

QUALITY ASSURANCE PROGRAM

TOPICAL REPORT  
GIBSAR - 17-A

GIBBS & HILL INC.  
ENGINEERS, DESIGNERS, CONSTRUCTORS  
NEW YORK, NEW YORK

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## MANAGEMENT POLICY STATEMENT

This Quality Assurance Program Topical Report establishes the Gibbs & Hill corporate policies, goals, objectives and references the procedures to be followed by all G&H offices during the design and engineering, procurement, fabrication and construction activities related to nuclear power projects. This program has been developed over many years of company experience in nuclear power and related work to provide confidence that the completed facility will perform in accordance with prescribed requirements in a safe and reliable manner.

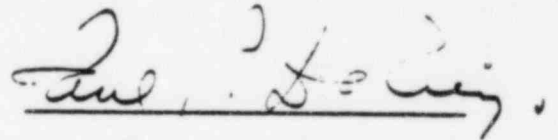
The Quality Assurance Program Topical Report is applicable to Gibbs & Hill activities involving nuclear safety-related systems, structures and components as defined in Gibbs & Hill's contractual scope. It is intended that this program comply with the requirements of Appendix B to 10 CFR Part 50 "Quality Assurance Criteria for Nuclear Power Facilities," and other regulatory criteria and applicable national codes and standards as specified elsewhere in this document.

Gibbs & Hill management recognizes Quality Assurance to be an interdisciplinary function requiring the full participation of all personnel involved in a nuclear project in order to be meaningful and effective. The authority to establish and implement this G&H Quality Assurance Program is delegated by company management, to the Quality Assurance Manager and covers

all quality assurance and quality-related activities performed by and for Gibbs & Hill in all G&H offices.

Procedures to satisfy the program set forth in this document have been incorporated into the G&H Quality Assurance Manual which delineates the methods to be followed in complying with the requirements of this QA Program. All employees associated with G&H nuclear projects are required to become familiar with the procedures of the Quality Assurance Manual and to conform to those procedures that are applicable to their respective assignments.

This program is subject to periodic revision and all holders will be furnished revisions and additions as they are issued. It is the responsibility of each program holder to maintain his document current.



P.P. DeRienzo

Vice President, Consulting  
Engineering, Quality  
Assurance and New Technology

## INTRODUCTION

This topical report describes the Gibbs & Hill Quality Assurance Program and sets forth the methods to be followed in controlling quality-related activities performed by Gibbs & Hill and its contractors. This program has been developed over many years of company experience in nuclear power and related work, and defines a system found effective in providing independent control of quality-related functions and documentation.

The scope of this report covers activities involving nuclear safety-related structures, systems, and components covered by Gibbs & Hill's contractual obligation to the Utility Owner for each project.

It is intended that this topical report will be reviewed periodically, at least annually, to assess adequacy of compliance with quality assurance objectives, and that amendments will be submitted as necessary to keep current with changing regulatory requirements. The program described herein is now in effect, except for specific projects too far along to incorporate new requirements. Activities on affected nuclear projects are following the procedures outlined in this report. Modifications established in future amendments to this report will be applied to active projects at the time of submittal of the amendment, but will not be automatically backfitted to previously performed activities.

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QUALITY ASSURANCE

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17.1 QUALITY ASSURANCE DURING DESIGN AND CONSTRUCTION

17.1.1 ORGANIZATION

17.1.1.1 General

Gibbs & Hill, Inc. (G&H) provides an integrated project organization and program to administer, engineer, design and construct, or manage the construction of, as applicable, nuclear power plants. Quality Assurance (QA) personnel are assigned to each project to determine that the QA Program is effectively implemented and executed. The program establishes conformance with applicable regulatory requirements and with the design bases specified in the license application. Job functional descriptions are written for each project level position related to quality functions, and included in the G&H Quality Assurance Manual. The descriptions delineate the reporting functions, internal and external interfaces, and the duties and responsibilities assigned to each position.

#### 17.1.1.2 Corporate Management Organization

The G&H Corporate Management Organization is shown on Figure 17.1-1. The Vice President, Consulting Engineering, Quality Assurance and New Technology, who is accountable to a Senior Vice President, is the G&H corporate officer directly responsible for the QA program for all G&H offices. Correspondingly, the QA Manager, who reports directly to the Vice President, is responsible for the QA Department and is delegated the authority to implement and administer the QA Program at all G&H offices, facilities and construction sites.

New York Office project management activities are headed by the Vice President, Power Projects who in turn reports to a Senior Vice President. Each project is assigned a project manager, who reports to the Vice President, Power Projects normally via a Manager of Projects.

New York Office engineering and design activities are headed by the Vice President, Power Engineering who reports to a Senior Vice President. The Manager, Mechanical Engineering; Manager, Structural and Hydro Engineering; Manager, Electrical Engineering; Manager, Advanced Technology; Manager, Analytics; and the Manager of Design report to the Vice President, Power Engineering. Each of their departments supply the technical personnel assigned to staff a particular project and work as a

team under the administrative responsibility of a project manager.

The Vice President, Consulting Engineering, Quality Assurance and New Technology; the Vice President, Power Projects; and the Vice President, Power Engineering all report to the same Senior Vice President who in turn reports to the President.

Regional offices are headed by a Vice President, Regional Office. These Vice Presidents report to the Vice President, Manager of Regional Offices, who in turn reports to the President. For quality assurance related matters, however, Vice Presidents of the regional offices and the Vice President, Manager of Regional Offices report to the Senior Vice President responsible for quality assurance.

All nuclear safety-related engineering and design activities at the regional offices are headed by a Manager who reports to the Vice President, Regional Office. Project managers, chief engineers and engineering and design personnel report to these Managers. Technical personnel are assigned to staff a particular project and work as a team under the administrative responsibility of a project manager. QA personnel assigned to staff a particular project are responsible to the G&H QA Manager.

New York Office procurement activities are headed by the Manager, Purchasing, who reports to the Senior Vice President responsible

for procurement activities via the Manager, Support Services. The Manager, Purchasing is responsible for the establishment and maintenance of a corporate list of approved bidders for nuclear safety-related items and services; coordinates preparation of the Instruction to Bidders and Terms and Conditions sections of the procurement document; and administers all purchasing and expediting aspects related to procurement functions. | 6

Procurement activities in the regional offices are headed by a Manager, Purchasing who is responsible to the Vice President, Regional Office. Purchasing Managers are responsible for coordinating with the Manager, Purchasing, New York Office to maintain the corporate list of approved bidders for nuclear safety related items. Managers, Purchasing in the regional offices are responsible for preparation of commercial bid documents; review and evaluation of bid proposals; preparation of contract and purchase order documents and coordination of the expediting aspects related to procurement. 6

Construction activities, performed as part of a G&H project, are coordinated by the Manager, Construction Liaison, who reports directly to the President. For quality assurance related matters, however, this manager is accountable to the Senior Vice President responsible for quality assurance.

The G&H QA Manager is also responsible for Quality Control (QC)

activities such as vendor shop surveillance and construction site QC functions.

The Vice President, Consulting Engineering, Quality Assurance and New Technology and the other Vice Presidents engaged in nuclear safety related activities are responsible for reviewing the G&H Quality Assurance Manual in accordance with corporate policies, goals and objectives. These Vice Presidents are also responsible for performing an annual management review of their respective departments to confirm the implementation and adequacy of the G&H corporate QA Program and procedures.

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### 17.1.1.3 Project Organization

An example of the organization of basic administrative and technical staffs for a project, responsible for carrying out all project activities to successful completion is shown on Figure 17.1-3. The interconnecting lines show the flow of responsibility and accountability for administration and technical direction, and for QA functions. At the start of a definitive project, a project manager is appointed to establish and maintain project relations with the Utility Owner, principal suppliers and constructors, and to direct and guide the engineering, design, procurement, and site construction functions to the extent of G&H contractual obligations to the Utility Owner, including the incorporation of the desired degree of quality in the engineering and design, procurement, and construction phases, as applicable.

The project manager's functions, with regard to quality-related activities, are in accordance with the duties prescribed in detailed written procedures in the G&H Quality Assurance Manual.

#### 17.1.1.4 QA Department

The QA Department performs the functions necessary to provide confidence that all safety-related structures, systems, and components of a nuclear power plant project conform to the design bases and the technical specifications set forth in a Safety Analysis Report (SAR), Nuclear Regulatory Commission (NRC) Regulatory criteria, and applicable national codes and standards. This department is headed by the QA Manager who is responsible for developing and maintaining QA procedures, and for periodically auditing the records of their application to verify that they are being properly implemented, thus establishing confidence that the desired level of quality is being achieved. The QA Department is completely separate, and functions independently of those persons or groups having specific project engineering and design, scheduling, or budgetary responsibilities. Independence is maintained by having the QA Manager report directly to the Vice President, Consulting Engineering, Quality Assurance and New Technology, as discussed in subsection 17.1.1.2. G&H requires that the QA Manager, as a minimum: a. be a degreed engineer; b. have 10 or more years of engineering experience; c. have five or more years of combined experience in nuclear power and quality assurance activities; and d. preferably have had responsible control of the QA program for essentially the entire engineering, design, procurement, and construction phases of at least one nuclear power plant. The



organization of the QA Department is shown on Figure 17.1-4.

The QA Department has four main functional responsibilities:

- a. to establish and approve QA and QC requirements and criteria;
- b. to review engineering and design documents for procurement and construction to verify that all nuclear safety requirements have been incorporated;
- c. to provide surveillance of all QA activities in all G&H offices, during the engineering and design, procurement, and construction phases to determine that all on-line and specified independent design verification procedures and quality control procedures have, in fact been applied to all processes-engineering, design, procurement, manufacture, fabrication, assembly, construction, erection, installation, and preparation for startup; and that all activities have been properly documented, whether at G&H facilities or at facilities of suppliers, constructors, and their subcontractors (to the extent of G&H contractual obligations to the Utility Owner); and
- d. to audit at regular intervals, by examination and evaluation, the objective evidence provided by documentation accumulated internally and externally in the normal course of the processes involved and during surveillance activities at G&H offices, at the supplier's facilities, and at the nuclear plant site. Audits are performed by the G&H QA Department in accordance with written procedures and checklists to verify compliance with all aspects of the G&H QA Program and to recommend, where indicated, improvements or modifications, with management followup where

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required, including reaudit of the deficient areas. The review and audit functions of the QA Department are described in written procedures contained in the G&H Quality Assurance Manual.

The G&H QA Manager, assisted by the Assistant QA Manager, assigns a project QA supervisor, a project QA engineer, vendor QA supervisor and a site QA supervisor for the project. They are responsible for reviews and audits of engineering, design, and procurement activities, and auditing site construction and QC activities, respectively. The project QA supervisor is responsible to supervise the daily activities of the project QA engineer. Further, the project QA engineer is assisted in his work by additional engineers on the QA Department staff assigned by the QA Manager, as necessary. The vendor QA supervisor is similarly assisted by additional QA representatives. The site QA supervisor is assisted by site QA engineers and site QC engineers. Audits include the review of conceptual documents involving nuclear safety-related structures, systems, and components, as necessary to demonstrate compliance with the QA Program for the particular project.

The project QA engineer is further responsible for surveillance to determine that independent design verification of documents pertaining to nuclear safety-related items has been adequately performed by the assigned design review engineers. The project

QA engineer is authorized to require revision to design documents as necessary to satisfy compliance with the established design bases and regulatory requirements.

Engineers representing the major disciplines, and qualified by training and experience in engineering and design of similar structures, systems, and components, are assigned by their respective chief engineers to perform independent design review and verification. Design review engineers review the conceptual documents related to nuclear safety-related structures, systems, or components as necessary to determine whether they comply with the requirements of the safety-related design bases established in the project Preliminary Safety Analysis Report (PSAR).

Design verification covers G&H originated work as well as proper use of those portions of documents prepared by others which relate to interfaces with G&H systems, structures, and components. The implementation of design verification comments is subjected to periodic surveillance and audit by the QA Department.

Surveillance activities in vendor shops are carried out by QA personnel experienced in surveillance of manufacturing and fabricating QC procedures, tests, material certifications, nondestructive examination, welding, and other specialized functions and qualified in accordance with American National Standards Institute (ANSI) N45.2.6 or SNTC-1A as appropriate for

the activities being performed. When continuous surveillance is needed, a resident vendor QA representative will be stationed at the vendor's facility. Vendor surveillance is performed in accordance with checklists prepared by QA personnel and subject to approval by the vendor QA supervisor.

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A site QA supervisor assigned to the nuclear plant construction site reports to the G&H QA Manager. He establishes an onsite staff of technical personnel experienced in construction methods and techniques, and is knowledgeable in QA procedures and requirements.

