

U. S. NUCLEAR REGULATORY COMMISSION  
OBSERVATION AUDIT REPORT  
FOR THE  
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT  
AUDIT NO. S89-1 OF  
HOLMES AND NARVER

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## 1.0 Introduction

From November 1, 1988 through November 4, 1988, the U. S. Nuclear Regulatory Commission (NRC) staff participated as observers in the U. S. Department of Energy/Yucca Mountain Project Office (DOE/YMPO) quality assurance (QA) audit of Holmes and Narver (H&N). H&N is a prime contractor providing support for design of the underground support systems and the above ground facilities, including field surveillance and inspection of facilities construction.

The DOE/YMPO audit S89-1 was conducted at the H&N offices in Las Vegas, Nevada. The pre-audit conference was conducted November 1, 1988 and the post-audit conference was conducted November 4, 1988.

This report addresses the adequacy of the DOE/YMPO audit. The NRC staff's evaluation of the DOE/YMPO audit team is based on direct observations of the auditors, discussions with the audit team, and review of the audit plan, checklist and background material.

## 2.0 Scope and Purpose of NRC Staff Participation

The purpose of the NRC staff observation was to determine if the DOE conducted the audit in a manner such that the NRC staff could gain confidence that the DOE and its contractors were properly implementing their programs in accordance with internal DOE requirements and 10 CFR Part 50, Appendix B. Observation audits enable the staff to provide recommendations to the DOE on their audit program and the implementation of their contractor QA programs as they are being developed. These observation audits and the subsequent recommendations should assist the DOE in meeting the NRC's QA requirements.

With respect to the technical portion of the audit, the staff observations allow it to evaluate whether DOE is reviewing ongoing activities with the depth and rigor necessary to ensure that the work is acceptable. These observation audits also allow the staff to provide DOE with guidance on where additional work may be needed in its site characterization and design work.

## 3.0 Audit Team Members

The DOE/YMPO audit team consisted of seven members - five from Science Applications International Corporation and two from the DOE/YMPO in Las Vegas.

The NRC team members, DOE/YMPO audit team members, and other observers are listed below.

### NRC

Bill Belke, Observer  
John Gilray, Observer  
Nafem Tanious, Observer  
Robert Brient, Observer, (Center for Nuclear Waste Regulatory Analysis)

DOE

Stephen Dana, Lead Auditor, SAIC, Las Vegas, Nevada  
William Camp, Auditor, SAIC, Las Vegas, Nevada  
Frederick Ruth, Auditor, SAIC, Las Vegas, Nevada  
Wendell Mansel, Auditor, YMPO, Las Vegas, Nevada  
Catherine Hampton, Auditor Candidate, YMPO, Las Vegas, Nevada  
Margaret Brake, Lead Technical Specialist, SAIC, Las Vegas, Nevada  
John Jardine, Technical Specialist, SAIC, Las Vegas, Nevada

Other Participants

Robert Clark, Observer, DOE/HQ (WESTON), Washington, D. C.  
Arthur Watkins, Observer, DOE/HQ (WESTON), Washington, D. C.  
Susan Zimmerman, Observer, State of Nevada, Carson City, Nevada  
James Grubb, Observer, State of Nevada, Carson City, Nevada

4.0 Staff Observations

As observers, the NRC staff evaluated the effectiveness of the audit and audit team. The audit areas that were observed and evaluated included:

- (1) scope of the audit;
- (2) timing of the audit;
- (3) examination of technical products;
- (4) conduct of the audit;
- (5) qualification of the auditors;
- (6) audit team preparation;
- (7) conduct of meetings;
- (8) team coordination; and
- (9) audit team independence.

4.1 Scope of Audit

As presented in the audit plan, the audit scope did not include the QA criteria listed below since this was a supplemental audit focusing primarily on design control.

