tree (YMP/89-14) that identifies the plans and other documents to be used to manage the YMP. This Document Tree establishes the Design Plan (DP) as subordinate to the SEMP and the PMP, and dictates that all the design activities for the YMP be managed in accordance with the Design Plan and its subordinate plans and procedures. Figure 4-1 depicts this hierarchy of engineering design plans.

Figure 4-1. Engineering Plan Hierarchy



Engineering Plan Hierarchy

Fig. 4-1

4.2 YMP DESIGN PLAN

The DP outlines broad management requirements for all of the design phases and design activities related to the site, repository, waste package, and ESF Subsystems of the YMP MGDS. The DP establishes and describes:

- The overall management, coordination, and implementation of the DP and its subordinate plans
- The four design phases for the Repository and Waste Package:
 - Conceptual Design (CD)
 - Advanced Conceptual Design (ACD)
 - License Application Design (LAD)
 - Final Procurement and Construction Design (FPCD)
- The design process for ESF and Surface Based Test Facilities (SBTF)
- The requirements and plan for controlling design activities from design input through design development, review and acceptance to final design output.

The DP also establishes the requirement and minimum content of the following subordinate plans:

- Repository Plan
- Waste Package Plan
- ESF Plan
- SBTF Plan
- General Support Facilities Plan

The purpose and content of these plans are essentially identical, with variations driven by the unique requirements of the Subsystem being addressed. Each of these plans in turn requires the publication of a Fiscal Year specific "Engineering Plan" which describes in detail the engineering design work to be accomplished for that Fiscal Year for a given Subsystem.

Only the ESF Plan and ESF "FYxx" Engineering Plan will be discussed in detail here.

4.3 EXPLORATORY STUDIES FACILITY PLAN (ESFP)

The Yucca Mountain site characterization investigations described in the Site Characterization Program Baseline (SCPB) are categorized as: 1) Laboratory investigations; 2) Surface-based Testing; and 3) ESF-based testing. The purpose of the ESF Plan is to describe the specific work that must be accomplished to ensure that the ESF design will support underground site characterization.

In describing the specific work to be accomplished, the ESFP:

- Assigns responsibilities for the work to the various participants and designates interfaces
- Establishes management controls
- Describes the design process
- References the sources of design requirements
- Establishes the types of reviews to be performed.

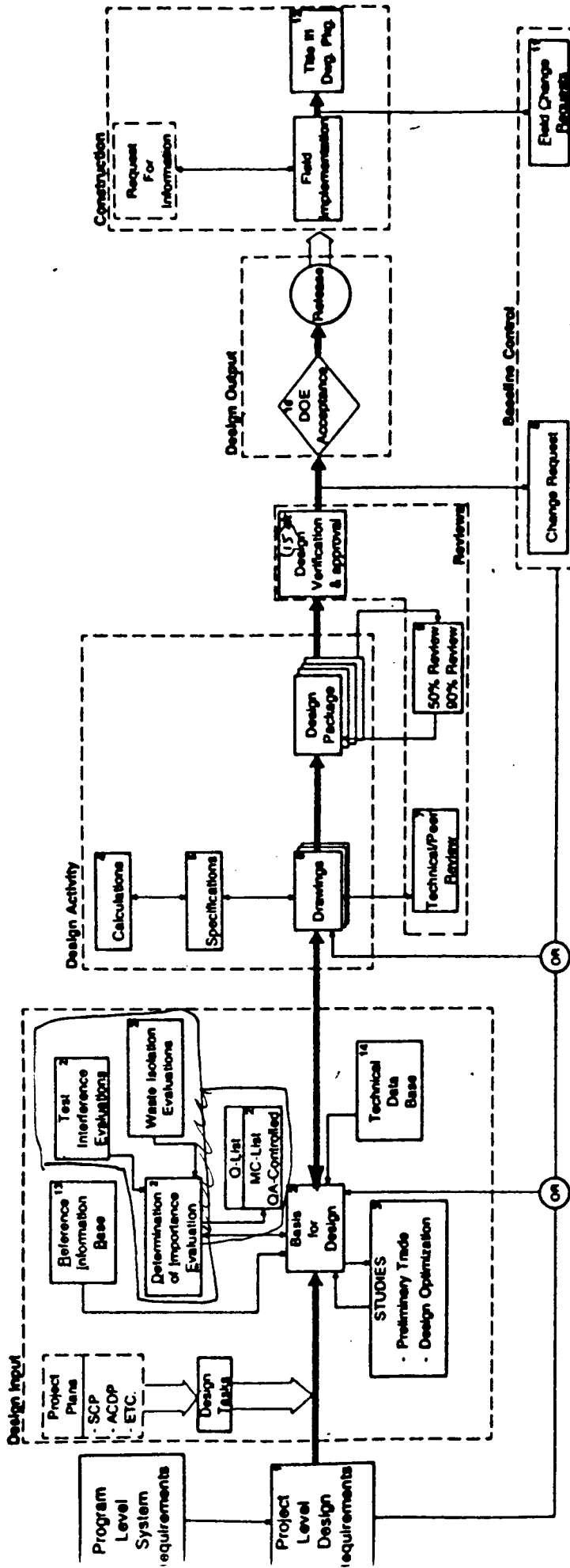
4.4 EXPLORATORY STUDIES FACILITY "FYxx" ENGINEERING PLAN

The ESF Engineering Plan is published annually as a work plan which outlines the resources (in terms of budget and manpower), the organization, the methodology, the deliverables, and the schedule required to meet the objectives for that year. It describes in detail the specific engineering design tasks to be accomplished. These tasks are described by individual design package, with the scope and content of each package detailed down to the estimate of numbers of documents by type.

The plan outlines the organization and staffing required to accomplish the planned design tasks and assigns specific responsibilities for those tasks. Budget allocation for the planned work is detailed down to the WBS sub-element and a schedule of the year's activities is included with milestones for major design reviews and deliverables.

We will add Tracers, Fluids, and Materials management to the DIE section when the information is available.

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS		
(1)	QAP-3-1, QAP-3-5, AP-4-10	(8) QAP-3-4
(2)	QAP-3-3, QAP-3-5, QAP-3-9, QAP-3-11,	
	QAP-3-12, QAP-17-1, AP-4-170, YMP/22-	(9) QAP-3-1, QAP 3-14
(3)	QAP-3-5	
		AP-3-30, AP-4-10, BTP-EDD-002,
		OMP-03-08, YMP/23-08
(4)	QAP-3-8, QAP-4-1, QAP-17-1	(11) AP-3-50, NLP-3-10
(5)	QAP-4-1, QAP-17-1, QAP 3-11	(12) AP-3-30, AP-3-70, AP-5-240,
		OMP-03-08, AP-5-210
(6)	QAP-3-10, QAP-4-1, QAP, 17-1	(13) AP 5-3
(7)	QAP-3-1, QAP-3-3	(14) AP 5-20
		(15) QAP-3-2

* Currently QAP's 3-9, 3-10, & 3-11. Will be incorporated in QAP-9-2, October 90.

8. INTRODUCTION

8.1 INTRODUCTION

8.1.1 Objective

The objective of the M&O MGDS DIE Program is to evaluate the DIE to (radiological) safety and waste isolation of the design, construction, and operation of items and activities which are part of the ESF.

8.1.2 Scope of the Program

The program contains: a method for the evaluation of permanent items relative to their classification as Important to Safety (ITS) or Important to Waste Isolation (ITWI); a method for evaluating the potential impacts of activities and related temporary items on ITS or ITWI; and a method for applying appropriate QA controls to these items and activities using QA procedures and guidance.

8.1.3 Philosophy and Methodology

The M&O philosophy for this program is derived from NRC guidance found in NUREG-1318, which defines Q-list items based on permanence, and the methods used to ensure that non-Q-list items based on permanence, and the methods used to ensure that non-Q-list items and activities are subject to appropriate QA controls. The QAP-3-9 procedure shall be utilized to perform the QA analyses used in the performance of DIES. A detailed description of the methodology utilized to support the M&O philosophy can be found in the "M&O Plan for Evaluating Items and Activities in the MGDS Program for Importance to Safety and Waste Isolation," Document Number B00000000-AA-01-00002-00.

8.2 APPLICABLE DOCUMENTS, DEFINITIONS, RESPONSIBILITIES, AND QAP PROCEDURES

8.2.1 Documents

The principle guidance documents are listed below:

- Code of Federal Regulations, Title 10, Part 60, Disposal of High-Level Radioactive Wastes in Geologic Repositories
- Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements, NUREG-1318, April 1988
- Quality Assurance Requirements and Description (QARD), DOE/RW-0333P.

8.2.2 Definitions

The definitions of standard terms may be found in the glossary contained in DOE/RW-0333P. Key DIE related definitions are presented below:

ACTIVITIES: deeds, actions, work, or performance of a specific function or task. Activities are broadly interpreted to include the use of temporary facilities during site characterization as well as those activities related to construction and operation of temporary or permanent items.

CLASSIFICATION: the process of establishing the level of significance (in a QA program) of an item or activity to a design or facility.

DETERMINATION OF IMPORTANCE EVALUATION (DIE): an evaluation, documented in accordance with QAP-3-9, that is used to establish the potential safety impact of an item or activity relative to specific ITS and ITWI criteria (including classifications as described in QAP-2-3), and to recommend appropriate QA controls for the item or activity.

IMPORTANT TO SAFETY (ITS): description applied to those activities or engineered structures, systems, and components essential to the prevention or mitigation of an accident that could result in a radiation dose to the whole body, or any organ, of 0.5 rem or greater at or beyond the nearest boundary of the unrestricted area at any time until the completion of permanent closure.

IMPORTANT TO WASTE ISOLATION (ITWI): description applied to activities or natural and engineered barriers which are relied upon for achieving the post-closure performance objectives of 10 CRF 60 Subpart E.

ITEM: structure, system, or component (including natural barriers).

MANAGEMENT CONTROL (MC) LISTS: Two lists (one for MGDS and one for S&T) controlled by the DOE, consisting of permanent items determined by exemption of analysis to be conventional quality and not subject to mandatory QA requirements, and to which the M&O is responsible for recommending changes based on the results of this procedure.

Q-LISTS: Two lists (one for MGDS and one for S&T) controlled by the DOE, consisting of permanent items determined by analysis or direct inclusion to be subject to mandatory QA requirements, and to which the M&O is responsible for recommending changes based on the results of this procedure.

8.2.3 Responsibilities

The functional responsibilities for the DIE program are described below:

- A. MGDS Development Manager - The MGDS Development Manager (or designee) has overall responsibility for the preparation of analyses which determine the importance of items and activities resulting from design development or other activities within that scope. Also responsible for ensuring that DIEs are prepared in accordance with the DIE M&O Plan and

documented in accordance with QAP-3-9.

- B. Systems Manager - The Systems Manager (or designee) is responsible for preparing analyses which determine the importance of items and activities associated with the waste isolation capability of the MGDS. This responsibility includes preparing supporting evaluation needed for the DIE evaluations.
- C. Site Characterization Manager - The Site Characterization Manager (or designee) is responsible for preparing analyses which determine the importance of items and activities associated with the potential adverse impacts on site characterization efforts as part of the MGDS. This responsibility includes preparing supporting (test interference) evaluations needed for the DIE evaluations.
- D. DIE Manager - The DIE Manager (or designee) is responsible for ensuring through evaluations of items and activities, that a design is safe, that the waste isolation capacity of the site meets the requirements of 10 CFR 60 Subpart E, and that items, activities, and equipment used will limit adverse effects on waste isolation or site characterization activities to the extent practical.

8.2.4 QAP Procedures

The following QAP procedures will be utilized in the performance of specified evaluations:

- A. ESF Design Organizations will provide formal design configuration packages (drawings, specifications, and calculations) performed in accordance with QAP-3-10, QAP-3-11, and QAP-3-9. Design configuration package will be transmitted in accordance with QAP-3-12.
- B. Performance Assessment Group will provide the Waste Isolation Evaluations performed in accordance with QAP-3-5. Waste Isolation Evaluations will be transmitted in accordance with QAP-3-12.
- C. Site Characterization Group will provided the Test Interference Evaluations performed in accordance with QAP-3-5. Test Interference Evaluations will be transmitted in accordance with QAP-3-12.
- D. DIE Group will perform the DIEs and Classification Analyses in accordance with QAP-3-9 and QAP-2-3. DIEs and Classification Analyses will be transmitted in accordance with QAP-3-12.

8.3 DIE REQUIRED INPUT DOCUMENTATION

8.3.1 Design Configuration Drawings and Specifications

ESF Design Organizations will provide formal design configuration packages (drawings and specifications) to the Performance Assessment, Site Characterization and Determination of Importance Groups.

8.3.2 Waste Isolation Evaluations

Performance Assessment Group will provide the Waste Isolation Evaluations to the DIE Group.

8.3.3 Test Interference Evaluations

Site Characterization Group will provide the Test Interference Evaluations to the DIE Group.

8.3.4 Tracers, Fluids, and Materials (TFM) Evaluations

Although TFM analyses are included within WI and TI evaluations, guidance for their development may require specific inputs from the constructor and/or design organizations.

8.3.5 Other Evaluations (future e.g., PRA, RSA)

Other evaluations will be required as methodologies and evaluation criteria become more complex, and as design progresses (e.g., radiological assessments in support of radiological safety evaluations). As these methodologies are developed, appropriate guidance will be described in subsequent revisions to the QACMD and the DIE Plan.

8.4 DIE CONTENT

8.4.1 Document Preparation

A DIE is performed in a QAP-3-9 calculation format, and provides the basis for determining that an item or activity is (or is not) ITS or ITWI. Regardless of the outcome of the evaluation, the DIE is a calculation which becomes a permanent part of the design or work package. Those permanent items determined to be ITS or ITWI, or which meet other M&O QA classification criteria, are recommended to DOE for placement on the Q-List. Where a permanent item is determined to not belong on the Q-List, then that item is recommended for placement on the MC-List. Those activities and associated temporary items determined to be ITS or ITWI are controlled via M&O Design Product Controls, which result from the DIE and which accompany the design package as part of the permanent record. The DIE document should include:

- the criteria and considerations for evaluation, such as the consequences of hydrological, geochemical, or geomechanical impact, release of radionuclides to the accessible environment, etc.
- description of the method of evaluation of the item or activity
- logic and basis to support the conclusion of the DIE
- conclusion concerning the importance of the item or activity, including a specific statement indicating why an item is (or is not) ITS or ITWI

- controls of the item or activity, if it is ITS or ITWI, to be identified to operations and or construction personnel per drawings, specifications, or other M&O Design/Operation Product Controls as appropriate.

8.4.2 Final Design Configuration Review

The design organizations will provide to the DIE group a final design configuration package for review prior to the issuance of the DIE. The review of the final design configuration package will be performed by the preparer of the DIE to ensure that the design configuration data utilized in the draft DIE developed has not been modified or superseded. If changes have been made to design, then the DIE preparer must evaluate them and modify the DIE if necessary.

8.4.3 Evaluation Criteria per QAP-2-3, QACMD or DIE Plan

The DIE will also contain classification evaluation per QAP-2-3. Each item or activity in the MGDS and ESF will be evaluated for classification purposes (utilizing the classification checklist) against the criteria listed in the seven classification categories (QA-1 through QA-7). Credibility as it relates to the classification of item is established in the analyses performed as described in the QACMD or the DIE Plan. A nominal probability threshold of 10^{-6} has been established as the MGDS and ESF credibility threshold.

8.5 Q AND MC LIST RECOMMENDED CHANGES

The DIE group, based on the classification analyses and DIE evaluation, performed in accordance with QAP-2-3 and QAP-3-9, will generate and submit recommended changes to the DOE MGDS Q- and MC-list. If changes to the Q- or MC -list are generated then the analysis shall be baselined in accordance with QAP-3-9 and QAP-3-4. Detailed Q- and MC-list submission, baselining and approval procedures are contained in QAP-2-3 and the DIE plan.

8.6 DIE TRANSMITTAL OF DESIGN REQUIREMENTS AND CONTROLS

8.6.1 QAP-3-12

The completed, reviewed, and approved DIE will be transmitted to the cognizant design organization utilizing the QAP-3-12 procedures (Design Input Data Issuance Instruction). The cognizant design organization manager will complete the Design Input Data Issuance Instruction form and return it to the DIE Group. He will then process the evaluation based on the indicated special instructions indicated on the form.

8.6.2 QAP-3-4

The DIE Group is responsible for the preparation and submittal of the baseline documentation and associated forms in compliance with QAP-3-4.

8.6.3 Managed Distribution

The DIE Group is also responsible for the generation and maintenance of the managed distribution list. The Local Records Center (LRC) is responsible for the reproduction and distribution of the documents to the managed distribution recipients based on the current managed distribution list.

8.7 INCORPORATION INTO DESIGN DOCUMENTS PER BFD

The cognizant design organization is responsible for the incorporation of the Quality Assurance Controls generated in the DIE into the BFD as well as the appropriate design output documents. The design organizations are also responsible for the integration of the classification analysis results into the BFD and appropriate design output documents.

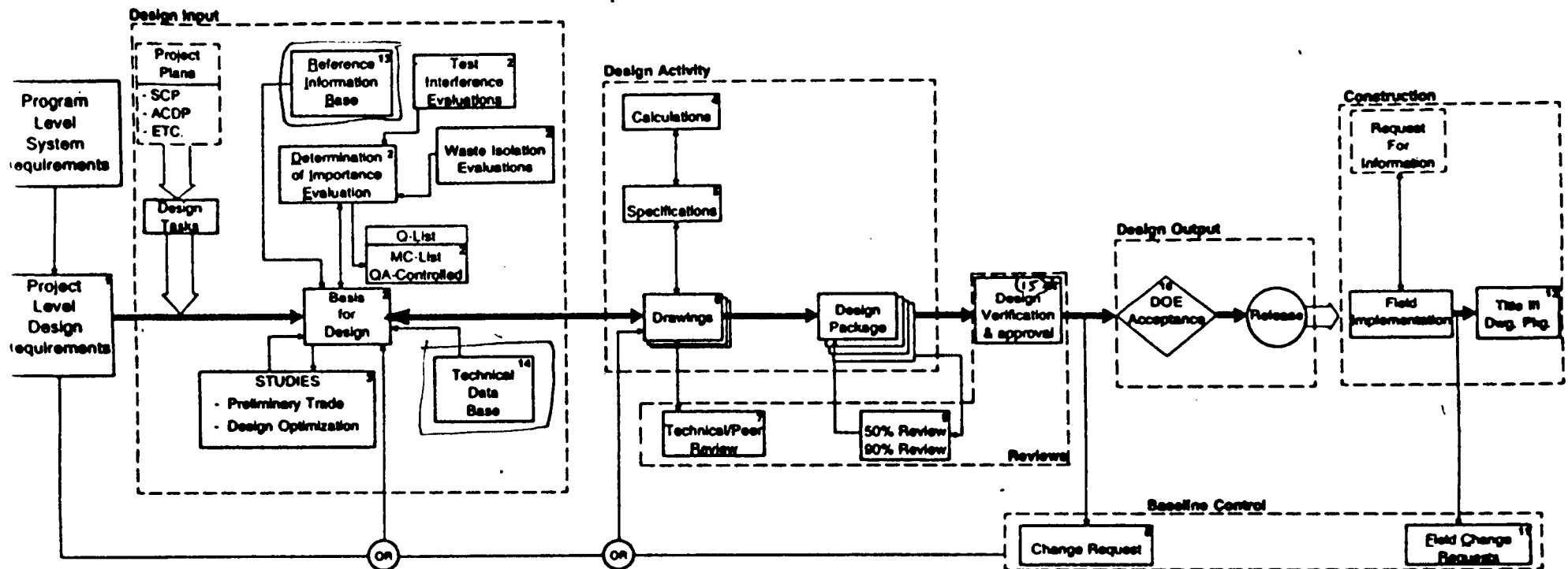
8.7.1 Drawings

The drawings will reflect the classification analysis results contained in the DIE and will be used, where appropriate to ensure the design issued for construction complies with the QA controls contained in the DIE.

8.7.2 Specifications

The specifications will reflect the classification analysis results contained in the DIE and will be used where appropriate to ensure the design issued for construction complies with the QA controls contained in the DIE.

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS			
(1)	QAP-3-1, QAP-3-5, AP-6.1Q	(8)	QAP-3-4
(2)	QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6.17Q, YMP/02-1	(9)	QAP-3-1, QAP 3-14
(3)	QAP-3-5	(10)	AP-3.3Q, AP-6.1Q, BTP-EDO-002, OMP-03-09, YMP/03-08
(4)	QAP-3-9, QAP-6-1, QAP-17-1	(11)	AP-3.5Q, NLP-3-10
(5)	QAP-6-1, QAP-17-1, QAP 3-11	(12)	AP-3.3Q, AP-3-7Q, AP-6.24Q, OMP-03-09, AP-5.21Q
(6)	QAP-3-10, QAP-6-1, QAP, 17-1	(13)	AP 5.3
(7)	QAP-3-1, QAP-3-3	(14)	AP 5.2Q
		(15)	QAP-3-2

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Currently QAP's 3-9, 3-10, & 3-11. Will be incorporated in QAP-3-2, October 88

Technical Data Inputs (RIB, Technical Data Catalog)

Introduction

The principal technical data bases available to Yucca Mountain Project (YMP) participants are the RIB (Reference Information Base) and the Technical Data Base (TDB). The TDB includes GENISES (Geographic Nodal Information Study and Evaluation System) and GEMBOCHS (Geologic and Engineering Materials Bibliography of Chemical Species). These data bases in general provide geological, hydrological, geochemical, geotechnical, and other Yucca Mountain site information that can be used for design and performance assessment activities. The RIB and the main listing for the TDB, which is the Technical Data Catalog, are described in more detail below.

RIB (Reference Information Base)

The RIB (Reference Information Base) is a Yucca Mountain Project approved, controlled document that provides technical data on site characteristics (for example: geology, geochemistry, hydrology, and rock thermal and mechanical properties), design inputs (for example: seismic loads and ventilation parameters), and performance assessment (for example: postemplacement conditions). The RIB provides summary information as well as sources of more detailed data on which the RIB information is based. Topics in the document are listed as "information items" and are summarized in several pages which consist of (1) change control information, (2) keywords, (3) a description and methodology summary, (4) quality assurance information, (5) sources, and (6) the technical data.

The RIB is made available to project participants as controlled documents that are continually updated as information becomes available during site characterization. Project personnel may propose additions or modifications to the RIB by submitting a RIB Change Request in accordance with AP-5.3Q, "Information Flow in the Project Reference Information Base".

Technical Data Catalog

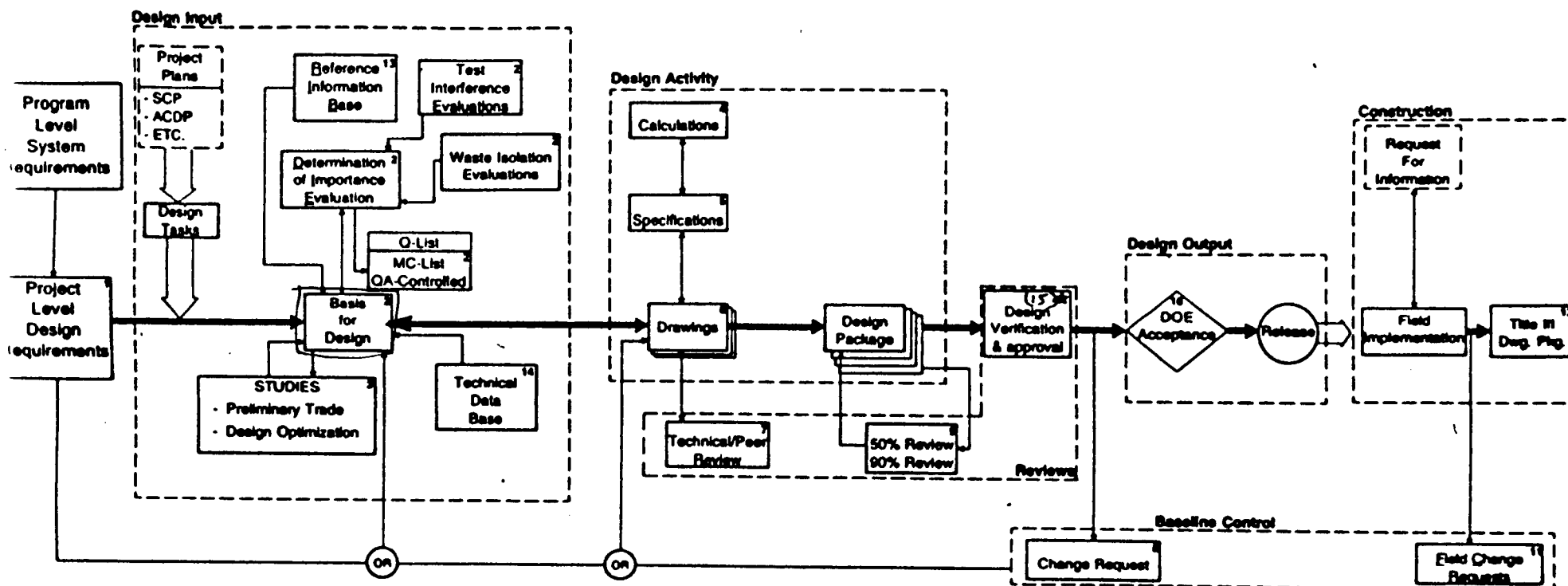
The Technical Data Catalog is a Yucca Mountain Project listing of data acquired or developed in support of the YMP. Data referenced in the catalog are also found in an electronic listing called the Automated Technical Data Tracking System (ATDT). The Technical Data Catalog is updated quarterly and published in the month following the end of each quarter. A complete revision to the catalog is published at the end of each fiscal year. Each item in the catalog is described, and the method, date, and location of data acquisition or development is given. The quality assurance program status is indicated by a "yes" or "no".

The Technical Data Catalog indicates that the data reside in and/or may be located in: (1) a participant data archive, (2) the Technical Data Base (TDB) which includes the Geographic Nodal Information Study and Evaluation System (GENISES) data base and the Geologic and Engineering Materials Bibliography of Chemical Species (GEMBOCHS) data base, or (3) the Central Records Facility (CRF) which provides an accession number for items in GENISES.