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G&H site QA personnel prepare QA procedures and checklists, subject to approval by the G&H QA Manager, related to the QA auditing of construction, erection, and installation of all structures and equipment important to nuclear safety throughout the area of the facility. Based on these procedures, they audit the site QC and construction activities of the constructor to determine if compliance with the project QC and QA requirements is being achieved.

This is accomplished by random witnessing of construction and inspection activities, as well as by reviewing the constructor's QC documentation for accuracy and completeness. Where nonconformances are found to exist, the G&H site QA supervisor reports his findings to the constructor's site superintendent and requests that work be stopped or corrections made, subject to

rejection of the work. When such a request is made, the G&H site QA supervisor notifies the Utility Owner's site representative, the G&H project manager and the G&H QA Manager, of the situation and advises them of his recommendation for work stoppage.

#### 17.1.1.5 Project Operation

The G&H project manager is appointed to direct and guide all activities (except those delegated to the QA Manager) of the various phases of the project under the contractual obligations of G&H to the Utility Owner. As such, he is responsible for overseeing the direct implementation of those QA procedures applicable to the work of the project staff. He receives technical support from specific engineering, design and construction staffs which are assigned to the project. The project manager is in direct communication with the project QA supervisor, and with pertinent QA personnel on his project as described in subsection 17.1.1.3 and as depicted in Figure 17.1-3.

The project manager deals directly with the Utility Owner, suppliers and constructors, and has the authority to stop work on engineering and design activities performed by G&H as well as authority to reject delivery of nonconforming structures, systems, or components as identified by QA surveillance activities. Surveillance is conducted by QA personnel in accordance with the G&H Quality Assurance Manual, using vendor surveillance checklists to ascertain that the supplier's manufacturing, inspection, testing and documentation activities are effectively implemented. In addition, a QA Release Form is used to record the final surveillance and review of documentation

to verify that the equipment is in conformance with the procurement document and that there are no unresolved nonconformances or deviations. No equipment can be shipped by a supplier until a G&H QA Release Form is complete and signed by a G&H QA representative.

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The engineering staffs receive their authority from the discipline job engineers who are, in turn, responsible to the discipline chief engineers and to the project manager. The design staffs receive their authority from the discipline squad leaders who are, in turn, responsible to the supervising design engineers and to the job engineers of the pertinent disciplines. The engineering and design staffs identify quality requirements applicable to nuclear safety-related structures, systems, and components, from sources such as the Regulatory Guides and applicable codes and standards, and incorporate them in the project design documents. Furthermore, they take adequate measures to ascertain that both internal and external interfaces are properly identified, so that all parties affected are duly notified to enable them to properly coordinate their work. The assigned job engineers also consider quality requirements when they review the work of their staffs to preclude nonconformances, or to identify them when they occur and institute corrective action, with a further review to ascertain that the corrective action has been taken.

The site construction staff is functionally responsible to the project manager for project related activities and to the Manager, Construction Liaison for technical and administrative control. (See Figure 17.1-3)

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The project QA supervisor maintains close contact with the project manager to coordinate QA activities with the progress of the project. The project QA supervisor oversees the project QA engineer and the site QA supervisor assigned to the project. The project QA engineer identifies quality-related problems, initiates or recommends solutions, and verifies implementation of corrective measures. Corrective action is requested as a result of QA audits or reviews. During the course of an audit or review all nonconformances found are identified to applicable instructions, procedures, regulatory criteria, codes or standards and are recorded on an audit report or QA Document Review Record Sheet. A copy of the audit report or QA Document Review Record Sheet is issued to the project manager and the applicable discipline/department, with instructions to provide a corrective action reply to the audit report or revise the applicable document to incorporate the comments noted on the QA Document Review Record Sheet and return it to the QA Department within a specified time limit. Where corrective action is not completed or is inadequate, the QA Manager has the authority to require the project manager to exercise his stop work or reject authority as previously described. Where disagreement as to corrective action

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cannot be resolved between QA and other department personnel within a project, the QA Manager will consult with the appropriate discipline chief engineer/department manager to establish appropriate corrective action.

Should resolution not occur at this level, the QA Manager will bring the matter to the attention of the responsible Vice President for action. If resolution acceptable to QA is not reached at this level of management, the problem is taken to the Vice President, Consulting Engineering, QA, and New Technology who interfaces with the responsible Vice President and ultimately to the Senior Vice President responsible for QA who makes the final decision for the corporation.

The G&H site QA supervisor performs surveillances and audits of quality-related activities of the construction manager, the constructors, and their subcontractors at the site, to identify problem areas, recommend solutions, and verify corrective action. Stop work authority at the construction site would be exercised through the appropriate Utility Owner's representative who has the authority to require work stoppage on a timely basis. Additional follow-up surveillance will be performed to verify that the nonconforming activity has been halted. This authority could be delegated to the G&H site QA supervisor in accordance with project contractual scope.

The project QA engineer's and the site QA supervisor's duties and responsibilities are described in subsection 17.1.1.4. Detailed job function descriptions are provided in the G&H Quality Assurance Manual. (They are guided in the performance of their functions by written procedures contained in the G&H Quality Assurance Manual.)

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### 17.1.2 QA PROGRAM

G&H has an established QA Program to be followed by all G&H offices for the management, engineering and design, procurement and construction phases of its work on nuclear power plant projects, based on extensive experience in the engineering, design, procurement, and construction of similar nuclear and conventional power-generating facilities. This program delineates the organization, functions, responsibilities, and procedures in effect for nuclear power plant projects within G&H, as defined by contractual obligations to the Utility Owner, and is intended to comply with the criteria specified in Appendix B to 10 CFR Part 50. The program is further designed to comply with the supplementary requirements of the American National Standards Institute (ANSI) N45.2 series standards as well as the NRC Regulatory Guides applicable to quality requirements as referenced in Appendix A of this document subject to contractual obligations with the Utility Owner. This program covers all those nuclear safety-related structures, systems, and components included in the PSAR submitted for a specific project and identified as Seismic Category I, in accordance with USNRC Regulatory Guide 1.29, or Class 1, 2 or 3, in accordance with ANSI N18.2 corresponding to quality groups A, B or C of USNRC Regulatory Guide 1.26.

The procedures established to meet the requirements of the G&H QA Program and the NRC Regulatory Guide 1.70.6 are set forth in

the G&H Quality Assurance Manual. For the control of quality-related project activities the Management Policy Statement which prefaces the Manual mandates the application of the approved Manual procedures to all nuclear projects. Figure 17.1-5 is a matrix showing the interrelations of the QA Manual procedures with the 18 criteria of Appendix B to 10 CFR Part 50. The arrangement of this manual and its various sections, with a listing of individual procedures, is outlined in Table 17.1-1. Procedure for Control of Distribution and Revisions of the Quality Assurance Manual, QAI-D1 of the G&H Quality Assurance Manual establishes those management persons responsible for generating and reviewing changes for updating and improving the QA Program procedures. Requests for proposed changes to the G&H Quality Assurance Manual must be approved by the chief engineer/department manager of the involved discipline/department and the QA Manager. When the proposed draft text of the change is completed it must then be approved by the following management personnel:

- a. QA Manager
- b. Manager, Support Services (procurement related procedures)
- c. Vice President, Power Projects
- d. Vice President, Power Engineering

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e. Vice Presidents of regional offices engaged in safety-related work.

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f. Vice President, Consulting Engineering, QA and New Technology

g. Manager, Construction Liaison (construction-related procedures)

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h. Senior Vice President responsible for QA

The QA Department is responsible for the distribution and accountability of the Quality Assurance Manual. The QA Department prepares, issues and maintains a Quality Assurance Manual Holder's List that identifies by name and book number those personnel, both internal and external, who have received copies of the manual. Initial issuance of Quality Assurance Manuals, as well as additions or revisions to the manual are accomplished by use of a cover memo which requires the recipient to sign the acknowledgement section of the cover memo and return it to the QA Department to document their receipt of the manual or revisions.

The G&H QA Program is available prior to the initiation of any nuclear safety-related activity which the Utility Owner may require for submittal of his application for a construction permit. The QA procedures of this program have been reviewed and accepted by responsible management personnel which assures their timely implementation with the commencement of any nuclear

safety-related activity, by properly trained and qualified engineering, design, and administrative personnel. To further satisfy this requirement the G&H QA Manager assigns a project QA supervisor and a project QA engineer at the start of a project to ascertain that the Quality Assurance Manual procedures are being implemented from the onset of any work on activities involving nuclear safety-related structures, systems, and components.

The written procedures specified in the Quality Assurance Manual are designed to demonstrate that the requirements stated in a project SAR are fully complied with and integrated in the engineering and design, procurement, and construction phases. The personnel engaged in the QA functions of surveillance and auditing the implementation and documentation of these procedures are appropriately trained, and experienced in performing their functions. Furthermore, the program is reviewed periodically by G&H Management in accordance with the requirements of the Quality Assurance Manual to ascertain the effectiveness in complying with the criteria of Appendix B to 10 CFR Part 50, and applicable Regulatory Guides.

Engineering and design activities affecting the quality of nuclear safety-related structures, systems, and components, as identified in the Q-List of the Utility Owner's PSAR, are subject to independent design verification as detailed in the G&H Quality Assurance Manual.

Also those Regulatory Guides applicable to a nuclear project will be referenced in the Utility Owner's PSAR. These, and Regulatory Guides issued subsequently during the design phase of the project, which have been reviewed in accordance with the written procedures of the G&H Quality Assurance Manual and judged applicable to the project, will be incorporated in the engineering and design activities. Control of the implementation of these Regulatory Guide requirements, or acceptable alternatives, will be subject to engineering and design verification and QA surveillance activities as described in subsection 17.1.3 of this Chapter.

G&H also has a continuing program to maintain an awareness of the capability of potential suppliers of nuclear safety-related items to meet the requirements of Appendix B to 10 CFR Part 50. A list of potentially qualified bidders is established in accordance with the requirements of the G&H Quality Assurance Manual and established procedures of the G&H Purchasing Department.

This qualification of potential suppliers is subject to review and acceptance by QA Department personnel in accordance with the procedures of the G&H Quality Assurance Manual. G&H requires that suppliers and constructors have established QA Programs and procedures which set forth their organization and program in accordance with Appendix B to 10 CFR Part 50, and establish the adequacy of their identification measures, their testing and

inspection activities with suitable instrumentation and equipment, and their documentation.

G&H requires for its work, and will require from contractors and subcontractors, the development and maintenance of documents and records in accordance with the guidelines prescribed in ANSI N45.2.9, and delineated in the G&H Quality Assurance Manual procedures. Further requirements will be imposed on suppliers and constructors to develop and implement adequate procedures for tagging and identifying structures, systems, and components, as discussed in subsequent subsections of this chapter. Transfer of such records under the jurisdiction of G&H will conform to the procedures established by the Utility Owner in his QA Program. Such records will include, as a minimum: a. material certification and test data for traceability and quality verification; b. reports of inspection, examinations, and test results for verification of conformance; c. drawings, specifications, procedures, and instructions for use in control of configuration; and d. records of deviations and their resolutions.

Personnel engaged in QA activities are indoctrinated or trained as necessary to responsibly perform functions as required by the procedures of the G&H Quality Assurance Manual. QA Seminars initiated by the QA Manager are designed to provide instruction in the understanding of the QA Program requirements and implementing the Quality Assurance Manual procedures. Seminars



are presented as necessitated by the number of new hires or transfers into the area of nuclear responsibility and are mandatory for all designers, engineers and project personnel having responsible input to a nuclear power plant. In addition, when major changes to the Quality Assurance Manual are issued, new QA Seminars are scheduled to indoctrinate personnel engaged in QA activities as to the new requirements of the manual procedures. Specialized indoctrination courses in specific areas of nuclear and structural engineering and design are also provided to familiarize new personnel with the requirements peculiar to the development of a nuclear power plant and related quality requirements. Responsibility for the development and implementation of these specialized indoctrination courses rests with the appropriate divisional management. These programs are documented as to general course content, length, and schedule of the course and records of attendance are maintained for the QA indoctrination sessions. The QA Department has the independence and authority necessary to determine the effectiveness of this indoctrination and training program. The indoctrination and training program is implemented by G&H management personnel in accordance with the written procedures in the G&H Quality Assurance Manual. QA Department personnel indoctrination and training program is organized and implemented by the QA Manager for all new QA personnel, to establish an understanding of the duties and responsibilities of the G&H Quality Assurance Program and Manual. This indoctrination and training program establishes

familiarity with Appendix B to 10 CFR Part 50, appropriate NRC criteria, ANSI Standards, industry codes and standards and the methods for performing audits and reviews of design and engineering, procurement, project administration, site and supplier shop activities. The program is also designed to develop understanding, knowledge and implementation of the G&H Quality Assurance Program and Manual aims and objectives; to establish that all QA personnel are at an adequate level of proficiency for performing their assigned duties and responsibilities; and that this level of proficiency is maintained by retraining as required.

