Enclosure 2
July 6, and 7, 1989
Exploratory Shaft Facility
Design and Design Control Meeting

On July 6, and 7, 1989, staff from the U. S. Nuclear Regulatory Commission (NRC) met with representatives from the U. S. Department of Energy (DOE), the State of Nevada, and local governments. The purpose of the meeting was to: (1) work with DOE to ensure that it understood the staff's position on the exploratory shaft facility (ESF) design and design control process (DCP) taken in the Site Characterization Analysis (SCA) draft point papers; (2) have DOE present its DCP for future ESF design work; and (3) discuss, among the participants, an approach for the staff's review of the ESF, Title II design process, including resolution of the staff's SCA comments. A list of attendees is contained in Attachment 1.

The meeting began with the NRC staff giving a presentation covering several areas including (1) its review of the ESF, Title I design; (2) an overview of what was expected in the ESF, Title II DCP; and (3) a proposal for conducting the ESF, Title II review. Attachment 2 is a copy of the staff's presentation. During its discussion, the staff noted that the draft point papers contained its comments on the Site Characterization Plan (SCP), the ESF, Title I Design Acceptability Analysis, and the ESF DCP. Because DOE had not completed the final design of the ESF, the staff wanted to ensure that DOE understood that the comments provided did not represent the final NRC comments on the ESF. With respect to the DCP, the staff presented the fundamental steps that it expected to see in the ESF, Title II DCP. In general, the staff discussed the fact that the DCP should be developed in accordance with Criterion III, as well as other criteria, of the Code of Federal Regulations, Title 10, Part 50, Appendix B (10 CFR Part 50, Appendix B). The DCP should involve identifying the applicable technical criteria from 10 CFR Part 60, then developing the higher-level controlling and implementing documents such as quality assurance (QA) plans or management plans. Next, the staff stated that the necessary design documents containing specific design criteria needed to be developed. After that, DOE would need to develop the necessary implementing procedures, both QA and technical. Finally, the staff noted that DOE needed to verify that the DCP was working through design reviews, QA audits, and surveillances.

Next, the staff gave a short summary presentation on its draft point papers. In general, the staff noted that it had one major concern which was the ESF DCP and ESF, Title I design. All of the other comments contained in the point papers support this concern. The staff then identified what areas of the ESF were covered by the comments, e.g., the shafts, the underground test layout, or drifting. The concern covered all of the above areas. After the staff completed its summary presentation, a detailed discussion was held on each of the draft point papers. In this discussion, the staff presented each draft point paper and the participants asked questions to help them understand the position.

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Once the detailed discussions were done, the staff presented its proposal for reviewing the ESF, Title II design. In this proposal, the staff noted that the burden of ensuring the acceptability of the ESF, Title II design was with DOE. However, the NRC staff proposed that DOE identify its design process, including major points where design milestones were complete and points where NRC's concerns would be addressed. Emphasis would be placed on addressing concerns with fundamental aspects of the design process as early as practicable. The staff could then review, if it chose, the parts of the design or design process before DOE completed the next step. This approach would allow the staff an opportunity to review the design process as it progressed rather than wait until it was complete. In response, DOE indicated that the NRC staff could observe the design process as it proceeded by attending the 30%, 60%, and 90% design package reviews. DOE agreed to provide logic and milestones for its design process to the NRC staff by September 1, 1989 so that the staff would be aware of when the DOE design package reviews and other milestones were scheduled. This would allow DOE and NRC to establish mutually agreeable observation points. In its presentation on the suggested approach, the staff identified, as examples, the first two steps in the design process, which were the identification of the applicable 10 CFR Part 60 requirements and the generation of detailed design criteria.

Following the staff's presentation, DOE made several presentations on its design process and DCP. In its presentation on the design process, DOE gave an overview that discussed the role of the participants. This included describing the roles taken by DOE/Headquarters, the Yucca Mountain Project Office (Project Office), and the six individual contractors working for the Project Office. DOE also noted that the Project Office and the six contractors were all members of the Interface Control Working Group (ICWG). The ICWG was responsible for managing the interface activities for design work. In its presentation, DOE identified the sources of design input and the method for generating the necessary design documents. The design documents discussed by DOE included the Subsystem Design Requirements Document (SDRD) and the Reference Information Data Base (RIB).

The next portion of the DOE presentation included a description of the design process for the ESF architect engineers (A/E). In this presentation, DOE discussed how the A/Es proceeded from design input to design output. Following this, DOE gave an overview of design change control process and design interface process. In these presentations, DOE described the controlling documents and the steps that would be followed. Finally, DOE discussed its design documentation and records.

The second presentation given by DOE covered in more detail the development of design criteria. In this discussion, DOE described the hierarchy of documents it used to implement the applicable requirements from 10 CFR Part 60, and then described how the 10 CFR Part 60 requirements were put into the SDRD as well as what the contents of the SDRD were. This was followed by a status on the development of the SDRD to be used in the ESF, Title II design, and a discussion of how changes to the SDRD would be controlled. The other areas of design input discussed in this presentation covered the RIB and the QA guidance that was applicable to the design input.

After the DOE presentations, the two contractors responsible for the ESF design, Fenix and Scisson, Nevada, and Holmes and Narver, gave a presentation on the DCP in place at these organizations. Copies of all of the DOE and contractors presentations are given in Attachment 3.

Besides giving the planned presentations, DOE selected some typical examples of NRC staff positions given in the draft point papers and provided some preliminary responses. Although DOE understood NRC's points, DOE provided additional considerations relative to the NRC staff positions that DOE believes should eliminate or reduce the extent of the concern. A copy of the DOE preliminary responses to the draft point papers is contained in Attachment 4.

During the discussions on the DCP, the DOE Project Office stated that it was proceeding with its ESF, Title II design even though it had not received all of the comments on the ESF design contained in the SCP. The DOE Project Office further stated that it had considered comments from some groups, including DOE/Headquarters, but had not reached agreement on how to resolve them. The Project Office continued by stating that it had established a series of points in its design process where it would verify that the work was done correctly or make any changes that would be needed. The staff stated that the risk associated with this approach involves more extensive backfitting and was greater than the risk associated with a control process that sequentially proceeded with: (1) identifying and incorporating all regulatory requirements; (2) preparing the design; and (3) evaluating the design through a critical design review, before baselining and controlling changes. DOE acknowledged that its approach was riskier relative to an "ideal" design control process.

In addition to the concern expressed by the staff, the State of Nevada had several concerns. First, the State questioned how DOE would incorporate comments on the SCP into the design process. In particular, the State noted that DOE had not yet developed a process for considering the comments. The State expressed concern over this because DOE had received or would receive comments on the ESF design given in the SCP; however, it appeared that DOE was completing the ESF, Title II design without considering the comments. Also, the State of Nevada expressed concern about issues with the design that were raised internally in DOE. The State questioned how these issues were addressed. DOE responded that any issue, whether it was raised externally or internally, was evaluated using the Technical Assessment Review (TAR) process or similar methods. The State then expressed concern with the fact that issues raised internally and closed by the TAR process might never be seen by the State of Nevada or the NRC staff.

In closing, the NRC staff stated that it needed to see how its comments on the ESF design were carried through the design process and incorporated into the ESF, Title II design. It further stated that DOE should continue to verify that the QA programs, including the DCP, were being acceptability implemented. However, the NRC staff expressed concern that the Project Office QA plan was still not in place. This is because the Project Office is the controlling organization for the repository activities. Also, the NRC staff reiterated its concern on the DCP approach the Project Office was using. Finally, the staff offered that it was available to meet in any area where DOE felt it needed guidance.

As part of its closing remarks, DOE stated that it had initiated three of approximately 22 design packages for the ESF. It further stated that it may reduce the number of design packages to 5 by consolidating some packages. During generation of each design package, DOE will review the design at 30%, 60%, and 90% completion of design. With respect to the information requested by the staff, DOE agreed to provide information on what was included in the design packages by September 1, 1989. In addition, DOE stated that a meeting on Revision 1 to the ESF, Title II SDRD would be beneficial. The staff agreed to schedule such a meeting in the future.

The last participant to offer closing remarks at the meeting was the State of Nevada. In its remarks, the State expressed concern that the NRC approach for accepting QA programs represented an erosion of NRC's original process for qualifying QA programs, and stated that it was opposed to the NRC approach. (This closing remark pertains to the July 6, 1989 QA meeting. Please see Enclosure 1 to this letter for details of that meeting.) The second concern raised by the State was that the NRC draft point papers contained open items on the ESF, Title I design, which the NRC staff said could be addressed in the ESF, Title II design. This indicated to the State that the staff had problems with the Title I design. The State believed that the open items with the ESF, Title I design need to be resolved before DOE proceeds to the ESF, Title II design. As an example, the State cited the location of the shafts as an issue that should be resolved before design work proceeded. Next, the State reported that it believed that DOE needed to establish a process to do an evaluation of the best available data before ESF, Title II design work begins. This was to ensure that the ESF, Title II design was done with the best data.

Finally, the State of Nevada expressed a concern with the NRC proposed approach for the review of the ESF, Title II design. As the State saw it, its role was one of oversight and consultation. On the other hand, the State viewed NRC's role as one of reviewing the design to determine if the appropriate 10 CFR Part 60 requirements were considered. The State believed that the NRC's proper role was not one of consultation during the design process. Therefore, the State's position was that it was inappropriate for the staff to interact too closely with DOE and to guide the design of the ESF or development of the QA program. Hence, the State was opposed to this approach. In subsequent discussions it was determined that the State interpreted the consultation process to be one of telephone calls or conversations just between NRC and DOE. The NRC staff responded that this was not the case, and that it intended the process to involve conference calls and meetings concerning the design process. These activities would be open to all participants. The State noted this clarification, and the staff stated that it would clarify this in the meeting minutes.

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ENCLOSURE 2
Attachment 1

July 6, and 7, 1989
Design Control Meeting

NRC
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B. J. Youngblood
J. Kennedy
J. Linehan
K. McConnel
P. Prestholt
J. Gilray
J. Conway
J. Bunting
M. Nataraja

State of Nevada
C. Johnson
S. Frishman
J. Grubb

Edison Electric Institute
T. Colandra
**J. Smith

Westinghouse/DOE
R. Bahorich
A. Jennetta

Sandia National Laboratory
A. Stevens

City of Las Vegas
A. Douglas

Nevada Nuclear Waste Task Force
J. Treichel

Science Application International, Corp
S. Crawford
S. Metta
M. L. Brown
C. Pflum
J. Davenport
M. Voegele
M. Mitchell
J. Waddell
M. Glora
**J. Shaler
**J. Nelson
F. Peters
J. Jenning
J. Treadwell

DOE
E. Wilmont
C. Gertz
M. Blanchard
*M. Frei
E. Regnier
L. Little
R. Murthy
R. Barton
*F. Hemmes
*A. Baca
R. Levich
D. Shelor
J. Robson
R. Dyer
**R. Stein
*M. Comar

Weston/DOE
H. Bermanis
D. Wagg
*W. Marchand
M. Lugo
G. Faust
**K. Cline

Fenix and Scisson, Nevada
R. Bullock
*D. Tunney

Holmes and Narver
H. Tuthill
**J. Calovini

MATEC/DOE
J. Caldwell

* July 6, 1989 only
** July 7, 1989 only

ENCLOSURE 2
Attachment 2

Nuclear Regulatory Commission Presentations

UNITED STATES NUCLEAR REGULATORY COMMISSION

July 6 and 7, 1989

Design Control Meeting

Joe Holonich

Division of High-Level Waste Management

OUTLINE

- Introduction
- NRC Review
- Draft Point Paper Concerns
- Design Control Process
- Summary
- Points for Consultation
- Conclusion

INTRODUCTION

- NRC Draft Point Papers Comment On:
  - Site Characterization Plan
  - Design Acceptability Analysis
  - Design Control Process for the Exploratory Shaft Facility (ESF)

- Reason for Today's Meeting
  - DOE Understands NRC Positions
  - DOE Presents Its Design Control Process (DCP)
  - Approach for ESF, Title II Review
    1. Resolve NRC Concerns On ESF Design and DCP Presented to Date
    2. Identify Steps for NRC to Complete Its Review of the ESF Design

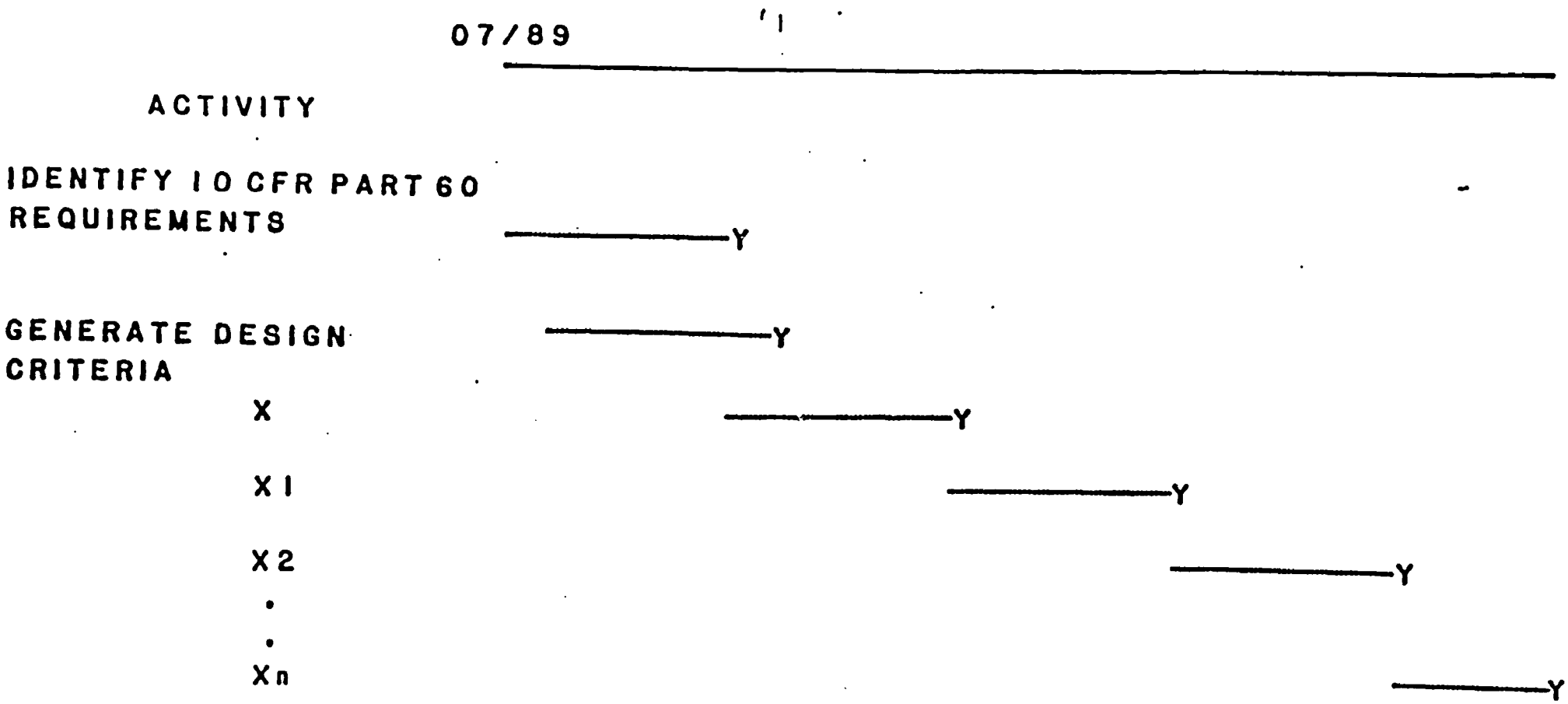
DESIGN CONTROL PROCESS

- 10 CFR Part 50, Appendix B, Criterion III
- Identify Applicable 10 CFR Part 60 Requirements
- Develop Higher-Level Controlling Documents
- Develop Higher-Level Implementing Documents
- Develop Design Documents
  - Systems Design Requirements
  - Subsystems Design Requirements
- Develop Implementing Procedures
- Verify Through
  - Design Reviews
  - Quality Assurance Audits
  - Surveillances

SUMMARY

- DOE Must Have a 10 CFR Part 50, Appendix B Design Control Program
  - Ensure That The Design Is Developed In An Acceptable Manner.
  - Verify That The Design Is Being Done Properly and Meets The Necessary Design Criteria.
- Burden of Ensuring The Acceptability of The Design Is With DOE.
- NRC Will Review To Determine If The DCP Meets 10 CFR Part 60

ESF Title II Design Activities



X DOE Design Process Step

Y : Design Product or NRC Review Point

Both X and Y need to be identified by DOE

CONCLUSION

NRC and DOE must have ongoing consultations in the ESF, Title II design process. These must be timely so that DOE has an opportunity to consider NRC's comments, if necessary, before it completes subsequent steps.

NRC STAFF REVIEW OF

THE ESF DESIGN
&
DESIGN CONTROL PROCESS

JULY 6-7, 1989

MAJOR CONCERN ON ESF DESIGN CONTROL PROCESS & THE ESF TITLE I DESIGN

THE SCP AND ITS REFERENCES (INCLUDING DAA) DO NOT DEMONSTRATE THE ADEQUACY OF THE ESF TITLE I DESIGN CONTROL PROCESS AND THE ADEQUACY OF ESF TITLE I DESIGN.

SUPPORTING BASES
(DESIGN CONTROL PROCESS)

SCA DRAFT CONCERN NUMBER 1
SCA DRAFT COMMENT NUMBER 127
SCA DRAFT COMMENT NUMBER 128
SCA DRAFT COMMENT NUMBER 129
SCA DRAFT COMMENT NUMBER 130
SCA DRAFT COMMENT NUMBER 131
SCA DRAFT COMMENT NUMBER 132
SCA DRAFT COMMENT NUMBER 133
SCA DRAFT QUESTION NUMBER 63

SUPPORTING BASES
(ESF TITLE I DESIGN)

SHAFTS
(SCA DRAFT CONCERN NUMBER 1; COMMENT NUMBER 121, 124, 127; QUESTION NUMBER 24, 27)

UNDERGROUND TEST LAYOUT
(SCA DRAFT CONCERN NUMBER 1; COMMENT NUMBER 82, 119; QUESTION NUMBER 58)

DRIFTING
(SCA DRAFT CONCERN NUMBER 1; COMMENT NUMBER 35)

DRAFT

Section 8.4.2.3.1 Exploratory Shaft facility testing, operations, layout constraints, and zones of influence, pages 8.4.2-93/147

CONCERN 1

The exploratory shaft facility (ESF) is intended to become an integral part of the repository if the site is found acceptable. However, the SCP and its references do not demonstrate the adequacy of ESF Title I design control process, and the adequacy of the ESF Title I design which is the basis for the SCP. For example, neither the design nor the subsequent Design Acceptability Analysis (DAA) considers some of the applicable 10 CFR 60 requirements. Also, the process used to integrate currently available technical data into decisions regarding shaft location appears to have overlooked evidence of a potential fault near the location of the exploratory shafts. In addition, it has not been demonstrated that the underground test facility and currently identified test durations will permit all tests to be conducted for the time periods required without interference. Furthermore, resolution of the problems identified with the Title I design may result in considerable corresponding modifications to the SCP.

BASIS

- In response to CDSCP objection number 3, the SCP described an acceptable approach for assessing the potential for test-to-test and construction-to-test interference. However, the SCP has not established that this approach has been appropriately implemented to resolve potential interference problems. In responding to NRC CDSCP objection number 3, the discussions and analyses presented in the SCP did not completely address the following NRC staff recommendations:

  a. In planning the underground test facility, the overall performance confirmation testing program and the need for starting certain performance confirmation tests (e.g., waste package testing) as early as practicable during site characterization should be considered.

  b. The design of the ESF should take into account the need for preliminary information from in situ seal testing to be available in the License Application submittal.

- The Design Acceptability Analysis (DAA) undertaken by DOE in response to NRC concerns for evaluating the acceptability of the ESF Title I design did not consider certain concerns critical to NRC acceptance of DAA conclusions. The following are some examples:

  a. Independence of the reviewers is in question. Five reviewers who were certified not to have significantly contributed to the ESF Title I design and SDRD (sub-system design requirements) are identified as authors, reviewers, and/or contributors to specific documents which were input documents to the ESF design. (Question 63)

b. Neither the ESF Title I design nor the subsequent DAA considers (qualitatively or quantitatively) 11 of the applicable 10 CFR 60 requirements. (Comment 128)

c. Of the 52 requirements considered by DOE to be applicable to the ESF design, only 22 were considered quantitatively. The remaining were said to have been considered qualitatively. Included in the remaining 30 are the requirements of Subpart F (Performance Confirmation Program) which according to 10 CFR 60.140(b), "shall have been started during site characterization." Several of these 30 requirements are potentially important in evaluating the acceptability of the ESF Title I design (Comment 130).

d. Of the 22 requirements that were considered quantitatively, some inadequacies have been identified. For example, in considering the regulatory requirement related to alternatives to major design features important to waste isolation (60.21(c)(1)(ii)(D)), the analysis presented was limited and incomplete. As a result, comparative evaluation of alternatives to the major design features was limited to comparative evaluation of five alternative ESF locations. Hence other comparative evaluations such as the number of man made openings were not considered. (Comment 132)

e. DAA did not thoroughly check the adequacy of data used in the ESF Title I design. For example, several key documents which were part of ESF Title I design were not reviewed. (Comment 131)

f. DAA has not demonstrated that DOE has considered information that indicates the presence of an anomaly in the immediate vicinity of the proposed locations of exploratory shafts 1 and 2 (Comment 127). By not considering this readily available information in reaching the decision on the locations of ES-1 and ES-2, uncertainties regarding the design control process are further heightened. The design itself is further questioned since the comparative evaluation of the major design features (i.e. ES-1 and ES-2) with respect to waste isolation did not assess the impact of the anomaly.

- The analysis presented did not demonstrate that the underground test area layout can accommodate currently identified tests in the ESF while avoiding interference between tests and between tests and construction operations. Also, information presented in the SCP did not clearly show that thermal tests can be conducted for sufficient lengths of time to gather necessary site characterization data without interference problems. The bases for these concerns are as follows:

a. SCP does not clearly address the potential incompatibility of some of the tests with construction operations. It has not been demonstrated that operational requirements (e.g., storage of mobile equipment, drill steel, blasting materials vent pipes, water pipes, support/reinforcement, disabled equipment, etc.) will not encroach on some of the identified test locations. For example, sequential drift

mining test, heated block test and canister-scale heater experiment are currently shown to be located adjacent to the first loop access drifts to the shafts and therefore subject to potential operational interference.

b. The zones of influence presented for thermal tests are based on short test durations. Thermal tests such as the canister-scale heater experiment, heated block test, and heated room experiment are planned to run for relatively short durations (30 months, 100 days, 36 months). The staff considers that longer durations will very likely be necessary. The need to obtain additional site characterization data beyond the planned time periods may result in larger zones of influence.

c. It is stated in the SCP that in some cases the same space can be used for more than one test by sequencing the tests. However, it is not clear if it has been fully considered that delays during initial testing could affect the timing for the tests to be followed in the same space.

d. It is not clear that uncertainties have been sufficiently considered in the calculations of zones of influence for various tests. For example, uncertainties associated with the numerical models and material properties have not been considered in calculating zones of influence.

e. The location of the canister-scale heater test shown in Figure 8.4.2-39 (page 8.4.2-209) has been erroneously indicated on the layout. As a result, its zone of influence apparently overlays the heated block test. In addition, the SCP gives the following two constraints for locating the canister scale heater test (page 8.4.2-120):

- located greater than 9 m from drifts or alcoves running parallel to the axis of the heater.

- located in a "low traffic" area.

Neither of these constraints has apparently been met.

f. The locations of several major tests identified in the SCP have not been specifically identified. These include some tests that could have a considerable zone of influence (e.g., Heated room experiment) and some that require extensive test area (e.g., Horizontal drilling demonstration test). Examples of other tests for which specific locations have not been identified include thermal stress measurements, development and demonstration of required equipment, three of the four diffusion tests identified on page 8.4.2-140, seal tests and other performance confirmation tests.

g. Page 8.3.2.1-14 of the SCP states that "there are other tests that have not yet been completely defined that will investigate coupled interactions." Information has not been presented to indicate if any of these undefined tests will be in the main test area.

h. The space designated for tests within the underground test area layout is very likely to be inadequate. DOE assumes that all the space within the dedicated test area may be or is usable. This is unlikely to be the case. For example, some areas may not be suitable for use because of faults, lithophysal content, breccia, etc. In addition, offsets from waste emplacement areas (30 m) and from proposed multi-purpose boreholes (two drift diameters) may further reduce the available test area.

i. The zone of influence from the drilling activities of existing borehole USW G-4 located within the dedicated test area should be considered in evaluating the size of suitable available test space. In calculating the zone of influence for USW G-4 it should be considered that a total of 342,255 gallons of water were lost to various formations. Over 81,000 gallons of soap were used in the operation; however, it is unknown as to how much soap was lost.

- Potential impacts of long-term performance confirmation testing on ESF design have not been addressed (see Comment 119).

  The SCP has not provided sufficient demonstration that in situ waste package testing will not be needed during site characterization to reduce uncertainties associated with long term waste package performance prediction for license application and closure. If such testing is found necessary, an analysis of the impact on ESF design is not presented (Question 58 and Comment 82).

- Some of the ESF design criteria are not sufficiently justified. These include:

  (a) Seismic design basis (Comment 121);
  (b) ES-1 drainage volume and long-term drainage reliability (Comment 124, Question 27); and
  (c) effect of liner removal at closure (Question 24)

- The subsurface drifting and exploration planned in the SCP have not been shown to be sufficient to yield the data needed for repository design and site suitability demonstration at license application (Comment 35).

RECOMMENDATION

- An acceptable baselined QA process should be used during Title II design.