Retrieval of data currently depends on inspection of the catalog, identification of the data tracking number given with each catalog item, and, if indicated, submittal to GENISES for a copy of the data. In the future, data should be accessible from the TDB by specifying words (called parameters) that describe the type of data.

cc: Paul McKie MGDS/MK

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS			
(1)	QAP-3-1, QAP-3-5, AP-6.1Q	(8)	QAP-3-4
(2)	QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6.17Q, YMP/82-	(9)	QAP-3-1, QAP 3-14
(3)	QAP-3-5	(10)	AP-3.3Q, AP-6.1Q, BTP-EDD-002, QMP-03-09, YMP/83-08
(4)	QAP-3-9, QAP-6-1, QAP-17-1	(11)	AP-3.5Q, NLP-3-10
(5)	QAP-6-1, QAP-17-1, QAP 3-11	(12)	AP-3.3Q, AP-3-7Q, AP-6.24Q, QMP-03-09, AP-5.21Q
(6)	QAP-3-10, QAP-6-1, QAP, 17-1	(13)	AP 5.3
(7)	QAP-3-1, QAP-3-3	(14)	AP 5.2Q
		(15)	QAP-3-2

* Currently QAP's 3-8, 3-10, & 3-11. Will be incorporated in QAP-3-2, October 88

Civilian Radioactive Waste
Management System

Management & Operating

1. INTRODUCTION

The purpose of the Basis for Design Document (BFD) is to define the conceptual criteria used by engineers and designers to develop and implement the requirements imposed by the higher tier Design Requirements Documents (i.e., ESFDR, SBTFRD, EBDRD, RDRD). As design progresses the BFD is expanded to provide a consolidated record of all the design criteria which were used in the final design.

Design criteria which will quantify and define these functional and performance requirements DRD through analyses and studies such trade-off studies, Determination of Importance Evaluations (DIE). In addition to criteria developed through analysis and studies, the BFD will incorporate requirements of applicable regulations, codes, standards, and DOE Orders. Other sources of design criteria will be derived from handbooks, manuals, correspondence, decisions reached at meetings, and inputs from the scientific community associated with the project. These inputs will be supplemented by the judgement, experience, and knowledge of the engineer or engineers tasked with the performance of the design effort.

When completed, the resulting document forms a data base of the detailed design criteria which were used in the design of the MGDS system (eg. ESF). As such, it provides documented traceability between the design outputs (i.e., calculations, specifications, and drawings) and the higher level requirements in the document hierarchy.

The BFD will be revised on a regular basis as design progresses, in this way it will incorporate design changes so as to reflect the latest design concepts. This process of revision will begin with conceptual design and continue through Title III and capture the as built criteria for the system.

2. BODY

The flowdown of design requirements from the higher tier documents to the BFD begins, at the OCRWM program level with the Civilian Radioactive Waste Management Requirements Document (CRD) into the Mined Geologic Disposal System Requirements Document (MGDS-RD). The flow continues as shown in Figure 1 through the individual MGDS system Design Requirements Document (DRD).

(Figure 1)

The BFD is the highest level design output document, and as such, it conveys the requirements for all subsystems and structures within the scope of one of the major MGDS systems (eg. the ESF) the design output documents which are deliverer for procurement and construction of elements of the system. To accomplish this the BFD defines and documents all of the specific design criteria which quantify and define the functional and performance requirements of the MGDS system described in the DRD. These criteria are responsive to the requirements, but emanate from many sources, some of which are:

- Determination of Importance Evaluations (DIE) - the DIE determines what items or activities are important to safety and important to waste isolation, it draws on information provided in the Test Interference Evaluations (TIE) and the Waste Isolation Analysis (WIE).
- Applicable regulations, codes, and acceptance standards.
- Trade-off studies and other system analyses.
- Specialty Engineering, RAM and Safety Analyses.

- Other referable documents and sources such as text books
- The knowledge and experience of the design engineers.

The process of developing the BFD, the source documents, and the design output (i.e., calculations, specifications, and engineering drawings) becomes an iterative process as the design evolves. In the case of the DIES, for example, design must have progressed to a reasonable maturity before all the evaluation can be completed and all of the quality effecting controls can be defined. A schematic diagram of the design process is shown in Figure 2.

(Figure 2)

The BFD also forms the source of the matrices which demonstrate traceability from the DRD to the design outputs. The BFD is developed in accordance with QAP-3-0, the structure, review and verification process are further defined in NLP-3-20 (*TBD*). External reviews are carried out in accordance with QAP-3-1 and QAP-3-14, and verification is carried out in accordance with QAP-3-2. The general layout of the BFD is as follows:

1. INTRODUCTION
2. SCOPE
3. DEFINITIONS AND SYMBOLS
4. RESPONSIBILITIES
5. GOVERNING DESIGN CRITERIA DOCUMENTS AND REFERENCES
6. QUALITY ASSURANCE REQUIREMENTS
7. DESIGN REQUIREMENTS AND METHODS

Section 7 contains all of the design criteria. This section is organized by Configuration Item Identifiers (CII) which identify a particular structure, system, or component. Figure 3 shows the sample of the traceability matrices from the ESF BFD as examples.

Appendix A Traceability Matrix ESFDR To BFD and Configuration Items Identifiers (CII)				
CI Title	CII	ESFDR	BFDDC	Comments
Linings and Ground Support	BABEAB000	3.2.2.4.I.1	7.5.1.2.IV.18	
Linings and Ground Support	BABEAB000	3.2.2.4.I.1	7.5.1.2.IV.18	
Linings and Ground Support	BABEAB000	3.2.2.4.I.1	7.5.1.2.IV.18	

Appendix B Traceability Matrix Configuration Items Identifiers (CII) To Design Outputs				
CI Title	CII	Calculations	Specifications	Drawings
Linings and Ground Support	BABEAB000	BABEAB000-01717-0200-00028 BABEAB000-01717-0200-00027 BABEAB000-01717-0200-00083	BABEAB000-01717-6300-03361	BABEAB000-01717-2100-40074 BABEAB000-01717-2100-40073 BABEAB000-01717-2100-40072
Furnishings	BABEAC000	None	None	None

Figure 3 Format of Trace Matrices

The final version of the BFD will contain the design criteria for the entire MGDS system being addressed. This will be accomplished by successive revisions as the design progresses. The design of the MGDS system is accomplished in a series of design steps or packages. Prior to the beginning of each segment the MGDS systems DR requirements for the systems or subsystems to be designed will be implemented as design criteria in the BFD. The specific design criteria will be incorporated as the design progresses. By using this approach each revision of the BFD will contain, as a minimum, all the design criteria which correspond to the current design documents.

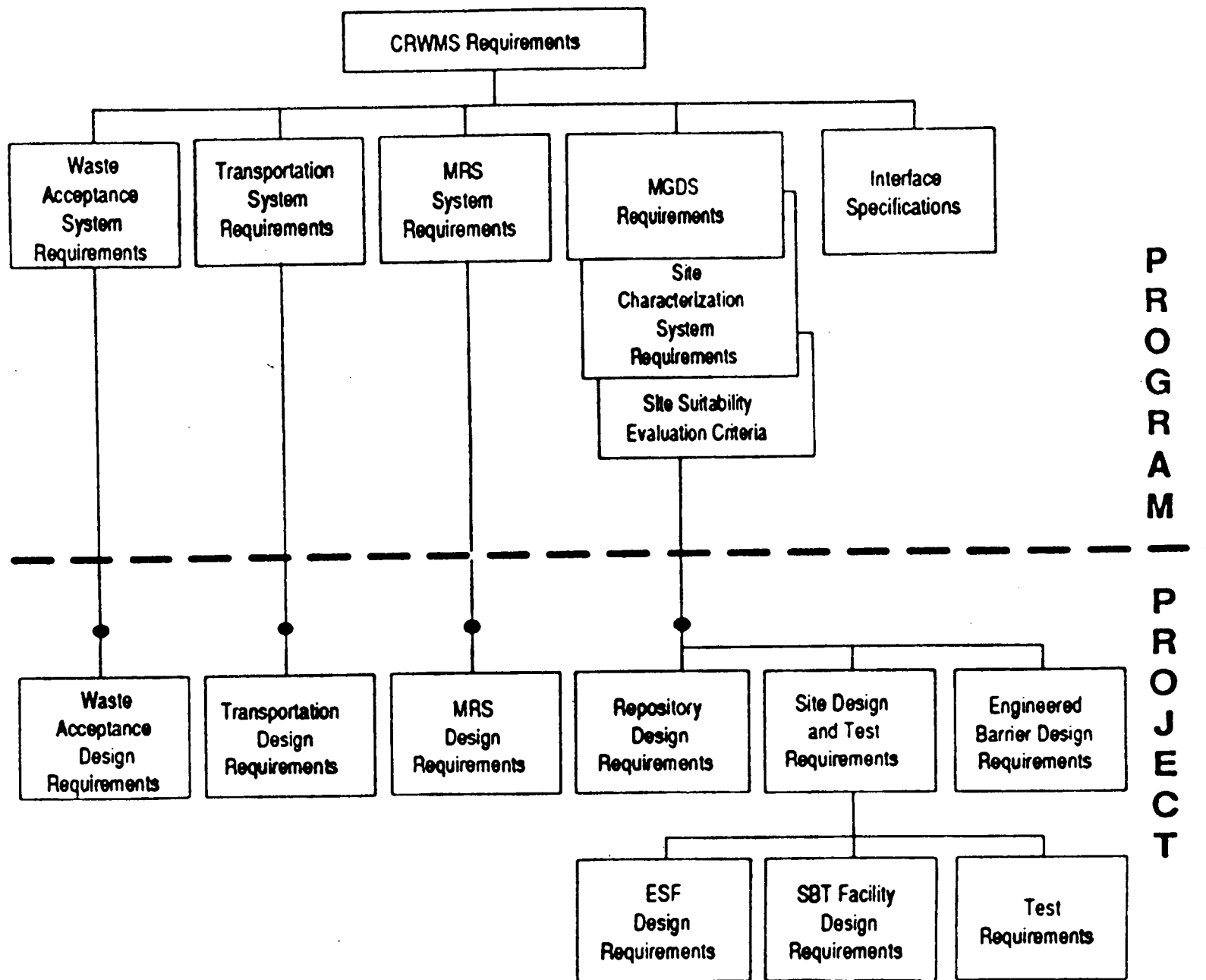


Figure 1 Hierarchy of Design Requirements Documents

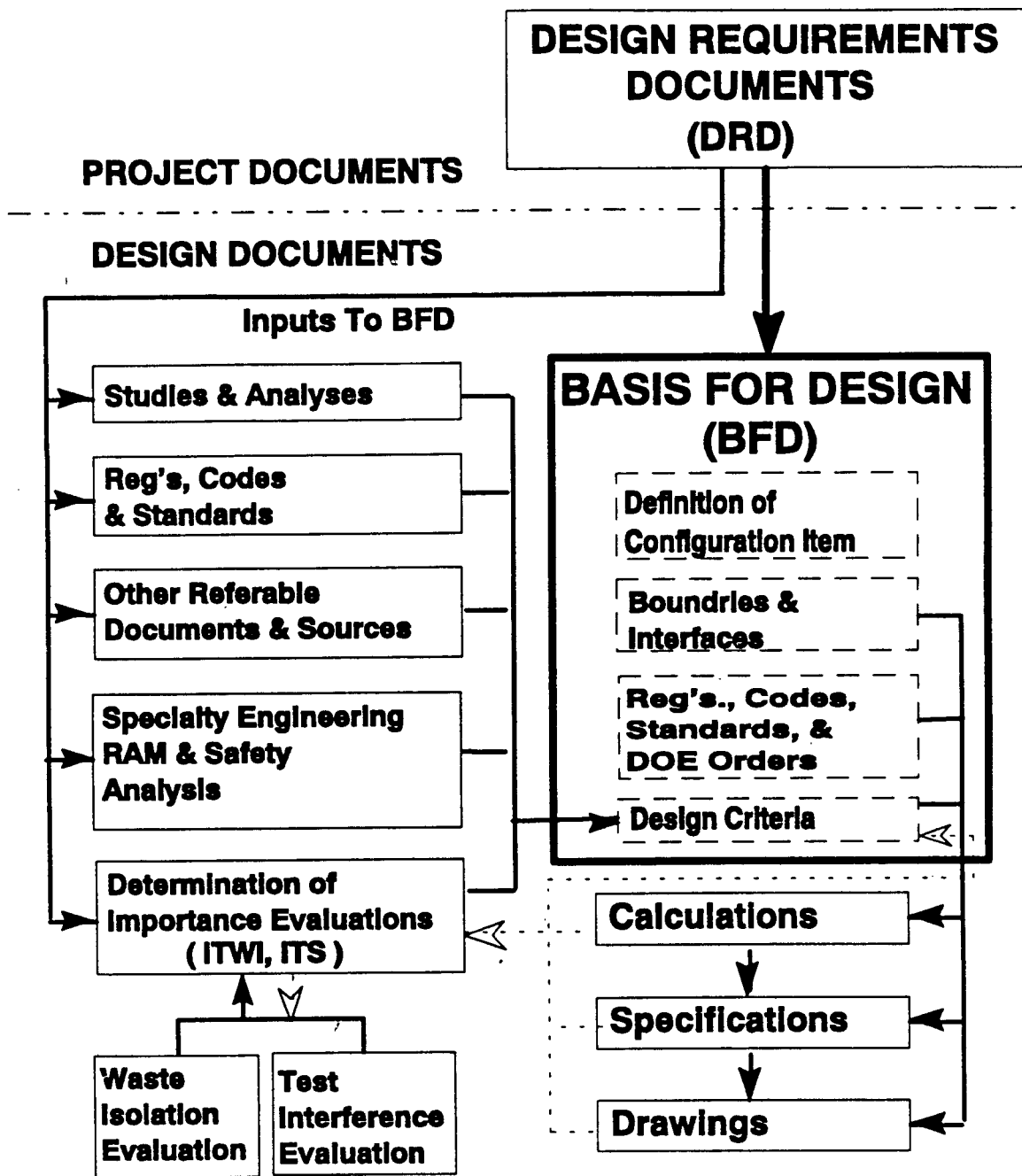
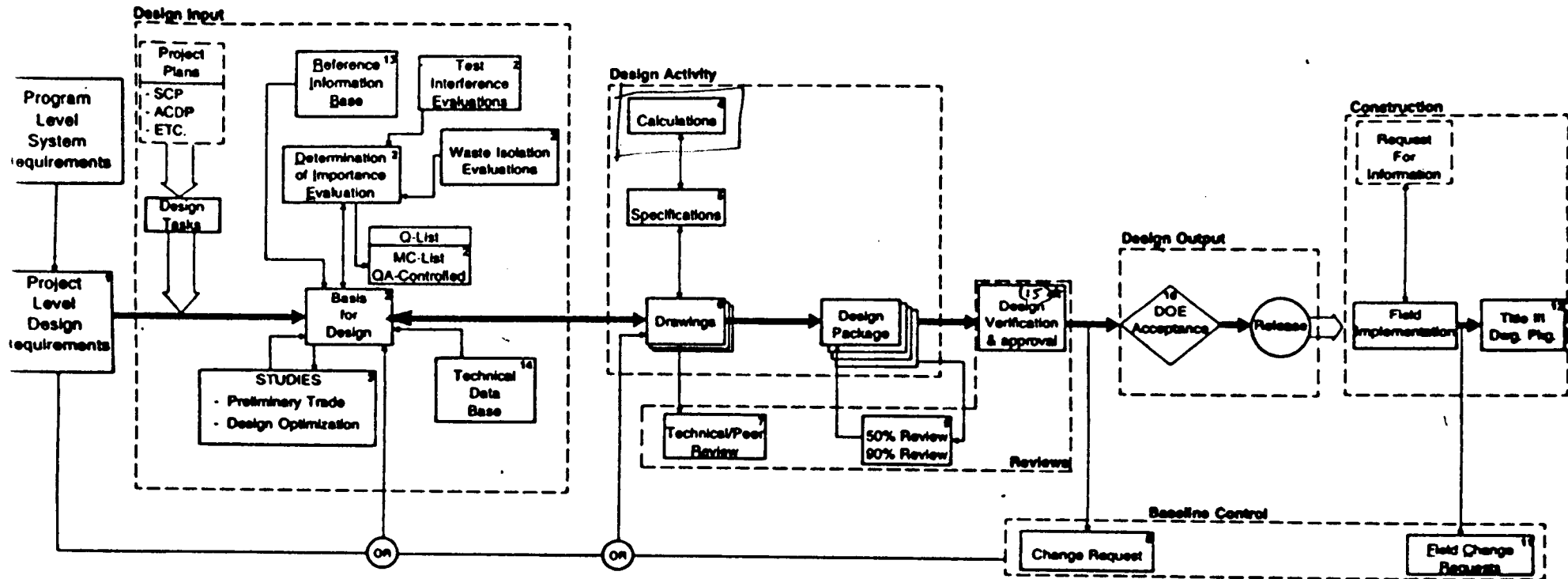


Figure 2 Information Flow To and From the BFD

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS			
(1)	QAP-3-1, QAP-3-5, AP-6.1Q	(8)	QAP-3-4
(2)	QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6.17Q, YMP/82-1	(9)	QAP-3-1, QAP-3-14
(3)	QAP-3-8	(10)	AP-3.3Q, AP-6.1Q, BTP-EDD-002, OMP-03-08, YMP/83-08
(4)	QAP-3-9, QAP-6-1, QAP-17-1	(11)	AP-3.5Q, NLP-3-10
(5)	QAP-6-1, QAP-17-1, QAP-3-11	(12)	AP-3.3Q, AP-3-7Q, AP-5.24Q, OMP-03-08, AP-5.21Q
(6)	QAP-3-10, QAP-6-1, QAP-17-1	(13)	AP-5.3
(7)	QAP-3-1, QAP-3-3	(14)	AP-5.2Q
		(15)	QAP-3-2

*

Currently QAP-3-8, 3-10, & 3-11. Will be incorporated in QAP-6-2, October 88

11. DESIGN CALCULATIONS

This manual describes the preparation, review, and approval of design calculations and revisions, as applicable to project deliverables for detailed design. All design calculations shall be prepared and organized as backup design media to the detailed design drawings and specifications. Calculations, including those performed by computer programs, shall meet the requirements of QAP-3-9. Requirements for the control and use of computer codes are specified in QAP-19-1.

11.1 REQUIREMENTS

Design calculations shall be submitted to LRC in accordance with QAP-17-1 as backup data for the design package reflecting the calculations. All internal reviews and checking shall be completed prior to the design review of any package containing calculations. Squad checks are not required for calculations. Calculations shall be made available during a review, if required.

11.1.1 Basis for Design Calculations/Analyses

Calculations and analyses that form the basis for design shall clearly state or include the following:

- Objective of analysis.
- Design inputs used, such as performance requirements, and regulatory requirements and their sources.
- Design basis codes, results of literature searches, or other applicable background data.
- Assumptions and considerations, including those used to derive mathematical models and those that would require verification. Include those assumptions that require vendor verification that may impact other package designs.
- Appropriate equations and algorithms and the models used to derive them.
- References to applicable computer codes, including electronic vendor catalogs or similar programs which perform calculations.
- Clearly identify if preliminary source data or design assumptions are being provided (data to be recalculated after it has become finalized).

11.1.2 Checking

Before the results are used, all calculations shall be checked by someone other than the originator who has the expertise and experience necessary to conduct the check satisfactorily.

Any change or correction to the calculation shall be discussed with the Lead Discipline Engineer and be mutually agreed upon prior to implementing the change.

Evidence of checking shall be in the form of the checker's signature and date on the cover sheet.

11.1.3 Alternate Calculations

Alternate calculations are calculations or analyses that may be made to verify correctness of the original calculations or analyses. The appropriateness of assumptions, input data used, and the computer program or other calculation method used shall also be reviewed.

11.1.4 Assumptions

A summary of assumptions shall be included in each calculation. The summary shall identify the assumptions that will require further confirmation.

11.2 FORMAT

All calculations will be reviewed for reasonableness of method and results. Hand calculations will be made on Project Sketch paper (Attachment 11.1).

At the time that calculations are submitted to LRC, each calculation shall include a completed cover sheet (Attachment 11.2).

The calculation cover sheet shall contain the original signatures of the:

- Originator
- Checker
- Lead Design Engineer
- Department Manager

Document any other design documents affected by the calculation in the "Remarks" section.

Obtain a document identifier in accordance with QAP-3-13.

Present the design analyses information in accordance with the specific outline in Attachment 11.3 in the order listed. If an item cannot be used in the analysis or does not warrant discussion, the heading shall be shown followed by "Not Applicable," "N/A," or "Not Used."

11.3 REVISIONS

Revisions, deletions, or additions shall be indicated on the Design Analysis Revision Record (Attachment 11.4).

Before submitting to the LRC, the Project Discipline Engineer shall ensure that the revised cover sheet is attached to the package and signed as described in Section 11.2.

11.4 RECORD RETENTION

Calculations will be maintained and logged by each discipline until the FDR issue of each package and associated calculations. After FDR issue, calculations will be transferred to the LRC for maintenance and tracking.

Calculations are lifetime project records. LRC will be responsible for filing, maintenance and tracking after the FDR issue.

ATTACHMENT 11.1

PAGE NO. _____ OF _____

WBS NO:1.2.6. _____

DATE: _____ REV NO: _____

CALC NO: _____

CALC NO: _____

ORIGINATOR: _____

CHECKED BY: _____

CHECKED DATE: _____

[illegible]

ATTACHMENT 11.2

CRWMS/M&O

Design Analysis Cover Sheet

ATTACHMENT II

WBS:

QA:

Design Analysis Title					
Document Identifier		Rev. No.	Total Pages	Total Attachments	Volumes
System Element		Configuration Item Name			
	Print Name	Signature		Date	
Originator					
Checker					
Lead Design Engineer					
Department Manager					
Remarks:					
1. This design analysis covers QA classification _____ items.					

ATTACHMENT 11.3

DESIGN ANALYSIS OUTLINE

1. **Purpose** - This section shall provide a statement of the purpose and objective of the analysis. If the work represents a revision to an analysis, the reason for the revision shall be stated.
2. **Quality Assurance** - This section shall provide a statement of the relation of the item to the applicable quality-affecting requirements.
3. **Method** - This section shall provide a statement of the design method used or analytical model employed and results of literature searches or other applicable background data.
4. **Codes and Standards** - This section shall provide a list of the applicable codes and standards by name, number, and date, including applicable revision date or addenda. The Originator shall provide the rationale for any deviation from applicable codes or standards.
5. **Design Inputs** - This section shall provide identification of design inputs and their sources, including other design criteria and other calculations. The Originator shall provide the rationale for not using any approved applicable design inputs.
6. **Criteria** - This section shall provide criteria cited in regulatory commitments bearing on this analysis, including section and revision date.
7. **Assumptions** - In order to complete the design analysis, the originator may have to make assumptions that are not clearly identified or controlled by the design inputs or other sources of information. These assumptions, along with the basis for the assumptions, shall be clearly stated within the analysis. Those assumptions that will require verification as the design proceeds shall be identified in this section along with the pages or section numbers where they are used. If an assumption is used more than six times in the analysis, the comment "used throughout" may be used instead of the individual references.
8. **Sources of Information** - Sources of information, data, and equations employed in the design analysis shall be listed in this section. This includes published reports, technical papers, manufacturer's specifications, studies, laboratory test reports, literature searches, or other background data or information.
9. **Computer Programs** - The Originator shall identify any computer calculation used to support the design analysis for quality affecting designs. The computer type, program name and version/revision numbers, computer software configuration item (CSCI) number, input, output, and the basis for use of the computer program to support the analysis shall be stated. This section shall also state whether computer programs are developed or qualified under QAP-19-1, QAP-19-2, QAP-19-3 and used in accordance with QAP-19-4.

ATTACHMENT 11.3 (Continued)

DESIGN ANALYSIS OUTLINE

- 10. Analysis** - The complete presentation of the analysis, including all calculations, shall be presented such that any qualified individual could review the calculation without recourse to the originator.
- 11. Conclusions** - The conclusions and any decisions or recommendations based on the analysis that will aid in further design decisions shall be presented in this section.
- 12. Attachments** - Supporting documentation, such as computer printouts, that are lengthy or cannot be conveniently included within the main body of the calculation shall be included as attachments. Each attachment except microfiche shall be given a sequential number and shall be bound in a volume. Computer printouts included as calculation attachments that are printed on continuous forms are exempt from page numbering requirements provided they are attached in the original fanfold form. Each attachment shall contain a unique page number.