The G&H QA Program is subject to review and audit for the adequacy of implementation by the Utility Owner, for whom it is being applied, in accordance with the requirements of the Utility Owner's QA Program defined in his PSAR submittal.

### 17.1.3 DESIGN CONTROL

#### 17.1.3.1 General

G&H has formulated control procedures for the engineering and design of all nuclear projects. These procedures are intended to attain high levels of quality commensurate with the importance of the safety functions to be performed by the structures, systems, and components. The engineering and design control procedures are applied to activities such as: reactor physics, stress, thermal, hydraulic, radiation, and accident analyses; determination of materials compatibility; provision of accessibility for inservice inspection, operation, maintenance and repair; and delineation of acceptance criteria for inspections and tests. These procedures are used in the preparation of technical descriptions; structural design criteria; analysis and calculations; specification and drawings; engineering check of vendor equipment drawings; and for the independent design verification of engineering and design documents. Design documents that are changed or corrected, for whatever reason, are subject to the same procedures as the original issue.

Interface requirements of the foregoing, among participating groups, are also controlled by the pertinent procedures of the G&H Quality Assurance Manual. Control for the distribution of G&H engineering and design documents is described in

subsection 17.1.6.

#### 17.1.3.2 Performance of Work

The work performed by G&H is, where applicable, governed or guided by established and recognized codes, standards, and criteria. Regulatory requirements defining the mandatory criteria and other conditions for acceptance of a project or parts thereof set forth by public authorities having jurisdictions in the area of such facilities will be referenced or stated in other chapters of the pertinent Utility Owner's PSAR. In addition to these statutory documents, other widely accepted industry standards are used as guidelines for performing engineering and design for nuclear power generating stations.

The determination of applicable NRC Regulatory Guides, codes, and standards is the responsibility of the discipline chief engineers in accordance with the Quality Assurance Manual procedures. The Chief Nuclear Engineer is delegated the responsibility of obtaining copies of the pertinent documents and for their distribution within G&H.

At the start of a project, the Project Manager undertakes the compilation, editing and issuance of a Project Guide for which he is responsible. The Project Guide is prepared primarily for in-house use and contains in a single document, both the administrative guidelines and reporting instructions required for the execution of G&H work. It gives all personnel assigned to the project an overall understanding of the total project, the

Utility Owner, and the detailed scope of work. It may also include brief descriptions of salient technical feature and QA requirements, although the applicable PSAR is referenced for definitive technical details.

The G&H engineering and design activities are subject to periodic audits by the QA Department in accordance with the G&H Quality Assurance Manual.

### 17.1.3.3 Control of Engineering and Design

The Quality Assurance Manual outlines the control of activities followed to develop the high quality of engineering and design required for nuclear projects. Any deviations or changes to these procedures are subject to review and control of the QA Department. Job engineers, supervising design engineers, and design squad leaders have the responsibility for implementation of the requirements of applicable NRC documents and ANSI Codes and Standards in activities under their jurisdiction. Design Review Engineers are further responsible, during performance of independent design verification to determine that applicable information, guidelines, or directives have been in fact, incorporated into engineering and design documents as required.

#### 17.1.3.3.1 Preparation of Q-List

A Q-List is prepared to identify and classify structures, systems, and components of the nuclear power plant required to perform safety-related functions. This list identifies those items which require consideration by the G&H QA Program with regard to design, procurement, fabrication, and installation. Criteria for the selection of items that shall be considered safety-related, and the safety class to be used are defined in Section 50.55a, Codes and Standards of 10 CFR Part 50, in NRC Regulatory Guide 1.26, Quality Group Classifications and Standards for Water, Steam, and Radioactive-waste-containing Components of Nuclear Plants and in NRC Regulatory Guide 1.29, Seismic Design Classification. These documents are supplemented by ANSI N18.2, Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants; and ANS-22N-212, Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants. Q-Lists are prepared, and are subject to independent design verification, in accordance with the written procedures of the G&H Quality Assurance Manual.



#### 17.1.3.3.2 Preparation of Technical Descriptions and Structural Design Criteria

Technical descriptions and structural design criteria are prepared to provide relevant technical information required for the preparation of G&H engineering and design documents for nuclear safety-related systems and components, and Seismic Category I structures. These documents are prepared, and are subject to independent design verification, in accordance with the written procedures of the G&H Quality Assurance Manual.

The original technical descriptions and structural design criteria are developed based on the scope of G&H responsibilities as delineated in the Project Guide and commitments made in the Utility Owner's PSAR. Periodic revisions to technical descriptions and structural design criteria are made when necessitated by engineering design changes or subsequent development of more detailed information. These revisions are subject to the same reviews as the original document. These documents are therefore, available to engineering and design personnel to assist them in performing their activities in accordance with the Utility Owner's PSAR.

#### 17.1.3.3.3 Preparation of Analyses and Calculations

Analyses and calculations are required for establishing detailed engineering and design features, results of which will be incorporated in specifications, drawings and other documents. The analyses and calculations are made by engineers under the direction of the discipline job engineers (nuclear, mechanical, electrical) of a specific project. In the case of structural discipline, calculations are made by an engineer, directed by either the design squad leader or, in special cases, by the job engineer. The engineers are experienced in this work and in the use of modern techniques and tools (such as computer programs). They are familiar with applicable Regulatory Guides, codes and standards, and recognized acceptable practices; have direct access to higher levels of their own, or other disciplines up to the chief discipline engineer for consultation and guidance; and follow the procedures set forth in the G&H Quality Assurance Manual. These procedures are briefly outlined below:

- a. Analysis and calculation work is identified by subject, sequentially numbered, and entered in a master index maintained by the job engineer. Standard calculation sheets are used and the engineer assigned to perform the computations identifies each sheet, dates it, and initials it as the originator. Basic conditions, parameters, and assumptions are stated and the sources identified as applicable. References to pertinent studies, formulas,

previous calculations, codes and standards, and other information related to the work are listed. When a computer is used to perform computations, this fact is noted and all sheets are properly identified. When diagrams, curves, or other such inputs are prepared on different forms, they are similarly identified and added to the calculation file and maintained in appropriate binders in an orderly manner by the discipline job engineer.

- b. Calculations for the nuclear, mechanical, analytical and electrical work are checked by the corresponding discipline job engineer or an engineer, other than the originator, assigned by the job engineer who indicates his acceptance by initialing the first page of the particular set of calculations. For the structural work, all calculations are checked as part of the design drawing checking process. Each sheet is initialed by the individual performing the computation and by the individual who checks it. The structural job engineer reviews and approves the result and indicates his acceptance also by initialing the cover sheet of the calculation set when the associated design drawing is approved. For all disciplines, when a computer program is used, the computer input and final data are checked by either the job engineer or an engineer assigned by the job engineer. Approval is by the job engineer who indicates acceptance by

initialing the first pages of the particular set. For the structural work, this approval is made when the associated design drawing is approved.

Engineering analyses and calculations are subject to independent design verification by a design review engineer in the appropriate discipline (nuclear, mechanical, electrical, structural), qualified by training and experience in the performance of similar calculations in accordance with the procedures of the G&H Quality Assurance Manual. Review of calculations is performed in accordance with a written checklist and considers accuracy; completeness; adequacy of input and assumptions; appropriateness of methods; reasonableness of results; and conformance with codes, standards, and regulatory criteria and guides. The calculations are initialed and dated by the reviewer when he concurs with the results. The calculation sheets are maintained and filed in accordance with the written procedures of the G&H Quality Assurance Manual.

When calculations are modified to reflect changes in design bases, this fact is recorded on the calculation sheet with details of the changes. New calculations are performed and the sheets attached to the original work, or entire new work sheets are prepared and placed in the files. New work is reviewed, checked, and approved in the same manner as the original work. The superseded work is so identified or destroyed as requirements may dictate.

#### 17.1.3.3.4 Preparation of Specifications

Specifications are prepared by G&H for the procurement of items (such as equipment, materials, systems) and services within the contract scope. It is the purpose of QA to determine that items and services meet the functional requirements and the high level of quality which are essential and mandatory for the items and services involved in nuclear safety-related functions, as defined in 10 CFR Part 50 and the Regulatory Guides. This applies whether the items for nuclear safety-related functions of structures, systems, and components are specially engineered and manufactured for a specific plant, or are standard commercial types, preengineered or previously approved and successfully used items for the given application. The G&H Quality Assurance Manual covers the steps to be followed from the origination of the specification to its issue as an official document, tailored to each particular project.

Specifications are prepared by assigned cognizant engineers with knowledge and experience of the functional and material requirements of the item covered, commensurate with the importance of the given item, and familiar with applicable NRC regulatory requirements; special safety requirements, codes and standards; as well as the level of quality desired for design, materials, workmanship, and appropriate acceptance criteria.

The cognizant engineer prepares, initials, and dates the

Specification Review-Record Form and submits it with the specification to the responsible discipline job engineer, his supervising engineer (or both), as well as the discipline chief or assistant chief engineer, who review the specification for technical accuracy, completeness, conformance with applicable regulations and overall acceptability. These reviewers also initial and date the record sheet to indicate their review.

Specifications are also reviewed by engineers of applicable associated disciplines, and QA for interfacing with related systems and design requirements, as well as by a construction services engineer, for any feature bearing on the installation of the equipment or other construction aspects. All these reviewers initial the record sheet as supporting discipline. The QA engineer review of specifications is performed to check that all the requirements for achieving the desired level of quality are defined as outlined in subsection 17.1.3.3.9.

Specifications are subject to a mandatory independent design verification by a design review engineer qualified in the appropriate discipline through training and experience on other nuclear projects in accordance with the procedures of the G&H Quality Assurance Manual. Verification of specifications is performed in accordance with written checklists for completeness; adequacy of inputs; incorporation of the requirements of applicable codes, standards and regulatory criteria; material compatibility; inclusion of appropriate quality requirements; and

suitability of the equipment for the application. The reviewer prepares and initials a record sheet to document his comments, acceptance, or both. The design review records are filed in accordance with the G&H Quality Assurance Manual procedures.

The specifications are then reviewed by the project manager for compliance with the overall project requirements and special conditions. He also reviews the Specification Review - Record Form to check that all appropriate signatures have been affixed. When he is satisfied that it complies, he also initials the record form to indicate his approval and its readiness for the Utility Owner's approval and for procurement as required.

When specifications are revised to reflect changes in design, the identical process is followed as for the preparation of the original specification.

#### 17.1.3.3.5 Preparation of Design Drawings

Power plant design drawings are required for the procurement of equipment and materials, and for the construction of the plant. These drawings are an important means for giving instructions to fabricators for assembling materials and parts into components, and to the field for building the structures, and for installing and erecting the equipment and accessory items. The drawings are required to be complete and accurate and are, therefore, subject to review and checks. The G&H Quality Assurance Manual contains procedures for the production and control of design drawings, briefly summarized below.

- a. Power plant design drawings are prepared by design personnel under the direction and supervision of an experienced squad leader of the applicable discipline. The squad leader assigned to the project by the discipline supervising design engineer, who, together with the Manager of Design, has the full responsibility for producing documents that are complete and accurate, that incorporate the concepts developed and approved during the engineering of the project, and that conform to NRC regulatory requirements for nuclear safety-related structures, systems, and components.
- b. The job engineer guides the design activities by supplying the squad leader with the necessary design base documents, such as technical descriptions and structural design



criteria, the PSAR, specifications, and other related design information. The squad leader then instructs the designers who perform the work to familiarize them with the engineering intent, the types of equipment to be installed, the applicable codes and standards, NRC regulations, the selection of materials, the modes of control and operation, and the design philosophy to be followed.

- c. When preliminary design is completed a print is routed to associated discipline squad leaders and job engineers for their review with regard to the extent that the design shown thereon may affect their own work. This is intended to eliminate interferences and inconsistencies, and achieve the intradiscipline interfacing essential to system design. If a revision is required to accommodate their own design, they consult the originating squad leader and job engineer and work out changes acceptable to each party. If the drawing is satisfactory, or when agreed-to modifications are incorporated, the drawing is completed and the preparer initials it.
- d. Following the preceding step, a drawing check is performed by checkers. In some disciplines a group of specialized checkers has been set up to perform this function, and they operate independently of the basic design squad. The drawings are checked generally for:

- 1) Completeness
  - 2) Accuracy of dimensioning
  - 3) Correctness of information and design data
  - 4) Adherence to design concepts established in the several design documents
  - 5) Correctness of layout, adequate headroom and passageway clearances, freedom from interferences
- e. Following his review for incorporation of any comments the checker signifies his acceptance by initialing the drawing. The drawing is then submitted to the job engineer to be reviewed for compliance with design criteria, supporting calculations, specification, codes and standards, NRC Regulatory Guides, and overall accuracy and acceptability. The job engineer when satisfied also initials the drawing. Similarly, the job engineers of the associated disciplines review pertinent drawings with emphasis on consistency and compatibility with related systems and design requirements. On acceptance, they also initial the drawings.
- f. The original issue of detail design drawings to be released for use outside G&H is reviewed, approved, and initialed by the responsible discipline supervising engineer and by the job engineer. Furthermore, these drawings are reviewed and initialed by the job engineers of other disciplines whenever

they include information affecting the work being performed by these other disciplines. Subsequent issues only require the review and approval of the responsible job engineer, and the applicable discipline job engineer whose work is affected by the revisions.

