INTRODUCTION

In early 1982, The Cleveland Electric Illuminating Company (CEI) conceptually defined the scope of a Design Verification Program. This was done to further our confidence in the Gilbert Associates, Inc. (GAI) design program and our recognition of the regulatory environment and its changing direction.

This report, Piping Design Review, represents one portion of that overall effort which includes design review programs addressing both Quality Assurance and Engineering objectives.

The Cygna Energy Consultants were selected to perform the piping design review on selected systems, as described in Part I, Section 1-3. This review was completed as of February 28, 1984. The methodology of the review is described in Part I Section 4.0 and Part II Volume I, Section 3. The results and all documentation from the review are contained in Part II Volumes 1 & 2 of this package.

INTRODUCTION (Cont'd)

After completion of Cygna review, CEI initiated a follow-up review, to assure that potential generic items identified are reviewed through the entire piping design control program. Cygna concentrated on the adequacy of the three systems within their review scope, whereas the CEI follow-up review addressed the potential for similar discrepancies to affect other safety-related systems. The CEI follow-up review and observation closure is described in Part I, Section 5 through 6 of this package. Observations are considered closed for the purpose of this report if action to insure it is addressed has been developed. This will insure any generic problems are tracked to closure thereby receiving proper action.

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1.0 PURPOSE

The Piping Design Review was initiated to confirm the technical adequacy of Gilbert Associates' mechanical and piping design. While design control has been audited throughout the project, an additional technical review was initiated to evaluate the conformance with design specifications, design criteria, licensing commitments and standard industry practices. This was accomplished by a complete design verification and technical design review by an independent consultant.

2.0 SCOPE

Three subsystems were chosen to give a good representation of GAI's piping analysis. This review approach has been called a "vertical slice" because it started with the application of design requirements from GE, ASME, Federal Regulations, etc., and ended by reviewing the detail design drawings from GAI. The review followed the design process through system flow calculations, piping analysis, and pipe support design to the detailed drawings. The piping subsystems were selected to be consistent with the GAI piping and support analysis scope. The mechanical review scope was broader in order to review the process calculations. The scope of the review is described in more detail within the Cygna final report.

Following the independent consultant review, CEI reviewed all observations for generic implications to assess the effect of noted discrepancies on other safety-related systems. Any resulting findings were documented on an Engineering Design Deficiency Report to properly track the resolution and closure of these generic items.

The three systems chosen were:

- o 1-E22-G004 Class 1 High Pressure Core Spray

  Primary Reasons:
  1. Important to Safe Shutdown or Cooldown
  2. Strong Interaction with Other Systems
  3. Large Bore
  4. Organizational Interface GE/GAI
  5. Attached to RPV

- o 1-N22-G001 Class 1 Main Steam Drain

  Primary Reasons:
  1. Typical Standard Design
  2. Small Bore
  3. Organizational Interface GE/GAI

- o 1-B21-G008 Class 3 SRV Discharge Line

  Primary Reasons:
  1. To Review Class 2 or 3 Piping Analysis
  2. Hydraulic Thrust Loads and Transients
  3. Piping is Highly Stressed and Difficult Routing
  4. Organization Interface
  5. Important to Overpressure Protection of the Reactor

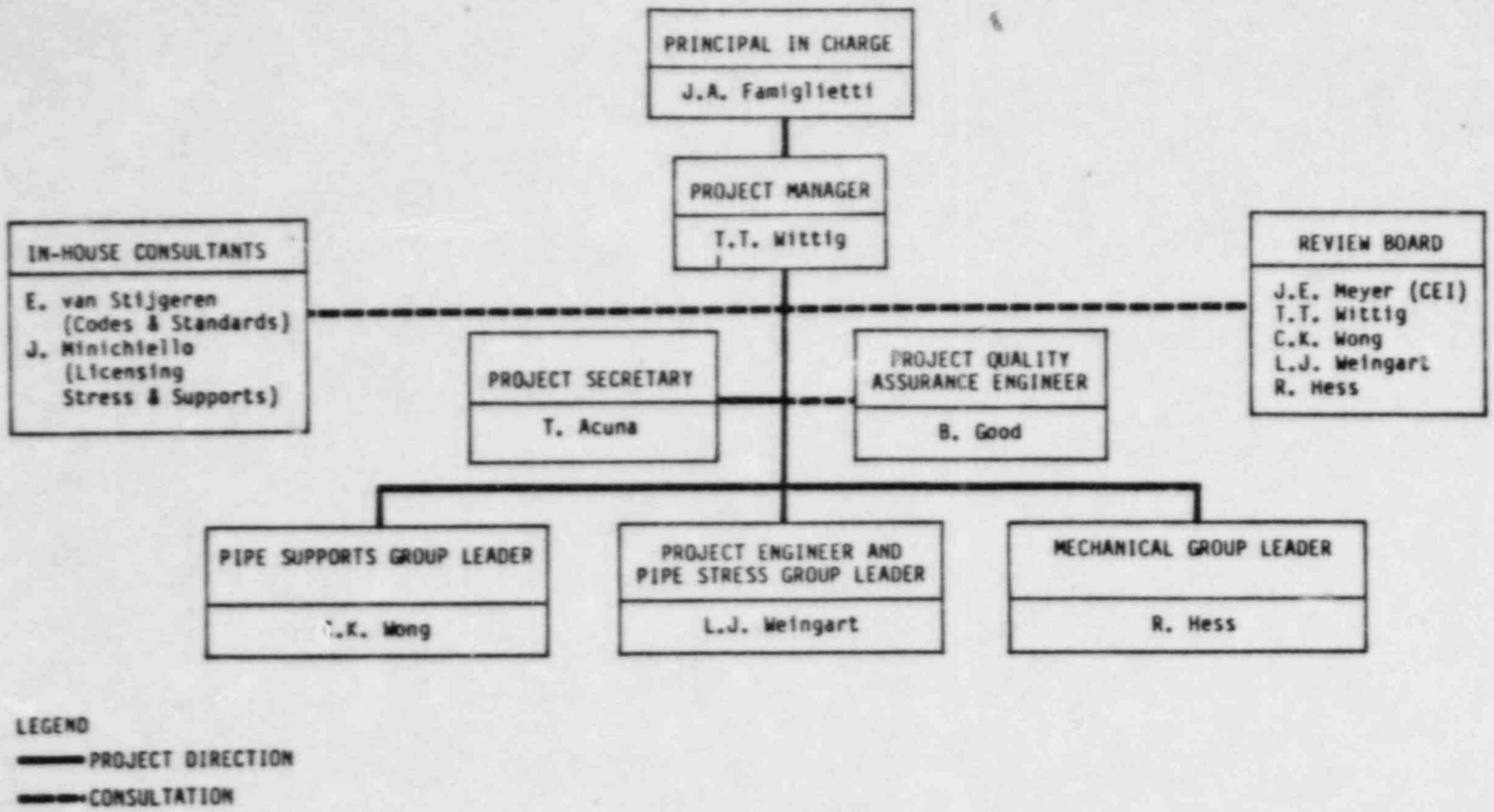
3.0 PARTICIPANTS

Cygna Energy Services provided most of the review organization which is shown in Figure #5. Their selection by CEI was based on their acceptability on all of the following items:

1. Design experience of personnel proposed for the review team.
2. Technical experts to supply backup for the review team if needed.
3. Independent of Gilbert Associates and the Perry Project design. Previous Cygna work on Perry represented less than 1% of their yearly revenue. In addition, this work did not involve design responsibility.
4. Cygna previously had performed two independent design verifications. Cygna's previous reviews, as well as their proposal to CEI, included developing detailed acceptance criteria and checklists prior to starting the review. CEI felt this well-organized approach would result in a meaningful review and a high confidence level in the outcome.

The review board also included J. E. Meyer. Mr. Meyer is a recent addition to the CEI organization. His expertise will increase CEI's piping analysis capabilities. He brought with him nine years of experience in piping and support analysis and has been active on various ANSI/ASME piping code committees. In addition, he was independent of prior Gilbert and CEI design decisions.

FIGURE #5



PIPING REVIEW ORGANIZATION

REVIEW BOARD

J. Meyer, CEI - SEE EXHIBIT 3.2
T. Wittig
L. Weingart
R. Hess
C. Wong

TED T. WITTIG

EDUCATION:

B.S., Civil/Structural Engineering, Michigan Technological University, Houghton, MI

PROFESSIONAL REGISTRATION:

Civil Engineer, California

PROFESSIONAL EXPERIENCE:

Mr. Wittig has over thirteen years of experience in structural engineering for nuclear power plants and is currently the Manager of Projects. This experience includes criteria development, seismic analysis, high temperature effects, impact evaluations and soil-structure interaction.

With Cygna, Mr. Wittig has acted as the Project Manager for the following projects:

- Independent Design Review for Mississippi Power & Light
- Independent Design Verification for Detroit Edison Company
- Third-Party Review for Cleveland Electric, Inc.
- Seismic Equipment Qualification for Washington Public Power Supply System

The design reviews listed above covered a broad range of engineering design and design control activities, including structural, piping, pipe supports, cable tray supports, equipment qualification, electrical and mechanical. These reviews involved considerable interaction with the NRC in the form of developing a program plan and presenting the results.

Prior to joining Cygna, Mr. Wittig was employed by a major architect/engineer. During this assignment he was responsible for the conceptual design and analysis of all structures on an LMFBR Study. He also acted as a liaison and technical reviewer for the LMFBR national team commissioned by the Department of Energy. His role as a technical reviewer covered the areas of structural, seismic, and planning/scheduling.

Mr. Wittig also functioned as a structural engineer for a commercial PWR plant. In this assignment he was responsible for the civil/structural design criteria, seismic analysis seismic specification for mechanical equipment and various special studies. The special studies included soil-structure interaction, tornado and turbine missile impact, and liquefaction. In addition, he was responsible for the design and analysis of the circulating water system intake structures.

TED T. WITTIG
(continued)

Mr. Wittig's previous experience has included design of roads, railroads and seismic Category I structures for a major nuclear project. This experience included design and analysis of the containment building basemat and reactor cavity. It also included seismic analysis of the containment building and the design of major equipment supports.

LEE J. WEINGART

EDUCATION:

B.S., Engineering. San Francisco State University, San Francisco, CA

Undergraduate studies, Mechanical Engineering, Drexel University, Philadelphia, PA

Undergraduate studies, Communications, Temple University, Philadelphia, PA

PROFESSIONAL REGISTRATION:

Registered Mechanical Engineer, California

PROFESSIONAL AFFILIATIONS:

Associate Member, American Society of Mechanical Engineers

Member, American Nuclear Society

PROFESSIONAL EXPERIENCE:

Mr. Weingart has over ten years of experience with particular emphasis in the analysis of components, piping and support structures. He is presently assigned as a Senior Engineer at Cygna's San Francisco office responsible for a broad range of engineering activities in the Engineering Design Division, including:

- Assistant Project Engineer for the WPPSS-2 dynamic equipment qualification.
- Lead Engineer for the Fermi-2 Independent Design Verification in the areas of equipment qualification and piping.
- Project Engineer for the Grand Gulf Independent Design Review and Perry Independent Piping Analysis.

Formerly, Mr. Weingart was employed as a Senior Engineer by Quadrex Corporation, a West coast consulting engineering firm. Mr. Weingart was instrumental in computerizing standard calculations, modeling, and analysis. He created FORTRAN programs to facilitate use of the SAGS program for computer modeling of pipe support structures, and performed static and nonlinear analysis of baseplates using STARDYNE.

As a Structural Analyst for computer services support at Control Data Corporation, Mr. Weingart was actively involved in customer support services in structural applications using ANSYS, EAC/EASE2, NASTRAN, SDRC/SAGS, STARDYNE and STRUDL, and in piping applications using DIS/ADLPIPE, NUPIPE and PIPESD. The capabilities of these finite element programs include linear and nonlinear static, dynamic, and heat transfer

LEE J. WEINGART
(continued)

analyses of structures and piping systems. Mr. Weingart also served as the primary West Coast analyst for piping graphics applications, in addition to organizing and participating (instructor) in training seminars for customers.

Prior to the above, Mr. Weingart served as an Engineer at Bechtel Power Corporation where, as part of an overall Equipment Qualification effort, he located and sized the instrumentation required to verify dynamic transient analyses which he performed (using available computer programs such as STARDYNE and ANSYS) for both nuclear and fossil fuel power plant piping systems to determine restraint sizes and locations, and to assure system acceptability within code limits (ASME B&PV Section III and B31.1). He also performed thermal flexibility, weight and seismic calculations for both small and large piping. He was also responsible for training new employees in analysis objectives and techniques, and coordinating their activities.

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ROBERT W. HESS

EDUCATION:

B.S., Engineering, University of Maryland, College Park, MD

Graduate course work in Engineering Administration, George Washington University, Washington, DC

Basic Project Management Course, American Management Association

Air Conditioning and Refrigeration, Brevard Junior College, Cocoa, FL

Cryogenics, Genesy's Extension of University of Florida, Gainsville, FL

PROFESSIONAL REGISTRATION:

Professional Engineer, Mechanical, State of California

PROFESSIONAL AFFILIATIONS:

Member, American Nuclear Society

Member, American Institute of Aeronautics and Astronautics

PROFESSIONAL EXPERIENCE:

Mr. Hess has more than eighteen years of experience in engineering and management. He is currently assigned as Engineering Manager-Systems Engineering for the Western Region. In this capacity he is responsible for the supervision of multiple discipline groups including mechanical, electrical, and instrumentation and control in the performance of systems analysis and design, systems modification, computer applications, and regulatory compliance projects.

Formerly associated with NUS as General Manager of its Western Engineering Office, he was responsible for the management, direction and staffing requirements of all engineering and design projects. In an earlier position as Manager, Plant Engineering, his duties included technical direction and administrative activities associated with process development and system design of modifications to nuclear and fossil-fueled generating facilities. This included supervision of site investigations to determine system design requirements based on plant operations and site-specific constraints, technical approval of conceptual and detail design and management of assigned discipline engineers and designers to meet schedule and budget requirements. Specific projects included NUREG 0612 compliance reports for Trojan and Crystal River Power Plants, ATWS modification requirements study for BWR's, preparation of emergency implementing procedures for a PWR, and modification of a pH control system for a fossil unit cooling tower.

ROBERT W. HESS
(continued)

As Project Engineer for the design of large waste treatment facilities for two fossil generating facilities, Mr. Hess was responsible for directing and sequencing project tasks to accomplish the work scope within budget and schedule, and maintaining formal communications with the client. This assignment required close coordination of design, procurement and construction efforts of process, mechanical, electrical, I&C, and civil/structural engineers.

Other assignments with NUS included responsibilites for conceptual and detail design of make-up water and wastewater treatment systems for both nuclear and fossil power plants. These projects included specification of demineralizer systems, floating roof make-up water storage tanks, sand filters, pumps and tie-ins to existing systems. Mr. Hess supervised engineers and designers in performance of discipline work scope within schedule and budget constraints; established system design criteria and coordinated inputs with other disciplines; prepared and supervised preparation of equipment specifications, construction bid packages, proposal bid evaluations, P&ID's, equipment and piping layout drawings and engineering manhour estimates. Various other project experience includes engineering design and analysis of radioactive waste treatment systems for nuclear power plants, design and review of RCP oil enclosure systems, fossil plant fire water system modifications, and addition of fire suppression systems to the cable spreading rooms. While assigned to a core spray system modification project, he coordinated field engineering efforts and client inputs during the analysis and modification design, in addition to being responsible for the preparation of specifications, drawings and construction work packages for the installation of mechanical modifications. Also, Mr. Hess prepared conceptual mechanical designs and weight analyses of shippings casks for solid waste generated by nuclear fuel reprocessing plants (concepts included both rail and truck-mounted casks for high- and low-level wastes).

Previously, Mr. Hess worked with Newport News Shipbuilding where he was responsible for the design and review of various fluid systems required for operation and support of a naval nuclear power plant. He participated the in formulation and composition of technical documents detailing and justifying system design characteristics, operating principles and maintenance requirements for primary shield water, reactor plant air and evacuation and nitrogen purge systems.

As Lead Systems Engineer with Grumman Aerospace Corporation, Mr. Hess was responsible for systems checkout and launch operations on the Lunar Module Propulsion Subsystems. His position required consideration of such items as test scheduling, manpower planning, review and approval of test procedures and direct supervision of engineers and technicians during pre-launch and launch operations. As Systems Engineer, he prepared and performed test procedures for fluid systems checkout, directed troubleshooting and repair of ground support and flight equipment, and participated in development and site start-up of high pressure gas and cryogenic loading equipment.

CHUN K. WONG

EDUCATION:

M.S., Structural Engineering, University of California, Berkeley, CA

B.S., Civil Engineering, University of California, Berkeley, CA

Ordinary Certificate Building Construction, Hong Kong Technical College, Hong Kong

PROFESSIONAL REGISTRATION:

Registered Professional Engineer (Civil), California

Registered Civil Engineer, Ontario, Canada

PROFESSIONAL EXPERIENCE:

Mr. Wong is currently an Engineering Supervisor in the Engineering Design Division at Cygna. He was assigned as Project Engineer for the design and analysis of the Control Rod Drive System for LaSalle Units 1 and 2. In this position, he was responsible for scheduling work and leading a group of ten engineers in the design of the support frames. His group used the ANSYS computer code to develop stiffnesses for the frames (for input to the pipe stress work) and to perform the final designs.

Previously, Mr. Wong worked on the Limerick Generating Station project. He coordinated and supervised stress analysts in the performance of the analyses of piping systems in accordance with ASME III and B31.1 codes, and reviewed and approved stress calculations. For the Peach Bottom project, Mr. Wong coordinated and supervised analysts in the performance of NRC IE Bulletin 79-14, as-built analysis of nuclear piping systems. Mr. Wong also served as senior stress analyst, for the Surry Power Plant project and performed NRC 79-14 computer analysis of nuclear piping systems.

Mr. Wong has also worked on such major projects as: Humboldt Bay Nuclear Power Plant, for which he performed dynamic seismic analysis of plant structures and soil-structure interaction analysis; Susquehanna Nuclear Power Plant, for which he performed pipe rupture time-history analysis of piping systems; Yankee Nuclear Power Station, for which he performed dynamic analysis of spent fuel pool; and Geyser Steam Gathering, for which he performed stress analysis of piping system.

During his course of work at Cygna, Mr. Wong has gained extensive experience in structural dynamics and in the use of many commercial and Cygna proprietary programs such as ANSYS, PIPESD, PSA, SAPIV, NUPIPE, ME101 (Bechtel Piping Program).

PROJECT TEAM

J. Minichiello
R. Baliga
S. Luo
V. Phi

CYGNA

RAVINDRANATH B. BALIGA

EDUCATION:

M. OcE., Ocean Engineering Structures, Oregon State University, OR

M. Tech., Marine Structures, Mysore University, India

B. E., Civil Engineering, Mysore University, India

PROFESSIONAL REGISTRATION:

Engineer-In-Training, California

PROFESSIONAL EXPERIENCE:

As a Senior Engineer in the Engineering Design Division at Cygna, Mr. Baliga is currently involved in the Independent Review of the Perry I plant, pipe support design group. Prior to this assignment on Perry, he was the Project Engineer in charge of the pipe stress analysis for Diablo Canyon Unit I. As such, he is responsible for the scheduling, technical direction, and approval of all work in this area of the project. He has been involved in a variety of tasks at Cygna, including:

- Midland Nuclear Station

  Performed pipe break analysis using PIPERUP and designed failure restraints.

- Susquehanna Nuclear Station

  Performed pipe stress analysis using ME101 and ANSYS and a valve response study using ME632.

- Palo Verde

  Performed pipe stress analysis and evaluated pipe support designs.

- La Salle

  Performed pipe stress analysis on the CRD system using ADLPIPE.

- Peach Bottom/Limerick

  Performed pipe stress analysis using ME101.

- Vermont Yankee

  Collected as-built piping data and performed evaluations in accordance with NRC IE Bulletins 79-01 and 79-14.

- Cygna Research and Development

  Developed a general purpose plotting package for in-house computer programs and performed dynamic analysis of beams on elastic foundations and two-way concrete slabs.

Previously associated with Ray Desai Associated, he was responsible for the design of the foundations of stationary and bridge cranes as well as retaining walls. Also performed dynamic analysis of multi-story steel and concrete structures using finite-element computer methods.

As a research assistant at Oregon State University, he performed a hydrodynamic study on sand waves in an estuary, data collection in the field, computer programming and report writing. He also performed an experimental study in stochastic wave forces.

Mr. Baliga also worked as an assistant lecturer at Mysore University, India, where he taught graphic statics, fluid mechanics and applied mechanics.

Prior to teaching, he worked as a consultant for planning and design of steel and concrete frame structures.

PUBLICATIONS:

"Influence of Hydrodynamics On Rate of Sediment Turnover Mechanics of Sand Wave Motion," National Science Foundation, Washington, D.C., 1976.

"Estuarine Sediment Dispersion," report submitted to National Science Foundation, Washington D.C., 1976

"Stochastic Wave Tests on Test Cylinder - Dynamic Analysis of Hydrodynamic Force on Cylinder," report submitted to Continental Oil Company, Ponca City, Oklahoma, January 1978.

"Evaluation of Sand Waves In an Estuary," Journal of the Hydraulics Division, ASCE, February, 1981.

SIMON LUO

EDUCATION:

M.S., Civil Engineering (structural), Texas Tech University, Lubbock, TX

B.S., Civil Engineering, Tamkang University, Taipei, Taiwan, R.O.C.

PROFESSIONAL REGISTRATION:

Engineer-in-Training, Texas

PROFESSIONAL AFFILIATIONS:

Member, American Concrete Institute

Member, American Institute of Steel Construction

PROFESSIONAL EXPERIENCE:

Mr. Luo is a Staff Engineer currently assisting in program development for Cygna's CYTRAC computer program which tracks radwaste in-plant. Other projects Mr. Luo has been involved in were the static and dynamic structural analysis and design evaluations of the pipe support systems for Perry Unit 1, Comanche Peak Units 1 and 2, Diablo Canyon Unit 1 and La Salle Unit 2.

Previous assignments have included computer analysis for the Susquehanna Nuclear Power Plant pipe support system under seismic load and documenting analysis results to meet ASME, ANS codes; computer pipe stress analysis for the La Salle Unit 1 Nuclear Power Plant CRD piping system under seismic, thermal and gravity loads.

Formerly employed by the Hugh M. O'Neil Company, Mr. Luo was responsible for the design and analysis of a jib crane including the detailing of structure in steel. Other design work required the application of finite element methods of dynamic analysis for a Lucky Stores' project.

While working on his master's at Texas Tech University, Mr. Luo was involved in the research of spall behavior for the U.S. Air Force. He developed a finite element computer program to simulate the stress wave propagation due to impact and by using a suitable numerical integration scheme for the dynamic equation of motion involved in the stress wave propagation phenomena.

SIMON LUO
(continued)

Additional industrial experience was acquired by Mr. Luo through his association with the Public Works Department, Taipei City. He was responsible for construction material quality and quantity control, sheer wall and basement construction design, schedule control.

PUBLICATIONS:

"A fracture spall finite element model in impact problems," Eleventh Southwestern Graduate Research in Applied Mechanics, Oklahoma State University, April 11, 1980.

VUONG PHI

EDUCATION:

B.S., Mechanical Engineering, San Francisco State University, San Francisco, CA

Bechtel Professional Training Program, Subjects: Piping Stress Analysis and Nuclear Power Plant Design

PROFESSIONAL EXPERIENCE:

As a Senior Engineer in the Engineering Design Division at Cygna, Ms. Phi is currently assigned as a pipe stress group leader for the Diablo Canyon Unit I reanalysis. With over six years in piping stress analysis, Ms. Phi is responsible for directing other engineers and solving technical problems as they arise. Just recently, Ms. Phi completed an Independent Design Review of the RHR piping analysis for the Grand Gulf Nuclear Station, in which she compared the actual analyses methods to that in the various ASME and NRC criteria and also checked that results met the stated criteria.

Her previous work included assignment as Coordinator, Trojan Project, in which she evaluated the safety and operability of a variety of systems under the scope of I.E.B. 79-14 and of the auxiliary control modification area.

Ms. Phi has served as Pipe Stress Analyst for a number of projects: Hope Creek, F.F.T.F., Susquehanna, Limerick, Peach Bottom, Yankee Rowe, Vermont Yankee, Vermont Main, Diablo Canyon, LaSalle and MP&L. In these, her duties included as-built analysis and hydrodynamic loading analysis in accordance with the requirements of the appropriate codes.

Prior to joining Cygna, Ms. Phi worked in the Power Division of Bechtel Power Corporation as a Stress Analyst. Her work involved analysis of piping subjected to thermal, gravity and seismic loadings.

Ms. Phi is also experienced in using linear elastic finite element programs such as: ME 101, ME 632, PIPESD, ADLPIPE, PIPSYS, SUPERPIPE, and ANSYS. She also conducted a session on how to utilize ME 101 for doing piping stress analysis.

JOHN C. MINICHIELLO

EDUCATION:

M.S., Applied Mechanics, Harvard University, Cambridge, MA

B.S., Mechanical Engineering, Tufts University, Boston, MA

PROFESSIONAL REGISTRATION:

Professional Engineer, Mechanical, Massachussetts and California

PROFESSIONAL AFFILIATIONS:

Member, American Society of Mechanical Engineers

Member, Tau Beta Pi Engineering Society

Member, American Nuclear Society

PROFESSIONAL EXPERIENCE:

Mr. Minichiello is assigned as the Manager of the Engineering Design Division at Cygna. His responsibilities include technical direction of all projects within the Division, staffing and budget preparation, and proposal generation.

As part of his assignment, Mr. Minichiello served as the project engineer for the dynamic requalification of Mechanical Equipment for the Washington Public Power Supply System Unit 2 nuclear plant. This work involved upgrading the previous work to the new hydrodynamic loads and the new criteria (IEEE-344-1975). His division is currently also responsible for the stress analysis of the piping and the design of new pipe supports to meet the SEP requirements for the Yankee Nuclear Station at Rowe, Massachusetts. Included in this evaluation is the analysis of the mechanical equipment (valves, steam generators, etc.) necessary to the operation of the plant. Other projects within his division included: the stress analysis and support design for the control rod drive piping for the LaSalle station; and reanalysis of piping and pipe supports for Diablo Canyon Unit 1.

As Section Manager for stress analysis at Brown and Root, Inc., Mr. Minichiello's responsibilities encompassed the overall direction of all mechanical analysis and design activities for the company's nuclear and fossil projects. Activities included: a full range of piping design and analyses for the South Texas Nuclear Project; computer-aided structural analysis of an electric substation insulating posts under 3-phase short circuit dynamic loading; and development of stress design standards for Brown and Root.