ATTACHMENT 11.4

WBS:

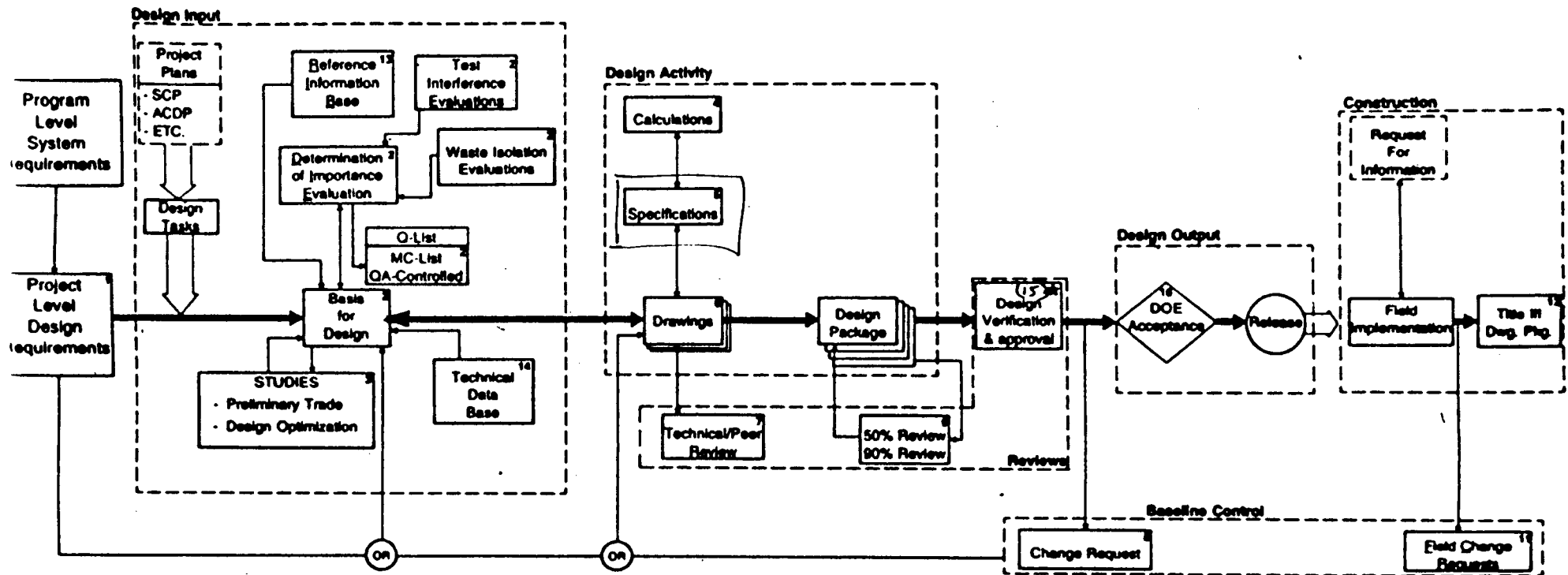
QA:

Page:

Of:

[illegible]

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS

(1) QAP-3-1, QAP-3-5, AP-6.1Q	(8) QAP-3-4
(2) QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6.17Q, YMP/92-1	(9) QAP-3-1, QAP 3-14
(3) QAP-3-5	(10) AP-3.3Q, AP-6.1Q, BTP-EDD-002, QMP-03-09, YMP/93-08
(4) QAP-3-9, QAP-6-1, QAP-17-1	(11) AP-3.5Q, NLP-3-10
(5) QAP-6-1, QAP-17-1, QAP 3-11	(12) AP-3.3Q, AP-3-7Q, AP-5.24Q, QMP-03-09, AP-5.21Q
(6) QAP-3-10, QAP-6-1, QAP, 17-1	(13) AP 5.3
(7) QAP-3-1, QAP-3-3	(14) AP 5.2Q
(15) QAP-3-2	

★ Currently QAPs 3-8, 3-10, & 3-11. Will be incorporated in QAP-6-2, October 89

13. INTRODUCTION

This procedure describes the preparation of detailed procurement and construction specifications for the purpose of defining the technical requirements for the supplier. The supplier is the vendor or seller who provides and/or installs the item described in the specification. The buyer for the procurement and construction of the YMP is the general construction contractor (REEC_o).

The term specification defines the qualitative requirements for products, materials and workmanship upon the contract is based.

The term section is a portion of project specifications covering one part of the total work requirements.

Specifications shall be in sufficient detail to permit the fabrication, manufacture, purchase, inspection, testing, preparation for shipment, acceptance, or installation of the desired items. Specifications shall cover operating conditions, materials used, and other data for defining the level of quality required.

Specification format shall follow the requirements of the Construction Specification Institute (CSI) three part format as modified for the Yucca Mountain Project. Specification examples are provided on an as needed basis and obtained from the project Specification Coordinator.

The technical reviews and subsequent approvals of both standard and package specific specification sections are described under Section 8, Design Reviews, of this manual.

A specification check list for both individual disciplines and the responsible Design Supervisor is provided in Exhibit 3.0-1 and 3.0-2. This list is to be used as a guide for specification section development, reviews and the subsequent issuance of the specifications within a specific package.

Exhibits

Exhibit 3.0-1 Discipline Checklist for Specification Sections (1 page)

Exhibit 3.0-2 Project Engineer Specification Checklist for Packages (1 page)

13.1 REQUIREMENTS

Procurement and construction specifications have the following requirements.

13.1.1 Preparation

There are two types of specifications which are as follows:

- Package Specific Specifications are issued for a specific package only.

- Standard Specifications represent a standard material, piece of equipment and/or installation requirement which can be used in multiple packages. If there is deviation from or a clarification of the Standard Specification required, then an Addendum will be used. An example of an Addendum is shown in Exhibit 3.1-1.

All specification sections shall be prepared in accordance with the Procurement and Construction Specification Preparation Guide (Exhibit 3.1-2).

13.1.2 Codes and Standards

Codes and standards, along with their date of issue, shall be tabulated.

Additional codes and standards will be added to the list as required. Changes to the revision date of standards already on the list shall first be evaluated to determine the construction cost impact and the impact of revising specifications that have already been issued.

13.1.3 Content

Individual specification sections shall describe the technical, safety, quality, and performance requirements of the components for the facilities, equipment, or systems, and shall include individual data sheets, sketches or attachments where applicable.

Generalities are not acceptable in specifications. Acceptance criteria and work description shall be specific and comprehensive.

Specifications shall be precise in all respects as to the Seller's scope of work, i.e., each specification section shall identify those components, services, and items the supplier is required to provide to the Buyer and shall specify any design work for which the supplier is responsible.

Specifications shall cover applicable testing and inspection requirements. Criteria for Factory Acceptance Tests (FATs) and Construction Acceptance Tests (CATs), if required, shall be included. Required parameters of what the FATs and CATs are to accomplish shall be called out, and the Seller; will then provide the procedures for review and/or approval. All references to testing must comply with Control/Quality Assurance.

Brand name or equal nomenclature is acceptable, but only after the safety, quality, and performance requirements including applicable standards and codes, have been defined. Do not use the term "Commercial Grade Item" within the specifications.

All equipment specifications shall include the requirement for the Supplier to submit Operation and Maintenance Manuals. The Construction Specification Institute (CSAI) Specification Section 01300, submittals shall be included and the submittal shall be in accordance with the specified data package. This section is only a guide of the requirements. Individual or specific requirements are to be included within each specification section. Specific requirements are to be indicated in each specification section under Part 4 Submittals and Notification.

Statements covering the handling of deviations or changes shall not be made in the specifications. These statements shall be included in the contractual documents to the selected Supplier by the Buyer.

Construction specifications shall state that the Supplier is responsible for field routing, wiring and conduit to components unless specifically stated otherwise in the contract documents.

13.1.4 Specification Language

Specification Language shall be in accordance of Chapter 4, Specification Language of the Construction Specification Institute (CSI) Manual of Practice.

13.1.5 Data and Documents Required Form

The general construction contractor REEC Co, shall submit a Vendor Drawing and Data Requirements (VDDR) form based on Part 4, Submittals and Notification of each specific section. See Exhibit 3.1-2, Part 4, Submittals and Notification for a discussion of submittals. In addition, Exhibit 3.1-3 discusses how to categorize vendor submittals. Each discipline shall be responsible for verifying the data submittal requirements from Part 4, Submittals and Notification.

UCAT is to provide the VDDR form for approval and verification of these requirements. This is considered a field support activity and part of the Title III Scope of Work.

Exhibits

- Exhibit 3.1-1 Procurement and Construction Specification Preparation Guide (12 pages)
- Exhibit 3.1-2 Category of submittals Guide (1 page)

PART 1: GENERAL

Part 1 contract clause provisions are being provided by the Buyer. Any Division 1 contract clause requirements that is believed necessary for any contract specification section, is to be approved by the Buyer prior to any implementation. Include the following Articles in Part 1, as required:

- 1.01 Section Includes
- 1.02 Related Sections
- 1.04 Quality Assurance

NOTE: If the articles are not used in a specification, the article will remain and the words "Not Used" will be inserted below the title. If additional articles are required, article numbers will be added. No underlining of articles or within the text are to be done.

- 1.01 **SECTION INCLUDES.** Use "Not Used" when the outline accompanies a "Stand Alone" descriptive or performance specification section as a related requirement. When the specification section is a stand alone or independent specification section, state "Section Includes...", "General Requirements," or "General" to list what the section includes.

1.03 REFERENCES. Where references are included, begin the article as follows:

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

- A. **Listing of Reference Publications.** Following this introductory paragraph, list the reference publications included in the specifications. List each non-Government organization's title. Each referenced publication shall be identified by its title, section, and date. Arrange this information in two columns, with the sections shown in the left column. The right column will show the document date and revision letter and amendment number, where appropriate, followed by the title.

Arrange the list of reference publications in alphabetical order.

For publications that have no section designations, create an acronym from the title and include it instead of leaving the designation area blank.

The format example is as follows:

- A. American Society for Testing and Materials (ASTM)

ASTM C33-92 Standard Specification For Concrete Aggregates

- B. **Use of Reference Publications.** Review reference publications for applicability prior to use. Apply the following guidelines:

1. Choices and options should satisfy the minimum functional requirements of the Government at the least life-cycle cost. To clarify choices and options, insert Criteria Notes in the specification section where appropriate.
2. Tailor reference publications, where possible, to minimize the number of documents referenced in a specification. If only a small portion of a reference applies, extract the pertinent text from the reference publication and include it in the specification section where appropriate.

For example, do not reference a government standard such as DOE Order 6430.1A in its entirety, but extract only the pertinent information for reference.

3. Use nationally recognized industry and technical society specifications and standards to the maximum extent possible. Where none is available, use federal and military specifications. When it is necessary to reference an entire publication, follow the reference with notations of applicable chapters, paragraphs, or other subdivisions pertinent to the specification. Do not repeat the requirements of the reference documents in the text of the specification section. Select references in the following order of precedence:
 - a. Non-Government standards

- b. Commercial Item Descriptions (CID)
 - c. Federal specifications
 - d. Military specifications
4. When Nationally recognized industry and technical society specifications and standards or federal and military specifications do not cover the requirements under consideration, specify materials and equipment that comply with commercial standards and which are available from commercial sources.

C. Options in Reference Publications. Most reference documents contain a range of possible options, e.g., grades, styles, types, sizes, colors, and other specifications, which must be addressed in the specification section. Select options in the reference document, where appropriate, and place specific requirements within the specification section. Where possible, amplify options, e.g., "Type 1, light duty" in lieu of "Type 1."

D. Titles of Reference Publications. List the titles of the reference publications verbatim, including capitalization, punctuation, and numerical designations.

E. Current Reference Publications. Research the Information Handling Services' VSMF system files, which are available in the REECo Library. The reference must be consistent with criteria documents. The listing of reference publications shall include all the reference publications and year referred to in the text of the specification section and vice versa.

Review the current baselined edition of a reference publication to ensure that it is compatible with the requirements of the specification. If the current issue of the reference publication is found to be unsatisfactory, seek another reference publication.

F. Reference Document Designations in the Text of the Specification Section. After the initial listing of references, do not repeat the title and date of the current reference publication in the text of the specification. When referred to in the text, federal specifications shall have "FS" placed before the basic publication identifier, e.g., "FSWW-P-000." Military specifications shall appear as: "MIL-A-000." Non-Government publications, e.g., America Society for Testing and Materials (ASTM) and National Electrical Manufacturers Association (NEMA), shall be identified in the text by their publication identifier only, e.g., ASTM A36/A 36M.

1.03 RELATED SECTIONS. This portion of each specification section identifies related work specified elsewhere but not part of this specification section. They are to be listed by specification section number and title. Information only Specifications or Publications are to be included under related sections.

1.04 QUALITY ASSURANCE. This portion of each specification section identifies whether products covered under the section are important or not important to waste isolation or radiological safety. It also addresses acceptance of product by receipt verification and/or field verification. Reference is made to specification Section 01400, Contractor Quality Control/Quality Assurance.

1.05 **DEFINITIONS.** If required, define words or terms used in the specification section that are not commonly known or that could be misinterpreted. Verify definitions.

1.06 **SYSTEM DESCRIPTION.** This is restricted to statements describing performance or design requirements and tolerances of a complete system. It is not a place to list the components that make up the system. Limit descriptions to composite and operational properties to the extent necessary to link multiple components of a systems together and to interface with other systems.

A. **Submittals and Notification, Part 4.** The purpose of a submittals and notification is to provide a checklist of submittals required of the Supplier. The submittals and notification requirement sheet identifies the items, materials, and equipment, e.g., control panel, vinyl floor tile, pumps, for which a submittal is required, and the submittal type, e.g., shop drawings, samples, product data, which is to be provided by the Supplier. See Exhibit 3.1-3 as a guide for preparation of submittals list. The Submittal Requirements will be summarized in the Vendor Drawing and Data Requirements (VDDR) section of the order/subcontract. See Exhibit 3.1-4 as a guide for preparation and submittals and notification.

B. **Shop Drawings.** This covers any shop drawings prepared specifically for the contract. Specify the type of information required on shop drawings.

C. **Product Data.** This covers any submittal prepared from standard data and used in lieu of shop drawings where standard catalog cuts, manufacturer's specifications, or other standard published data are sufficient. Where contract size will determine the need for shop drawings versus product data, include both submittals and an explanatory note to the specifying engineer to choose the appropriate paragraph on the basis of contract complexity.

D. **Samples.** This is any submittal which is a physical example. List the quantity and size of each sample required. Allow full-size samples to be tagged and installed where feasible. Because of the expense of storage, the use of samples should be limited to items that cannot be evaluated and approved by some other method.

E. **Test Requirements.** Include requirement for submittal of test procedure for approval and for test results. Types of tests anticipated:

- Factory Acceptance Tests (FATs).
- Construction Acceptance Tests (CATs).
- Field Tests done from material onsite.
- Tests done on prototypical material or products.

F. **Certified Material Test Reports.** Certified Material Test Reports are normally required as further evidence to specifically verify the chemical composition and physical properties of materials used in components, systems and structures. The discipline engineer should determine the need for this additional evidence based on the following:

- The component, system or structure design
- The consequences of component, system or structure failure
- The requirements of the codes and standards referenced or used in the design, construction or testing of the component, system, or structure.

This criteria applies to both Quality Level I and Quality Level II items.

While it is generally expected that most material used on HWVP will need a CMTR, discipline engineers still must review applicable codes and standards, and use sound engineering judgement to determine if a CMTR is required or necessary.

G. **Certificate of Conformance (C of C).** Discipline Engineers shall not require the seller to provide a C of C. Rather than requesting a C of C the Engineer should determine if there are specific attributes, features, or characteristics of the item about which additional technical documentation is needed. The specific technical backup documentation is needed. The specific technical backup documentation should then be made a requirement for submittal in the specification.

For example, in a specification for an "Off the shelf" valve operation, the engineer determines that a closure time of 2 seconds is an essential characteristic. Because the specification is for a generic item (ITT model xxx or equivalent) the final item will most likely come from a supply house. The engineer should specify that "Manufacturers Documentation" be submitted which demonstrates that the model supplied meets the closure time requirement. This documentation will most likely be in the form of a specification sheet and manufacturers prototype test report.

H. **Sample Panels or Sample Installations.** A sample panel or sample installation, while not transportable, is considered a form of submittal, i.e., it is used in controlling the quality of construction. It is usually constructed at the jobsite where it is readily available for comparison with work installed in the facility being constructed. Sample panel requirements should be identified only when required. Specify the comments and features to be illustrated in the sample panel.

I. **Operation and Maintenance (O&M) Manuals.** Training in operations, maintenance, safety, and emergency procedures shall be specified in Part 3 under Part 3.7 "Demonstration." Reference to Specification Section 01730, Operation and Maintenance Data, and any other appropriate data shall be made.

- 1.07 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS.** Grouped under this article are the provisions as they pertain to a particular specification which establish the limitations, criteria and coordination relating to the physical and environmental conditions under which the Supplier must perform. Subjects such as "existing conditions" and "environmental protection requirements" are to be included under this article. Division 1 as provided by the Buyer may cite many project or site conditions which must be maintained. Do not duplicate those requirements.

PART 2: PRODUCTS

- 2.1 **MATERIALS AND EQUIPMENT.** Include articles describing in detail the requirements for the materials and accessories related to the work within the specification. When a variety of acceptable materials or equipment is available, include as many options as practical for the Seller to select from. From time to time, requests are made to consider the use of materials which are comparatively new. The fact that a product is new shall not, necessarily, preclude its use. However, specifications shall not be used as experimental vehicles for untested products. Conversely, a product's previous use shall not place it in a favored status. Usually, it is necessary to base judgments on laboratory tests. Such tests, in order to be accepted as authoritative, shall be made by reputable laboratories recognized by industry or Government as producing unbiased, complete tests and test reports.

- A. **"Or Equal" Specifications.** Specifying items by naming an acceptable commercial product's brand name followed by the words "or equal" is permitted under the following conditions: (1) there are no industry or Government specifications for the item; or (2) the item is a minor part of the work; or (3) the item cannot adequately be described because of its technically involved construction or composition. The essential features of the item must be set forth in sufficient detail to establish the basis upon which the equality of nonlisted products will be determined. The term "Commercial Grade" shall not be used since special controls would be necessary to process items so specific.
- B. **Proprietary Specification:** Procurement of sole source and proprietary items is a lengthy and involved process; therefore, in the specification, it is advisable to avoid proprietary procurement requirements. Avoid using trade names, copyrighted names, other proprietary names, manufacturers' part numbers, or drawing numbers applying exclusively to the product of one company, unless the items cannot be described adequately due to technical involvement, construction, or composition.
- C. **Methods of Specifying Materials and Equipment.** Include statements describing in detail the products and related accessories to be provided. Either specify the products with a reference publication or specify their performance requirements.
1. **Equipment.** Specify performance requirements in describing an item of equipment to be incorporated into the work. Do not use this paragraph to describe equipment used to execute the work.
 2. **Mixes.** Mixing is a process which prepares the materials for use. Refer to attachments describing proportions or procedures in mixing materials.

- D. **FATs and CATs.** Include requirements for tests and inspections to be conducted in the factory along with acceptance criteria. CATs are to be specified and included under Part 3 Execution, Field Quality Control.

FATs shall be performed on all materials and equipment except for minor items or off-the-shelf types of material and equipment. The manufacturer's standard test and inspection procedures may be acceptable for non-critical equipment.

The following criteria shall be used in specifying the FATs and CATs requirements:

1. **FATs**

- Specification for FATs shall be confined to testing requirements that are necessary to demonstrate that the fabrication and assembly of the materials and equipment meet the requirements delineated on the design drawings and specifications.
- The specification shall also identify to the Supplier requirements for specific hold, witness, or test points that have been determined by the responsible discipline engineer to be necessary to ensure that the materials and equipment meet the requirements.
- The specification shall also identify requirements for environmental qualification testing, structural tests, reliability (MTBF) and maintainability demonstrations that have been determined by the design criteria for the materials and equipment.
- FATs shall be performed at the Supplier shop or designated location approved by Buyer.
- FATs shall be incorporated into procurement specification packages and into construction packages where the contractor is also to provide equipment requiring factory tests.

2. **CATs**

- Specification for CATs shall be confined to testing requirements that are necessary to confirm that the equipment installation and construction have been accomplished properly and meet the requirements denoted in the construction drawings and specifications.
- The construction specification shall identify requirements for specific hold, witness, or test points required by the Buyer to be necessary to ensure that installation and construction meet the requirements.

- The specification shall include requirements for structural tests and support equipment compatibility tests to verify the compatibility among prime equipment, test and support equipment, and transportation and handling equipment, as deemed necessary by the responsible engineer or discipline/system lead engineer.
- CATs shall be performed at the project site or designated location where the installation and/or construction will finally be made.
- CATs shall be incorporated into the construction specification package.

3. Software Tests (FATs or CATs application)

- Requirements of the development, maintenance, use, and control of computer software related to Quality Affecting computer software are presented in the detailed design Quality Administrative Procedures Computer Software Verification and Validation QAP-19-1. These requirements must be included in the specification when requesting the Supplier to provide software tests.

4. Quality Affective Designated Elements

- Technical specifications must include unique acceptance requirements for FATs and CATs.
- Technical specifications must identify potential sources of testing uncertainty and error, and affected parameters must be identified for control by the testing organization.
- Technical specifications must delineate precision and accuracy requirements for measuring and testing equipment that will be used by the testing organization.

5. Submittals/Approvals

Suppliers shall be required to submit and/or provide to the Buyer for review and approval, the following:

- Itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria.
- To be assured that the equipment, installation and/or construction has adequate compliance, it shall be stressed to the Seller that the acceptance criteria shall be explicit and shall not require any interpretation as to its meaning.
- Detailed shop testing procedure and inspection and verification checklist.

- Test reports containing at least the following information:

- Item tested
- Date of test
- Tester or data recorder and date of last calibration
- Type of observation (visual, audible, electronic, etc.)
- Results and acceptability
- Action taken in connection with any deviations noted
- Person evaluating test results

E. **Tests Reports.** List the test reports required so the Seller may determine quickly what reports are to be provided. Test reports are to be provided for tests made within the previous three years on samples of the same types of materials which are to be incorporated into the work. If current tests are required, omit the paragraph. Specify only those tests and the results necessary to provide the level of quality required to satisfy Government functional and/or QA programs requirements.

2.2 **FABRICATION AND MANUFACTURE.** Describe products which must be processed or created off-site before installation, e.g., precast or prestressed concrete.

PART 3: EXECUTION

This part is not required in procurement packages except for support of shop fabrication requirements (e.g., Welding Specifications). The words "Not Used" should be inserted following the title in procurement packages.

In construction packages, this part incorporates the products specified in Part 2 into the project. Included in Part 3 are the "on-site" or "field" functions and requirements. Part 3 of the specification contains both general and specific provisions which contribute to the accomplishment and control of the work. The groupings are to be arranged in the chronological sequence normally occurring in the orderly progression of the work. Included in Part 3 are:

- 3.1 Preparation
- 3.2 Installation, Application, and Erection
- 3.3 Field Quality Control
- 3.4 Adjustments
- 3.5 Cleaning
- 3.6 Protection
- 3.7 Demonstration
- 3.8 Schedules

3.01 **PREPARATION.** (Construction Specifications Only) Include requirements which describe those preliminary actions necessary to prepare for the accomplishment of the work. The requirements can range from simple cleaning to elaborate technical efforts such as grading, etching, or establishing grades and levels. Examples of some provisions which may be included are protection of surrounding areas and preparation of surfaces, such as final grading.

3.02 INSTALLATION, APPLICATION, AND ERECTION. (Construction Specifications Only) Installation includes placing concrete, laying brick, framing floors, as well as site clearing, general excavating, structure excavating, rough grading, etc. Application includes applying roofing, paint vinyl wall covering, etc. Erection includes raising of structural steel, bar joists, trusses, etc.

3.03 FIELD QUALITY CONTROL. (Construction Specifications Only) These tests are primarily for control of the quality of products installed in the field. The requirements include tests at the site or tests on products made away from the site. The tests methods, the frequency or number of tests per unit, and results to be accomplished are to be specified. Do not require excessive testing. Specify only those tests necessary to ensure that the products provided comply with requirements.

Review tests required by the reference publications and require only those considered essential. Where standard methods have been established for performing tests or for taking samples in the field, they shall be referenced. Examples are soil compaction tests, concrete compressive strength tests, concrete slump tests, and piping system leak tests.

CATs shall be performed on all installation and construction of materials and equipment. CATs which must be performed in the field to demonstrate that installation and construction of the materials and equipment meets the requirement of the construction drawings and specifications, shall be required from the construction subcontractor. Tests and inspections required, and the acceptance criteria, shall be listed in this section. CATs requirements are as outlined under Part 2 Products, 2.1 Materials and Equipment of the pertinent specification section.

3.04 ADJUSTMENTS. (Construction Specifications Only) Requirements for adjustments necessary to place an item of equipment in proper operating condition shall be specified in this article.

3.05 CLEANING. (Construction Specifications Only) When the cleaning requirements of a specification exceed the scope of cleaning established in the Contract Clauses, the additional requirements shall be included in Part 3. In many cases, cleaning shall be performed immediately and shall not be delayed until the completion of the project.

3.06 PROTECTION. (Construction Specifications Only) Generally, the Seller is responsible for protecting work which is in place from damage by weather, persons, construction, etc. If special protection is required for some element of the construction, the requirement shall be placed in Part 3. Ensure that the special requirement is in addition to protection requirements stated in the Contract Clauses.

- 3.07 **DEMONSTRATION.** (Construction Specifications Only) Include an article pertaining to training for operations and maintenance personnel where equipment, control systems, processes, etc., are sufficiently complex that they may be beyond the capability of operations and maintenance personnel and require instruction by the Seller's or manufacturer's staff. Refer to the following example:

Instructing Government Personnel

Upon completion of the work and at a time designated by the Buyer, the services of a competent technician regularly employed or authorized by the manufacturer of the _____ shall be provided for instructing Government personnel in the proper operation, maintenance, safety, and emergency procedures of the _____. The period of instruction shall be not less than _____ but not more than _____ 8-hour working days. The training shall be conducted at the job-site or at another location mutually satisfactory to the Government and the Supplier.

Where applicable, a clause similar to the previous example shall be included in Division 16 specifications and in other specifications as deemed appropriate. Division 15 specifications shall comply with the provisions of Mechanical General Requirements, which relate to this subject. Include the following as a Criteria Note keyed to the previous paragraph.

There are restrictions on the type and extent of training. Training is usually on-site, three days or less. Factory representatives or others provide basic instructions to facility maintenance and operation personnel. If more extensive training is required, e.g., student travel, special consultants, consult the Buyer for assistance.

- 3.8 **SCHEDULES.** (Construction Specification Only) Schedules tell "where" to put "what." While every effort should be made to have schedules placed on the drawings, there are occasions where it is desirable to include them in the specifications. Since schedules are subject to change until the construction documents are released, it is desirable that they be the last item included in a specification. An example is the finished hardware schedule.