- The Title II design should ensure that the design process, which appears to have overlooked key regulatory requirements and information about the

suitability of exploratory shaft locations during Title I design, is adequate and that the number of shafts and their locations in the final repository contribute to reduce uncertainty with respect to waste isolation.

- The DOE should evaluate existing technical data (e.g., geophysical, geological) with respect to ESF location decisions and criteria; and, if deemed necessary, the DOE should consider additional geological and geophysical surface based tests in the vicinity of the exploratory shafts to investigate potentially adverse features and conditions.

- The ESF Title II Design should present the basis for selected test durations, address the suitability of established test durations and their impact on the testing program.

- The ESF Title II Design should provide a complete conceptual layout of the main test level and related test schedules. The layout and schedule should account for the following:

  (a) uncertainties in the zones of influence calculations; (b) construction and facilities operations; (c) contingencies for unsuitable test areas; (d) drilling effects of USW G-4; (e) contingencies for tests that will need to be running longer than planned; (f) effect of sequencing tests on the overall license application and performance confirmation test programs; and (g) coupled interaction tests mentioned on page 8.3.2.1-14.

  Based on these considerations, the ESF Title II design should recognize the potential need for additional underground testing area and demonstrate sufficient flexibility to accommodate likely contingencies.

Section 8.3.1.4.2 Investigation: Geologic Framework of the Yucca Mountain Site
Section 8.3.1.4.3 Investigation: Development of three-dimensional models of rock characteristics at the repository site.
Section 8.4.2.1 Rationale for planned testing

COMMENT 35

The program of drifting in the north, combined with systematic drilling and feature sampling drilling, appears unlikely to provide the lithologic and structural information necessary to adequately investigate potentially adverse conditions at the site or insure that observations made and data collected will be representative of conditions and processes throughout the repository block. Also, it has not been demonstrated that the proposed site characterization plan provides for a sufficient amount of underground drifting to collect data necessary for designing the repository and analyzing repository performance.

BASIS

- Activities described in the SCP are not sufficient to resolve the concerns expressed in NRC CDSCP comment 28. For example, the response to NRC CDSCP comment 28 on the ability of site characterization activities to adequately characterize the site indicates that additional information on rock property values will be collected during the construction phase of the repository. This response does not satisfy the requirements of 10 CFR Part 60, in that Section 60.122(a)(2) requires that potentially adverse conditions be adequately investigated during site characterization.

- The response to CDSCP comment 100 has not demonstrated that the amount of subsurface drifting and exploration planned in the SCP would be sufficient to yield the data needed for repository design at license application.

- Data collection activities appear to be heavily biased to the northern part of the repository and to non-welded to moderately welded tuffs, an attribute that will lead to population densities that are highly skewed to rock characteristics found in nonwelded to moderately welded tuffs in the northern part of the repository. For example, data collection in the northern third of the repository will include 5 coreholes, 2 shafts, and 3 drifts, while in the southern third of the repository, data collection will be largely restricted to several unsaturated zone test holes. Coring in most holes will be continuous in nonwelded tuffs, but due to problems in core recovery, densely welded tuffs are generally only to be spot cored.

- Barton and Scott (1987), citing Spengler (R.W. Spengler, USGS, oral communication, 1986), state that "The general depth at which abundant lithophysal cavities will be found can be interpolated from drillhole data, but the exact depth, with the precision necessary for repository construction cannot be predicted" (p. 12).

- The SCP indicates that fracture and fault zone characteristics will be determined in the ESF excavation (p. 8.4.2-26). However, the SCP also indicates that faults decrease in both offset and abundance northward through Yucca Mountain (p. 1-119). For example, the Ghost Dance fault has 38 meters of vertical offset at the southeastern margin of the perimeter drift and is unmeasureable at the northeastern boundary of the perimeter drift (p. 1-128). All excavation associated with the ESF will take place in the northern part of the repository where the number of faults and amount of offset along faults do not appear to be representative of the rest of the repository block.

- Portions of two structural blocks, the Central block and the Abandoned Wash block, appear to be included within the Conceptual Perimeter Drift Boundary (CPDB). Excavations related to the ESF will test only the Central block. The Central block contains a scarcity of large-displacement faults and a uniform 5° to 10° eastward dip of beds (USGS, 1984). The Abandoned Wash block is characterized by many north-northwest-striking faults and fractures with dips of beds of the Central block steepening eastward into the Abandoned Wash block (USGS, 1984). Excavations in the the Central block may not provide representative data on the characteristics of faults and fractures in the Abandoned Wash block.

- Planned drifting to the imbricate fault zone is not sufficient to characterize the full range of conditions to be expected in an imbricate fault zone. Chapter 1 (p. 1-332) indicates that the repository would be bounded on the east by the western edge of an imbricate fault zone and Section 8.3.1.4.2 states that the perimeter drift is "limited" on its eastern extent by structural features. Both citations suggest that the main part of the imbricate fault zone is east of the perimeter drift and east of drifting related to the ESF. Figure 8.4.2-4 and other Figures and statements in the text emphasize that drifting will occur <u>to</u> the imbricate fault zone and not through that zone. Therefore, the character of imbricate fault zones will not be tested across the full range of conditions that may occur.

- Section 8.4.2 states that boreholes are unsuited for a statistical evaluation of fault and fracture characteristics and that studies in long drifts from the ESF will be used to collect data on the hydrologic and geomechanical significance of faults and fractures that are believed to be similar to those encountered in the southeastern part of the site. However, Barton and Scott (1987) state that "The presence or detailed character of faults in any one part of the repository is not predictable from studies of any other part of the repository, particularly within the older and non-exposed Topopah Spring Member of the Paintbrush Tuff (p. 4)" suggesting that observations of fault and fracture characteristics in the northern part of the repository cannot be extrapolated to other parts of the repository.

- SCP Section 8.4.2.1.6 (p. 8.4.2-32) states that "Discussed below are options for obtaining the needed information for the Calico Hills unit and

for the southern part of the repository, and factors that will be considered in determining which approaches will be used." However, options for obtaining information 'for the southern part of the repository' are not explicitly addressed in the sections following Section 8.4.2.1.6.

- If additional drifting is not accounted for in planning, a potentially significant disruption to characterization schedules may occur and substantially reduce the ability of DOE to obtain information necessary for licensing.

RECOMMENDATION

- Demonstrate that from a scientific perspective, the program of drifting in the northern part of the repository combined with the systematic drilling program and feature sampling program will provide the information necessary to ensure that conditions and processes encountered are representative of conditions and processes throughout the site and that potentially adverse conditions will be adequately investigated.

- Demonstrate that the planned site characterization will provide sufficient data for designing the repository and analyzing the repository performance.

- Compare and evaluate the benefits and disadvantages between more extensive drifting during site characterization (including supplemental horizontal core drilling) and the surface-based systematic drilling program with respect to the data derived and effects on repository performance. In the event that additional drifting is determined to be necessary by DOE, SCP updates should discuss the bases that will be used to determine the extent and direction of drifting.

REFERENCES

Barton, C.C., and Scott, R.B., 1987, Rationale for a continuous map of geologic features in the exploratory shaft and drifts: U.S. Geological Survey Administrative Report, 15 p.

USGS, 1984, A summary of geologic studies through January 1, 1983, of a potential high-level radioactive waste repository site at Yucca Mountain, Nye County, Nevada: U.S. Geological Survey Open-File Report 84-792, 103 p.

REVIEW GUIDES

3.3.2, 3.3.4, 3.2.4.2

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Section 8.3.5.9	Issue resolution strategy for Issue 1.4: Will the waste package meet the performance objective for containment as required by 10 CFR 60.113?
Section 8.3.5.10	Issue resolution strategy for Issue 1.5: Will the waste package and repository engineered barrier systems meet the performance objective for radionuclide release rates as required by 10 CFR 60.113?
Section 7.4.5.2	Processes affecting waste package performance
Section 7.4.5.4	Yucca Mountain Project waste package system model description

COMMENT 82

There is inadequate discussion on how performance of the waste package may be verified at the time of license application.

BASIS

- Section 7.4.5.4 discusses how the YMP plans to model the processes affecting waste package performance (Section 7.4.5.2) to resolve issues 2.2 and 1.4. These issues are:

  1. Issue 2.2 (Section 8.3.5.4); Can the repository be designed, constructed, operated, closed, and decommissioned in a manner that ensures the radiological safety of workers under normal operations as required by 10 CFR 60.111, and 10 CFR Part 20?

  2. Issue 1.4 (Section 8.3.5.9); Will the waste package meet the performance objective for containment as required by 10 CFR 60.113?

- Sections 8.3.5.9 and 8.3.5.10 include discussions of laboratory tests to obtain information for waste package performance assessment models but no discussion on how well the models represent what actually might happen in the repository environment or how the models will be validated at repository depth in the host rock environment. If in situ test data are not obtained during site characterization, the needed information may not be available at the time of license application.

- It is not clear how the large scale coupled effects of prolonged thermal, radiation, and geochemical phenomena are planned to be investigated for the waste package in the current test plan.

- It is not clear how DOE plans to investigate stress related effects for container base metal as well as the weld-affected region after long-term thermal and radiation exposure without large scale waste package tests under repository conditions.

- DOE has not demonstrated that the potential effect of the container coming in contact with dissimilar metals, resulting in galvanic corrosion, can be sufficiently investigated without large scale waste package tests under repository conditions.

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RECOMMENDATION

The SCP should be modified to include in situ waste package tests to obtain the data needed to verify waste package performance at the time of license application. Alternatively, DOE should demonstrate that the plan laid out in the SCP is sufficient to obtain the needed waste package behavior information to support the license application.

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Section 8.3.5.16 Issue Resolution Strategy for Issue 1.7, pages 8.3.5.16-1/10

COMMENT 119

The information presented in the SCP, Section 8.3.5.16 - Performance Confirmation Testing, is insufficient to allow NRC staff to determine if the confirmation program meets the requirements of 10 CFR 60 Subpart F.

BASIS

- The SCP indicates, in its response to NRC CDSCP comment 103, that Section 8.3.5.16 has been revised to clearly define the phased volume of the DOE's performance confirmation program. The SCP recognizes "that 10 CFR 60.140(b) requires that a performance confirmation program shall have been started during site characterization" (p. 8.4.2-147). However, the staff considers that the SCP does not adequately address NRC CDSCP comment 103. The SCP does not provide sufficient details on confirmation of geotechnical and design parameters, design testing and monitoring and testing waste package required by 10 CFR 60, Subpart F. Potential impacts of performance confirmation testing on ESF design have not been addressed.

- Section 60.137 of 10 CFR Part 60 requires a performance confirmation program that meets the Subpart F requirements.

- 10 CFR 60.140(b) requires that the performance confirmation program shall have been started during site characterization.

- The Annotated Outline for the SCP (DOE, 1987, page xiii) states that one of the objectives of the SCP is to provide details of the performance confirmation testing program. This information is needed to allow evaluation of the effects of performance confirmation activities, in particular, the ability of the natural and engineered barriers of the repository system to meet the performance objectives.

- The USNRC Generic Technical Position on In Situ Testing During Site Characterization for High-Level Nuclear Waste Repositories, Section 5.6 states that "DOE should identify in its test plan which tests will be completed at the time of construction authorization application, and which tests and long-term monitoring activities will continue after that."

- It is not clear if the laboratory tests of intact rock mechanical properties under various environmental conditions (see Section 8.3.1.15.1.3.2) would be continued during performance confirmation. Although Blacic et al. (1986) has reported strength changes in intact tuff as a result of exposure to repository conditions over time, further quantification of these effects during performance confirmation may be necessary.

- No testing is described in the SCP to verify by direct observation the behavior of the waste package and waste package environment under repository conditions.

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RECOMMENDATION

The SCP updates should demonstrate that the performance confirmation program meets the requirements of 10 CFR 60 subpart F.

REFERENCES

10 CFR 60.

DOE's Annotated outline for the Site Characterization Plan, Rev. 1, 1987.

USNRC Generic Technical Position on In Situ Testing During Site Characterization of High-Level Waste Repository.

J. D. Blacic, D. T. Vaniman, D. L. Bish, C. J. Duffy and R. C. Gooley, "Effects of Long-term Exposure of Tuffs to High-Level Nuclear Waste Repository Conditions: Final Report," Los Alamos, 1986.

Section 8.4.2.1.2 Principal data needed for preclosure performance evaluations and design - Data needed for underground facility design, pages 8.4.2-14/15

COMMENT 121

Seismic design criteria for the ESF are not sufficiently described in the SCP.

BASIS

- The implicit assumption appears to be that the jointed rock mass in which the shafts are to be constructed will exhibit continuum behavior in the modified local stress field around the shaft. Effects such as local slip or separation on joint surfaces are not taken into account.

- The analysis of dynamic interaction of the peripheral rock mass with the shaft liner assumes continuous deformation of the rock. Under the conditions of dynamic loading imposed on the medium, it is possible that rock deformation will be discontinuous, resulting in highly localized loading of the shaft liner.

- The ground motions which are to be the basis for shaft design and performance assessment are stated in terms of probable bounds on the orthogonal components of peak acceleration and peak velocity which may be induced by earthquakes and UNE's. However, seismic loading results in cyclic loading of the rock mass. Experiments on jointed rock show that it is the number of excursions of dynamic loading into the plastic range of joint deformation which determines the performance of the joint (Brown and Hudson, 1974). A particular effect is that joint peak-residual behavior is modified. Further, tuff-like materials demonstrate strength loss under dynamic loading. Both effects (i.e. shear strength reduction of joints and reduction of material strength) are analogous to fatigue of metals under cyclic loading. These observations suggest that the design basis motions should be prescribed in terms of full time histories of acceleration and velocity, and not merely the peak ground motions. (Lemos, 1987).

RECOMMENDATION

The seismic design basis for the exploratory shaft facility should be clarified in SCP updates.

REFERENCES

E. T. Brown, and J. A. Hudson 1974, "Fatigue failure characteristics of some models of jointed rock," Earthquake Eng. and Struct. Dyn., 2, 379-386.

J. Lemos, 1987, "A Distinct Element Model for Dynamic Analysis of Jointed Rock with Application to Dam Foundations and Fault Motion," Ph.D. Thesis, University of Minnesota, June 1987.

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Section 8.4.3.2.1.1 Water infiltration from the surface, (3) Water accumulation in the exploratory shaft, pages 8.4.3-10/11

COMMENT 124

The discussion of the potential causes for a reduction in the drainage capacity of the shaft bottom does not include certain plausible mechanisms.

BASIS

- Of several possible ways in which the sump drainage could be rendered ineffective, silting is the only mechanism addressed (Fernandez et al, 1988). Dissolution and remineralization effects are not mentioned. Omitted from consideration are thermal, mechanical, and geochemical effects (e.g., p. 8.4.3-58: Geochemical changes).

- Permeability tests on fractured tuff suggest a high risk of rapidly reducing permeability during flow tests as a result of precipitation (e.g., Lin and Daily, 1984, as summarized in SCP section 7.4.1.5).

RECOMMENDATION

SCP updates should include a broader range of scenarios that could affect drainage.

REFERENCES

W. Lin, and W. Daily, 1984, "Transport Properties of Topopah Spring Tuff," UCRL-53602, Lawrence Livermore National Laboratory, Livermore, California.

J. A. Fernandez, T. H. Hinkebein, and J. B. Case, 1988, "Selected Analyses to Evaluate the Effect of the Exploratory Shafts on Repository Performance at Yucca Mountain," SAND88-0548, Sandia National Laboratories, Albuquerque, NM.

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Section Design Acceptability Analysis, Chapter 3: Assessment of Alternative Shaft Locations

COMMENT 127

The process used to integrate all available technical data into decisions regarding shaft location appears to have been inadequate because an apparent lack of data integration raised concerns about the suitability of shaft locations and about a process that has resulted in a possible violation of the criteria specified in the Design Acceptability Analysis (DAA) for set-back distances from faults.

BASIS

- The Design Acceptability Analysis cites Bertram (1984) as the basis for decisions regarding shaft set-back distance from faults and concludes that "...all five shaft locations are more than 100 feet from the nearest faults and this factor is nondiscriminating..." (DAA, p. 3-7). The DAA states that "Thus, consideration in this report of fault locations as a surrogate for performance essentially adopts the use of the same characteristic by Bertram" and "Because Bertram (1984) excluded all areas within 100 feet of faults, all five alternative locations compared by Bertram are in an acceptable zone" (DAA, pgs. 2-26, 2-29). However, the Bertram (1984) report, while publishing the results of siting activities conducted in early 1982, does not include the results of recommended activities to determine the presence of potentially adverse structures near the shaft locations. Therefore, the Bertram (1984) report does not support the conclusion made in the DAA regarding faulting as a factor in shaft location.

- The activities of DOE's shaft related Technical Integration Group conducted in 1982, and reported on by Bertram in 1984, made several recommendations regarding geologic mapping and geophysical evaluations in the vicinity of the preferred shaft locations. Some of the recommended mapping and evaluation was carried-out in the two years (1982-1984) preceeding publication of the Bertram (1984) report, however, there is no indication in either Bertram (1984) or a subsequent report on shaft location by Gnirk and others (1988) that the results of the geologic mapping and geophysical surveys were ever integrated into the decision on shaft location.

- In 1987, in response to concerns raised by the NRC staff, the locations of the exploratory shafts were moved from the center of Coyote Wash to the rock slope that bounds the wash to the north (Gnirk and others, 1988). There is no indication that data other than that presented in the outdated Bertram (1984) report was used in the decision-making process that led to the determination of the new locations.

- In 1982, the NNWSI Technical Integration Group (TIG) recommended that the sites of the shafts be re-evaluated should the recommended sites contain surface joint densities significantly higher than other sites. The SCP

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indicates that scientific criteria were used so that the exploratory shaft would not be constructed in areas of fractures associated with structural features (8.4.2-155). The area near the present sites on the northern slope of the wash is said to contain "fracture sets ...so intense that they are essentially breccias..." (Dixon to Vieth, 1982). Based on the recommendations made in 1982, a re-evaluation of the recommended site should have been conducted to determine the significance of the fracturing near the sites selected in 1987. While the DAA refers to the Dixon to Vieth letter and suggests that the mapping "tends to support the data set used in the original selection..." (p. I.6-8), there is no indication that the site selection process included a detailed analysis of these fracture data.

- The TIG also recommended that a geophysical evaluation be made in the washes near Yucca Mountain to explore for structures not exposed at the surface. Many of the geophysical surveys (most are regional studies) cited in the Gnirk and others' (1988) report as addressing the TIG recommendation were completed after the final decision on shaft locations was made (August, 1982). In addition, there is no indication that the results of resistivity surveys suggesting the presence of a fault at the current shaft locations (Smith and Ross, 1982) were considered in the selection of the site.

- There is no indication that the results of the geologic mapping, showing a high degree of fracturing present in rocks near the present shafts sites, were integrated and assessed with the results of the 1982, geophysical survey that suggests the possible presence of a fault in the vicinity of the mapped breccias.

RECOMMENDATION

- DOE should reconsider whether the design process, which appears to have overlooked key information about the suitability of exploratory shaft locations, is adequate to assure that the shafts will not adversely impact waste isolation.

- DOE should address apparent conflicts between the design criteria specified (i.e., set-back of 100 feet from faults) in Bertram (1984) and Gnirk and others (1988) and the presence of a possible fault near the exploratory shafts as suggested by the geophysical testing (Smith and Ross, 1982).

- The present shaft locations should be re-evaluated based on an assessment of available technical data.

- Consider conducting further tests (e.g., geophysical testing and trenching) in the vicinity of the proposed shafts to verify features and conditions that exist in that area.

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REFERENCES

Bertram, S., 1984, NNWSI Exploratory shaft site and construction method recommendation report: Sandia National Laboratory, SAND 84-1003, 100 p.

Dixon to Vieth, 1982, letter: G.L. Dixon, (USGS/Las Vegas) to D.L. Vieth (DOE/NV-WMPO), re: "Results of detailed geologic mapping at the five potential exploratory shaft locations on Yucca Mountain," July 16, 1982.

Gnirk, P., Hardin, E., and Voegele, M., 1988, Exploratory shaft location documentation report: U.S. Department of Energy Nevada Operations Office, Las Vegas, Nevada, December 21, 1988, 127 p.

Smith, C., and Ross, H.P., 1982, Interpretation of resistivity and induced polarization profiles with severe topographic effects, Yucca Mountain area, Nevada Test Site, Nevada: U.S. Geological Survey Open-File Report 82-182, 21 p.

REVIEW GUIDES

3.3.4, 3.3.23

COMMENT 12B

Several applicable 10 CFR 60 requirements have not been considered in evaluating the acceptability of ESF Title I design.

BASIS

- The DAA lists fifty two (52) 10 CFR 60 requirements that are considered in ESF Title I Design Acceptability Analysis (DAA). This list of (52) requirements does not include all applicable 10 CFR 60 requirements. The following requirements are missing from the list and are not considered in the DAA:

  60.17 Contents of Site Characterization Plan

  The ESF will be used to obtain information called for by (a) the SCP, (b) the waste package program, and (c) the repository design. As such, this requirement could potentially affect ESF requirements.

  60.24(a) Updating of Application and Environmental Report

  This section requires various applications (e.g., license application) to be as complete as possible in light of information that is reasonably available at the time of docketing. This requirement is applicable to ESF design because it provides guidance regarding scope and possible sequencing of activities.

  60.113(a)(2) Performance of Particular Barriers After Permanent Closure - Geologic Setting

  This regulation is applicable because the ESF design could impact the location of the disturbed zone boundary.

  60.113(b)(2) Performance of Particular Barriers After Permanent Closure

  These requirements are applicable to the ESF design, as the ESF design should allow gathering of information necessary to evaluate factors which bear upon:

  - the time during which the thermal pulse is dominated by decay heat from the fission products
  - geochemical characteristics of the host rock
  - sources of uncertainty in predicting the performance of the geologic repository

  60.122 Siting Criteria

  This requirement is applicable, as it provides detailed descriptions of the information which must be obtained (largely in ESF) to assess the

adequacy of the site and to assess other adverse conditions. In particular, 60.122(c)(1) imposes a design criterion on the location of underground accesses.

60.131(a) General Design Criteria for the Geologic Repository Operations Area - Radiological Protection

This requirement is applicable because it imposes requirements on all components of the ventilation systems, not just mechanical equipment. DOE's statement that "Compliance with the specified criteria is a function of equipment design and operational procedures, which imposes future requirements on equipment and operation, but not on the ESF permanent components" (Attachment I, p. 32) is too narrow. See, also, Attachment J (TDG's Members' Statement, filed by D. Michlewicz).

Also, 10CFR60.15(d)(4) requires coordination of subsurface excavation with the geologic operation area design and construction. As currently planned, ESF shafts and drifts will be part of ventilation system for the repository.

60.131(b)(4)(ii) General Design Criteria for the Geologic Repository Operations Area - Emergency Capability

See Attachment H, p. 7. (TDG report)

60.131(b)(5) General Design Criteria for the Geologic Repository Operations Area - Instrumentation and Control Systems

This requirement is applicable, because it could impact ESF design by requiring allowances for instrumentation and control systems.

60.131(b)(10) General Design Criteria for the Geologic Repository Operations Area - Shaft Conveyances Used in Radioactive Waste Handling

If radioactive wastes are to be placed in the ESF, then this requirement is applicable.

60.134 Design of Seals for Shafts and Boreholes

This requirement is applicable, because it provides design guidance relative to future sealing requirements. The SCP recognizes the relevance of this requirement in Section 8.3.3 (see, for example, p. 8.3.3.2-52, Table 8.3.3.2-9b).

60.143 Monitoring and Testing Waste Packages

This requirement is applicable for the same reasons that 60.131(b)(10) is applicable - namely, that 10 CFR 60.74 requires flexibility in testing.

RECOMMENDATION

Design criteria corresponding to the applicable 10 CFR 60 requirements, not considered in the DAA, should be developed and used for the Title II design.

REFERENCE

Lugo, M., et al., Technical Oversight Group for U.S. DOE OCRWM, Office of Facilities Siting and Development. Applicability of 10 CFR Part 60 Requirements to the Yucca Mountain Exploratory Shaft Facility (Technical Oversight Group Report), December 1988.

COMMENT 129

Various appendices of the DAA and the YMP ESF TITLE I Design Report do not consider the applicability of 10 CFR 60 requirements to the ESF Title I design in a consistent manner.

BASIS

The following is a listing of sources that itemize applicability of 10 CFR 60 requirements to ESF design in an inconsistent manner:

A. Yucca Mountain Project Exploratory Shaft Facility, Title I Design - Volume I, Narrative Report

Section 7.2 of this report is entitled "Repository Licensing Requirements Applicable to the ESF" and gives a "list of repository licensing requirements that are considered applicable to the design of the ESF" (p. 7-2).

B. Applicability of 10 CFR Part 60 Requirements to the Yucca Mountain Exploratory Shaft Facility (Technical Oversight Group Report) - Attachment I (TOG Conclusions)

Attachment I documents, in the form of a table, the consensus reached by TOG members "regarding Part 60 applicability" (p. 3).

C. Applicability of 10 CFR Part 60 Requirements to the Yucca Mountain Exploratory Shaft Facility (Technical Oversight Group Report) - Attachment H (Expanded TRG Rationales for Applicability)

Attachment H provides "rationales for applicability provided in the TRG Report, reflecting the discussions that took place at the TRG review meetings" (p. 3).

D. Review Record Memorandum - Exploratory Shaft Facility (ESF) Title I Design Applicability Analysis and Comparative Evaluation of Alternative ESF Locations, Volume 2, Appendix I, Supporting Documentation for Design Acceptability Analysis

Appendix I contains the following four sub-appendices, each of which list 10 CFR 60 requirements:

I-1 Association of SDRD Functional Requirements with Relevant 10 CFR 60 Requirements

I-2 Association of Supplemental SDRD Information with Relevant 10 CFR 60 Requirements

I-3 ESF-Applicable Criteria Related to 10 CFR 60 Requirements for

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NRC Concerns 1, 2, 3

I-4 ESF Criteria Addressed in Title I SDRD

RECOMMENDATION

The inconsistencies and incompleteness identified in this comment should be resolved in the Title II design.