On completion and prior to issuance for construction or fabrication, drawings are subjected to independent design verification by a design review engineer in accordance with the procedures of the G&H Quality Assurance Manual. This verification is performed in accordance with written checklists and emphasizes the following: completeness; accuracy of dimensioning and detail; conformance to design concepts; regulatory requirement-including quality requirements; applicable codes and standards; accessibility of maintenance; and inservice inspection and repair. The reviewer prepares and initials a record sheet to document his comments, acceptance, or both. The design verification records are filed in accordance with written procedures of the G&H Quality Assurance Manual.

When drawings are modified to reflect changes in the design it is the responsibility of the designer or engineer making the changes to review referenced drawings and specifications to determine if they are affected by the changes.

The preceding procedures are applicable to the original issue, as well as to all subsequent revised issues of each document which

incorporate all design changes originating in the G&H engineering office. Similarly, within the G&H scope, all major field changes are reviewed, documented, and are reflected in record drawings which are subject to the same drawing controls and reviews as previously outlined.

When a drawing is ready to be released for use outside G&H as an original issue, and has been fully and correctly signed by all responsible engineering and design personnel, the drawing is passed to the project manager. The project manager is responsible for reviewing the drawing for compliance with overall project requirements and special conditions. If the project manager is satisfied that the drawing may be issued, he initials the drawing. No drawings are released from the company unless initialed by the project manager. All subsequent revisions of the drawing will also require the approval and initials of the project manager.

#### 17.1.3.3.6 Vendor Drawings, Specifications, and Procedures

Review of vendor drawings, specifications, and procedures received from a supplier are recorded with pertinent identification, data, and date of receipt. Documents are routed through the cognizant engineering and design discipline personnel (nuclear, mechanical, electrical, structural) in accordance with procedures of the G&H Quality Assurance Manual, to check for compliance with G&H design drawings and specifications. Each squad leader and job engineer, as applicable, initials and dates the appropriate action required (e.g., approved, returned for correction) on the office copy routing form. The project manager reviews the documents to ascertain the action required and to determine whether comments from engineering and design (if any) are pertinent and in compliance with contractual requirements. Documents are then returned to the vendor with appropriate instructions for required action.

#### 17.1.3.3.7 Interface Control

Internal and external interface requirements are defined prior to the start of detail engineering and design of a system or structure based on contractual obligations to the Utility Owner. Discipline job engineers prepare a list of required internal and external interface inputs to complete the engineering and design effort in accordance with the G&H Quality Assurance Manual procedures. Interface inputs received are identified and examined for completeness and applicability. (Is data certified for final design or is it preliminary information?) Discipline job engineers record internal and external interface requirements on Design Data Input Forms and maintain these forms active until all the required interface information is received for final design of the appropriate structure or system.

#### 17.1.3.3.8 Independent Design Verification

Independent design verification activities concerning nuclear safety-related structures, systems, and components are performed by designated design review engineers in accordance with the procedures of the G&H Quality Assurance Manual. Independent design verification is performed by use of the following methods:

- a. Design Reviews-to verify that all nuclear safety-related engineering and design documents are in accordance with safety documents, codes, standards or other requirements of the project. The results of design reviews are documented and measures taken to demonstrate that the findings are implemented;
- b. Alternate Calculations-by use of simplified alternate methods of calculation or analysis to ascertain the correctness of the original calculation. The results are documented and measures taken to demonstrate that the findings are implemented; and
- c. Qualification Testing-is not normally used as a verification method by G&H for its own design activities, although this method may be imposed on equipment suppliers for verification of seismic analysis as specified by the G&H procurement document.

Surveillance is performed by QA Personnel in accordance with the G&H Quality Assurance Manual to verify that the item has satisfactorily met the seismic criteria. This verification process is applied to technical descriptions, structural design criteria, analyses and calculations, specifications, drawings, Q-List, technical SAR text, and amendments in accordance with

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written checklists to determine compliance with safety-related design bases, QA requirements, applicable codes, standards, and NRC regulatory criteria.

Design review engineers are appointed by and are under the direction of and responsibility of the pertinent discipline chief engineers subject to approval by the QA Manager. These engineers are responsible for the independent design verification of nuclear safety-related documents developed within their discipline for specific projects. These individuals are not involved in the original design being verified nor is their design verification function subject to budgetary or schedular pressures.



#### 17.1.3.3.9 QA Reviews of Engineering and Design Documents

Review activities are carried out by QA engineers under the direction and responsibility of the QA Manager and the project QA supervisor in accordance with the procedures of the G&H Quality Assurance Manual to ascertain that engineering and design activities of nuclear plant safety-related structures, systems, and components are performed in accordance with the NRC QA regulatory requirements. Calculations and drawings are selectively reviewed during audits to check compliance with the QA requirements established for the project. The project manager and the applicable engineering discipline chief, as well as appropriate higher management personnel, are notified by the QA Department of any apparent design deficiencies, so that corrective measures can be undertaken and necessary followup instituted to determine if proper action has been accomplished.

On acceptance of a document (drawing or calculation), the QA engineer signifies his approval by preparing a QA Document Review Record Sheet. Should corrections be required, comments are noted on the record sheet and transmitted to the job engineer for action. QA engineers maintain documented evidence of the results of these reviews and responses in accordance with the procedures of the G&H Quality Assurance Manual.

All technical specification sections of the procurement document

concerning nuclear safety-related items are reviewed by QA engineer to determine that they contain as appropriate:

- a. Applicable design bases, technical requirements, regulatory requirements, component and material identification, drawings, referenced specifications, codes and industry standards, tests and inspections requirements, and special process instructions for such activities as fabrication, cleaning, erection, packaging, handling, shipping, storage, and inspection
- b. Requirements that identify the documentation to be prepared, maintained, submitted, and made available to the purchaser for review and comment, such as drawings, specifications, procedures, inspection and fabrication plans, inspection and test records, personnel and procedure qualifications, and chemical and physical test results on materials
- c. Requirements for the retention, control, and maintenance of documents and quality assurance activities records which are to be delivered to the purchaser prior to use or installation of the item.

On acceptance of a document (including procurement technical specifications and referenced drawings), the QA engineer signifies his approval by signing the Specification Review Record Form. The original Specification Review Record Form documenting

the results of these reviews are maintained in accordance with written procedures of the G&H Quality Assurance Manual.

The specifications and referenced drawings produced by G&H for a project, supplemented by referenced codes, and standards, and applicable NRC Regulatory Guides, are the basic sources of technical requirements contained in the nuclear safety-related procurement documents prepared by G&H for the purchase of items or services. The G&H Procurement Document is composed of three sections: a. Instructions to Bidder; b. Terms and Conditions; and c. Technical Specifications and referenced drawings. These specifications and drawings are subject to technical and administrative reviews and controls as described in subsection 17.1.3. The control measures to be applied to these specifications and drawings, which require that applicable regulatory requirements, design bases, inspection, testing, acceptance criteria, and appropriate documentation be addressed, are contained in written procedures of the G&H Quality Assurance Manual.

The specification section (including referenced drawings) of the procurement document is subject to review by a QA engineer, prior to its release, as described in subsection 17.1.3.3.9, to determine that all quality requirements are correctly stated and that necessary inspection, testing, and control requirements, including acceptance and rejection criteria, are called out. The documentation is available for audit.

Procurement documents involving items and services for nuclear safety-related structures, systems, or components require suppliers or constructors to establish QA/QC Programs which satisfy the requirements of Appendix B to 10 CFR Part 50 and appropriate ANSI N45.2 series standards.

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The procurement documents further require that the purchaser or his designated representative have access to the suppliers facilities and defines the QA documentation to be generated and submitted to the purchaser in accordance with the procedures of the G&H Quality Assurance Manual.

Changes or revisions to technical requirements of the procurement documents are subject to the same review and control procedures as the original procurement documents.

#### 17.1.5

#### INSTRUCTIONS, PROCEDURES AND DRAWINGS

Instructions, procedures, drawings, and specifications are used, as applicable, by technical and administrative personnel for various phases of the design and procurement activities of nuclear plants and are consistent with the level of quality required to produce a safe and reliable operating plant. Written procedures for preparation and control of these technical documents are contained in the G&H Quality Assurance Manual, referenced in Table 17.1-1, and are intended to establish the activities necessary to conform to the requirements of Appendix B to 10 CFR Part 50. It is the responsibility of the project manager and his staff to determine that instructions and procedures are being implemented and adhered to. The QA Manager and his staff will perform reviews and audits to determine if the Project is in compliance with the QA requirements and initiate corrective action when nonconformances are discovered.

Quantitative acceptance criteria (such as dimensions, tolerances, and operating limits) and qualitative acceptance criteria (such as workmanship samples, welding and radiographic standards) for activities affecting quality are included in G&H drawings, specifications, and in the applicable codes and standards referenced in the specifications. To confirm proper inclusion of these requirements, the drawings and specifications are subject to independent design verification as described in subsection 17.1.3, and performed in accordance with procedures of

the G&H Quality Assurance Manual. The specifications require that a supplier or constructor submit detail procedures which include acceptance criteria of specified fabrication, inspection, and testing activities. These procedures are subject to review and acceptance by the G&H engineering group requesting such procedures. For submittals concerning inspection plans; test, calibration and special process procedures; drawings and specifications; and changes thereto, these documents are submitted as appropriate to QA for review and comment. These comments are incorporated by the cognizant engineer in his response to the supplier or constructor.

#### 17.1.6

#### DOCUMENT CONTROL

All G&H record design documents (such as specifications and drawings) for use outside G&H are issued by the project manager with his approval noted thereon, and only after all other required approvals are also noted in the appropriate locations, in accordance with the procedures of the G&H Quality Assurance Manual.

A record copy of all original and revised issues of such design documents is retained in the appropriate record files, as delineated by the G&H Quality Assurance Manual. Before revised design documents are issued, they are reviewed and approved in the same manner as the original issue, in accordance with the procedures cited in subsection 17.1.3.

Provisions for proper and timely distribution of these documents and their revisions are set forth in the procedures of the G&H Quality Assurance Manual. The documents controlled by these procedures are specifications and drawings (which constitute the technical portion of procurement documents), PSAR and related design criteria documents, test procedures, Design/Engineering Change/Deviation Requests and Nonconformance Reports and Corrective Action Requests as well as analyses and calculations, other technical documents, and the G&H Quality Assurance Manual and its procedures. Implementation and control of distribution are verified through periodic audits performed by QA engineers.



External distribution of engineering and design documents is made by the project manager. Such distribution includes an acknowledgment form to be completed by the recipient to confirm his receipt of the latest issue. Further to determine that all project participants are cognizant of the latest revisions of documents, the status of each document is periodically summarized and published. These status reports indicate the latest approved revision and date of each document. The engineering and design departments, the project department, and the field forces use these lists to update their files and remove obsolete information when necessary. The QA staff performs periodic audits to verify that status reports are current and properly distributed. Field and shop surveillance is performed by QA/QC personnel to verify that the latest document issues are in use. | 6

Engineering and design changes, whether field or supplier originated are documented on a Design/Engineering Change/Deviation Request Form and subject to the same review and approval procedures as the original document in accordance with the G&H Quality Assurance Manual. Copies of the completed change form, whether dispositioned as approved or not approved, are distributed to the project QA engineer, the involved discipline engineers, the project manager, the Utility Owner and the organization who initiated the request.

No work can proceed until the change has been approved and that documentation attesting to this has been received by the supplier or constructor.

17.1.7 CONTROL OF PURCHASED MATERIAL, EQUIPMENT AND SERVICES

17.1.7.1 Evaluation and Selection of Suppliers and Constructors

A list of potential bidders for nuclear safety-related items or services is established, based on a. the current capability of the supplier or constructor to comply with the requirements of Appendix B to 10 CFR Part 50 that are applicable to the types of items or services being procured; and b. previous experience with suppliers or constructors supplying similar items or services. When this is not available, or for adding new bidders to the list, G&H requires a written response to a pre-Qualification supplier questionnaire to determine a bidder's capability as a possible procurement source and to evaluate their QA/QC performance capabilities.