PART 4: SUBMITTALS AND NOTIFICATION

4.01 SUBMITTALS

- A. Submittals shall be in accordance with the attached Submittal and Notification Requirements sheet.
- B. Reinforcing Steel Shop Drawings: Prepare shop drawings for reinforcing steel in accordance with ACI 315. Indicate bending and assembly diagrams, splicing and laps of bars, and dimensions and details of bar reinforcing. (HOLD POINT)

- C. Mix Designs: Submit concrete mix designs for each concrete strength indicated on the Drawings. Mix designs shall be prepared in accordance with ACI 211.1 and meet the requirements of ACI 301, Chapter 3. The laboratory mix design report shall include, but not be limited to, the following: (HOLD POINT)
1. Confirmation of aggregate test data based on available test results determined within the past six months and the date tests were made.
 2. Indicate proportions of aggregates, cement, water, and admixtures used in the laboratory trial mixes and present yield calculations.
 3. Report 7-day and 28-day compressive strength of test specimens made from the laboratory trial mix.
- D. Certified Mill/Laboratory Test Reports: Submit certified copies of the results of tests performed on the following materials:
1. Cement (2.01A.1)
 2. Admixtures (2.01D)
 3. Reinforcement (2.04)
 4. Liquid Membrane-Forming Curing Compound (2.05B).
- E. Placement Log: The Contractor shall prepare and submit documentation allowing traceability of concrete. This log shall as a minimum, include:
1. Documentation relating placement location to time slip
 2. Time slip relating delivered concrete to batch ticket
 3. Batch ticket relating concrete to constituents
 4. Verification of constituent mill or field tests
 5. Test result of field sampled concrete.
- F. Contractor Procedures: The Contractor shall prepare and submit the following for Architect/Engineer (A/E) review:
1. Detailed procedures for cleaning surfaces prior to concrete placement (3.01)
 2. Detailed methods of heating or cooling concrete (3.06.B.2)
 3. Detailed methods for curing concrete (3.10.A).

4.02 NOTIFICATION

Should any change in this Specification Section be required to comply with these requirements, the Contractor shall notify the A/E in writing or review.

3.2 FORMAT

Specification sections shall follow the Construction Specification Institute (CSI) format and the guidelines presented in Exhibit 3.1.2.

3.2.1 Cover Sheet and Table of Contents

All specification section sections shall be issued with a cover sheet (Exhibit 3.2-1) which includes the following:

- Specification section number and title
- Specification identifier (see Section 3.2.2)
- Reason for issue (Interim Design Review, Group Review, Squad Check, Final Design Review, and Approved for Construction)
- Revision number and date
- QA quality level, and safety class designations
- Signatures as required

Exhibit 3.2-1 shows an example of both a package specific and a standard specification section cover sheet. The cover sheet for specification sections and the section table of contents (Exhibit 3.2-2) are to be used for all project reviews and external issues.

Individual specifications sections, when finalized for Final Design Review (FDR) and Approved for Construction (AFC) issue, will be consolidated into a specification summary form using CSI standard practices by the Project Engineer. A summary cover sheet will be added to the specification as shown in Exhibit 3.2-3 and Exhibit 3.2-4, respectively.

3.2.2 Numbering

Specification numbers shall be in accordance with the master list of section titles and numbers of the CSI master format and also in accordance with Quality Administrative Procedures QAP 3.6 Configuration Items and CI Identifiers.

3.2.3 Attachments

Attachments may include data sheets or other documents as required.

In specifications where reference is being made to data sheets and/or attachments of which the data will change for package specific requirements, use the following procedure in developing the Standard Specification section.

A. Data Sheets

Data sheets shall be submitted on attachments to the Specification Section. See Exhibit 3.2-4.

B. Other Documents

Attachments (other than data sheets) shall be numbered as Attachment B, C. If no data sheets are included in this section, numbering shall start a "A."

3.2.4 Exhibits

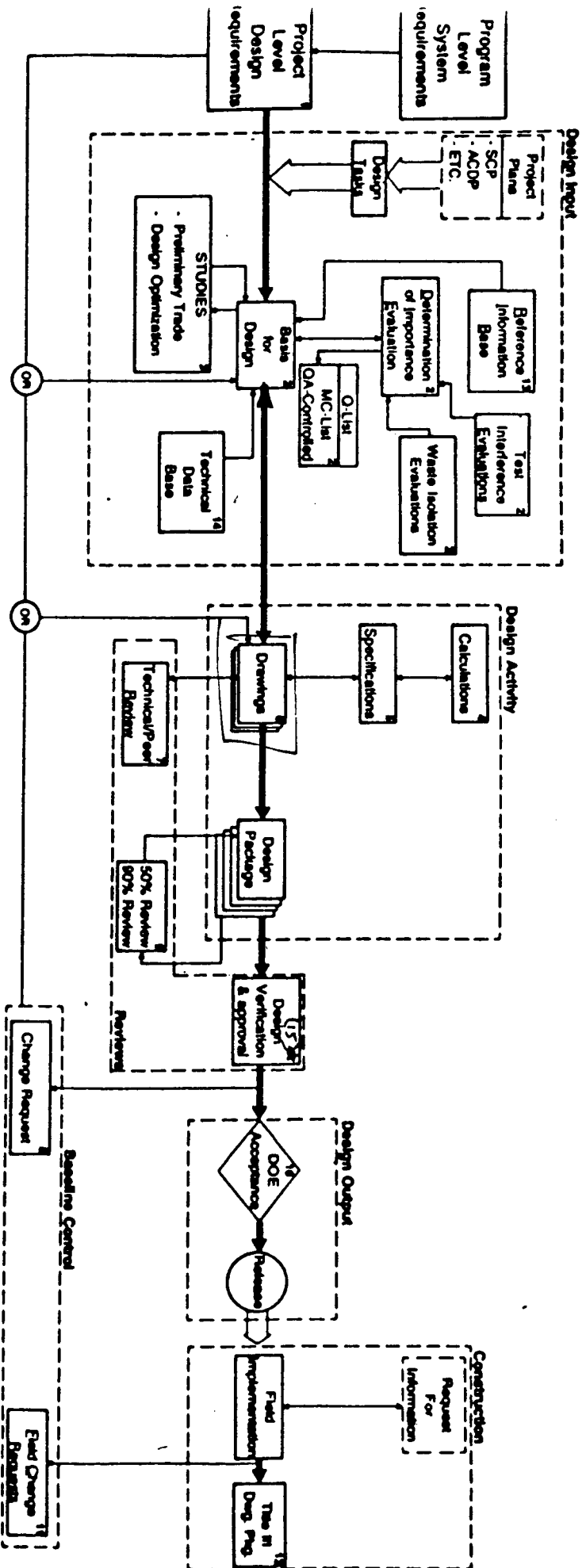
Exhibit 3.2-1 Specification Section Cover Sheet - Sample (1 page)

Exhibit 3.2-2 Certification of Specification - Sample (1 page)

Exhibit 3.2-3 Revision Description - Sample (1 page)

Exhibit 3.2-4 Data Sheet (2 pages)

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS

(1)	OAP-3-1, OAP-3-5, AP-6-10	(8)	OAP-3-4
(2)	OAP-2-3, OAP-3-5, OAP-3-9, OAP-3-11, OAP-3-12, OAP-17-1, AP-6-170, YMP/02-1	(9)	OAP-3-1, OAP-3-14
(3)	OAP-3-6	(10)	AP-3-30, AP-4-10, 8TP-EDD-002, OMP-03-09, YMP/03-08
(4)	OAP-3-9, OAP-4-1, OAP-17-1	(11)	AP-3-50, NLP-3-10
(5)	OAP-4-1, OAP-17-1, OAP-3-11	(12)	AP-3-30, AP-3-70, AP-5-240, OMP-03-09, AP-5-210
(6)	OAP-3-10, OAP-4-1, OAP-17-1	(13)	AP-5-3
(7)	OAP-3-1, OAP-3-3	(14)	AP-5-20
(15)	OAP-3-2		

Currently OAP-3-3, 3-10, & 3-11, will be incorporated in OAP-3-2, October 1987

12. INTRODUCTION

This document establishes guidelines for producing design drawings utilizing the Intergraph Microstation 32 Computer Aided Design (CAD) system. Intergraph Microstation 32 is a CAD system used to produce two and three-dimensional scaled and nonscaled drawings efficiently, uniformly, and expeditiously with the aid of seed files, cell libraries, user commands, menus, and reference files.

All disciplines shall be consistent in their approach to applying these guidelines. Compliance is mandatory as partial application to the steps involved may be detrimental to the drawings. Any conflicts in these guidelines must be reported to the Design Support Supervisor (DSS).

New designers must sign a computer security agreement prior to receiving a user name and logon authorization to the Intergraph System. This agreement may be obtained by the DSS or a person designated by the DSS.

12.1 DIRECTORY STRUCTURE

Directory structure will be maintained by the DSS assignee. Username directories will be maintained by Information Management System (IMS).

/proj	uppermost directory structure, under which all project files are kept
/proj/stds	standards utilized by all disciplines
/proj/stds/form	all standard drawing borders
/plot	pen tables for plotting
/cell	project standard symbols (multi-discipline)
/proj/rsn	all original files from Raytheon Services Nevada (RSN), with read access only
/proj/esfs	all surface drawing files, cell libraries, user commands and menus will be contained under this header directory
/proj/esfss	all subsurface drawing files, cell libraries, user commands and menus will be contained under this header directory
/proj/esf*/(discipline)/cell	cell libraries
	/dgn - drawings, backgrounds, models, sketches
	/ucm - user commands
	/menu - menus
	additional subdirectories may be added by disciplines.

(Reference Appendix B for aliases of directories.)

- * s - surface
- ss - subsurface

12.2 ELECTRONIC FILE-NAMING CONVENTIONS

Electronic file naming conventions shall be used as a multidiscipline guide to establish file names for ESF electronically created drawings. Lead engineers are responsible for the implementation of this practice for drawing files under their control.

The DSS is responsible for assigning individuals to maintain File Management Logs throughout the project. These logs shall include the following:

- Drawing File/Drawing Number Log
- Background file log
- Sketch file log

At the end of the project, these logs shall be compiled and turned over to the LRC.

12.2.1 Construction Drawing File Names

Drawings shall be numbered per QAP 3-13 Document Identifiers.

The construction drawing file name for each drawing shall correspond to the sequential number field in QAP 3-13. Drawing files should normally carry a .dgn extension and shall be named in lower case letters using the following numbering system. Ex. 20000.dgn.

20000 - 20999 ESF - GENERAL NOTES

20000 - 20999 ESF - SURFACE - CIVIL

22000 - 22999 ESF - SURFACE - ARCHITECTURAL

23000 - 23999 ESF - SURFACE - STRUCTURAL

24000 - 24999 ESF - SURFACE - ELECTRICAL

25000 - 25999 ESF - SURFACE - MECHANICAL

26000 - 26999 ESF - SURFACE - HVAC

27000 - 27999 ESF - SURFACE - PLUMBING

28000 - 28999 ESF - SURFACE - CONTROL SYSTEMS

29000 - 29999 ESF - SURFACE - TBD

30000 - 39999 TBD

40000 - 40999 ESF - SUBSURFACE - MINING

41000 - 41999 ESF - SUBSURFACE - CIVIL/STRUCTURAL

42000 - 42999 ESF - SUBSURFACE - ARCHITECTURAL

43000 - 43999 ESF - SUBSURFACE - PROCESS AND
INSTRUMENTATION

44000 - 44999 ESF - SUBSURFACE - ELECTRICAL

45000 - 45999 ESF - SUBSURFACE - MECHANICAL

46000 - 46999 ESF - SUBSURFACE - TBD

47000 - 47999 ESF - SUBSURFACE - TBD

48000 - 48999 ESF - SUBSURFACE - PIPING
49000 - 49999 ESF - SUBSURFACE - TBD

12.2.2 Background File Names

Background files are design files used solely for the purpose of creating a reference file for a design drawing, and are not intended to be stand-alone design drawings (i.e., Topographic maps).

Background files shall have a sequential number assigned by the Design Support Supervisor, all in lower case letters. If background files were originally developed by RSN, the file names will remain the same as delivered by RSN.

12.2.3 Sketch File Names

SK-series drawing are sketches prepared as temporary drawings for coordination of interoffice design activities and for the M&O interface documentation. Sketch file names shall have a discipline designator followed by -SK and a sequential number with a .dgn extension. Subsurface sketch files will be preceded by ss. Ex. ss-m-sk001.dgn

12.2.4 Seed File Names

Seed files are design files with set parameters and working units used to start a new working drawing. Seed file names shall contain "seed" or "sd" within the file name. Ex. seed2a.dgn

12.2.5 Cell Library Names

Cell library names shall be assigned by disciplines, but the name should be explanatory as to the type of cells contained in the library.

12.3 WORKING UNITS

Three types of working units are currently being used; architectural, civil, and metric. Architectural working units are generally used by all surface disciplines other than civil. Civil will use the civil working units to provide a larger working area in the design file. Subsurface will use metric working units.

<u>Architectural</u>	<u>Civil</u>	<u>Metric</u>
Master Unit = ' or ft	Master Unit = ' or ft	Master Unit = m
Sub Unit = " or in	Sub Unit = None or "	Sub Unit = mm
Sub Units/Master Unit = 12	Unit/Master Unit = 10	Sub Units/Master Unit = 1000
Positional Unit/Sub Unit = 8000	Position Unit/Sub Unit = 100	Pos Unit/Sub Unit = 1
Total 44,379 sq ft for use	Total 4,294,967 sq ft for use	Total 4,294,967 sq meters for use

Before starting a drawing in a design file the operator must always check the working units for correctness. Working units must not be changed in a design file once the drawing has been started as this would alter the accuracy of the drawing.

When placing cells from different working units, use the following formula to determine the active scale.

Divide total positional units per master unit of current file by total positional units of source file. Multiply the result by the scale factor of the current file. This number will be the active scale that should be used.

Example:

From Arch to Civil Working Units Active Scale

$$\frac{1000}{96000} = .0104167 \times \text{Scale of Drawing (if needed)} = \text{Active Scale (AS)}$$

From Civil to Arch Working Unit Active Scale

$$\frac{96000}{1000} = 96 \times \text{Scale of Drawing (if needed)} = \text{AS}$$

12.4 SEED FILES

It is the responsibility of each discipline to set up a seed file. The seed file contains set parameters such as working units, dimension parameters, font, text size, and data read out. After a seed file has been created, a user can use the seed file to create a design file.

12.5 DESIGN FILE SETUP AND DRAWING PRACTICES

The designer should make sure the elements in the file are located at proper coordinates in relation to the site or building. Civil and mining should accomplish this by attaching the civil site plan as a reference file. All other disciplines should attach the architectural floor plan for proper location of the buildings.

The border shall always be attached to the active design file as a reference file. If the design file contains physical items or a physical design then it is usually necessary to scale the border at a specific scale as required to fit around the design. If the design file does not contain physical items then it is usually not desirable to scale the border. This would apply when drawing schematic diagrams, flow sheets, equipment schedule charts, etc. Since the border is actually 22 ft x 34 ft then it is almost always necessary to scale the design file for plotting. The border or parts of the border should never be copied into the active design file.

Unit lock and grid display should be used on design files except where Nevada State Plane coordinates are used.

12.5.1 Scales

Drawing scales to be used wherever possible are as follows:

<u>English</u>	<u>Metric</u>
1/8" = 1"-0"	1:10
3/16" = 1"-0"	1:20
1/4" = 1'-0"	1:25
3/8" = 1'-0"	1:50
3/4" = 1'-0"	1:75
1" = 1'-0"	1:100
1 1/2" = 1'-0"	1:200
3" = 1'-0"	1:250
1" = 10'	1:300
1" = 20'	1:400
1" = 40'	1:500
1" = 50'	1:750
1" = 100'	1:1000
1" = 200'	1:2000
1" = 300'	1:3000
1" = 500'	1:4000
1" = 1000'	1:5000
	1:7500

(Reference Table 1 for sample scale factors)

12.5.2 Standard Symbols

The standard symbols aka cells created by an assigned operator shall contain M&O standards that are to be used by all disciplines. These standard cells shall contain but not be limited to: north arrows, section and detail titles, section and detail bubbles, and column line designations. These cells will reside in libraries in the /proj/stds/cell directory, and shall be on level 59. (Reference Attachment 3)

12.5.3 Text

Intergraph microstation font 3 shall be the font used by surface and subsurface.

A text height of .10 with line spacing of half the height of the text (.05) and weight of 1 will be used for main drawing text and dimensions.

A text height of .125 with line spacing of half the height of the text (.0625) and weight of 2 will be used for equipment titles and room names. Text of .125 to be underlined should be .125 line spacing to allow enough room for the underlines.

A text height of .20 with line spacing of half the text height (.10) and weight 2 will be used for subtitles (plan, detail). Text of .20 to be underlined should be .125 line spacing to allow enough room for underlines.

For text height at specific scales reference Table 2.

12.5.4 Dimensions

All dimensions for surface facilities shall be in the English system (feet and inches for all disciplines, decimals of a foot for files using State Plane Coordinates). Subsurface dimensions shall be in metric, with mining also including the English equivalent.

Stack dimensions shall normally have a distance of 3/8" between dimension lines. Dimension arrowheads shall be filled and shall have the following settings: 1.35 in length and .45 in width.

12.5.5 Line Weights

Line weights 0-6 are to be used on all ESF generated drawings. (Reference Attachment 4 for example of weights.)

(Reference Appendix A; Level Assignments for weights to be used.)

12.5.6 Level Assignments

It is the responsibility of all CAD users to adhere to the leveling scheme set forth by their discipline (Reference Appendix A). Doing so facilitates the use of reference files by other disciplines, for turning off elements not needed.

12.6 STANDARD BORDERS

12.6.1 M&O Borders

Standard borders have been created in feet. After borders have been attached as reference files, they may need to be scaled up or down according to plot scale.

Size A - 11 x 8.5	/proj/stds/form/form-av.dgn	saved view name = formav
Size A - 8.5 x 11	/proj/stds/form/form-a.dgn	saved view name = forma
Size B - 11 x 17	/proj/stds/form/form-b.dgn	saved view name = formb
Size D - 22 x 34	/proj/stds/form/form-d.dgn	saved view name = formd

12.6.2 Standard FCR Border

Size A - 8.5 x 11	/proj/stds/form/fcra.dgn	saved view name = fcra
Size A - 11 x 8.5	/proj/stds/form/fcrav.dgn	saved view name = fcrav
Size B - 11 x 17	/proj/stds/form/fcrb.dgn	saved view name = fcrb
Size D - 22 x 34	/proj/stds/form/fcrd.dgn	saved view name = fcrd

12.6.3 Calculation Borders

Size A - 11 x 8.5	/proj/stds/form/calc.dgn
Size A (metric) 11 x 8.5	/proj/stds/form/calcm.dgn
Size B - 11 x 17	/proj/stds/form/calcb.dgn
Size B (metric) 11 x 17	/proj/stds/form/calcmb.dgn

Datafield cells for the forms have also been created and reside in /proj/stds/cell/datafield.cel.

The cell names are:

fcr_a - for A size fcr border

fcr_d - for D size fcr border

TITLE - for standard M&O D size border Reference Attachment 1 for filling in title block information

12.7 REFERENCES FILES

A reference file is a design file that is used for reference purposes (read only) and can be visually attached to a design file in which the user is working. It can be another discipline's file or the user's own design file.

The reference file feature makes interactive work with large files easier. A maximum of 256 reference files can be supported with a single active design file. The operator must attach the reference file with an environment variable (Reference Appendix C) and must also assign a logical name to each attached reference file, the operator may also attach it with a saved view name. If a reference file needs to be screened in plotting, it must be attached with a logical name starting with SCR.

12.8 MENUS

Each operator is responsible for being familiar with menus and for utilizing them where applicable. The discipline menu will consist of matrix menus and screen menus. The menu provides the operator with commonly used symbols (cells), user commands, color table, and cell library. Drawings can be created more quickly and efficiently with the aid of the menus.

12.9 ELECTRONIC MEDIA CONTROL

12.9.1 Back-Up For Working Files

The standard back-up of electronic media performed by the IMS is as follows:

- Each night all active files (files that have been revised that day) are copied onto magnetic tape and stored for a minimum period of three weeks on-site.

- Once each week all files stored on the system are copied onto magnetic tape. These tapes are stored off-site for a minimum of one week and on-site for four weeks.
- Monthly, the entire memory of the Intergraph system is dumped to tape. These tapes are stored off-site for a minimum of one month and on-site for six months.
- Any file may be archived on request and these tapes are stored on-site indefinitely.

12.9.2 Electronic Media for 50 Percent Review and 90 Percent Review

The electronic media are transferred to the CAD Layout Specialist (CLS) according to the following steps:

- The DSS shall be notified when all issued drawings have been updated.
- The DSS shall then request the IMS group to copy the files onto a tape or other approved media.
- The IMS group shall then transmit the tape, or other approved media to the CLS. The IMS group shall copy the DSS on the transmittal.
- CLS shall inform the DSS when the tapes are received.

ATTACHMENT 12.1
EXAMPLE TITLE BLOCK

ATTACHMENT 12.2
EXAMPLE OF DRAWING PRACTICES

ATTACHMENT 12.2

**EXAMPLES OF DRAWING PRACTICES
(USING LEADER LINES)**

ATTACHMENT 12.3
STANDARD SYMBOLS

ATTACHMENT 12.4

ESF LINE WEIGHTS

Table 1. Scale Chart

SCALES					
Scale	Main Drawing Scale	Cells or Border Created in Inches File	Inverse Scale Factor	Cells or Border Created in Feet and Plot	Inverse Border Scale
A	1 = 1	1	1.0	0.08333	12.0
B	6" = 1'-0"	2	0.5	0.16667	6.0
C	3" = 1'-0"	4	0.25	0.33333	3.0
D	1-1/2" = 1'-0"	8	0.125	0.66667	1.5
E	1" = 1'-0"	12	0.08333	1.0	1.0
F	3/4" = 1'-0"	16	0.0625	1.33333	0.75
G	1/2" = 1'-0"	24	0.04167	2.0	0.5
H	3/8" = 1'-0"	32	0.03125	2.66667	0.375
I	1/4" = 1'-0"	48	0.02083	4.0	0.25
J	3/16" = 1'-0"	64	0.01563	5.33333	0.1875
K	1/8" = 1'-0"	96	0.01041	8.0	0.125
L	3/32" = 1'-0"	128	0.007813	10.66667	0.093750
M	1/16" = 1'-0"	192	0.005208	16.0	0.0625
N	1" = 10'-0"	120	0.008333	10.0	.01
O	1" = 20'-0"	240	0.004167	20.0	0.05
P	1" = 30'-0"	360	0.002778	30.0	0.033333
Q	1" = 40'-0"	480	0.002083	40.0	0.025
R	1" = 50'-0"	600	0.001667	50.0	0.02
S	1" = 60'-0"	720	0.001389	60.0	0.01667
T	1" = 100'-0"	1200	0.0008333	100.0	0.01
U	1" = 200'-0"	2400	0.0004167	200.0	0.005
V	1" = 300'-0"	3600	0.0002778	300.0	0.0033333
W	1" = 400'-0"	4800	0.0002083	400.0	0.0025
X	1" = 500'-0"	6000	0.0001667	500.0	0.002
Y	1" = 1000'-0"	12000	0.00008333	1000.0	0.001
Z	1" = 5280'-0"	63360	0.00001578	5280.0	0.00018939

Table 2. Text Scales

TEXT SIZES						
	0.1" Wt = 1		0.125" Wt = 2		0.2" Wt = 2	
Scale	TX	(LS)	TX	(LS)	TX	(LS)
A	0.100"	(0.050")	0.125"	(0.625")	0.200"	(0.100")
B	0.20"	(0.10")	0.25"	(0.125")	0.40"	(0.20")
C	0.40"	(0.20")	0.50"	(0.25")	0.80"	(0.40")
D	0.80"	(0.40")	1.00"	(0.50")	1.60"	(0.80")
E	0.100'	(0.50')	0.125'	(0.0625')	0.200'	(0.100')
F	0.133'	(0.067')	0.167'	(0.083')	0.267'	(0.133')
G	0.20'	(0.10')	0.25'	(0.125')	0.40'	(0.20')
H	0.267'	(0.133')	0.333'	(0.167')	0.533'	(0.267')
I	0.40'	(0.20')	0.50'	(0.25')	0.80'	(0.40')
J	0.533'	(0.267')	0.667'	(0.333')	1.067'	(0.533')
K	0.80'	(0.40')	1.00'	(0.50')	1.60'	(0.80')
L	1.067'	(0.533')	1.333'	(0.667')	2.133'	(1.067')
M	1.60'	(0.80')	2.00'	(1.00')	3.20'	(1.60')
N	1.00'	(0.50')	1.25'	(0.625')	2.00'	(1.00')
O	2.0'	(1.0')	2.5'	(1.25')	4.0'	(2.0')
P	3.0'	(1.5')	3.75'	(1.875')	6.0'	(3.0')
Q	4.0'	(2.0')	5.0'	(2.5')	8.0'	(4.0')
R	5.0'	(2.5')	6.25'	(3.125')	10.0'	(5.0')
S	6.0'	(3.0')	7.5'	(3.75')	12.0'	(6.0')
T	10.0'	(5.0')	12.5'	(6.25')	20.0'	(10.0')
U	20.0'	(10.0')	25.0'	(12.5')	40.0'	(20.0')
V	30.0'	(15.0')	37.5'	(18.75')	60.0'	(30.0')
W	40.0'	(20.0')	50.0'	(25.0')	80.0'	(40.0')
X	50.0'	(25.0')	62.5'	(31.25')	100.0'	(50.0')
Y	100.0'	(50.0')	125.0'	(62.5')	200.0'	(100.0')
Z	528.0'	(264.0')	660.0'	(330.0')	1056.0'	(528.0')

APPENDIX A: STANDARD BORDER LEVEL ASSIGNMENTS

STANDARD BORDER LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
1	Border & Title Block			
2				
3				
4				
5	Notice of Open Change Docs.			
6	DOE Acceptance Stamp			
7	Revision Lines			
8				
9				
10	Revision Lines			
11	Revision Lines			
12	Revision Lines			
13	Revision Lines			
14	Revision Lines			
15	Revision Lines			
16	Revision Lines			
17	Revision Lines			
18	Revision Lines			
19				
20				
21				
22				
23				
24				
25				

STANDARD BORDER LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				

STANDARD BORDER LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
53	Civil Grid			
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				