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JOHN C. MINICHIELLO
(continued)

As head of the component analysis section at NUS Corporation, he was responsible for proposal generation, direction and completion of the analysis (thermal, stress, and dynamic) of equipment in accordance with ASME, ANSI, and AISC codes. Projects included direction of the analysis of a fuel pool skimmer tank for dynamic loading, the dynamic analysis of vacuum relief valves, and the stress analysis of heat exchangers. He was also responsible for technical direction for a team of 25 engineers performing the piping analysis of 200 sub-systems for the Wm. H. Zimmer Nuclear Station. Mr. Minichiello generated proposals for linear and nonlinear (gapping) analysis of heat exchanger component parts. For the Nine Mile Island plant, he performed fracture analyses of welds on the downcomers. This activity involved determining the stability of crack growth initiated by thermal cycling. His past work also included dynamic analysis of high radiation sampling systems (panels and piping), and analysis of various pressure vessels.

As Lead Senior Engineer with EDS Nuclear, he was responsible for the design and analysis for safety-related piping systems for the McGuire Nuclear Station. This effort involved the thermal transient and fatigue analysis required for ASME Class I systems and the identification of system modifications, when required to alleviate thermal problems. Other projects included finite element analysis of penetration head fittings for thermal and structural loads and verification of the SUPERPIPE program per EDS QA standards.

Mr. Minichiello's previous experience at NUS Corporation includes fluid, thermal and structural analysis of nuclear systems and components using finite element codes such as ANSYS, STARDYNE and PIPESD. These analyses included such evaluations as the dynamic response of the auxiliary cooling piping for a reactor coolant pump test loop, the dynamic response of centrifugal chiller assemblies, the dynamic response of high density spent fuel racks and the high temperature response of spent fuel shipping casks. He produced the hydraulic and thermal analysis report for the S7G reactor pressure vessel head and performed the flow calculations for the S7G purification filter. He has performed complete stress and thermal analysis of the LOFT reactor vessel, including comparison of results to ASME code allowables and generation of the final stress report, and was responsible for the computer code generation used to pre- and post-process finite element stress output to aid in the evaluation of ASME code requirements. As a stress engineer, Mr. Minichiello performed thermal and stress analysis of a purification filter using finite-difference and shell computer codes and performed the stress analysis of electrical plug plates per ASME Class III criteria.

Earlier, at Raytheon Co., Mr. Minichiello worked as a design engineer and was in charge of fabrication of a prototype analog-digital computer interface device. He also designed components of a control board for missile tracking systems.

CRITERIA VERIFICATION

L. Kammerzell
D. Gardner
T. Nguyen

CYGNA

LARRY L. KAMMERZELL

EDUCATION:

M.B.A., National University (in progress), San Diego, CA

B.B.A., National University, San Diego, CA

Third Year Industrial Engineering, Drexel Institute of Technology, Philadelphia, PA

SPECIALTY COURSES:

Business Management Seminars at General Atomic Company

Naval Training:

- Navy Nuclear Power School
- Advanced Submarine Engineering School
- Nuclear Deep Submersible Pilot and Power Plant Training

PROFESSIONAL REGISTRATION:

Professional Engineer (Nuclear), California

PROFESSIONAL AFFILIATIONS:

Member, American Nuclear Society (Past Chairman of San Diego Section)

Member, National Management Association (Past President, General Atomic Chapter)

PROFESSIONAL EXPERIENCE:

Mr. Kammerzell has twenty years of nuclear-related experience covering a broad spectrum of Nuclear Power Plant risk assessment, analysis, testing, construction, and operations. He is presently serving as a Product Development Manager for Cygna. Previously, he acted as a discipline and project manager for reliability, risk assessment and radwaste projects, and as manager of Cygna's San Diego office.

Prior to joining Cygna, Mr. Kammerzell held responsible engineering and management positions with Stone & Webster Engineering Corp., United Engineers and Constructors, General Atomic Company and the U.S. Navy. The following summarizes his activities over the past 20 years.

- At General Atomic Company Mr. Kammerzell was Manager of Systems Engineering, responsible for the coordination and technical integration of the

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various systems and component designs into an optimum plant design and to organize, direct and administer overall systems engineering efforts on HTGR plants including Safety Analysis, Probabilistic Risk Assessment programs, and Economic Study Evaluations.

In other positions held at General Atomic, Mr. Kammerzell was responsible for plant thermal performance evaluations including the development of analytical techniques to determine the thermal performance risk associated with the specific plant design.

- As lead nuclear engineer at United Engineers and Constructors, he was responsible for the preparation of the safety analysis report for systems and facilities supporting the nuclear steam supply. These included the radwaste, core cooling, and fuel storage systems and the associated building arrangements.

- At Stone and Webster, Mr. Kammerzell was responsible for evaluation of vendor test and weld procedures. He was also responsible for the design, specification, and field erection of nuclear power plant pumps, vessels and heat exchanges.

- Mr. Kammerzell held several positions in the United States Navy. Representative of this period is his assignment as Nuclear power plant prototype instructor and assignment as M/A division officer on board the NR-I during the construction, testing, seatrials and initial service. The NR-I is a Nuclear Powered Deep Submersible research submarine. Mr. Kammerzell had responsibility for: all phases of testing, trouble shooting, calibration and maintenance of reactor, propulsion, and turbine generating equipment; all power plant evolutions; and all underwater evolutions. He was the duty officer during power range testing and was responsible for testing during initial criticality.

DONALD A. GARDNER, JR.

EDUCATION:

M.S., Nuclear Engineering, State University of New York at Buffalo, Buffalo, NY

B.S., Aerospace Engineering, State University of New York at Buffalo, Buffalo, NY

Associates Degree, Engineering, Auburn Community College, Auburn, NY

ASME Radwaste Seminar, Georgia Institute of Technology and Arizona State University

PROFESSIONAL REGISTRATION:

Professional Engineer, Nuclear, California

PROFESSIONAL EXPERIENCE:

Mr. Gardner is currently an Associate at Cygna, responsible for Radwaste Engineering Services.

Prior to joining Cygna, Mr. Gardner held supervisory and lead engineer positions at United Engineers and Constructors, General Atomic Company, Long Island Lighting Company, Virginia Electric and Power Company, and Niagara Mohawk Power Corporation. His experience background is summarized as follows:

- Corporate Specialist for radwaste systems working on the Seabrook 1 and 3 and Washington Public Power Supply Systems 1 and 4 radwaste system designs. In this capacity he acted as Lead Engineer on the conceptual design and cost evaluation of an Interim On-Site Radwaste Storage Facility for the Seabrook 1 and 2 project.

- Responsible for the performance of nuclear systems analyses, radioactivity release and dose assessment analyses and radiation protection studies for the Brunswick 1 and 2, Indian Point 2, Seabrook 1 and 2, and Washington Public Power Supply System 1 and 4 nuclear plants.

- As Lead Nuclear Systems and Radwaste Engineer on the Shoreham and Jamesport projects, Mr. Gardner was responsible for reviewing and evaluating NSSS and radwaste system designs, approving design changes related to these systems, and development of operating procedures for these systems. He also supported plant licensing efforts for the two projects and routinely interfaced with NRC Staff in order to resolve open issues.

- Proposal Manager at United Engineers for the Advanced Packaging Facility Concepts Study Proposal to Battelle's Office of Nuclear Waste Isolation.

- Program Coordinator for the Anticipated Transients Without Scram (ATWS) Program at General Atomic Company. In this capacity, he was responsible for ensuring the technical adequacy and timely completion of technical analysis and evaluation of results.

- Coordinated major General Atomic Company design reports which described the resolution of the primary system parameter-related technological issues of the HTGR-GT Plant.

- Responsible for writing the bid specification and procurement activities for the Seabrook 1 and 2 Radwaste Volume Reduction and Solidification System.

- Responsible for the design, analysis and system sizing of the Core Auxiliary Cooling System for the HTGR NSSS. He was also responsible for the design optimization of the HTGR-GT plant, using the CODER computer program.

- Lead Safety Engineer on the Ohio Edison Erie Nuclear project for PSAR Chapters 15 and 16.

- Lead Engineer responsible for core analysis and follow-up of operation for the two PWR's at Surry. Mr. Gardner was also a Lead Startup Engineer during the initial startup and criticality of Surry Power Station and performed nearly all phases of the physics testing. In this capacity, Mr. Gardner co-authored the VEPCO submittals to the NRC, documenting physics tests results for the Surry 1 and 2 units.

- Mr. Gardner acquired extensive training and experience in the use of the major computer codes used in the industry to evaluate and design nuclear fuel. Reactor physics and thermal/hydraulics analyses were performed for the Nine Mile Point plant, relative to BWR fuel cycle optimization and reload assembly design.

PUBLICATIONS:

"Startup Physics Test Program at Surry Units 1 and 2," Transactions of the American Nuclear Society, June 1974.

"Modular Interim Waste Storage Building for Low-Level Radwaste," Waste Management '83, February, 1983.

THINH DUC NGUYEN

EDUCATION:

Doctorate, Mechanical Engineering, University of Lyon, France

Post Graduate Certificate, Applied Mechanics, University of Lyon, France

M.S., Mechanical Engineering, Ecole Centrale de Lyon, France

Certificates in Mechanics, Engineering Mathematics, Fluid Mechanics and Engineering Electrics, University of Lyon, France

PROFESSIONAL REGISTRATION:

Registered Professional Engineer, California

PROFESSIONAL EXPERIENCE:

As a Senior Engineer at Cygna, Dr. Nguyen is currently assigned as the piping project engineer for the Yankee Nuclear Power Station at Rowe, Masachusetts. This work includes the stress analysis of the piping to the SEP requirements. Dr. Nguyen has personally performed the analyses of those systems requiring special techniques such as displacement time history analyses or inclusion of the structural mass and stiffness in the piping model.

Dr. Nguyen was previously assigned as pipe stress group leader for the La Salle Unit 2 CRD piping analysis. In this function, he was responsible for issuing design criteria and work instruction, coordinating work with the frame analysis group, and liaison with the client. Dr. Nguyen performed parametric studies which allowed the large number (370) of CRD lines to be qualified by the analysis of very few. In a similar position for the La Salle Unit 1 CRD piping, Dr. Nguyen's responsibilities included:

- sensitivity study of static, seismic, and hydrodynamic analyses of the CRD system composed of 370 similar lines. Analysis was principally performed through mode shape studies.
- evaluation of seismic anchor movement, Annulus Pressurization displacement from time history data.
- generation of matching response spectra from time history and envelope spectra to use for each system.
- time history analysis for Annulus Pressurization displacements.
- study of a simplified model for the Hydraulic Control Unit.

- establishing standards, such as charts related to maximum mass point spacing versus pipe sizes based on cut-off frequencies, and coding procedures conforming to ANSI B31.1 standards.

- writing procedures and final reports.

Dr. Nguyen's other project work included static and dynamic analysis of class 1 and 2 piping systems in accordance with applicable codes and standards such as ASME III, B31.1 for plants such as Vermont Yankee, Arkansas, Susquehanna, and Diablo Canyon. These analyses included the study of behavior of supports, finding the appropriate type of support through load, stress, and mode shape considerations; selection of spectra to be used according to eccentricity, elevation, location of attachment points, and envelope of spectra; evaluation of the applicability of previous thermal analysis to the suggested changes to the systems (cutting a relatively big system to small ones and using the overlapping techniques).

In the performance of the work detailed above, Dr. Nguyen has acquired extensive experience in the use of computer programs such as PIPESD, INSPEC, ADLPIPE, NEWSPECTRA, and ANSYS.

Dr. Nguyen's previous industry experience included serving as a senior engineer for an American architectural/engineering firm based in Saigon, Viet Nam. During this time he concurrently provided private consulting engineering services for a construction firm in Saigon, Viet Nam, which involved the study of unsteady flow in canal networks, hydraulic reduced scale models of outlets, gates, dams, and basins of dissipation of energy.

Dr. Nguyen's academic experience includes holding the position of Professor and Dean of the School of Engineering, National Institute of Technology, Saigon, Viet Nam, for eight years. For five years, he was Assistant Professor at Ecole Centrale de Lyon, France. Dr. Nguyen concurrently performed research in the reduced scale compressor project for the Chatou Thermal Power Plant, France.

THESIS:

"Study of the Secondary Effects of the Flow at the Extremity of Blades in an Axial Compressor." The research was closely related to the rotating stall phenomena in axial compressors.

EXHIBIT 3.2

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JIMMY E. MEYER

ENGINEER

GENERAL BACKGROUND

Mr. Meyer has experience in all design aspects of flexibility analysis and support of piping systems for chemical, petroleum and petrochemical processing facilities. He possesses a broad background in both manual and computerized techniques for solution of complex piping stress analyses. Since 1979, he has become active as a member of ANSI/ASME B31.3 Code Committee in the work group responsible for the design of Petroleum and Chemical Plant Piping.

EXPERIENCE

Cleveland Electric Illuminating

Since joining the Cleveland Electric Illuminating Company in October, 1982, Mr. Meyer has been assigned to the nuclear plant being built outside of Cleveland.

Davy McKee

Summary of his job responsibilities at Davy McKee are listed below:

1981-October, 1982 - Senior Group Supervisor - Purchasing
Responsible for purchasing and expediting of fabricated pipe and engineered pipe supports.

Purchasing
- Preparing inquiry packages.
- Evaluating quotations and preparing bid tabulations.
- Writing purchase orders based on lump sum or unit price agreements.
- Miscellaneous purchasing of other engineered items.

Expediting
- Home Office expediting of Davy McKee isometric production and transmission to vendors.
- Vendor expediting of:

A. Spool detailing from isometric drawings.
B. Expediting of materials to vendor's shop.
C. Expediting of vendor's fabrication and adherence to priority schedules.

Davy McKee (continued)

1978-1981 - Senior Group Supervisor - Piping Engineering
(Approximately 25 engineers)

Areas of Responsibility:

A. Piping specifications.
B. Piping line list development.
C. Piping flexibility and stress analysis.
D. Pipe support design.
E. Review of isometric drawing to specify support and flexibility requirements.
F. Pressure test circuit analysis.
G. Field resolution of piping problems during plant start-up or operation.

1973-1978 - Engineer in group described above.

Some of the major projects which he has participated in are:

- Shell Oil Company, Marietta, Ohio - Thermoplastic Rubber Plant.
- Carter/Exxon Co., Bayport, Texas - Coal Liquefaction Pilot Plant.
- Shell Oil Company, Geismar, Louisiana - Ethylene Oxide/Ethylene Glycol.
- Gulf Oil Chemicals, Cedar Bayou, Texas - Polypropylene.
- Shell Oil Company, Geismar Louisiana - Chemical Processing facilities.
- Diamond Shamrock Chemical Co., Greens Bayou, Texas - Fungicide Processing Facilities.
- Esso FIOR, Puerto Ordaz, Venezuela - Iron Ore Direct Reduction.
- Mobile Oil, Beaumont, Texas - Fuel Oil Desulfurization.
- Texaco Oil Company, Nanticoke, Ontario, Crude & Fluid Catalytic Cracking Units.
- Nipro, Inc., Augusta, Georgia - Caprolactam Plant.

PROFESSIONAL DATA

B.S., Mechanical Engineering, The University of Akron, Akron, Ohio.
Registered Professional Engineer: Ohio
Member: ANSI/ASME B31.3 Code Committee. (Until November, 1982)
ANSI/ASME B31.1 (Appointed as a subgroup member 1983)

DW119/G/2/sp

4.0 METHODOLOGY

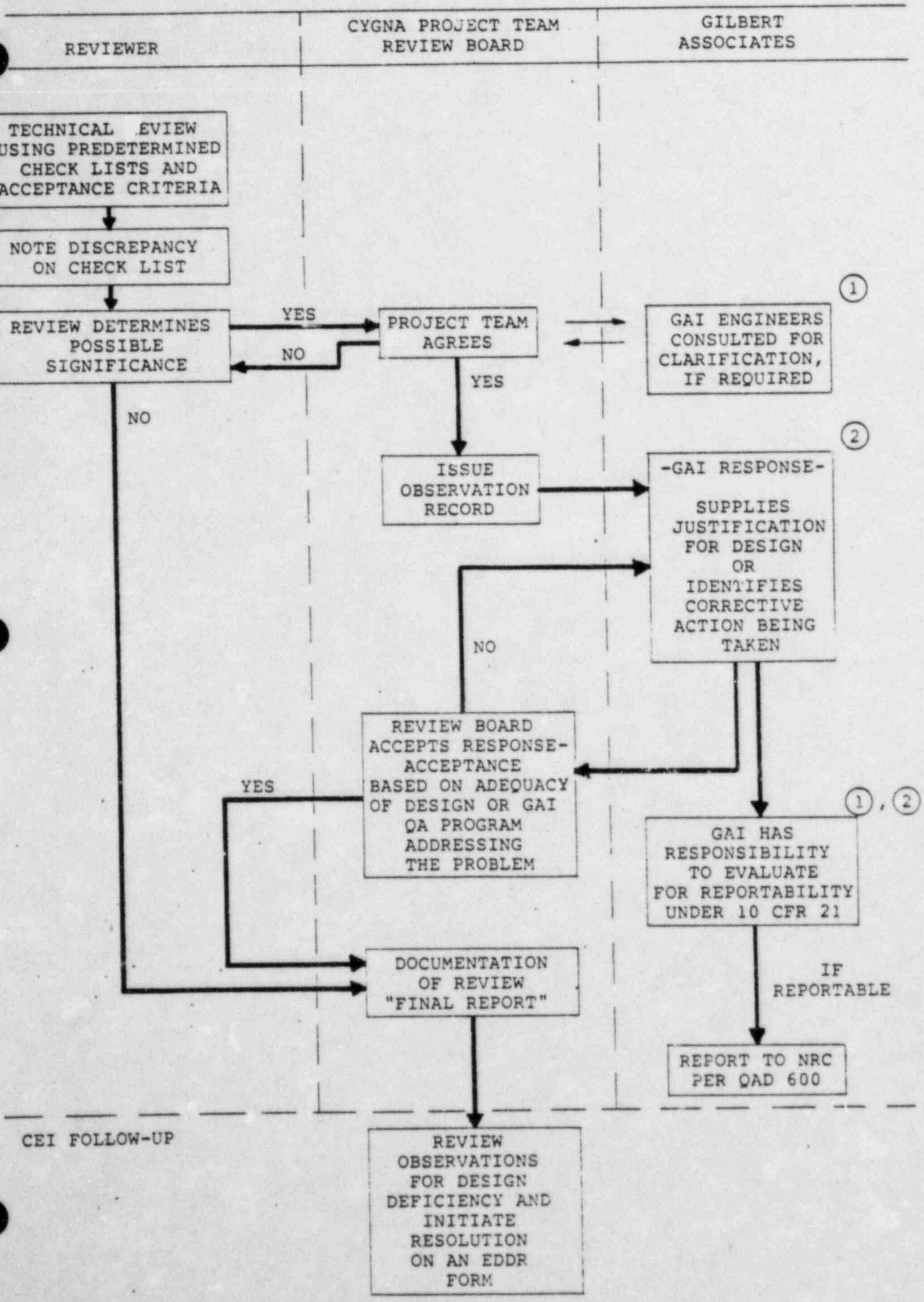
The review was conducted to predetermined checklists and acceptance criteria which are contained in the Project Manual for the piping design review. Separate checklists and acceptance criteria were prepared for each of the disciplines reviewed.

1. Mechanical
2. Piping Analysis
3. Pipe Supports

Any discrepancies noted during this review were documented on the appropriate checklist. Significant items were resolved with GAI as observations. The identification, documentation, and resolution cycle is described in Figure 6. CEI reviewed all discrepancies, as documented in the Cygna Final Report. GAI was responsible for determining reportability of all discrepancies per Appendix E of their Nuclear Quality Assurance Manual. CEI also reviewed all observations with respect to generic application to other systems. Any deficiencies found during this review resulted in the initiation of a CEI Engineering Design Deficiency Report (EDDR) per CEI Procedure 35-1501.

PIPING DESIGN REVIEW METHODOLOGY

FIGURE #6



5.0 OBSERVATION FOLLOW-UP

CEI was responsible for review of the resolution of all observations. Also, CEI completely reviewed all of the Cygna observations for any generic issues. A summary of this review is included as "Attachment B" to each observation. CEI considered the observation closed if any of the following conditions were met.

1. The Cygna observation did not represent a deficiency in the design, or documentation.

2. A generic review has been completed which verified the item has no effect on any system's ability to perform its intended safety function.

3. A generic review will be performed to approved procedures and tracked by Engineering Design Deficiency Report (EDDR). The procedures are developed specifically to address the generic issues.

This section is organized in the following manner:

5.1 Mechanical - Observation Status
- Mechanical Observations - including:
  - Cygna Observation Record
  - Cygna Observation Record Review - Attachment A
  - CEI Observation Closure - Attachment B

5.2 Piping Analysis - Observation Status
- Piping Analysis Observations - including:
  - Cygna Observation Record
  - Cygna Observation Record Review - Attachment A
  - CEI Observation Closure - Attachment B

5.3 Pipe Support - Observation Status
- Pipe Support Observations - including:
  - Cygna Observation Record
  - Cygna Observation Record Review - Attachment A
  - CEI Observation Closure - Attachment B

5.1 MECHANICAL OBSERVATION STATUS

REVISION 0 DATE 5-11-84

OBSERVATION NO.	DEFICIENCY YES/NO	EDDR NO. OR GC PRE NO.	FOLLOW-UP ACTION COMPLETE	SCHEDULED COMPLETION DATE FOR FOLLOW-UP	COMMENTS
ME-01-01	YES	72	NO	JUNE 30, 1984	
ME-01-02	YES	72	NO	JUNE 30, 1984	
ME-02-01	YES	72/73	NO	JUNE 30, 1984	
ME-02-02	NO	NA	NA	NA	
ME-02-03	YES	72	NO	JUNE 30, 1984	
ME-02-04	YES	GC PRE-83 GC PRE-85	YES, 1/16/84	NA	
ME-02-05	NO	NA	NA	NA	
ME-02-06	YES	72	NO	JUNE 30, 1984	
ME-02-07	NO	NA	NA	NA	
ME-02-08	YES	72	NO	JUNE 30, 1984	
ME-02-09	YES	72	NO	JUNE 30, 1984	
ME-03-01	YES	72/73	NO	JUNE 30, 1984	
ME-03-02	YES	72	NO	JUNE 30, 1984	
ME-03-03	YES	72	NO	JUNE 30, 1984	
ME-03-04	YES	72	NO	JUNE 30, 1984	
ME-03-05	YES	72	NO	JUNE 30, 1984	

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Observation Record

Observation No.	ME-01-01	Revision No.	0
Checklist No.	ME-01 MSSRVS Item #4	Sheet	1 of 1
Originated By	R. W. Huz	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

1.0 Description

Safety relief valve discharge line sizing (flow and pressure drop) calculations could not be located by GAI.

2.0 Requirement

Per the Perry FSAR Section 5.2.2.2.3.3, the discharge line is sized to prevent the backpressure on each safety/relief valve from exceeding 40 percent of the valve inlet pressure. The GE Process Diagram 105D5575 also states that the ASME relieving capacity of the S/RV's only applies when the back pressure at the discharge side of the S/RV's is $\leq$ 40% of the S/RV inlet pressure with a flow rate corresponding to nameplate.

3.0 Reference Documents

3.1 Perry FSAR Amendment #7 (5-27-82), Section 5.2.2

3.2 Nuclear Boiler Specification, 22A4622, Rev. 5

3.3 Nuclear Boiler Data Sheet, 22A4622 AR, Rev. 2

3.4 Process Diagram Nuclear Boiler, 105D5575, Rev. 0

3.5 Design Specification, DSP-B21-1-4549-00, Rev. 2

4.0 Potential Design Impact

Due to the lack of verifiable and documented calculations, the adequacy of the S/RV discharge line size cannot be determined. However, per the Perry Supplemental Safety Evaluation Report #3 Table 6.4, the Perry S/RV discharge line size of 10" is the same as two similar nuclear power plants (Kuosheng and Grand Gulf).

5.0 Probable Cause

Document control.

Attachments

A. Observation Record Review

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Observation Record Review
Attachment A

Observation No.	ME-01-01	Checklist No.	ME-01	Revision No.	0
PFR No.				Sheet 1 of 1	

	Yes	No
Closed	X	

Extent 3 of 3 Systems with missing calculations

Comments

GAI submitted portions of piping engineering calculation P203, Rev. 0, dated 1/20/83 as verification that the safety relief valve discharge piping was adequately sized. The original purpose of this calculation was to perform a thermal-hydraulic transient analysis on the MSSRV discharge piping and to generate a hydraulic transient force history for input to the TPIPE time history dynamic analysis. However, the submitted portions of calculation P203 do show that the discharge piping backpressure will be equal to or less than 40% of MSRV inlet pressure at a rated flow of 1.12×10^6 lb/hr. This meets the GE and FSAR requirement for this piping.

Based on the above, this Observation does not have any impact on design or safety.

Approvals

Originator	R. W. Hess	Date	1/16/84
Project Engineer	[signature]	Date	1/16/84
Project Manager	Ted T. Watting	Date	1/16/84
CEI Representative	E. E. Meyer	Date	1/20/84

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Perry Nuclear Power Plant Piping Design Review

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Observation
Record Closure
Attachment B

Observation No. ME-01-01	Checklist No. ME-01	Revision No. 0
EDDR No. 72	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
This was not a design deficiency, however, compliance with a GE requirement was not documented.

3.0 Action Taken
A GE Criteria Compliance Review is being performed by GAI.

4.0 Conclusion
The review listed above will insure documentation of compliance with GE requirements.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant, GE Criteria Compliance Review Procedure, Rev. 0

Approvals

Originator	J E Meyer	Date	5-8-84
Senior Project Engineer	E. A. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	F. A. Boss	Date	5/10/84
GAI Project Manager	W J Leong	Date	5/9/84
GAI Manager Corporate QA Programs	W. Manning	Date	5/9/84

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Observation Record

Observation No.	ME-01-02	Revision No.	0
Checklist No.	ME-01 MSSRVS, Item No. 3	Sheet	1 of 2
Originated By	R. W. Hur	Date	12/1/83
Reviewed By	KJ Weingart	Date	12/9/83

1.0 Description

Vacuum breaker valves F037 and F038 are 6 inch valves with a maximum resistance coefficient of K = 1.6 as specified in GAI Specification SP-639-4549-00 Rev. 1. Per information supplied by the vendor, Anderson, Greenwood and Co., the actual K = 1.408 and the flow area is 0.201 ft.^{2} This data results in an $A/\sqrt{K}$ factor equal to 0.17 ft.^{2}, rather than the General Electric specified minimum of 0.30 ft.^{2} for each of these valves. In addition, no documented and verified calculations justifying the size of these valves could be located by GAI.

2.0 Requirement

General Electric Specification 22A4622 Section 4.3.3.5 requires that two parallel vacuum relief valves be provided on each relief valve discharge line to minimize drawing water up into the line due to steam condensation following termination of safety/relief valve operation. General Electric Specification Data Sheet 22A4622AR Section 3.1.20.1.2 states that the vacuum breaker $A/\sqrt{K}$ ratio shall be equal to or greater than 0.30 ft^2. K is the effective loss coefficient of the vacuum breaker and its connecting pipe to the S/RVDL.