QA Department review of procurement documents, as discussed in subsection 17.1.3 establishes the adequacy of QA requirements imposed on suppliers and constructors. Further, these documents require all bidders to submit their QA/QC Programs for review by the G&H QA Department to establish that they conform to the requirements of Appendix B to 10 CFR Part 50.

Prior to actual award of contract, preaward surveys are performed on those suppliers or constructors for whom adequate current experience data is not available at G&H. Such preaward surveys

are performed by the QA Department, with the aid of qualified engineering personnel as may be required, to ascertain compliance with previously reviewed supplier's or constructor's QA/QC manuals. Results of these surveys are documented, distributed to the Utility Owner, supplier or constructor surveyed, and the original maintained by G&H. The foregoing activities are performed in accordance with the written procedures of the G&H Quality Assurance Manual.

17.1.7.2            Surveillance and Audits of Supplier Operations

Surveillance of suppliers during manufacture, fabrication, and assembly is performed by QA personnel in accordance with the procedures of the G&H Quality Assurance Manual. The surveillance activities follow the requirements of a vendor surveillance checklist, which sets forth the quality documents to be reviewed, check the revision status of the design and engineering documents in use and the operations, inspections, or tests to be witnessed or verified in accordance with the acceptance criteria of procurement document technical specification. These checklists are prepared by QA personnel subject to approval by the project QA supervisor. G&H does not rely on supplier certificates of conformance for acceptance of equipment. Surveillance by QA personnel is performed to verify conformance to the procurement document technical specification and referenced drawing requirements and to review the suppliers quality documentation package which is to be available with the equipment prior to release for shipment. Equipment cannot be released from a supplier's facility until a G&H QA Release Form is completed and signed by a G&H QA Representative. Written reports of such activities are issued to the supplier, Utility Owner, G&H QA Manager, and the G&H project manager.

Further, periodic audits of supplier operations are performed by the QA Department in accordance with the written procedures of

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the G&H Quality Assurance Manual to: a. provide an objective determination of compliance with established requirements, methods and procedures; b. determine the adequacy of the supplier's QA/QC program; c. verify implementation of corrective action; and d. confirm the completion and maintenance of appropriate documentation. These audits follow a preplanned audit checklist which establishes the criteria to be audited. The completed checklist is reviewed and approved by the project QA supervisor and a report is issued to the supplier, Utility Owner, G&H QA Manager, and the G&H project manager.

Recommendations resulting from surveillance or audits as applicable for improvement, adjustment, or corrective action to be taken will be made to the supplier, and additional surveillance or audits will be performed to ascertain that measures have been taken to implement the recommendations.

17.1.7.3 Surveillance and Audits of Construction Site Operations

Receipt inspection of supplier-furnished items is performed by the constructor at the construction site, and appropriately documented in accordance with approved written procedures of the constructor's QA Program in accordance with the requirements of the G&H Quality Assurance Manual. Construction procedures shall include the requirement that items be properly identified, that required QA documentation package has been received, that items be inspected for shipping damage, that all criteria for acceptance be satisfied, and that nonconforming items be appropriately identified and segregated as applicable.

G&H site QA and QC personnel audit and survey the constructors' operations, including receiving, fabrication, installation, inspection, testing, and documentation activities.

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Surveillance activities are performed in accordance with preplanned documents to: a. perform periodic checks of the constructors' quality system to determine continued effective implementation of that system; b. witness constructor's performance during fabrication, installation, assembly, inspection, and testing to verify conformance with the design criteria; c. check the revision status of the design and engineering documents in use; d. review contractors' quality documentation for traceability, completeness, and retrievability.

Surveillance reports are prepared and maintained at the site and become part of the overall project QA documentation.

Auditing activities are performed in accordance with checklists prepared by site QA personnel under the authority of the site QA supervisor and in accordance with the requirements of the G&H Quality Assurance Manual. Audit Reports are prepared and issued to the audited organization, the Utility Owner, the G&H QA Manager and the G&H project manager.

Recommendations resulting from surveillance or audits as applicable, for improvement, adjustment or corrective action to be taken will be made to the constructor and further surveillance or audits will be performed to ascertain that measures have been taken to implement the recommendations.



17.1.8 IDENTIFICATION AND CONTROL OF MATERIALS, PARTS AND COMPONENTS

G&H prepares specifications, subject to review and control as described in subsection 17.1.3, which require the contractor to have established procedures for identification and control of materials, parts, and components which will not impair the function or quality of the item. These procedures are required so that any segment of the manufacture, fabrication, assembly, or construction activity can be readily verified or checked for compliance with the QC procedures in the previously approved supplier's or constructor's (or their subcontractors) QA/QC manuals. QC records are carefully reviewed to ascertain that whatever type of identification mark (such as heat number, part model number, component serial number, as applicable) is applied, it will accompany the segment, part, or component through manufacture, fabrication, or assembly, to its ultimate installation and onsite testing, and be retained as required by codes or Regulatory Guides. These procedures are applied to subcontractors so that G&H surveillance personnel can trace any identified item in the chain of documentation from origin to final installation. Each of the contributors to the progression of the item, including the Utility Owner at the site, is required to obtain and retain the records up to and including those of its own contribution. Surveillance personnel have the responsibility to ascertain, in

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accordance with procedures outlined in the G&H Quality Assurance Manual, that the proper traceability procedures are used by suppliers and constructors (and their subcontractors), and that these identifications can be traced to such associated documents as drawings, specifications, purchase orders, physical and chemical mill test reports; manufacturing, fabrication, assembly, inspection, and test reports; deviation reports; installation; and onsite test reports to the extent of G&H contractual obligations.

When special processes are used for the production, fabrication and services involved in purchased items or services, G&H specifies the codes and standards, Regulatory Guides and QA/QC requirements in the procurement documents. Bidders are required, as outlined in subsection 17.1.7 to provide documentation with their proposals, indicating their capability to implement the special process requirements including written procedures and evidence of verification of adherence to such procedures as well as evidence of availability of qualification records for the procedures and for personnel performing such activities. Special processes include, but are not necessarily limited to: welding, plating, nondestructive testing, heat-treating, electrochemical machining, and cleaning, and will require certification by a proper authority, of procedures and personnel where appropriate or required by code or NRC Regulatory Guides. Prior to award of a contract, the supplier or constructor will be required to submit to G&H, for review and approval, the procedures it will use to accomplish the special processes specified by the procurement documents, including references to the appropriate codes and standards, and Regulatory Guides. The pertinent engineering department responsible for the special process requirements described in the procurement documents, will review and approve these procedures. Surveillance personnel observe supplier or constructor (and their

subcontractor's as applicable) operations to ascertain compliance with the approved procedures, and to review the special process records to determine whether; a. proper documentation of purchased items or services is being maintained; b. materials and parts are being appropriately identified and controlled; and c. qualifications and certifications are being properly developed and maintained current. Revisions to any special process procedures and requirements require approval by the appropriate G&H engineering department. G&H QA/QC personnel monitor the supplier or constructor to determine compliance with the accepted revisions and maintenance of proper documentation.

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G&H prepares a general specification, as part of the procurement documents for nuclear safety-related structures, system, or components, which requires that suppliers or constructors establish and put into operation a quality program to satisfy the requirements of Appendix B to 10 CFR Part 50, with regard to manufacture, fabrication, assembly, installation, inspection, and testing of materials, equipment, or structures. Each supplier or constructor is required to submit to G&H its existing QA/QC Manual and any other specific procedures detailing the organization and methods for satisfying the requirements that inspection procedures are in effect for the purchased items or services, and that inspection personnel are independent of the group performing the work.

These procedures will be required to address the following:

- a. Identification of the individuals or organization (and their qualifications and authority) performing the inspection activities
- b. Identification and control of items or work subject to inspection, such as materials, parts, components, or construction services, including partially complete assemblies or work, to prevent use of incorrect or defective items or work

- c. Identification of quality characteristics to be inspected
- d. Acceptance and rejection criteria
- e. Measures established to control special processes
- f. Description of the methods of inspection or tests to be performed as necessary to verify quality (including indirect control of processing methods, equipment and personnel where direct inspection is not possible)
- g. Methods to be followed for calibration of inspection and test equipment
- h. Documentary evidence of completion and certification of inspection activities
- i. Documentation of nonconformances, and implementation of corrective action
- j. That inspections and tests are performed with specified equipment and under suitable environmental conditions, and prerequisites have been met.

In addition, the supplier or constructor is required to submit a manufacturing schedule or sequence of operations, including witness and hold points critical to the quality of the item or service being performed. G&H will review this schedule and indicate the witness and hold points it wishes to observe in the contractor's facility. Work shall not proceed beyond an

established hold point without prior approval by G&H. The QA Department reviews the supplier's or constructor's QA/QC Manual to determine its adequacy in meeting the requirements of the specification and applicable criteria, codes and standards, and Regulatory Guides. An initial audit is performed by G&H QA personnel at the supplier's or constructor's facility in accordance with the G&H Quality Assurance Manual, to review the procedures detailed in their QA/QC Manual; to ascertain the qualifications of the supplier's or constructor's personnel; and to review the records and procedures required for documenting all critical aspects of their procedures for performing process activities, including inspection. Furthermore, G&H reviews the requirements for supplier's or constructor's senior management involvement in their quality program.

The supplier or constructor is required to notify G&H prior to a required witness or hold point, so that the appropriate surveillance personnel will be available to observe the event. Surveillance personnel are responsible for periodically observing the supplier's or constructor's implementation of his approved quality procedures in the areas previously listed. | 6

Inspection of modified or repaired items or work is required to be performed by the supplier or constructor in accordance with the same procedures which applied to the original work.

Surveillance reports for each visit are prepared and include recommendations for corrective action when necessary.

These reports and corrective action requests are distributed to the contractor, Utility Owner, the G&H project manager, and G&H QA Manager, whose department maintains a complete file of QA reports, and keeps senior management apprised of such activities in accordance with G&H established procedures.



17.1.11 TEST CONTROL

G&H establishes the necessary test programs for structures, systems, and components in the appropriate procurement documents which include, as required, proof tests during or after fabrication, assembly, construction or installation, and preoperating tests prior to startup. The supplier or constructor is required to establish a detailed written procedure for each of the tests that are necessary to demonstrate that the structures, systems, or components will perform satisfactorily in service, in accordance with their design requirements and within their acceptance limits. The test procedures will include provisions for assurance that:

- a. The prerequisites for conducting the test have been met
- b. Adequate test information is available and will be used
- c. Properly identified and calibrated up to date test instrumentation and equipment are available
- d. The test is conducted by trained or appropriately qualified personnel
- e. Adequate acceptance and rejection criteria are included
- f. Proper environmental conditions for the test are maintained during its performance.

The supplier or constructor is responsible for adequately documenting the test and its results, and for submitting the documentation to G&H for review and acceptance. G&H personnel will witness the test where appropriate, at specified hold points, and will ascertain that the requirements specified in the procurement documents have been satisfactorily met. To ascertain compliance with the contractors approved procedures, surveillance personnel monitor the manufacturing, fabrication, assembly, inspection, and test procedures in the supplier's shops, and the installation, inspection, and test procedures at the construction site in accordance with the G&H Quality Assurance Manual.

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G&H prepares procurement documents which require that suppliers and constructors establish control procedures to assure that all items of measuring and test equipment used in activities affecting quality are properly identified and calibrated, at scheduled intervals, against certified standards having documented relationship to nationally recognized standards. If no national standard exists, the certification of the calibration used will require verification in accordance with applicable industry standards and documentation of acceptability. The supplier or constructor is required to maintain records that identify the measuring and test equipment and show the latest and next due calibration dates. The calibration interval for each item is to be based on the type of equipment, required accuracy, stability characteristics, use, and other conditions affecting measuring control. Items that have not been properly maintained or calibrated in accordance with specified schedules, or that have been damaged in service will be required to be identified and removed from service.

The supplier or constructor may perform his own calibration, using duly qualified personnel. As an alternate, the constructor may use the services of an approved standardization laboratory. Standards are to be maintained, and measuring and test equipment calibrated in an environment having controlled temperature, humidity, and radiation or contamination limits compatible with

the required accuracy and measuring objective of the required test. The error in certified calibration standards shall be less than 1/4 of the tolerance of the equipment being calibrated, unless limited by the state of the art. When discrepancies in measuring and test equipment are found at the next calibration date, the supplier or constructor will be required to determine the corrective action required. Where equipment is shown to be out of calibration, all items inspected or tested since the last acceptable calibration are considered unacceptable until the supplier or constructor demonstrates that the applicable design requirements of those items have been satisfactorily met.