APPENDIX A: ARCHITECTURAL - LEVEL ASSIGNMENTS

ARCHITECTURAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
1	General Notes, etc.	2		
2	Graphic Scales	2		
3	Legends/Schedules	2		
4	Schedule Headers	4		
5	Key Plan	2		
6	Interior Bearing Wall	4		
7	Interior Non-Bearing Wall	3		11
8	Demountable Partition	2		
9	Cast-In-Place Concrete Wall	4		
10	CMU Wall	4		
11	Exterior Siding	1		
12	Exterior Wall Girt Line	1		
13	Edge of Concrete/STRL Line	4		9
14	Renovation (Walls to Remain)	2		
15	Renovation (Walls to Remove)	0		
16	Doors	2		79
17	Windows	2		37
18	Stairs/Ramps/Stoops	2		86
19	Handrails	1		36
20	Lockers/Benches/Cabinets	1		4
21	Furniture	2		54
22	Toilet Partitions	1		136
23	Toilet Fixtures	1		190

ARCHITECTURAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
24	Toilet Accessories	1		
25	Janitor's Equipment	2		93
26	Plumbing Fixtures	2		12
27	Drains	2		
28	Fire Risers/Telephone Cabinet	2		173
29	Reflected Ceiling Grid	2		
30	Reflected Ceiling Fixtures	3		
31	Reflected Ceiling Walls	1		
32	Raised Floor (Access)	0		
33	Building Footprint	6		29
34	Bldg. Related Flatwork	3		27
35				
36				
37	Misc. Furniture/Equip	1		
38	Fencing	1		38
39	Misc. Equipment	1		
40	General Text 1/2	1/2		32
41	Columns	4		22
42	Steel Other Than Columns	4		
43	Overhead Crane/Steel	4		
44	WWF	2		
45	Floor Joists	4		
46	Rebar	4		
47	Anchor Bolts	6		
48	Control Joints	1		
49	Column Grid	0		200
50	Dimensioning	0		

ARCHITECTURAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
51	Patterning	0		135
52	Room Numbers	1		
53	Detail/Section Callouts	6		
54	Door/Window/Wall Symbol	2		
55				
56	Overhang	1		155
57				
58	Exterior Line at Door/Win	1		25
59	Match Lines & Standard Symbols	6		
60	Revision	6		
61	Revision Triangle	3		
62	Project Signatures	1		
63	User Definable			

APPENDIX A: CIVIL - LEVEL ASSIGNMENTS

CIVIL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
1	General Notes, Legend, Keyplan & Title Block Information			1
2	Intermediate Contours	0	0	1 (use cell)
3		5	0	3
4	Top & TOE Slope	1	0	5
5	Slope & Grading Indicators	1	0	5
6	Coordinate Grid Related Text	0	0	0
7	Coordinate Grid	0	0	7
8	Matchline Text	2	0	18
9	Column Lines & Grid Lines		0	9
10	Column Bubbles, Column & Grid Related Text	0	0	10
11	Section & Detail Symbols & Related Text			(use cell)
12	Exist, Access Road	1	3	1
13	Dimensions	0	0	18
14				14
15	Building Outline			15
16				16
17				17
18				18
19	Equipment Outline	3	0	19
20	Equipment Outline Text	2	0	20
21	Roads, Sidewalks, Parking Lots (Including Patterning)	2	0	3

CIVIL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
22	Gutters	2	0	3
23	Road/Railroad Shoulders	1	0	23
24	Centerline of Roads & Railroads	0	4	17
25	Road, Railroad Stationing	2	0	25
26	Road, Railroad Related Text	2	0	26
27	Parking Striping	0	0	17
28	Fences	3	0	28
29	Fence Related Text	1	0	28
30	Index Contours (Such as 5 ft., 10 Ft.)	2	0	0
31	Index Contours (Such as 1 Ft., 2 Ft.)	3	0	2
32	Spot Elevations, Slope & Grade Indicators		0	
33	Buildings, Walks & Stairs	4/1	0	29/27
34	Contours & Text (Existing)	0	0	6
35	Retention Ponds, Holding Basin	3	0	5
36	Topsoil Stockpiles	3	0	6
37	North Portal Top & TOE Slope	1	0	3
38	Slope Smy.	1	0	22
39	Irrigation Water Lines & Related Text, North Portal Top & TOE	1	0	1
40	Storm Drainage Structures	3	0	10
41	Storm Drainage Lines	3	0	11
42	Storm Drainage Related Text	2	0	12
43	Underground Waste Structures	3	0	13
44	Underground Waste Lines (SS, IW, PW)	3	0	14
45	Underground Waste Related Text	1	0	15
46	Underground Fire Lines/ Structures	3	0	16

CIVIL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
47	Underground Fire Protection Related Text		0	17
48	Underground Water Lines	3	0	18
49	Underground Water Lines Related Text	1	0	19
50	Channel	0/3	5/0	0
51	Underground Cooling Water Line Related Text	1	0	21
52	Underground Electrical or Telephone Conduit & Text	3/1	0	22
53	Aboveground Electrical or Telephone Lines, Poles & Text	2/1	0	23
54	Fuel Oil or Natural Gas Lines & Related Text	3/1	0	24
55	Property Lines, Easement, & Right of Way	4	0	24
56	Monuments & Related Text	1	0	25
57	Soil Borings, Walls, & Related Text	1	0	27
58	Survey Related Text	1	0	28
59	Standard Symbols			
60	Revision Cloud	3	0	0
61	Rev. Triangle & Number	2	0	1
62	Project Signatures			2
63				

APPENDIX A: ELECTRICAL - LEVEL ASSIGNMENTS

ELECTRICAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
1	General Notes, Legend, Key Plan & Title Block Information			34
2	Graphic Scale/North Arrow			0
3				
4				
5	Line Work for Tables & Schedules	2	0	0
6	Text for Tables & Schedules	1	0	0
7	Matchlines	4		0
8	Matchline Text	2		17
9	Column Lines, Column Bubbles & Grid Lines	0		0
10	Column & Grid Related Text	0		17
11	Section & Detail Symbols with Related Text			17
12	Miscellaneous Text	1		17
13	Dimensioning Linework & General Text	1	0	17
14	Equipment Detail Linework	1	0	
15	Architectural Information			
16	Architectural Text	1		17
17	Structural Linework (Design File Related)			
18	Structural Text (Design File Related)	1		
19	Equipment Outline	2	0	43
20	Equipment Outline Related Text	1	0	17
21	User Definable Coordinate Attributes for EDM Elms			

ELECTRICAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
22	User Definable Text Attributes for EDM Elms			
23	Details, Assemblies			
24	User Definable			
25	User Definable			
26	User Definable			
27	User Definable			
28	User Definable			
29	User Definable			
30	Non-Dimensional Control Signal		3	
31	Non-Dimensional Equipment	2	0	
32	Non-Dimensional Equipment Enclosure	0	4	
33	Non-Dimensional Components	2	0	
34	All Electrical Text	1	0	17
35	Wiring, Main Bus, Exposed & Sealed Conduit, Ckt. Hashmarks	3,5	0,3	42
36	Dimensional Instrument Wiring	3	0	42
37	Dimensional Grounding	3	3	
38	User Definable			
39	Dimensional Communications Wiring	3	0	42
40	Dimensional Power Equipment	3	0	39
41	Dimensional Lighting Equipment	3	0	39
42	User Definable			
43	Dimensional Instrument & Communications Equipment	3	0	
44	User Definable			
45	Dimensional Electrical Equipment Dimensions	1	0	
46	Dimensional Existing Equipment	1	0	

ELECTRICAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
47	LTG Switches	2		0
48	User Definable			
49	User Definable			
50	High Voltage Cable Tray	3	0	0
51	480V Cable Tray	3	0	0
52	Low Voltage Cable Tray	3	0	0
53	Instrument Cable Tray	3	0	0
54	Miscellaneous Cable Tray	3	0	0
55	Duct Bank	4		34
56	Manhole	4		34
57	User Definable			
58	User Definable			
59	Standard Symbols			
60	Revision Clouds	5		14
61	Revision Triangle & Character	3		14
62	Project Signatures			0
63				

APPENDIX A: MECHANICAL - LEVEL ASSIGNMENTS HVAC

MECHANICAL - LEVEL ASSIGNMENTS HVAC				
Level	Description	Weight	Style	Color
1	General Notes, Legend, Key Plan & Title Block Information	1,2	0	0
2	Graphic Scale/North Arrow			
3				
4				
5	Line Work for Tables & Schedules	1,4		0
6	Text for Tables & Schedules	2		6
7	Matchlines	4	5	7
8	Matchline Text	2		
9	Column Lines, Column Bubbles & Grid Lines	0	7	
10	Column & Grid Related Text	1		
11	Section & Detail Symbols with Related Text	2		
12	Miscellaneous Text	1		
13	Dimensioning Linework & General Text, Center Line	1,0	0,7	13
14	Equipment Detail Linework	1	0	14
15	Architectural Information			
16	User Definable			
17	Structural Linework (Design File Related)	1,0		17
18	User Definable			
19	Equipment Outline	2	0	19
20	User Definable			20
21	Existing Return Ductwork Systems	2	1	21

MECHANICAL - LEVEL ASSIGNMENTS HVAC				
Level	Description	Weight	Style	Color
22	User Definable			22
23	Return Ductwork Systems	2	0	23
24	User Definable			24
25	HVAC Detail Linework	1,2	0	25
26	All HVAC Text	1,2	0	26
27	Supply Ductwork Systems	2	0	27
28	User Definable			28
29	Existing Supply Ductwork Systems	2	2	29
30	User Definable			30
31	Mechanical Symbols	2	0	31
32	Existing Air Devices	1	3	32
33	User Definable			33
34	Existing Exhaust Ductwork Systems	2	3	34
35	User Definable			35
36	Exhaust Ductwork Systems	2	0	36
37	User Definable			37
38	Existing Equipment Linework	2	3	38
39	Existing Equipment Related Text	1	0	39
40	New Air Devices	1	0	40
41	User Definable			41
42	Glycol Pipe	1	0	42
43	User Definable			
44	Duct Support	1	0	44
45	Misc. Elec. ref.	0	0	45
46	Piping Lines	1,2		
47	Air Devices for Coordination Use			
48	Piping Lines - Text	1	0	48

MECHANICAL - LEVEL ASSIGNMENTS HVAC				
Level	Description	Weight	Style	Color
49	User Definable			
50	Fire Damper	2	0	50
51	User Definable			
52	Room Number	1		18
53	User Definable			
54	User Definable			
55	User Definable			
56	User Definable			
57	User Definable			
58	User Definable			
59	Standard Symbols			Use Cell
60	Revision Clouds	5		
61	Revision triangles & Character	3		
62	Project Signatures			
63				

APPENDIX A: MECHANICAL - LEVEL ASSIGNMENTS FIRE PROTECTION

MECHANICAL - LEVEL ASSIGNMENTS FIRE PROTECTION				
Level	Description	Weight	Style	Color
1	General Notes, Legend, Key Plan & Title Block Information	1,2	0	0
2	Graphic Scale/North Arrow			
3				
4				
5	Line Work for Tables & Schedules	1,4		
6	Text for Tables & Schedules	2		
7	Matchlines	4	0	7
8	Matchline Text	2		
9	Column Lines, Column Bubbles & Grid Lines	0		
10	Column & Grid Related Text	1		
11	Section & detail symbols with Related Text	2		
12	Miscellaneous Text	1		
13	Dimensioning Linework & General Text	1	0	13
14	Equipment Detail Linework	1	0	14
15	Architectural Information			
16	Architectural Text	1		
17	Structural Linework (Design File Related)			
18	Structural Text (Design File Related)	1		
19	Equipment Outline	2	0	19
20	User Definable			20
21	Existing Underground Fire Protection Systems	3	3	21

MECHANICAL - LEVEL ASSIGNMENTS FIRE PROTECTION				
Level	Description	Weight	Style	Color
22	Existing Underground Text & Dimensions	1	0	22
23	Underground Fire Protection Systems	3	0	23
24	User Definable			24
25	Sprinkler Risers	4	0	25
26	All Fire Prot. Text	1	0	26
27	Sprinkler Heads	4	0	27
28	User Definable			28
29	Fire Protection Density criteria	1	0	29
30	Fire Prot. Equipment (Ext., Hose Racks & Reels)	2	0	30
31	User Definable			31
32	Future Wet Pipe Systems	1	2	32
33	Future Wet Pipe Systems Text & Dimensions	1	0	33
34	Future Dry Pipe Systems	1	2	34
35	Future Dry Pipe Systems Text & Dimensions	1	0	35
36	Wet Pipe Systems	2	0	36
37	User Definable			37
38	Dry Pipe Systems	2	0	38
39	User Definable			39
40	Existing Wet Pipe Systems	2	2	40
41	User Definable			41
42	Existing Dry Pipe Systems	2	3	42
43	User Definable			43
44				
45				
46				

MECHANICAL - LEVEL ASSIGNMENTS FIRE PROTECTION				
Level	Description	Weight	Style	Color
47				
48	Alarm Equipment (Detectors, Bells, Pull Stations)	2	0	48
49	User Definable			49
50	Deluge & Pre-Action Systems	2	0	50
51	User Definable			51
52	Existing Deluge & Pre-Action Systems	2	3	52
53	User Definable			53
54	Hydraulic Calculation Nodes & Remote Area	2	0	54
55	Hydraulic Calc. Nodes & Remote Area Text & Dimensions	1	0	55
56	Fire Protection Details	1	0	59
57	Fire Protection Demolition	1	3	57
58	Fire Protection Demolition Text & Dimensions	1	0	58
59	Standard Symbols - Section Detail Bubbles		0	59
60	Revision Clouds			
61	Revision Triangles & Character	3		
62	Project Signatures			
63				

APPENDIX A: MECHANICAL - LEVEL ASSIGNMENTS PLUMBING

MECHANICAL - LEVEL ASSIGNMENTS PLUMBING				
Level	Description	Weight	Style	Color
1	General Notes, Legend, Key Plan & Title Block Information			
2	Graphic Scale/North Arrow			
3				
4				
5	Line Work for Tables & Schedule	1,4		
6	Text for Tables & Schedules	2		
7	Matchlines	4		
8	Matchline Text	2		
9	Column Lines, Column Bubbles & Grid Lines	0		
10	Column Bubbles, Column & Grid Related Text	1		
11	Section & Detail Symbols & Related Text	2		
12	Miscellaneous Text	1	0	12
13	General Dimensioning	1	0	13
14	Equipment Detail Linework			
15	Gasoline Systems Linework	2	0	15
16	User Definable			16
17	Fuel Oil Linework	2	0	17
18	User Definable			18
19	Equipment Outline			
20	User Definable			
21	Sanitary Sewer Systems	4	0	21

MECHANICAL - LEVEL ASSIGNMENTS PLUMBING				
Level	Description	Weight	Style	Color
22	User Definable			22
23	Storm Drainage Systems	4	0	23
24	User Definable			24
25	Venting Systems	2	3	25
26	All Plumbing Text	1	0	26
27	Domestic Cold Water Systems	2		27
28	User Definable			28
29	Domestic Hot Water & Return Systems	2		29
30	User Definable			30
31	Process Waste Systems	3	0	31
32	User Definable			32
33	Containment Systems Systems	3	0	33
34	Containment Waste Systems Related Text	1	0	34
35	Compressed Air Systems	2	0	35
36	Compressed Air Systems Related Text	1	0	36
37	Vacuum Systems	2	0	37
38	User Definable			38
39	Medical Gas Systems	2	0	39
40	Floor Drains	2	0	40
41	Natural Gas Systems	2	0	41
42	User Definable			42
43	Plumbing Fixtures	2	0	43
44	User Definable			44
45	Cooling Water Systems	2	0	45
46	User Definable			46
47	Heating Water Systems	2	0	47
48	User Definable			48

MECHANICAL - LEVEL ASSIGNMENTS PLUMBING				
Level	Description	Weight	Style	Color
49	Chilled Water Systems	2	0	49
50	User Definable			50
51	Steam Piping Systems	2	0	51
52	User Definable			52
53	Condensate Piping Systems	3	0	53
54	User Definable			54
55	Existing Water Systems	2	2	55
56	User Definable			56
57	Existing Waste Systems	3	2	57
58	User Definable			58
59	Standard Symbols			
60	Revision Clouds	4		
61	Revision Triangle & Character	3		
62	Project Signatures			
63				

**APPENDIX A: SUBSURFACE MECHANICAL GENERAL
ARRANGEMENT - LEVEL ASSIGNMENTS**

SUBSURFACE MECHANICAL GENERAL ARRANGEMENT - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
1	General Notes, Legends, Key Plan - Common etc.	1	0	17
2	Graphic Scale, North Arrow - Common		0	
3				
4				
5	Conveyor	2	0	14
6	Ventilation	2	0	18
7	Pipe	2	0	38
8	Miscellaneous Mechanical	2	0	15
9	Rock Outline, Excavated	0	0	20
10	Shotcrete Outline	1	0	25
11	Pump	2	0	20
12	Conduit Way - Clearance Outline	1	1	11
13	Access - Clearance Outline	1	1	9
14	Pipe Way - Clearance Outline	1	1	10
15	Tank	2	0	29
16				
17	Bin, Hopper, Silo	2	0	25
18	Product	1	0	2
19				
20	Chute	2	0	17
21	Instream Material Handling Equipment (Not Conveyor)	2	0	38

SUBSURFACE MECHANICAL GENERAL ARRANGEMENT - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
22	Small Portable Equipment	2	0	17
23	Vehicle	1	0	26
24	Grade, Finish	0	0	20
25	Grade, Existing	0	2	5
26				
27	Fire Protection	2	0	190
28				
29	Grating & Plate, Floor (Pattern-Plan View)	0	0	8
30	Steel Misc - Stair, Ladder, Catw, H Rail (wt=2)	0	0	5
31	Steel, Single Line	4	0	3
32	Steel, Double Line	0	0	4
33	Column Line, Grid Line, misc Centerline	0	4	0
34	Concrete Foundation	1	0	9
35	Road, Walkway	1	0	3
36	Concrete Slab	1	0	11
37	Masonry	0	0	26
38	Figure, Human	0	0	26
39	Fence, Barrier	1	0	21
40				
41	Building, Outline			
42	Building, Details			
43				
44				
45				
46				
47				

SUBSURFACE MECHANICAL GENERAL ARRANGEMENT - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
48				
49				
50				
51	Dimension, Elevation & coordinate Callout	1	0	17
52	General Text, Note	1	0	38
53	Equipment Tag Number	1	0	19
54				
55	Matchline (wt=6)	6	0	0
56				
57	Reference, Primary (Level not Normally Plotted)			
58	Reference, Secondary (Level not Normally Plotted)			
59	Subtitle, Section, Detail, Annotation - Common	1	0	
60	Revision Cloud - Common	5	0	33
61	Revision Triangle & Text - Common	1	0	33
62	Signature, Project - Common	1	0	33
63				

APPENDIX A: MINING (SUBSURFACE) - LEVEL ASSIGNMENTS

MINING (SUBSURFACE) - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
1	General Notes, Legend, Key plan	1	0	17
2	Graphic Scale/North Arrow			
3	Centerlines	0	4	0
4	Dashed, Phantom Lines	0	3,6	0
5	Excavated Rock Line Drill & Blast	2	0	18
6	Finished Rock Line (Shotcrete)	1	0	2
7	Excavated Rock Line (TBM)	2	0	18
8	Excavated Rock Line (TBM)	2	0	18
9	Concrete (Outline)	3	0	2
10	Concrete (reinforcing)	4	0	3
11	Concrete (Embedments)	2	0	17
12				
13	Steel (Single Line)	5	0	3
14	Steel (Double Line)	0	0	17
15	Steel Details	2	0	2
16				
17	Rockbolts (Single Line)	4	0	3
18	Misc. Mining Symbolology (WWF, Wire Mesh, etc.)	1	0	0
19				
20	Equipment Outline (Conveyor, TBM, etc.)	1	0,3,6	0
21				
22				
23				

MINING (SUBSURFACE) - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
24	Background (Other than Ref. Drawings)	0	0,3,6	17
25	Misc. Text Size .1	1	0	17
26	Text Size .2 (Subtitles)	4	0	3
27	Dimensions, Leaders	0	0	17
28	Schedule Table Line Work	1	0	17
29	Schedule Text .1	1	0	0
30	Matchlines	4	0	33
31	Matchline Text	4	0	33
32				
33				
34	General Symbology (Patterning)	0	0	0
35	Misc. Items	As	Needed	
36	General Work	0	0	0
37	General Work	1	0	17
38	General Work	0	0	0
39	General Work	0	0	0
40				
41	User Definable			
42	User Definable			
43	User Definable			
44	User Definable			
45	User Definable			
46	User Definable			
47	User Definable			
48	User Definable			
49				
50				

MINING (SUBSURFACE) - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
51				
52				
53				
54				
55				
56				
57				
58				
59	Section & Details Sym. & Text (Standard Cells)			
60	Revision Clouds	5	0	33
61	Revision Triangle & Text	1	0	33
62	Project Signatures	1	0	33
63				

APPENDIX A: STRUCTURAL - LEVEL ASSIGNMENTS

STRUCTURAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
1	General Notes, Legend, Key Plan, & Title Block Information			0
2	Graphic Scale/North Arrow			
3				
4				
5	Schedule Table Line Work, Det. Blocks	1,3		0
6	Schedule Table Text	2		0
7	Match Lines	4		9
8	Match Line Text	2		0
9	Column Grid Lines	0		9
10	Column Bubble & Text	1		4
11	Section & Detail Symbol & Related Text	2		0
12	Miscellaneous Text	1		0
13	Dimensions (Column Grid Line)	1		0
14				
15				
16				
17				
18	Steel Text	1		0
19	Equipment Outlines	0		4
20				
21	Columns	4		3
22	Beams	2		6
23	Platform/Stairs/Handrail	1		4

STRUCTURAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
24	Posts/Hangers	3		3
25	Grating/Floor Plate Symbol	1		
26	Skirts/Puruns/Grit Lines	2		4
27	Secondary Steel (SAG Rod).	1		2
28	Steel Piles	4		3
29				
30	Columns, Piers, Concrete Walls, & Equipment Foundation	3		3
31	Beams, Grad Beams	2		6
32	Slabs, Curbs, Equipment Pads	2		2
33	Pile Caps, Speed Footing	2		7
34	U-Drain, Floor Drain	1		9
35	Slope Lines, Joints	1		0
36	Embodiments	2		9
37	CMU Walls	1		4
38	Piles	4		3
39	Reinforcements	3		4
40				
41				
42				
43				
44				
45				
46				
47				
48				
49	Future/Existing	0		8
50				

STRUCTURAL - LEVEL ASSIGNMENTS				
Level	Description	Weight	Style	Color
51				
52				
53				
54				
55				
56				
57				
58				
59	Standard Symbols			
60	Revision Clouds	5		
61	Revision Triangle & Character	3		
62	Project Signatures			
63				

APPENDIX B: GUIDELINE FOR CLIX ALIASES

Aliases are substitute names that correspond to a program or path name, etc. in the Clix environment.

To use an alias at the \$ sign prompt, type in an alias that corresponds to the directory needed (Reference attached sheet). Clix will then proceed to that directory without typing the path.

Ex.: \$ ARCH (ARCH must be typed in capitals, cd is not needed)
will change directory to \$/proj/esfs/arch/dgn

APPENDIX B: ALIASES

```
echo "/usr2/u/.env"
PATH=$PATH:/usr2/bin
export PATH
#HOST='/etc/hostname'
#PS1='$HOST$'
alias -x h='fc -l'
alias lock='/usr/ip32/smgr/LockScr'
alias -x lo='exit'
alias -x ls='ls -CF'
alias lsa='ls -aCF'
alias lsl='ls -la'
alias man='nman'
alias -x more='pg -n'
alias rm='rm -i'
alias -x ACELL='cd /proj/stds/arch/cell'
alias -x ARCH='cd /proj/esfs/arch/dgn'
alias -x CCELL='cd /proj/stds/civil/cell'
alias -x CIVIL='cd /proj/esfs/civil/dgn'
alias -x CCELL='cd /proj/stds/cs/cell'
alias -x CSYS='cd /proj/esfs/csys/dgn'
alias -x ECELL='cd /proj/stds/elec/cell'
alias -x ELEC='cd /proj/esfs/elec/dgn'
alias -x FIRE='cd /proj/esfs/firepro/dgn'
alias -x FORM='cd /proj/stds/form'
alias -x GENUCM='cd /proj/stds/gen/ucm'
alias -x HCELL='cd /proj/stds/hvac/cell'
alias -x HVAC='cd /proj/esfs/hvac/dgn'
alias -x MCELL='cd /proj/stds/mech/cell'
alias -x MECH='cd /proj/esfs/mech/dgn'
alias -x MECHSS='cd /proj/esfss/mech/dgn'
alias -x MMCELL='cd /proj/stds/mine/cell'
alias -x PLUMB='cd /proj/esfs/plumb/dgn'
alias -x RSN='cd /proj/rsn/trw'
alias -x SCELL='cd /proj/stds/stru/cell'
alias -x STRU='cd /proj/esfs/stru/dgn'
alias -x TOPO='cd /proj/rsn/civil'
alias -x UCM='cd /fd/elcs/ucm'
alias -x UCC='cd /fd/elcs/ucc'
```

APPENDIX B: ALIASES (Continued)

```
alias -x EXEU='cd /fd/elcs/exe'  
alias -x MINE='cd /proj/esfss/mine/dgn'  
alias -x ELECSS='cd /proj/esfss/elec/dgn'  
alias -x STRUSS='cd /proj/esfss/stru/dgn'  
alias -x ARCHSS='cd /proj/esfss/arch/dgn'  
HISTFILE=$HOME/.history  
FCEDIT=vi  
VISUAL=vi  
export HISTFILE FCEDIT VISUAL1
```

APPENDIX C: GUIDELINE FOR USING ENVIRONMENT VARIABLES

Environment variables are substitute names for use while in the graphics environment. They define which path microstation should use to locate various types of files; including program names, microstation development language (MDL) applications, user commands, cell libraries, etc.