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COMMENT 130

Out of the fifty-two (52) 10 CFR 60 requirements considered applicable to ESF design by the DOE in reviewing the acceptability of Title I design, the DAA focuses on only 22 requirements that belong to the three areas specifically outlined by NRC. Other requirements (e.g., retrievability, preclosure radiological safety, performance confirmation, and QA program) are said to be qualitatively evaluated (see p. 2-1, second paragraph). The approach adopted in the DAA raises questions about completeness and rigor of the design acceptability analysis, as detailed design criteria were not developed for all applicable requirements.

BASIS

- The DAA has considered only 52 requirements from the applicable 10 CFR 60 requirements as stated in DAA comment number 1; the DAA did not consider all applicable 10 CFR 60 requirements in evaluating the acceptability of ESF Title I design.

- On page 2-1 of the DAA, it is stated that out of the 52 requirements considered applicable to ESF Title I design "30 requirements were outside the scope of this Technical Assessment Review and, hence, were not considered further. These requirements addressed the areas of preclosure radiological safety, retrievability, types of tests to be conducted during performance confirmation, the QA program, and procedural requirements." These 30 requirements are as follows:

60.15(d)(4)	60.133(e)(1)
60.16	60.133(g)
60.21(c)(1)(ii)(E)	60.140(b)
60.72(a)	60.140(c)
60.72(b)	60.141(a)
60.111(a)	60.141(b)
60.111(b)(1)	60.141(c)
60.111(b)(3)	60.141(d)
60.131(b)(1)	60.141(e)
60.131(b)(2)	60.142(a)
60.131(b)(3)	60.142(b)
60.131(b)(4)(i)	60.142(c)
60.131(b)(6)	60.142(d)
60.131(b)(9)	60.151
60.133(c)	60.152

- Qualitative evaluation of the above listed 30 requirements does not ensure that they have been adequately considered because detailed design criteria were not developed in evaluating if those requirements were considered in ESF Title I design.

- Some of these requirements are potentially important in evaluating the acceptability of the Title I design. Examples follow.

60.15(c)(4) - As pointed out in the ESF Title I summary report, this requirement imposes constraints on the design of the ESF in order to limit adverse effects on the long-term performance of the repository" (p. 7-3). As pointed out in Attachment I of the TDG report, this requirement also calls for "the ESF to be coordinated with the geologic repository operations area" (p. 4).

60.111 - ESF should be designed to meet the two performance objectives of this requirement because the ESF will be incorporated into the geologic repository operations area and, for example, "this potential use dictates that the drift stability be designed to meet repository requirements for the operational and retrieval life of the repository." As pointed out by Attachment I of the TDG report, "the ESF may contribute to waste retrieval by conveying ventilation supply air to the retrieval area. Therefore, the design, construction, and operation of the ESF must bear in mind its later utility" (p. 26).

60.133(b) - Because the ESF is intended to become part of the operating repository if the site is found suitable, it should be determined if any of the structures, systems or components could potentially impact radiological safety (see p. 7-5 of the ESF Title I Design summary report). Attachment I of the TDG report recognizes that at least some subparts [(1), (2), (3), (4)(i), (6) and (9)] of this paragraph impose requirements on the ESF (see pp. 35-37 and 39).

60.140(b) and(c), 60.141, 60.142 - These sections impose requirements on the ESF. The ESF must be designed to accommodate performance confirmation testing (see attachment 1, pages 49 and 54 of the TDG report).

RECOMMENDATION

The SDRD used in Title II design should consider all applicable 10 CFR 60 requirements.

REFERENCES

Lugo, M., et al., Technical Oversight Group for U.S. DOE OCRWM, Office of Facilities Siting and Development. Applicability of 10 CFR Part 60 Requirements to the Yucca Mountain Exploratory Shaft Facility (Technical Oversight Group Report). December 1988.

MacDougall, Hugh R., Leo W. Scully, and Joe R. Tillerson (Compilers). Site Characterization Plan Conceptual Design Re-port: Volume 1, Chapters 1-3. Sandia National Laboratories, SAND84-2641. September 1987.

U.S. Department of Energy, Nevada Operations Office. Yucca Mountain Project Exploratory Shaft Facility Title I Design Summary Report. YMP/88-20, D301-D206, 1988.

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COMMENT 331

One of the key steps in the DAA process was to review the adequacy of data used in Title I design. It appears that the DAA does not reasonably address this step.

BASIS

- A basic step in evaluating the adequacy of the data should have been to identify what data were used in the Title I design. The DAA focuses attention only on reviewing supporting documents in Section 8.4 of the SCP. This raises concerns about the relevance of the documents reviewed in Section 2.4 of the DAA. For example, it is not clear why the following Title I design documents were not reviewed:

  (1) "Free Field Load Calculations for ESF Drifts," 1988, by B. L. Ehgartner, manuscript dated 9/30/88;

  (2) "Design of Shaft Liner," 1988, by H. Gleser, Fenix and Scission, FS-CA-0004;

  (3) "Preliminary Stability Analysis for the Exploratory Shaft," 1984, by W. Hustrulid, Contractor Report for Sandia National Laboratories, SAND83-7069;

  (4) "Seismic Design Analysis," 1988a, by M. J. Mrugala, Fenix and Scisson, TI-ST-0053; and

  (5) "Pillar Stability Analysis," 1988b, by M. J. Mrugala, Fenix and Scisson, TI-ST-0054.

- The DAA includes a review of RIB Version 3.001, however, it is not clear to what extent parameter ranges have been included in the RIB. The ESF Title I design summary report does not discuss ranges for any parameters.

- The ESF Title I design references only the RIB values, but numerous parameters used in the design are not included in the RIB.

- Although it is evident that the adequacy of the RIB data was reviewed, there is no indication that other relevant design data were reviewed as part of the DAA. The following are examples:

  1. In-situ ground stresses are given on p. 2-9. The vertical stress is said to be derived from the product of the unit weight of rock and the depth at which the stress is required. Because not all rock units have the same unit weight, it is not clear how the vertical stress is determined or how the stress components conform to RIB Version 3.001.

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2. Seismic design considerations are discussed on p. 2-10 and in Tables 2-6 and 2-7. All of the seismic design components are not discussed in the RIB.

3. Design basis events are discussed in Section 5.2.4 of the ESF Title I design. The events address important design considerations, such as flood potential (p. 5-4). It is not clear that any of these design basis events are covered by the RIB. The DAA reviews of RIB Version 3.001 did not cover meteorological data because they were not "primary information related to subjects of this technical assessment review" (p. I.6-107).

- Some of the documents reviewed as part of the DAA Section 2.4 used RIB Version 1.001 (see, for example, Bauer et al., 1988). Other documents were written prior to the development of the RIB. In both cases, it is not clear how the data used relates to data used in Title I design.

- Introduction of data through documents referenced in SCP Section 8.4 complicates the acceptability analysis and understanding because some documents use RIB 3.001 and others use RIB 1.001, and still others use no RIB values at all. For example, Bauer et al. (1988) use RIB Version 1.001 and give an ambient temperature of 31°C at the main test level. Appendix B-2 of the Title I design uses RIB Version 3.001 and indicates an ambient temperature at the main test level of 18°C.

- Review of documents in Appendix I-6 is not consistent. Some reviewers simply provided summaries of documents (see, for example, the review of Appendix B-2 of the ESF Title I Design Summary Report) without critical evaluation of the appropriateness of data, approach, etc.

- As pointed out on p. C.6-40, comparison of the RIB to EA and/or SCP data does not necessarily assure reasonableness because, in many cases, data are derived from the same source.

- There is little, if any, indication of how the documents reviewed for Section 2.4 were used in Title I design (i.e., what conclusion do they support, what decision they affect, etc.). Table 2.4-2 is a summary of DAA Reasonableness Reviews and includes a heading entitled "Use of Analysis in Title I Evaluation". However, entries under this heading relate almost exclusively to use in SCP Section 8.4.

RECOMMENDATIONS

- The Title II design should be based on a complete set of appropriate data which indicate to designers the expected ranges, not just average values. It should be clarified if all ESF design data are contained in the RIB or additional design data are given in other documents including, for example, the SEPDB (Site Engineering Properties Data Base).

- The DOE should explain the differences between end uses of the RIB and SEPDB.

- Recommendations of document reviewers presented in the DAA should be considered for Title II design. In particular, the following recommendation (for one document) should be applied to most, if not all, supporting documents: "The objectives and use of the analyses should be clarified if used to support Title II design. The sections discussion of the results of the analyses should be expanded and focused on design considerations" (p. 1.6-2).

- A consistent set of coordinate axes should be used to avoid confusion over left- and right-handed axes. (See, for example, Appendix B-4 of Title I design).

REFERENCES

Bauer, S. J., L. S. Costin and J. F. Holland. "Preliminary Analyses in Support of In Situ Thermomechanical Investigations," Sandia National Laboratory, SAND88-2785, December 1988.

Ehgartner, B. L. "Free Field Load Calculations for ESF Drifts," manuscript dated 9/30/88.

Gleser, H. "Design of Shaft Liner," Fenix and Scission, FS-CA-0004, 1988.

Hustrulid, W. "Preliminary Stability Analysis for the Exploratory Shaft," Contractor Report, Sandia National Laboratories, SAND83-7069, 1984.

Mrugala, M. J. "Seismic Design Analysis," Fenix and Scisson, TI-ST-0053, 1988a.

Mrugala, M. J. "Pillar Stability Analysis," Fenix and Scisson, TI-ST-0054, 1988b.

COMMENT 132

The requirements of 10 CFR 60.21(c)(1)(ii)(D) [i.e., consideration of major design features], in particular, have not been adequately addressed in evaluating the acceptability of ESF Title I design.

BASIS

- In considering the requirement of 10 CFR 60.21 (c)(1)(ii)(D) DOE has limited the analysis primarily to comparative evaluation of five alternative ESF locations. Comparative evaluation of alternatives to the major design features could include evaluations of such alternatives as number of man-made openings; comparison of the alternatives of drilling and blasting excavation method and mechanical excavation method; and comparative evaluation of the several possible layouts for main test level.

- Conclusion (No. 1) on p. 4-6 of Appendix J states that "Differences among the alternative shaft locations for currently expected conditions are not significant to waste isolation. This is because all the locations are expected to have conditions that would allow regulatory requirements to be met by wide margins." The evidence for this conclusion is not convincing, as the supporting analyses are based largely on assumptions of vertical matrix flow, average fluxes, ambient conditions, etc., which are not shown to lead to conservative conclusions with respect to waste isolation.

- Appendix J includes discussion that indicates that the northeast part of the repository has the poorest waste isolation performance and, therefore, requires characterization. Appendix J does not provide convincing arguments that indicate that a shaft at the present location is the only possible way to characterize this area.

- Conclusion (No. 3) on p. 4-6 of Appendix J states that "The presence of a shaft at any of the locations is not expected to affect significantly the waste isolation capability of a repository." This conclusion, derived from Section 3, is questionable, as topography, which was addressed for Conclusion (No. 1), was not considered in Section 3. In addition, the location of the shaft with respect to emplaced waste was not evaluated in the context of fracture flow.

- The anomaly near the ESF, shown on SCP Figure 1-40, does not appear to have been considered in evaluating the requirements of 10 CFR 60.21(c)(1)(ii)(D).

- In the analysis by Nimick et al. (1988), the data from borehole USW G-4 along with four other boreholes were used to evaluate representativeness of the ESF location. Only one out of seven categories of data from USW G-4 was determined to be representative; others were determined to be inconclusive or non-representative.

- Surface uplift/subsidence induced by waste emplacement surrounding the shafts has not been sufficiently considered.

- Blockage of shaft sump drainage by geochemical changes (SCP page 8.4.3-58) does not appear to have been explicitly considered.

RECOMMENDATION

The Title II design should be expanded to fully address the 10 CFR 60.21 requirements.

REFERENCES

10 CFR 60.21

Nimick, F. B., L. E. Shepard, and T. E. Blejwas, 1988. Preliminary Evaluation of the Exploratory Shaft Representativeness for the NNWSI Project, Draft, SAND88-1665, Sandia National Laboratories, Albuquerque, N. Mex.

Beall, G. K., 1984. Recommendation for a Second Access for the Yucca Mountain Exploratory Shaft Facility, SAND84-1261, Sandia National Laboratories, Albuquerque, N. Mex.

DRAFT

COMMENT 133

To examine the thoroughness of the DAA, the NRC staff has reviewed the adequacy of one of the documents used in Title I design, as an example. The document selected by the staff was Appendix B.4 of ESF Title I design report, "Free Field Seismic Load Calculations for ESF Drifts." This document was not reviewed by the TAR team. This appendix has errors and raises concerns as to whether the calculations were checked.

BASIS

As an example on page 4 of the Appendix:

(1) In Section 4, for $\theta=30°$, Combination 1, Case 2, $\sigma_{crown}=0.44$, $\sigma_{wall}=5.69$ (not 4.69).

(2) In Section 4, for $\theta=30°$, Combination 2, Case 2, $M_2=1.10/2.34$ (not 1.10/2.64), = 0.47 (not 0.42).

Related boundary stresses are $\sigma_{crown}=5.92$ and $\sigma_{wall}=0.96$ (not 6.81 and 0.69).

and on page 5 of the Appendix:

In the conclusions, the combination expression should be $1.0\ S_V + 0.4(P + S_H)$, not $1.0\ S_V - 0.4(P + S_H)$.

RECOMMENDATION

The design control process for the Title II design should assure that calculations for the ESF Title II design are thoroughly checked.

DRAFT

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Section 8.3.3.1 Overview of the Seal Program (p. 8.3.3.1-1, second paragraph)

QUESTION 24

What is the justification for concluding that the shaft liner does not provide structural support for the formation and that the removal of the liner does not significantly modify the permeability?

BASIS

- No specific analysis of the effect of liner removal has been found in SCP Section 8.4.3.2.3, referenced in response to CDSCP point paper comment number 66.

- In response to CDSCP comment number 66, the SCP states that the shaft liner does not provide structural support for the formation. In view of this SCP statement, the purpose of a liner is not clear.

- According to p. 8.3.3.1-1, last sentence of second paragraph, "Because the liner does not provide structural support for the formation, removal of the liner is not expected to cause significant additional stress redistribution or to significantly modify the permeability." This statement is contradicted by several shaft analysis summaries in Section 8.4.3.2.3.1, which indicate a high probability of stress/deformation interactions (in particular 8.4.3.2.3.1, Items 2 and 3). None of these account for concrete, rock bolt and rock deterioration over a period of nearly 100 years.

- In Section 8.4.3.2.3 it is stated that "the MPZ model implicitly includes the effect of liner removal." (p. 8.4.3-26). The MPZ (modified permeability zone) model discussed is that presented by Case and Kelsall (1987). In developing this model, no liner was assumed to be present and no thermal, time, or three-dimensional effects were considered. If the rock or lining exhibits time-dependent behavior, or if thermal loading is experienced, or if the liner is installed near the face of an advancing shaft, then the liner will be stressed and will provide some support to the surrounding rock. It is not obvious, therefore, that the MPZ model adequately accounts for liner removal.

- The supporting reference (Fernandez et al, 1988) does not provide an analysis to justify the conclusion that the shaft liner removal at closure is not expected to cause stress redistribution, and implies that a supporting function may be required (e.g. Fernandez et al, 1988, Sections 8.1.1, 8.1.3).

- Cumulative displacement and convergence rate limitations imposed by other SCP sections (in particular Tables 8.3.2.4-1/2/5/8) recognize the potential for rock movements sufficient to stress the shaft liners.

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RECOMMENDATION

It is recommended that analyses be provided in SCP updates in support of the statement that shaft liner removal is not expected to cause additional stress redistribution or significant permeability changes.

REFERENCES

J. A. Fernandez, T. E. Hinkebein, and J. B. Case, "Selected Analyses to Evaluate the Effect of the Exploratory Shafts on Repository Performance at Yucca Mountain," SAND85-0598. Sandia National Laboratories, Albuquerque, NM, 1988

J. B. Case, and P. C. Kelsall, "Modification of Rock Mass Permeability in the Zone Surrounding a Shaft in Fractured, Welded Tuff," SAND 86-7001, Sandia National Laboratories, Albuquerque, NM, 1987.

DRAFT

Section 8.3.3.2-2 Issue Resolution strategy for Issue 1.12, Table 8.3.3.2-2 General Design constraints passed to Issue 1.11, configuration of underground facilities (post-closure) for major repository features from sealing program, page 8.3.3.2-13.

QUESTION 27

Does ES-1 have 150 m^3 water storage capacity at base of shaft for attaining the tentative design goal identified on p. 8.3.3.2-13?

BASIS

- The height required to accommodate 150 m^3 of water, assuming a 12-foot internal diameter and backfill porosity of 0.3, would be 155 feet. Figure 8.4.2-27 indicates a depth below repository level of less than 155 feet. ES-1 (Title I design (Figure 8.4.2-33)) has only a 50-foot depth below the main test level.

RECOMMENDATION

The means for attaining a tentative design goal of 150 m^3 of water storage capacity at base of shaft assuming backfill porosity of 0.3 should be presented in the SCP updates.

Draft

DRAFT

Section 8.4.2.3.1 Exploratory shaft facility testing operations, layout constraints, and zones of influence, pages 8.4.2-93/147

QUESTION 58

How does the ESF design described in the SCP provide the flexibility to accomodate in situ testing of waste packages, should it be considered desirable or necessary by DOE?

BASIS

- 10 CFR 60.140 (b) requires that the performance confirmation be started during site characterization.
- There is inadequate discussion on how performance of the waste package may be verified at the time of license application (See WP Com.)
- Impact of potential need for in situ waste package testing on ESF design has not been presented in the SCP.
- Other similar projects have proposed tests including prototypical radioactive waste packages in the waste package environment to collect needed data.
- The SCP has not demonstrated that in-situ data on waste package interaction with the host rock under repository conditions involving coupled hydrological-mechanical-thermal-geochemical-radiological effects are not required before license application.
- The SCP notes (p. 8.3.5.2-19) that the ability of the host rock to provide an acceptable level of shielding is "of primary concern." The SCP does not discuss testing aimed at evaluating rock radiation shielding which accounts for jointing, damaged rock, etc. (See CDSCP question 37 and SCP question 15).

RECOMMENDATION

Should it be desirable or necessary to perform in situ waste package testing, an analysis of the impact of such testing on ESF design should be presented in the SCP updates.

REFERENCES

10 CFR 60

QUESTION 63

What is the justification for certifying (Appendix C.3 of DAA) that all TAR reviewers were not principal contributors to ESF Title I Design or to the Subsystem Design Requirements Document which was used for ESF Title I Design in view of the documentation in the DAA showing that some of the TAR reviewers worked on the ESF Title I Design and/or SDRD?

BASIS

- Documentation in the ESF Title I Design Acceptability Analysis (DAA) indicates that some of the same people participated in both Exploratory Shaft Facility (ESF) Title I Design and the DAA process. This raises concerns of conflict of interest, where reviewers may not be independent of the design report preparation.

- There are five (5) individuals listed on both Table 5 of the ESF Title I Design Control Process Review Report and on pages C.2-1 or C.2-2 of DAA Vol. 1. Some of the individuals are given different titles in each of the two documents (e.g., geotechnical engineer vs. mechanical engineer).

  The following listing provides a summary of what each individual is credited for on the ESF Title I Design.

  One Hydrologist

  - prepared "Subsystem Design Requirements Document (SDRD)"

  - prepared and reviewed "Test Requirements"

  - prepared and reviewed "Identification of Interfaces Among Different Aspects of the ESF Program"

  One Civil Engineer

  - prepared "ES Location and Diameter"

  - provided analysis and consultation on "second shaft need"

  Note: The individual is listed as mining engineer on C.2, DAA Vol. 1, but his questionnaire does not appear in C.5 of DAA Vol. 1.

  One Mechanical Engineer

  - prepared and reviewed "Shaft Separation"

  - prepared and reviewed "Identification of Interfaces Among Different Aspects of the ESF Program" Note: The individual is listed as Performance Assessment Specialist and Geotechnical Engineer in C.2. of DAA Vol. 1.

In addition, he reviewed the following principal support documents:

Costin, L. S. and E. P. Chen, 1988. An Analysis of the G-Tunnel Heated Block Thermomechanical Response Using a Complaint-Joint Rock-Mass Model, SAND87-2699, Sandia National Laboratories, Albuquerque, NM.

Bauer, S. J., L. S. Costin, and J. F. Holland, 1988. Preliminary Analysis in Support of In Situ Thermomechanical Investigations, SAND88-2785, Sandia National Laboratories, Albuquerque, NM.

Costin, L. S. and S. J. Bauer, 1988. Preliminary Analysis of the Excavation Investigation Experiments Proposed for the Exploratory Shaft at Yucca Mountain, Nevada Test Site, SAND87-1575, Sandia National Laboratories, Albuquerque, NM.

Hill, J., 1985. Structural Analysis of the NNWSI Exploratory Shaft, SAND84-2354, Sandia National Laboratories, Albuquerque, NM.

Johnson, R. L. and S. J. Bauer, 1987. Unit Evaluation at Yucca Mountain Nevada Test Site: Near-Field Thermal and Mechanical Calculations Using the SANDIA-ADINA Code, SAND83-0030, Sandia National Laboratories, Albuquerque, NM.

Johnstone, J. K., R. R. Peters, and P. F. Gnirk, 1984. Unit Evaluation at Yucca Mountain Nevada Test Site: Summary Report and Recommendation, SAND83-0372, Sandia National Laboratories, Albuquerque, NM.

St. John, C. M., 1987. Interaction of Nuclear Waste Panels with Shafts and Assess Ramps for a Potential Repository at Yucca Mountain, SAND84-7213, Sandia National Laboratories, Albuquerque, NM.

He had previously reviewed these same documents in his capacity as supervisor of the underground design activities for the repository. (See p. C.5-43 and C.5-45 of the DAA).

Another Mechanical Engineer

- prepared and reviewed "Shaft Separation"

- prepared and reviewed "Identification of Interfaces Among Different Aspects of the ESF Program"

Note: This individual is listed as Geotechnical Engineer in C.2 and states that he authored Sections 8.4.2.3.1 and 8.4.2.3.6 of the Site Characterization Plan (SCP). One Geotechnical Engineer

DRAFT

- reviewed "Title I Design"

Note: This individual is listed as Mining Engineer in C.2 and claims review of the following:

Technical Assessment Review (TAR), of ESF Title I Design (50%)

Technical Assessment Review (TAR), of ESF Title I Design (100%)

ESF-SDRD Licensing Review

RECOMMENDATION

For ESF Title II design, the DOE should ensure that there is no conflict of interest for the development and review process. The NRC staff recommends that the DOE should make arrangements to reach mutual agreement with the NRC staff on mutually acceptable standards that establish criteria for no conflict of interest and independence.

DRAFT

ENCLOSURE 2
Attachment 3

Department of Energy Presentations

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

YUCCA MOUNTAIN PROJECT

OVERVIEW

PRESENTED TO

DOE/NRC MEETING ON THE ESF TITLE II DESIGN CONTROL PROCESS

PRESENTED BY

LEO LITTLE

CHIEF, ENGINEERING & DEVELOPMENT DIVISION

YUCCA MOUNTAIN PROJECT

JULY 6-7, 1989

UNITED STATES DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

MEETING OBJECTIVES

- FOR NRC TO PRESENT THE NRC REVIEW OF ESF TITLE I AND NRC PROPOSED TITLE II APPROACH
- TO PRESENT THE DESIGN CONTROL PROCESS THAT THE DOE IS USING TO DEVELOP THE TITLE II ESF DESIGN, INCLUDING INCORPORATION OF THE RECOMMENDATIONS OF THE TITLE I DESIGN ACCEPTABILITY ANALYSIS
- TO DISCUSS RESOLUTIONS AND ACTION ITEMS TO RESOLVE QUESTIONS AND CONCERNS

NRC COMMENTS ON THE DESIGN CONTROL PROCESS

DOCUMENTED IN MEETING MINUTES FROM

- JULY 18, 19, 1988
- OCTOBER 19-21, 1988
- NOVEMBER 3, 1988
- NOVEMBER 23, 1988
- DECEMBER 8, 1988
- MAY 9, 10, 1989
- MAY 11, 1989 (ACNW MEETING)
- JUNE 13, 1989 (ACNW MEETING)

SUMMARY OF KEY NRC COMMENTS AND DOE ACTIONS IN RESPONSE

NRC: THE DESIGN CONTROL PROCESS DOES NOT ENSURE INCORPORATION OF 10CFR60 REQUIREMENTS

DOE: 10CFR60 REQUIREMENTS WERE REVIEWED FOR THEIR APPLICABILITY TO ESF DESIGN. THE GENERIC REQUIREMENTS DOCUMENT APPENDIX E WAS REVISED TO INCLUDE ADDITIONAL APPLICABLE 10CFR60 REQUIREMENTS. THE SDRD WAS ALSO REVISED TO INCORPORATE ADDITIONAL APPLICABLE 10CFR60 REQUIREMENTS. THE DAA EVALUATED THE TITLE I DESIGN AGAINST CRITERIA DERIVED FROM APPLICABLE 10CFR60 REQUIREMENTS AND RECOMMENDED CHANGES TO THE SDRD AND RIB WHICH ARE BEING INCLUDED.