3.0 Reference Documents

3.1 Nuclear Boiler Specification, 22A4622, Rev. 5

3.2 Nuclear Boiler Data Sheet, 22A4622AR, Rev. 2

3.3 Specification for Vacuum Breaker, SP-63-4549-00, Rev. 1

3.4 Anderson, Greenwood and Co. Assembly, 6"-300 ANSI, CVIB SPCL Vacuum Breaker Valve N04-2217-530, Rev. D.

Observation Record

Observation No. ME-01-02	Revision No. 0
Checklist No. ME-01-MSSRVS, Item No. 3	Sheet 2 of 2
Originated By R. V. Hur	Date 12/1/83
Reviewed By [signature]	Date 12/9/83

4.0 Potential Design Impact

Due to the lack of documented and verified calculations, the adequacy of the specified valves cannot be determined. Per the Perry Supplemental Safety Evaluation Report No. 3 Table 6.4, similar plants (Kuosheng and Grand Gulf) have two 10 inch vacuum breaker valves on each SRVDL instead of the 6 inch valves specified for Perry. The Perry SSER 3 Section 6.2.1.8.2 (Pg. 6.3) states, "This criterion ($A/\sqrt{K} = 0.30 \ ft^2$) is met by the two 6 inch vacuum breakers at Perry." However, the General Electric Specification Data Sheet 22A4622AR indicates this criteria should be met by <u>each</u> valve and not by the sum of the two valves.

5.0 Probable Cause

Design control.

Attachments

A. Observation Record Review

Observation Record Review
Attachment A

Observation No. ME-01-02	Checklist No. ME-01	Revision No.	0
PFR No.		Sheet 1 of 1	

	Yes	No
Closed	X	

Extent 3 of 3 Systems with valve data inconsistent with GE Requirements

Comments

Per the attached GE/GAI telecon of November 2, 1983 (E. Wood, GE, to T. Daugherty, GAI), the $A/\sqrt{K} = 0.30\ ft^2$ criteria in the GE specification is to be interpreted as the total ratio for both vacuum breaker valves. The vacuum breaker design provides $2 \times 0.17\ ft^2 = 0.34\ ft^2$, which satisfies GE's requirements as explained in the referenced telecon.

Based upon this telecon, there is sufficient documentation to justify the sizing of these valves. Accordingly, there is no impact on design or safety.

Approvals

Originator	R. W. Hess	Date	12/6/83
Project Engineer	L J Weinart	Date	12/6/83
Project Manager	T.T. Wittig	Date	12/6/83
CEI Representative	J E Mezue	Date	12/16/83

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Observation
Record Closure
Attachment B

Observation No. ME-01-02	Checklist No. ME-01	Revision No. 0
EDDR No. 72	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
This was listed as part of EDDR 72 to improve documentation of compliance with GE requirements. The design by GAI did meet the GE requirements and the only documentation missing was an interpretation of the GE requirement.

3.0 Action Taken
A GE Criteria Compliance Review is being performed by GAI.

4.0 Conclusion
The review listed above will insure documentation of compliance with GE requirements.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant GE Criteria Compliance Review Procedure, Rev. 0.

Approvals

Originator J E Meyer	Date	5-8-84
Senior Project Engineer E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit F. A. Buss	Date	5/10/84
GAI Project Manager	Date	5/9/84
GAI Manager Corporate QA Programs	Date	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

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Observation Record

Observation No.	ME-02-01	Revision No.	0
Checklist No.	ME-01 HPCS, Item No. 1	Sheet	1 of 2
Originated By	R. W. Hus	Date	12/1/83
Reviewed By	L J Weingart	Date	12/9/83

1.0 Description

There are various inconsistencies between Table 1 of GAI Specification DSP-E22-1-4549-00 Rev. 1 and Rev. 2 and the General Electric Process Diagram 762E455. Specifically:

a. GAI Table 1 defines both design conditions and operating conditions for the HPCS. In one region of the system, the operating conditions (234 psig @ 104°F) exceed the design conditions (100 psig @ 212°F). Specifically, this occurs at locations 16, 17 and 27 for operating mode B.

b. GAI Table 1 lists the pressure above the suppression pool as 15 psi<u>g</u> in modes D through J. The GE diagram lists this pressure as 14.7 psi<u>a</u>.

c. GAI Table 1 location No. 1.5 pressure is stated to be 36 psig. This is higher than would be achieved by adding the static head of water in the tank to the General Electric stated atmospheric pressure of 14.7 psia in the tank.

d. In GAI Table 1 for modes D through G, the difference in pressure between the source of suction and the reactor vessel does not match the General Electric requirements of 1550 gpm @ 1147 psid and 6110 gpm @ 200 psid.

e. In GAI Table 1, mode H, the pressure at locations No. 16, No. 17, and No. 27 should be the same. Location No. 27 is given as 15 psig while No. 16 and No. 17 are given as 25 psig.

2.0 Requirement

General Electric Specification 22A3131, Data Sheet 22A3131AS and Process Diagram 762E455 are the design basis documents. They provide flow, pressure, and temperature data for which the system must be designed.

Observation Record

Observation No.	ME-02-01	Revision No.	0
Checklist No.	ME-01 HPCS, Item No. 1	Sheet	2 of 2
Originated By	R. V. Hur	Date	12/1/83
Reviewed By	RJWeingart	Date	12/9/83

3.0 Reference Documents

3.1 Design Specification, 22A3131 Rev. 5 HPCS

3.2 HPCS Data Sheet, 22A3131 Rev. 2

3.3 Process Diagram, 762E455 Rev. 6

3.4 Design Specification HPCS, DSP-E22-1-4549-00 Rev. 1

3.5 Design Specification HPCS, DSP-E22-1-4549-00 Rev. 2

4.0 Design Impact

Since the GAI design specification is used for piping and pipe support design, inconsistencies in pressure, temperature, and flow data could cause inaccuracies in this design effort. It is not clear what other design functions (valve sizing, I & C, etc.) use Table 1 data as design input information.

5.0 Probable Cause

Failure to document the resolution of differences between corresponding General Electric and GAI specifications.

Attachments

A. Observation Record Review

Observation Record Review
Attachment A

Observation No. ME-02-01	Checklist No. ME-02	Revision No.	0
PFR No.		Sheet 1 of	1

	Yes	No
Closed	X	

Extent 2 of 3 Systems with inconsistencies between GE and GAI data

Comments

Based on the following GAI data and commitments, this Observation does not have any impact on the design or safety of components or systems within the scope of this review.

a. GAI will revise the system design conditions portion of Table 1 in DSP-E22-1-4549-00, Rev. 2, to reflect design conditions that envelop all system operating conditions.

b. GAI will revise the Mode H operating pressure at locations #16 and #17 in Table 1 of DSP-E22-1-4549-00, Rev. 2, to be consistent with location #27, i.e., 15 psig.

c. GAI does not intend to correct any of the other inconsistencies and/or inaccuracies in Table 1 of DSP-E22-1-4549-00, Rev. 2. The GAI reason for not making additional revisions to this table is that the existing data is conservative for use in the design of system piping and pipe supports. As indicated by GAI in the title and Section 1:01 of Specification DSP-E22-1-4549-00, Rev. 2, Table 1 is intended to be used solely by the piping analysis and pipe support design groups. In addition, GAI has stated in various discussions that no other GAI procedures (other than piping procedures) specifically require the use of data in the E22 piping design specification as design input for other system/component design. Based on the fact that the systems review was limited to those items which may affect the piping analysis and that the existing Table 1 data is conservative for this purpose, Cygna concurs that a general revision to the Table is not required at this time.

Approvals

Originator	R. W. Hess	Date	1/18/84
Project Engineer	[signature]	Date	1/18/84
Project Manager	Ted [signature]	Date	1/19/84
CEI Representative	[signature]	Date	1/20/84

CEI

Observation
Record Closure
Attachment B

Observation No. ME-02-01	Checklist No. ME-01	Revision No. 0
EDDR No. 72 and 73	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
- 2.1 Item 1) of this observation addresses design conditions and will be addressed by EDDR 72.
- 2.2 Items b, c, d, and e of this observation will be addressed by EDDR 73.
- 2.3 Subsequent review per EDDR 73 has resulted in a decision to review items b, c, d, and e under the GE Criteria Compliance Review.

3.0 Action Taken
GE Criteria Compliance Review is being performed by GAI.

4.0 Conclusion
The Review listed as 3.0 above will insure that correct Design Conditions are listed.

5.0 References
(9) EDDR 72
(10) EDDR 73
(25) Perry Nuclear Power Plant GE Criteria Compliance Review Procedure, Rev. 0.

Approvals

Originator J E Meyer	Date	5-8-84
Senior Project Engineer E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit T. A. Boss	Date	5/10/84
GAI Project Manager [signature]	Date	5/9/84
GAI Manager Corporate QA Programs H. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

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Observation Record

Observation No.	ME-02-02	Revision No.	0
Checklist No.	ME-02 HPCS Item No. 1	Sheet 1 of 1	
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	L. J. Weinzapfel	Date	12/9/83

1.0 Description

In GAI Specification DSP-E22-1-4549-00 Table 1, the Mode A pressure drop across valve F010 is given as 522 ft., and the drop across valve F011 is given as 116 ft. These drops are well above the General Electric stated minimum of 62 ft., indicating that the valves are not fully open in mode A. Also, these pressure drops (throttled position) were not used in the flow and orifice sizing calculation for the system.

2.0 Requirement

General Electric Process Diagram 762E455, Note 8, states that a 62 ft. pressure drop is the minimum drop for these valves and that they may be throttled to facilitate the piping arrangement. Note 16 of this process diagram recommends installing orifice RO-D004 to limit flow to 6110 gpm with valves F010 and F011 fully open.

3.0 Reference Documents

3.1 Process Diagram, 762E455, Rev. 6 HPCS

3.2 HPCS Design Specification, DSP-E22-1-4549-00, Rev. 1 and Rev. 2

3.3 Calculations HPCS Line Losses, E22 A/J-CC Dated 2/8/79

4.0 Potential Design Impact

The orifice, RO-D004, was sized based on (1) both F010 ad F011 being fully open and (2) dissipating an excess head of 945.3 ft. If valves F010 and F011 are throttled as indicated in Table 1 to absorb an additional 514 ft. of head [(522 - 62) + (116 - 62)], then the total system pressure drop at 6110 gpm will exceed the available head at this flow.

5.0 Probable Cause

Design control.

Attachments

A. Observation Record Review

Observation Record Review
Attachment A

CYGNA

Observation No. ME-02-02	Checklist No. ME-02	Revision No.	0
PFR No.		Sheet 1 of	1

	Yes	No
Closed	X	

Extent 1 of 3 Systems with inconsistent use of GE data

Comments

GAI has stated that they will revise Table 1 of Specification DSP-E22-1-4549-00 to indicate a pressure drop of 62 ft through valve F010 and 62 ft through valve F011. In addition, the revised specification will indicate that the remaining excess pump head is dissipated by orifice RO-D004. This is in accordance with the calculation of reference 3.3. GAI also verified in a telecon with Cygna on 11/16/83 that these changes to Table 1 will not affect any other design calculations, drawings or specifications.

Based upon the above GAI statements, this observation does not have any impact on design or safety.

Approvals

Originator	R. W. Hess	Date	12/6/83
Project Engineer	L. J. Weingart	Date	12/6/83
Project Manager	T. T. Wittig	Date	12/6/83
CEI Representative	J. E. Mazzo	Date	12/16/83

Cleveland Electric Illuminating; 83102
Perry Nuclear Power Plant Piping Design Review

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
ME-02-02	ME-02	0
EDDR No.	QAD 600 No.	Sheet of
N/A	N/A	1 1

	Yes	No	
Closed	X		
Isolated			Not applicable
Potential Design Impact		X	

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
This observation resulted from Cygna using the data for something other than its intent.

3.0 Action Taken
None required.

4.0 Conclusion
Conservative pressure drop values used by GAI were taken by Cygna to indicate the valves are not fully open. This was an extrapolation of the data in the design specification beyond its intended purpose. This information has no effect on the piping design and, as Cygna noted, was not used in flow and orifice sizing.

5.0 References
(26) GAI letter PY-GAI/CEI 15478.

Approvals

Originator J E Meyer	Date	5-8-84
Senior Project Engineer E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit F. A. Bass	Date	5/10/84
GAI Project Manager W. [illegible]	Date	5/9/84
GAI Manager Corporate QA Programs H. A. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/11/Q/sp

CYGNA

Observation Record

Observation No. ME-02-03	Revision No. 0
Checklist No. ME-02 HPCS Item No. 2	Sheet 1 of 2
Originated By R. W. Hess	Date 12/1/83
Reviewed By RJ Weingart	Date 12/9/83

1.0 Description

The location and arrangement of some equipment and piping is inconsistent with General Electric and NRC Criteria. Specifically:

a. The HPCS suppression pool suction strainer is not located outside the safety relief valve discharge zone.

b. Valve F023 is located approximately 14 ft. from the containment penetration. It should be located as close as practical to the penetration. Normally a distance of 5 ft. or less is achievable.

c. The length of straight pipe after a valve and prior to flow orifice N007 does not meet the 43 ft. requirement.

2.0 Requirement

a. General Electric Specification 22A3131, Section 4.2.4.6, states that the HPCS suction strainer shall be located away from safety relief valve discharge zones.

b. Both General Electric Specification 22A3131, Section 4.2.3.13 and 10CFR50 Appendix A Criterion 56 require that outside containment isolation valves, such as F023, be located as close to the containment penetration as practical.

c. Per General Electric Specification 21A9505BV, Rev. 1, Section 4.3.1.1 there should be 43 ft. of straight pipe between the outlet of a valve and the inlet of the flow measuring orifice.

3.0 Reference Documents

3.1 Design Specification HPCS, 22A3131, Rev. 5

3.2 General Design Criteria, 10CFR50 Appendix A

3.3 Flow Orifice Assembly HPCS, 21A9505BV

CYGNA

Observation Record

Observation No.	ME-02-03	Revision No.	0
Checklist No.	ME-02 HPCS, Item No. 2	Sheet	2 of 2
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

3.4 Drawings

3.4.1	HPCS Plans and Sections	D-304-701
3.4.2	HPCS Sections	D-304-702
3.4.3	HPCS Reactor Building El. 620'-6" and 574'-10"	D-304-703
3.4.4	MSSR Piping Inside Reactor Building El. 574'-10" and 599'-9"	D-304-026
3.4.5	Discharge Quencher	767E676 I.C.D
3.4.6	Quencher Arrangement Design Envelope	B-301-734, Rev. J

4.0 Potential Design Impact

a. The location of the HPCS suction strainer within the quencher discharge zone could cause air or steam entrainment in the HPCS pump suction line.

b. The location of F023 away from the containment penetration provides a greater length of nonisolatable piping which could lead to a breach of containment if it failed.

c. The accuracy of flow orifice N007 could be affected by its proximity to the valve located upstream.

5.0 Probable Cause

Design oversight and lack of documentation of design variances.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. ME-02-03	Checklist No. ME-02	Revision No.	C
PFR No.		Sheet 1 of	1

	Yes	No
Closed	X	

Extent 1 of 3 Systems with nonconformance to GE Equipment arrangement requirements

Comments

Based on the following GAI and GE data and documentation, this Observation does not have any impact on design or safety.

a. General Electric approved the location of the HPCS, LPCI, RCIC and RHR suction strainers within the SRV discharge quencher zones in Field Deviation Disposition Request No. KL1-301 approved on 6/6/83. This approval was based on the pump vendor certification that the quantity of ingested air (40% maximum in 1.5 seconds) is acceptable for pump operation.

b. GAI has stated, based upon their review of the piping arrangment, that due to the proximity of other piping and the valve operator size, F023 cannot be located any closer to the containment penetration.

c. GAI has stated that the current piping arrangement will provide the 1% accuracy specified for flow element E22-FE-N007. GE concurrence with the existing piping arrangement was requested by GAI in letter PY-GAI/GEN-2931, dated 12/30/83.

Approvals

Originator	R. W. Hus	Date	1/13/84
Project Engineer	LJ Wainwright	Date	1/13/84
Project Manager	Ted T Witting	Date	1/16/84
CEI Representative	J. E. Myers	Date	1/20/84

Cleveland Electric Illuminating; 83102
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Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
ME-02-03	ME-02	0
EDDR No.	QAD 600 No.	Sheet of
72	N/A	1 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
These examples of incorporation of GE criteria have been accepted by GE as required, but documentation to that effect was not available in all cases.

3.0 Action Taken
A GE Criteria Compliance Review is being performed by GAI.

4.0 Conclusion
The review listed above will insure documentation of compliance with GE requirements.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant, GE Criteria Compliance Review Procedure, Rev. 0.

Approvals

Originator	J E Meyer	Date	5-8-84
Senior Project Engineer	E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date	5/10/84
GAI Project Manager	E W J Lenigar	Date	5/9/84
GAI Manager Corporate QA Programs	H. D. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
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DW138/12/Q/sp

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Observation Record

Observation No.	ME-02-04	Revision No.	0
Checklist No.	ME-02-HPCS, Items No. 7 and 24	Sheet	1 of 2
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	HJ Wingate	Date	12/9/83

1.0 Description

The vendor print (Rockwell) for valve F005 indicates this valve is a lift check valve with no stem (i.e., no stem leak-off connection) or external operator for remote testing. In addition the pressure and temperatures indicated on the drawing approximately match a 600 lb. class valve. The General Electric data, CEI SAR and GAI P & ID all indicate this valve should be a remotely testable swing check valve with an air operator and stem leak-off connection. In addition, line specification D1-1 recommends valves of this size be 900 lb. class valves.

2.0 Requirement

General Electric Specification 22A3131, Section 4.2.3.3 states that a testable check valve shall be provided in the HPCS discharge line inside the drywell. The General Electric P & ID for the HPCS system, 795E873, indicates this valve has an air operator and stem leakoff connection. 10CFR50 Appendix A criterion 37 requires that the HPCS be designed to permit functional testing of the operability and performance of the active components of the system.

3.0 Reference Documents

3.1 HPCS Design Specification, 22A3131, Rev. 5

3.2 General Design Criteria, 10CFR50 Appendix A

3.3 Amendment No. 3 Section 6.3.2.2.1, Perry FSAR

3.4 Drawings

3.4.1 HPCS P & ID, D-302-701, Rev. G

3.4.2 Piping Design Specification HPCS, D-320-701, Rev. C

3.4.3 HPCS Reactor Building Elevation 620'-6" and 574'-10", D-304-703 Rev. G

3.4.4 HPCS P & ID, 795E873, Rev. 1

3.4.5 Rockwell International Testable Piston Check Valve with indicator (GAI Tag No. RNU-237), D82-24401-18, Rev. C

CYGNA

Observation Record

Observation No.	ME-02-04	Revision No.	0
Checklist No.	ME-02, Items No. 7 and 24	Sheet	2 of 2
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	R J Weingart	Date	12/9/83

3.5 Letter PY-GAI/GEN-1888 Dated 5/18/83, ECCS Testable Check Valves.

3.6 Letter PY-GEN/GAI-2656 Dated 4/25/83, ECCS Testable Check Valves.

4.0 Potential Design Impact

The lift (piston) check valve has a higher flow resistance then the swing check valve and will affect the overall system pressure drop. The method of testing of this valve during normal plant operation is not given in any of the documents reviewed and therefore the design impact cannot be assessed. However, it appears that either a spare or new drywell penetration will be required for the hydraulic test line. ALARA aspects of the testing of this valve should be reviewed, since, per discussion with GAI, personnel performing the test will now be located inside containment but outside the drywell, rather than outside containment. This location may expose test personnel to a higher radiation field.

The use of the Rockwell Valve was approved with comment by General Electric in Reference 3.5 but no NRC approval or FSAR amendment was found.

5.0 Probable Cause

Inadequately documented design changes.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No.	ME-02-04	Checklist No.	ME-02	Revision No.	0
PFR No.				Sheet 1 of 1	

	Yes	No
Closed	X	

Extent 3 of 3 Systems with inconsistencies between valve data and GE requirements

Comments

Per GAI, valve E22-F005 is remotely testable by a fluid system which applies pressure to a test fitting on the valve and forces the piston to lift. The test fluid system is currently in preliminary design and is not yet reflected in design documents.

The higher pressure drop through the piston type lift check valve was considered in the revised HPCS calculations (see Observation ME-02-09).

The GAI design condition for this valve was lowered from 1575 psig to 1475 psig at 140°F by ECN 12412-E22-001, Rev. 0, dated 6/17/82. The manufacturer, Rockwell International, in a letter to GAI on 12/1/83, stated that the valve rating can be increased from Class 494 to Class 590 and that they will provide the new documentation by 1/27/84. Rockwell also stated in this letter that a motor operated version of this valve had previously been given a full 900 Class rating with the only exception being the corrosion allowance.

Based on the above, this Observation does not have any impact on design or safety.

Approvals

Originator	R. W. Hu	Date	1/13/84
Project Engineer	[signature]	Date	1/16/84
Project Manager	Ted T. Wittig	Date	1/16/84
CEI Representative	J. E. Murphy	Date	1/20/84

Observation No.	Checklist No.	Revision No.
ME-02-04	ME-02	0
EDDR No. N/A	QAD 600 No. PRE-083, 085	Sheet 1 of 2

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
The Cygna observations questioned 3 categories of discrepancy, i.e.; Valve Type/ Testability, Pressure Drop, and Pressure/Temperature Rating. The first two items were resolved through confirming documentation. The Pressure/Temperature Rating concern resulted in evaluation via QAD 600 (Possible Reportable Event) (PRE) and review for generic applicability.

.0 Action Taken
Action taken regarding the Pressure/Temperature Rating concern included two QAD-600 evaluations and a review of all Class 1 valves to preclude any potentially generic discrepancies.

4.0 Conclusion
QAD 600, PRE-083 was closed based upon a vendor statement which was subsequently retracted, reopening the question in PRE-085. PRE-085 was closed based upon subsequent analysis.

The review of all Perry Class 1 valves by GAI concluded that the discrepancy was not generic in nature.

Any remaining questions regarding availability of documentation will be resolved as a result of the GE Criteria Compliance Review.

5.0 References
(11) PRE-083
(13) PRE-085
(25) Perry Nuclear Power Plant GE Criteria Compliance Review Procedures

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
ME-02-04	ME-02	0
EDDR No.	QAD 600 No.	Sheet of
N/A	PRE-083, 085	2 2

Approvals

Originator	J E Myers	Date	5-8-84
Senior Project Engineer	E.M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	F.A. Barr	Date	5/8/84
GAI Project Manager	W J Levin	Date	5/9/84
GAI Manager Corporate QA Programs	H.W. Manning	Date	5/9/84

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Observation Record

Observation No.	ME-02-05	Revision No.	0
Checklist No.	ME-02 HPCS, Items No. 10, 11 and 24	Sheet	1 of 1
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	AJ Weingart	Date	12/9/83

1.0 Description

HPCS system check valve drawings for F002, F016, F024, and F007 do not show any provisions for checking free movement of the valve disc.

2.0 Requirement

General Electric specification 22A313, Rev. 5 Section 4.5.1.4 requires that HPCS check valves be testable to verify free movement of the valve disc.

3.0 Reference Documents

3.1 HPCS design specification, 2A3131, Rev. 5

3.2 Drawings

3.2.1 Valve assembly 16 inch, 900 lb. swing check (Borg Warner) GAI B/M RDQ 217, 81510, Rev. E

3.2.2 DUO·check valve (TRW Mission) GAI B/M ROQ 221, 21140, Rev. A, Sht. 12

4.0 Potential Design Impact

Valve discs should be checked for free movement on a periodic basis to insure that valve is not binding or stuck in the closed position. If valves bind or stick closed, they will increase the overall system pressure drop or reduce the available NPSH to the HPCS pump.

5.0 Probable Cause

Design oversight.

Attachments

A. Observation Record Review

Observation Record Review
Attachment A

Observation No. ME-02-05	Checklist No. ME-02	Revision No.	0
PFR No.		Sheet 1	of 1

	Yes	No
Closed	X	

Extent 3 of 3 Systems with inconsistencies between valve data and GE requirements

Comments

Per telecon between T.S. Daugherty of GAI and D. Reich and S. Bellows of GE on 12/22/83, the GE requirement that HPCS check valves be testable to verify free movement of the valve disc can be met by system functional testing. It is not GE's intent to require external manually or mechanically actuated operators to verify free movement.

Based on the above, this Observation has no impact on design or safety.

Approvals

Originator	R. W. Hum	Date	1/13/84
Project Engineer	[illegible]	Date	1/16/84
Project Manager	Ted T. Wattig	Date	1/16/84
CEI Representative	J. E. Mysza	Date	1/20/84

Cleveland Electric Illuminating; 83102
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Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
ME-02-05	ME-02	0
EDDR No.	QAD 600 No.	Sheet of
N/A	N/A	1 1

	Yes	No
Closed	X	
Isolated	Not applicable	
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
None required

3.0 Action Taken
No additional action required. Nuclear Energy Services is developing a pump and valve testing program for CEI.

4.0 Conclusion
Cygna interpreted the GE requirement in a more stringent manner than GE intended. GE has confirmed that the GAI interpretation is correct.

5.0 References
None

Approvals

	Date
Originator	5-8-84
Senior Project Engineer	5/8/84
CEI Supervisor Quality Audit Unit	5/10/84
GAI Project Manager	5/9/84
GAI Manager Corporate QA Programs	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

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Observation Record

Observation No.	ME-02-06	Revision No.	0
Checklist No.	ME-02 HPCS Item #17	Sheet	1 of 1
Originated By	R. W. Hu	Date	12/1/83
Reviewed By	LJ Weingart	Date	12/9/83

1.0 Description

The sizing calculation for pump C-003 minimum flow bypass orifice, RO-D003, is based on a minimum flow of 10 GPM and an assumed head loss of 96 feet. The specification for the pump and its attached "Design Requirement Summary Sheet" list two different minimum flows (i.e., 10 GPM and 15 GPM) for this pump. No sizing or pressure drop calculation could be located for this pump so the 96 feet of head available for orifice sizing could not be verified.

2.0 Requirement

Specification SP-506-4549-00, Rev. VII Bill of Material Sheet 19 lists a minimum required flow of 10 GPM and the attached design requirement summary sheet lists a minimum flow rate (continuous bypass) of 15 gpm. The Perry FSAR Amendment #3 Section 6.3.2.2.5 states that a low flow bypass is provided for this pump to prevent overheating.

3.0 Reference Documents

3.1 Attachment #1 dated 2/8/79, Calculation E22 A-J, CC

3.2 Specification for Fabrication and Delivery of Water Leg Pumps, SP-506-4549, Rev. VII

3.3 Amendment #3 Section 6.3.2.2.5, Perry FSAR

3.4 HPCS Design Specification, 22A3131, Rev. 5

4.0 Potential Design Impact

Dependent on the actual pump minimum flow requirement and available head, orifice RO-D003 may be incorrectly sized.