To use an environment variable while in graphics, key in the variable needed (in caps) that corresponds to the directory needed (Reference attachment). The format for using variables in VARIABLE:filename.

Ex. rc=CCELL:civil.cel

will attach the civil cell library in /proj/stds/civil/cell

rf=FORM:form-d.dgn

will attach the form in /proj/stds/form as a reference file

uc=UCM:cenlin

will attach the center line user command in /fd/elcs/ucm

APPENDIX C: ENVIRONMENT VARIABLES

```
ACELL="/proj/stds/arch/cell/"  
export ACELL
```

```
ARCH="/proj/esfs/arch/dgn/"  
export ARCH
```

```
ARCHSS="/proj/esfss/arch/dgn/"  
export ARCHSS
```

```
CCELL="/proj/stds/civil/cell/"  
export CCELL
```

```
CIVIL="/proj/esf/civil/dgn/"  
export CIVIL
```

```
CIVRSN="/proj/esfs/civil/rsn/"  
export CIVRSN
```

```
CSCELL="/proj/stds/cs/cell/"  
export CSCELL
```

```
CSYS="/proj/esfs/cs/sys/dgn/"  
export CSYS
```

```
ECELL="/proj/stds/elec/cell/"  
export ECELL
```

```
ELEC="/proj/esfs/elec/dgn/"  
export ELEC
```

```
ELECSS="/proj/esfss/elec/dgn/"  
export ELECSS
```

```
ESK="/proj/esfs/elec/dgn/esk/"  
export ESK
```

```
ESTD="/proj/stds/elec/std/"  
export ESTD
```

```
EXEU="/fd/elcs/exe/"  
export EXEU
```

```
FIRE="/proj/esfs/firepro/dgn/"  
export FIRE
```


APPENDIX C: ENVIRONMENT VARIABLES (Continued)

FORM="/proj/stds/form/"
export FORM

GEN_UCM="/proj/stds/gen/ucm/"
export GEN_UCM

HCELL="/proj/stds/hvac/cell/"
export HCELL

HVAC="/proj/esfs/hvac/dgn/"
export HVAC

MCELL="/proj/stds/mech/cell/"
export MCELL

MECH="/proj/esfs/mech/dgn/"
export MECH

MECHSS="/proj/esfss/mech/dgn/"
export MECHSS

MECHCEL="/proj/esfss/mech/cel/"
export MECHCEL

MECHSTD="/proj/esfss/mech/std/"
export MECHSTD

MINE="/proj/esfss/mine/dgn/"
export MINE

MMCELL="/proj/stds/mine/cell/"
export MMCELL

MS_CELLSEED="/usr/ip32/mstation/seed/seed2d.cel"
export MS_CELLSEED

MS_INITAPPS="mm"
export MS_INITAPPS

MS_PLTR="/usr/ip32/mstation/plotting/pltcfg/hp7585b.plt"
export MS_PLTR

MS_UCM="/usr/ip32/mstation/ucm/"
export MS_UCM

PLUMB="/proj/esfs/plumb/dgn/"
export PLUMB

APPENDIX C: ENVIRONMENT VARIABLES (Continued)

```
PRO_DD_VPLOT=  
export PRO_DD_VPLOT
```

```
RSN="/proj/rsn/la/"  
export RSN
```

```
SCCELL="/proj/stds/stru/cell/"  
export SCCELL
```

```
STRU="/proj/esfs/stru/dgn/"  
export STRU
```

```
STRUSS="/proj/esfss/stru/dgn/"  
export STRUSS
```

```
TOPO="/proj/rsn/civil/"  
export TOPO
```

```
UCC="/fd/elcs/ucc/"  
export UCC
```

```
UCM="/fd/elcs/ucm"  
export UCM
```

```
UM_AUTO="yes"  
export UM_AUTO
```

```
UM_CMDS="/usr/ip32/mstation/umenu/mstn/cfg/ustn.cmds"  
export UM_CMDS
```

```
UM_DIR="/usr/ip32/mstation/umenu/bin/"  
export UM_DIR
```

APPENDIX D: INTERGRAPH LOG FORMS

The Intergraph Problem Log should be used for reporting any software or hardware related problems or enhancements an operator would like to suggest.

The Intergraph Downtime Log is used to report any lost time due to software or hardware failures.

APPENDIX D: INTERGRAPH LOG FORMS (Continued)

[illegible]

APPENDIX D: INTERGRAPH LOG FORMS (Continued)

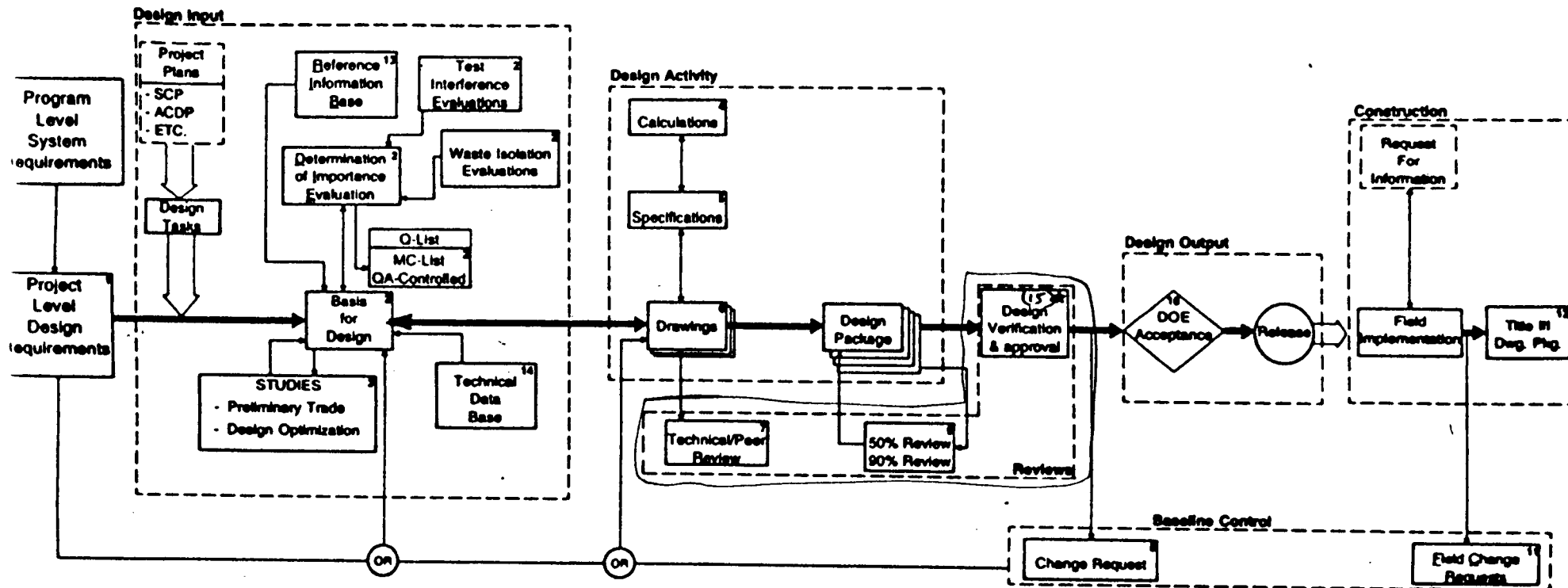
[illegible]

**THE INFORMATION FOR THIS CHAPTER
IS TO BE DIVIDED INTO TWO
CHAPTERS.**

**THE CHAPTERS ARE: DESIGN VERIFICATION
DETAILED DESIGN REVIEWS**

**THE BREAKDOWN WILL BE PROVIDED
AT A LATER DATE.**

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS			
(1)	QAP-3-1, QAP-3-5, AP-6.1Q	(8)	QAP-3-4
(2)	QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6.17Q, YMP/92-	(9)	QAP-3-1, QAP 3-14
(3)	QAP-3-8	(10)	AP-3.3Q, AP-6.1Q, BTP-EDD-002, QMP-03-09, YMP/93-08
(4)	QAP-3-9, QAP-6-1, QAP-17-1	(11)	AP-3.5Q, NLP-3-10
(5)	QAP-6-1, QAP-17-1, QAP 3-11	(12)	AP-3.3Q, AP-3.7Q, AP-5.24Q, QMP-03-09, AP-5.21Q
(6)	QAP-3-10, QAP-6-1, QAP, 17-1	(13)	AP 5.3
(7)	QAP-3-1, QAP-3-3	(14)	AP 5.2Q
		(15)	QAP-3-2

★

Currently QAP's 3-8, 3-10, & 3-11. Will be incorporated in QAP-6-2, October 92

Civilian Radioactive Waste
Management System

Management & Operating

Section 15

Design Reviews

This chapter was to originally cover only detailed design reviews currently held at the 50% and 90% points of the design. Due to the recent changes in the ²⁴⁴⁻³three series, this chapter is going to be split into two separate chapters.

One chapter will cover design verification, specifically "How to" perform design verification at the M&O. The chapter will cover the general guidelines and the three methods of design verification.

The second chapter will cover detailed design reviews. The new design review process (as of November 15, 1993) will be explained in a "How to" format. Also covered will be other types of reviews (System Requirement Reviews, System Design Reviews, Key Decision Readiness Reviews, License Application Design Reviews, As-built Design Reviews, and Milestone Reviews. This chapter will map closely to the next revision of the SEMP, Revision 4, due in January 1994.

MGDS DESIGN PROCESS GUIDELINES MANUAL

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The flowchart illustrates the Design Process, organized into several functional areas:

- Program Level System Requirements:** The starting point, leading to Project Level Design Requirements.
- Design Input:** A dashed box containing:
 - Project Plans (SCP, ACDP, ETC.)
 - Design Tasks
 - Reference Information Base
 - Test Inference Evaluations
 - Determination of Importance Evaluation
 - Waste location Evaluations
 - O-List, MC-List, QA-Confined
 - Base for Design
 - STUDIES (Preliminary Trade, Design Optimization)
 - Technical Data Base
- Design Activity:** A dashed box containing:
 - Calculations
 - Specifications
 - Designs
 - Design Packages (50% Review, 80% Review)
 - Design Verification & Approval
 - Technical/Peer Review
- Design Output:** A dashed box containing:
 - DOE Acceptance (Decision Diamond)
 - Release (Circle)
- Construction:** A dashed box containing:
 - Request for Information
 - Field Implementation
 - The in Prog
- Baseline Control:** A dashed box containing:
 - Change Request
 - End Change Request

The process flow is as follows: Program Level System Requirements → Project Level Design Requirements → Design Input → Design Activity → Design Output → Construction. A feedback loop labeled "Baseline Control" connects the Construction phase back to the Design Input phase.

Currently URS-6-3-8, 3-10, & 3-11. Will be incorporated in URS-3-2 October 2002.

Civilian Radioactive Waste Management System

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6.0 CONFIGURATION MANAGEMENT for MGDS DESIGN

Configuration Management (CM) is comprised of four key functions or elements: configuration identification, change control, configuration status accounting, and configuration review/audit. Figure 6-1, Overview: Configuration Management Process, illustrates the basic process and relationships between these functions. These functions are covered in the M&O Configuration Management Plan (CMP) that flow-down of the requirements of the program OCRWM Baseline Management Plan (BMP).

In Figure 6-1, the baseline definition represented by requirements and BFDs is the foundation for determining a configuration item (CI) structure, selecting CIs, assigning configuration identifications and linking design documents to CIs. When design documents are issued into the baseline or changed, the change control process is applied. Field change activity is treated as an extension of the main change board activity, with special consideration for change threshold and urgency. Baseline and change control is accomplished through the M&O Level 3 contractor or design Baseline Change Control Board (BCCB). Configuration status accounting is implemented and periodic reports are published regarding the baseline status and changes to it. Configuration audits are made to verify that physical or functional results are complete and conform to associated design documentation.

As describe in the M&O CMP, there are four levels of configuration management and associated BCCBs. These are shown in Figure 6-2, Program Change Control Hierarchy. These design process guidelines address configuration management in two parts, at the M&O design contractor Level 3, and YMP project Level 2.

- In this section, guidelines discussed for the MGDS Design Process apply to ESF Design Packages 1B, 2A, and subsequent design packages.
- In a supplement to this section, guidelines discussed for the YMP project level apply to ESF Design Package 1A.

6.1 CONFIGURATION IDENTIFICATION**6.1.1 Configuration Item (CI)****6.1.1.1 General**

A configuration item is a physical entity, or any of its portions, that is an aggregation of facilities, equipment, hardware or software that satisfies an end use function. It is established for the purpose of configuration management and providing traceability between physical entities and documents. Specifically, a CI structure allows linkage of (1) one CI to another CI; (2) a CI to its documentation; (3) a CI's documentation to another CI's documentation. The designation of an item as a CI means that that CI and its directly related documents are subject to the baseline change control process. Not all physical items are necessarily CIs.

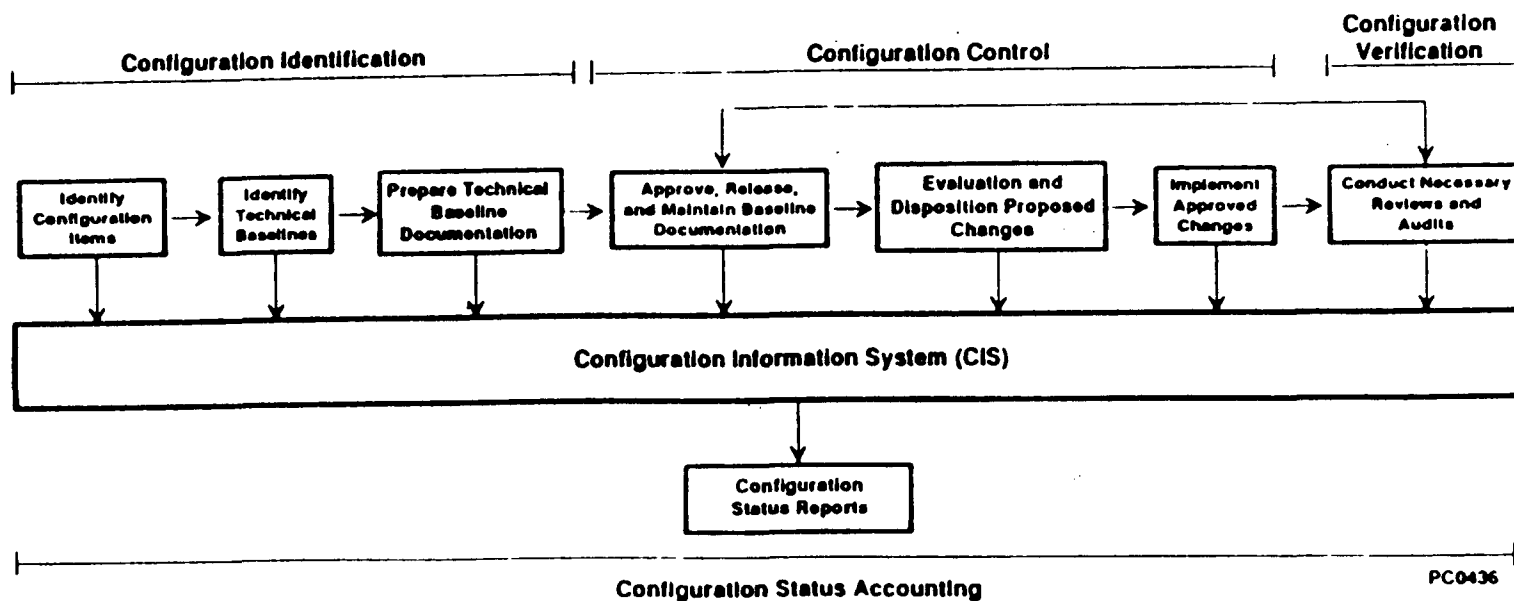


Figure 6-1 Overview of the Configuration Management Element Interface

Change
Control Level

Level 0

Energy System
Acquisition Advisory
Board
(ESAAB) BCCB

Level 1

Program Baseline
Change Control
Board
(PBCCB)

Level 2

Project Office Baseline
Change Control
Boards
(POBCCBs)

Level 3

Contractor
Baseline Change
Control Board

Figure 6-2 Program Change Control Hierarchy

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6.1.1.2 Applicable Documents

- M&O QAP-3-6, Configuration Item (CI) and CI Identifiers
- M&O QAP-3-13, Document Identifiers (DI)

6.1.1.3 Scope and Description**M&O Design Level 3**

Key Document: M&O QAP-3-6 Related Document: M&O QAP-3-13

Applicability: Used on ESF Design Packages 1B/2A and subsequent packages

A CI structure is defined by the MGDS design organization. For MGDS design, the CI Identifiers (CIIs) are determined relative to the CI structure in accordance with the M&O procedure QAP-3-6. This procedure has a Request for Assignment of CI Identifiers form comprised of two parts, Form 0067 and Form 0068.

The MGDS design organization selects items from the CI structure and completes the checklist in Form 0068 for each item in the structure. This is shown in the first block of Figure 6-3, CI/CII Process Flow. Those items selected as CIs are formally established by MGDS design organization by completing the checklist and Form 0067 for assignment. For items not selected as a CI, the checklist on Form 0068 is submitted and Form 0067 for assignment. For items not selected as a CI, the checklist on Form 0068 is submitted and Form 0067 is not required. After the Design Department Manager's approval is obtained, the RFA is submitted to the M&O Configuration Management. The requested CIs are assigned identifiers (CIIs) and entered into the CI Register. M&O CM returns a signed copy of the RFA to MGDS Design and submits it to the Local Records Center (LRC) in accordance with QAP-17-1. A listing of CIIs is published periodically in a CI Register Report by M&O Configuration Management.

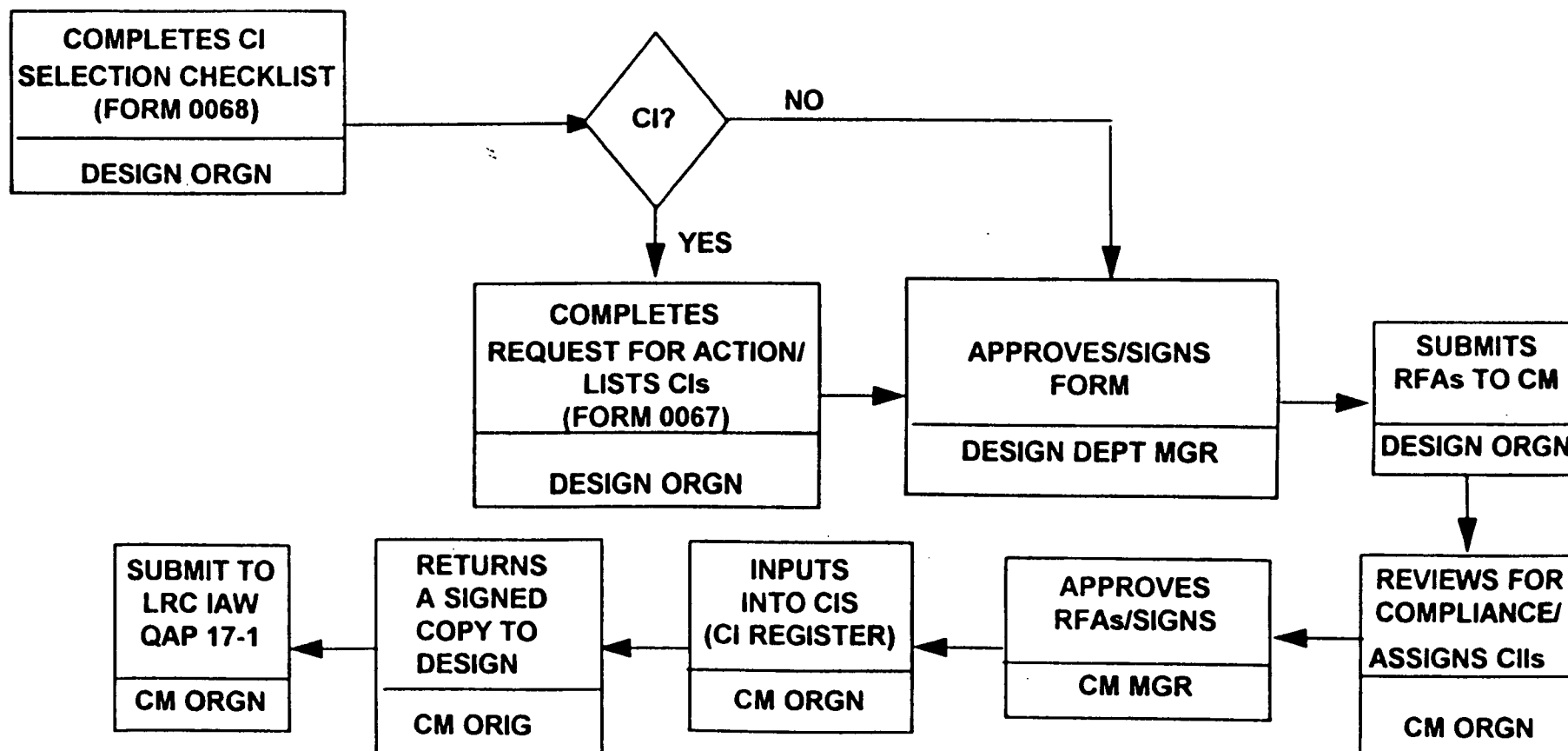
As part of the procedure for establishing a CI, a DI is also determined in accordance with QAP-3-13. The details concerning DIs is discussed in Section 7.2. A document number in Design packages 1B/2A established by QAP-3-36 and QAP-3-13 results in a document number that is a CII and DI, separated by a hyphen. The CII portion is nine characters and the DI portion is 17 (or more) characters including dashes. When an approved RFA is implemented, the M&O Configuration Management also issues a corresponding DI number, if appropriate. The DI is discussed in Section 7.1.2.

Note: The M&O CI procedure QAP-3-6 reflects a flow-down of the requirements in the OCRWM CI procedure DOE/RW-0415 that was recently issued in 1993.

Figure 6-3

CI/CII PROCESS FLOW (QAP 3-6 REV 2)

REQUIREMENT: PROCEDURE IS APPLICABLE ONLY AFTER THE SYSTEM ARCHITECTURE/STRUCTURE IS DEFINED



DESIGN DEPT MGR:
 SURFACE - PAUL PIMENTEL
 SUBSURFACE - PAUL MCKIE

CM ORGN: ED DEMBOWSKI/
 RICHARD JIU
CM MGR: BETTY G. CRUZ

MGDS DESIGN PROCESS GUIDELINES MANUAL

6.1.2 Document Identifier**6.1.2.1 General**

A document identifier is required for the following documents: (1) management documents consistent with the approved document hierarchy; (2) technical documents or design documentation; (3) documents necessary to support licensing the Civilian Radioactive Waste Management System (CRWMS); (4) computer software CIs (CSCIs) and CSCI documents developed in accordance with M&O procedure QAP-19-2; (5) and implementing documents subject to the Quality Assurance Requirements and Description (QARD). The MGDS design process keys on technical documents, design documentation or design products.

6.1.2.2 Applicable Documents

- M&O QAP-3-6, Configuration Item (CI) and CI Identifiers
- M&O QAP-6-1, Document Control
- M&O QAP-3-13, Document Identifiers
- M&O QAP-17-1, Record Source Responsibilities for QA Documents

6.1.2.3 Scope and Description

M&O Design Level 3

Key Document: QAP-3-13 Related Document: QAP-3-6

Applicability: ESF Design Packages 1B/2A and subsequent packages

The document identifier consists of alphanumeric characters contained in four sub-fields separated by dashes, plus a revision number. When applicable, it also includes a Document Change Notice (DCN) number. All alphanumeric characters are in capital letters.

CCCCCCCC	-	XXXXX	-	DDDD	-	SSSS
Sub-Field 1		Sub-Field 2		Sub-Field 3		Sub-Field 4
CI Identifier		Originator		Document		Sequence
		Code		Code		Number
9 characters		5 characters		4 characters		5 characters

Sub-Field 1 is the configuration item identifier. Sub-Field 2 describes the identity of the document originator. Sub-Field 3 is the document type code; changes to this list in Attachment II of QAP-3-13 may be requested through a form in Attachment III in this procedure. Sub-Field 4 is the sequence number and may be assigned within a reserved block sequence numbers that have been requested from M&O CM in accordance with this

MGDS DESIGN PROCESS GUIDELINES MANUAL

procedure. These sub-fields are defined in more detail in the procedure.

When a revision or DCN applies, the identifier is formatted as follows:

CCCCCCCC - XXXXX - DDDDD - SSSSS REV nn DCN nn

- Revision and DCN numbers run from 00 to 99
- Whenever a document identifier is recorded on a document, the revision number is always recorded with the document identifier.
- The DCN is recorded on a document with the document identifier and revision number only when a DCN is issued against a document.

In Figure 6-4, Process Flow for QAP-3-13, the steps of document identification relative to responsibilities of the M&O Department Managers, Office Managers, the M&O CM organization and document preparers are illustrated. This flow is only applicable after a CI structure is defined, CIs have been selected, and CII Identifiers are assigned, as described in Section 6.1 above.

Note: The M&O procedure QAP-3-13 reflects a flow-down of the requirements in the recently issued OCRWM procedure DOE/RW-0416.

Note: M&O procedures QAP-6-1 and QAP-17-1 refer to a Document Control Center (DCC) and Local Records Center (LRC), respectively, that are responsible to receiving, screening, distributing, accessioning and retrieving records/records packages. In Las Vegas, both are operated by the M&O. At the site, there is a Document Records Center (DRC) which is a combined field LRC and field DCC. The M&O operates this also.