SUMMARY OF KEY NRC COMMENTS AND DOE ACTIONS IN RESPONSE

(CONTINUED)

NRC: LACK OF A SPECIFIC AND IDENTIFIABLE ENTITY RESPONSIBLE FOR ABOVE IS A SIGNIFICANT WEAKNESS

DOE: DOE HAS PUT PROCEDURES AND WORK ASSIGNMENTS IN PLACE TO SPECIFY RESPONSIBILITY FOR ENSURING THAT 10CFR60 REQUIREMENTS ARE IDENTIFIED, CONSIDERED, AND INCORPORATED IN THE ESF DESIGN

- DOE: RESPONSIBLE FOR ASSURING THAT 10 CFR 60 REQUIREMENTS ARE PROPERLY INCORPORATED IN THE DESIGN INPUT

- SNL : TECHNICAL LEAD IN DEVELOPING DETAILED TECHNICAL CRITERIA IN SDRD TO IMPLEMENT 10 CFR 60 REQUIREMENTS

SUMMARY OF KEY NRC COMMENTS AND DOE ACTIONS IN RESPONSE

(CONTINUED)

NRC: GRD APPENDIX E SHOULD BE MORE ACCURATE AND COMPLETE

DOE: APPENDIX E HAS BEEN SUBSTANTIALLY REVISED AND NOW INCLUDES 10CFR60 REQUIREMENTS APPLICABLE TO THE ESF

NRC: THE DESIGN PROCESS DOES NOT ENSURE THAT ITEMS AND ACTIVITIES RELATED TO WASTE ISOLATION ARE QUALITY LEVEL I

DOE: PROCEDURES HAVE BEEN IMPLEMENTED TO ASSURE THAT ITEMS AND ACTIVITIES RELATED TO WASTE ISOLATION ARE IDENTIFIED AND DOCUMENTED AS QUALITY LEVEL I AND THAT GRADING IS COMPLETED TO IDENTIFY APPROPRIATE CONTROLS

MANAGEMENT OVERVIEW

- TITLE II IS BEING PERFORMED IN ACCORDANCE WITH SUBPART G QA REQUIREMENTS AND WITH MORE EXPLICIT INCORPORATION OF REGULATORY GUIDANCE

- PLANS AND PROCEDURES HAVE BEEN PREPARED THAT DOCUMENT THE DESIGN CONTROL PROCESS TO BE USED FOR ESF TITLE II

- THE PROCESS IS CONSISTENT WITH THE QA REQUIREMENTS PRESENTED IN NNWSI 88-9; INCLUDING DEVELOPMENT OF DESIGN INPUTS, CHANGE CONTROL, INTERFACE CONTROL, VERIFICATION, AND REVIEWS

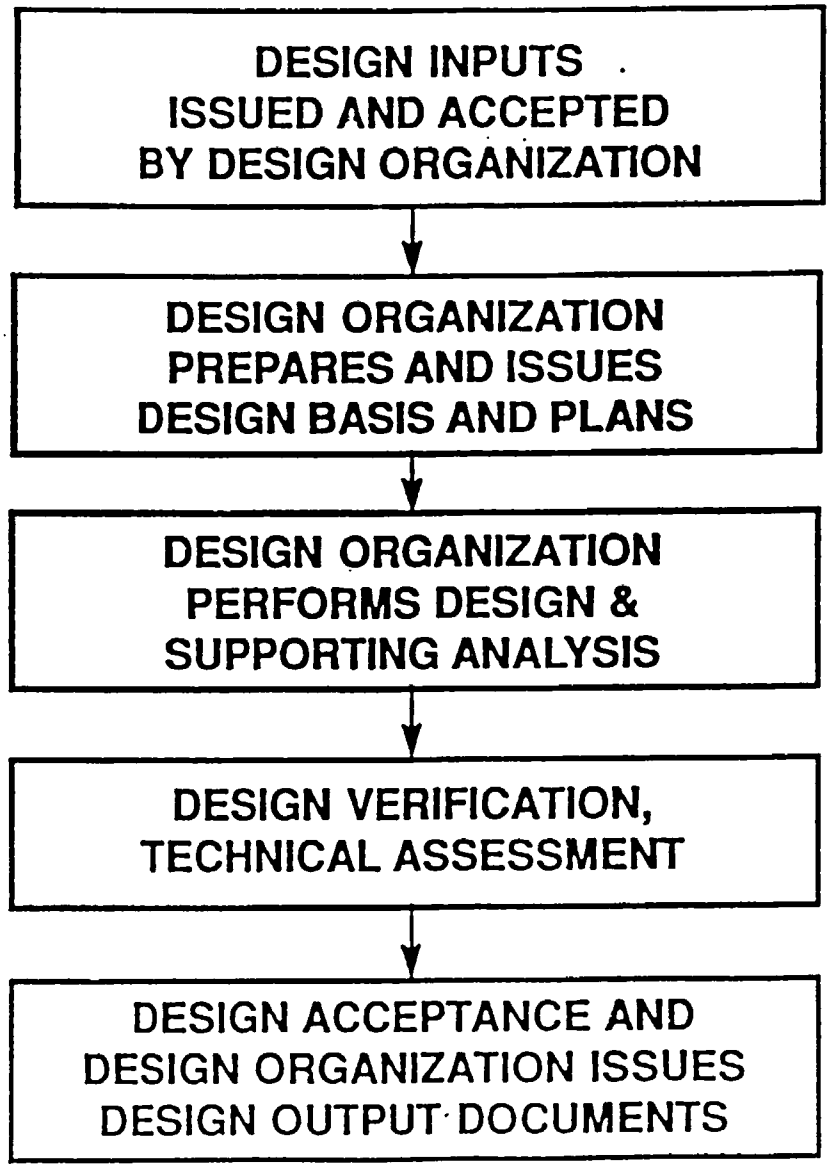
MANAGEMENT OVERVIEW

(CONTINUED)

- THE DESIGN ACCEPTABILITY ANALYSIS RECOMMENDATIONS ARE BEING INCORPORATED INTO THE TITLE II DESIGN INPUTS (ESF-SDRD AND REFERENCE INFORMATION BASE) AND RESOLUTION WILL BE TRACKED AS PART OF THE NORMAL TITLE II DESIGN CONTROL

- DESIGN INPUTS HAVE BEEN EXTENSIVELY EXPANDED TO INCORPORATE INPUT FROM THE REGULATORY FLOWDOWN, TESTING INTERFACES, PERFORMANCE ASSESSMENT REQUIREMENTS, REPOSITORY INTERFACES, AND OTHER INTERFACES SUCH AS CONSTRUCTION

SIMPLIFIED DESIGN CONTROL PROCESS



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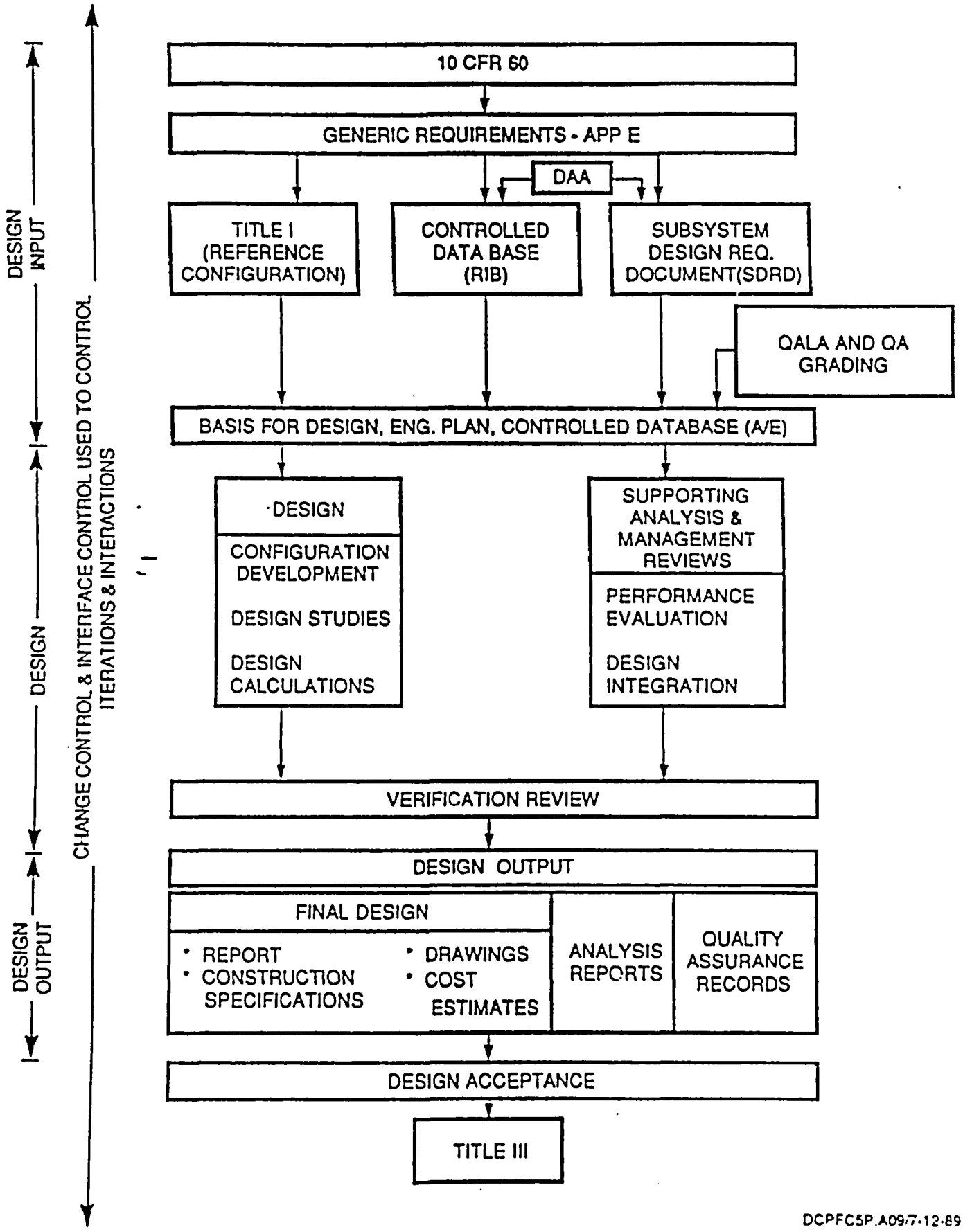
DESIGN CONTROL PROCESS



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SPEAKERS

JOHN K. ROBSON	EXPLORATORY SHAFT FACILITY DESIGN CONTROL
A. STEVENS	DESIGN INPUT
R.L. BULLOCK	DESIGN CONTROL BY FENIX & SCISSON OF NEVADA
JOSEPH A. CALOVINI	DESIGN CONTROL BY HOLMES & NARVER
LEO LITTLE	SUMMARY

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

YUCCA MOUNTAIN PROJECT

EXPLORATORY SHAFT FACILITY DESIGN CONTROL

PRESENTED TO

DOE/NRC MEETING ON THE ESF TITLE II DESIGN CONTROL PROCESS

PRESENTED BY

JOHN K. ROBSON

CHIEF, EXPLORATORY SHAFT BRANCH

JULY 6-7, 1989

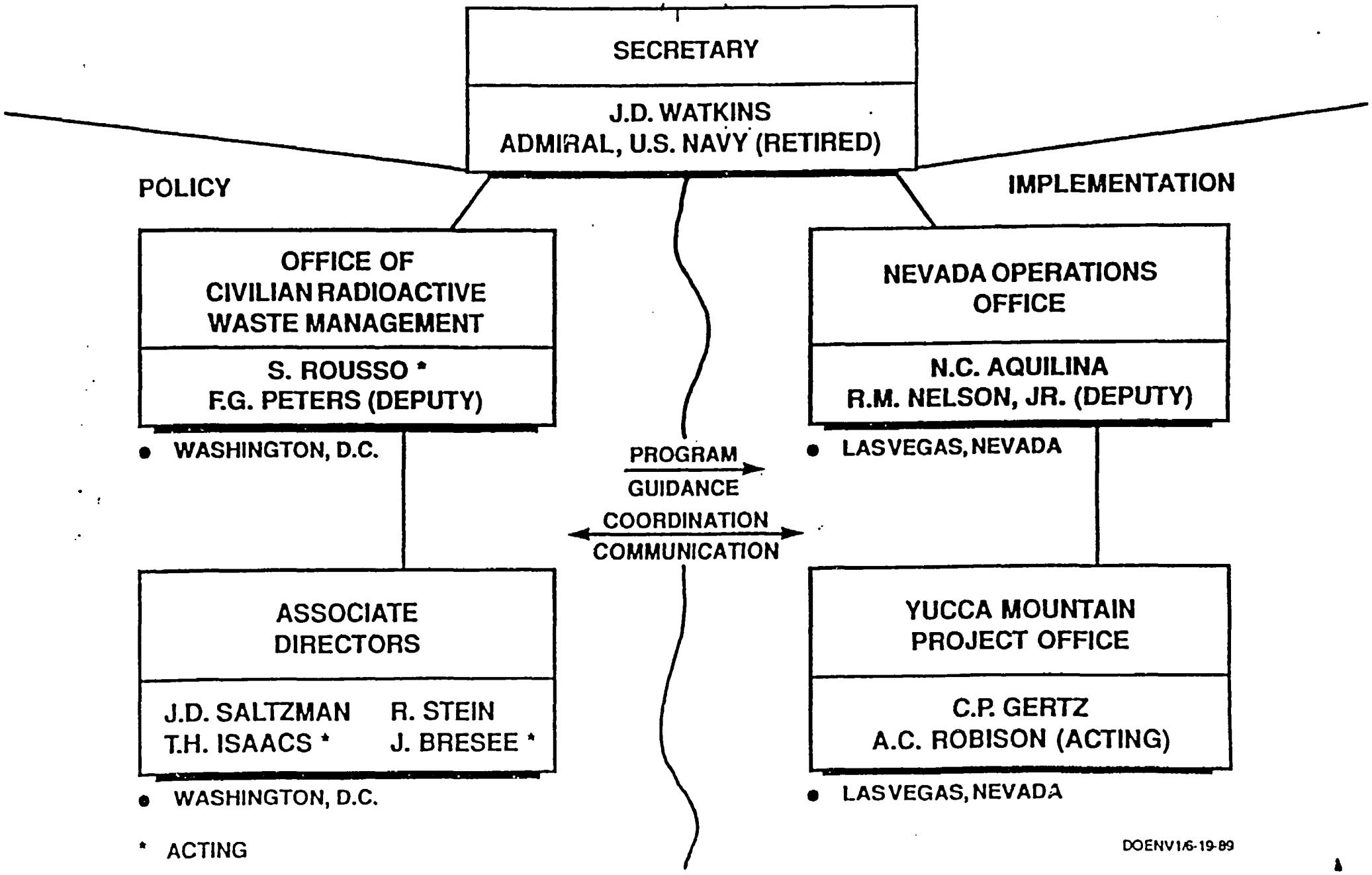
UNITED STATES DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

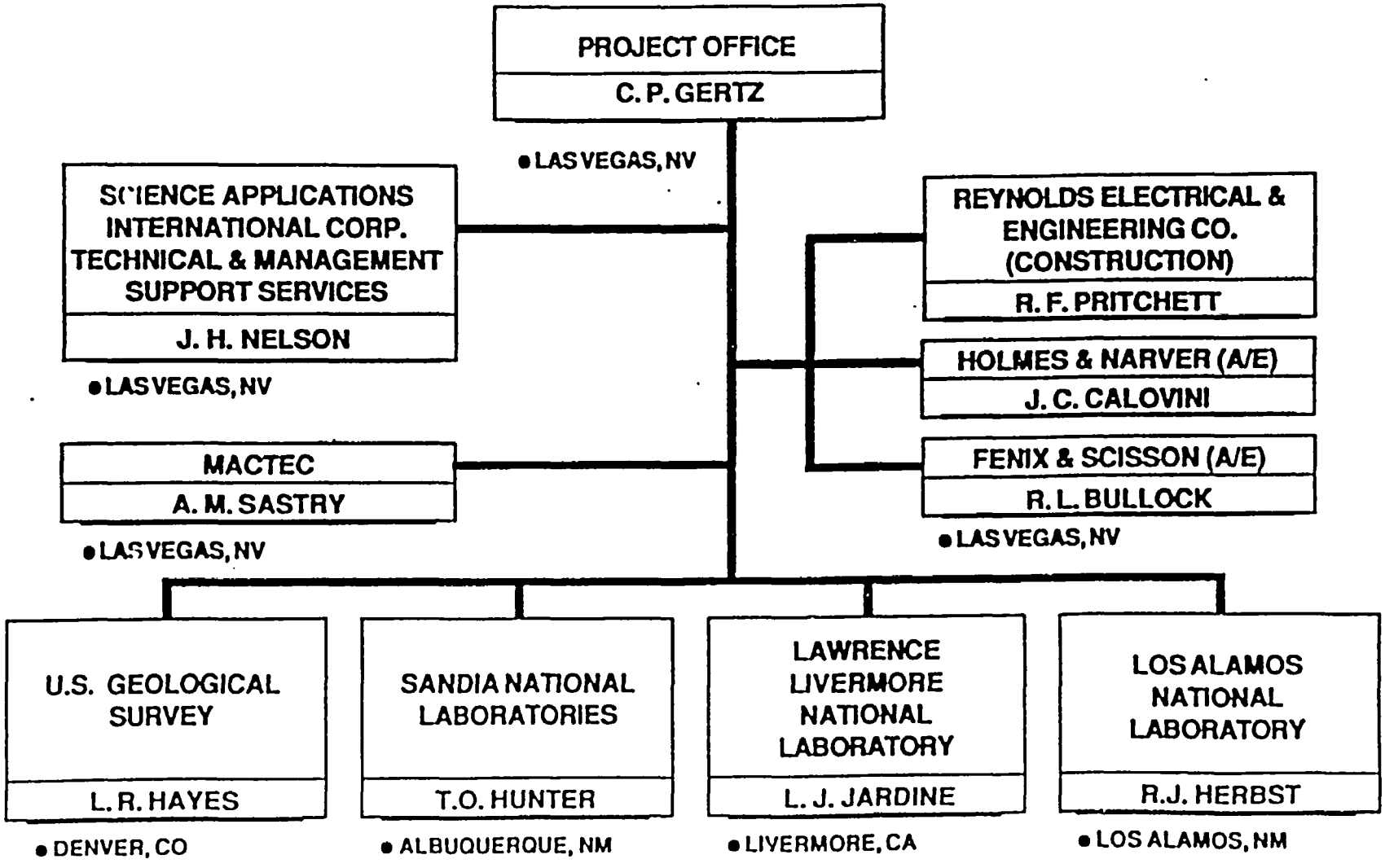
DESIGN CONTROL PROCESS - OVERVIEW

- ROLES OF PARTICIPANTS
- DESIGN INPUT
- DESIGN PROCESS BY ARCHITECT/ENGINEERS
- DESIGN CHANGE CONTROL
- DESIGN INTERFACE CONTROL
- DESIGN DOCUMENTATION AND RECORDS

U.S. DEPARTMENT OF ENERGY



YUCCA MOUNTAIN PROJECT



DCPOV5P A09/7-6/7-89

HEADQUARTERS' ROLE IN THE DESIGN CONTROL PROCESS

- ESTABLISHMENT OF PROGRAM LEVEL REQUIREMENTS
- CONTROL OF PROGRAM LEVEL REQUIREMENTS
- ESTABLISHMENT OF INTERFACES BETWEEN HQ AND PO
- PARTICIPATION IN REVIEWS
- OVERVIEW OF THE WORK PERFORMED
- CONCURRENCE ON SELECTED PROJECT DOCUMENTS

PROJECT OFFICE ROLE IN THE DESIGN CONTROL PROCESS

- MANAGES THE PROJECT
- PROVIDES THE SUBSYSTEM DESIGN REQUIREMENTS DOCUMENT AND GUIDANCE
- CHAIRS CHANGE CONTROL BOARD (CCB)
- MANAGES DEVELOPMENT OF ESF DESIGN
- CHAIRS INTERFACE CONTROL WORKING GROUP (ICWG)
- REVIEWS AND ACCEPTS DESIGN INPUTS AND DESIGN OUTPUTS
- PROVIDES COMPLETE PROJECT DOCUMENTATION
- APPROVES QALAS AND GRADING

TECHNICAL & MANAGEMENT SUPPORT SERVICES (T&MSS) ROLE IN THE DESIGN CONTROL PROCESS

- SUPPORTS THE PROJECT OFFICE IN THE MANAGEMENT AND INTEGRATION OF THE ESF
- MEMBER OF ICWG

SANDIA ROLE IN THE DESIGN CONTROL PROCESS

- PROVIDES PERFORMANCE ASSESSMENT INPUT
- PROVIDES REPOSITORY/ESF INTERFACE REQUIREMENTS
- DEVELOPS DESIGN INPUT - SDRD, RIB
- PREPARES AND REVIEWS QALAS AND GRADING
- MEMBER OF ICWG

LOS ALAMOS ROLE IN THE DESIGN CONTROL PROCESS

- SUPPORTS THE PROJECT OFFICE IN THE INTEGRATION OF ESF TESTING
- IDENTIFIES ESF TEST-RELATED DESIGN INPUT FOR SDRD
- COORDINATES THE EFFORTS OF THE PRINCIPAL INVESTIGATORS
- MANAGES THE DESIGN OF THE INTEGRATED DATA SYSTEM
- MEMBER OF ICWG

FENIX & SCISSON ROLE IN THE DESIGN CONTROL PROCESS

- ACCEPTS DESIGN INPUT
- DEVELOPS BASIS FOR DESIGN AND ENGINEERING PLAN DOCUMENTS
- DEVELOPS THE SUBSURFACE DESIGN
- VERIFIES TITLE II DESIGN
- PERFORMS TITLE III SERVICES
- PREPARES QALAS AND GRADING
- MEMBER OF ICWG

HOLMES & NARVER ROLE IN THE DESIGN CONTROL PROCESS

- ACCEPTS DESIGN INPUT
- DEVELOPS BASIS FOR DESIGN AND ENGINEERING PLAN DOCUMENTS
- DEVELOPS THE SURFACE DESIGN
- VERIFIES TITLE II DESIGN
- MANAGES PROJECT PHYSICAL INTERFACE CONTROL REQUIREMENTS
- PERFORMS TITLE III SERVICES
- PREPARES QALAS AND GRADING
- MEMBER OF ICWG

REECo ROLE IN THE DESIGN CONTROL PROCESS

- ESF CONSTRUCTION MANAGER
- PROVIDES ESF PROCUREMENT SERVICES
- PROVIDES CONSTRUCTION AND OPERATION RELATED DESIGN REQUIREMENTS
- PARTICIPATES IN REVIEWS OF DESIGNS FOR CONSTRUCTABILITY AND OPERABILITY
- MEMBER OF ICWG

DESIGN CONTROL PROCESS - OVERVIEW

- ROLES OF PARTICIPANTS
- DESIGN INPUT
- DESIGN PROCESS BY ARCHITECT/ENGINEERS
- DESIGN CHANGE CONTROL
- DESIGN INTERFACE CONTROL
- DESIGN DOCUMENTATION AND RECORDS

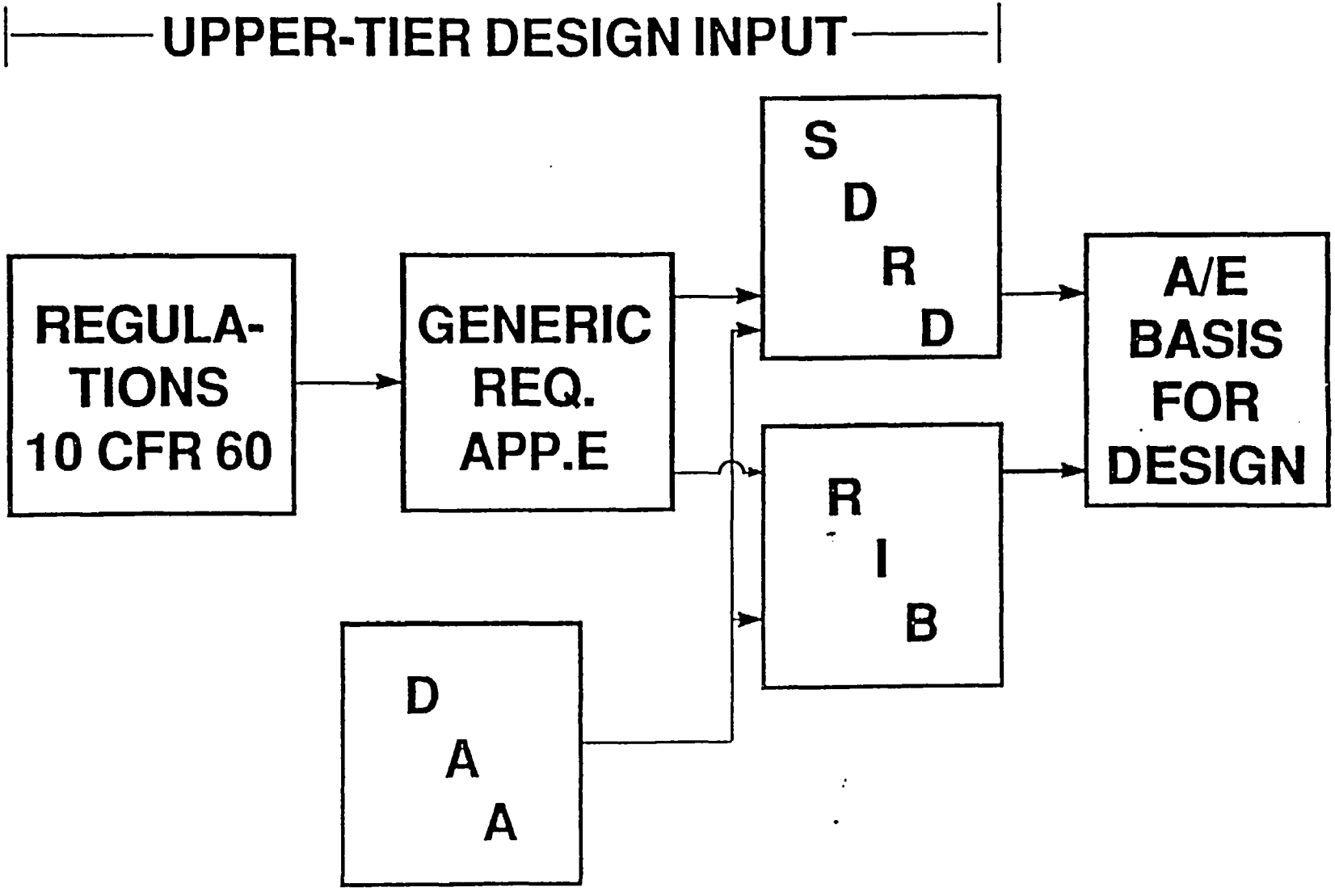
DESIGN INPUT

NNWSI/88-9, 2.2.1

DESIGN INPUT SHALL BE IDENTIFIED AND DOCUMENTED, AND THEIR SELECTION REVIEWED AND APPROVED BY THE RESPONSIBLE DESIGN ORGANIZATION AND THE RESPONSIBLE QA ORGANIZATION