5.0 Probable Cause

Incomplete and conflicting documentation.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. ME-02-06	Checklist No. ME-02	Revision No.	0
PFR No.		Sheet 1 of	1

	Yes	No
Closed	X	

Extent 2 of 3 Systems with calculation inconsistencies

Comments

GAI located preliminary pump design calculation SP-506-1. This calculation was verified and signed by GAI on 11/17/83 and issued as E22-7, Rev. 0, on 12/27/83. The calculation contains some minor inaccuracies but verifies the capability of pump C003 to meet its design function. The vendor pump curve included with calculation E22-7 shows that the pump shutoff is 100' and not 106' as assumed in the sizing calculation for orifice RO-D003. This reduction in shutoff head will result in a reduced bypass/recirculation flow through orifice RO-D003 and could affect the heat dissipation capacity of the minimum flow bypass loop. GAI will ensure a minimum 10 gpm bypass flow during system performance testing and install a larger size orifice, if required at that time.

Based on the fact that pump C003 is adequate for its intended purpose and that the pump heat dissipation and orifice size adequacy will be verified by GAI in system tests, this Observation is closed.

Approvals

Originator	R. W. Hert	Date	1/13/84
Project Engineer	[signature]	Date	1/16/84
Project Manager	Ted T. Wittig	Date	1/16/84
CEI Representative	[signature]	Date	1/20/84

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
ME-02-06	ME-02	0
EDDR No.	QAD 600 No.	Sheet of
72	N/A	1 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
As stated in the Cygna observation record review the pump is adequate and the orifice size will be verified by testing.

3.0 Action Taken
The GE Criteria Compliance Review will be performed.

4.0 Conclusion
The review listed above will provide additional assurance that all required calculations are available and verified.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant, GE Criteria Compliance Review Procedure, Rev. 0.

Approvals

Originator J E Meyer	Date	5-8-84
Senior Project Engineer E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit F. A. Bora	Date	5/10/84
GAI Project Manager	Date	5/9/84
GAI Manager Corporate QA Programs H. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

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Observation Record

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Observation No.	ME-02-07	Revision No.	0
Checklist No.	ME-02-HPCS Item #24	Sheet 1 of 1	
Originated By	R. V. Hur	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

1.0 Description

It is not apparent from the P&ID or piping drawings how valves F001, F010, and F011 will be leak tested. There do not appear to be any drain valves located such that meaningful test results can be obtained.

2.0 Requirement

General Electric Specification 22A3131, Rev. 5 section 4.5.1.7 states that drains shall be provided which will permit leak testing valves F001, F004, F005, F010, and F011. 10CFR50 Appendix A Criterion 37 also requires that the HPCS system be designed to permit periodic pressure testing to assure the structural and leaktight integrity of its components.

3.0 Reference Documents

3.1 HPCS Design Specification, 22A3131, Rev. 5

3.2 General Design Criteria, 10CFR50, Appendix A

3.3 Drawings

3.3.1 HPCS P&ID, D-302-701, Rev. G
3.3.2 HPCS Piping, D-304-701, Rev. M
3.3.3 HPCS Piping, D-304-702, Rev. L
3.3.4 HPCS Piping, D-304-703, Rev. G

4.0 Potential Design Impact

Drains may have to be added to the system piping in order to meet the leak test requirements for these valves.

5.0 Probable Cause

Design oversight.

Attachments

A. Observation Record Review

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Observation Record Review
Attachment A

Observation No. ME-02-07	Checklist No. ME-02	Revision No.	0
PFR No.		Sheet 1	of 1

	Yes	No
Closed	X	

Extent 2 of 3 Systems with inconsistencies between GE and GAI data

Comments

GAI has stated that the test method for the subject valves is currently being reviewed by the CEI/NTS (Nuclear Test Section) group. Additional drain valves may be added as a result of this review. This review and any required design document changes will be completed in 1984.

Based on the fact that this item is currently under review by GAI and CEI, this Observation is closed.

Approvals

Originator	R. W. Hess	Date	1/16/84
Project Engineer	[signature]	Date	1/16/84
Project Manager	Ted P. Whiting	Date	1/16/84
CEI Representative	[signature]	Date	1/20/84

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
ME-02-07	ME-02	0
EDDR No.	QAD 600 No.	Sheet of
N/A	N/A	1 1

	Yes	No	
Closed	X		
Isolated			Not applicable
Potential Design Impact		X	

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
None required.

3.0 Action Taken
No additional action required - two testing programs are now being developed which will resolve all testing requirements.

4.0 Conclusion
The project is now reviewing all testing requirements. CEI/NTS (Nuclear Test Section) group is insuring all vents and drains needed for testing have been provided in addition NES (Nuclear Energy Services) is developing a pump and valve inservice testing program for CEI.

5.0 References
None Required.

Approvals

Originator	J E Meyer	Date	5-8-84
Senior Project Engineer	S. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date	5/10/84
GAI Project Manager	[illegible]	Date	5/9/84
GAI Manager Corporate QA Programs	R. A. Manning	Date	5/9/84

CYGNA

Observation Record

Observation No.	ME-02-08	Revision No.	0
Checklist No.	ME-02-HPCS	Sheet	1 of 3
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	[illegible]	Date	12/9/83

1.0 Description

The following items either lack proper documentation or utilize inconsistent data.

a. HPCS Fill Pump C003 sizing calculations could not be located by GAI. In addition, the specification for this pump (SP-506-4549, Rev. III) contains inconsistencies on pump minimum flow and discharge nozzle size. The discharge nozzle size is also inconsistent between the vendor supplied pump curve and pump drawing.

b. The suppression pool suction strainer pressure drop utilized in all calculations is 1 PSI. Per the strainer specification this is the maximum drop at 8500 G.P.M. and would be lower at lower flow rates. Per the vendor pressure drop calculations, the actual drop thru the strainer at 8500 G.P.M. is 0.42 PSI in the clean condition and 0.60 PSI with the straner 50% plugged. These pressure drops would then have to be adjusted for the lower system flowrates of 7000 G.P.M., 6110 G.P.M. and 1550 G.P.M.

c. Per the Perry FSAR section 6.3.2.2.1 reflief valve F014 has a capactiy of < 10 G.P.M. 10% accumulation with a set pressure of 100 PSIG. The valve data gives the capcity as 16.2 G.P.M.

d. Per the Perry FSAR section 6.3.2.2.1, valve F039 is a thermal relief valve set at 15 P.S.I.D. The valve shown on the P&ID, physicals, and Bill of Material for Perry is a lift check valve with no specified opening pressure.

e. The calculated size of orifice RO-D002 is 6.54" but the Perry Information System (P7837151.S) lists the size as 6.51" The size of this orifice will be affected by inconsistencies in the flow pressure drop calculations with flow to the reactor vessel.

f. The calculated size of orifice RO-D004 is 4.27" but the Perry Inforamtion System (P7837151.S) lists the size as 4.32". In addition, the calculation assumed valves F010 and F011 were fully open whereas specification DSP-E22-1-4549 Table 1 indicates the valves are in a throttled position. This would affect the size of RO-D004.

CYGNA

Observation Record

Observation No.	ME-02-08	Revision No.	0
Checklist No.	ME-02-HPCS	Sheet	2 of 3
Originated By	R. V. Hur	Date	12/1/83
Reviewed By	LJ Weingart	Date	12/9/83

g. The calculated and specified size of orifice RO-D005 is 5.10". However, this size may be affected by inconsistencies in the system pressure drop calculations i.e., strainer loss, valve losses, pump operating point, etc.

h. In calculation E22-1 on HPCS Pump C001 NPSH, an incorrect but conservative value is used for the loss thru the suction strainer and the pump runout flow. Also the specific gravity of water at 212°F is approximately 0.96 not 1.0.

i. In calculation E22A/J-cc on page 13 it is indicated tha the RCIC is operating concurrently with the HPCS. No documentation was found of this operating condition, but the assumption leads to conservative suction losses.

j. Relief Valve F035 is a 900 lb. class valve. However Line Specification DI-2 calls for 1500 lb. class valves in this size.

2.0 Requirement

Good engineering practice requires that design data be well documented and consistent through the design process.

3.0 Reference Documents

3.1 Water Leg Pumps, SP-506-4549-00, Rev. VII

3.2 Suction Line Stainers, SP-529-4549-00, Rev. III

3.3 Mac-Iron Pressure Drop Calculations dated 8/3/76, C.E.I. Job s.O. 52811-3

3.4 Amendment #3 dated 9/11/81, Perry FSAR

3.5 NPSH Calculations, Calculation E22-1 dated 12/10/81

3.6 Line Losses, Calculation E22 A/J-cc dated 2/16/79

3.7 HPCS Restricting Orifices, Attachment #1 to Calculation E22 A.J-cc dated 2/8/79

3.8 Byron Jackson Pump Curve dated 3/22/74 (GAI #4549-20-009-1), PC-741-S-1414

Observation Record

Observation No.	ME-02-08	Revision No.	0
Checklist No.	ME-02-HPCS	Sheet	3 of 3
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	[illegible signature]	Date	12/9/83

3.9 Bingham Pump Curve (INQ #P-249-K) Water Leg Pumps, CA-3201-1

3.10 Perry Information System, P7837151.S dated 9/15/83

3.11 Design Specification HPCS, DSP-E22-4549-00, Rev. 1 and Rev. 2

3.12 Bingham-Willamette Pump Drawing (GAI #4549-21-034-3), E-17409X, dated 9/28/77

3.13 Check Valves Specifications, SP-531-01-4549-00

3.14 Relief Valves Specifications, SP-523-4549

4.0 Potential Design Impact

The noted inconsistencies and lack of documentation could lead to design errors and possibly incorrectly sized components.

5.0 Probable Cause

Design control.

Attachments

A. Observation Record Review

Observation Record Review
Attachment A

Observation No. ME-02-08	Checklist No. ME-02	Revision No.	0
PFR No.		Sheet 1 of	2

	Yes	No
Closed	X	

Extent 3 of 3 Systems with missing calculations and inconsistent data application

Comments

GAI has presented the following resolutions to the noted inconsistencies:

a. The HPCS fill pump calculation E22-7 was located and verified (see Observation ME-02-06). GAI has agreed to revise specification SP-506 to reflect the correct (2") nozzle size.

b. GAI, in the independent HPCS calculations, has used a 1 psi drop at 6110 gpm for the suction strainer and adjusted this pressure drop at other flowrates. This is conservative and acceptable (see ME-02-09).

c. Per GAI memo from J.S. Smith to J. Hickson dated 1/13/84, FSAR pages 6.3-13 and 6.3-14 will be changed to indicate that the capacity of relief valve F014 is less than 20 gpm.

d. Per GAI memo from J.S. Smith to J. Hickson dated 1/13/84, FSAR pages 6.3-13 and 6.3-14 will be changed to indicate that valve F039 is a lift check vavle used for relieving thermally expanded fluid.

e. The HPCS independent calculations by GAI verify the adequacy of the 6.51" size of orifice RO-D002.

f. The HPCS independent calculations by GAI verify the adequacy of the 4.32" size of orifice RO-D004.

g. The HPCS independent calculations by GAI verify the adequacy of the 5.10" size of orifice RO-D005.

Approvals

Originator	R. W. Hess	Date	1/20/84
Project Engineer	[signature]	Date	1/20/84
Project Manager	Ted T. Witting	Date	1/20/84
CEI Representative	[signature]	Date	2/3/84

Cleveland Electric Illuminating; 83102
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CYGNA

Observation Record Review
Attachment A

Observation No. ME-02-08	Checklist No. ME-02	Revision No.	0
PFR No.		Sheet 2 of 2	

	Yes	No
Closed	X	

Extent 3 of 3 Systems with missing calculations and inconsistent data application

Comments

h. Based on the fact that the pressure drop thru the strainer used in the calculation is conservative and that the fluid specific gravity has no effect on the end result of the calculation, the calculated NPSH available is acceptable for system operation.

i. The HPCS independent calculations by GAI do not indicate that RCIC is operating concurrently with HPCS. This matches other documentation and is acceptable from a system design standpoint.

j. The 900 lb rating of relief valve F035 meets all system operating pressure and temperature requirements. The line specifications only list recommended ratings for gate, globe and check valves, and do not apply to relief valves.

Based on the above, this Observation has no impact on design or safety.

Approvals

Originator	R. V. Hun	Date	1/20/84
Project Engineer	[signature]	Date	1/20/84
Project Manager	Ted T. Wittig	Date	1/20/84
CEI Representative	[signature]	Date	2/3/84

Cleveland Electric Illuminating; 83102
Perry Nuclear Power Plant Piping Design Review

CEI

Observation
Record Closure
Attachment B

Observation No. ME-02-08	Checklist No. ME-02	Revision No. 0
EDDR No. 72	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
Three of the ten inconsistencies were conservative assumptions (a, h, i) and one (J) was a misinterpretation of GAI requirements.

3.0 Action Taken
Items a, c, d, e, f, & g represent questions of documentation which will be addressed generically as a result of the GE Criteria Compliance Review.

4.0 Conclusion
The review listed above will insure that all calculations are consistent and documented.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant, GE Criteria Compliance Review.

Approvals

Originator	J E Meyer	Date	5-8-84
Senior Project-Engineer	E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date	5/10/84
GAI Project Manager	E. J. Benigo	Date	5/9/84
GAI Manager Corporate QA Programs	H. C. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/16/Q/sp

CYGNA

Observation Record

Observation No.	ME-02-09	Revision No.	0
Checklist No.	ME-02-HPCS Item #20, 21, 22, & 23	Sheet	1 of 4
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	DJ Wengert	Date	12/9/83

1.0 Description

The following items summarize the inconsistencies and inaccuracies noted in GAI Calculation E22-A/J-cc, HPCS Line Losses.

a. The L/D used for valve F005 in all calculations is 135 (for a swing check valve). The valve is actually a lift check for which an L/D of 340 should have been used.

Note: The vendor drawing for this valve indicates that C_v = 1993.

b. The static head used in Modes A & E is based on a condensate tank low water level of 633'-0". However, the worst case flow condition (max. ΔH_s) would be just prior to switching to suppression pool suction. This point is assumed to be at a tank level at the tank suction nozzle top and would add ≈ 10ft. to the ΔH_s. In addition, Drawing D-302-102, Rev. G indicates that the 150,000 gallon reserve in the condensate tank for HPCS is at level 630'-9".

c. In Mode E a suction flow rate of 7800 G.P.M. is used fo calculating suction head loss, but the pump discharge head losses are based on a system discharge flow of 6110 G.P.M. This is inconsistent, but conservative.

d. HPCS pump suction strainer D006 is not included as a head loss in the calculations. If this stainer is just used for startup and then has the element removed for normal operation, this should be stated in the calculation. The physical drawing shows a large assembly for this strainer which may contribute some head loss even if the element is removed.

e. On page 27 of the calcuation, a head loss of 0.4 ft. for valve F001 is added to the total head even though this valve was already included in total system equivalent length and head loss. This is a G.E. suppied valve and the 0.4 ft. drop is specified by G.E. This head loss should be used in lieu of, but not added to the previously calculated loss.

f. The head loss for valve F004 has been added to the total system head loss twice . Once as an equivalent length and once as 1.4 ft., the G.E. specified maximum. In addition, the loss of 1.4 ft. has been added to the 16 inch pipe segment on page 28 rather than the 12 inch segment in which the value is located.

Observation Record

Observation No.	ME-02-09	Revision No.	0
Checklist No.	ME-02-HPCS Item #20, 21, 22, & 23	Sheet	2 of 4
Originated By	R. V. Thu	Date	12/1/83
Reviewed By	LJWingart	Date	12/9/83

g. In Mode B the suppression pool suction strainer head loss is given as 2.31. ft. on page 18. This is the maximum allowable drop with the strainer 50% plugged at 8500 G.P.M.. For 1550 G.P.M. and 50% blockage, this loss should not exceed

$$2.31 \left(\frac{1550}{8500}\right)^2 = 0.08 \text{ ft.}$$

h. Page 20 of the calculation lists the suppression pool low water elevation as 592'10", but the pump NPSH calcuation E22-1 lists the minimum level as 589'0".

i In Mode C on page 22 of the calculation, the head loss of valve F015 has been added to the system loss twice. The stated loss for this G.E. supplied valve is 0.07 ft. at 6110 G.P.M.

j. Page 23 of the calculation again adds the G.E. stated loss for valve F004 to the toal system loss which already includes valve F004.

k. Page 32 of the calculation again adds the G.E. supplied drop for valve F015 to the total system loss which already includes valve F015.

l. The G.E. stated valve head loss was not used in the calculation of head losses for Mode F on page 23.

m. The pump operating points used in the calculations for the various modes of operation do not appear to match the Byron Jackson Pump Curve Dwg. PC-741-S-1414.

2.0 Requirement

Per the General Electric Process Diagram 762E455 and Specification Data Sheet 22A3131AS, the HPCS Piping System shall be designed to provide 1550 G.P.M. to the reactor vessel with the R.V. pressure 1147 PSI above source suction pressure and 6110 G.P.M. to the reactor vessel with the R.V. pressure 200 PSI above source suction pressure. The system should also limit the flow to the reactor vessel at 14.7 PSIA to 7800 G.P.M. or the tested runout flow of the pump, whichever is lower.

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Observation Record

Observation No.	ME-02-09	Revision No.	0
Checklist No.	ME-02-HPCS Item #20, 21, 22, & 23	Sheet	3 of 4
Originated By	R. W. Hus	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

3.0 Reference Documents

3.1 HPCS Design Specification, 22A313, Rev. 5

3.2 HPCS Design Specification Data Sheet, 22A313, Rev. 5,

3.3 Process diagram HPCS, 762E455, Rev. 6,

3.4 Buryon Jackson Pump Curve (GAI #4549-20-009-1-0), PC-741-S-1414, dated 3/22/74

3.5 HPCS System NPSH, Calculation E22-1 (5/12/81)

3.6 HPCS - Line Losses, Calculation E22-A/J-cc (2/16/79)

3.7 HPCS Restricting Orifices, Calculation E22-A/J-cc Attachment #1 (2/8/79)

3.8 Drawings:

3.8.1 HPCS Piping, D-304-701, Rev. M
3.8.2 HPCS Piping, D-304-702, Rev. L
3.8.3 HPCS Piping, D-304-703, Rev. G
3.8.4 Northeast Main Plant Area, E-303-002, Rev. U
3.8.5 Sections & Details, E-303-016, Rev. H
3.8.6 Auxiliary Plans - Sections & Details, E-303-017, Rev. N
3.8.7 Plans and Details, E-303-002, Rev. F
3.8.8 Condensate Transfer and Storage, D-304-317, Rev. V
3.8.9 Condensate Transfer and Storage, D-304-315, Rev. E
3.8.10 Condensate Transfer and Storage, D-304-315, Rev. F
3.8.11 Condensate Transfer and Storage, D-302-102, Rev. G
3.8.12 HPCS, D-302-701, Rev. G

3.9 Testable Piston Check Valve w/Indicator (HPCS System Valve F005), Rockwell International, Dwg. No. 082-24401-18, Rev. C

4.0 Potential Design Impact

The major design impact of the calculational inaccuracies will be their affect on the sizing of the system orifices. The result of improperly sized orifices may be off-nominal flow to the reactor vessel and/or inaccurate flow testing of the system.

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Observation Record

Observation No.	ME-02-09	Revision No.	0
Checklist No.	ME-02-HPCS Item #20, 21, 22, & 23	Sheet	4 of 4
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

5.0 Probable Cause

Documentation inconsistencies and minor design oversights.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. ME-02-09	Checklist No. ME-02	Revision No.	0
PFR No.		Sheet 1 of	1

	Yes	No
Closed	X	

Extent 2 of 3 Systems with calculation inconsistencies and inaccuracies

Comments

GAI reanalyzed the HPCS system flow and head loss in calculations N22-3, N22-4, N22-5, N22-6 and N22-8. These new calcualtions utilized Tube Turns Piping Engineering Chart 3 data for equivalent lengths of fittings and valves rather than the Crane Technical Paper 410 data which was used in the original calculations. This resulted in lower head losses for fittings and valves in the new calculation. Certain approximations are used in the revised calculations, but they have a negligible affect on the total system head loss. The new calculations indicate that with the specified orifices installed, the system head exceeds requirements for all modes of operation. The adequacy of these calculations and orifice sizes will be confirmed by system performance and pre-operational testing.

Based on the above, the system head losses are acceptable for design and this Observation has no impact on safety.

Approvals

Originator	R. W. Hess	Date	1/18/84
Project Engineer	[illegible]	Date	1/18/84
Project Manager	Ted T. Wittig	Date	1/19/84
CEI Representative	J. E. [illegible]	Date	1/20/84

CEI

Observation
Record Closure
Attachment B

Observation No. ME-02-09	Checklist No. ME-02	Revision No. 0
EDDR No. 72	QAD 600 No.	Sheet of 1 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
The inconsistencies noted in the subject were considered to be minor since they did not affect the adequacy of the system. The GE Criteria Compliance Review will document the acceptability of such inconsistencies, which are primarily conservative assumptions to simplify the calculations.

3.0 Action Taken
GAI will complete the GE Criteria Compliance Review.

4.0 Conclusion
The GE Criteria Compliance Review will insure verified calculations are available to document that the systems will perform their intended function.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant, GE Criteria Compliance Review.

Approvals

Originator	J E Meyer	Date	5-8-84
Senior Project Engineer	E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date	5/10/84
GAI Project Manager	E J Leniger	Date	5/9/84
GAI Manager Corporate QA Programs	H. G. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
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Observation Record

Observation No.	ME-03-01	Revision No.	0
Checklist No.	ME-03 MSDS Item #1	Sheet	1 of 2
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

1.0 Description

The following inconsistencies within Table 1 of DSP-B21-1-1-4549 and between Table 1 and the General Electric system data are noted below:

a. The indicated pressure drop in Table 1 from location 4 to 13 for a constant flow of 310 lb/hr varies from 47.7 PSI for mode A to 390 PSI for mode B and 100 PSI for mode E.

b. In mode D of Table 1, the flow between locations 4 and 13 is given as 6,670 lb/hr and the pressure drop is listed as 100 PSI. This is the same pressure drop as given for mode E with a flow of only 310 lb/hr between these two locations.

c. GAI Table 1 indicates a continuous drain flow of 310 lb/hr for modes A, B, and E, i.e., drain valve F033 open. The General Electric Process Data 131 C7911C and Specification 22A4622 indicate that the drain valve F033 only opens at power levels of 50% and below and that the flow rate through the orifice is 2,000 lb/hr.

d. Both Table 1 of the GAI Specification and the GE process data indicate that the drain flowrate between location 13 and 14 in mode C is 50 GPM at 125°F. This drain path consists of two 3/4" valves and approximately 125' of 3/4" pipe which will significantly restrict the actual drain rate. In addition, no pressure drop is indicated across the two drain valves with the 50 GPM flow through them, i.e., 100 PSIA indicated upstream and downstream of the valves.

2.0 Requirement

GE Specification 22A4622, Process Data 131C7911C, and Process Diagram 105D5575 are the design basis documents for the system. They provide flow, pressure, and temperature data for which the system should be designed.

3.0 Reference Documents

3.1 Nuclear Boiler Design Specification, 22A4622, Rev. 5

3.2 Nuclear Boiler Design Specification Data Sheet, 22A4522AR, Rev. 2

CYGNA

Observation Record

Observation No.	ME-03-01	Revision No.	0
Checklist No.	ME-03 MSDS Item #1	Sheet	2 of 2
Originated By	R. L. Hess	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

3.3 Process Diagram Nuclear Boiler, 105D5575, Rev. 0

3.4 Process Data Nuclear boiler, 131C7911C, Rev. 5

3.5 Design Specification Nuclear Boiler System Piping and Pipe Supports, DSP-B21P1P4549-00, Rev. 2

3.6 Main, Reheat, Extraction, and Miscellaneous Drains P&ID, D-302-131, Rev. D

4.0 Potential Design Impact

Since the GAI design specification is used for piping and pipe support design, inconsistencies in pressure, temperature, and flow data could cause inaccuracies in this design effort. It is not clear what other design functions (valve sizing, I&C, etc.) use Table 1 data as design input information.

5.0 Probable Cause

Failure to document the resolution of differences between the GAI design specification and corresponding GE design data.

Attachments

A. Observation Record Review

Observation Record Review

Attachment A

Observation No. ME-03-01	Checklist No. ME-03	Revision No.	0
PFR No.		Sheet 1 of	1

	Yes	No
Closed	X	

Extent 2 of 3 Systems with inconsistencies between GE and GAI data

Comments

GAI has stated that Table 1 of Design Specification DSP-B21-1-1-4549 will be updated to correct the inconsistencies noted in this Observation. Regarding items (c) and (d), GAI has obtained verbal concurrence from GE (reference 10/19/83 telecon between T. Daugherty and J. Hickson of GAI and E. Wood and D. Foster of GE) and has requested written agreement (reference letter PY-GAI/GEN 2964 dated 1/3/84) on the following modes of system operation:

1) Continuous draining through the first MSIV before seat drain at all power levels. The resulting nominal drain rate will be approximately 310 lb/hr in lieu of GE-specified 2000 lb/hr at power levels below 50%.

2) A maintainance drain flowrate of less than 50 gpm to the clean radwaste system.

3) A maintainance drain rate of 50 gpm or greater to the main condenser, if condenser water quality requirements are met.

Based on the above, this Observation has no impact on design or safety.

Approvals

Originator	R. W. Hess	Date	1/18/84
Project Engineer	[signature]	Date	1/18/84
Project Manager	Ted F. Attig	Date	1/19/84
CEI Representative	[signature]	Date	1/20/84

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Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
ME-03-01	ME-02	0
EDDR No.	QAD 600 No.	Sheet of
72 and 73	N/A	1 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
No impact on system reviewed but generic effort to be addressed.

3.0 Action Taken
Perform the GE Criteria Compliance Review and a review for any negative effects from operating data inconsistency.

4.0 Conclusion
The above review will insure inconsistencies which could affect system design will be resolved.

5.0 References
(9) EDDR 72
(10) EDDR 73
(25) Perry Nuclear Power Plant GE Criteria Compliance Review Procedure.

Approvals

Originator J E Meyer	Date	5-8-84
Senior Project Engineer E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit F. A. Barg	Date	5/10/84
GAI Project Manager E J Lang	Date	5/9/84
GAI Manager Corporate QA Programs H. U. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
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DW138/22/Q/sp

CYGNA

Observation Record

Observation No.	ME-03-02	Revision No.	0
Checklist No.	ME-01 MSDS Item #3	Sheet	1 of 1
Originated By	R. V. Hr	Date	12/1/83
Reviewed By	[illegible]	Date	12/9/83

1.0 Description

No sizing calculation could be located for restricting orifice RO-D001. Therefore, no documented basis exists for the specified orifice size.

2.0 Requirement

The General Electric Process Data 131C70911 gives the orifice RO-D001 flow conditions as 2000 lb/hr at greater than a 600 psi pressure drop. The G.E. Design Specification 22A4622, Rev. 5 states that a restricting orifice be provided for continuous draining of condensate during operation below 50 percent power level.

3.0 Reference Documents

3.1 Nuclear Boiler Design Specification, 22A4622, Rev. 5,

3.2 Process Data Sheet, 131C7911C, Rev. 5

3.3 Nuclear Boiler Process Diagram, 105D5575, Rev. 0

3.4 Nuclear Boiler Design Specification, DSP-B21-1-4549-00, Rev. 2,

3.5 Perry Information System, P7837151.S Dated 9/15/83,

4.0 Potential Design Impact

Since no sizing calculation or documentation could be located for orifice RO-D001, its adequacy to perform the G.E. specified function could not be verified.