- 4.0 Procurement Document Control
- 7.0 Control of Purchased Material, Equipment, and Services
- 8.0 Identification and Control of Samples and Items
- 9.0 Control of Processes
- 10.0 Inspection
- 11.0 Test Control
- 12.0 Control of Measuring and Test Equipment
- 13.0 Handling, Storage, and Shipping
- 14.0 Inspection, Test, and Operating Status
- 15.0 Nonconforming Materials, Parts, or Components

Programmatic elements 2, 3, 5, 6, 16, 17, and 18 were selected because these elements are integral to the design process (e.g., indoctrination and training of design personnel, design procedures and drawings, control

of design documents, etc.). In addition, problem areas identified during Audit 88-02 were added to the audit scope to determine whether H&N is now effectively implementing their program in these areas. The programmatic elements that were included in this audit were covered in-depth during Audit 88-02. An audit of all 18 criteria will be conducted in early 1989. As the audit progressed however, the audit scope was broadened to include Criterion I, "Organization," since the audit team wanted to verify whether there were adequate numbers of design personnel to accomplish design activities. Checklists were sufficiently detailed and comprehensive to allow the auditors to conduct an efficient audit for the areas audited. Checklists contained questions that covered the appropriate criteria of Appendix B to 10 CFR Part 50 which were supplemented by additional questions when necessary. Consequently, the scope of the audit was acceptable. The scope of the technical portion of the audit is discussed in Section 4.3.

#### 4.2 Timing of Audit

Since H&N is responsible for design of the underground support systems and the above-ground facilities, the supplemental audit focused primarily on design control and H&N exploratory shaft facility Title I design activities. The above programmatic elements were selected since they are an integral part of the design process. As a result, there were sufficient elements and technical evidence available for review and audit and therefore, the timing of the audit was acceptable. Based on the Standard Deficiency Reports (SDRs) identified by the audit team during this audit, additional audits should be scheduled to provide confidence that the H&N QA Program Plan and QA related activities are being properly implemented.

#### 4.3 Examination of Technical Products

As observers, the staff found that the technical specialists on the team performed acceptable investigations. They were part of the overall team and participated in both the technical and QA areas. This, along with the team coordination by the team leaders, resulted in an integrated review by the entire team. The scope of the technical audit was appropriate and covered areas of the Title I design which are important to the following stage of the design (Title II). The audit also covered areas of interaction with the ESF underground facilities contractor (Fenix & Scission) and other contractors. The audit scope included the following work breakdown structure packages (WBS):

##### WBS Number/Work Package Title

- 1.2.6.2.2.1 - Power Systems
- 1.2.6.2.2.2 - Water Systems
- 1.2.6.2.2.4 - Mine Waste Water System
- 1.2.6.2.2.5 - Communications
- 1.2.6.3.1.7 - Surface Data Building

- 1.2.6.3.1 - Subsurface Data Building
- 1.2.6.7.1.1 - Subsurface Power System
- 1.2.6.7.1.2 - Life Safety System
- 1.2.6.9.3 - Data Cabling

The technical audit team conducted a detailed, methodical examination of all design drawings, documents, and procedures associated with the ESF Title I design in the WBS listed above. For each WBS there was a file which contained the work initiation sheet, and the technical audit team determined this was the proper QA level assigned to the design component. The NRC staff agreed this was the proper determination for the areas selected for this audit. These files were examined for design calculations, analyses, and to determine compliance with the H&N QAPP procedures. Since much of the data in the WBS packages pertained to the electrical discipline, and the electrical technical auditing specialist was unavailable, calculations were not physically verified (see Observation 2 in paragraph 4.3). The auditors used the checklist throughout to guide the audit. They filled out the checklist prior to closing one work package and moving to the next. The drawing packages were examined for correctness and for design interdisciplinary reviews. The audit team examined the reviewers comments and H&N procedures for documenting resolution of the comments, whether H&N agreed with the comments and incorporated it into the design, disagreed with the comments and explained why, or some other response. One area that received considerable discussion is verification of design input (assumptions, test data, etc.) by H&N.

The technical auditors were qualified for this audit. The resume of the lead technical auditor was reviewed in a previous audit at Sandia National Laboratories in addition to observing the technical auditor's performance during that audit. This technical auditor is a Registered Professional Engineer and has over 18 years of experience.

The technical audit team was prepared as evidenced by the audit binder and the checklist No. S89-01-02, which is a set of 11 questions designed to cover all aspects of the audited Title I design. This checklist was filled out by the technical audit team.

Based on its observations, the staff concluded that the DOE technical specialists performed an acceptable investigation.