- 10CFR60 REQUIREMENTS
- PERFORMANCE ALLOCATION REQUIREMENTS
- DAA RECOMMENDATIONS
- SITE CHARACTERIZATION DATA
- DESIGN BASES
- CODES
- CRITERIA LETTERS
- MANUFACTURERS' DESIGN DATA
- DOE ORDERS
- OTHER REQUIREMENTS

DESIGN INPUT



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DESIGN INPUT

(CONTINUED)

SDRD CONTAINS:

- ALL APPLICABLE 10CFR60 DESIGN REQUIREMENTS
- PERFORMANCE ALLOCATION REQUIREMENTS
- CRITERIA RESULTING FROM DAA
- OTHER REQUIREMENTS

DESIGN INPUT

(CONTINUED)

SDRD:

- PREPARED AND VERIFIED BY SNL
- CONTAINS REQUIREMENTS SUPPLIED BY <u>ALL</u> PARTICIPANTS
- SUBJECTED TO TECHNICAL ASSESSMENT REVIEW BY ALL PARTICIPANTS
- APPROVED BY P.O., INCLUDING PQM, AND CONCURRED BY DOE/HQ
- PLACED UNDER PROJECT CHANGE CONTROL
- ACCEPTED BY ARCHITECT/ENGINEERS

DESIGN INPUT

(CONTINUED)

RIB CONTAINS NUMERICAL VALUES OF SITE CHARACTERISTICS

- PREPARED AND VERIFIED BY SNL
- REVIEWED AND ACCEPTED BY PROJECT OFFICE
- PLACED UNDER PROJECT CHANGE CONTROL
- REVISIONS BY SNL PER "INFORMATION FLOW INTO THE RIB" PROCEDURE (AP 5.3Q)
- ACCEPTED BY ARCHITECT/ENGINEER
- UTILIZED BY ARCHITECT/ENGINEER FOR DESIGN ANALYSES

DESIGN CONTROL PROCESS - OVERVIEW

- ROLES OF PARTICIPANTS
- DESIGN INPUT
- DESIGN PROCESS BY ARCHITECT/ENGINEERS
- DESIGN CHANGE CONTROL
- DESIGN INTERFACE CONTROL
- DESIGN DOCUMENTATION AND RECORDS

DESIGN PROCESS BY ARCHITECT/ ENGINEERS

- DESIGN INPUT
- BASIS FOR DESIGN AND ENGINEERING PLANS
- QALA AND QA GRADING
- HOLD POINTS
- DESIGN ANALYSIS
- PREPARE DESIGN DOCUMENTATION
- DESIGN VERIFICATION
- DESIGN OUTPUT

NRC STAFF REVIEW OF

THE ESF DESIGN
&
DESIGN CONTROL PROCESS

JULY 6-7, 1989

MAJOR CONCERN ON ESF DESIGN CONTROL PROCESS & THE ESF TITLE I DESIGN

THE SCP AND ITS REFERENCES (INCLUDING DAA) DO NOT DEMONSTRATE THE ADEQUACY OF THE ESF TITLE I DESIGN CONTROL PROCESS AND THE ADEQUACY OF ESF TITLE I DESIGN.

SUPPORTING BASES
(DESIGN CONTROL PROCESS)

SCA DRAFT CONCERN NUMBER 1
SCA DRAFT COMMENT NUMBER 127
SCA DRAFT COMMENT NUMBER 128
SCA DRAFT COMMENT NUMBER 129
SCA DRAFT COMMENT NUMBER 130
SCA DRAFT COMMENT NUMBER 131
SCA DRAFT COMMENT NUMBER 132
SCA DRAFT COMMENT NUMBER 133
SCA DRAFT QUESTION NUMBER 63

SUPPORTING BASES
(ESF TITLE I DESIGN)

SHAFTS
(SCA DRAFT CONCERN NUMBER 1; COMMENT NUMBER 121, 124, 127; QUESTION NUMBER 24, 27)

UNDERGROUND TEST LAYOUT
(SCA DRAFT CONCERN NUMBER 1; COMMENT NUMBER 82, 119; QUESTION NUMBER 58)

DRIFTING
(SCA DRAFT CONCERN NUMBER 1; COMMENT NUMBER 35)

DESIGN CONTROL PROCESS - OVERVIEW

- ROLES OF PARTICIPANTS
- DESIGN INPUT
- DESIGN PROCESS BY ARCHITECT/ENGINEERS
- DESIGN CHANGE CONTROL
- DESIGN INTERFACE CONTROL
- DESIGN DOCUMENTATION AND RECORDS

DESIGN CHANGE CONTROL

- NNWSI/88-9, 2.5.1

  CHANGES TO APPROVED DESIGNS, INCLUDING FIELD CHANGES, SHALL BE JUSTIFIED AND SUBJECTED TO DESIGN CONTROL MEASURES COMMENSURATE WITH THOSE APPLIED TO THE ORIGINAL DESIGN AND APPROVED BY THE SAME ORGANIZATIONS WHICH REVIEWED AND APPROVED THE ORIGINAL DESIGN DOCUMENTS

- ACCOMPLISHED PER CHANGE CONTROL PROCEDURES, e.g. AP-3.3Q

DESIGN CHANGE CONTROL
(CONTINUED)

- ALL CHANGES TO APPROVED DESIGNS MUST BE APPROVED BY PROJECT CCB
- PROCESS OF MAKING DESIGN CHANGES IS THE SAME AS INITIAL DESIGN PROCESS
- SAME ORGANIZATION WILL BE INVOLVED IN THE CHANGE AS IN ORIGINAL DESIGN

DESIGN CONTROL PROCESS - OVERVIEW

- ROLES OF PARTICIPANTS
- DESIGN INPUT
- DESIGN PROCESS BY ARCHITECT/ENGINEERS
- DESIGN CHANGE CONTROL
- DESIGN INTERFACE CONTROL
- DESIGN DOCUMENTATION AND RECORDS

DESIGN INTERFACE CONTROL

- NNWSI/88-9

  2.6.1 INTERNAL AND EXTERNAL DESIGN INTERFACES SHALL BE IDENTIFIED AND CONTROLLED AND DESIGN EFFORTS SHALL BE COORDINATED AMONG AND WITHIN RESPONSIBLE DESIGN ORGANIZATIONS

  2.6.2 DESIGN INFORMATION TRANSMITTED ACROSS INTERFACES SHALL BE DOCUMENTED AND CONTROLLED

- ACCOMPLISHED PER INTERFACE CONTROL PROCEDURE, e.g. AP-5.19Q (REPLACES AP-5.6Q)

  - PROJECT OFFICE
  - PARTICIPANTS

DESIGN CONTROL PROCESS - OVERVIEW

- ROLES OF PARTICIPANTS
- DESIGN INPUT
- DESIGN PROCESS BY ARCHITECT/ENGINEERS
- DESIGN CHANGE CONTROL
- DESIGN INTERFACE CONTROL
- DESIGN DOCUMENTATION AND RECORDS

DOCUMENTATION AND RECORDS

- NNWSI/88-9, 2.8

  DESIGN DOCUMENTATION, INCLUDING DESIGN INPUTS, ANALYSES, DRAWINGS, SPECIFICATIONS APPROVED CHANGES THERETO, EVIDENCE OF DESIGN VERIFICATION AND RECORDS CONFIRMING INTERFACE CONTROL SHALL BE COLLECTED, CONTROLLED, STORED, AND MAINTAINED AS QA RECORDS

- ACCOMPLISHED PER "RECORDS MANAGEMENT" PROCEDURES, e.g. AP-1.7Q

  - PROJECT OFFICE
  - PARTICIPANT

DESIGN CONTROL PROCESS

SUMMARY

PROCEDURES HAVE BEEN DEVELOPED AND IMPLEMENTED TO CONTROL THE DESIGN PROCESS

- 15 NEW PO PROCEDURES SINCE OCTOBER '88
- PARTICIPANT PROCEDURES TO CONTROL THEIR DESIGN WORK
- STAFF TRAINED IN USE OF PROCEDURES
- TRAINED STAFF ARE IMPLEMENTING PROCEDURES
- AUDITS AND SURVEILLANCES WILL CONFIRM CONTINUED COMPLIANCE
- IN COMPLIANCE WITH NNWSI/88-9

DCPOV5P.A09/7-5/7-89

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

YUCCA MOUNTAIN PROJECT

DESIGN INPUT

PRESENTED TO

DOE/NRC MEETING ON THE ESF TITLE II DESIGN CONTROL PROCESS

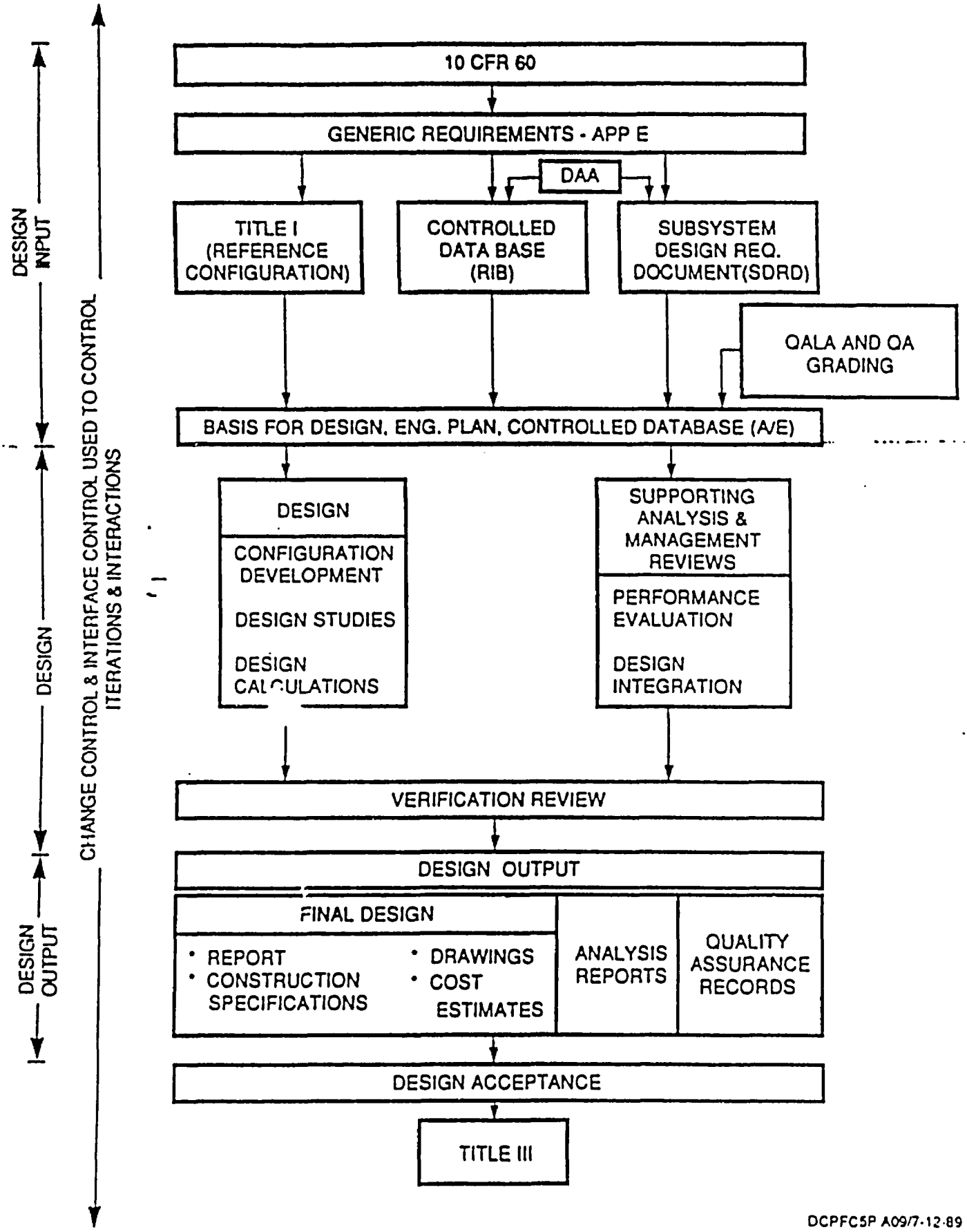
PRESENTED BY

A. STEVENS

JULY 6-7, 1989

UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

DESIGN CONTROL PROCESS



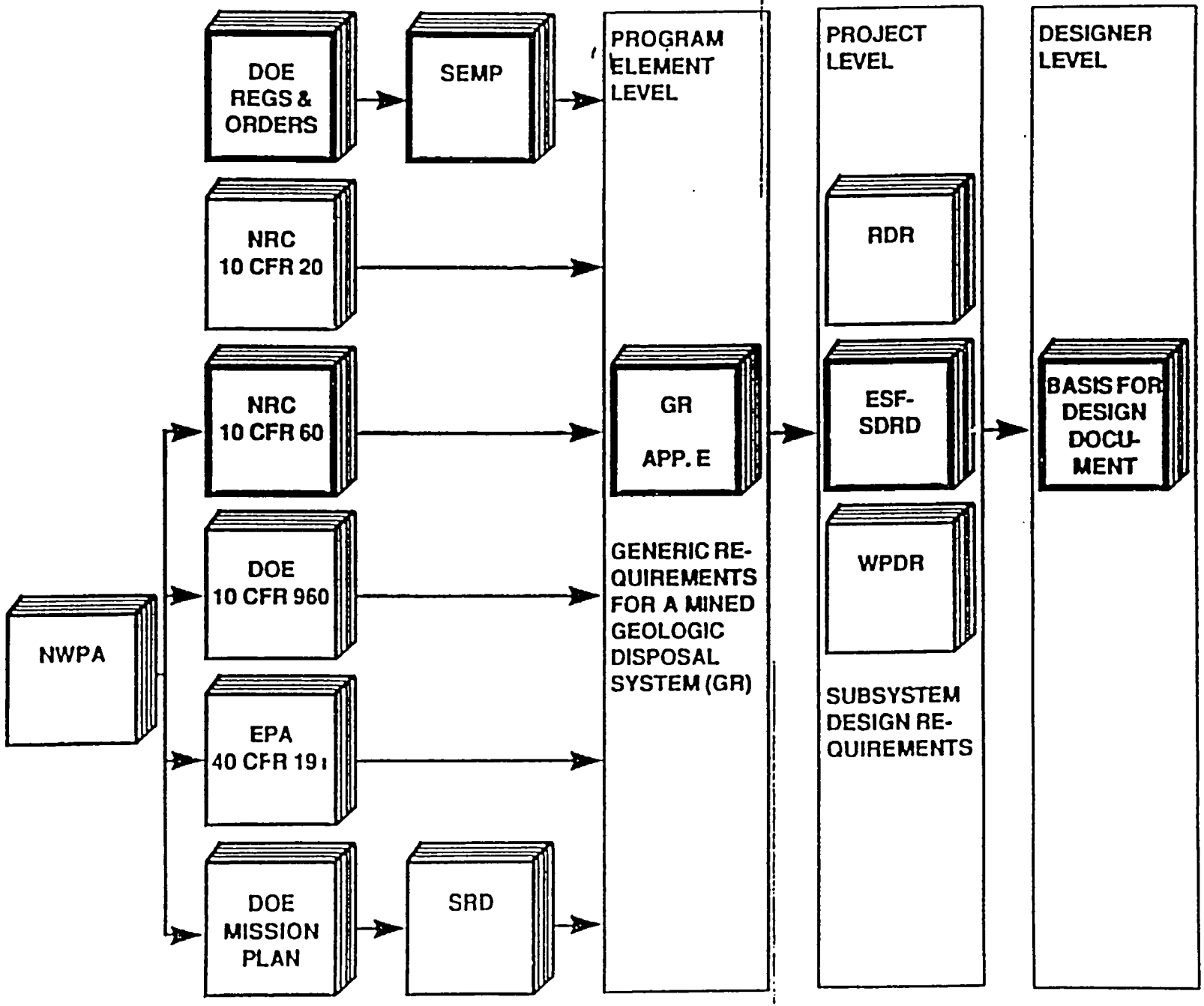
DCPFC5P A09/7-12-89

DESIGN INPUT

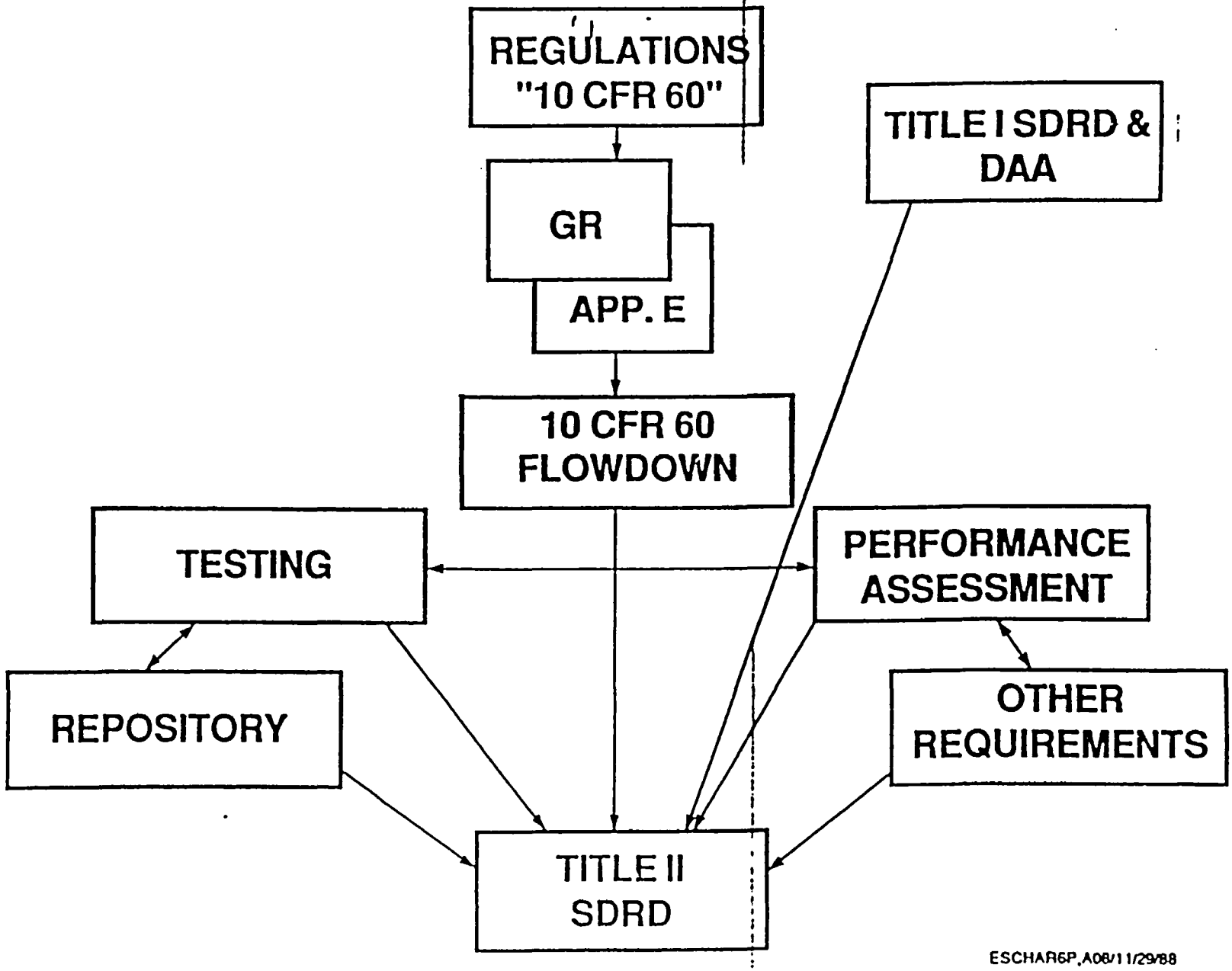
THREE PRINCIPAL COMPONENTS:

1. DESIGN REQUIREMENTS
   - ESF SUBSYSTEM DESIGN REQUIREMENTS DOCUMENT
2. REFERENCE INFORMATION (AND DATA)
   - REFERENCE INFORMATION BASE (RIB)
3. QA GUIDANCE

HIERARCHY OF DOCUMENTS IMPLEMENTING THE REGULATIONS



INPUT TO ESF TITLE II SDRD



ESCHAR6P,A08/11/29/88

CONTENTS OF SDRD

SECTIONS

1. ESF SITE

2. SURFACE UTILITIES

3. SURFACE FACILITIES

4. FIRST SHAFT

5. SECOND SHAFT

6. UNDERGROUND EXCAVATIONS

7. UNDERGROUND SUPPORT SYSTEMS

8. UNDERGROUND TESTS

9. ESF DECOMMISSIONING STRATEGY

CONTENTS OF SDRD

(CONTINUED)

APPENDICES

- SELECTED TOPICS INCLUDING:
  - ESF REPOSITORY INTERFACES
  - TEST AND IDS REQUIREMENTS
  - ESF DRILLING REQUIREMENTS
  - APPLICABLE REGULATIONS, CODES, AND SPECIFICATIONS

STATUS OF ESF TITLE II SDRD

DRAFT COMPLETED WITH INTERFACE INFORMATION	JANUARY 26, 1989
MANAGEMENT REVIEW, QMP 06-03	MARCH 29, 1989
REV. O CONTROLLED BY CCB	APRIL 7, 1989
TECHNICAL ASSESSMENT REVIEW, QMP 02-08	IN PROGRESS
REVISION 1	PENDING COMPLETION OF QMP 02-08 REVIEW

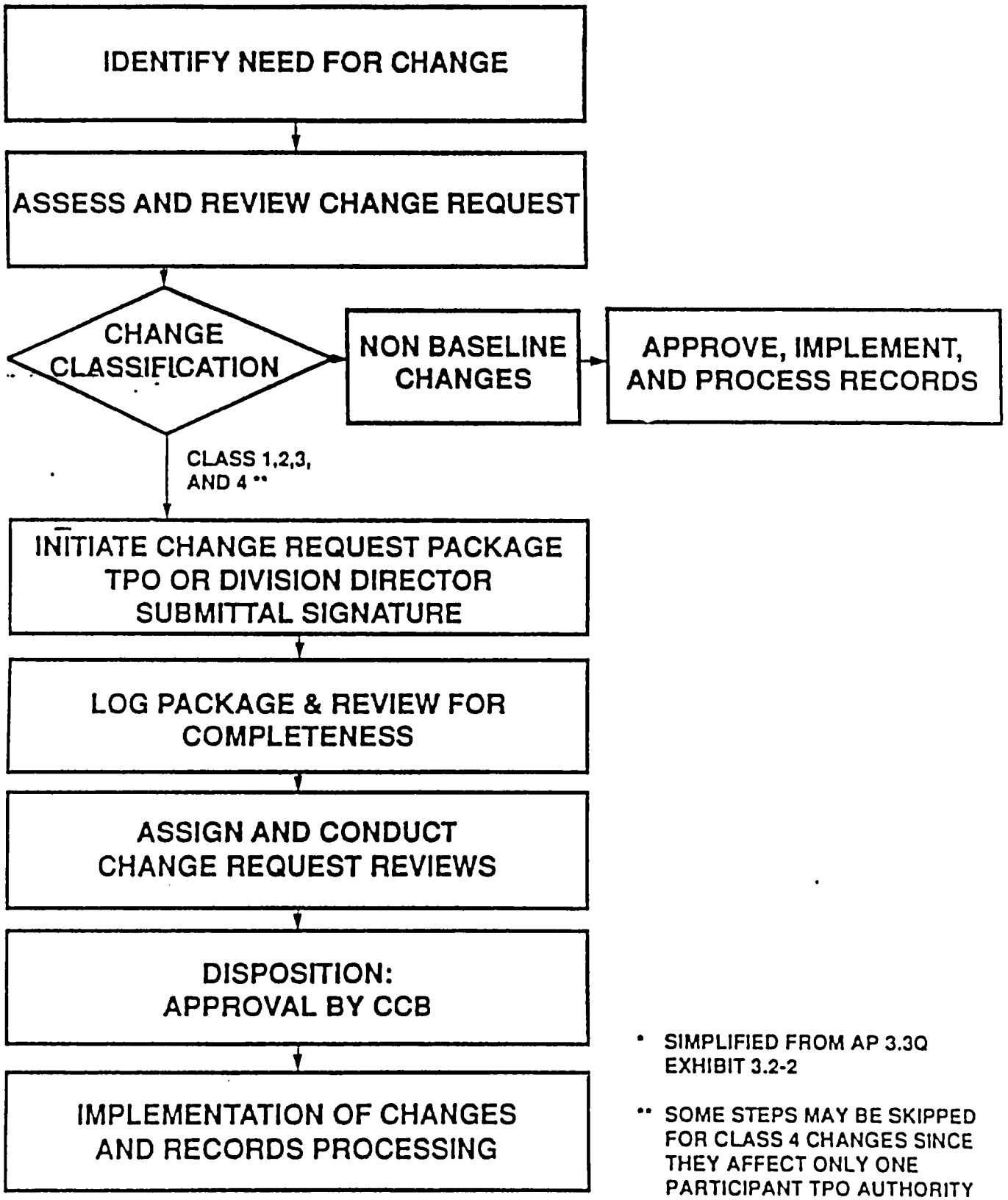
DCPHTR5P.A09/7-6,7-89

PROCESS FOR CONTROLLING UPDATES TO SDRD

YMP ADMINISTRATIVE PROCEDURE 3.3Q, CHANGE CONTROL PROCESS

- AP 3.3Q DEFINES THE RESPONSIBILITIES OF THE PROJECT PARTICIPANTS FOR THE
  - IDENTIFICATION
  - PREPARATION
  - EVALUATION
  - APPROVAL
  - DISPOSITION, AND
  - IMPLEMENTATION OF CHANGES