5.0 Probable Cause

Design Control

Attachments

A. Observation Record Review

Observation Record Review
Attachment A

Observation No. ME-03-02	Checklist No. ME-03	Revision No.	0
PFR No.		Sheet 1 of	1

	Yes	No
Closed	X	

Extent 3 of 3 Systems with missing calculations

Comments

GAI has generated a new calculation to verify the sizing of orifice RO-D001. Cygna's review of this calculation, N22-9 dated 11/15/83, verifies that the existing orifice size is adequate for all system flow conditions.

Based on the above, this Observation has no impact on design or safety.

Approvals

Originator	R. W. Hux	Date	1/11/84
Project Engineer	[signature]	Date	1/11/84
Project Manager	[signature]	Date	1/16/84
CEI Representative	[signature]	Date	1/20/84

Cleveland Electric Illuminating; 83102
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Observation
Record Closure
Attachment B

Observation No. ME-03-02	Checklist No. ME-03	Revision No. 0
EDDR No. 72	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
The case cited by Cygna was a documentation issue.

3.0 Action Taken
3.1 GAI generated a calculation which verified that the orifice was adequate.
3.2 GAI will perform the GE compliance review, which includes a review that all required calculations are available.

4.0 Conclusions
The review listed above will insure adequacy of documentation.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant, GE Criteria Compliance Review Procedure.

Approvals

Originator	J. E. Myers	Date 5-8-84
Senior Project Engineer	E. M. Mead	Date 5/8/84
CEI Supervisor Quality Audit Unit	F. A. Bass	Date 5/10/84
GAI Project Manager	E. J. Beiringer	Date 5/9/84
GAI Manager Corporate QA Programs	H. W. Manning	Date 5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/18/Q/sp

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Observation Record

Observation No.	ME-03-03	Revision No.	0
Checklist No.	ME-03 MSDS Item #8 and #9	Sheet	1 of 2
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

1.0 Description

Calculation N22-3 page 13 is for sizing the 1st MSIV before seat drain line. This calculation does not match the physical piping arrangement and does not include all modes of operation. Specifically.

a. The calculation is for a single 3" pipe from the 1st MSIV to the condesner. The actual piping arrangement consists of four 2" pipes (one from each MSIV) connected to a 3" drain header with a parallel orifice bypass line. The 3" pipe then ties into a 24" header which connects to the condenser.

b. The calculation is based on a flow of 6670 lb/hr. However, the system design specification lists flows of 310 lb/hr and 50 gpm in addition to the 6670 lb/hr. Also, G.E. lists a flow of 2000 lb/hr for low power operation.

c. The calculation does not cover or show flow through valve F033 and RO-D001 or draining through valves F034 and F035.

d. The calculation indicates no elevation difference between valve F016 and F021, whereas the physical piping drawing indicates a difference in elevation of approximately 15' feet.

2.0 Requirement

GE Specification 22A4622 and process data 131C7911C provide the design requirements for the first MSIV before seat drain line. Section 4.6 of the specification states that the system should provide for draining the flooded main steam lines in a reasonable length of time and remove steam condensate generated during heat-up and operation below percent power level. The process data lists a drain flowrate of 50 gpm and an operation below 50 percent power flowrate of 2000 lb/hr.

3.0 Reference Documents

3.1 Nuclear Boiler Design Specification, 22A4522, Rev 5

3.2 Nuclear Boiler Process Specification, 105D5575, Rev 0

Observation Record

CYGNA

Observation No.	ME-03-03	Revision No.	0
Checklist No.	ME-03 MSDS Item #8 and #9	Sheet	2 of 2
Originated By	R. W. Hess	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

3.3 Nuclear Boiler Process Data, 131C7911C, Rev. 5

3.4 Design Specification Nuclear Boiler, DSP-B21-1-4539-00, Rev. 2

3.5 N22-Line Sizing, Calculation N22-3 (11/7/78)

3.6 Drawings

3.6.1 Piping N22, D-304-501, Rev. E
3.6.2 Piping N22, D-304-122, Rev. G
3.6.3 Piping N22, D-304-304, Rev. E
3.6.4 Piping N22, D-304-304, Rev. D

4.0 Potential Design Impact

The adequacy of the piping system to meet the design requirements cannot be determined based on the calculations presented.

5.0 Probable Cause

Documentation control.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. ME-03-03	Checklist No. ME-03	Revision No. 0	
PFR No.		Sheet 1 of 1	

	Yes	No
Closed	X	

Extent 2 of 3 Systems with calculation inconsistencies and inaccuracies

Comments

GAI submitted revised calculation N22-3A, dated 1/6/84, to verify the adequacy of the size of the main steam drain piping from the first main steam isolation valve before seat drain to codenser connection 194. This calculation does not address flow through the 1" bypass line, valve F033 and orifice RO-D001 which is the continuous drain path during normal reactor operation. However, calculation N22-9 for verification of the adequacy of orifice RO-D001 indicates that sufficient margin exists in this flowpath to account for the 1" pipe and valve F033 losses.

Based on the above, this observation has no impact on design or safety.

Approvals

Originator	R. W. Hess	Date	1/16/84
Project Engineer	[signature]	Date	1/16/84
Project Manager	Ted F. [signature]	Date	1/18/84
CEI Representative	J. E. [signature]	Date	1/20/84

Cleveland Electric Illuminating; 83102
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CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
ME-03-03	ME-03	0
EDDR No. 72	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
Some inconsistencies noted resulted from documents being reviewed by Cygna beyond their intended purpose. None of these had any impact on the design of the system.

3.0 Action Taken
GAI has eliminated the inconsistencies in the cases cited by Cygna, in addition, the GE Criteria Compliance Review will be performed on a generic basis.

4.0 Conclusion
The GE criteria review will assure the adequacy of systems designed by GAI.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant GE Criteria Compliance Review

Approvals

Originator	J E Meyer	Date	5-8-84
Senior Project Engineer	E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date	5/10/84
GAI Project Manager	W J Leininger	Date	5/9/84
GAI Manager Corporate QA Programs	H. P. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/19/Q/sp

CYGNA

Observation Record

Observation No.	ME-03-04	Revision No.	0
Checklist No.	M3-03 MSDS Item #10	Sheet	1 of 1
Originated By	R. W. Hur	Date	12/1/83
Reviewed By	RJ Weingart	Date	12/9/83

1.0 Description

Valves F034 and f035 are 3/4" Y pattern globe valves arranged in series with approximately 125 feet of 3/4" pipe attached to the outlet of valve F035. the flowrate specified for this drain is 50 GPM of 125°F water with a pressure upstream of valve F034 of 100 PSIA.

2.0 Requirement

Section 4.6.1 of G.E. Specification 22A4522 states that the main steam line drains shall drain the flooded steam lines in a reasonable length of time. The G.E. process data sheet 131C7911C states that the flowrate for this flowpath should be 50 G.P.M.

3.0 Reference Documents

3.1 Nuclear Boiler Design Specification, 22A4622, Rev. 5

3.2 Process Data Nuclear Boiler, 131C7911C, Rev. 5

3.3 Main, Reheat Extraction, and Miscellaneous Drains, D-302-121, Rev. D

3.4 Piping N22, D-304-121, Rev. E

3.5 Piping N22, D-304-129, Rev. D

3.6 3/4" Series 1500 Y-Type Globe Valve, Kerotest Dwg. D-9955

4.0 Potential Design Impact

The 3/4" drain size will restrict the drain flowrate to less than 50 GPM and increase the time required to drain the flooded main steam lines.

5.0 Probable Cause

Design oversight.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. ME-03-04	Checklist No. ME-03	Revision No.	0
PFR No.		Sheet 1	of 1

	Yes	No
Closed	X	

Extent 3 of 3 Systems with inconsistencies between valve data and GE requirements

Comments

GAI has discussed the drain flowrate requirement with GE (reference telecon dated 10/19/83 between T. Daugherty and J. Hickson of GAI and E. Wood and D. Foster of GE). The 50 gpm rate stated by GE is a nominal value and higher or lower rates are acceptable. GE has stated that a faster rate can be achieved by draining to the condenser rather than the clean radwaste system as long as water chemistry limits are not exceeded. GAI has requested GE to confirm these discussions in writing (Ref. PY-GAI/GEN-2964, dated 1/3/84).

Based on the above, this Observation has no impact on design or safety.

Approvals

Originator	N. W. Hse	Date	1/13/84
Project Engineer	[signature]	Date	1/16/84
Project Manager	Ted [signature]	Date	1/16/84
CEI Representative	[signature]	Date	1/20/84

Cleveland Electric Illuminating; 83102
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Observation
Record Closure
Attachment B

Observation No. ME-03-04	Checklist No. ME-03	Revision No. 0
EDDR No. 072	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
This item is also addressed in observation ME-03-01, item d.

3.0 Action Taken
GE Criteria Compliance Review will be performed.

4.0 Conclusion
There was no effect on the systems reviewed by Cygna, and the generic review listed above will insure documentation of reconciliation of variations from GE criteria.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant GE Criteria Compliance Review Procedure, Rev. 0.

Approvals

Originator	J. E. Myers	Date	5-8-84
Senior Project Engineer	E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date	5/10/84
GAI Project Manager	W. J. Beringer	Date	5/9/84
GAI Manager Corporate QA Programs	H. G. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
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DW138/20/Q/sp

CYGNA

Observation Record

Observation No.	ME-03-05	Revision No.	0
Checklist No.	ME-03 MSDS Item #4 & #5	Sheet	1 of 1
Originated By	R. W. Horr	Date	12/1/83
Reviewed By	[signature]	Date	12/9/83

1.0 Description

The closing speed specified for valves F016 and F019 in GAI Specification 521-02-4549-00 and bill of material RNU-202 is "Vendor Standard." The Borg-Warner vendor drawing 81180 states that the valve closing time is 20 seconds maximum. This closing time corresponds to a minimum closing speed of approximately 9 inches per minute for a 3 inch valve.

2.0 Requirement

The GE Nuclear Boiler Design Specification Data Sheet 22A4522AR Section 3.1.17.1 states that valves F016 and F019 shall have a closing speed of at least 12 inches per minute.

3.0 Reference Documents

3.1 Nuclear Boiler Design Specifications 22A4522, Rev. 5

3.2 Nuclear Boiler Data Sheet 22A4522AR, Rev. 2

3.3 2-1/2 inch and Larger Valves SP-521-02-4549-00, Rev. 5

3.4 Valve Assembly, Gate 3 inch, 1,500 C S. Motor Operated Drawing 81180, Rev. H

4.0 Potential Design Impact

Since the valve minimum closing speed of 12 inches per minute was not specified in the GAI purchase specification and the vendor drawing only indicates a maximum closing time of 20 seconds, it cannot be determined if the valve meets the GE criteria.

5.0 Probable Cause

Design control.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. ME-03-05	Checklist No. ME-03	Revision No.	0
PFR No.		Sheet 1	of 1

	Yes	No
Closed	X	

Extent 3 of 3 Systems with inconsistencies between valve data and GE requirements

Comments

GAI has received verbal concurrance from GE (Ref. telecon PY-GAI/GEN-2903T between T. Daugherty of GAI and E. Wood of GE, dated 11/4/83) and has requested written confirmation (Ref. telecon PY-GAI/GEN-2964, dated 1/3/84) of the acceptability of the closing speed of valves B21-F016 and B21-F019, which is slower than the GE requirement. Per memo T. Daugherty to M. Stewart dated 12/2/83, GAI is initiating an SAR change to Table 6.2-32 to reflect the 18.5 second closing time of these valves.

Based on the above, this Observation has no impact on design or safety.

Approvals

Originator	R. W. Hess	Date	1/16/84
Project Engineer	[signature]	Date	1/16/84
Project Manager	Ted T. Wetting	Date	1/18/84
CEI Representative	[signature]	Date	1/20/84

Cleveland Electric Illuminating; 83102
Perry Nuclear Power Plant Piping Design Review

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Observation
Record Closure
Attachment B

Observation No. ME-03-05	Checklist No. ME-03	Revision No. 0
EDDR No. 72	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
None required.

3.0 Action Taken
GE acceptance will be documented, and the GE Criteria Compliance Review will be performed.

4.0 Conclusion
The review listed above will insure that all GE criteria have been met, or deviations documented as acceptable.

5.0 References
(9) EDDR 72
(25) Perry Nuclear Power Plant GE Criteria Compliance Review Procedure.

Approvals

Originator	J E Myers	Date 5-8-84
Senior Project Engineer	E. M. Mead	Date 5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date 5/10/84
GAI Project Manager	[signature]	Date 5/9/84
GAI Manager Corporate QA Programs	[signature]	Date 5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/21/Q/sp

5.2 PIPING ANALYSIS OBSERVATION STATUS

OBSERVATION NO.	DEFICIENCY YES/NO	EDDR NO. OR GC PRE NO.	FOLLOW-UP ACTION COMPLETE	SCHEDULED COMPLETION DATE FOR FOLLOW-UP	COMMENTS
PI-00-01	NO	--	NA	NA	
PI-00-02	YES	64	YES, 1/13/84	NA	
PI-00-03	NO	--	NA	NA	
PI-00-04	YES	65	NO	JUNE 30, 1984	
PI-01-01	YES	66	YES, 3/19/84	NA	
*PI-01-02	NO	--	NA	NA	*INVALID OBSERVATION
PI-02-01	NO	--	YES, 1/13/84	NA	
PI-03-01	NO	--	YES, 1/30/84	NA	

CYGNA

Observation Record

Observation No.	PI-00-01		Revision No.	0	
Checklist No.	PI-01, -02, -03	General	Sheet	1	of 1
Originated By	[signature]		Date	12/2/83	
Reviewed By	John Marchiello		Date	12/2/83	

1.0 Description

Support flexibility is not considered in Class 2 or Class 3 piping analyses. Supports are input as rigid and then designed using a maximum deflection criterion of 0.1".

2.0 Requirement

Cygna Review Criteria 83102-DC-1, Rev. 0, Sect. 4.8.9.

3.0 Document Reference

3.1 GAI Analysis Report No. 1B21G08A (MSRV)

3.2 GAI Class 1 Analysis Guide No. 04, Rev. C

4.0 Design Impact

Large variations in as-built support stiffness as compared to the analyses could significantly change system mode shapes, load distribution, support loads and pipe stress.

5.0 Probable Cause

Standard GAI practice.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No.	PI-00-01	Checklist No.	PI-01, -02, -03	Revision No.	0
PFR No.				Sheet	1 of 1

	Yes	No
Closed	X	

Extent All 3 Systems

Comments

The use of rigid supports is acceptable provided that the GAI deflection criteria of 0.1 inches is sufficient to provide assurance that the flexibility of the supports will have no significant effect upon the piping analysis results (stresses and loads).

An approximate evaluation of this issue can be made utilizing a cantilevered support (limiting case) with a pipe/support system frequency of 33 Hz (i.e., the "rigid" range of the seismic spectra). Under an applied load approximately equal to the tributary mass weight on the support, the deflection, δ, for this system is approximately

$$f = \frac{1}{2\pi}\sqrt{\frac{g}{\delta}} \quad \Rightarrow \delta = 0.01''$$

This is 1/10 of the value required by the GAI criteria. This shows that the supports, themselves, can be subjected to dynamic excitation due to loads well above the ZPA level.

Based on the above, Cygna performed a review of the pipe support deflections and stiffnesses for the Main Steam Relief Valve Discharge System 1B21-G08. This review considered the GAI design calculations as well as some approximate hand calculations by Cygna. The review indicated that the deflections of supports on this system were well below the 0.1 inch limit and that the corresponding stiffnesses were sufficient to provide confidence that there would not be any significant impact on the loads and stresses in this system.

Approvals

Originator	[signature]	Date	1/6/84
Project Engineer	[signature]	Date	1/6/84
Project Manager	Ted T. [signature]	Date	1/6/84
CEI Representative	E. Mayer [signature]	Date	2/3/84

Cleveland Electric Illuminating; 83102
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Observation
Record Closure
Attachment B

Observation No. PI-00-01	Checklist No. PI-01, 02, 03	Revision No. 0
EDDR No. N/A	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No	
Closed	X		
Isolated			Not applicable
Potential Design Impact		X	

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
Observation noted different techniques being used on Class 1 and Class 2 or 3, not a deficiency.

3.0 Action Taken
None required

4.0 Conclusion
No design criteria has been exceeded or ignored in GAI approach to this problem. GAI has chosen different methods to meet the ASME requirement. Both methods are adequate to insure the acceptability of the piping design for Perry Nuclear Power Plant.

5.0 References
N/A

Approvals

Originator	J E Myer	Date	5-8-84
Senior Project Engineer	E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date	5/11/84
GAI Project Manager	W J Ferger	Date	5/9/84
GAI Manager Corporate QA Programs	H. A. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
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Observation Record

Observation No.	PI-00-02	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	1 of 5
Originated By	LJWeinert	Date	12/2/83
Reviewed By	D.K. Wong	Date	12-2-83

1.0 Description

The following items summarize minor inconsistencies noted during the review of the MSRV, HPCS and MSD piping analyses:

a. Deleted.

b. In the functional capability check for the SRV discharge line (1B21-G08A, Rev. 2), the worst case was not examined for a reducing elbow. Specifically, the 12 inch end of a 12" x 10" 90° reducing elbow was examined, but not the 10" end. The was expressly omitted because a 10" 45° elbow, having higher stresses, had already been examined. In this case, and in general, such logic is not appropriate because the stress indice for a 45° elbow is nearly 30 percent lower than for a 90° elbow.

c. In the calculation for modeling gate valves for the piping analysis, four mass points are included: (1) operator, (2) stem and yoke, (3) bonnet and (4) body. There is no mass point for the gate. Consequently, the mass moment of inertia is underestimated.

For valve 1E22-F036, this technique results in the following calculated values:

- moment arm w/o gate = 13.7 in.
- moment arm w/gate = 14.4 in.*
- ratio = 1.05

*The actual moment arm shown on the vendor drawing is 14.90 in.

d. As shown on Fig. 1, MSD piping is enclosed by a guard pipe from the drywell to the shield wall. The guard pipe is connected to the drywell and is isolated from the shield wall and containment vessel by bellows.

In performing the thermal modes analysis for MSD piping, thermal movement of the shield wall and containment vessel are expressly excluded due to the bellows at those points. Thermal movement of the drywell, on the other hand, is neither included nor addressed.

CYGNA

Observation Record

Observation No.	PI-00-02	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	2 of 5
Originated By	[signature]	Date	12/2/83
Reviewed By	C.K. Wong	Date	12-2-83

e. The weight of water was included in the deadweight and all dynamic analyses for the MSD piping. This line is always filled with steam except during hydro testing. It should be noted that the thermal transient analysis was properly done considering the fluid properties of steam.

2.0 Requirement

a. Deleted.

b. Interim Technical Position "Functional Capability of Passive Piping Components," Mechanical Engineering Branch, Division of Systems Safety.

c. Cygna Review Criteria, 83102-DC-1, Section 4.7.6.

"Weights and centers of gravity shall be as specified on the applicable vendor supplied valve assembly drawings."

d. All significant thermal anchor movements should be considered.

e. N/A.

3.0 Document Reference

3.1 Deleted.

3.2 Deleted.

3.3 GAI "Document Evaluation of Functional Capability of Piping Components", dated July 29, 1982. (b)

3.4 GAI Stress Analysis Report 1B21G08A Rev. 2. (b)

3.5 Borg-Warner Drawing 81030. (c)

3.6 Borg-Warner Report No. 81030 (GAI No. 4549-94Q-386-1). (c)

3.7 GAI Calculation File No. 2.69.2, RNU 226. (c)

3.8 GAI Analysis Report IN2201C. (d)

Observation Record

Observation No.	PI-00-02	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	3 of 5
Originated By	[signature]	Date	12/2/83
Reviewed By	C.K. Wong	Date	12-2-83

3.9 Nutech Report Py-NTC-GAI-034, Rev. 0. (d)

3.10 GAI Analysis 1N22G01C, Rev. 2. (e)

4.0 Potential Design Impact

a. Deleted.

b. This system still meets funcitonal requirements, however the margin is reduced from over 30 percent to 4 percent. If this same assumption was used for other similar lines, it could lead to the functional requirements not being met.

c. It should be noted that the valve is appropriately modeled to simulate the fundamental frequency predicted by the vendor.

Valve loads transferred into the piping are directly proportional to the moment arm. For Valve 1E22-F016, this corresponds to a 5 percent increase in loads, which is insignificant.

However, this matter should be investigated for other gate valves on PNPP.

d. Thermal stresses in the guard pipe and at the piping/guard pipe juncture may be incorrect. These predicted stresses will be unconservative only if the piping and drywell grow thermally in opposing directions.

CYGNA

Observation Record

Observation No.	PI-00-02	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	4 of 5
Originated By	L J Wingart	Date	12/2/83
Reviewed By	C.K. Wong	Date	12-2-83

e. The change in weight is summarized as follows:

Pipe Size	Input Weight (lbs./ft.)	Actual Weight (lbs./ft.)	% Decrease
2"	11.91	10.94	8.1
3"	20.72	18.38	11.3

This 11.3% in mass could increase the frequencies by as much as 5.5%. This small shift in frequencies will not significantly affect the dynamic analysis due to the conservatisms of the response spectra analysis and the broadening of spectra peaks.

5.0 Probable Cause

Minor oversights in the analysis and design.

Attachments

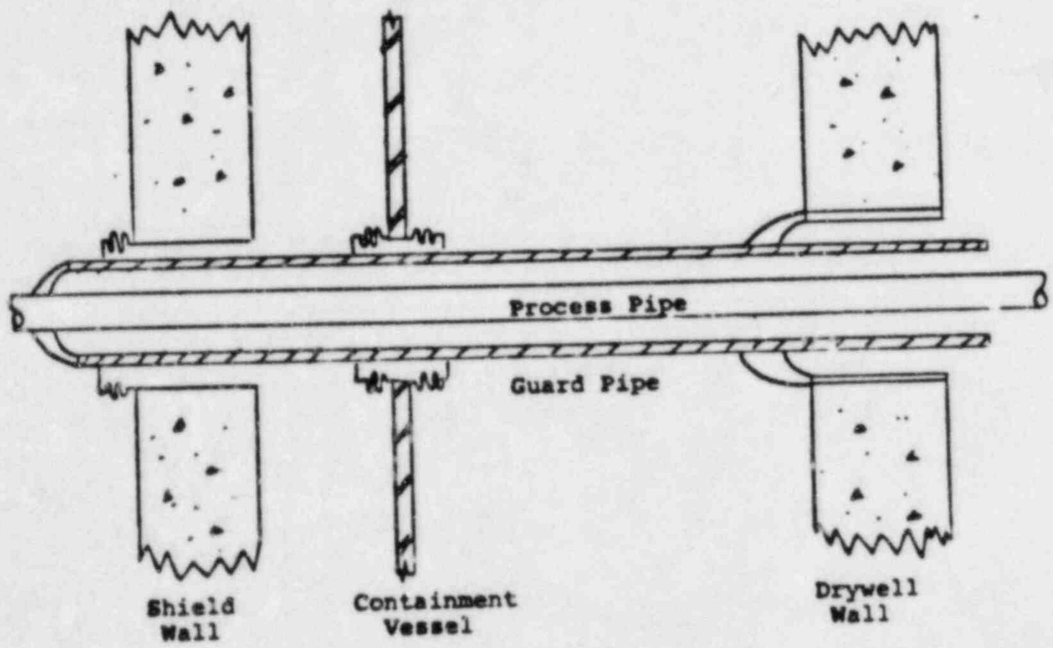
A. Observation Record Review

CYGNA

Observation Record

Observation No.	PI-00-02	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	5 of 5
Originated By	AJ Weinsart	Date	12/2/83
Reviewed By	C.K. Wong	Date	12-2-83

FIGURE 1



CYGNA

Observation Record Review
Attachment A

Observation No. PI-00-02	Checklist No. PI-01, -02, -03	Revision No. 0	
PFR No.		Sheet 1 of 1	

	Yes	No
Closed	X	
Extent	All 3 Systems	

Comments

Based on evaluation of each of the noted items in this Observation, Cygna concludes that individually these items have no impact on design for the three systems reviewed. In addition, due to the small number of items per system, there are no cummulative effects.

Approvals			
Originator	[signature]	Date	1/25/84
Project Engineer	[signature]	Date	1/25/84
Project Manager	Ted Dutittig	Date	1/26/84
CEI Representative	J E Myers	Date	2/3/84

Cleveland Electric Illuminating; 83102
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CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PI-00-02	PI-01, PI-02, PI-03	0
EDDR No.	QAD 600 No.	Sheet of
064	N/A	1 1

	Yes	No
Closed	X	
Isolated	X Item B Other items not applicable	
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
Items A, C, D, E were conservative assumptions or insignificant as described below.

3.0 Action Taken
Item B initiated EDDR No. 64, and associated GAI review for similar discrepancies.

4.0 Conclusion
a. Deleted - Observation invalid
b. Discrepancy was isolated as determined by EDDR 64
c. This item resulted in a 5% discrepancy in the mass moment of inertia of the valve. This is judged to be insignificant. In addition it should be noted that this value would vary depending on the valve position.
d. The thermal movement of a five foot concrete wall from ambient temperature effect was correctly assumed insignificant.
e. This was judged to be a conservative assumption which is acceptable regardless of the likelihood of the event. The effect of small frequency shifts will be offset by the additional mass of the system.

5.0 References
(1) EDDR 64

Approvals

Originator	J E Meyer	Date	5-8-84
Senior Project Engineer	E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	F. A. Baer	Date	5/11/84
GAI Project Manager	W J Beiger	Date	5/9/84
GAI Manager Corporate QA Programs	R B Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
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CYGNA

Observation Record

Observation No.	PI-00-03	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	1 of 3
Originated By	[signature]	Date	12/2/83
Reviewed By	C.K. Dong	Date	12-2-83

1.0 Description

The following items either lack documentation or utilize inconsistent data:

a. GAI Specification B21 requires that SRV piping within the drywell be designed for a post-LOCA condition temperature of 250°F. 195°F (185 + 10) was used.

b. Deleted.

c. Deleted.

d. There is no documentation within the calculation package justifying the thicknesses used in the thermal transient analysis for:

1) Reactor Nozzle (HPCS)

2) Sweepolet (HPCS)

3) Valves (MSD and HPCS)

4) Penetration (MSD)

5) Tee (MSD)

e. There is no documentation justifying the exclusion of the effects of bend or elbow ovalization for the HPCS.

f. There is no documentation indicating that the movement of the Main Steam lines during turbine trip has been considered for its effect on the MSD lines.

2.0 Requirement

a. GAI Project Design Specification, DSP-B21-1-4549, Rev. 1 Table 6.

b. Deleted.

c. Deleted.

CYGNA

Observation Record

Observation No.	PI-00-03	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	2 of 3
Originated By	[signature]	Date	12/2/83
Reviewed By	J C K Wong	Date	12-2-83

d. Standard industry practice.

e. ASME B & PV Code Section III 1974 with addendum through Winter 1975, Subsection NB, Paragraph NB-4223.2.

f. N/A.