The supplier or constructor is required to maintain the records which indicate the calibration status of all items under the calibration system in effect, and which identify the measuring and test equipment. G&H surveillance personnel are responsible for verifying records of the measuring and test equipment calibration; and the reports thereof issued by them will recommend corrective action when required.

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G&H prepares procurement documents containing basic guidelines for the proper handling, cleaning, preservation, storage, packaging and shipping of nuclear safety-related items. Suppliers and constructors will be required by procurement documents to develop written procedures or instructions detailing protective measures, including the establishment of special environments as may be required to prevent damage or deterioration to items or structures during handling, storage, and shipping at the suppliers' facilities, in transit, or at the construction site. G&H will review and comment on the procedures developed by the suppliers or constructors.

G&H surveillance personnel at the shop or construction site are responsible for ascertaining if the suppliers or constructors actually implement the protective measures in compliance with the previously submitted and accepted procedures. This surveillance activity is performed in accordance with the G&H Quality Assurance Manual procedures and will encompass visual and nondestructive examinations; witnessing of the level of workmanship and care being exercised; and reviewing the documentation that is required. Reports of G&H findings, together with recommendations for improvements or corrective action to be taken, where required are prepared, issued, and distributed as appropriate to the contractor, Utility Owner, the

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G&H project manager and the G&H QA Manager. Followup surveillance or audits will be instituted as required to establish that improvements and corrective action have been effective where indicated.

G&H prepares procurement documents which require that suppliers and constructors be responsible for establishing procedures for identifying the status of inspection, test, and readiness for operation of nuclear safety-related structures, systems, and components throughout manufacturing, fabrication, installation and testing. G&H also requires that suppliers and constructors prepare written procedures to establish that the inspection and test status of individual items be indicated by readily identifiable means such as stamps, tags, labels, routing cards, shop travelers, or other suitable indicators. These procedures will also establish the authority for the application and removal of identification and status markings and that this is performed by personnel not subject to cost or schedule pressures. Indicators are required to identify those items which have satisfactorily passed required inspections and tests, to preclude bypassing required inspections and tests, and to prevent the inadvertent use of unsatisfactory items. Where inspection and welding stamps are in use, procedures are required to incorporate controls to prevent deterioration of materials or components. The suppliers' and constructors' procedures shall also include provisions to control the bypassing of required inspections, tests, or other critical operations subject to approval by each of their quality organization.

G&H will be responsible for reviewing and commenting on suppliers and constructors procedures, including requirements for documentation. This documentation will be required to indicate the types of inspections and tests, and the authority under whom the tests were performed and witnessed. Review of such documentation at the suppliers' shop or the construction site is performed by G&H surveillance personnel to determine correlation with the inspection, test, and operating status of the materials, components, and structures, and to determine conformance to accepted contractors' procedures. |6

As applicable, procedures will be established by G&H for transfer of equipment or systems from the constructor to the Utility Owner's operating staff. These procedures will include preparation of suitable records indicating the status of equipment or systems. During construction site testing, adjustment, trial operation and any other times when hydraulic, mechanical, or electrical systems are energized, the G&H tagging procedure is put into effect to promote equipment, systems and personnel safety, and to prevent inadvertent use. Under this procedure the Utility Owner will have the sole responsibility for operation and maintenance of equipment and systems thus transferred to their control.



G&H prepares procurement documents which require that suppliers and constructors establish, implement, and maintain procedures for the identification, control, and documentation of materials, parts, components, systems, structures, or processes which do not conform to requirements of the procurement documents, in order to prevent their inadvertent use or installation. These procedures are to provide for identification, quality review, segregation, disposition, verification, and documentation of the nonconforming item, structure, system, or process, and notification to affected organizations.

The supplier or constructor will be required to identify all nonconforming items, structures, or systems by tagging or other suitable means, and to segregate or isolate them where practicable, to prevent their unauthorized shipment, installation or use. The identification system is to be established in the written procedures. Special areas for segregation and for storage of nonconforming items will be provided as required. The contractors' procedures are to include the requirements for maintaining records of all nonconformances and their disposition. Repairs or rework of nonconforming items will require that reinspection and retesting be accomplished by methods equivalent to those of the original inspection or test. Acceptance of a nonconformance will require that a written deviation report containing verification of disposition and a technical

justification establishing that neither safety nor function will be adversely affected shall be submitted to G&H for review and approval. Such deviation reports for nonconforming items will require review and approval by the responsible G&H engineering department, and a subsequent QA review in accordance with the procedures of the G&H Quality Assurance Manual.

Implementation by contractors of their procedures for handling of nonconformances will be subject to periodic surveillance by G&H personnel. | 6

All deviation or nonconformance reports (including those dispositioned accept as is or repair) generated by suppliers will be required to be forwarded to the construction site, along with those reports generated by constructors which will become part of the QA documentation to be filed at the plant site and transferred to the Utility Owner. Copies of deviation and nonconformance reports are required to be submitted to the G&H project manager and G&H QA Department for review and analysis of quality trends and maintenance of documentation. Situations where supplier's and constructor's quality appears to be trending away from the desired levels, will be reported to the supplier or constructor, the appropriate senior G&H management, and the Utility Owner.

17.1.16 CORRECTIVE ACTION

G&H has established nonconformance reporting and corrective action procedures to identify conditions that are adverse to quality as discussed in subsection 17.1.15. These procedures are concerned with the engineering and design activities of G&H, as well as activities of its suppliers and constructors. The corrective action to be instituted by G&H, its suppliers or constructors will be determined by the source and nature of the nonconformance, and follow-up action as necessary will be performed to verify implementation of the required corrective action.

QA Department personnel perform periodic audits of G&H engineering and design, project administration, procurement, and site QC activities to substantiate that applicable QA procedures and contractual obligations are adhered to, and properly administered by the cognizant organizations. During the course of these audits all nonconformances found are identified to applicable criteria, instructions, procedures, codes, and standards and recorded on an audit report. This audit report is then issued to the project manager and the audited organization to complete the corrective action reply section within a specified time limit. These actions are performed in accordance with the procedures of the G&H Quality Assurance Manual. Auditors will assess the corrective action reply to determine

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that the respondent has included in his reply as applicable: a. the cause of deficiency or nonconformance; b. the action to be taken to correct the deficiency or nonconformance; c. the action taken to prevent recurrence; d. the action taken to establish that other areas or previous work completed have not been effected; e. projected date of corrective action completion; and f. identification of cognizant personnel assigned to implement the corrective action. Auditors will also review the corrective action reply to check that the corrective action to be taken is in accordance with the applicable criteria, instructions, codes, standards, contractual requirements, and the procedures of the G&H Quality Assurance Manual. Followup action will be scheduled after the corrective action completion date to confirm that the corrective action indicated has been satisfactorily implemented. Copies of the completed audit report with the corrective action input are distributed to the cognizant organization audited, the G&H project manager, and appropriate G&H management personnel in accordance with the G&H Quality Assurance Manual. The original of the audit report is maintained in the QA files. | 6

Corrective action is also requested as a result of QA reviews of engineering and design documents (including procurement specifications). During the course of the review all nonconformances found are identified to applicable instructions, procedures, codes, standards or regulatory criteria and are

recorded on a QA Document Review Record Sheet or for procurement technical specifications comments are noted on the document as described in subsections 17.1.3.3.4 and 17.1.3.3.9. | 6

A copy of this form is issued to the project manager and the applicable discipline/department with instructions to revise the applicable document to incorporate the comments noted within a specified time limit and resubmit the document to the QA Department to verify that all comments have been incorporated. Where corrective action is not complete or is inadequate, the QA Manager has the authority to require the project manager to exercise his stop work authority and consult with appropriate G&H Management personnel to resolve the condition.

G&H prepares procurement documents which require that suppliers and constructors establish, implement, and maintain a nonconformance reporting and corrective action system that identifies conditions adverse to quality, and that appropriate action is taken to preclude repetition. Audits and surveillance of suppliers and constructors are performed by G&H QA personnel in accordance with the procedures of the G&H Quality Assurance Manual. During the course of the audit or surveillance activities, all nonconformances or deficiencies found are identified to applicable criteria, instructions, codes, standards, and procedures, and are recorded on an audit report or vendor shop surveillance report. In addition a Nonconformance | 6

Report and Corrective Action Request Form or a Deficiency Report and Corrective Action Request Form will be issued to the supplier or constructor respectively, with instruction to complete the applicable form and return it to G&H for review. The project QA engineer will assess the response in the same manner as previously discussed. Copies of the completed nonconformance or deficiency report and corrective action request form are distributed to the supplier or constructor, the Utility Owner, the G&H QA Manager, the G&H project manager, and appropriate G&H management personnel in accordance with the procedures of the G&H Quality Assurance Manual.

Any significant conditions adverse to quality which are not observed by audits or surveillance nor documented on Nonconformance Report and Corrective Action Request Form or Deficiency Report and Corrective Action Request Form, which are discovered by suppliers or constructors will be recorded on a Design/Engineering Change/Deviation Request Form. Corrective action for these conditions will be individually documented on a memorandum by the project QA engineer and distributed to the QA Manager, the project manager and appropriate levels of management in the cognizant areas of the nonconformance or deficiency, to review, make assessment of and institute appropriate corrective action to prevent recurrence.

17.1.17

QUALITY ASSURANCE RECORDS

G&H maintains QA records for all its work involving nuclear safety-related structures, systems, and components in accordance with procedures of the G&H Quality Assurance Manual. These procedures are designed to meet the requirements of Appendix B to 10 CFR Part 50, Criteria XVII, Quality Assurance Records and establish the requirements for those records to be maintained including duration, location, and assigned responsibility, using as a guide ANSI N45.2.9, Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants, as applicable in accordance with G&H contractual obligations to the Utility Owner.

Recognizing the obligation of the Utility Owner as the ultimate repository for all required lifetime and nonpermanent records, G&H maintains a complete in-house file of all the documents and records it generates during its phase of the work, and transmits them when completed to the Utility Owner as required with the exception of calculations. Calculations are retained by the job engineer and a copy as applicable furnished to the G&H Print File Department to be maintained until completion of the G&H design activity. These documents are then transferred to the QA files at the site for retention by the Utility Owner for the life of the plant.

G&H prepares procurement documents which require that suppliers

and constructors have established procedures detailing the generation, maintenance, and retrievability of records to furnish evidence of activities affecting quality, and provide adequate identification for relating a record to the item or activity to which it applies, as well as to the persons involved; the results, the acceptability, and also recommendations and actions taken in connection with any deviations or deficiencies noted. Furthermore, G&H requires that suppliers and constructors transmit to the Utility Owner, in due course, those lifetime and nonpermanent records which the NRC Regulatory Guides require to be kept at the site.

These records are to include as a minimum: a. material certification and test data for traceability and quality verification; b. reports of inspections, examinations, and test results for verification of conformance; c. drawings, specifications, procedures, and instructions for use in control of configurations; and d. records of nonconformances or deviations and their corrective action (including those dispositioned accept as is or repair).

Surveillance of suppliers and constructors during manufacture, fabrication, assembly, installation and testing is performed by QA personnel to verify that the suppliers and constructors are maintaining inspection and test records as required by the procurement document. QA personnel will review the supplier's

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and constructor's inspection and test records to verify that they contain as applicable: a. a description of the type of observation; b. evidence of completing and verifying a manufacturing inspection, or test operation; c. the date and results of the inspection or test; d. information related to conditions adverse to quality; e. inspector or data recorder identification; and f. evidence as to the acceptability of the results.

17.1.18 AUDITS

G&H QA Department personnel perform periodic audits of G&H engineering and design, project administration, procurement, and site QC operations to substantiate that applicable QA procedures, criteria, and contractual obligations are adhered to and properly administered by the cognizant organizations. These audits include the objective evaluation of work areas, activities and items, and the review of documents and records, and are performed using written checklists in accordance with the procedures of the G&H Quality Assurance Manual and are scheduled on the basis of the status and safety importance of the activity being performed. Reports documenting the results of these audits are prepared and issued to the project manager; the audited organization; the Vice President, Consulting Engineering, QA, and New Technology and other appropriate G&H management personnel in accordance with the G&H Quality Assurance Manual. These audit reports serve as an indication of the quality trends within our own organization. All nonconformances found are recorded on the audit report and the audited organization is instructed to provide a corrective action reply within a specified time limit as described in subsections 17.1.15 and 17.1.16. Followup action is scheduled after the corrective action completion date to confirm that the corrective action indicated has been satisfactorily implemented.

The completed audit report is maintained in the QA files.