6.2 Configuration/Change Control

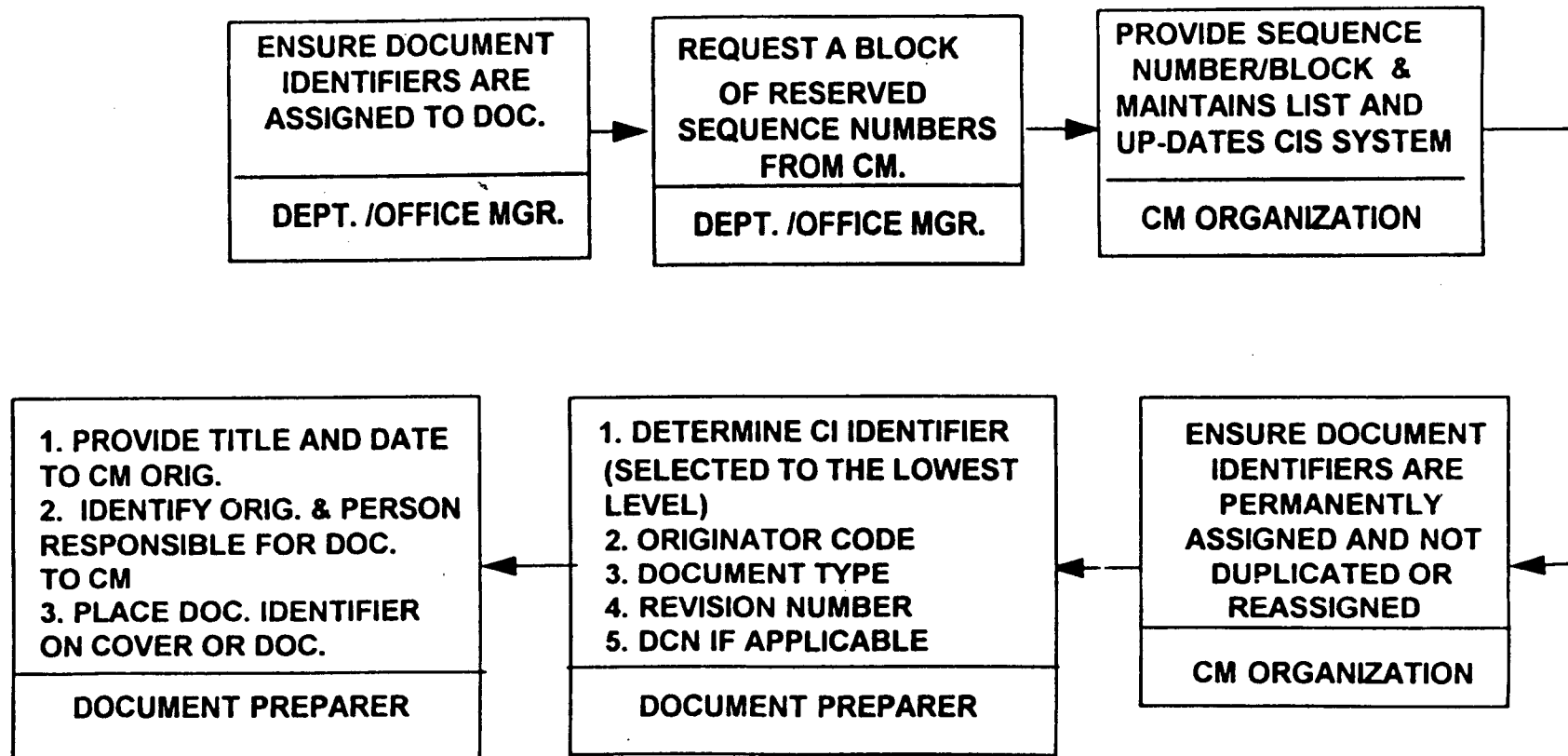
6.2.1 General

The purpose of Configuration/Change Control is to evaluate and accomplish changes while ensuring that necessary and/or beneficial changes are approved and, when necessary, expedited. It is the charter of the change control process to provide traceability from the initial technical baseline through all approved changes. Further, it is the responsibility of the change control process to prove that the eventual "as built" match the final design documentation.

Figure 6-4

PROCESS FLOW (QAP 3-13 REV 2)

REQUIREMENT: PROCEDURE IS APPLICABLE ONLY AFTER THE SYSTEM ARCHITECTURE/STRUCTURE AND THE CI/CIIs ARE DEFINED AND BEING ISSUED.



MGDS DESIGN PROCESS GUIDELINES MANUAL

6.2.2 Applicable Documents

- M&O QAP-3-4, Baseline Control
- YMP AP-1.5Q, Distribution, Maintenance, and Use of Controlled and Managed Documents

6.2.3 Scope and Description

Proposed Level 0, 1, 2, and 3 changes are submitted on a BCP form in accordance with appropriate change control procedures. The BCP form includes a change description; technical, cost, and schedule impacts; justification; change processing priority; and tracking identification. Changes are submitted to the appropriate level board based on established thresholds as specified in CM plans and procedures. Summary reports of all proposed changes and information copies of all approved changes are to be submitted to the next higher level board for verification of level designation.

All changes are reviewed to determine that the change is required, that the proper technical approach is described, and that the cost and schedule impacts are defined. Assessments of the impacts a proposed change may have on costs, schedules, original design criteria, installation status, suitability of applications procedures, training, compliance with regulatory requirements, and contractual agreements are performed by affected organizations.

Proposed changes are either approved, disapproved, cancelled, or approved with conditions by a CCB Chairperson. The Chairperson normally makes his/her decision after carefully considering the inputs provided by experts in various potentially affected functional areas. Only those changes that are approved or approved with conditions are implemented. Change incorporation is verified by the CCB Secretary to ensure that the affected documentation is complete and accurate, and that the changes have been properly implemented.

All changes are tracked from initiation of a change proposal through assessment, disposition, implementation, verification, and close-out. The current status of any change is available in the Configuration Information Data Base at all times throughout the process. The four (4) level of Configuration Control Boards are as follows:

- Level 0 - Energy System Acquisition Advisory Board and Baseline Change Control Board (ESAAB BCCB)
- Level 1 - Program Baseline Change Control Board (PBCCB)
- Level 2 - Project Office Baseline Change Control Board (POBCCB)
- Level 3 - Contractor Baseline Change Control Board (CBCCB)

Formal configuration control begins with the establishment of the approved technical, cost and schedule baselines. The configuration control process ensures the systematic analysis, evaluation, and disposition of proposed changes and the implementation of approved changes.

MGDS DESIGN PROCESS GUIDELINES MANUAL

The attached figure (Figure 6-5) represents an overview of the change control process.

The change control process evaluation includes, but is not limited to, design criteria, performance, cost, schedule, compliance with regulatory requirements, operational effectiveness, logistics support, contractual requirements, and training. Changes affecting the configuration of an item, as stated previously, are normally limited to those that are necessary or that offer significant benefits. Examples of these types of changes are changes that:

- Correct deficiencies, including safety deficiencies
- Offer significant improvements in performance or functionality
- Effect substantial capital and life cycle cost savings or avoidance
- Prevent slippage in an approved program/project schedule

All M&O Level 3 change proposals are processed in accordance with QAP-3-4 and are dispositioned by the M&O Design Change Control Board. After a change has completed development and technical review, it is submitted to the M&O Board for evaluation and disposition in accordance with the process discussed above. After approval of the change by the CCB, the updated documentation is appropriately issued and distributed by DCC in accordance with AP-1.5Q. All drawings are signed off by the DOE's EDD branch as accepted for construction prior to issuance and distribution. A process overview of the Level 3 CM/CCB process is attached as Figure 6-6.

6.3 Status Accounting

The M&O CM is using the YMP Configuration Information System (CIS). This will change in mid-1994 when CIS Phase 2/3 INGRES base system currently in development by M&O Vienna for OCRWM is implemented on an OCRWM-wide basis. The CM and Data Base organizations of Las Vegas, Vienna, YMP and OCRWM have been working together in reviewing the functional requirements of the new CIS Phase 2/3 and its development. YMP CM currently uses an INGRES-RDBMS software system.

Applicable Documents:

- Configuration Information System (CIS) Users Manual, Version 7.2/0
- M&O NLP-3-15, To Be Verified (TBV) and To Be Determined (TBD) Monitoring System

Scope and Description

M&O Design Level 3

Key Document: CIS Users Manual, Version 7.2/0

Applicability: ESF Design Packages 1B/2A, and subsequent packages

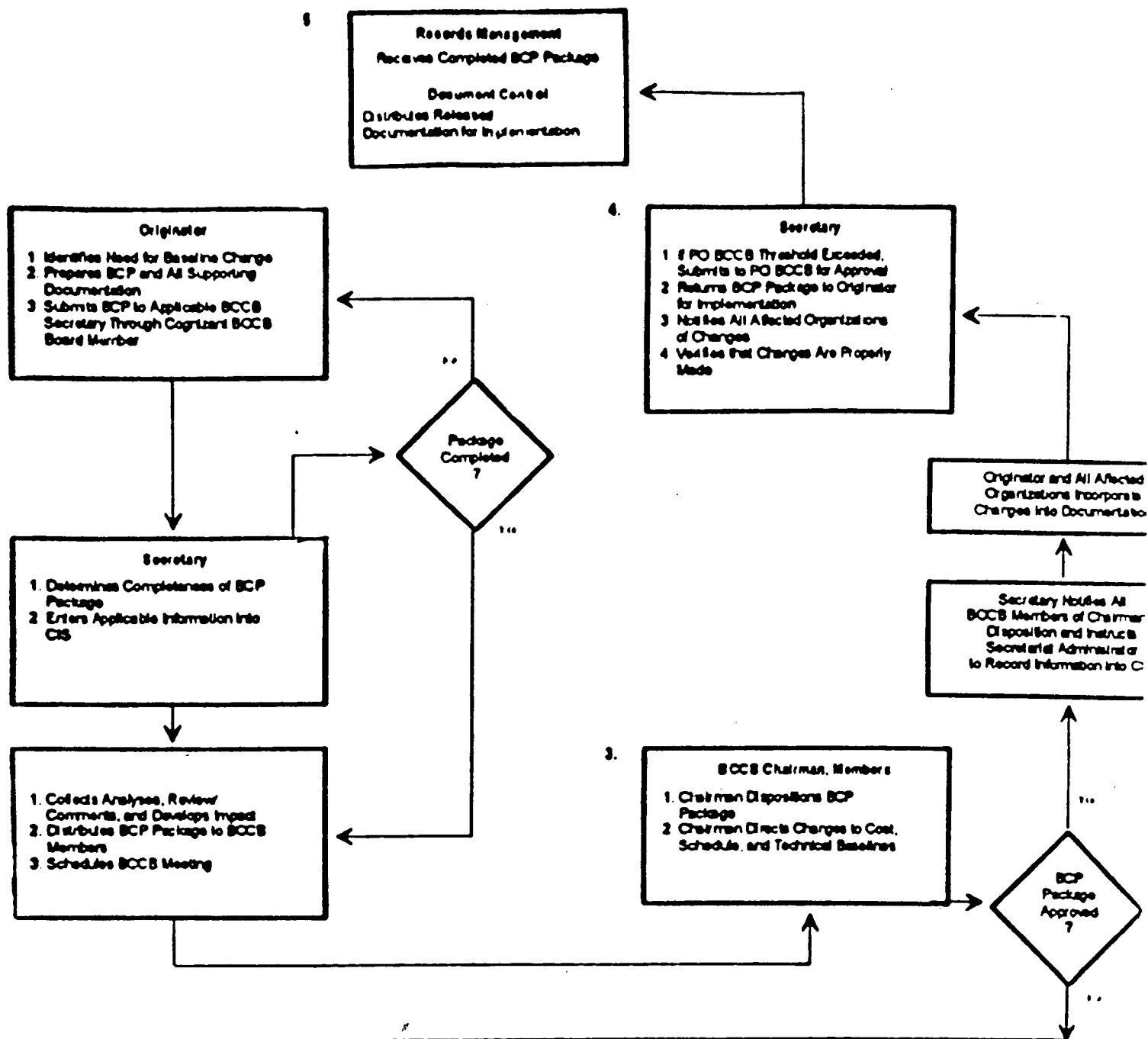


Figure 6-5 Change Control Process Overview

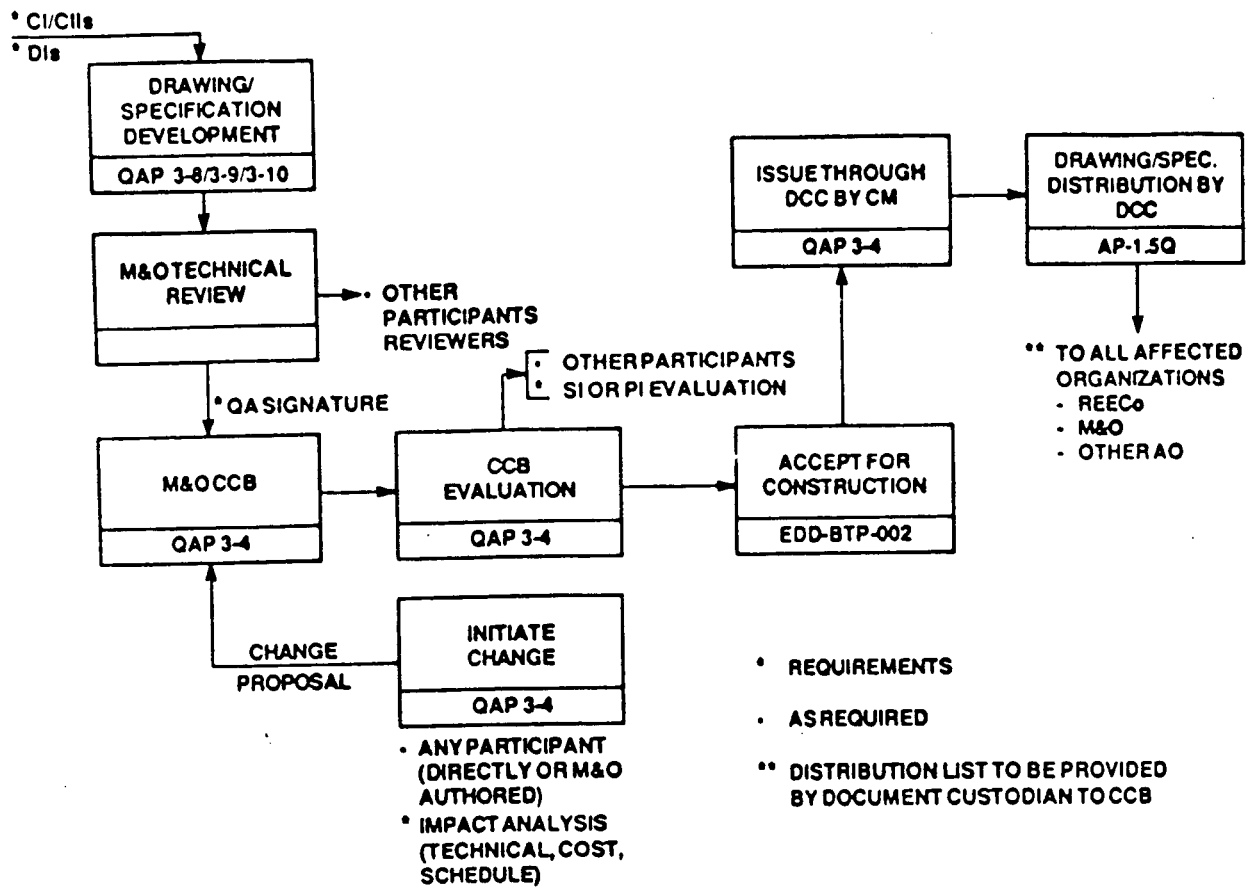


Figure 6-6

MGDS DESIGN PROCESS GUIDELINES MANUAL

The YMP CIS is the system supporting management of the ESF configuration baseline. The release of ESF Design Packages 1B/2A design documents will be entered into the CIS. Changes to these documents will be tracked and reported. Periodically, the following CM reports are being prepared. A sample format of each is attached as Figure 6-5, Parts A, B, C, D, and E: *mw F*;

- Configuration Item (CI) Status Report
- Baseline Change Control Board (BCCB) Register Report
- Baseline Change Proposal (BCP) Log Status Report
- Document Identifier (DI) Status Report
- Cross Reference Between CIs and Interface Control Documents (ICDs). This cross reference will be included in the above BCCB Register Report.
- To Be Determined/To Be Validated (TBD/TBV) Status Report
- Hold Status Report (Requirement of YMP AP-5.20, Hold Control)

For ESF Design Package 1A, it will be entered into the M&O Level 3 baseline before being removed from the YMP Level 2 baseline.

6.4 Configuration Audits

M&O Design Level 3

Key Document: M&O Procedure in Preparation

Applicability: ESF CIs

The M&O procedure governing configuration audits is in preparation. A draft program level document, OCRWM Baseline Management Procedure for Configuration Audit, is undergoing review. When issued, this program procedure will be the basis for flow down to the M&O procedure. Meanwhile, necessary configuration audits will be conducted in accordance with the YMP AP-3.6Q project procedure, as described in the Supplement to this Section.

6.5 Interface Control Management

The management of interface control in design is performed within the design organization, and M&O Configuration Management is not directly involved. Interface control is to be elevated to the project level under certain conditions, as described in section 7.5.

Figure 6-7A YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
CONFIGURATION ITEM IDENTIFIER STATUS REPORT

CII ---	CII NOMENCLATURE -----	DATE ISSUED -----	COMMENT -----
B00000000	MGDS	9/ 2/93	LEVEL 2
BA0000000	SITE	9/ 2/93	LEVEL 3
BAA000000	SBT	9/ 2/93	LEVEL 4
BAAA00000	BOREHOLE		LEVEL 5
BAAB00000	LM300		LEVEL 5
BAB000000	ESF	9/ 2/93	LEVEL 4
BABA00000	ACCESS ROADS	9/ 2/93	LEVEL 5
BABB00000	MAIN SITE	9/ 2/93	LEVEL 5
BABBA0000	SURFACE FACILITIES	9/ 2/93	LEVEL 6
BABBAA000	SWITCHGEAR HOUSING	9/ 2/93	LEVEL 7
BABBAB000	PARKING AREAS	9/ 2/93	LEVEL 7
BABBAC000	COVERED STORAGE	9/ 2/93	LEVEL 7
BABBAD000	SHOP BUILDING	9/ 2/93	LEVEL 7
BABBAE000	WAREHOUSE	9/ 2/93	LEVEL 7
BABBAF000	CHANGE HOUSE	9/ 2/93	LEVEL 7
BABBAG000	OPERATIONS BUILDING	9/ 2/93	LEVEL 7
BABBAH000	GUARD HOUSE	9/ 2/93	LEVEL 7
BABBAI000	ESF VISTOR CENTER	9/ 2/93	LEVEL 7
BABBB0000	SITE DRAINAGE	9/ 2/93	LEVEL 6
BABBC0000	SITE PREPARATION	9/ 2/93	LEVEL 6
BABBD0000	SURFACE UTILITIES	9/ 2/93	LEVEL 6
BABBDA000	SURFACE POWER	9/ 2/93	LEVEL 7
BABBD0000	SURFACE WATER	9/ 2/93	LEVEL 7
BABBD0000	SURFACE SANITATION	9/ 2/93	LEVEL 7
BABBD0000	SURFACE COMMUNICATIONS	9/ 2/93	LEVEL 7
BABBDE000	SURFACE WASTE WATER	9/ 2/93	LEVEL 7
BABBD0000	SURFACE COMPRESSED AIR	9/ 2/93	LEVEL 7
BABBE0000	CONTROL SYSTEMS	9/ 2/93	LEVEL 6

Figure 6-7B M&O LEVEL 3 DESIGN CCB REGISTER

DOCUMENT NUMBER	DOCUMENT TITLE	REV. NUMBER	CHANGE NUMBER	EFFECTIVE DATE	CONFIGURATION ITEM NUMBER
Level 3 M&O CCB Baselined Document					
B00000000-AA-12-00002-00	Calculation: Underground Diesel Emission Analysis	00	BCP-02-93-0005	4/28/93	BAB000000 ESF
B00000000-01717-0200-00022 REV 00	Redesign of Headwall and Final Concrete Liner Reinforcing Bars Calculation	00	BCP-02-93-0013	6/25/93	BAB000000 ESF
B00000000-01717-0200-00031 REV 00	Allowable Blast Hole Deviation Study (ST-MN-201)	00	BCP-02-93-0009	6/25/93	BAB000000 ESF (CI.16.4000 ESF First Ramp)
B00000000-01717-0200-00032 REV 00	Surface Blast Design (ST-MN-202)	00	BCP-02-93-0009	6/25/93	BAB000000 ESF (CI.16.4000 ESF First Shaft)
B00000000-01717-0200-00033 REV 00	Starter Tunnel/Test Alcove Blast Design Analysis (ST-MN-203)	00	BCP-02-93-0009	6/25/93	BAB000000 ESF (CI.16.4000 ESF First Shaft)
B00000000-01717-0200-00034 REV 00	Controlled Drill and Blast Methodology Study (ST-MN-204)	00	BCP-02-93-0009	6/25/93	BAB000000 ESF (CI.16.4000 ESF First Shaft)
B00000000-01717-0200-00035 REV 00	Portal Highwall Excavation Methods Analysis (ST-MN-205)	00	BCP-02-93-0009	6/25/93	BAB000000 ESF (CI.16.4000 ESF First Shaft)
B00000000-01717-0200-00036 REV 00	Portal Construction Sequence Analysis (ST-MN-206)	00	BCP-02-93-0009	6/25/93	BAB000000 ESF (CI.16.4000 ESF First Shaft)
B00000000-01717-0200-00037 REV 00	North Portal Starter Tunnel Sizing Analysis (ST-MN-207)	00	BCP-02-93-0009	6/25/93	BAB000000 ESF (CI.16.4000 ESF First Shaft)
B00000000-01717-0200-00038 REV 00	Highwall Stability Analysis- Preliminary (ST-MN-209)	00	BCP-02-93-0009	6/25/93	BAB000000 ESF (CI.16.4000 ESF First Shaft)

Changes Thru 17-Nov-1993

Page 2

Figure 6-7C

CRWMS M&O DESIGN CHANGE CONTROL BOARD
BASELINE CHANGE PROPOSAL (BCP) STATUS LOG REPORT

BCP NO /CLASS /TYPE	DESCRIPTIVE TITLE	SUBMIT DATE	BCP ORIGINATOR/ORG SPONSOR/ORG	AFFECTED DOCUMENT/CI	ICD	PROCESSOR	CURRENT STATUS	REQUIRED ACTION/ RESPONSIBLE ORG.
CURRENT/PENDING BCP's								
BCP-02- 93/0014 3 BCP	Baseline the Determination of Importance Evaluation for the ESF Switchgear Building/Temporary Office Facility (B00000000-AA-09-000 06-00) as per requirements of QAP-3-9.	06/24/93	R. T.mGeer/CRWMSM&OO	B00000000-AA-09-0 0006-00 BAB000000		ANGUS	OPEN 11/01/93	CRWMSM&O: Document originator to supply publication ready document and return to BCP processor for Baselining.
BCP-02- 93/0016 3 BCP	Baseline the Determination of Importance Evaluation for the ESF Rock Storage Area (B00000000-AA-09-000 04-01) as required per QAP-3-9.	06/24/93	R. T.mGeer/CRWMSM&OO	B00000000-AA-09-0 0004-01 BAB000000		ANGUS	OPEN 07/22/93	CRWMSM&O: Processor preparing Disposition Summary and CCB Directive
BCP-02- 93/0017 3 BCP	Baseline the Determination of Importance Evaluation for the ESF Starter Tunnel Steel Arch Section (B00000000-AA-09-000 03-02) as required per QAP-3-9.	06/24/93	R. T.mGeer/CRWMSM&OO	B00000000-AA-09-0 0003-02 BAB000000		ANGUS	OPEN 11/01/93	Processor preparing Disposition Summary and CCB Directive
BCP-02- 93/0018 3 BCP	Baseline the Determination of Importance Evaluation for the ESF Stormwater System (B00000000-AA-09-000 02-02) as required per QAP-3-9.	06/24/93	R. T.mGeer/CRWMSM&OO	B00000000-AA-09-0 0002-02 BAB000000		ANGUS	OPEN 11/01/93	CRWMSM&O: Document originator to supply publication ready document and return to BCP processor for Baselining.