SIMPLIFIED* FLOW CHART FOR CHANGE CONTROL PROCESS



* SIMPLIFIED FROM AP 3.3Q EXHIBIT 3.2-2

** SOME STEPS MAY BE SKIPPED FOR CLASS 4 CHANGES SINCE THEY AFFECT ONLY ONE PARTICIPANT TPO AUTHORITY

ESCHAA6P A08/7-6.7-89

DESIGN INPUT

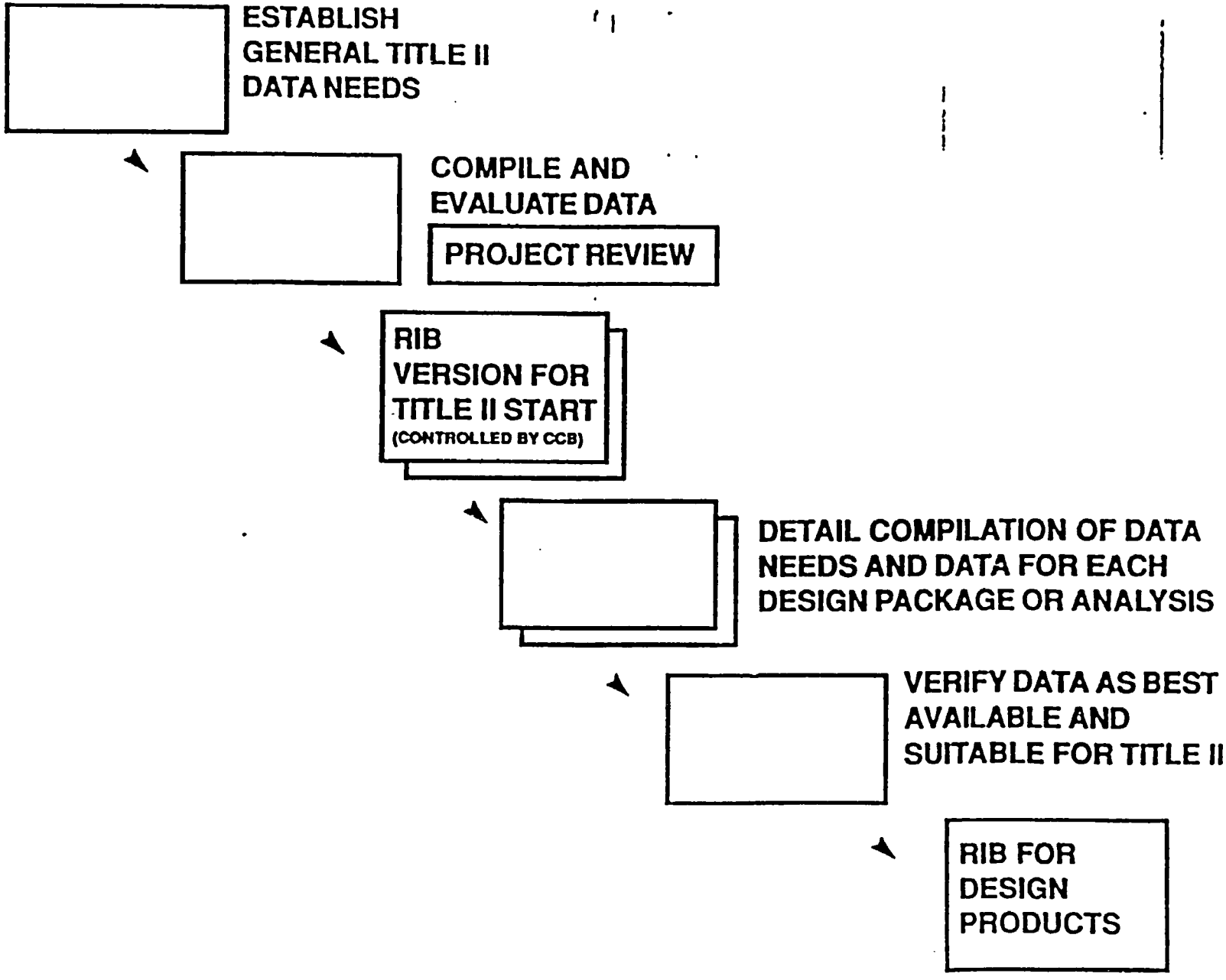
THREE PRINCIPAL COMPONENTS:

1. DESIGN REQUIREMENTS
   - ESF SUBSYSTEM DESIGN REQUIREMENTS DOCUMENT

2. REFERENCE INFORMATION (AND DATA)
   - REFERENCE INFORMATION BASE (RIB)

3. QA GUIDANCE

REFERENCE INFORMATION BASE FOR ESF TITLE II



DCPDIH5P.A09/7-6,7-89

DATA VERIFICATION

ESF TITLE II RIB INFORMATION WILL BE VERIFIED AS "BEST AVAILABLE" AND "SUITABLE" FOR EACH APPLICATION

- USES QUALITY LEVEL I PROCEDURES

DESIGN INPUT

THREE PRINCIPAL COMPONENTS:

1. DESIGN REQUIREMENTS
   - ESF SUBSYSTEM DESIGN REQUIREMENTS DOCUMENT

2. REFERENCE INFORMATION (AND DATA)
   - REFERENCE INFORMATION BASE (RIB)

3. QA GUIDANCE

DESIGN CONTROL INCORPORATES NUREG 1318 AND GRADED QA FOR ESF

- IDENTIFIED CANDIDATE ITEMS AND ACTIVITIES
- DETERMINED ORGANIZATION AND STRUCTURE
- DETERMINED ITEMS IMPORTANT TO SAFETY
- DETERMINED ITEMS IMPORTANT TO WASTE ISOLATION
- DETERMINED QUALITY ACTIVITIES
- DEVELOPED AND GRADED ESF QALAS

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

YUCCA MOUNTAIN PROJECT

DESIGN CONTROL BY FENIX & SCISSON OF NEVADA

PRESENTED TO

DOE/NRC MEETING ON THE ESF TITLE II DESIGN CONTROL PROCESS

PRESENTED BY

R.L. BULLOCK

TECHNICAL PROJECT OFFICER

FENIX & SCISSON OF NEVADA

JULY 6-7, 1989

UNITED STATES DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

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JULY 6-7, 1989

UNITED STATES DEPARTMENT OF ENERGY

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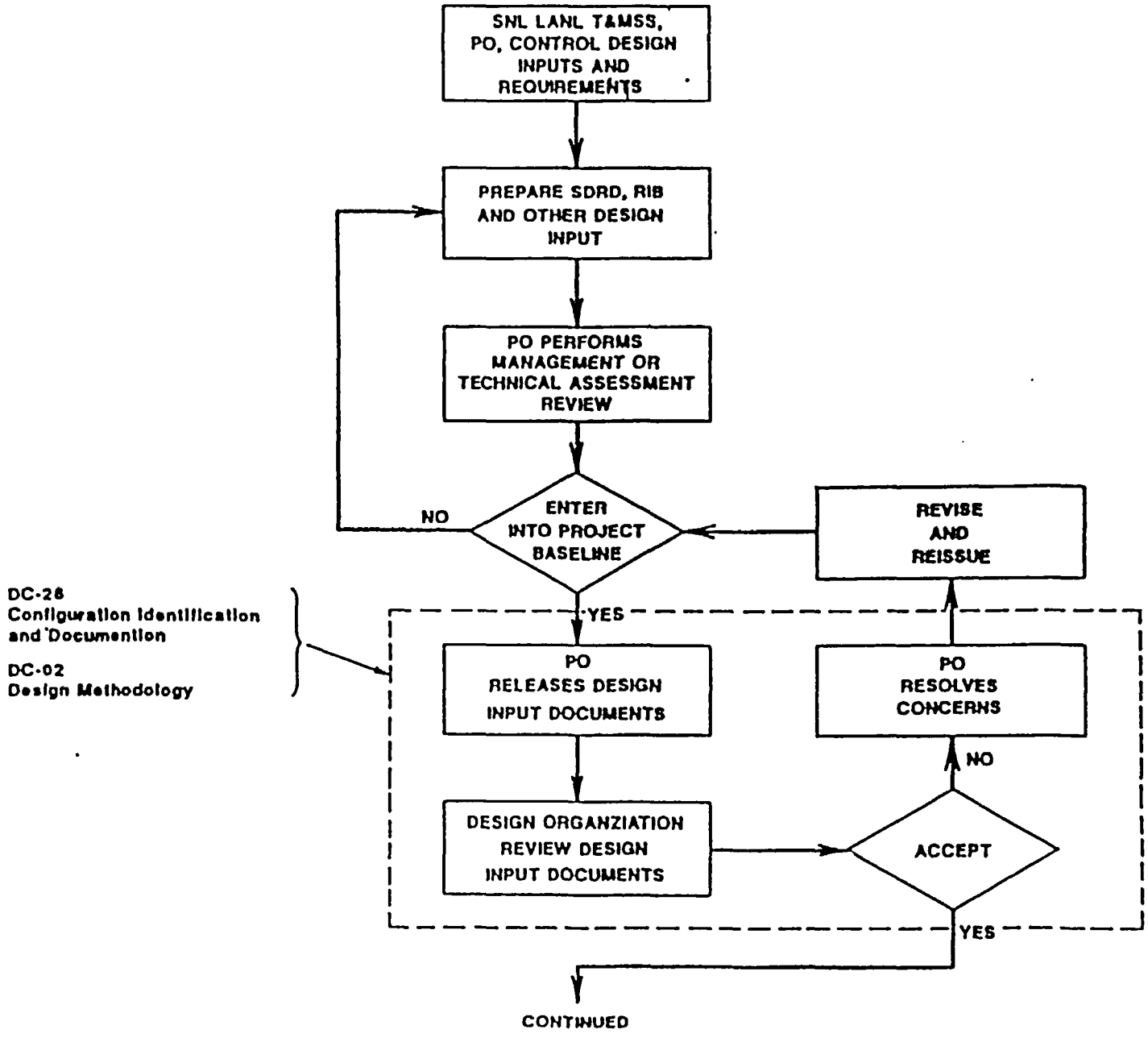
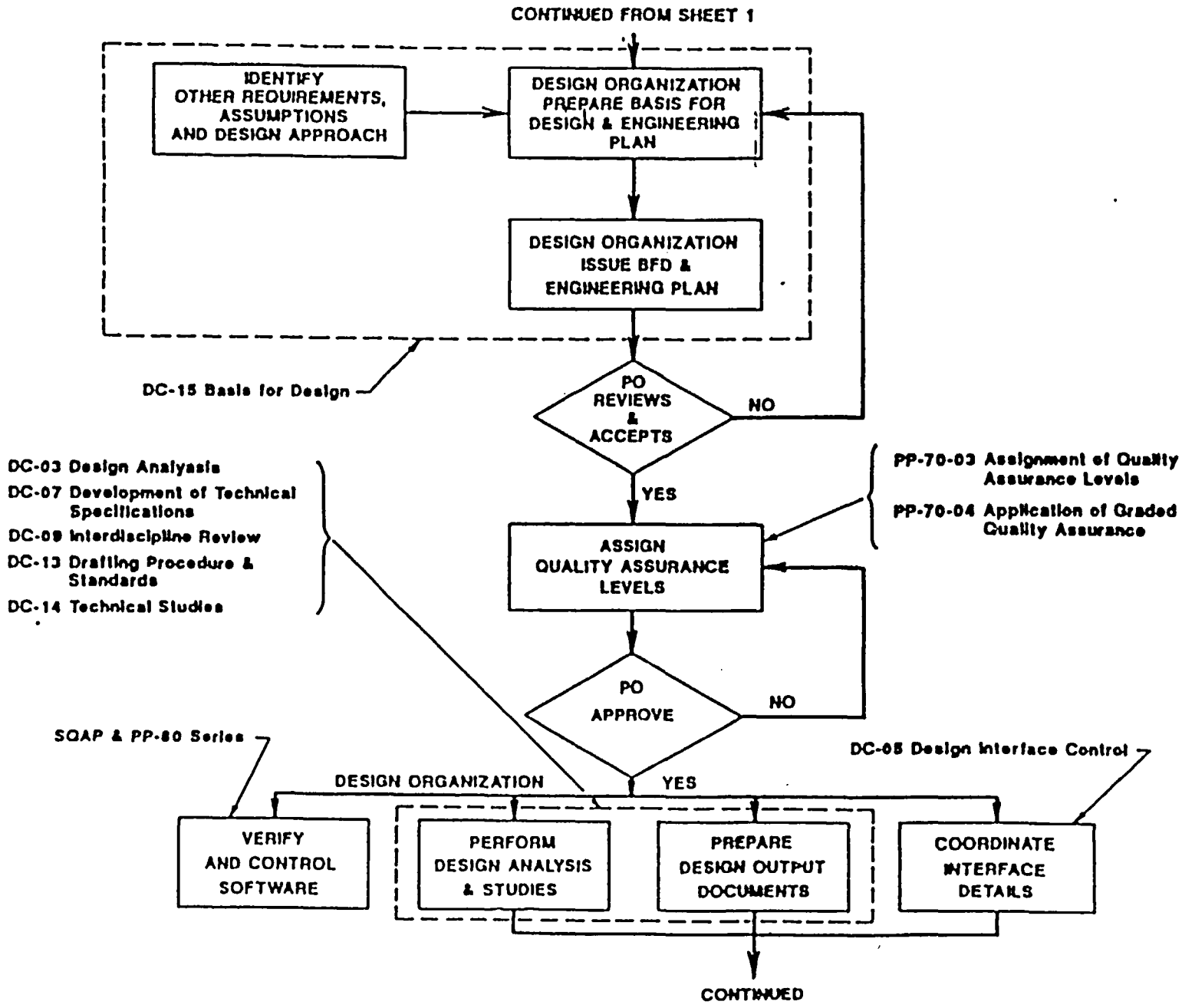
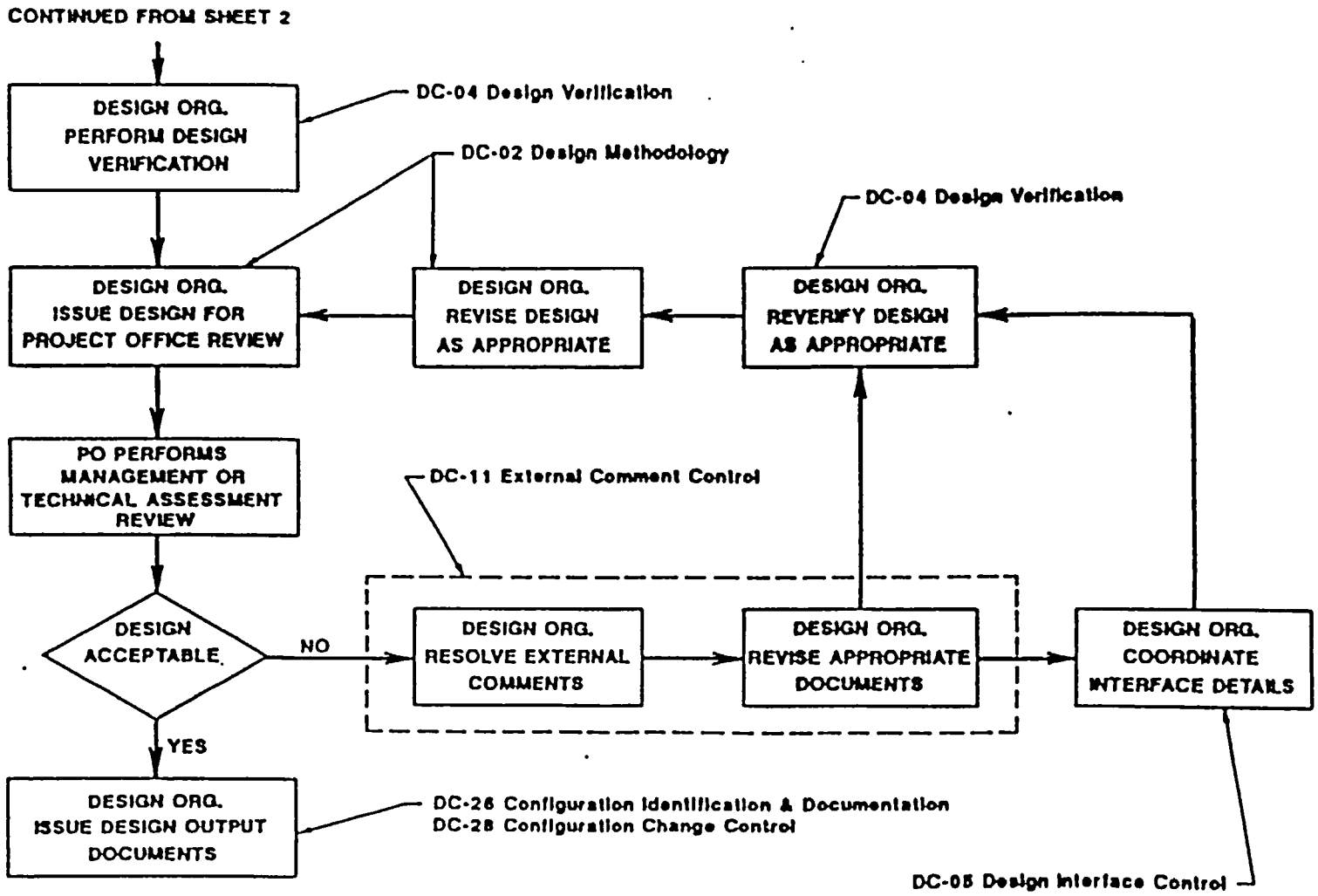