3.0 Reference Documents

3.1 GAI Analysis Report No. 1B21G08A, Rev. 2. (a)

3.2 Deleted.

3.3 Deleted.

3.4 GAI Analysis Report Nos. 1N22G01C, Rev. 2 and 1E22G04C, Rev. 2. (d)

3.5 GAI Analysis Report No. 1E22G04C, Rev. 2. (e)

3.6 GAI Analysis Report No. 1N22G01C, Rev. 2. (f)

4.0 Potential Design Impact

a. The following table shows the temperature considered in designing a portion of the SRV piping.

SECTION	TH1 (UPSET)	TH2 (UPSET)	TH3 (NORMAL)	TH4 (POST-LOCA)
1	450°F	450°F	145°F	195°F

195°F TO 250°F is a significant temperature rise, which could impact design stresses. However, taking into account the other design conditions (upset temperature = 450°F) and the higher allowable normally associated with post-LOCA event, the oversight in design will have no impact.

CYGNA

Observation Record

Observation No.	PI-00-03	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	3 of 3
Originated By	D. Wingate	Date	12/2/83
Reviewed By	C. K. Wong	Date	12-2-83

b. Deleted.

c. Deleted.

d. Individual loose sheets indicate that the values are appropriate. These sheets should be incorporated into the analysis package.

e. The following calculation shows that the pressure stress indice may increase by as much as 3 times. Per NB-4223.2 ovality is limited to .08 x Do as a maximum (could be less)

$$\therefore F_{1a} \approx 1 + .08 \frac{Do}{t} \left(\frac{1.5}{k}\right)$$

$$= 1 + .08 \frac{(12.75)}{.687} \frac{(1.5)}{\left(1 + .455 \left(\frac{12.75}{.687}\right)^3 \frac{1050}{27 \times 10^6}\right)}$$

$$F_{1a} = 3$$

$$\therefore K_1' = F_{1a} \times K_1 = 3 \times 1 = 3$$

This would be a maximum. For ANSI B16.9 elbows, the out-of-round may be less.

f. Additional stresses may occur in the drain lines due to the movement of the Main Stream lines to which they are attached.

5.0 Probable Cause

Document and design control.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. PI-00-03	Checklist No. PI-01, -02, -03	Revision No.	0
PFR No.		Sheet 1	of 1

	Yes	No
Closed	X	

Extent All 3 Systems

Comments

Based on evaluation of each of the noted items in this Observation, Cygna concludes that individually these items have no impact on design for the three systems reviewed. In addition, due to the small number of items per system, there are no cummulative effects.

Approvals

Originator	[signature]	Date	1/25/84
Project Engineer	[signature]	Date	1/25/84
Project Manager	Ted T. Witting	Date	1/26/84
CEI Representative	J. E. Mugod	Date	2/3/84

CEI

Cbservation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PI-00-03	PI-01, 02, 03	0
EDDR No.	QAD 600 No.	Sheet of
N/A	N/A	1 2

	Yes	No
Closed	X	
Isolated	Not applicable	
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
None required.

3.0 Action Taken
None required.

4.0 Conclusion

a. No impact because the upset temperatures bound the post loca ambient temperatures. In addition, the GAI final piping analysis calculation review (79-14) includes an ambient temperature review. This will insure this kind of oversight will not affect the design of any system.

b. Delete - Observation invalid.

c. Delete - Observation invalid.

d. Descriptions of all models used in the thermal transient analysis are provided in the analysis package. Discontinuity thicknesses used in the one-dimensional heat transfer analysis are based on the maximum thickness occurring dt distance from the location being analyzed. In cases where maximum thickness is used, no additional justification is given or considered necessary. For those cases or models for which maximum thickness cannot be used, sketches and descriptions are provided in the calculation.

e. The GAI assumption was that this term has a negligible effect. GAI has demonstrated that this is a correct assumption for the pipe sizes and wall thickness used on the Perry project.

f. The movement of the main steam line at this point was correctly assumed to be negligible. The maximum movement from the GE stress report was 0.02 inches.

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PI-00-03	PI-01, 02, 03	0
EDDR No.	QAD 600 No.	Sheet of
N/A	N/A	2 2

5.0 References
(15) GAI memo dated March 19, 1984 from J. T. Zalewski to C. W. Whitehead

Approvals

Originator J E Myer	Date	5-8-84
Senior Project Engineer E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit T. A. Boss	Date	5/10/84
GAI Project Manager EJ Lenig	Date	5/9/84
GAI Manager Corporate QA Programs H.A. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/27/Q/sp

CYGNA

Observation Record

Observation No.	PI-00-04	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	1 of 2
Originated By	C. K. Wong	Date	1-3-84
Reviewed By	[signature]	Date	1/3/84

1.0 Description

The following analysis oversights are noted for Jet Impingement load calculations:

- Main Steam Safety Relief system, 1B21 G08(A), Rev. 2, Shts. 17.5 thru 17.10.

a1. Case 6.b in Table 7 of specification. The jet load input at node point 11 should be $-F_y$ instead of F_x (597.3#), since local coordinates are used for that node point.

- High Pressure Core Spray, 1E22G04(C), Rev. 3.

b1. Item 1C of Table 7 in specification (break LPB2LL). The total load computed is 6902.6#. The total load specified in the design specification is 7488#.

b2. Item 2 of Table 7. Break SD3A.

F_z component should be included in the input.

b3. Item 3 of Table 7. Break SB3A.

F_z component should be included in the input.

b4. Item 7J of Table 7.

Force input at node A18 should be at node B18 (difference of 0.566' in elevation).

b5. Item 8 of Table 7. B33 Break RD7 (header side) Loop "B".

Jet loads on piping and valve E22-F036 are not included in the calculation. This is listed as an analysis exception in the Class 1 Stress Report, P-1001, Rev. 0.

b6. The load input for nodes 18 and A18 (Jet 6D) are interchanged.

b7. At node 13, a negative load of -1122.0# was input as a positive load.

CYGNA

Observation Record

Observation No.	PI-00-04	Revision No.	0
Checklist No.	PI-01, PI-02, PI-03 General	Sheet	2 of 2
Originated By	C. K. Wong	Date	1-3-84
Reviewed By	H. Weingart	Date	1/3/84

2.0 Requirement

1. GAI specification - DSP-B21-1-4549-00, Rev. 2.

2. GAI specification - DSP-E22-1-4549-00, Rev. 2.

3.0 Reference Documents

3.1 GAI analysis 1B21G08(A), Rev. 2. (a)

3.2 Computer output for 1B21G08(A), Run #JOHNVXW (1/12/83) (a)

3.3 GAI Analysis 1E22G04C, Rev. 2, Run #3, E22G4J Run ID=AOXZGCL (3/28/83) (b)

3.4 GAI Class 1 Stress Calculation 1E22G04C, Rev. 3. (b)

4.0 Potential Design Impact

1. Individually, no significant impact.

2. The combined effect could impact the accuracy of the analysis.

5.0 Probable Cause

Analysis oversights.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. PI-00-04	Checklist No. PI-01, -02, -03	Revision No. 0	
PFR No.		Sheet 1	of 1

	Yes	No
Closed	X	

Extent 2 of 2 Systems with Jet Loading

Comments

Further review indicates the following:

a. This item had been noted by the GAI verifier in Calculation 1B21G08A and was determined not to be significant enough to warrant reanalysis for the MSRV system. Cygna concurs with this conclusion.

b. As a result of this Observation, GAI has performed a reanalysis for the HPCS system incorporating all the specified corrections. Cygna has reviewed the input calculation for this reanalysis. GAI has stated that there was not any significant change in the results (it should be noted that per GAI, the piping is now shielded from B33 Break RD7 which closes item b5).

Based on the above, this Observation has no impact on design or safety.

Approvals

Originator	C. K. Wong	Date	1-24-84
Project Engineer	D. Wi[illegible]	Date	1/24/84
Project Manager	Ted [illegible]	Date	1/24/84
CEI Representative	[illegible]	Date	2/3/84

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PI-00-04	PI-01 PI-2, PI-03	0
EDDR No.	QAD 600 No.	Sheet of
065	N/A	1 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
This observation resulted from CYGNA reviewing the calculation before the jet work was completed. The jet maps have been updated since the CYGNA review and will be again, before they are final.

3.0 Action Taken
The generic jet calculation (File Code X176) is being finalized. This will include a matrix of all jets, shields, and piping or supports impacted. It will document that all jets are accounted for and all piping impacted is properly analyzed and all pipe supports impacted are either shielded or designed to withstand the impact.

4.0 Conclusion
Based on the jet calculation X176, this item will not impact plant safety.

5.0 References
(2) EDDR 65
(16) Generic Jet Calculation - File Code X176

Approvals

Originator	J. E. Myers	Date 5-9-84
Senior Project Engineer	E. M. Mead	Date 5/9/84
CEI Supervisor Quality Audit Unit	Timothy A. Boss	Date 5/9/84
GAI Project Manager	W. J. Baiga	Date 5/10/84
GAI Manager Corporate QA Programs	H. A. Manning	Date 5/10/84

The Cleveland Electric Illuminating Company:
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Observation Record

Observation No.	PI-01-01	Revision No.	0
Checklist No.	PI-01 MSRV	Sheet	1 of 2
Originated By	[signature]	Date	12/2/83
Reviewed By	C. K. Wong	Date	12-2-83

1.0 Description

The stress intensification factors (SIF's) at points 2, F1, and F2 are not input properly.

POINT	ACTUAL SIF	INPUT SIF	ANALYSIS
			(PIPE/FLANGE)
2	2.1	2.1	1.083
F1	1.9	1.9	2.889/1.766
F2	1.9	1.9	2.889/1.766

Where,

actual SIF = ASME value

input SIF = value input to the TPIPE analysis

analysis SIF = value utilized by TPIPE

2.0 Requirement

ASME B & PV Code, Section III, 1974 with Addenda to Winter 1975 Subsection ND, Fig. 3673.2 (b)-1.

3.0 Document Reference

3.1 GAI computer analysis 1B21G08, Rev. 2

3.2 TPIPE Manual.

CYGNA

Observation Record

Observation No.	PI-01-01	Revision No.	0
Checklist No.	PI-01 MSRV	Sheet	2 of 2
Originated By	[signature]	Date	12/2/83
Reviewed By	C.K. Wong	Date	12-2-83

4.0 Potential Design Impact

Using the actual intended SIFs at these points results in the following ratio of maximum to allowable stress:

POINT	MAX. STRESS/ALLOWABLE
2	0.16
F1	0.26
F2	0.28

These revised stresses are clearly well within the allowable limits.

5.0 Probable Cause

This observation resulted from the analyst's attempt to override an internally computed SIF. This is specifically cautioned against in the TPIPE manual. In addition, the analyst did not review the program's interpretation of the SIF input.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. PI-01-01	Checklist No. PI-01	Revision No.	0
PFR No.		Sheet 1 of	1

	Yes	No
Closed	X	
Extent 1 of 1 Class 3 Systems		

Comments

As shown in Section 4.0, the increased stresses using the correct SIFs, are still within the Code limits. Therefore, there is no design impact on these three systems. Even though there is no design impact on this system, GAI plans to correct the SIFs and include the corrected stresses in the analysis package.

Section 4.0 also shows that stresses at the points of concern on the SRV discharge increased to up to 28% of the Code allowable when the correct SIFs are applied. Cygna did not evaluate the impact of this issue on systems where the design margin may be less than that found in the SRV discharge.

Approvals

Originator	[signature]	Date	1/16/84
Project Engineer	[signature]	Date	1/16/84
Project Manager	Ted T. Wittig	Date	1-16-84
CEI Representative	[signature]	Date	1/20/84

CEI

Observation
Record Closure
Attachment B

Observation No. PI-01-01	Checklist No. PI-01	Revision No. 0
EDDR No. 065	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated	X	
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
None required

3.0 Action Taken
Initiated EDDR No. 66 and associated GAI review to determine that it was an isolated case.

4.0 Conclusion
As indicated on the EDDR and the GAI memo, there was no effect, and this was an isolated case.

5.0 References
(3) EDDR No. 66
JEM (15) GAI memo dated March 19, 1984 from J. T. Zalewski to C. W. Whitehead.

Approvals

Originator	J E Meyer	Date 5-8-84
Senior Project Engineer	E. M. Mead	Date 5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date 5/10/84
GAI Project Manager	E. J. Lange	Date 5/9/84
GAI Manager Corporate QA Programs	H. U. Manning	Date 5/9/84

The Cleveland Electric Illuminating Company:
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DW138/6/Q/sp

Observation Record

Observation No.	PI-01-02	Revision No.	0
Checklist No.	PI-01 MSRV	Sheet	1 of 1
Originated By	John C Mrunchello for V. PHi	Date	12/2/83
Reviewed By	[illegible signature]	Date	12/2/83

1.0 Description

MSRV seismic anchor movements (SAM) in the z-direction are applied in the x-direction at point J1.

2.0 Requirement

Standard Industry practice.

3.0 Reference Documents

GAI TPIPE Computer Output 1B21G08, Rev. 2.

4.0 Potential Design Impact

Inputting SAM in the wrong direction will result in an incorrect stress distribution that may impact design of the MSRV piping supports.

5.0 Probable Cause

Analysis oversight. This occurs at one out of two points where movements are input in the analysis for subsystem 1B21-G008.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. PI-01-02	Checklist No. PI-01	Revision No.	0
PFR No.		Sheet 1 of 1	

	Yes	No
Closed	X	
Extent 1 of 3 Systems		

Comments

The seismic anchor movements were correctly input by GAI in a local coordinate system corresponding to the direction of the restraint at point J1. Therefore this observation is invalid.

Approvals

Originator	Vuong Chi	Date	1-04-84
Project Engineer	[signature]	Date	1/4/84
Project Manager	Ted P. Wolby	Date	1/5/84
CEI Representative	[signature]	Date	1/20/84

Cleveland Electric Illuminating; 83102
Perry Nuclear Power Plant Piping Design Review

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Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PI-01-02	PI-01	0
EDDR No.	QAD 600 No.	Sheet of
N/A	N/A	1 1

	Yes	No
Closed	X	
Isolated	Not applicable	
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
None required

3.0 Action Taken
None required

4.0 Conclusion
Observation was invalid.

5.0 References
None

Approvals

Originator	J E Meyer	Date	5-8-84
Senior Project Engineer	E. M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date	5/10/84
GAI Project Manager	W J Lemings	Date	5/9/84
GAI Manager Corporate QA Programs	R. U. Manning	Date	5/9/84

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Perry Nuclear Power Plant Piping Design Review

DW138/7/Q/sp

CYGNA

Observation Record

Observation No. PI-02-01		Revision No.	0
Checklist No. PI-02	HPCS	Sheet 1 of 2	
Originated By [signature]		Date	12/2/83
Reviewed By John C. Fanchiello		Date	12/2/83

1.0 Description

The fatigue analysis did not consider the different thermal gradients (ΔT1 and ΔT2) for the sweepolet and socket welded boss. The piping thermal gradients were input as the default values and these were not overridden for the sweepolet and socket welded boss. The thermal transient analysis indicates that the only instances for which this happens to be non-conservative is for the sweepolet (Point C24) during the up transients.

In addition, the thermal transient analyses considered the flow to be zero at these same points. While this may be conservative when determining the discontinuity stresses ($T_A - T_B$), it is non-conservative in the calculation of the thermal gradients through the thickness (ΔT1 and ΔT2).

2.0 Requirement

a. ASME B&PV Code Section III 1974 with Addendum through Winter 1975, Subsection NB, Paragraph NB-3653.

3.0 Document Reference

3.1 GAI Analysis Report and TPIPE computer output 1E22G04C, Rev. 3.

4.0 Potential Design Impact

The stress increases at the sweepolet (based upon the original thermal transient analyses) are listed below:

Observation Record

Observation No.	PI-02-01	Revision No.	0
Checklist No.	PI-02 HPCS	Sheet	2 of 2
Originated By	[signature]	Date	12/2/83
Reviewed By	[signature]	Date	12/2/83

Event	Sweepolet		Piping		Temp. Increase		Stress Increase		
	$\Delta T1$ (°F)	$\Delta T2$ (°F)	$\Delta T1$ (°F)	$\Delta T2$ (°F)	$\Delta T1$ (°F)	$\Delta T2$ (°F)	$\frac{E\alpha\Delta T_1}{2(1-\nu)}$ (PSI)	$\frac{E\alpha\Delta T_2}{1-\nu}$ (PSI)	$\frac{K_3 E\alpha\Delta T_1}{2(1-\nu)}$ (PSI)
12D	133	23	53	8.5	110	14.5	13306	3509	22620
20A	144.5	25.0	54.0	8.5	90.5	16.5	10947	3991	18610
20A	120.5	20.5	45.5	7.0	75.	13.5	9072	3266	15422

It should be noted that the magnitude of the increase will go up when flow is considered.

The sweepolet is already overstressed. Usage factor requirements are also exceeded for the sweepolet (2.7481) and the socket welded boss (0.2744 - No Break Zone).

Both of these components will require more refined analyses as noted in the Class 1 stress report. The reanalysis should incorporate the impact of this observation. In addition, these concerns should be addressed with regard to all Class 1 analyses due to the fact the impact may not be insignificant as shown by the above table.

5.0 Probable Cause

Analyst oversight.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No.	PI-02-01	Checklist No.	PI-02	Revision No.	0
PFR No.				Sheet 1 of 1	

	Yes	No
Closed	X	

Extent 1 of 1 Systems with Branch component where Branch piping is not modeled.

Comments

GAI has reanalyzed these components using a 2D finite analysis method (P-267, Rev. 1). Cygna has not reviewed this analysis and does not intend to do so within the scope of this review. Per GAI, in this analysis flow was considered in the crotch area and the results show that the components in question now meet ASME Code requirements.

Based upon the above, this Observation is considered not to have any impact on the design or safety of the HPCS system.

Approvals

Originator	[signature]	Date	1/13/84
Project Engineer	[signature]	Date	1/13/84
Project Manager	Ted T. [signature]	Date	1/13/84
CEI Representative	[signature]	Date	1/20/84

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Perry Nuclear Power Plant Piping Design Review

CEI

Observation
Record Closure
Attachment B

Observation No. PI-02-01	Checklist No. PI-02	Revision No. 0
EDDR No. N/A	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated	Not applicable	
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
The Cygna review noted this observation in the middle of the GAI design process. The component was identified by GAI as being over stressed based on simplified analysis and was scheduled for a more detailed analysis.

3.0 Action Taken
GAI continued with their design process and reanalized the component using a 2D finite element method.

4.0 Conclusion
No descrepancies of the type were noted on completed calculations.

5.0 References
(17) calculation P-267, Rev. 3

Approvals

Originator J E Magee	Date	5-8-84
Senior Project Engineer E.M. Mead	Date	5/8/84
CEI Supervisor Quality Audit Unit T.A. Boss	Date	5/10/84
GAI Project Manager	Date	5/9/84
GAI Manager Corporate QA Programs R.A. Manning	Date	5/9/84

The Cleveland Electric Illuminating Company:
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Observation Record

Observation No.	PI-03-01	Revision No.	0
Checklist No.	PI-03 MSD	Sheet	1 of 1
Originated By	[signature]	Date	12/2/83
Reviewed By	[signature]	Date	12/2/83

1.0 Description

The review of the thermal transient reanalysis (P-256, Rev. 0) did not consider the following discontinuities for evaluation of T_A-T_B:

1. Valve coupling to 2" pipe.
2. 3" x 3" x 2" tee to 3" pipe.
3. 3" x 3" x 2" tee to 2" pipe.
4. 3" pipe to 3" valve.
5. 3" pipe to penetration.

This analysis was rerun due to errors in fluid properties. It should be noted that the original analysis did consider these discontinuities. In addition there is no documentation to indicate that the fatigue analysis is to be rerun using the later transient analysis data.

Furthermore, the tee sections did not consider any additional thickness in the crotch area of the component.

2.0 Requirement

ASME B & PV Code Section III 1974 with addendum through Winter 1975, Subsection NB-3653.

3.0 Reference Documents

3.1 GAI Analysis 1N22G01C, Rev. 3.

3.2 GAI Analysis P-256, Rev. 0.

4.0 Potential Design Impact

The T_A-T_B effects at these discontinuities, as well as the thermal gradient effects at the tee crotch areas, may be underestimated which may lead to failure in meeting ASME Code Requirements.

5.0 Probable Cause

Analyst oversight.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. PI-03-01	Checklist No. PI-03	Revision No.	0
PFR No.		Sheet 1	of 1

	Yes	No
Closed	X	

Extent 1 of 2 Class 1 Systems

Comments

GAI has performed a 2D thermal discontinuity analysis (P-258, Rev. 0), for items 1, 4 and 5, and plans to incorporate this information in their next revision of the fatigue analysis. Regarding the tee components, GAI has performed a study using a thickness increase of 50% in a 1D thermal analysis. Based on vendor drawings, this is a reasonable value to assume at the crotch region for the purpose of this study. This analysis showed a maximum increase of 295% in the thermal stresses (from 1900 PSI to 5600 PSI). However, due to the very high margin to both Code allowable stress (15900 PSI = 30%) and break exclusion allowables (43%) at these components, this increase does not impact the design or safety of the Main Steam Drain system.

Approvals

Originator	[signature]	Date	2/6/84
Project Engineer	[signature]	Date	2/6/84
Project Manager	[signature]	Date	2/6/84
CEI Representative	[signature]	Date	2/8/84

Cleveland Electric Illuminating; 83102
Perry Nuclear Power Plant Piping Design Review

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Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PI-03-01	PI-03	0
EDDR No.	QAD 600 No.	Sheet of
N/A	N/A	1 1

	Yes	No	Not applicable
Closed	X		
Isolated			Not applicable
Potential Design Impact		X	

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
The purpose of calculations is to insure that the design requirements have been met, not that the exact stress is known.

3.0 Action Taken
GAI performed a study to insure that the conservatism in the simplified analysis would compensate for discontinuities not considered.

4.0 Conclusion
GAI has adequately demonstrated that a more detailed analysis will reduce the calculated stresses enough to offset the increases from discontinuities which were not considered. This approach insures all ASME design requirements have been met.

5.0 References
(18) GAI letter to Mr. J. M. Lastovka dated January 30, 1984 PY-GAI/CEI-15279.

Approvals

Originator	J E Myer	Date 5-8-84
Senior Project Engineer	E. M. Mead	Date 5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date 5/10/84
GAI Project Manager	E J [illegible]	Date 5/9/84
GAI Manager Corporate QA Programs	R. H. Manning	Date 5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

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5.3 PIPE SUPPORT OBSERVATION STATUS

OBSERVATION NO.	DEFICIENCY YES/NO	EDDR NO. OR GC PRE NO.	FOLLOW-UP ACTION COMPLETE	SCHEDULED COMPLETION DATE FOR FOLLOW-UP	COMMENTS
PS-00-01	YES	67	NO	9-28-84	
PS-00-02	YES	68	YES, 5/10/84	NA	
PS-00-03	YES	PRE-084	YES, 1/16/84	NA	
----	---	----	-----	---	PS-00-04 was changed to PI-00-04
PS-00-05	NO	NA	NO	9-28-84	
PS-00-06	YES	69/139	NO	6-15-84	
PS-00-07	YES	70	NO	9-28-84	
PS-01-01	NO	NA	YES, 1/24/84	NA	
PS-02-01	YES	71	YES, 3/31/84	NA	
PS-02-02	YES	65	NO	6-30-84	

CYGNA

Observation Record

Observation No.	PS-00-01	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	1 of 6
Originated By	S. Luo	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

1.0 Description

The following items either lack documentation or utilize inconsistent data:

- Main Steam Safety Relief System

a. Support MK-1B21-H061

Drawing S-322-605, Sht. 061.2, Rev. B. Location plan dimensions require revision per ECN 9152-44-1111. The dimensions shown on drawing do not incorporate all of the specified changes.

b. Support MK-B?1-H062

Drawing S-322-605, Sht. 062.2, Rev. E. A 10" x 10" x 1/2" base plate was utilized in the design. This was not properly specified on the drawing. The 1/4" all around fillet weld to the embedment plate was not specified.

c. Support MK-1B21-H063

The design calculation and verification calculation (pg. 1.9 thru 1.15) were based on Rev. C of the drawings, whereas the current drawing revision is "D". Effects from support 1G61-H033 are not evaluated (Ref. ECN 9627-44-1291).

d. Support MK-1B21-H064

RAP No. OR-SV-231 has not been incorporated in the drawing (Dwg. S-322-605, Sht. 064.2, Rev. C).

e. Support MK-1B21-H066

The support rear bracket angle used in the design (Dwg. Rev. C) does not match the angle calculated from the dimensions shown on the drawings (Rev. D). Horizontal angle (48°) shown on Sht. 066.1 of the drawing is in conflict with the angle computed using dimensions shown on Sht. 066.2 of the drawing (S-322-605, Rev. D).

The design loads shown on the drawing for the emergency condition (+18400 lbs, -19500 lbs) are incorrect. The correct design loads are: upset = ±18400 lbs and emergency = ±19500 lbs.

CYGNA

Observation Record

Observation No. PS-00-01		Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	2 of 6
Originated By	S. Luo	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

f. Support MK-1B21-H067

The restraint direction used in the design calculation differs by about 9° from the direction calculated based on the current support configuration (Dwg. S-322-605, Sht. 067.2, Rev. D).

g. Support MK-1B21-H068

The verification calculation references Rev. "0" of Dwg. S-322-605, Sht. 068.1 and 2. Letters A, B, C and D were actually used for revision number (pg. 1.34).

The snubber size (catalog number P/N 1801172) and the pin-to-pin dimension shown on the drawing do not match the size specified in the design verification calculation (pg. 1.37).

h. Support MK-1B21-H112

The snubber size (catalog number P/N 1801172) and the pin-to-pin dimension shown on the drawing do not match the size specified in the design verification calculation (pg. 1.45).

Notes on Sht. 1.40 of verification calculation refer to Shts. 3 and 4 for sketches. The sheet numbers are incorrect and should be Shts. 1.41 and 1.42.

i. No calculation was provided for Support MK-1B21-H436.

j. For the Main Steam Safety Relief System (1B21-G08) pipe support design, the assumption that no jet impingment load was acting on the supports requires verification. No such verification was provided in the design calculation.

- High Pressure Core Spray System

k. General

Design verification record pg. 1.1, 1.2 and 1.3 is not properly filled out. Specifically, the pertinent items are not checked off.

Observation Record

CYGNA

Observation No.	PS-00-01	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	3 of 6
Originated By	S. Luo	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

l. Support MK-1E22-H004

The dimensions of Item "L" on Dwg. Sht. 2 do not match the dimensions shown on Sht. 3, Detail "L" in the design calculation. The restraint direction shown on Dwg. S-322-701, Sht. 1, Rev. D, is incorrect.

m. General

There is insufficient information on the design verification sheet. The supporting documents section references "latest analysis."