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Additionally, the Vice Presidents of Power Engineering; Power Projects; Consulting Engineering, QA and New Technology; the Manager, Support Services who is responsible for procurement, the Manager Construction Liaison and the Vice Presidents, Regional Offices involved in performing nuclear safety-related activities, institute annual management reviews of the areas under their cognizance to assess the adequacy and effectiveness of the G&H QA Program in accordance with the criteria of Appendix B to 10CFR Part 50. Management Review Reports are issued to the appropriate Senior Vice President or Vice President and submitted to the President for approval. Where Reports identify the need for specific changes or improvements, follow-up action is monitored by the QA Department to verify that implementation is accomplished within a specified time frame. Procedures for performing management reviews are established in the G&H Quality Assurance Manual.

The G&H QA Department also performs periodic audits of suppliers and constructors, as contractually required, to determine that they are complying with and implementing the requirements of the procurement documents, their previously approved QA/QC Manual and procedures, and the criteria of Appendix B to 10 CFR Part 50. These audits include objective evaluation of work areas, activities, processes, and items and the review of documents and records, and are performed using preplanned written checklists based on the status and safety importance of the activities being

performed in accordance with the procedures of the G&H Quality Assurance Manual. Reports documenting the results of supplier or constructor audits are prepared and issued to the contractor, the Utility Owner, the G&H project manager and appropriate G&H management personnel. Nonconformances or deficiencies are handled as described in subsections 17.1.15 and 17.1.16. Followup action will be scheduled to confirm satisfactory implementation of the required corrective action, and the results are distributed in the same manner as the original report.

GIBBS & HILL  
QA PROGRAM TOPICAL REPORT

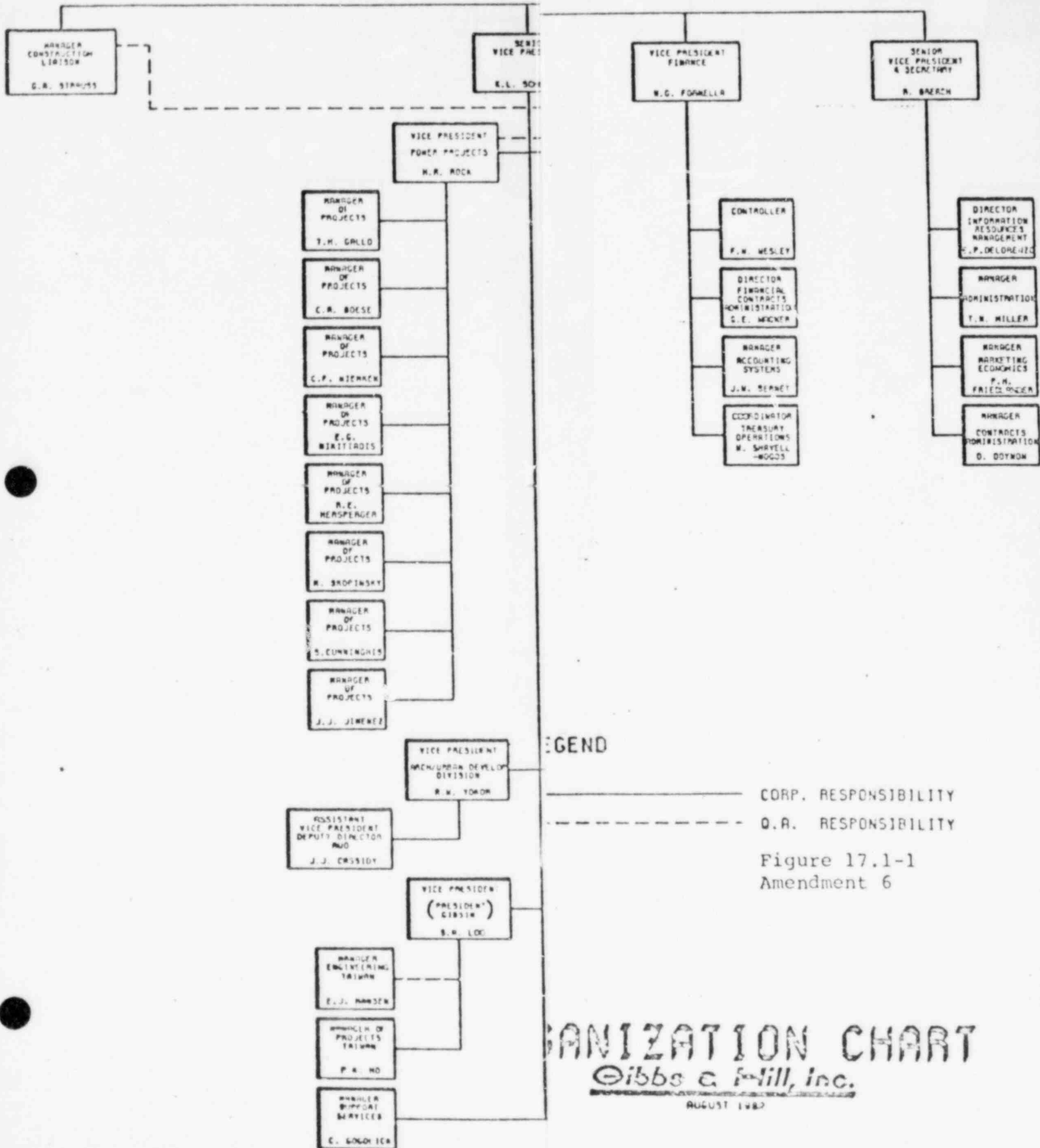
APPENDIX A

1. 10 CFR Part 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.
2. NRC Regulatory Guide 1.28 (Revision 2 - February 1979), Quality Assurance Program Requirements (Design and Construction), endorses ANSI N45.2.
3. NRC Regulatory Guide 1.30 (Revision 0 - August 1972), Quality Assurance Requirements for Installation, Inspection, and Testing of Instrumentation and Electric Equipment, endorses ANSI N45.2.4.
4. NRC Regulatory Guide 1.37 (Revision 0 - March 1973), Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants, endorses ANSI N45.2.1.
5. NRC Regulatory Guide 1.38 (Revision 2 - May 1977), Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water-Cooled Nuclear Power Plants, endorses ANSI 45.2.2.

6. NRC Regulatory Guide 1.39 (Revision 2 - September 1977), Housekeeping Requirements for Water-Cooled Nuclear Power Plants, endorses ANSI N45.2.3.
7. NRC Regulatory Guide 1.58 (Revision 1 - September 1980), as required for the work being done, Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel, endorses ANSI N45.2.6.
8. NRC Regulatory Guide 1.64 (Revision 2 - June 1976), Quality Assurance Requirements for Design of Nuclear Power Plants, endorses ANSI N45.2.11.
9. NRC Regulatory Guide 1.70 (Revision 2 - September 1975), Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants.
10. NRC Regulatory Guide 1.74 (Revision 0 - February 1974), Quality Assurance Terms and Definitions, endorses ANSI 45.2.10.
11. NRC Regulatory Guide 1.88 (Revision 2 - October, 1976), Collection, Storage, and Maintenance of Nuclear Power Plant Quality Assurance Records, endorses ANSI N45.2.9.
12. NRC Regulatory Guide 1.94 (Revision 1 - April 1976), Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During

the Construction Phase of Nuclear Power Plants, endorses ANSI 45.2.5.

13. NRC Regulatory Guide 1.116 (Revision 0 - June 1976) Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems, endorses ANSI N45.2.8.
14. NRC Regulatory Guide 1.123 (Revision 1 - July 1977) Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants, endorses ANSI N45.2.13.
15. NRC Regulatory Guide 1.144 (Revision 1 - September 1980) Auditing of Quality Assurance Programs for Nuclear Power Plants, endorses ANSI N45.2.12
16. NRC Regulatory Guide 1.146 (Revision 0 - August 1980) Qualifications of Quality Assurance Program Audit Personnel for Nuclear Power Plants, endorses ANSI N45.2.23



LEGEND

————— CORP. RESPONSIBILITY  
 - - - - - O.A. RESPONSIBILITY

Figure 17.1-1  
 Amendment 6



Figure 17.1-2

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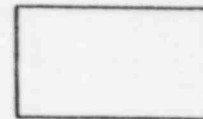
Amendment 6