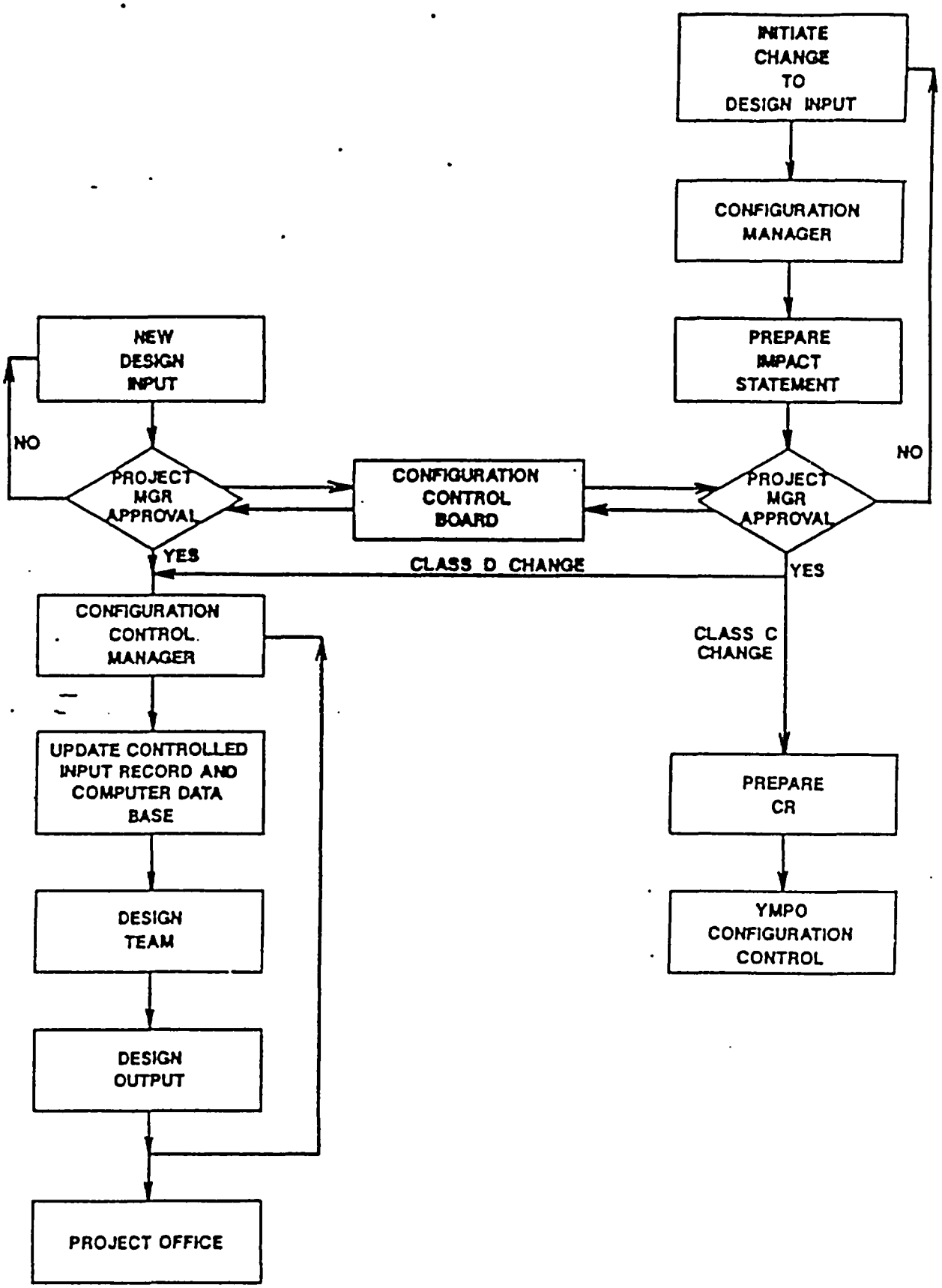
PROJECT ESF DESIGN CONTROL sheet 1



PROJECT ESF DESIGN CONTROL sheet 2



PROJECT ESF DESIGN CONTROL sheet 3



FSN DESIGN INPUT AND CHANGE CONTROL

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YUCCA MOUNTAIN

YUCCA MOUNTAIN PROJECT

DESIGN CONTROL BY HOLMES & NARVER

PRESENTED TO

DOE/NRC MEETING ON THE ESF TITLE II DESIGN CONTROL PROCESS

PRESENTED BY

JOSEPH A. CALOVINI

TECHNICAL PROJECT OFFICER

HOLMES & NARVER

JULY 6-7, 1989

UNITED STATES DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

U.S. DEPARTMENT OF ENERGY

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YUCCA MOUNTAIN

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JULY 6-7, 1989

UNITED STATES DEPARTMENT OF ENERGY

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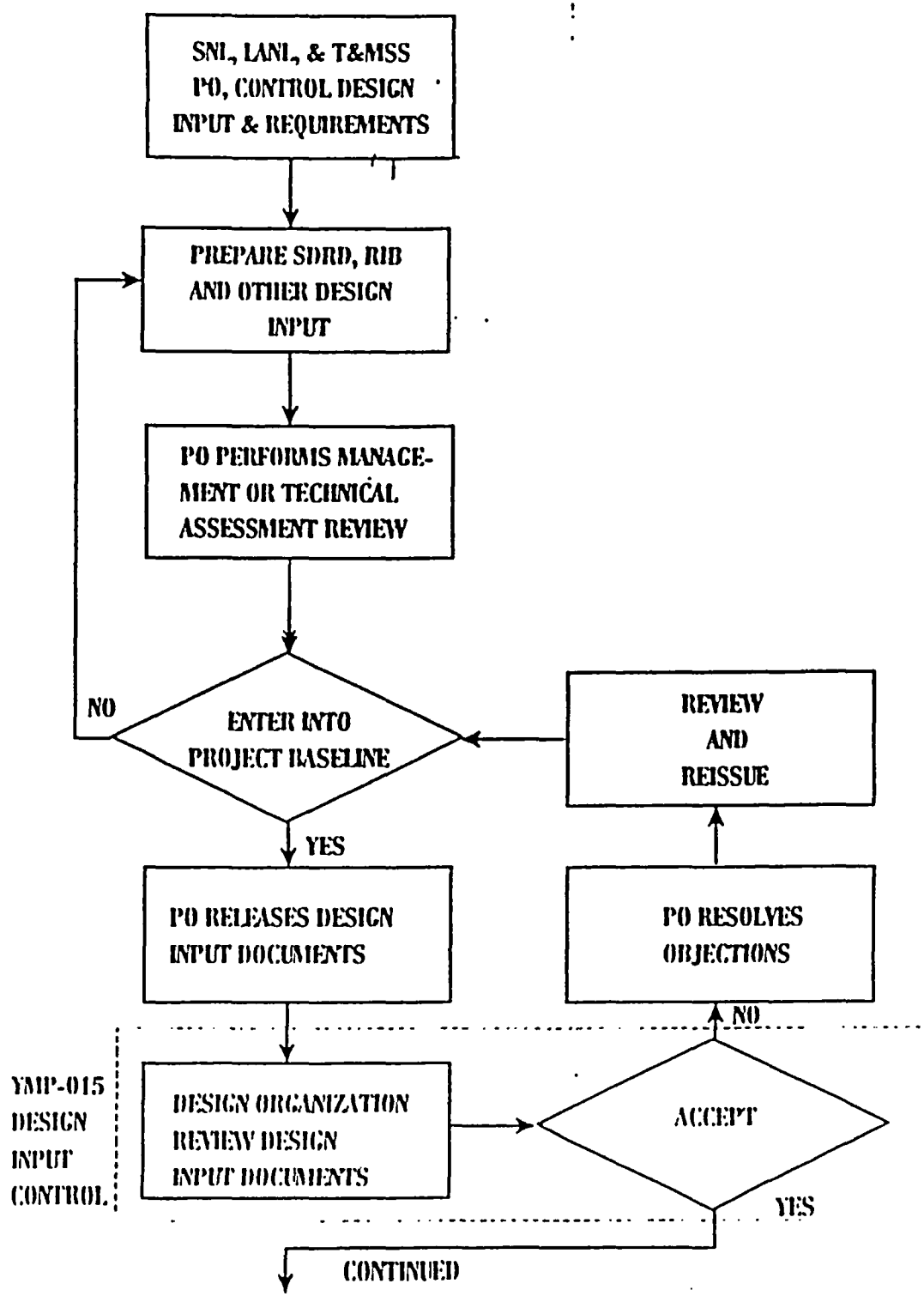
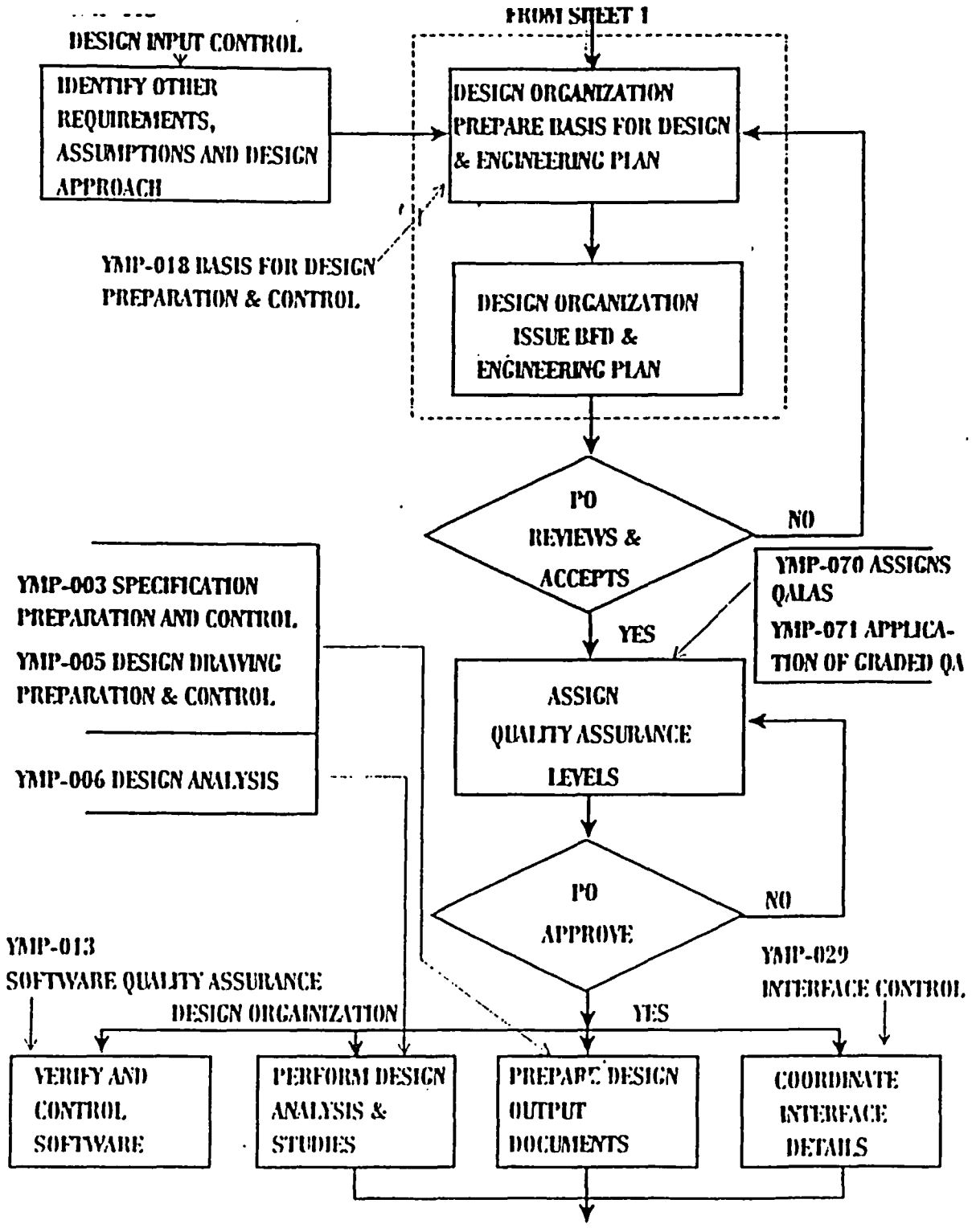
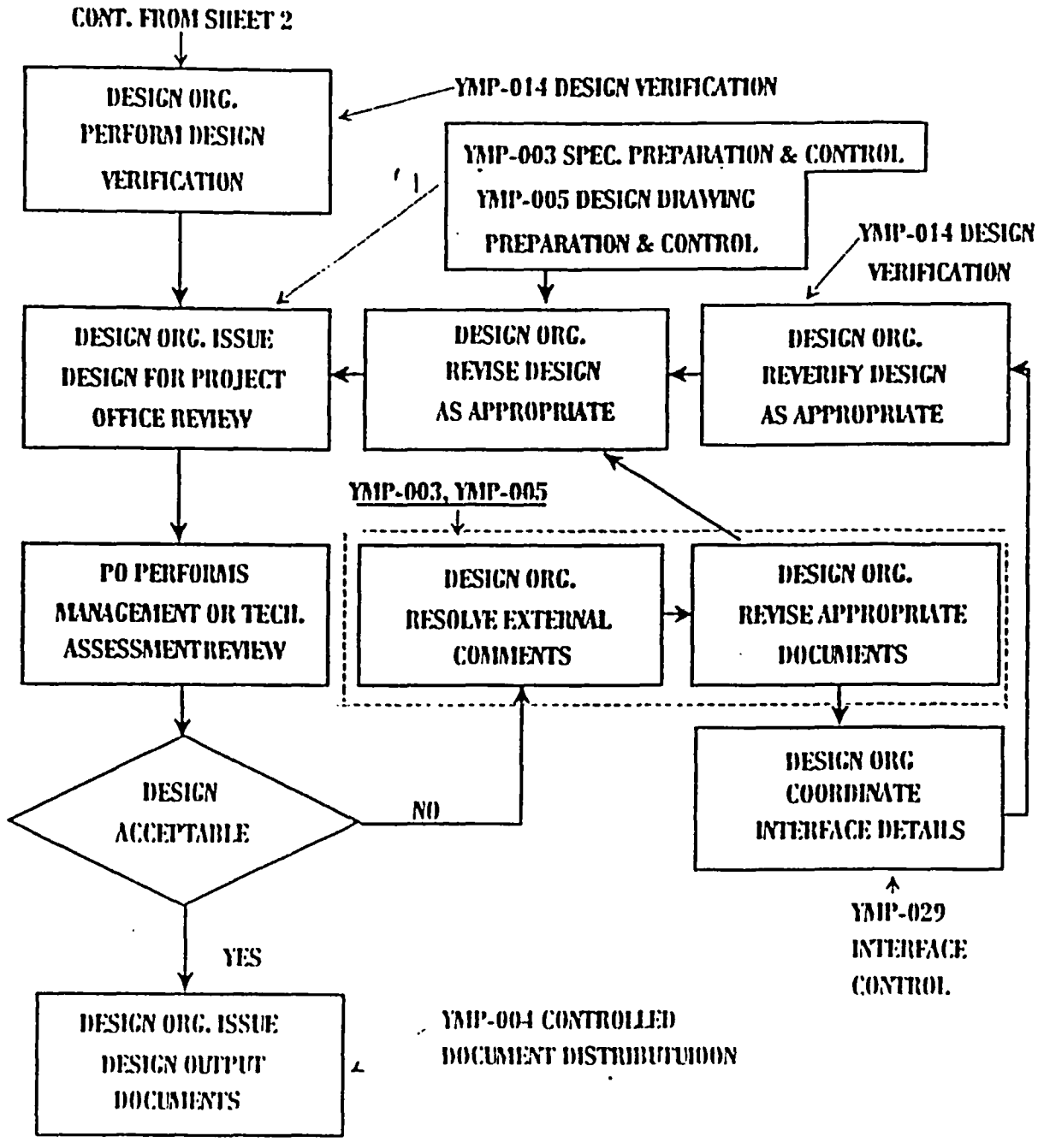
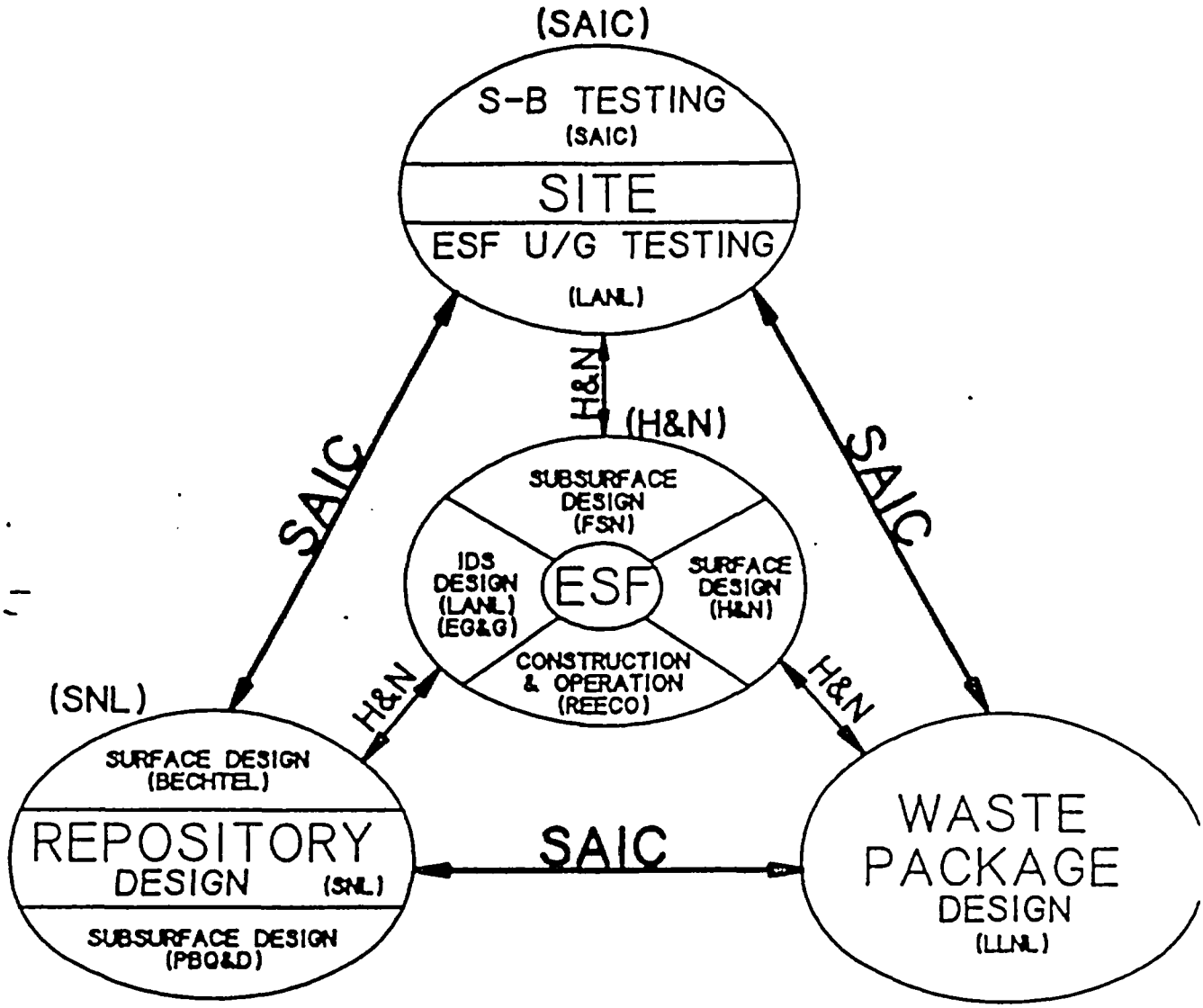

SNL, LANL, & T&MSS
PO, CONTROL DESIGN
INPUT & REQUIREMENTS
PREPARE SDRD, RIB
AND OTHER DESIGN
INPUT
PO PERFORMS MANAGE-
MENT OR TECHNICAL
ASSESSMENT REVIEW
NO
ENTER INTO
PROJECT BASELINE
REVIEW
AND
REISSUE
YES
PO RELEASES DESIGN
INPUT DOCUMENTS
PO RESOLVES
OBJECTIONS
NO
YMP-015
DESIGN
INPUT
CONTROL
DESIGN ORGANIZATION
REVIEW DESIGN
INPUT DOCUMENTS
ACCEPT
YES
CONTINUED

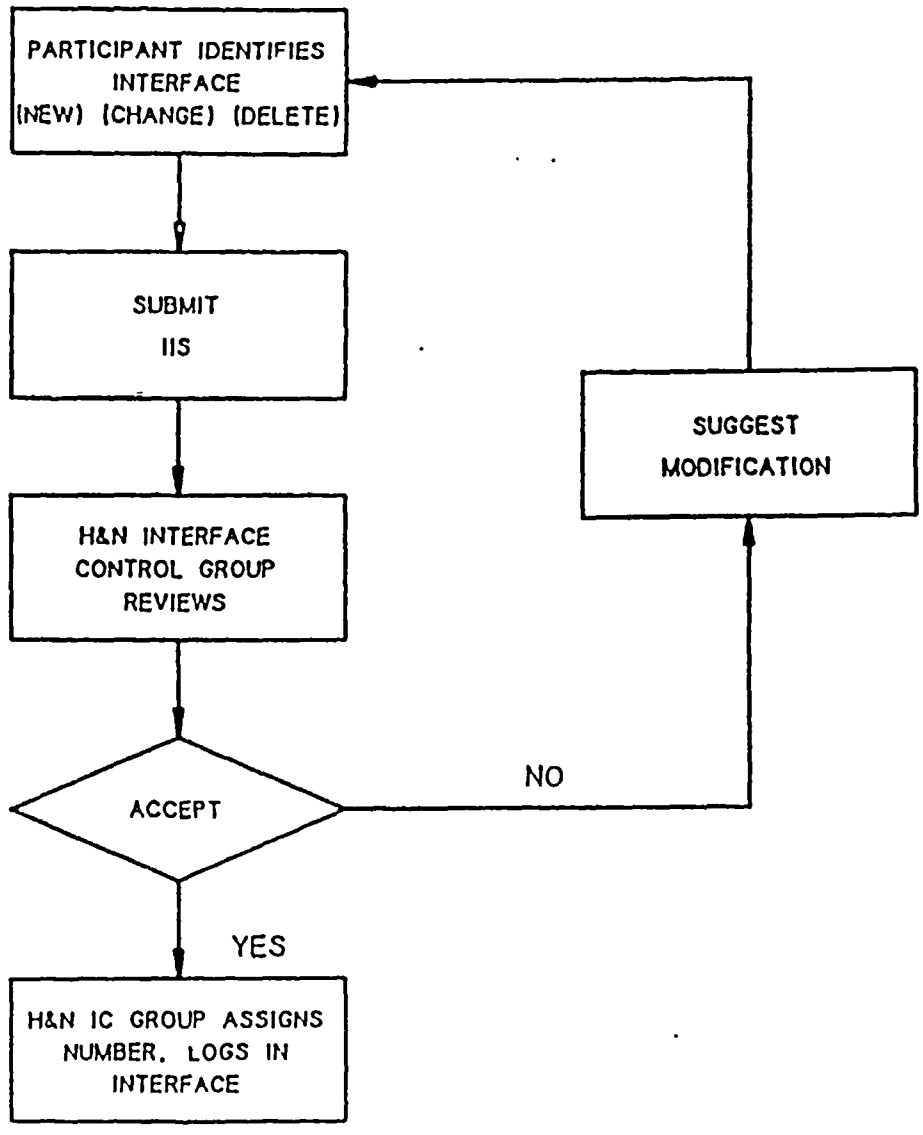

FROM SHEET 1
DESIGN INPUT CONTROL
IDENTIFY OTHER REQUIREMENTS, ASSUMPTIONS AND DESIGN APPROACH
DESIGN ORGANIZATION PREPARE BASIS FOR DESIGN & ENGINEERING PLAN
YMP-018 BASIS FOR DESIGN PREPARATION & CONTROL
DESIGN ORGANIZATION ISSUE BFD & ENGINEERING PLAN
PO REVIEWS & ACCEPTS
NO
YES
YMP-070 ASSIGNS QALAS
YMP-071 APPLICATION OF GRADED QA
YMP-003 SPECIFICATION PREPARATION AND CONTROL.
YMP-005 DESIGN DRAWING PREPARATION & CONTROL.
YMP-006 DESIGN ANALYSIS
ASSIGN QUALITY ASSURANCE LEVELS
PO APPROVE
NO
YES
YMP-013 SOFTWARE QUALITY ASSURANCE
YMP-029 INTERFACE CONTROL
DESIGN ORGAINIZATION
VERIFY AND CONTROL SOFTWARE
PERFORM DESIGN ANALYSIS & STUDIES
PREPARE DESIGN OUTPUT DOCUMENTS
COORDINATE INTERFACE DETAILS


CONT. FROM SHEET 2
DESIGN ORG. PERFORM DESIGN VERIFICATION
YMP-014 DESIGN VERIFICATION
YMP-003 SPEC. PREPARATION & CONTROL
YMP-005 DESIGN DRAWING PREPARATION & CONTROL
YMP-014 DESIGN VERIFICATION
DESIGN ORG. ISSUE DESIGN FOR PROJECT OFFICE REVIEW
DESIGN ORG. REVISE DESIGN AS APPROPRIATE
DESIGN ORG. REVERIFY DESIGN AS APPROPRIATE
YMP-003, YMP-005
PO PERFORMS MANAGEMENT OR TECH. ASSESSMENT REVIEW
DESIGN ORG. RESOLVE EXTERNAL COMMENTS
DESIGN ORG. REVISE APPROPRIATE DOCUMENTS
DESIGN ACCEPTABLE
NO
DESIGN ORG COORDINATE INTERFACE DETAILS
YMP-029 INTERFACE CONTROL.
YES
DESIGN ORG. ISSUE DESIGN OUTPUT DOCUMENTS
YMP-004 CONTROLLED DOCUMENT DISTRIBUTUIOON



INTERFACE CONTROL ACTIVITY

PHYSICAL INTERFACES
INTERFACE IDENTIFICATION SHEET (IIS)



Attachment 8.3
Sheet 1 of 1

INTERFACE CONTROL LOG--PROCESSING SHEET

Page 1 of
March 23, 1989

COMMUNICATIONS SYSTEM

RECORD/FILE NO.
1.2.6.1.1.501

INTERFACE NUMBER	DATE REC'D	INTERFACE PARTICIPANTS	SUBJECT	DIST. DATE	EFFECTIVE DATE	REMARKS
C-001	08/26/88	GREINER/F&S FRANCIS/LANL	ES-1 SHAFT WALL MAPPING			
C 002	02/15/89	SHURTLEFF/H&N GREINER/F&S	OPERATORS HOIST HOUS ES-1 & ES-2			
C-003	02/15/89	SHURTLEFF/H&N GREINER/F&S	PHYSICAL IN[illegible] CAMERAS			
C 004	02/15/89	SHURTLEFF/H&N GREINER/F&S	SUP[illegible]G FOR CCTV CAMERAS			
C 005	02/15/89	SHURTLEFF/H&N GREINER/F&S	INTERF. CONDUIT & CABLE SUPPORT & J-BOXES AT VARIOUS LOCATIONS			

TYPICAL

Attachment 8.2
Sheet 1 of 2

INTERFACE IDENTIFICATION

YUCCA MOUNTAIN PROJECT

FOR M&N IC GROUP USE ONLY	1. THIS INFORMATION
8. SYSTEM	☐ ADD NEW INFORMATION
9. INTERFACE NO. (ASSIGNED BY M&N)	☐ DEDUCT EXISTING INFORMATION (REFERENCE EXISTING INTERFACE NUMBERS)
	☐ CHANGE EXISTING INFORMATION (REFERENCE EXISTING INTERFACE NUMBERS)
10. RECORDS FILE NO. (ASSIGNED BY M&N)	2. ENTER EXISTING INTERFACE NUMBER FOR CHANGE OR DELETION

3. INTERFACE INFORMATION (DESCRIPTION/LOCATION OF NEW OR EXISTING INTERFACE)

CONCURRENT SIGNATURE	ORGANIZATION	DATE	LEAD ASE	APPROVED	
4.			☐	☐	☐
5.			☐	☐	☐
6.			☐	☐	☐
7.			☐	☐	☐

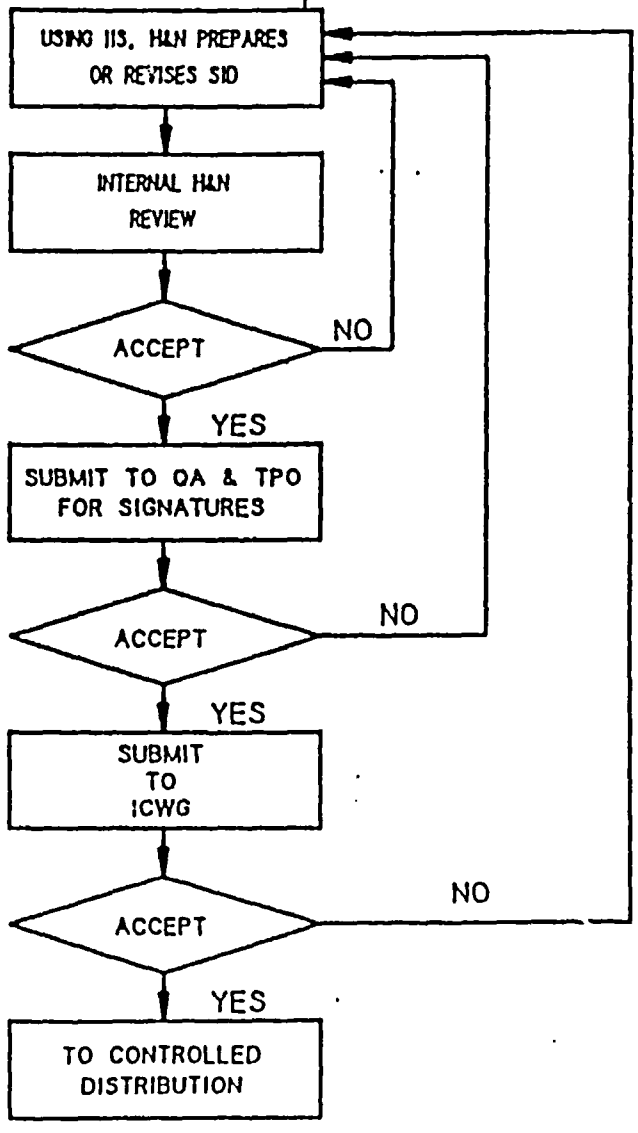
FOR M&N IC GROUP USE ONLY

11. DATE LOGGED	12. DISTRIBUTION DATE

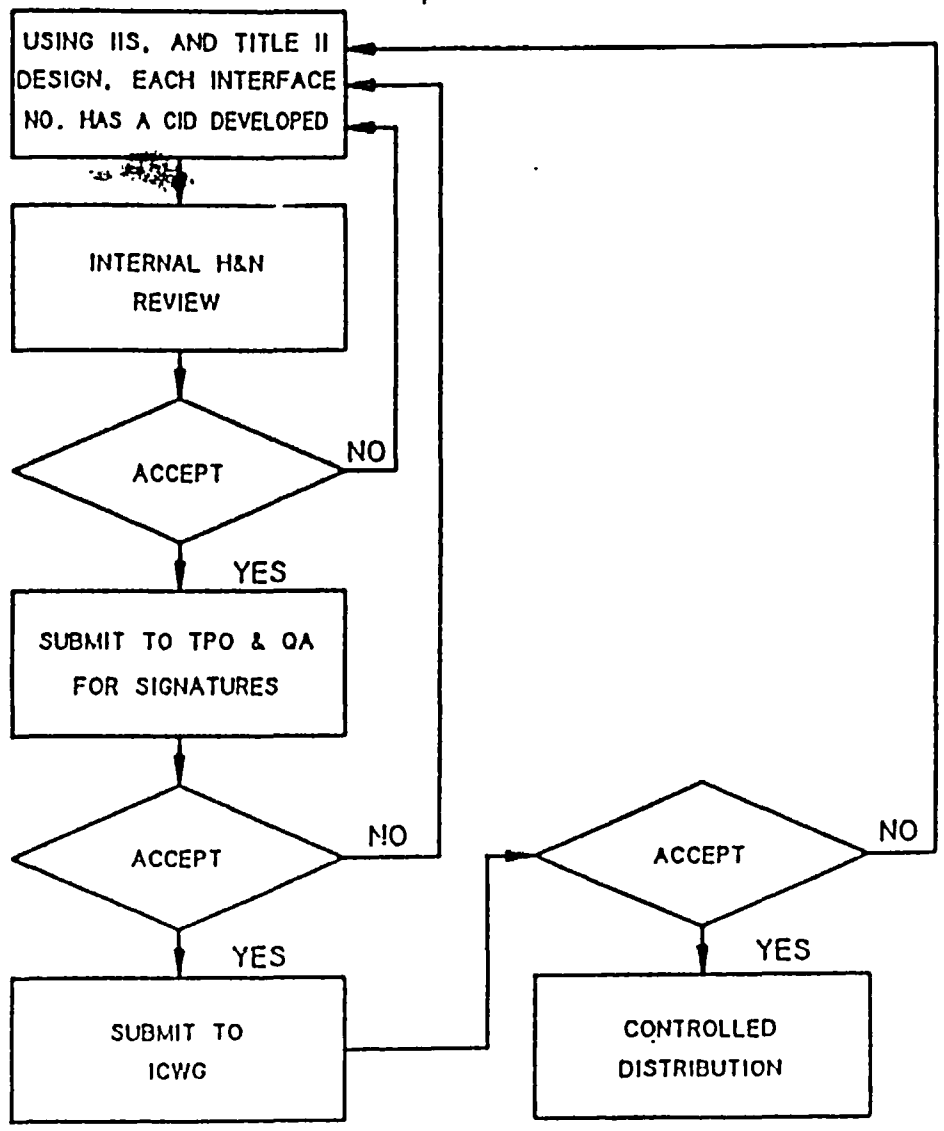
13. DISTRIBUTION

☐ CONCURRENCE _____	☐ LASL REPRESENTATIVE	☐ M&N SUPERVISOR	☐ LRC FILE
☐ CONCURRENCE _____	☐ PNL REPRESENTATIVE	☐ M&N LEAD PROJ. ENG.	☐ IC WORKING FILE
☐ CONCURRENCE _____	☐ M&N REPRESENTATIVE	☐ M&N PROJ. COORD.	☐ YMP FILE
☐ CONCURRENCE _____		☐ M&N LEAD DESIGNER	☐ OTHER _____