Figure 6-7D YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
DOCUMENT IDENTIFIER STATUS REPORT

DI --	TITLE -----	ISSUED TO -----	ISSUE DATE -----	ISSUED BY -----	PREVIOUS CII -----
B00000000	00002 UNDERGROUND DIESEL EMISSION ANALYSIS	A. RUST	1/15/93	T. MYETTE	
B00000000	00003 DETERMINATION OF QUALITY FOR WASTE AFFECTING ACTIVITIES PACKAGE DEVELOPMENT	T. DOERING	2/15/93	T. MYETTE	
B00000000	00005 STRUCTURAL ANALYSIS-UNDERGROUND VENT DUCT STRUCTURE	A. RUST	3/18/93	T. MYETTE	
B00000000	00006 STRUCTURAL ANALYSIS-UNDERGROUND VENT DUCT SUPPORTS AND BRACKETS	A. RUST	3/18/93	T. MYETTE	
B00000000	00007 ENTRY POINT ELEVATION DETERMINATION: ESF NORTH RAMP/TS MAIN DRIFT INTERSECTION	R. NOLTING	3/23/93	T. MYETTE	
B00000000	00008 MUCK STORAGE	J. STEINHOFF	3/25/93	T. ANGUS	
B00000000	00010 SURFACE CONVEYOR DESIGN ANALYSIS	L. MORRISON	4/ 1/93	T. MYETTE	
B00000000	00009 ROCK MASS CLASSIFICATION ANALYSIS	S. BONABIAN	4/ 1/93	T. MYETTE	
B00000000	00011	D. VANICA	4/ 2/93	T. MYETTE	
B00000000	00012 CUTOUT CONFIGURATION ANALYSIS	J. TAIPALE	4/ 5/93	T. MYETTE	
B00000000	00013 SUBSURFACE CONVEYOR SYSTEM DESIGN ANALYSIS	A. KAHN	4/ 6/93	M. MCGRATH	
B00000000	00014 DESIGN BASIS LOADING ANALYSIS	S. BONABIAN	4/ 8/93	T. MYETTE	
B00000000 01717 0200 00001	ASSESSMENT OF THE UE-25 NRG-1 ROCK PROPERTIES DATA AND ITS IMPACT ON PACKAGE 1A TITLE II DESIGN	A. RUST	12/18/92	T. MYETTE	
B00000000 01717 0200 00004	LATTICE GRIDERS-M ADDITIONAL INITIAL GROUND SUPPORT	A. RUST	3/18/93	T. MYETTE	
B00000000 01717 0200 00015	ESF VENTILLATION ANALYSIS	H. YANG	5/ 5/93	T. ANGUS	
B00000000 01717 0200 00016	BLAST ANALYSIS	J. TAIPALE	5/26/93	T. ANGUS	
B00000000 01717 0200 00021	DEWATERING SYSTEM ANALYSIS	J. TAIPALE	5/26/93	T. ANGUS	

NUMBER	DESCRIPTION	DOCUMENT IDENTIFIER	REV	SCHEDULED COMPLETION	ACTUAL COMPLETION	RESP. ORG.	TBD/TBV ORIGIN.
TBD-089	CLASSIFICATION ANALYSIS RELATED TO TBV-001	YMP-025-1-CIVL-GP101 YMP-025-1-CIVL-GP102 YMP-025-1-CIVL-GP104	2 2 0	12/30/92		M&O A/E	
TBD-090	CLASSIFICATION ANALYSIS RELATED TO TBV-004	YMP-025-1-CIVL-GP101 YMP-025-1-MING-MG109 YMP-025-1-MING-MG110 YMP-025-1-MING-MG111 YMP-025-1-MING-MG113 YMP-025-1-MING-MG114 YMP-025-1-MING-MG115 YMP-025-1-MING-MG116 YMP-025-1-MING-MG117 YMP-025-1-MING-MG118	2 0 0 0 0 0 0 0 0 0	12/30/92		M&O A/E	
TBD-091	DETERMINATION OF LENGTH OF TBM CUTTERHEAD	YMP-025-1-MING-MG121 YMP-025-1-MING-MG123 YMP-025-1-MING-MG126	0 0 0	1/1/93		M&O A/E	
TBD-092	DETERMINATION OF TBM CONFIGURATION	YMP-025-1-MING-MG123	0	1/1/93		M&O A/E	
TBD-093	LAUNCH CRADLE DIMENTIONS AND CONFIGURATION	YMP-025-1-MING-MG138 YMP-025-1-MING-MG139	0 0	1/1/93		M&O A/E	
TBD-094	SELECTION OF FAN SILENCER ASSEMBLY.	YMP-025-1-MING-MG147	0	1/1/93		M&O A/E	
TBD-095	LOCATION OF HYDROCHEMISTRY AND RADIAL BOREHOLE ALCOVE.	YMP-025-1-MING-MG147	0	1/1/93		M&O A/E	
TBD-101	LOCATION OF NEW 138KV OVERHEAD ELECTRICAL FEED LINE REQUIRES DETERMINATION	BABFCA000-01717-2100-45002	01	1/1/93		M&O A/E	MORRISON, L
TBD-102	W/MK SWITCHGEAR, TBM TRANSPORT, MINE GROUND MAT SIZE & LOCATION	BABBDA000-01717-2100-24039 BABBDA000-01717-2100-24070 BABBDA000-01717-2100-24074 BABBDA000-01717-2100-24075 BABBDA000-01717-2100-24076 BABBDA000-01717-2100-24078		11/30/93		M&O A/E	HOWELL, R
TBD-103	INTERFACE TO CENTRAL CONTROL AND MONITORING SYSTEM AT 2 PLACES	BABFAA000-01717-2100-44000	01	11/1/93		M&O A/E	EBERHAND, E
TBD-104	DETAIL DESIGN OF CKT. CONVEYOR BELT STORAGE UNIT 1 AND 2, 125HP, 480V	BABFAA000-01717-2100-44000	01	2/1/94		M&O A/E	EBERHAND, E
TBD-105	DETAIL DESIGN OF CKT. CONVEYOR MAIN DRIVE UNIT 1 AND 2, 150HP, 480V	BABFAA000-01717-2100-44000	01	2/1/94		M&O A/E	EBERHARD, E
TBD-106	NO. PRTL LIGHTING DISTRIBUTION PANEL AND CONNECTIONS 100KVA, 480/277V	BABFAA000-01717-2100-44000	01	2/1/94		M&O A/E	EBERHARD, E

Changes thru 5 OCTOBER 1993

Figure 6-7F Inceca Mountain Site Characterization Project
SEPTEMBER Hold Status Report

HOLD NUMBER	SUBJECT OF HOLD	CHANGES RELATED TO HOLD	HOLD RELEASING ORG(S)	DOCUMENT NUMBER	SCHEDULED /FORECAST COMPLETION DATE	OVERDUE HOLD STATUS INFO.
HR93-16.1001-02	Selection of Pump	93/083	CRWMSM&O	YMP-025-1-7008-ST101-R0	11/30/93	
HR93-16.1001-03	TBM Track Installation		CRWMSM&O	YMP-025-1-MING-MG126 YMP-025-1-MING-MG127	10/01/93 07/01/94	Await TBM vendor Track Gauge data & A/E determination of floor configuration
HR93-16.1001-05	Starter Tunnel TBM Launch Area	93/405	CRWMSM&O	YMP-025-1-MING-MG121	06/30/93 07/01/94	Design dependent on TBM vendor details.
HR93-16.1001-06	Start of Underground Mining Using the TBM		CRWMSM&O	YMP-025-1-MING-MG121 YMP-025-1-MING-MG123 YMP-025-1-MING-MG126 YMP-025-1-MING-MG135 YMP-025-1-MING-MG138 YMP-025-1-MING-MG139	12/14/93	
HR93-16.1001-07	Water Tank Foundation		CRWMSM&O	YMP-025-1-STRU-ST117	11/30/93	
HR93-16.1001-08	Booster Pump Station Water Tank Foundations		CRWMSM&O	YMP-025-1-STRU-ST118	11/30/93	
HM93-16.1001-10	Water & Sanitary Sewer System Construction	93/097	CRWMSM&O	YMP-025-1-SP06	10/01/93 11/01/93	Reviewing recent DIE information on Package 1A.
HM93-16.1001-14	Evaluate/Correct Design Deficiencies in North Portal Wingwalls		CRWMSM&O	YMP-025-1-STRU-ST106 YMP-025-1-STRU-ST108 YMP-025-1-STRU-ST111 YMP-025-1-STRU-ST112	10/15/93 04/01/94	Await disposition of VE study recommendations.
HM93-16.1000-16	Parking Areas and Bus Loop Construction	93/346	CRWMSM&O	YMP-025-1-CIVL-GP101	10/01/93 04/01/94	Await disposition of VE study recommendations.
HM93-16.1000-17	Switchgear Related Specifications and Drawings		CRWMSM&O	YMP-025-1-SP02 YMP-025-1-ELEC-EL110 YMP-025-1-ELEC-EL113 YMP-025-1-ELEC-EL115 YMP-025-1-ELEC-EL116 YMP-025-1-ELEC-EL118 YMP-025-1-ELEC-EL119 YMP-025-1-ELEC-EL121 YMP-025-1-ELEC-EL122 YMP-025-1-ELEC-EL123 YMP-025-1-ELEC-EL125 YMP-025-1-ELEC-EL126 YMP-025-1-7007-EL101		

SUPPLEMENT: CONFIGURATION MANAGEMENT for YMP RELATIVE TO MGDS DESIGN

7.0 CONFIGURATION MANAGEMENT for MGDS DESIGN

At the program, project and design levels (Levels 1, 2, and 3, respectively), CM is currently governed by a mix of three suites of procedures. This mix results from the following conditions: (1) transition of ESF design activity from RSN to the M&O after ESF Package 1A was issued; (2) a recent YMP decision to realign the YMP technical baseline by having design documents be held at the Design Level 3 rather than YMP Level 2; (3) differences between M&O procedures, existing YMP procedures and existing OCRWM program procedures; (4) and recently issued OCRWM program procedures that require a planned implementation flow-down with associated changeovers. Differences between these procedures are noted and their relative applicabilities are described.

7.1.1.1 General

A configuration item is a physical entity, or any of its portions, that is an aggregation of facilities, equipment, hardware or software that satisfies an end use function. It is established for the purpose of configuration management and providing traceability between physical entities and documents. Specifically, a CI structure allows linkage of (1) one CI to another CI; (2) a CI to its documentation; (3) a CI's documentation to another CI's documentation. The designation of an item as a CI means that that CI and its directly related documents are subject to the baseline change control process.

7.1.1.2 Applicable Documents

- YMP/88-4, YMP Configuration Management Plan
- DOE/RW-0415, OCRWM Baseline Management Procedure for CIs and CI Identifiers

YMP Project Level 2

Key Document: CMP YMP/88-4

Applicability: ESF Design Package 1A and SBT Designs (RSN)

At the project level, a CI structure and related CII's have been in place for several years. It applies project-wide, including EBS/Waste Package, Repository, ESF and Test Facilities items. This structure is defined in the YMP Configuration Management Plan (CMP) YMP/88-4 and the CIs are published periodically in a Configuration Item Register Report by YMP Configuration Management.

The ESF Design Package 1A introduced by RSN into the YMP baseline applied the YMP CIs. Examples of YMP CIs are: CI.16.1000 for ESF Site Preparation and CI.16.2000 for ESF Surface Utilities.

The design documents comprising ESF Design Package 1A also include the following numbers in addition to the YMP CII: a drawing or specification number and a RSN CII. An

SUPPLEMENT: CONFIGURATION MANAGEMENT for YMP RELATIVE TO MGDS DESIGN

example of a RSN CII is: 6-SI-UCS-FA-WA-01A.

Note: The YMP CI structure does not reflect a flow-down of the recent OCRWM CI procedure DOE/RW-0415. A changeover is planned later.

7.1.2.1 General

A document identifier is required for the following documents: (1) management documents consistent with the approved document hierarchy; (2) technical documents or design documentation; (3) documents necessary to support licensing the Civilian Radioactive Waste Management System (CRWMS); (4) computer software CIs (CSCIs) and CSCI documents developed in accordance with M&O procedure QAP-19-2; (5) and implementing documents subject to the Quality Assurance Requirements and Description (QARD). The MGDS design process keys on technical documents, design documentation or design products.

7.1.2.2 Applicable Documents

- DOE/RW-0415, OCRWM Baseline Management Procedure for Document Identifiers
- YMP AP-1.5Q, Distribution, Maintenance, and Use of Controlled and Managed Documents
- YMP AP-1.18Q, Records Management: Las Vegas Record Source Responsibilities
- DOE/RW-033P, OCRWM Quality Assurance Requirements and Description

7.1.2.3 Scope and Description

YMP Project Level 2

Key Document: OCRWM DOE/RW-0416

Applicability: Not currently used on ESF Package 1A which was baselined prior to issue of this procedure. A changeover is planned for a later date.

The project does not perform design or software work; hence, it does not have a document identifier procedure in place for design documentation.

Design documentation intended for the Level 2 baseline through the YMP CCB carry the design organizations identifiers and include an appropriate YMP CII. ESF Design Package 1A documents reflect the RSN approach that shows a DI separate from the CII. For example, a drawing in this package includes a drawing number, the RSN CII, and the corresponding YMP CII. The first two were applied during the design process and the YMP CII was included for the YMP Level 2 baseline. When a Design package 1A document is revised, the existing YMP drawing number and YMP CII will be carried forward. If a Design Package

SUPPLEMENT: CONFIGURATION MANAGEMENT for YMP RELATIVE TO MGDS DESIGN

1A document is replaced or re-drawn, it will carry the M&O identifier but retain the YMP CII.

Note: As previously discussed, the M&O operates the record centers in Las Vegas and the field. This also applies for YMP records responsibilities. The governing YMP procedures are AP-1.5Q and AP-1.18Q, which are the project counterparts to the M&O QAP-6-1 and QAP-17-1, respectively.

Note: Both the YMP AP-1.5Q and M&O QAP-6-1 procedures address the distribution, maintenance and use of controlled documents. AP-1.5Q differentiates between a controlled and a managed document. Examples of controlled documents are drawings, specifications and calculations. A controlled document is approved in accordance with established implementing procedures, contains a document identifier, is subject to revision, is provided to designated individuals on controlled distribution, and is subject to a defined change process. A managed document is approved in accordance with established procedures, is subject to revisions, but cannot be used to accomplish quality affecting activities.

7.2 Configuration/ Change Control

7.2.1 General

Under certain conditions, change proposals need to be elevated to the project level and to the YMP BCCB. These include design documents pertaining to ESF Design Package 1A or proposals that exceed the thresholds described in the applicable documents listed below. The basic change process is the same, but different forms and procedures are used.

7.2.1 Applicable Documents:

- YMP BTP-4DDF-002, Criteria for Document Reviews Performed by the Engineering and Development Division
- YMP AP-3.3Q, Baseline Change Control Process
- YMP AP-3.5Q, Field Change Control Process
- YMP AP-3.7, Cost and Schedule Baseline Maintenance and Change Control
- QMP-03-09, Project Change Control Process

7.2.3 Scope and Description

New, re-drawn or changed versions of design documents for ESF Design Package 1A are

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submitted to EDD for construction planning or acceptance in accordance with YMP BTP-EDD-002. This procedure requires M&O QA signature prior to a review. Design documents for ESF Design Packages 1B, 2A and subsequent packages will be submitted to the M&O BCCB for approval prior to submittal to the project.

7.3 Status Accounting

The project using the YMP Configuration Information System (CIS). This will change in mid-1994 when CIS Phase 2/3 INGRES base system currently in development by M&O Vienna for OCRWM is implemented on an OCRWM-wide basis. The CM and Data Base organizations of Las Vegas, Vienna, YMP and OCRWM have been working together in reviewing the functional requirements of the new CIS Phase 2/3 and its development. YMP CM currently uses an INGRES-RDBMS software system.

- YMP AFP-3.6Q, Configuration Management
- Functional Requirements Document for CIS Phase 2/3, March 30, 1993
- YMP AP-5.20, Document Hold Control

YMP Project Level 2

Key Documents: AP-3.6Q and CIS Users Manual, Version 7.2/0

Related Document: CIS Functional Requirements for CIS Phase 2/3

Applicability: YMP Level 2 CIS applications

The YMP CIS will remain in use for the project until the CIS Phase 2/3 is developed and implemented on a program-wide basis. With realignment of the YMP technical baseline document control, the ESF Design Package 1A/2B documents will be held in the Level 2/3 M&O baseline and not entered into Level 2. An exception may apply to a few documents designated to held in the YMP technical baseline.

Package 1A is currently held in the Level 2 BCCB. A transfer is planned whereby ESF Package 1A is entered into the M&O Level 3 baseline and removed from the YMP Level 2 baseline.

As required by AP-3.6Q and AP-5.20 procedures, the following reports are published on a monthly basis:

- Change Request (CR) Status Log Report
- Configuration Item Register Report
- CCB Register Report
- Cross Reference Index Between CIs and Interface Control Documents (ICD).
This cross reference is included in the above CCB Register Report.
- Monthly Hold Status Report

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7.4 Configuration Audits

YMP Project Level 2

Key Document: AP-3.6Q Related Document: CMP YMP/88-4

Applicability: Project CIs

The project audit requirements for configuration reviews are described in the YMP/88-4 Configuration Management Plan and AP-3.6Q Configuration Management procedure. There are three types of reviews: configuration information system review (CISR), physical configuration review (PCR), and functional configuration review (FCR). These reviews are conducted in accordance with an approved configuration review plan.

A configuration review is an audit that is intended as a stand-alone event for a representative sample of configuration items. Although separate and distinct from other checks and balances, it can be conducted in coordination with other project review activities. It is not as broad in scope as a design review or Title III Services nor is it an alternative to quality assurance audits. Also, a configuration review is not intended to address compliance to requirements other than assuring that the as-built configuration reflects its corresponding documentation.

7.4.1 Configuration Information System Review (CISR)

A CISR verifies that the information contained within CIS agrees with the corresponding documentation. These reviews are conducted by the BCCB Secretary or independent reviewer, as directed by YMP Engineering Development Director.

7.4.2 Physical Configuration Review (PCR)

A PCR validates that an as-built item accurately conforms to its technical documentation and represents the completed item. This review encompasses the verification of document changes through change directives (CDs) and to drawings and specifications. For selected CIs, a PCR is performed at or near completion of construction to establish the as-built baseline.

7.4.3 Functional Configuration Review (FCR)

A FCR validates that design and construction has been satisfactorily completed and the configuration item has achieved the performance and functional characteristics specified in its technical documentation. Approved design inputs are compared against official test data. The results are checked for completeness and accuracy.

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7.5 Interface Control Management

Applicable documents:

- YMP AP-5.19Q, Interface Control
- YMP Configuration Management Plan (CMP), YMP/88-4

Scope and Description

On a project basis, interface control is defined into four levels in the CMP: A, B, C, and D. Interface control is classified to the highest level of classification that it affects. These levels and the associated control authorities are described in Tables ~~XX-1~~ and ~~XX-2~~ which have been extracted from the YMP CMP. 7-1 7-2

Interface control management is implemented by interface control documents (ICDs). These documents include component interface documents (CIDs), system interface drawings (SIDs), Interface Revision Notices (IRNs), other drawings and specifications and Interface Memorandum of Understandings (IMOU). The Interface Control Procedure AP-5.19Q describes two processes relative to two kinds of interface documents: (1) an IMOU that is an agreement to establish, define, document and control informational and organizational interface requirements; (2) an IRN used to define or describe physical interface requirements or change existing physical interface requirements. These physical requirements typically include form, fit and function considerations.

Informational/organizational interface matters are non-quality affecting in nature and documented on an IMOU form. Physical interface matters are quality affecting and submitted to the YMP Interface Control Working Group (ICWG) on an IRN. After ICWG acceptance of an IRN, it is transmitted to the YMP BCCB.

The ICWG operates relative to a charter and the group is comprised of a Chairperson, Secretary, a representative from the YMP, and representatives from each participant. The Chairperson is the Systems Branch Chief of the Engineering and Development Division (EDD). The Secretary is the CRWMS M&O representative who is assigned from the M&O CM organization.

Table 7-1 Interface Control Level Descriptions

Level	Description
A	Interfaces between the Waste Management System (WMS) and other external systems (e.g., waste producers)
B	Interfaces between the WMS elements (Repository, Transportation, and Monitored Retrievable Storage).
C	Interfaces between the Project systems (e.g., System, Repository, Waste Package, ESF, and Site CIs).
D	Interfaces between subsystems internal to a Project system.

Table 7-2 Interface Control Authorities

Authority	Description
DOE/RW	Level A and B interfaces.
Project Office	Level C interfaces and Level D and lower interfaces that involve more than one Project Participant.
Project Participant	Level D and lower level physical interfaces that are internal to one single Project Participant.

Section XXXX INTERFACE CONTROL MANAGEMENT

M&O Design Interface Control

The management of interface control in design is performed within the design organization, and M&O Configuration Management is not directly involved. Interface control is to be elevated to the project level under certain conditions, as described below.

YMP Project Interface Control

Applicable Documents:

- YMP AP-5.19Q, Interface Control
- YMP Configuration Management Plan (CMP), YMP/88-4

Scope and Description

On a project basis, interface control is defined into four levels in the CMP: A, B, C and D. Interface control is classified to the highest level of classification that it affects. These levels and the associated control authorities are described in Tables XX-1 and XX-2 which have been extracted from the YMP CMP.

Interface control management is implemented by interface control documents (ICDs). These documents include component interface documents (CIDs), system interface drawings (SIDs), Interface Revision Notices (IRNs), other drawings and specifications and Interface Memorandum of Understandings (IMOU). The Interface Control procedure AP-5.19Q describes two processes relative to two kinds of interface documents: (1) an IMOU that is an agreement to establish, define, document and control informational and organizational interface requirements; (2) an IRN used to define or describe physical interface requirements or change existing physical interface requirements. These physical requirements typically include form, fit and function considerations.

Informational/organizational interface matters are non-quality affecting in nature and documented on an IMOU form. Physical interface matters are quality affecting and submitted to the YMP Interface Control Working Group (ICWG) on an IRN. After ICWG acceptance of an IRN, it is transmitted to the YMP BCCB.

The ICWG operates relative to a charter and the group is comprised of a Chairperson, Secretary, a representative from the YMP and representatives from each Participants. The Chairperson is the Systems Branch Chief, of the Engineering and Development Division (EDD). The Secretary is the CRWMS M&O representative who is assigned from the M&O CM organization.

Table Interface Control Level Descriptions

Level	Description
A	Interfaces between the Waste Management System (WMS) and other external systems (e.g., waste producers)
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D	Interfaces between subsystems internal to a Project system.

Table Interface Control Authorities

Authority	Description
DOE/RM	Level A and B interfaces.
Project Office	Level C interfaces and Level D and lower interfaces that involve more than one Project Participant.
Project Participant	Level D and lower level physical interfaces that are internal to one single Project Participant.

**THERE IS ADDITIONAL INFORMATION
ON M&O DESIGN INTERFACE CONTROL
FOR THIS CHAPTER.**

**IT WILL BE PROVIDED AT A LATER
DATE.**

MGDS DESIGN PROCESS NONCONFORMANCES (MGP-15-1)

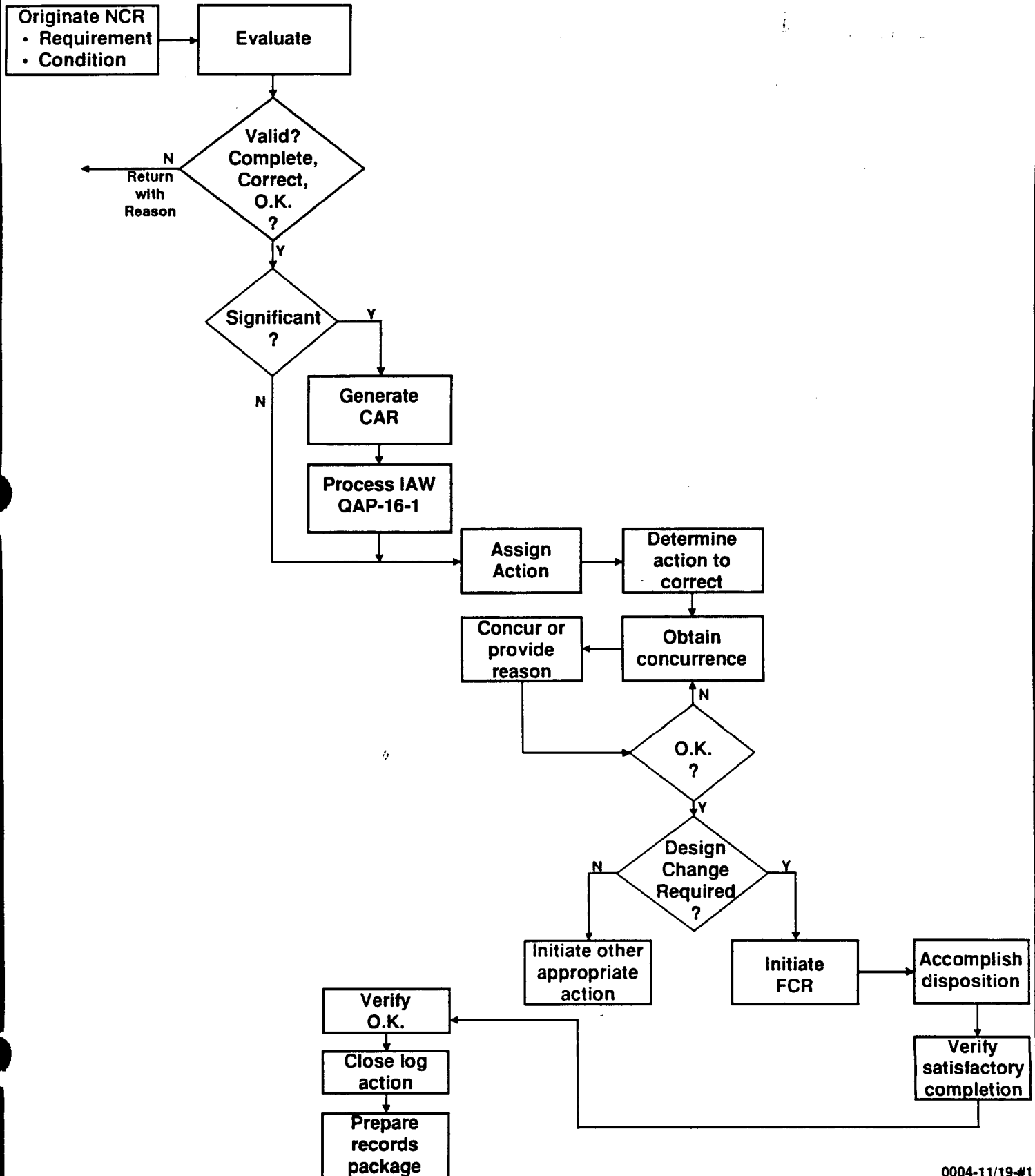
Discovering
Party

QA

MGDS
Dept. Mgr.

Qualified
Assignee

Responsible
Organization



NON-CONFORMANCES

Measures for identifying and documenting that items do not conform to specified requirements are described in YMP Administrative Procedure 5.27Q. The M&O has developed procedure MGP-15-1 "Control of Non-Conforming Items" to implement the requirements of AP-5.27Q. Any M&O personnel or YMP personnel may originate a Non-Conformance Report (NCR) when non-conforming items are found. A copy of the NCR form is found within MGP-15-1. The NCR is filled out describing the non-conforming condition including the requirement not achieved. Once completed, the NCR is submitted to the Quality Assurance Department and evaluated for validity, completeness, correctness and determination of significance. NCRs that are evaluated and found to be valid are sent to the MGDS Department Manager for disposition. A qualified individual is then assigned the action to evaluate the non-conformance and provide what action is required to correct the non-conformance. Factors to be considered in determining the disposition action are established within MGP-15-1. A revision to technical specifications and drawings may be required as part of the corrective action disposition. Therefore the NCR would be dispositioned with a Field Change Request (FCR) generated in accordance with AP-3.5Q "Field Change Requests" and NLP-3-10 "Preparation of Field Change Requests Against Engineering Drawings and Specifications". The organization for implementing the disposition will perform the disposition and verify the corrective action prescribed in the NCR has been completed.