#### 4.4 Conduct of the Audit

Overall, the conduct of the audit was acceptable. Auditors used the checklist as a starting point and branched out with persistent questions and evaluations.

Deficiencies in QA program implementation were brought to the attention of the audited organization but only those of significant programmatic importance were classified as findings or observations. SDRs were thoroughly supported with specific examples.

No conditions requiring immediate action were identified. However, daily briefings were held with H&N management to accomplish this should it had been necessary.

The audit plan called for an appropriate mix of technical and programmatic activities. Prior to the exit meeting, the audit team discussed their findings and observations along with the basis for these findings with members of the audit team and observers. In addition, each auditor was requested by the Lead Auditor to determine for the respective area audited, whether or not that area had effectively implemented the H&N QA Plan. The net conclusion was that for the design area, the QA Program implementation was marginally effective. Certain elements need greater involvement by the QA organization in the design process to enhance the quality of the product output.

H&N explained to the NRC staff how the design process is implemented from start to finish (See Enclosure 1). For certain phases of the process, there were measures to control and implement changes to a particular design. However, there did not appear to be any controls to assure that if any portion of the design were changed, that the effects of this change would be considered on the overall design. The NRC staff believes the audit team should have reached this conclusion. This was brought to the attention of the audit team prior to the exit meeting and indicated it would be noted in the NRC Observation Audit Report.

The NRC staff did not have the opportunity to observe whether the audit team had actually verified the implementation of a sample or all of the corrective action measures associated with responses to previously identified deficiencies. When this question was asked of the audit team, the response was that the deficiencies and responses were not of such significance to require physical verification. The NRC staff indicated that it would recommend for all future audits, that DOE/YMPO audit teams take a representative sample of the deficiency responses and actually verify their implementation.

The NRC staff observed that when an SDR had not been responded to, another SDR was issued. The NRC staff recommended at the NRC exit meeting with audit team members, that the DOE/YMPO should have a mechanism whereby if the response to an SDR is inadequate, it should be elevated to the next higher level of management to obtain satisfactory corrective action. The DOE/YMPO indicated to the NRC staff that such a mechanism is presently being drafted to elevate an inadequate SDR response to the YMPO Project Manager.

#### 4.5 Qualification of the Auditors

As part of its effort to more efficiently observe the DOE audit program, the NRC staff has conducted a review of the SAIC QA auditors who could be used on DOE/YMPO audit teams and the procedure used to qualify them. The results of this review are contained in the NRC staff observation report

covering the DOE/YMPO audit of the U. S. Geological Survey (John J. Linehan (NRC) letter to Ralph Stein (DOE) dated August 22, 1988). Based on this review, the NRC staff concluded that the DOE/YMPO QA auditors available for audits were acceptably qualified to perform QA audits. In addition, as a result of its review of QMP-02-02, "Qualification of Quality Assurance Program Audit Personnel," the NRC staff concluded any new auditors qualified using this procedure would also be acceptable. Since the qualifications of the auditors on the team were reviewed by the NRC staff or were qualified using QMP-02-02, the NRC staff finds the team qualified.

During this audit, a newly hired DOE/YMPO individual participated as an auditor candidate under the supervision of a trained auditor. The NRC staff observed this individual and noted this individual's participation in the audit was acceptable. This individual's qualification process will be observed during future audits.

#### 4.6 Audit Team Preparation

The auditors were well prepared in the areas they were assigned to audit and knowledgeable in the QA Program Plan and implementing procedures. The audit plan overall was complete and included the necessary information to support the audit. This included: (1) the audit scope; (2) a list of audit personnel and observers; (3) a list of all the audit activities; (4) a copy of the notification letter; (5) copies of the H&N QAPP, procedures, past audit reports, and work breakdown structure activities; and (6) copies of the QA and technical checklists. Implementing procedures were not only audited for compliance but for QA and technical adequacy as well. This resulted in SDR's being issued for either an ineffective procedure or the total absence of a procedure to accomplish a certain quality function.

As the audit progressed, documented checklists were revised to add additional questions to enable a more detailed in-depth review. Where possible, checklist questions that were able to be answered prior to the audit were completed to allow more effective use of the auditor's time.