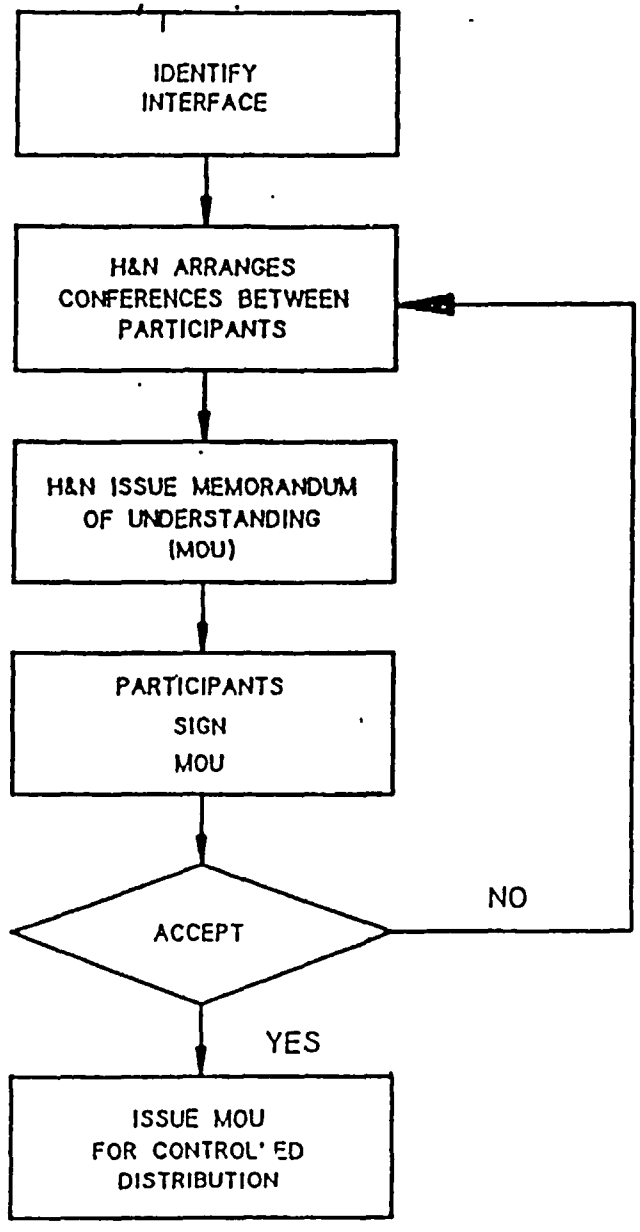
PHYSICAL INTERFACE SYSTEM INTERFACE DOCUMENT (SID).



PHYSICAL INTERFACE
COMPONENT INTERFACE DOCUMENT
(CID)



INFORMATION INTERFACE



U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

YUCCA MOUNTAIN PROJECT

SUMMARY

PRESENTED TO

DOE/NRC MEETING ON THE ESF TITLE II DESIGN CONTROL PROCESS

PRESENTED BY

LEO LITTLE

CHIEF, ENGINEERING & DEVELOPMENT DIVISION
YUCCA MOUNTAIN PROJECT

JULY 6-7, 1989

UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

SUMMARY

- TITLE II IS BEING PERFORMED IN ACCORDANCE WITH:
  - SUBPART G QA REQUIREMENTS
  - MORE EXPLICIT INCORPORATION OF REGULATORY GUIDANCE
  - RECOMMENDATIONS OF THE DESIGN ACCEPTABLILITY ANALYSIS
- THE PROCESS IS CONSISTENT WITH THE QA REQUIREMENTS PRESENTED IN NNWSI 88-9 INCLUDING:
  - DEVELOPMENT OF DESIGN INPUTS
  - CHANGE CONTROL
  - INTERFACE CONTROL
  - VERIFICATION
  - REVIEWS
- DOE IS PROCEEDING WITH ESF TITLE II DESIGN

ENCLOSURE 2
ATTACHMENT 4

Department of Energy Responses
to Draft Point Papers

July 7, 1989

DISCUSSION POINTS

Theme - SCP is a long and complex document and represents a product from a complicated and first of a kind program. It appears that some of the bases for concerns, comments, and questions may be more communication difficulties that need further clarification rather than issues for technical debate.

We offer the examples below for your consideration because our early understanding suggests that some bases may be more apparent than real. Of course there are other bases for which it is clear that fundamental disagreements exist that need to be resolved.

- o Concern #1, Basis Bullet 3 - interference and flexibility
- o Comment #35, Basis Bullet 7 & 10 - additional drifting
- o Comment #35, Recommendations 1 & 2 - demonstration
- o Comment #119, Basis Bullet 3 - performance conformation
- o Comment #128, Basis Bullet 1 - closure on flow down
- o Comment #129, Basis Bullet 1 - documentation inconsistencies
- o Comment #130, Basis Bullet 2 & 3 - apparent agreement
- o Comment #132, Basis Bullet 3 - uncertainty was the basis

CONCI .N 1, BASIS BULLET 3

FLEXIBILITY/INTERFERENCE

THE DOE MUST RETAIN THE CAPABILITY TO ADJUST THE ESF LAYOUT IN RESPONSE TO INFORMATION GAINED BOTH FROM SURFACE BASED TESTS AND CONSTRUCTION OF THE ESF

THE ESF DESIGN IS RELATIVELY MORE MATURE THAN THAT OF THE REPOSITORY

- o THE ESF DESIGN IS TIED TO THE REPOSITORY THROUGH AN INTERFACE CONTROL DRAWING
- o THE ESF DESIGN CAN CHANGE SIGNIFICANTLY AND STILL BE ACCOMMODATED IN THE REPOSITORY DESIGN
- o THE REPOSITORY MAIN DRIFT IS THE MOST IMPORTANT CONSTRAINT FOR DRIFTING IN THE ESF
- o IF SCHEDULING OR SEQUENCING OF TESTS BECOME A CONCERN IN OPERATION OF THE ESF, THE CURRENT DESIGN ALLOWS TESTING TO BE EXPANDED

CONCERN 1, BASIS BULLET 3

FLEXIBILITY/INTERFERENCE (CONT)

TEST DURATION- NOT ALL TESTS WILL BE LONG DURATION, LIFE TIME FOR EACH TEST WILL BE IDENTIFIED IN SDRD

UNCERTAINTIES IN ZONE OF INFLUENCE- DON'T BELIEVE "WORST-CASE SCENARIOS" ARE APPROPRIATE FOR ALLTESTS; CONSERVATIVE LIMITS ARE BELIEVED TO HAVE BEEN USED IN SETTING THE ZONES; G-TUNNEL PROTOTYPING HAS OCCURRED IN SOME AREAS (STRESS & TEMP)

LOCATIONS OF TESTS NOT IDENTIFIED- DO NOT EXPECT ALL TESTS WILL BE IDENTIFIED BY COMPLETION OF TITLE II DESIGN OR EVEN BY TIME OF CONSTRUCTION. HENCE BASIC PREMISE OF ESF DESIGN IS THAT WE MUST HAVE FLEXIBILITY FOR ADDITIONAL TESTING AS WE ACQUIRE NEW INFORMATION ABOUT SITE

INADEQUATE SPACE- IMPRACTICAL TO DESIGN WITH ARBITRARY CONTINGENCY FOR FAULT LOCATIONS; CRITERIA WILL BE DEVELOPED BASED ON OBSERVED CONDITIONS UNDERGROUND; SUBSTANTIAL FLEXIBILITY STILL EXISTS

CONCERN 1, BASIS BULLET 3e

CANISTER SCALE HEATER TEST CONCERN

THE ZONE OF THERMAL INFLUENCE ILLUSTRATED ON FIGURE 8.4.2-39 IS PORTRAYED CORRECTLY

FIGURE 8.4.2-11 INCORRECTLY INDICATES THE LOCATION OF THE HEATER IN THE TEST

COMMENT 35, BASIS BULLET 1

DRIFTING TO THE SOUTH

PROGRAM PRIORITIES, AS INDICATED IN THE SCP, ARE TO DRIFT TO THREE STRUCTURAL FEATURES; CAPABILITY EXISTS FOR AT LEAST 10,000 FT OF ADDITIONAL DRIFTING

NOT YET CLEAR THAT DRIFTING TO THE SOUTH IS HIGHER PRIORITY THAN OTHER FEATURES OF INTEREST

DESIGN INTENTIONALLY INCLUDES FLEXIBILITY FOR SUBSTANTIAL ADDITIONAL DRIFTING (~~F&S~~ IMPACT ANALYSES)

ADDITIONAL DATA FROM UNDERGROUND IS NEEDED BEFORE DECISIONS ABOUT PRIORITIES OR DRIFTING CAN BE MADE

DRIFTING TO THE SOUTH

WE NEED TO RESOLVE THE ISSUE OF LEVEL OF INFORMATION REQUIRED AT EACH PROGRESSIVE STEP OF THE LICENSING PROCESS

comment 22, bullet 10 (continued)

DECISION TO LIMIT EXTENT OF SUBSURFACE EXCAVATION

EVOLVING ESF CONCEPT CONSISTENT WITH LIMITED EXCAVATION • must resolve "how much is enough" for 1st stage of licensing process.

WASTE CONFIDENCE RULEMAKING (1980)

- DEPENDING ON ABILITY TO CHARACTERIZE FULLY, IT MAY BE NECESSARY TO PROCEED WITH AT DEPTH CHARACTERIZATION
- CONSTRUCTION OF SHAFT...AFTER ISSUANCE OF FINAL EIS

PROPOSED RULE: 10 CFR PART 60 (DEC 6, 1979)

- PRINCIPAL IMPACT .. MANAGEMENT OF ~5000 CU YDS SPOILS
- VOLUME OF SPOILS ~10% OF MAIN SHAFT FOR REPOSITORY

STATEMENT OF CONSIDERATIONS: 10 CFR PART 60 (FEB 25, 1981)

- IN SITU TESTING AT DEPTH REQUIRED
- DID NOT CONSIDER "EXTENSIVE" UNDERGROUND DEVELOPMENT TO BE CONSISTENT WITH RULE
- CONSIDERED A FACILITY WITH TWO SHAFTS, AND UP TO 1000 FEET OF DRIFTS AN APPROPRIATE ARRANGEMENT

SCIENTIFIC AND TESTING CONSIDERATIONS

- EXPLORATORY DRIFTING
- PROGRAM TO INVESTIGATE POTENTIALLY ADVERSE GEOLOGIC STRUCTURES COMPLEMENTS SURFACE BASED INVESTIGATIONS (EG. MAPPING, SLANTED HOLES)
- FEATURES TO BE INVESTIGATED ENCOMPASS A RANGE OF CONDITIONS

FLUX	LATERAL DIVERSION
HYDROLOGIC CHARACTER	AGE
TYPE OF FAULTING	NATURE OF FAULTS AT DEPTH
OFFSET	

REPOSITORY CONSTRUCTION FEASIBILITY

SCIENTIFIC AND TESTING CONSIDERATIONS

- EXPLORATORY DRIFTING

  - 3 LONG DRIFTS TO INVESTIGATE SEVERAL STRUCTURES WITH A RANGE OF FEATURES

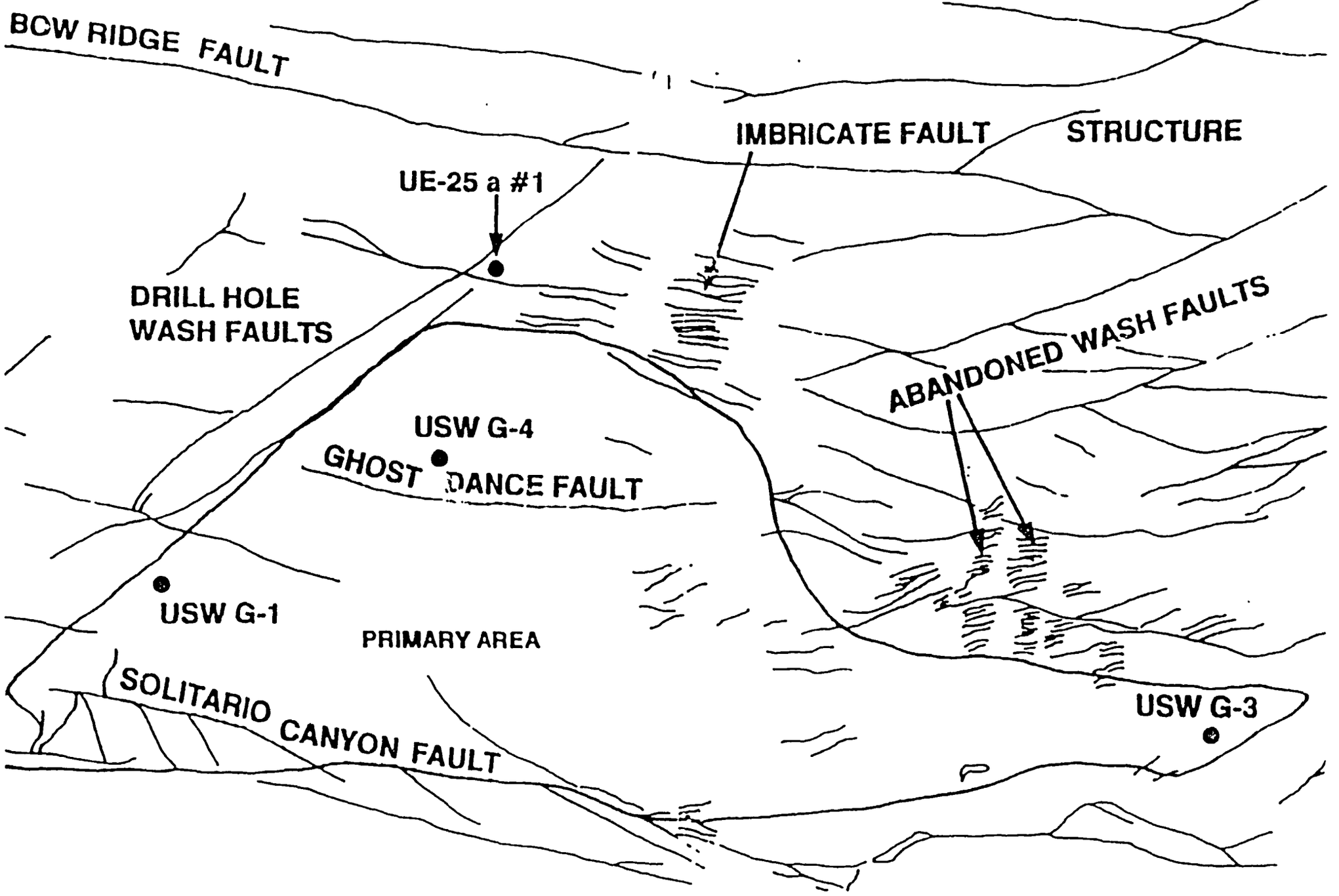
    IMBRICATE NORMAL FAULTING
    - HIGH STRUCTURAL DIP?
    - HIGH FLUX?
    - COMPETENT ROCK?

    DRILL HOLE WASH FEATURE
    - PRE-QUATERNARY AGE FAULT?
    - HIGH FLUX?
    - COMPETENT ROCK?
    - REPOSITORY EXPANSION BEYOND?

    GHOST DANCE FAULT
    - HYDROLOGIC SIGNIFICANCE?
    - GROUND SUPPORT IMPLICATIONS FOR REPOSITORY?

  - PROVISION TO INVESTIGATE OTHER FAULTS OR STRUCTURE

YUCCA MOUNTAIN AREA
FEATURE/STRUCTURE MAP



COMMENT 35, RECOMMENDATIONS 1&2

DEMONSTRATION OF ADEQUACY OF CHARACTERIZATION PROGRAM

THE CURRENT DEMONSTRATION IN THE SCP IS BASED UPON THE AVAILABLE INFORMATION (RELATIVELY SPARSE AND LIMITED DATA)

PLAN TO USE PERFORMANCE ASSESSMENT RELATED CALCULATIONS TO ASSIST IN THE ASSESSMENT OF THE ADEQUACY OF THE DATA

PLAN TO ITERATIVELY DISCUSS THE QUESTION OF REASONABLE ASSURANCE WITH THE NRC AND MODIFY, IF NECESSARY, THE PROGRAMS OF DRILLING AND DRIFTING TO OBTAIN THE DATA NECESSARY TO ADEQUATELY CHARACTERIZE THE SITE

COMMENT 35, RECOMMENDATIONS 1&2

ADDITIONAL TEST DEFINITION

THE ESF MUST BE ABLE TO ACCOMMODATE ADDITIONAL TESTS THAT ARE IDENTIFIED AS NEW SITE INFORMATION IS GAINED

IF THE FLEXIBILITY IN THE CURRENT LAYOUT IS NOT SUFFICIENT TO ACCOMMODATE SUCH TESTS, THE EXTENT OF THE ESF WILL NEED TO BE EXPANDED

ALSO, IT IS POSSIBLE THAT INFORMATION FROM THE SITE CHARACTERIZATION PROGRAM WILL RESULT IN THE ELIMINATION OF SOME CURRENTLY PLANNED ESF TESTS

COMMENT 119, BASIS BULLET 3

PERFORMANCE CONFIRMATION PROGRAM

COMMENT HAS THE POTENTIAL OF BEING MISLEADING WITH RESPECT TO THE EXTENT OF THE PERFORMANCE CONFIRMATION PROGRAM EXPECTED TO BE AVAILABLE AT THIS TIME.

RECOMMEND THAT IT BE MADE CLEARER THAT THE PERFORMANCE CONFIRMATION ASPECTS OF THE PROPOSED SITE CHARACTERIZATION TESTING IS THE FOCUS OF THIS COMMENT RATHER THAN THAT A COMPLETE PERFORMANCE CONFIRMATION PROGRAM FOR THE SITE, REPOSITORY, AND WASTE PACKAGE IS EXPECTED BEFORE THE START OF SITE CHARACTERIZATION

COMMENT 128, BASIS BULLET 1

ADDITIONAL REQUIREMENTS

THE NRC RATIONALE FOR THE APPLICABILITY OF THE ELEVEN ADDITIONAL PART 60 REQUIREMENTS IS STILL NOT READILY OBVIOUS TO US

CLEAR EXPLANATION OF THE MANNER IN WHICH THE ELEVEN ADDITIONAL REQUIREMENTS RESULT IN EXPLICIT DESIGN CRITERIA FOR THE ESF IS NEEDED

A CONTINUED INTERACTION OF THE STAFFS IS NEEDED

ESF APPLICABLE 10 CFR 60 REQUIREMENTS
NRC POSITIONS

SCP REVIEW PLAN Dec. 12, 1988 FULL SET	NRC/DOE MEETING Dec. 8, 1988 ADDITIONAL TO 52 DOE IDENTIFIED IN DAA	LINEHAN LETTER TO APPEL June 29, 1988 ADDITIONAL TO 52 DOE IDENTIFIED IN DAA
60.2		
60.15		
60.16		
60.17		60.17
60.18		
	60.21(c)(1)(ii)(A)	
	60.21(c)(1)(ii)(B)	
		60.24(a)
60.112		
60.113		60.113(a)(2)
		60.113(b)(2)
		60.122
		60.131(a)
		60.131(b)(4)(ii)
		60.131(b)(8)
		60.131(b)(10)
	60.131(b)(8)	
60.134	60.134	60.134
60.137		
60.140		
60.142		
		60.143
60.151		
60.152		

COMMENT NO. 128, BASIS BULLET 1, (CONT)

O APPLICABLE REQUIREMENTS MUST PROVIDE EXPLICIT GUIDANCE THROUGH CRITERIA (IE, SERVE SOME USEFUL PURPOSE)

EXAMPLE; 60.17, CONTENT OF SITE CHARACTERIZATION PLAN, TELLS US NOTHING ABOUT HOW AN EXPLORATORY SHAFT SHOULD BE DESIGNED THE INTENT OF THAT REQUIREMENT IS EMBODIED IN THE PERFORMANCE ALLOCATION PROCESS USED TO DEFINE THE TEST PROGRAM

0 BEFORE SAYING A REQUIREMENT IS APPLICABLE TO THE DESIGN OF THE ESF, ASK OURSELVES: WHAT USEFUL DESGIN CRITERIA COULD BE DEVELOPED FROM THAT REQUIREMENT?

COMMENT 129, BASIS BULLET 1

INCONSISTENT REQUIREMENTS LISTS

TO TERM THESE DOCUMENTS AS "INCONSISTENT" NEEDS CLARIFICATION

DOCUMENTS REFERENCED WERE DEVELOPED AT DIFFERENT TIMES

REFERENCE B IS DOE'S PRESENT POSITION

REFERENCE C WAS THE DRAFT EVALUATION THAT LED TO THE FINAL CONCLUSIONS IN REFERENCE B

REFERENCES A & D WERE EVALUATED AS PART OF THE DAA, USING REFERENCE B AS A SOURCE

basis bullet 2 & 3

COMMENT 130: THE APPROACH RAISES QUESTIONS ABOUT COMPLETENESS AND RIGOR OF THE DAA AS DESIGN CRITERIA WERE NOT DEVELOPED FOR ALL APPLICABLE REQUIREMENTS

DEC. 8, 1988 NRC/DOE MEETING ON THE DAA

- DOE PRESENTED PRELIMINARY RESULTS OF FLOWDOWN ANALYSIS
- DOE PRESENTED THOSE 10 CFR 60 REQUIREMENTS APPLICABLE TO THE THREE MAJOR OBJECTIVES OF THE DAA
- NRC STATED THAT DOE SHOULD CONSIDER ALL APPLICABLE 10 CFR 60 REQUIREMENTS IN THE DAA

RESOLVED (DOE PROPOSED AND NRC AGREED)

- "THIS CONSIDERATION COULD BE AN EVALUATION OF THE IMPACT ON THE TITLE I DESIGN OF OMITTING AN APPLICABLE REQUIREMENT, AND A RATIONALE DESCRIBING WHY, IF THE IMPACT WAS NOT SIGNIGICANT, ANY DESIGN CONSIDERATIONS COULD BE DELAYED UNTIL TITLE II DESIGN"

basis bullet 2 & 3.

COMMENT 130: THE APPROACH RAISES QUESTIONS ABOUT COMPLETENESS AND RIGOR OF THE DAA AS DESIGN CRITERIA WERE NOT DEVELOPED FOR ALL APPLICABLE REQUIREMENTS

DEC. 8, 1988 NRC/DOE MEETING ON THE DAA

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TECHNICAL ASSESSMENT REVIEW : APPENDIX J ; SECTION 4.3

COMPARATIVE EVALUATION OF ... ALTERNATIVE LOCATIONS FOR EXPLORATORY SHAFTS

The overall conclusions and recommendations based on the comparative evalaution are the following:

1. Differences among the alternative shaft locations for currently expected conditions are not significant to waste isolation. This is because all the locations are expected to have conditions that would allow regulatory requirements to be met by wide margins.

2. Differences among the alternative shaft locations might be significant if future data show that widespread large-flux conditions exist at the repository site (currently considered unlikely) or could result from future disruptions of current conditions. Significant differences might also exist if current or future local concentrations of large flux are caused by subsurface lateral diversion or spatially variable pulses of surface infiltration. In either of these cases, locations toward the northeast would be more likely to have groundwater flow times to the water table less than the period of regulatory concern (10,000 yr) in the local zones of flux concentration. Under these conditions evaluations of other natural barriers including geochemical retardation, flow times in the saturated zone, and longer flow times outside the zones of flux concentrations may be necessary to demonstrate adequate waste isolation capabilities for the overall site.

3. The presence of a shaft at any of the locations is not expected to affect significantly the waste isolation capability of a repository.

4. The current shaft location is the preferred location for characterization. Although the relative differences discussed in conclusions 1 and 2 are judged not significant to the waste isolation capabilities of the overall site, they suggest that the characteristics of the current location may be less favorable than the characteristics of the other locations. Therefore, the current location is the most suitable for a conservative approach to collecting data to reduce uncertainties associated with the models, assumptions, and processes that affect predictions of waste isolation.

5. The addition of a waste isolation criterion to the set of criteria used in selecting a shaft location would not have changed the selection of the current location, but might have strengthened the scientific basis for choosing it, on the basis of conclusion 4.

6. The DOE should continue to support the current ESF location as the preferred location for the site-characterization program, on the basis of conclusions 1 through 5.