- Main Steam Drain System

n. Support MK-1N22-H017R

The elevation shown on the isometric differs from the support drawing. There is a total elevation difference of 2.04 feet which considerably exceeds the standard criteria of one pipe diameter.

o. Support MK-1N22-H018

A 45° bracing member was used in design calculation (Pg. 10.31), whereas a 30° brace was specified in drawing (S-322-121, Rev. A). Also, the plan view of Items "E" and "F" is not consistent with Section A-A on Sht. 018.3 of the drawing.

p. Supports MK-1N22-H126; -H127; -H128; -H129; -H130 and -H131

In each of the calculations, an LCD sheet for a special piping clamp (Power Piping Co.) was included, but was not referenced or used in the calculation. Furthermore, the clamps specified in the corresponding support drawings are BE-419N series (National Valve and Manufacturing Co). Clarification of the purpose of the LCD sheets is required.

CYGNA

Observation Record

Observation No.	PS-00-01	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	4 of 6
Originated By	S. Luo / R. BALIGA	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

q. Many of the supports of this MSD system have revised or changed support stiffnesses. (Examples are H016, H017,H018, H130, H132...etc.) The aggregate effect of these changes have not been confirmed by analysis.

r. Deleted.

s. Deleted.

t. Support No. H003

Calculation does not show the detailed design of snubber and attachment. Cold setting and offset are not shown on the support drawing.

u. Support No. H004

Calculation is not shown for the support attachment.

v. Support No. H007

There is no calculation of stiffness presented.

w. Support No. H014

Design calculation gives loads for X and Y directions. X-direction load is for Support H014. Y direction load is for support H148.

x. Support No. H148

A separate calculation is not provided for this support or its connection. Only snubber sizing is done as a partial calculation on support H014 calculation sheet.

2.0 Requirement

Standard practice and proper documentation.

CYGNA

Observation Record

Observation No.	PS-00-01	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	5 of 6
Originated By	S. Luo	Date	1/3/84
Reviewed By	C K. Wong	Date	1-3-84

3.0 Reference Documents

- Main Steam Relief System
  - 3.1 GAI Support Design Calculation 1B21G08(B), Rev. 0 (a thru j)
  - 3.2 Drawing S322-605, Sht. 061.2, Rev. B (a)
  - 3.3 ECN 9152-44-1111 (a)
  - 3.4 Drawing S-322-605, Sht. 062.2, Rev. E (b)
  - 3.5 ECN 9627-44-1291 (c)
  - 3.6 RAP No. OR-SV-231 (d)
  - 3.7 Drawing S-322-605, Sht. 064.2, Rev. C (d)
  - 3.8 Drawing S-322-605, Sht. 066.1, Rev. D (e)
  - 3.9 Drawing S-322-605, Sht. 066.2, Rev. D (e)
  - 3.10 Drawing S-322-605, Snt. 067.2, Rev. D (f)
  - 3.11 Drawing S-322-605, Shts. 068.1 and 068.2, Rev. D (g)
- High Pressure Core Spray System
  - 3.12 GAI Support Design Calculation 1E22-G04(B), Rev. 1 (k thru m)
  - 3.13 Drawing S-322-701, Shts. 2 and 3, Rev. D (1)
- Main Steam Drain System
  - 3.14 GAI Support Design Calculation 1N22-G01(B), Rev. 1 (n thru x)
  - 3.15 GAI Load Capacity Data Sheets of Class 1 Component Supports, P-2010, Rev. 0. (n thru x)
  - 3.16 GAI program M093, Rev. 1, Load Combination Computer output, J71 A (dated 5/10/83) for N22G01 (n thru x)
  - 3.17 Power Piping Co., Pipe Hanger Catalog and Load Capacity Data Sheets (n thru x)
  - 3.18 Pacific Scientific Co., Mechanical Arrestor Catalog and Load Capacity Data Sheets (n thru x)

CYGNA

Observation Record

Observation No.	PS-00-01	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	6 of 6
Originated By	S. Luo	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

3.19 National Valve and Manufacturing Co., Bas c Engineering Load Capacity Data Sheets (n thru x)

3.20 Drawing S-322-121, Sht. 018.3, Rev. A (o)

4.0 Potential Design Impact

1. Individually these items have no significant impact on design based upon:
   - A spot check of the above listed items.
   - The design margin used in the Perry Project.
2. The cumulative effect of the noted documentation problems could lead to a design deficiency.

5.0 Probable Cause

Design control.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. PS-00-01	Checklist No. PS-01, 02, 03	Revision No.	0
PFR No.		Sheet 1 of	4

	Yes	No
Closed	X	
Extent	All 3 Systems	

Comments

Further review and discussions with GAI reveal the following:

a. The referenced ECN was written 7/30/82. In this change, an interference was noted which required relocation of the P.A. by 2" north and 4" east. This was incorporated in drawing Rev. B issued 8/31/82. The change block should have noted this.

b. ECN 10130-44-1485, Rev. A, issued 9/19/83 deleted the baseplate from the design. Rev. F of the support drawing notes this but is not issued pending incorporation of ECNs after Phase II inspection. Elimination of the baseplate and welding directly to the embedded plate did not require back-up calculations.

c. Back-up calculations for Rev. D of the design, which include the effects of 1G61-H033, are contained in the "pending revision" book for subsystem 1B21-G08(B), Rev. 1.

d. ECN 9781-44-1341, Rev. A, issued 7/26/83 against Rev. C of the support drawing makes the necessary changes.

e. Based on the dimensions shown on Drawing S-322-605, Sht. 066.2, Rev. D, and taking into consideration the length of the rear bracket, the computed angle is 36.1°. This closely matches the 35.6° angle used in the stress analysis. Thus, only the coordinate system shown on pg. 1 of the drawing would require revision to be correct. Per GAI, this will be corrected in their upcoming cosmetic update program prior to fuel load.

Per GAI, load summary sheets are not updated for a revised analysis if no hardware changes are necessary due to the revised loads. Their current program provides for updating miscellaneous items on the support cover sheet (cosmetic revisions) after Phase II tagging by field QA. This will occur prior to fuel load.

Approvals

Originator	C. K. Wong	Date	1-27-84
Project Engineer	A J Weinmann	Date	1/27/84
Project Manager	Ted T Witting	Date	1/27/84
CEI Representative	J G Mayer	Date	2/3/84

Observation Record Review
Attachment A

Observation No.	PS-00-01	Checklist No.	PS-01, 02, 03	Revision No.	0
PFR No.				Sheet 2 of 4	

	Yes	No
Closed	X	
Extent	All 3 Systems	

Comments

f. Calculations supporting Rev. D of the drawing are contained in pending Rev. 1 file to 1B21-G08(B), Rev. 1. This was in response to RI #477.

g. This is a minor documentation error. Sheet ib of iii gives the correct drawing revision number for H068.

g. & h. The snubber size and pin-to-pin dimension was changed on the Power Piping drawing when they re-detailed the sheet. In accordance with GAI Fabrication Specification SP-527, fabrication drawings are submitted to the engineer (GAI) for approval prior to use for fabrication.

h. The incorrect sheet number reference is a minor documentation error which was overlooked when renumbering the sheets.

i. Calculation is contained in pending revision file for 1B21-G08B, Rev. 1.

j. Jet impingement work is still in progress. Per GAI, upon completion of this work, the assumption will be removed.

k. Page 1.1 is a superceded form. The current Design Control Procedure (DCP) utilizes GAI form 468 which is contained in the referenced package. Per GAI, pages 1.2 and 1.3 are not an official part of the design control program.

l. This piece was changed per RI #865 from PPC. When revising the GAI drawing, the bill of material was changed but not detail "L". The correct dimensions are shown on the PPC drawing.

Regarding the restraint direction, the support location plan is correct and consistent with the analysis. The discrepancy exists in the cartesian coordinate system sketch on the support cover sheet.

Approvals

Originator	C. K. Wong	Date	1-27-84
Project Engineer	[signature]	Date	1/27/84
Project Manager	Ted T. Wittig	Date	1/27/84
CEI Representative	J E M[illegible]	Date	2/3/84

CYGNA

Observation Record Review
Attachment A

Observation No. PS-00-01	**Checklist No.** PS-01, 02, 03	**Revision No.** 0			
PFR No.		**Sheet** 3 **of** 4			

	Yes	No
Closed	X	
Extent	All 3 Systems	

Comments

m. Although the design verification sheet does not reference any specific analysis revision in the supporting documentation section, Section 7 of the package provides all the analysis data used as reference or supporting documents.

n. Per GAI, the piping was re-routed and the analyst considered a new support location but the relocation was not picked up. This has since been corrected. Support relocations of this nature would have been picked up by the as-built program.

o. ECN 9631-44-1294, Rev. A, shows the proper orientation of the brace. Per GAI, the ECN is the governing document and the calculation will be updated to incorporate any specified changes prior to fuel load.

p. Per GAI, there was a transition period during which the PPC clamp was replacing the equivalent clamp from National Valve. In accordance with GAI Fabrication Specification SP-527, these changes are submitted to the engineer (GAI) for approval prior to fabrication.

q. Per GAI, there is a design loop to confirm final stiffness of the design with that in the analysis. This will also be accomplished when as-built dimensions are confirmed.

r. Deleted.

s. Deleted.

t. The designer referenced the snubber size required and this was verified. LCD sheets provide the capacities. No offset was intended and a lack of cold set would require PPC to set the snubber at mid-stroke. This would accommodate the movement of 0.16".

Approvals

Originator	C. K. Wong	**Date**	1-27-84
Project Engineer	[signature]	**Date**	1/27/84
Project Manager	[signature]	**Date**	1/27/84
CEI Representative	[signature]	**Date**	2/3/84

CYGNA

Observation Record Review
Attachment A

Observation No.	PS-00-01	Checklist No.	PS-01, 02, 03	Revision No.	0
PFR No.				Sheet 4 of 4	

	Yes	No
Closed	X	

Extent All 3 Systems

Comments

u. Per GAI, on the previous calculation, 3" of the 1/4" weld was determined by inspection to be adequate for a load of 1,300 lbs. For Rev. A of the support, the load decreased to 1,000 lbs. The existing weld was again determined adequate by inspection. Cygna agrees with this assessment.

v. Per GAI, calculation book 1N22-G01(B), Rev. 2, contains the stiffness calculations for this support. Rev. 2 of this calculation was not in the Cygna review scope.

w. & x. The originally specified x and y restraint was designed as two individual support marks, H014 and H148. This was requested per RAP #6701.

As stated in Section 4.0, individually these items do not have impact upon design. In addition, based on the explanations above, Cygna does not consider the cumulative effect of these items to be a potential problem for the three systems reviewed.

Approvals

Originator	C. K. Wong	Date	1-27-84
Project Engineer	[signature]	Date	1/27/84
Project Manager	[signature]	Date	1/27/84
CEI Representative	[signature]	Date	2/3/84

Observation No.	Checklist No.	Revision No.
PS-00-01	PS-01, 02, 03	0
EDDR No.	QAD 600 No.	Sheet 1 of 2
67	N/A	

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
The items cited are examples of incomplete details in an in-process design, for which explanatory information was available in other files in most cases. None of the items were found to compromise design adequacy. To facilitate future reviews, GAI is preparing a summary procedure (road map) clarifying availability of additional information augmenting documentation in support design changes.

3.0 Action Taken
GAI Engineering has initiated a series of programs to ensure completeness and availability of the documentation:

1. A data base is being maintained which lists all change documents and PPC shop sheets against a particular support. A copy of each of these change documents and shop sheets will be included in each support calculation package.

2. An effort is underway to close out all items identified as requiring later confirmation.

3. A snubber and spring can "cold set form" will be completed for every snubber and spring can, and issued to the field on a subsystem basis. This form will confirm the snubber/spring size, confirm the movements, and assure that the proper settings are issued for construction.

4. A Generic Jet calculation (File Code X176) is being finalized to include a matrix of all jets, shields, and piping or supports impacted. It will document that all jets are accounted for, that piping impacted is properly analyzed, and that pipe supports impacted are either shielded or designated to withstand the impact.

5. Pipe inspection reports (submitted at 75% and 100% Construction) will be reviewed by GAI Engineering to ensure that the as-built configuration at the piping system and the support type, direction, and location match the as-analyzed condition. Any discrepancies will be resolved in a letter of reconciliation.

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PS-00-01	PS-01, 02, 03	0
EDDR No.	QAD 600 No.	Sheet of
67	N/A	2 2

4.0 Conclusion

The items cited by CYGNA are addressed by the five action above as follows:

1. Procedure clarifying availability of supporting documentation: Items g, k, and m.
2. Data Base: Items a, b, c, i, l, o, u, v, w, and x.
3. Closeout of items requiring later confirmation: Items o and p.
4. Cold Set Program: Items h and t.
5. Generic Jet File: Item j.
6. As-built review: Items e, f, n and q.
7. Not addressed (deleted by CYGNA): Items r and s.

.0 References

(20) PPM Appendix AA - General Procedure for IE Bulletin 79-14.

(4) EDDR 67

Approvals

Originator J E Meyer	Date	5-9-84
Senior Project Engineer E. M. Mead	Date	5/9/84
CEI Supervisor Quality Audit Unit Timothy A. Bose	Date	5/9/84
GAI Project Manager WJ Seiger	Date	5/10/84
GAI Manager Corporate QA Programs R.A. Manning	Date	5/10/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

W138/Q/31/es

CYGNA

Observation Record

Observation No.	PS-00-02	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	1 of 2
Originated By	C K Wong	Date	1-3-84
Reviewed By	[signature]	Date	1/3/84

1.0 Description

The following items are not consistent with design commitments, requirements or criteria:

a. The GAI method for combining dynamic inertial loads and dynamic displacement loads differs from the General Electric specification. The difference is shown below:

GAI method: $(OBE_I^2 + SRV_I^2)^{1/2} + (OBE_D^2 + SRV_D^2)^{1/2}$

General Electric method: $[(OBE_I + OBE_D)^2 + (SRV_I + SRV_D)^2]^{1/2}$

where
OBE = Operating Basis Earthquake
SRV = Safety Relief Valve
I = Inertial Load
D = Displacement Load

b. GAI Design Specifications B21 and E22 do not include Faulted Load Case No. 8 as specified in Table 3.9-21 of the PNPP FSAR.

2.0. Requirement

a. General Electric Design Specifications 22A5454, Rev. 1 and 22A6547, Rev. 0.

b. PNPP FSAR, Amendment No. 3, dated 9/11/81, Table 3.9-21.

3.0 Reference Documents

3.1 General Electric Specification for ECCS Piping Systems No. 22A6547 Rev. 0 (Table 5, Sht. No. 21) (a)

3.2 General Electric Specification for Main Steam Piping No. 22A5454 Rev. 1 (Table 8, Sht. No. 28) (a)

3.3 GAI Support Design Calculations for HPCS Calculation E22G04B (a)

3.4 Computer Load Combination Output E22G04C (4/18/83) (a)

3.5 Program M093LOC1 (a)

3.6 Load Capacity Data Sheets of Class 1 Component Support P-2001, Rev. 0 (a)

3.7 GAI Design Specification DSP-B21-1-4549-00, Rev. 1 and 2 (b)

3.8 GAI Design Specification DSP-E22-1-4549-00, Rev. 1 and 2 (b)

3.9 GAI Support Design Calculation 1E22-G04(B), Rev. 1 (b)

3.10 GAI Support Design Calculation 1B21-G08(B), Rev. 0 (b)

3.11 GAI Support Design Calculation 1N22-G01(B), Rev. 1 (b)

4.0 Potential Design Impact

a. By inspection, the GAI method for combining loads is more conservative than the General Electric recommended approach. This conclusion is supported by the following sensitivity calculations:

CASE	OBE_I	SRV_I	OBE_D	SRV_D	GAI COMBINATION	GENERAL ELECTRIC COMBINATION	% DIFFERENCE
1	100	100	100	100	283	283	0
2	100	1	100	1	200	200	0
3	100	1	1	100	200	143	-40
4	100	100	1	1	143	143	0
5	4397	390	2313	5478	10361	8914	-16

Where Case 5 is an actual loading case for Support 1E22-H005.

Consequently, the GAI method is conservative and may be up to 40% conservative.

b. More severe design loads may result due to the excluded load combination.

5.0 Probable Cause

Standard GAI practice.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No.	PS-00-02	Checklist No.	PS-01, 02, 03	Revision No.	0
PFR No.				Sheet	1 of 1

	Yes	No
Closed	X	

Extent All 3 Systems

Comments

Further review indicates the following:

a. As stated in Section 4.0, the GAI method for combining inertial loads and dynamic displacement loads is conservative.

b. Consideration of FSAR Load Case No. 8, for the three systems reviewed, does not result in any significant increase in support design loads.

Based on the above, this Observation does not have any impact on design or safety.

Approvals

Originator	C.K. Wong	Date	1-20-84
Project Engineer	[signature]	Date	1/20/84
Project Manager	Ted T. Wittig	Date	1/20/84
CEI Representative	[signature]	Date	2/3/84

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PS-00-02	PS-01 PS-02, PS-03	0
EDDR No.	QAD 600 No.	Sheet of
068	N/A	1 1

	Yes	No	Not Applicable
Closed	X		
Isolated			Not Applicable
Potential Design Impact		X	

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
Item A is conservative in all cases and Item B is controlled by other load cases and allowables for all systems.

3.0 Action Taken
The items were reviewed under EDDR 68 for any generic effect.

4.0 Conclusion
Their is no effect on plant safety from these items.

5.0 References
(5) EDDR 68

Approvals E. M. Mead 5/10/84

Originator J E Myers Date 5-10-84

Senior Project Engineer E. M. Mead Date 5/10/810

CEI Supervisor Quality Audit Unit F. A. Bass Date 5/10/84

GAI Project Manager W J Beringer Date 5/10/84

GAI Manager Corporate QA Programs JW Whittoffey for H.A. MANNING Date 5/10/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/Q/38/mm

CYGNA

Observation Record

Observation No.	PS-00-03	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	1 of 1
Originated By	C. K. Wong	Date	1-3-84
Reviewed By	[signature]	Date	1/3/84

1.0 Description

The signs of Jet Impingement load input for support load combinations in utilizing the computer program "M093" were not properly considered (e.g., HPCS, E22G04(C), Run No. J484, dated 4/18/83, the dynamic Jet Impingement input loads are all positive).

2.0 Requirement

1. GAI Design Specifications DSP-B21-1-4549, Rev. 1 and 2 and DSP-E22-1-4549-00, Rev. 1 and 2.

2. Perry FSAR Amendement No. 3, dated 9/11/83.

3.0 Reference Documents

3.1 GAI Support design calculation 1E22-G04(B), Rev. 1.

3.2 GAI Support design calculation 1B21-G08(B), Rev. 0.

4.0 Potential Design Impact

Incorrect signs will give incorrect design load combinations and may lead to underdesign of some supports.

5.0 Probable Cause

Design oversight.

Attachments

A. Observation Record Review

NOTE: Jet Impingement load is not applicable to the Main Steam Drain Line, 1N22-G01, per GAI memo from D. H. Hunt to J. Chang, dated 9/27/83.

CYGNA

Observation Record Review
Attachment A

Observation No. PS-00-03	Checklist No. PS-01, 02, 03	Revision No. 0	
PFR No. 01		Sheet 1 of 1	

	Yes	No
Closed	X	

Extent 2 of 2 Systems with jet loading

Comments

Standard GAI practice for input to the "M093" combination program is to use the same sign for the support loads as that found in the TPIPE output. In general, it is critical that the signs are properly input, however, any inaccuracies in sign input are of minor consequence for the HPCS system due to the small magnitude of the weight loads.

In addition, during the course of performing further review to explain inconsistencies between input loads and output combination values for the MSRV system, GAI has discovered a bug in the "M093" program. The problem occurs when considering the negative jet impingement loads in the emergency load combinations. A value of zero is always used in this situation due to taking the maximum (instead of the minimum) between the negative load and zero. This could result in situations where support stresses exceed Code allowables due to the loads being underestimated.

Due to the potential design and safety impact associated with this problem, a PFR has been written.

Approvals

Originator	G K Wong	Date	1-19-84
Project Engineer	[illegible]	Date	1/19/84
Project Manager	Ted [illegible]	Date	1/19/84
CEI Representative	[illegible]	Date	1/20/84

Cleveland Electric Illuminating; 83102
Perry Nuclear Power Plant Piping Design Review

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PS-00-03	PS-01, PS-02, PS-03	0
EDDR No.	QAD 600 No.	Sheet of
N/A	GC PRE-084	1 1

	Yes	No
Closed	X	
Isolated		X (Yes with respect to programming error)
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
None required

3.0 Action Taken
Evaluate pipe supports which could have been affected by this program error, and correct program.

4.0 Conclusion
The programming error did not affect the design of any of the 100 supports sampled. From this it was concluded that a substantial safety hazard was not created on the Perry Project.

5.0 References
(12) GC Pre-084
(24) GAI memo dated January 16, 1984 from J. B. Muldoon to F. L. Moreadith

Approvals

Originator	J E Myers	Date 5-8-84
Senior Project Engineer	E. M. Mead	Date 5/8/84
CEI Supervisor Quality Audit Unit	F. A. Bass	Date 5/10/84
GAI Project Manager	W. J. Lerrig	Date 5/9/84
GAI Manager Corporate QA Programs	R. A. Manning	Date 5/9/84

CYGNA

Observation Record

Observation No.	PS-00-05	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	1 of 4
Originated By	S. Luo	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

1.0 Description

The following design oversights were noted:

- Main Steam Safety Relief System

  a. Support MK-1B21-H062

  The wrong eye nut allowable load was used. (Pg. 1.5)

  b. Support MK-1B21-H163

  The design is based on the calculation for support 1B21-H179 (Rev. 0) with enveloped design loads.

  b.1 The calculation and assumptions shown on Pg. 10.30 are not applicable since they do not represent the actual condition of the support.

  b.2 Allowable stress used is 1.2 S_h. S_h was mistakenly stated as S_y (Pg. 10.31).

  b.3 The width of the ring is 5-1/2", but 12" was used in the calculation. Consequently the section properties were incorrect (Dwg. S-322-605, Sht. 163.2, Rev. E).

  b.4 Penetration sleeve was specified as schedule 40. It should be schedule 30 based on the thickness of 0.375" (Pg. 10.32).

  b.5 The thickness of the ring is 0.875", but 1.1875" was used in computing the section modulus. (Pg. 10.36)

  GAI is currently redesigning this support due to the overstress caused by this item and item b.3.

  b.6 The Lug size L_1 used in the computer analysis did not match the actual size of the Lug.

  b.7 The design was based on a very simplified analysis. There are other load conditions which were not considered (e.g., friction loads etc.) A more detailed analysis model is recommended to reduce the stress level and obtain more accurate results.

CYGNA

Observation Record

Observation No.	PS-00-05	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	2 of 4
Originated By	S. Luo	Date	1/3/84
Reviewed By	C.K. Wong	Date	1-3-84

- High Pressure Core Spray System

  c. Support MK-1E22-H003

  The cold load (10.87^k) used by the verifier (Pg. 1.5) was based on an incorrect calculation in Section 11 (Pg. 5). The correct cold load calculation procedure in Section 10 (Pg. 10.29) should be used to update the loads and to perform verification.

  d. Support MK-1E22-H004

  The property of a solid circular section instead of a hollow tube section was used in the stiffness calculation (Pg. 7.2).

  e. Support MK-1E22-H006

  The proper loadings from H005 (Pg. 1.9; $F_y = 13.9^k$, $F_z = 25.9^k$) were not used in the design calculation (Pg. 5, Section 11, Support H006). The support frame weight was not included in the design.

- Main Steam Drain System

  f. Support MK-1N22-H017

  The moment arm used in checking the existing W12x40 should be calculated as the distance from the point of load application to the center of W12x40 beam. The distance used in the calculation was measured only to the top of the flange.

  g. Deleted.

  h. For most of the supports (MK-1N22-H126; -H127; -H128; -H129, etc.), Youngs Modulus was not adjusted for temperature effects.

  i. Deleted.

CYGNA

Observation Record

Observation No.	PS-00-05	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	3 of 4
Originated By	S. Luo / R. BALIGA	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

j. Deleted.

k. The following supports do not meet the GAI stiffness criteria:

1. H004
2. H006
3. H008
4. H009
5. H011
6. H012
7. H014
8. H015

l. Deleted.

2.0 Requirement

2.1 Standard Practice

2.2 ASME B&PV Code Section III, 1974 with Addenda to Winter, 1975, Subsection NF

2.3 GAI Design Specification DSP-B21-1-4549-00, Rev. 1 and 2 (MSRV and MSD)

2.4 GAI Design Specification DSP-E22-1-4549-00, Rev. 1 and 2 (HPCS)

3.0 Reference Documents

- Main Steam Relief System

3.1 GAI Support Design Calculation 1B21G08(B), Rev. 0 (a thru b)

3.2 Drawing S-322-605, Sht. 163.2, Rev. E (b)

- High Pressure Core Spray System

3.3 GAI Support Design Calculation 1E22-G04(B), Rev. 1 (c thru e)

3.4 ECN-8857-44-1004, Rev. C (e)

CYGNA

Observation Record

Observation No.	PS-00-05	Revision No.	0
Checklist No.	PS-01, PS-02, PS-03 General	Sheet	4 of 4
Originated By	S. Luo	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

- Main Steam Drain System

  3.5 GAI Support Design Calculation 1N22-G01(B), Rev. 1 (f thru 1)

  3.6 GAI Load Capacity Data Sheets of Class 1 Component Supports, P-2010, Rev. 0 (f thru 1)

  3.7 GAI program M093, Rev. 1, Load Combination Computer output, J71 A (dated 5/10/83) for N22G01 (f thru 1)

- General - All Systems

  3.8 Power Piping Co., Pipe Hanger Catalog and Load Capacity Data Sheets.

  3.9 Pacific Scientific Co., Mechanical Arrestor Catalog and Load Capacity Data Sheets.

  3.10 National Valve and Manufacturing Co., Basic Engineering Load Capacity Data Sheets.

4.0 Potential Design Impact

1. Individually these items have no significant impact on design based upon:
   - A spot check of the above listed items.
   - The design margin used in the Perry Project.
2. The cumulative effect of the noted oversights could lead to a design deficiency.

5.0 Probable Cause

Design control.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No.	PS-00-05	Checklist No.	PS-01, 02, 03	Revision No.	0
PFR No.				Sheet 1 of 2	

	Yes	No
Closed	X	

Extent All 3 Systems

Comments

Further review and discussions with GAI reveal the following:

a. The reference calculation compared the applied load of 4312 lbs to 8900 lbs. the actual allowable should have been 8000 lbs.

b. Per GAI, the original configuration of this support was 12" long with a thickness of 1.1875" and no lugs. Due to constructability concerns, this was revised to the 5-1/2" configuration with lugs. Welded attachment calculations are contained in the A Calculation, which in this case references Calculation P-584, a finite element analysis of the configuration shown on Rev. E of the support drawing. Cygna has not reviewed this analysis due to GAI's detailed attention to this support.

c. For this subsystem, the line is normally cold in the operating mode but the vessel is hot. This creates the maximum differential condition. One analysis (thermal case with hot vessel and hot line) showed a 0.8" displacement at the spring. A second analysis (hot vessel and cold line case) showed a 1.5" displacement at the spring. The true condition during normal operation is somewhere in between. The corresponding spring cold setting for this more realistic condition should be

$$10.8K + \left(\frac{0.8 + 1.5}{2}\right) \times \text{spring constant} = 13.1K.$$

Since spring settings are verified as part of GAI's Phase III program, the 11.8K setting on Rev. C of the drawing does not create a safety concern.

d. The calculation reviewed was a preliminary calculation used initially for estimating. Per GAI, the noted discrepancy was picked up by the designer when reviewing final stiffnesses with the analyst in a later revision of the calculation.