#### 4.7 Conduct of Meetings

The overall conduct of the pre-audit and post-audit conferences by the audit team was acceptable. During the pre-audit conference, the scope of the audit was clearly defined, requirements documents were identified, contacts were established, and questions or comments were encouraged. At the post-audit conference, the SDRs, observations, and recommendations were, in general, explained well and the H&N personnel were given the opportunity to respond. This is consistent with QMP-18-01 and standard auditing practice.

Daily caucuses were held with the audit team and observers to address the progress and results of the audit and to include improved changes in auditing assignments as necessary. In addition, the auditors, during their daily auditing process, kept the audit observers fully informed of what they were doing.

#### 4.8 Audit Team Coordination

The overall coordination of the audit team was acceptable. The Lead Auditor shifted resources to assure that each criterion was audited thoroughly. Daily caucuses were held to discuss individual findings to determine their significance and whether such findings indicated a trend or impacted on other areas. For example, when a particular area or criterion indicated no apparent problems, the Lead Auditor would direct a particular auditor to assist other auditors in areas indicating potential problems. This type of coordination assured that existing auditing resources were used in the most productive and efficient manner.

#### 4.9 Audit Team Independence

None of the audit team had any direct responsibility for performing the activities they investigated. This conclusion is based on the fact that primarily individuals from SAIC made-up the team, and none of the team members was responsible for reviewing, approving, or implementing the H&N QA program. Members of the team did have sufficient authority to make the audit meaningful and effective.

#### 4.10 Summary of Observations

Based on the information contained in the previous sections, the NRC staff has identified areas where improvements should be considered. DOE/YMPO should review the NRC staff observations and provide a response describing how these will be considered in future audits.

##### Observation 1

The H&N staff explained how their overall design process is implemented from start to completion (see Enclosure 1). The NRC staff observed that if any portion of this design were changed, there were no definitive controls covering the impact of this change on other aspects of the design. In this regard, consideration should be given to develop controls to improve this area. It appeared to the NRC staff that the audit team did not reach this conclusion. (Section 4.4)

##### Observation 2

Much of the technical data in the Work Breakdown Structure Packages pertained to the electrical discipline. During this audit, the technical auditing specialist in this discipline was unavailable due to previous workload commitments and priorities. Consequently, in the electrical area,



checks of the calculations and verification of design analysis were not performed. For future audits, there should be sufficient planning to allow technical auditors to perform technical reviews e.g. calculations, specification checks, etc. (Section 4.3)

### Observation 3

The Audit Plan contained a Deficiency Matrix indicating the appropriate SDR number and the applicable program element previously identified through DOE/YMPO audits. The use of the Deficiency Matrix was a recommendation by the NRC staff resulting from the USGS audit in June 1988. The corrective actions and close-out for these deficiencies should be, when applicable, verified more thoroughly and not just accepted as written, as they were in this audit. (Section 4.4)

## 5.0 Preliminary SDRs of the DOE/YMPO Audit Team

As a result of the audit, the DOE/YMPO team has tentatively identified 10 deficiencies, 14 observations and 3 recommendations. The more substantive deficiencies are as follows:

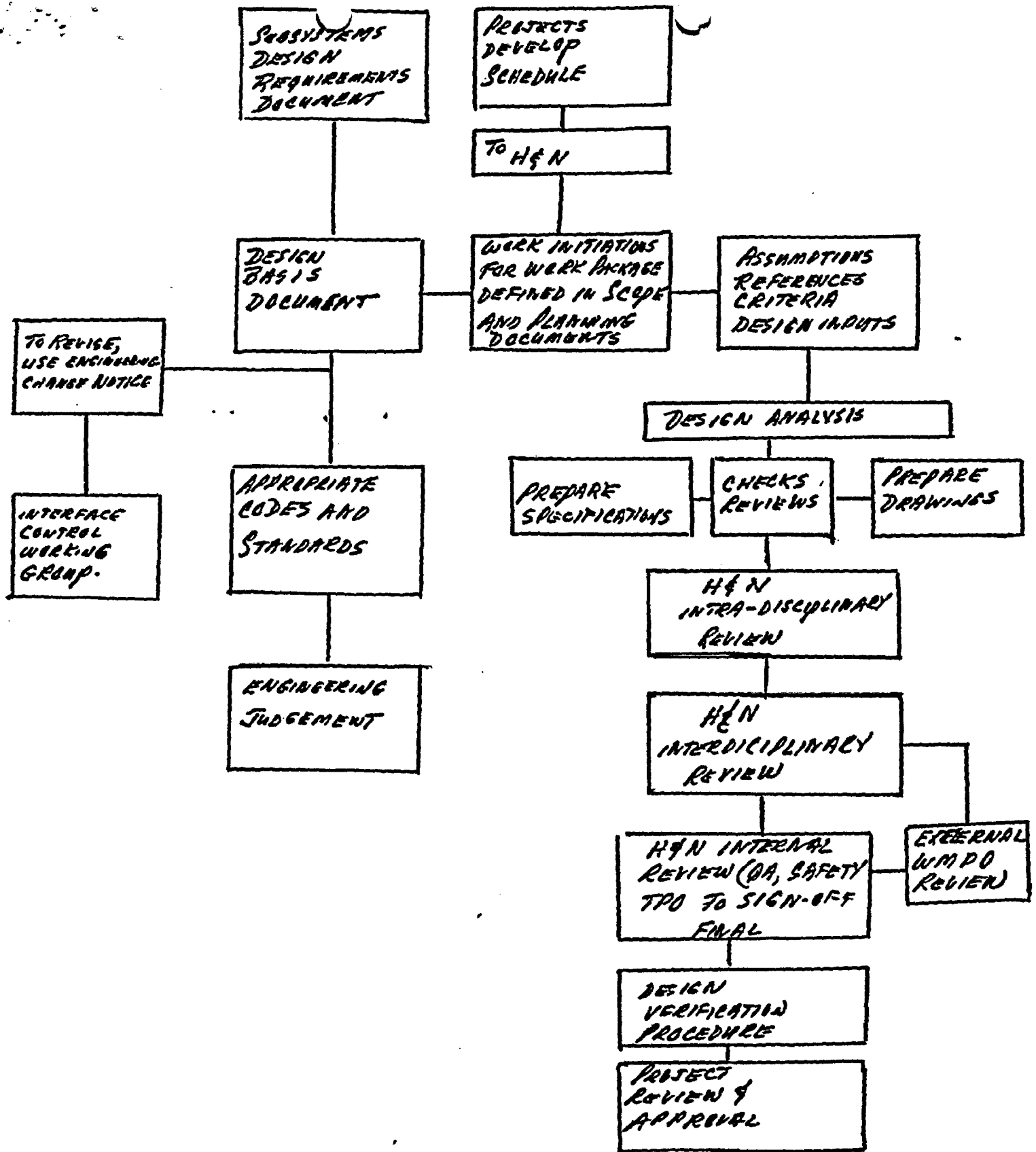
- The implementing procedure for design analysis requires that calculations be orderly and complete so that work can be understood, reviewed, and verified by other knowledgeable individuals. The design analysis for an electrical calculations and one civil calculation did not meet this criteria.
- Work initiation packages and design basis documents were not updated to the current revised design output packages.
- No evidence of drafting checks were being performed on drawings. H&N however, states these checks were performed.
- Specifications were not being checked as required by the specification and control procedure.
- H&N audit reports did not contain a direct statement of effectiveness.
- The H&N audit schedule did not contain provisions for auditing criteria 16 "Corrective Action" and 18, "Audits".
- There was no procedure to control design basis documents.
- There was no implementing procedure to cover QA Level I and II procurement activities.

- H&N procedures do not contain quantitative and qualitative acceptance criteria for determining that prescribed activities have been satisfactorily accomplished.

#### 6.0 NRC Conclusion

The NRC concluded that the overall audit was acceptable in that it reached the conclusion that the H&N QA Program was lacking in effective QA Program procedures for certain aspects of the design activities. However, in spite of this weakness, the overall design activities within H&N appeared to be carried out in a disciplined manner and the backup design documentation appeared to adequately support the designs. It should be noted that the adequacy of the design bases provided by DOE to its contractors, however, has been questioned by the NRC staff and is undergoing review in DOE's Design Acceptability Analysis for the Exploratory Shaft Title I design.

The NRC staff has identified some improvements in Section 4.3 of this report that should be corrected to enhance the effectiveness of future audits.



H&N DESIGN PROCESS  
(ENCLOSURE 1)