# Gibbs & Hill, Inc.

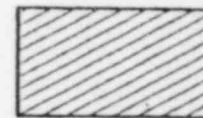
## NUCLEAR PROJECT ORGANIZATION CHART

### LEGEND

- DIRECT PROJECT RESPONSIBILITY
- - - QA AUDIT RESPONSIBILITY
- - - TECHNICAL RESPONSIBILITY



INDICATES OFFSITE PERSONNEL



INDICATES ONSITE PERSONNEL

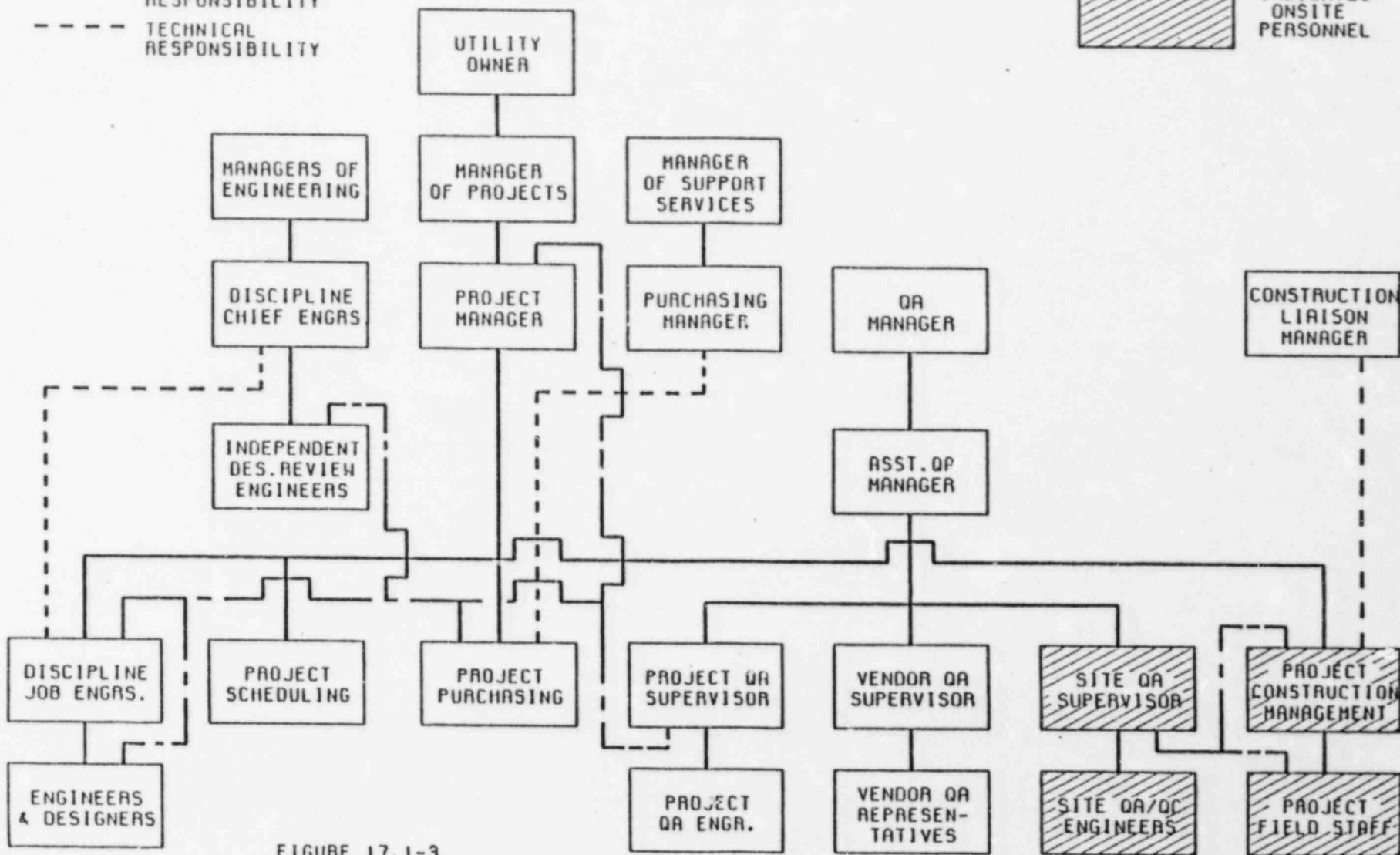


FIGURE 17.1-3  
AMENDMENT 6

**Gibbo & Hill, Inc.**

**QUALITY ASSURANCE DEPARTMENT  
ORGANIZATION CHART**

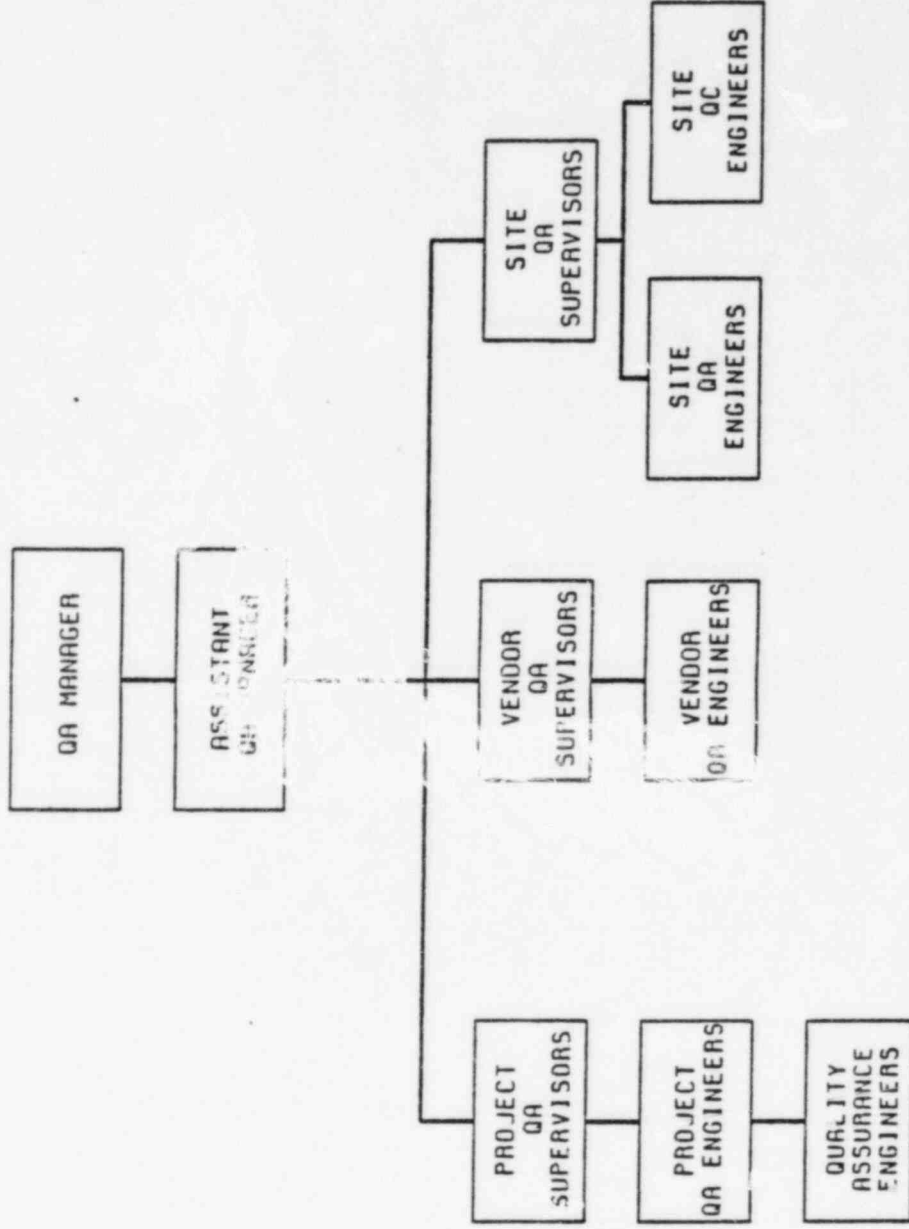


FIGURE 17.1-4  
AMENDMENT 8

### CRITERIA IMPLEMENTATION MATRIX

G & H QUALITY ASSURANCE MANUAL PROCEDURES	APPENDIX B OF 10 CFR 50 - QUALITY ASSURANCE CRITERIA FOR NUCLEAR POWER PLANTS																	
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
QAI - A		●																
QAI - B1	●																	
QAI - B2	●																	
QAI - C		●																
QAI - D1		●																
QAI - D2		●																
QAI - E															●	●		
QAI - F																	●	
QAI - G																		●
QAI - A			●															
QAI - B1		●																
QAI - B2					●													
QAI - B3.1					●													
QAI - B3.2					●													
QAI - B4.1			●															
QAI - B4.2			●															
QAI - B5			●				●	●	●	●	●	●	●	●	●			
QAI - B6			●															
QAI - B7			●															
QAI - B8					●				●		●	●		●				
QAI - C		●	●															
QAI - D			●															
QAI - E						●												
QAI - F			●															
QAI - A				●														
QAI - B1							●											
QAI - B2							●											
QAI - C				●			●											
QAI - D				●														●
QAI - E							●									●	●	
QAI - F							●	●	●	●	●	●	●	●	●	●	●	●
QA IV - A					●		●	●	●	●	●	●	●	●	●	●	●	●

Figure 17.1-5

TABLE 17.1-1  
Sheet 1 of 8

GIBBS & HILL PROCEDURES FOR ESTABLISHING PROJECT QUALITY

<u>PROCEDURE NUMBER</u>	<u>TITLE</u>	<u>PURPOSE</u>
	Quality Assurance Manual	To set forth the G&H Corporate procedures developed to document and control the QA activities concerned with nuclear safety-related structures, systems, and components.
PART I	GENERAL	
QAI-A	Glossary of Terms and Definitions	To define terms important to the uniform understanding of the Quality Assurance Manual Procedures.
QAI-B1	Quality Assurance Organizations	To describe the G&H Project and QA organization and functions established to effectively administer, design and construct nuclear power plants.
QAI-B2	Project Staff Personnel and their Responsibilities	To establish the duties and responsibilities of G&H personnel performing quality related activities during the engineering and design, procurement and construction phases of a nuclear project.
QAI-C	Quality Assurance Program Description	To describe the measures by which the G&H QA Program meets the criteria of Appendix B to 10 CFR Part 50 and to establish G&H Management involvement in the Program.
QAI-D1	Procedure for Control of Distribution and Revisions of Quality Assurance Manual	To establish the methods to control distribution and revisions of the Quality Assurance Manual and its procedures.

TABLE 17.1-1  
Sheet 2 of 8

<u>PROCEDURE NUMBER</u>	<u>TITLE</u>	<u>PURPOSE</u>
QAI-D2	Procedure for Indoctrination and Training	To establish the requirements for indoctrination and training of personnel performing quality-related activities and to define the methods to be followed for such indoctrination and training.
QAI-E	Procedure for Control of Nonconformances and Corrective Action	To establish methods for documentation and reporting of nonconformances and to control the implementation of corrective action.
QAI-F	Procedure for Control of QA Documents	To set forth the requirements for collection, filing, and retention of QA records generated during the engineering and design, procurement and construction phases of a nuclear project.
QAI-G	Procedure for Performance of Audits	To establish a system of audits to confirm implementation of the internal G&H QA program as well as external contractor QA programs.
PART II	QUALITY ASSURANCE DURING ENGINEERING AND DESIGN	
QAII-A	Procedure for Dissemination of Regulatory Guides and other Publications	To define the methods for distribution and maintenance of publications related to nuclear projects and for confirming that they are being received by cognizant engineering and design personnel responsible for their implementation.

TABLE 17.1-1  
Sheet 3 of 8

<u>PROCEDURE NUMBER</u>	<u>TITLE</u>	<u>PURPOSE</u>
QAII-BI	Procedure for Preparation of Q-List	To set forth instructions for preparation and control of the list of nuclear safety-related structures, systems and major components and to establish responsibility for originating and maintaining this list.
QAII-B2	Technical Data Input Procedure	To set forth the methods for identification, accumulation, documentation and maintenance of all technical inputs required for engineering and design of nuclear safety-related items generated by G&H personnel and supplied to G&H by other organizations.
QAII-B3.1	Procedure for Preparation of Technical Descriptions	To establish the procedures to be followed for the control of preparation, review, distribution and maintenance to technical descriptions setting forth design bases to be followed in the design of nuclear safety-related systems and components.
QAII-B3.2	Procedure for Preparation of Structural Design Criteria	To establish the procedures to be followed for the control of preparation, review, distribution and maintenance of structural design criteria setting forth design bases to be followed in the design of nuclear safety-related structures.

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<u>PROCEDURE NUMBER</u>	<u>TITLE</u>	<u>PURPOSE</u>
QAII-B4.1	Analyses and Calculation Procedure - Power and Energy Division (Other than Structural and Special Analysis Departments)	To set forth the procedures for the control of preparation, review, documentation and retention of analyses and calculations concerned with nuclear safety-related power plant structures, systems, and components generated by the Power Division.   6
QAII-B4.2	Analyses and Calculations Procedure - Structural and Special Analysis Departments	To set forth the procedures for the control of preparation, review, documentation and retention of analyses and calculations concerned with nuclear safety-related power plant structures, systems, and components generated by the Structural Department.   6
QAII-B5	Specification Procedure	To establish the methods to be followed for the control of preparation, review, documentation and maintenance activities associated with specifications for nuclear safety-related items and services.
QAII-B6	Design Drawing Procedure	To describe the procedures for the control of preparation, checking, review, documentation and maintenance activities applied to design drawings for nuclear safety-related structures, systems, or components.



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<u>PROCEDURE NUMBER</u>	<u>TITLE</u>	<u>PURPOSE</u>
QAII-B7	Safety Analysis Report Procedure	To set forth the requirements for control of preparation, review and documentation of material for inclusion in Safety Analysis Reports and amendments thereto.
QAII-B8	Installation and other Special Design Documents Procedure	To establish the instructions for the control of preparation, review, documentation and maintenance activities concerned with installation and special design requirements for nuclear safety-related items or services.
QAII-C	Interface Control Procedure	To set forth the methods to be followed for the identification and control of engineering and design interface infor- mation and to establish the requirements for coordination among G&H engineering disci- plines and between G&H and external participating organ- izations.
QAII-D	Engineering and Design Verification Procedure	To establish the procedures for performing and documenting independent design verification of those engineering and design documents concerned with nuclear safety-related power plant structures, systems, and components.
QAII-E	Engineering and Design Document Control Procedure	To set forth the instructions to control the distribution and retention of engineering and design documents prepared by G&H.

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<u>PROCEDURE NUMBER</u>	<u>TITLE</u>	<u>PURPOSE</u>
QAII-F	Design Change Procedure	To establish the procedures for the control and documentation of changes to engineering and design documents concerned with nuclear safety-related items.
PART III	QUALITY ASSURANCE DURING PROCUREMENT	
QAIII-A	Procedure for Control of Review and Compilation of Procurement Documents	To set forth the requirements for control of the review and issuance to be exercised during the assembly of procurement documents prior to their release.
QAIII-B1	Procedure for Preparation of Qualified Bidders List	To establish the procedure for control of the selection and evaluation of acceptable procurement sources for their inclusion in the Qualified Bidders List for nuclear safety-related items or services. This list is limited to those suppliers showing potential for meeting the project QA requirements.
QAIII-B2	Procedure for Performance of Preaward Surveys	To define the procedures for in depth evaluation of technically acceptable suppliers or constructors QA programs, and implementation in accordance with project requirements.
QAIII-C	Bid Proposal Evaluation Procedure	To define the methods to be followed during processing of proposals received in reply to invitation to bid requests, including QA review of the contractor's QA/QC programs, and any exceptions taken to specified requirements.

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<u>PROCEDURE NUMBER</u>	<u>TITLE</u>	<u>PURPOSE</u>
QAIII-D	Procedure for Control of Vendor Submitted Documents	To set forth the procedures by which G&H controls the receipt, internal distribution, review, documentation, filing and return to vendor of specifications, drawings procedures, test reports and other pertinent data submitted for information or comment by contractors in accordance with the requirements of the procurement document.
QAIII-E	Procedure for Control and Evaluation of Supplier Performance	To establish the requirements for audit control and evaluation of supplier performance to determine adherence to his QA program, Appendix B to 10 CFR Part 50, and the procurement document during his design, fabrication and procurement activities.
QAIII-F	Procedure for Surveillance of Supplier Operations	To describe the performance of G&H supplier shop surveillance activities designed to establish confidence that materials, components and equipment conform to the specified requirements and that appropriate quality related documentation has been generated.
PART IV	QUALITY ASSURANCE DURING CONSTRUCTION	
QAIV-A	Site Quality Assurance Procedure	To set forth the procedure for a system of site QA activities to monitor site constructors, subcontractors and suppliers engaged in field fabrication, installation, erection, inspection, testing and documentation for a nuclear power plant.

TABLE 17.1-1  
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<u>PROCEDURE NUMBER</u>	<u>TITLE</u>	<u>PURPOSE</u>
PART V	AUTHORIZED INSPECTOR	
QAV-A	Interrelation with Authorized Inspector	This procedure establishes the areas of involvement and describes the relationship between the Authorized Nuclear Inspector and G&H.