Approvals

Originator	C. K. Wong	Date	1-27-84
Project Engineer	[signature]	Date	1/27/84
Project Manager	Ted P. [signature]	Date	1/27/84
CEI Representative	[signature]	Date	2/3/84

Cleveland Electric Illuminating; 83102
Perry Nuclear Power Plant Piping Design Review

CYGNA

Observation Record Review
Attachment A

Observation No.	PS-00-05	Checklist No.	PS-01, 02, 03	Revision No.	0
PFR No.				Sheet	2 of 2

	Yes	No
Closed	X	

Extent All 3 Systems

Comments

e. The loads of 13.9^K and 25.9^K are 150% of the actual loads. Per GAI this was done to provide margin in long lead time hardware at the time supports were designed. This would allow for a substantial variation in load when spring stiffness was included in the later analysis. The actual loadings were used for the design of the support structural steel (consideration of frame weight is addressed in PS-00-06).

f. Per GAI, the W12X40 is a structural member checked in the load confirmation effort by structural engineers.

g. Deleted.

h. Per Table I-6.0 of ASME Subsection NA, Young's modulus varies with temperature from 27.9 ksi at ambient to 27.3 ksi at 330°, which is the accident temperature inside drywell. Since this property is only used for the calculation of support deflection and support stiffness, there is potentially a 2% maximum variation in calculated values. This would have a negligible impact on design.

i. Deleted.

j. Deleted.

k. Per GAI, their stiffness criteria was a guideline established for Class 1 work to aid designers in new designs and minimize iterative cycles between analysis and design. Final stiffnesses are included in the "C" calculation and have been addressed by the analyst.

l. Deleted.

As stated in Section 4.0, individually these items do not have impact upon design. In addition, based on the explanations above, Cygna does not consider the cumulative effect of these items to be a potential problem for the three systems reviewed.

Approvals

Originator	C.K. Wong	Date	1-27-84
Project Engineer	[signature]	Date	1/27/84
Project Manager	Ted T. Watting	Date	1/27/84
CEI Representative	[signature]	Date	2/3/84

Observation No.	Checklist No.	Revision No.
PS-00-05	PS-01, PS-02, PS-03	0
EDDR No.	QAD 600 No.	Sheet of
67	N/A	1 2

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description

See Cygna observation record and observation record review.

2.0 Discussion

The majority of these observations resulted because the GAI packages were still being developed at the time of the review. It is difficult to freeze design documentation for a review of this type. A "Road Map" is being prepared to assure that all necessary documentation is identified to facilitate future reviews.

3.0 Action Taken

1. A data base is being maintained which lists all change documents and PPC shop sheets against a particular support. A copy of each of these change documents and shop sheets will be included in each support calculation package.

2. A snubber and spring can "cold set form" will be completed for every snubber and spring can, and issued to the field on a subsystem basis. This form will confirm the snubber/spring size, confirm the movements, and assure that the proper settings are issued for construction.

4.0 Conclusion

All discrepancies noted during the Cygna Review will be addressed by the programs described in Section 3.0. The items cited in this observation have been addressed as follows:

1. Deleted by CYGNA: Items g, i, and j.
2. Data Base: Items b, d, e, f, h, k, l.
3. Cold Set Program: Item c.
4. Minor documentation error of no consequence: Item a.

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No
PS-00-05	PS-01, PS-02, PS-03	0
EDDR No.	QAD 600 No.	Sheet of
67	N/A	2 2

5.0 References

(4) EDDR 67
(19) Spring and snubber setting forms.

Approvals

Originator J E Myer	Date 5-9-84
Senior Project Engineer E.M. Mead	Date 5/9/84
CEI Supervisor Quality Audit Unit Timothy A. Boss	Date 5/9/84
GAI Project Manager W J [illegible]	Date 5/10/84
GAI Manager Corporate QA Programs H.A. Manning	Date 5/10/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/Q/34/es

CYGNA

Observation Record

Observation No.	PS-00-06	Revision No.	0
Checklist No.	PS-01, PS-02 & PS-03 General	Sheet 1 of 1	
Originated By	S. Luo	Date	1/3/84
Reviewed By	C. K. Wong	Date	1-3-84

1.0 Description

The design of the supports does not consider the following items:

a. Dead weight of the support itself.

b. Inertial loads due to support self-weight excitation.

2.0 Requirement

Standard industry practice.

3.0 Document Reference

3.1 GAI support design calc. 1N22G01 (B), Rev. 1.
3.2 GAI support design calc. 1B21G08 (B), Rev. 0.
3.3 GAI support design calc. 1E22G04 (B), Rev. 1.

4.0 Potential Design Impact

a. This is critical only for frame-type supports which have a small margin with respect to allowables.

b. This is most critical in the unrestrained direction for frame-type supports where high accelerations must be considered.

In the restrained direction this is only critical when the margin with respect to allowable is small.

Note: "Restrained direction" is defined as the line of action of the support.

5.0 Probable Cause

GAI standard practice.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No.	PS-00-06	Checklist No.	PS-01, 02, 03	Revision No.	0
PFR No.				Sheet	1 of 2

	Yes	No
Closed	X	

Extent All 3 Systems

Comments

The GAI standard practice is that the consideration of dead weight and inertial loads due to support self-weight excitation is made at the designer's discretion. During the design process, the designer makes a judgment as to whether these factors are critical to the design and integrates them in his calculations as appropriate. GAI has performed an evaluation of the three systems within the scope of this review to determine the most critical support(s) for the loads of concern. Their determination was that a frame comprised of supports H004 and H009 in subsystem 1N22G01(B) was most critical. This judgement was based on the following three factors:

1. The support frame appears to be flexible in the out-of-plane direction.

2. The frame is attached at two structural points (drywell wall and bio-shield platform steel) which are highly excited.

3. The support frame is located in containment building where the most severe transient loadings are found.

GAI's evaluation was made by analytically determining the natural frequencies in the three orthogonal directions. Once the frequencies were found, the corresponding accelerations were read from the response spectrum curves. The accelerations were applied to the frame mass, resulting in the self-weight inertial loads.

GAI then performed a static analysis combining the out-of-plane inertial loads (in two directions) with in-plane piping loads, in-plane inertial loads, and support dead weight. The resulting stresses for loadings in different directions were added directly. This is conservative since it is unlikely that the maximum inertial loadings would occur simultaneously in three orthogonal directions. Per GAI, the results showed that for this conservatively combined loading case, the stresses were within code allowables.

Approvals

Originator	C. K. Wong	Date	2-7-84
Project Engineer	A. Dinant	Date	2/7/84
Project Manager	Ted F. Witting	Date	2/7/84
CEI Representative	J E Meyer	Date	2-8-84

CYGNA

Observation Record Review
Attachment A

Observation No. PS-00-06	Checklist No. PS-01, 02, 03	Revision No.	0
PFR No.		Sheet 2	of 2

	Yes	No
Closed	X	

Extent All 3 Systems

Comments

Cygna has not reviewed this analysis, and based upon an independent assessment of the supports for the three systems within the scope of this review, Cygna requested GAI to perform a similar evaluation as that described above for support 1N22-H132. The results of this analysis showed that the stress levels are acceptable. However, GAI has decided to install bracing for this support in order to provide additional out-of-plane stability.

Based on the above, this Observation does not have any impact on the design or safety of the MSRV, HPCS, or MSD systems.

Approvals

Originator	C. K. Wong	Date	2-7-84
Project Engineer	[signature]	Date	2/7/84
Project Manager	Ted F. Wittig	Date	2/7/84
CEI Representative	[signature]	Date	2-8-84

Cleveland Electric Illuminating; 83102
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CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PS-00-06	PS-01, PS-02, PS-03	0
EDDR No.	QAD 600 No.	Sheet of
069	N/A	1 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
GAI Engineering includes support weight and support self-weight excitation as part of the calculation when they could have a potential design impact. Therefore, this consideration is only noted when necessary in the design.

3.0 Action Taken
Self-weight excitation will be addressed as the systems are walked down at 75% and 100% completion. Supports identified by the walkdown as being flexible in the out of plane direction will be investigated and braced if necessary.

4.0 Conclusion
The effects of support weight and support weight excitation are negligible for the majority of supports. Those supports either requiring further calculation to document their adequacy or needing bracing will be identified by the walkdown.

5.0 References
(6) EDDR 69
(14) EDDR 139

Approvals

Originator J E Myers	Date	5-9-84
Senior Project Engineer E. M. Mead	Date	5/9/84
CEI Supervisor Quality Audit Unit Timothy A. Boss	Date	5/9/84
GAI Project Manager W J Beringer	Date	5/10/84
GAI Manager Corporate QA Programs H. A. Manning	Date	5/10/84

CYGNA

Observation Record

Observation No.	PS-00-07	Revision No.	0
Checklist No.	PS-01, PS-02 & PS-03 General	Sheet	1 of 2
Originated By	S. Luo / R. BALIGA	Date	1/3/84
Reviewed By	C.K. Wong	Date	1-3-84

1.0 Description

The following items were noted in relation to the setting for springs and snubbers.

- Mainstream Relief Valve System

  a. Deleted.

- High Pressure Core Spray System

  b. Supports MK-1E22-H003 and MK-1E22-H006

  Neither a cold setting calculation nor an indication of the proper normal thermal mode for design was given in the verification calculation reflecting the latest support data (drawing Rev. C).

- Main Steam Drain System

  c. Deleted.

  d. Support MK-1N22-H019

  Incorrect thermal movement was used in calculating the cold load (See Sht. 019.2 of Dwg. S-322-121, Rev. A). Also the normal thermal mode (THN2) displacement was not used.

  e. Supports MK-1N22-H008, H131, H127, H013, H011

  Snubber setting was computed in calculation, but was not specified on the drawing. The drawing indicates "N/A" for setting. Per GAI this instructs installer to set the snubber at midstroke. The actual settings should be:

H008	2.875"	H011	1.25"
H127	2.82"	H131	Max thermal = 2.0156", but no setting was calculated.
H013	0.325"		

CYGNA

Observation Record

Observation No.	PS-00-07	Revision No.	0
Checklist No.	PS-01, PS-02 & PS-03 General	Sheet	2 of 2
Originated By	S. Lu / R. BALIGA	Date	1/3/84
Reviewed By	C.K Wong	Date	1-3-84

- General

  f. There is no indication that bottoming or topping out of springs is checked for combined thermal and dynamic movements. There are no calculations performed combining the displacements due to dynamic loading.

2.0 Requirement

Standard industry practice.

3.0 Document Reference

3.1 GAI support design calc. 1M22G01 (B), Rev. 1.
3.2 GAI support design calc. 1E21G08 (B), Rev. 0.
3.3 GAI support design calc. 1E22G04 (B), Rev. 1.

4.0 Potential Design Impact

Improper settings may result in a spring or snubber bottoming or topping out. This would result in the support not performing its intended function.

5.0 Probable Cause

Minor design/analysis oversights.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No.	PS-00-07	Checklist No.	PS-01, 02, 03	Revision No.	0
PFR No.				Sheet 1 of 2	

	Yes	No
Closed	X	

Extent 2 of 3 Systems

Comments

Further review and discussions with GAI indicate the following:

a. Deleted.

b. Appropriate settings are shown on the drawings but not documented in the calculations.

c. Deleted.

d. Per GAI, a value of 0.549" down (from a previous analysis) was used versus the current actual value of 0.387". For the spring rate of 200 lbs/inch, this would change the setting from 390 lbs to 423 lbs. Cygna agrees that this deviation is not sufficient to warrant a drawing revision at this time, pending as-built information.

e. The settings specified on the drawing bill of material are correct for H011, H013 and H127.

Per GAI, for H008, the PPC drawing has this snubber set at mid-stroke. GAI has committed to update the drawing to reflect this setting during the upcoming "cosmetic revision" cycle prior to fuel load.

Regarding H131, the thermal movement exceeds the specified mid-stroke setting by 0.015". However, per GAI, all settings will be reviewed as part of the as-built program prior to fuel load.

Approvals			
Originator	C.K. Wong	Date	1-27-84
Project Engineer	D Weinert	Date	1/27/84
Project Manager	Ted T. Witting	Date	1/27/84
CEI Representative	J E Mxxx	Date	2/3/84

Cleveland Electric Illuminating; 83102
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CYGNA

Observation Record Review
Attachment A

Observation No.	PS-00-07	Checklist No.	PS-01, 02, 03	Revision No.	0
PFR No.				Sheet 2	of 2

	Yes	No
Closed	X	

Extent 2 of 3 Systems

Comments

f. In general, inertial movements are small compared to thermal movements. Spring cans are selected to achieve a center set as much as possible. Per GAI, travel is then restricted to the recommended load range which permits a minimum 1/2" margin on each end to prevent bottoming out. It is also important to note that it is standard design practice to locate springs either adjacent to equipment or near large concentrated masses where they provide constant dead weight support. GAI states that dynamic displacements of 1/2" do not occur at these locations since they could not be tolerated by the piping or supporting equipment.

Based on the above, this Observation does not have any impact on design or safety.

Approvals

Originator	C. K. Wong	Date	1-27-84
Project Engineer	[signature]	Date	1/27/84
Project Manager	Ted T. Wolting	Date	1/27/84
CEI Representative	[signature]	Date	2/3/84

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PS-00-07	PS-01, PS-02, PS-03	0
EDDR No.	QAD 600 No.	Sheet of
070	N/A	1 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
The correct thermal movement, size and load for all springs/snubbers will be issued before construction.

3.0 Action Taken
A snubber and spring can cold set form will be completed for every snubber and spring can, and issued to the field by subsystem. The documentation confirms the snubber/spring size and the thermal movement used, and assures that the proper cold set has been issued for construction.

4.0 Conclusion
All spring and snubbers will be at the correct settings prior to hot functional testing, and the actual movements will be verified during the testing of the systems.

5.0 References
(7) EDDR No. 70
(19) Spring/snubber forms

Approvals

Originator	J E Meyer	Date	5-9-84
Senior Project Engineer	E. M. Mead	Date	5/9/84
CEI Supervisor Quality Audit Unit	Timothy A. Boss	Date	5/9/84
GAI Project Manager	W J Bemjer	Date	5/10/84
GAI Manager Corporate QA Programs	W.B. Manning	Date	5/10/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

Observation Record

Observation No.	PS-01-01	Revision No.	0
Checklist No.	PS-01 MSRV	Sheet	1 of 1
Originated By	C. K. Wong	Date	1-3-84
Reviewed By	[signature]	Date	1/3/84

1.0 Description

For the design of Main Steam Safety Relief system pipe supports, there is no indication that the hydro test load is considered in the design.

2.0 Requirement

All pertinent loading conditions should be considered.

3.0 Reference Documents

GAI support design calculation 1B21G08(B), Rev. 0.

4.0 Potential Design Impact

Some supports may be underdesigned if hydro test load was not considered.

5.0 Probable Cause

Improper assumption that the discharge line does not require hydro test.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. PS-01-01	Checklist No. PS-01	Revision No.	0
PFR No.		Sheet 1	of 1

	Yes	No
Closed	X	

Extent 1 of 1 Steam Systems

Comments

Further review indicates the following:

a. The rigid supports for this system are designed for an upset load which is larger than 1.9 x deadweight load (hydro-test load).

b. Per GAI, Power Piping Company designs springs and variable supports in accordance with the "Manufacturers Standardization Society" (MSS) Standard Practice SP-58. This practice requires that elements designed for use with hydrostatic test stops be capable of supporting up to two times the normal operating load.

c. The structural support steel associated with variable spring support H062 is sufficient to withstand the additional loading due to hydro-test. Cygna has not reviewed the support detail for variable spring support H468 due to the fact that this is a recently added support which was not part of the Rev. 0 calculation. This support is included in the Rev. 1 calculation which was not within the scope of this review.

Based on the above, this Observation does not have any impact on design or safety.

Approvals

Originator	C. K. Wong	Date	1-24-84
Project Engineer	[signature]	Date	1/24/84
Project Manager	Ted I. Wittig	Date	1/24/84
CEI Representative	[signature]	Date	2/3/84

Cleveland Electric Illuminating; 83102
Perry Nuclear Power Plant Piping Design Review

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PS-01-01	PS-01	1
EDDR No.	QAD 600 No.	Sheet of
N/A	N/A	1 of 1

	Yes	No
Closed	X	
Isolated	X	
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
The inclusion of hydrotest load should not be considered safety related because it is not a safety function of the system.

3.0 Action Taken
None required

4.0 Conclusion

The system was designed adequately for the hydrotest loads. In addition, this case was isolated based on the following.

1. GAI normal procedure is to include the hydrotest load in their analysis. This system was not considered for this load case because it is an open ended piping system.
2. All 19 lines which are open ended still required hydrotesting are adequate for the hydrotest load.
3. Most of this hydrotesting has been completed with no adverse effect.

5.0 References
None

Approvals

Title	Signature	Date
Originator	J E Mayor	5-8-84
Senior Project Engineer	G. M. Mead	5/8/84
CEI Supervisor Quality Audit Unit	F. A. Baer	5/10/84
GAI Project Manager	W J Feeney	5/9/84
GAI Manager Corporate QA Programs	R.A. Manning	5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/2/Q/sp

CYGNA

Observation Record

Observation No.	PS-02-01	Revision No.	0
Checklist No.	PS-02-H001 HPCS	Sheet	1 of 1
Originated By	C.K. Wong	Date	1-3-84
Reviewed By	[signature]	Date	1/3/84

1.0 Description

The following design oversights were noted for support 1E22-H001:

a. Wrong section properties were used in shear and deflection calculations (Pg. 10.4).

b. Young's modulus "E" has not been adjusted for temperature effect in the stiffness calculation (Pgs. 10.1 and 10.2).

c. Welding between items D and F is overstressed.

d. Dimensions of some items on the support drawings are not clearly defined (e.g. length of item D, and length of weld between F and D).

2.0 Requirement

2.1 ASME B&PV Code, Section III, 1974 with addenda to Winter 1975 Subsection NF.

2.2 Standard Industry Practice.

3.0 Document Reference

3.1 GAI Support Design Calculation 1E22-G04(B), Rev. 1.

3.2 Support drawings for MK-1E22-H001, S-322-701, Sht. 1 and 2, Rev. E.

4.0 Design Impact

Support is not adequate.

5.0 Probable Cause

Design oversight.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No.	PS-02-01	Checklist No.	PS-02	Revision No.	0
PFR No.	02			Sheet	1 of 1

	Yes	No
Closed	X	

Extent 1 of 3 Systems

Comments

a. Per GAI, in April 1983, due to reanalysis, the design loads increased by approximately 50%. This required substitution of a 6" schedule 160 pipe for a previous 5 x 5 x 1/2" tube section. For the shear and deflection calculation, the higher section properties were not used to update the calculation. This is conservative.

b. Per Table I-6.0 of ASME Subsection NA, Young's modulus varies with temperature from 27.9 ksi at ambient to 27.3 ksi at 330°, which is accident temperature inside drywell. Since this property is only used for the calculation of support deflection and support stiffness, there is potentially a 2% maximum variation in calculated values. This would have a negligible impact on design.

c. Due to the potential impact on design and safety associated with the overstressed weld, PFR 02 has been written.

d. Per GAI, dimensions of a minor nature are not always provided on the GAI drawing. The GAI drawing is an engineering drawing which is re-detailed by the fabricator (PPC) for use as a fabrication/installation drawing. In accordance with the GAI fabrication specification SP-527, fabrication drawings are submitted to the engineer (GAI) for approval prior to use for fabrication. Adherence to this specification that the hardware will be properly dimensioned and that there will be no impact on design or safety.

Approvals

Originator	C. K. Wong	Date	1-24-84
Project Engineer	[signature]	Date	1/24/84
Project Manager	Ted F. Witting	Date	1/24/84
CEI Representative	[signature]	Date	2/3/84

CEI

Observation
Record Closure
Attachment B

Observation No. PS-02-01	Checklist No. PS-02-H001	Revision No. 0
EDDR No. 071	QAD 600 No. N/A	Sheet 1 of 1

	Yes	No
Closed	X	
Isolated	X	
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
None required

3.0 Action Taken
Review of other work by the designer to insure it was an isolated design error, and revise support so all ASME allowables have been met.

4.0 Conclusion
No substantial safety hazard would have been created if this had gone uncorrected. Follow-up documented on EDDR 071 verifies this was an isolated design error.

5.0 References
(8) EDDR 071
(23) GAI memo from B. M. Stevens to C. W. Whitehead dated March 31, 1984

Approvals

Originator	J E Meyer	Date 5-8-84
Senior Project Engineer	E. M. Mead	Date 5/8/84
CEI Supervisor Quality Audit Unit	T. A. Boss	Date 5/10/84
GAI Project Manager	E J Bergin	Date 5/9/84
GAI Manager Corporate QA Programs	H. P. Manning	Date 5/9/84

The Cleveland Electric Illuminating Company:
Perry Nuclear Power Plant Piping Design Review

DW138/3/Q/sp

Observation Record

Observation No.	PS-02-02	Revision No.	0
Checklist No.	PS-02-H001 & H002 HPCS	Sheet	1 of 1
Originated By	C. K. Wong	Date	1-3-84
Reviewed By	S. Luo	Date	1/3/84

1.0 Description

The Jet loads on supports H001 and H002 are specified in the design specification, but were not included in the support design calculations.

2.0 Requirement

2.1 GAI Design Specification DSP-E22-1-4549-00, Rev. 1 and 2.

2.2 Perry FSAR Amendement No. 3, dated 9/11/83.

3.0 Reference Documents

GAI Support design calculation 1E22-G04(B), Rev. 1.

4.0 Potential Design Impact

Design loads will be increased and may necessitate redesign of the supports.

5.0 Probable Cause

Design oversight.

Attachments

A. Observation Record Review

CYGNA

Observation Record Review
Attachment A

Observation No. PS-02-02	**Checklist No.** PS-02	**Revision No.**	0
PFR No.		**Sheet** 1 **of**	1

	Yes	No
Closed	X	

Extent 1 of 2 Systems with Jet Loading

Comments

Further review indicates that the jet map drawings are used in conjunction with the design specification to determine which jets strike particular supports. These drawings are continually updated as source shields are added.

Per GAI, as a result of this process, supports 1E22-H001 and H002 are now shielded from all breaks.

Based on the above, this Observation does not have any impact on design or safety.

Approvals

Originator	C. K. Wong	**Date**	1-24-84
Project Engineer	[signature]	**Date**	1/24/84
Project Manager	[signature]	**Date**	1/24/84
CEI Representative	[signature]	**Date**	2/3/84

CEI

Observation
Record Closure
Attachment B

Observation No.	Checklist No.	Revision No.
PS-02-02	PS-02 - H1101 & H002	0
EDDR No.	QAD 600 No.	Sheet of
065	N/A	1 1

	Yes	No
Closed	X	
Isolated		X
Potential Design Impact		X

1.0 Description
See Cygna observation record and observation record review.

2.0 Discussion
This observation resulted from CYGNA reviewing the calculation before the jet work was completed. The jet maps have been updated since the CYGNA review and will be again, before they are final.

3.0 Action Taken
The generic jet calculation (File Code X176) is being finalized. This will include a matrix of all jets, shields, and piping or supports impacted. It will document that all jets are accounted for and all piping impacted is properly analyzed and all pipe supports impacted are either shielded or designed to withstand the impact.

4.0 Conclusion
Based on the jet calculation X176, this item will not impact plant safety.

5.0 References
(2) EDDR 65
(16) Generic Jet Calculation - File Code X176

Approvals

Originator	J E Meyer	Date	5-9-84
Senior Project Engineer	E. M. Mead	Date	5/9/84
CEI Supervisor Quality Audit Unit	Timothy A. Boss	Date	5/9/84
GAI Project Manager	W J Lange	Date	5/10/84
GAI Manager Corporate QA Programs	H.R. Manning	Date	5/10/84

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6.0 CEI CONCLUSIONS

Based on a thorough review of the Cygna report on the three systems, CEI concluded that the selected systems are adequately designed and will perform the intended safety functions.

In addition, CEI believes the Cygna review was broad enough to uncover any generic design problems, which could affect the ability of other systems to perform their intended safety functions.

As identified earlier in this report, CEI reviewed all observations and identified items of generic applicability to insure they will not affect any other safety systems. As a result of the piping design review, follow-up programs have been initiated in two areas. In the first area, three activities have been initiated to address observations in the pipe support design program. These include finalizing a generic jet calculation, review of pipe inspection reports and the snubber cold set program. In the second area, programs have been initiated to address documentation of the mechanical design. This will involve a thorough update of the mechanical process calculations, and will insure all GE criteria have been designed into the systems and the design properly documented. This GE Criteria Compliance Review program has been expanded to include all other disciplines (see Attachment 1). All of these follow-up activities will be tracked to closure (per Procedure 35-1501 EDDR, under CEI's Quality Assurance program).

6.0 CEI CONCLUSIONS (continued)

With the activities underway to ensure complete closure of all EDDRs including issues of a generic nature, CEI concludes that the Perry Nuclear Power Plant mechanical and piping design will assure the safety function capabilities are maintained and the design is in compliance with all applicable codes, standards and regulations.

Reviewed Earle M. Mead
Senior Project Engineer

Approved Frank R Stead
Manager - Nuclear
Engineering Department

Attachment 1

PERRY NUCLEAR POWER PLANT
GE Criteria Compliance Review Procedure

1.0 PURPOSE

The purpose of the GE Criteria Compliance Review is to provide additional assurance that the appropriate GE Criteria requirements have been properly incorporated and documented for the GAI scope of design.

2.0 SCOPE

GE is the designer for the Perry reactor and emergency core cooling systems. Most major equipment for these systems are supplied by GE under the NSSS contract.

GAI is the designer for the plant facility into which the NSSS will be installed as well as for a significant portion of these GE systems. This includes interconnecting piping, instrumentation, and most valves and other equipment. In addition, GAI is the designer for all support systems (cooling water, HVAC, compressed air, etc.)

GE design requirements are contained in text-type documents (design specifications, application engineering information, data sheets, ect.) and drawings (P&ID's, Process Diagrams, FCD's, IED's, etc.). It is GAI's responsibility to comply with these requirements or obtain GE and/or CEI approval of any deviations from them.

The primary source document for review of system and plant requirements is the the PNPP 1 & 2 Master Parts List (MPL), GE Document No. 18NS06803, Revision 11. The baseline revision level of each of the GE documents used in the review will be that reported in GE CDCS Report RPT01, dated March 9, 1984. Review results will be documented per this procedure, and any questions arising from the review will be resolved with GE as expeditiously as possible. As necessary design changes be initiated, which will be proposed to the Project Manager via Change Request (CR). Once the baseline review has been established, subsequent revisions of GE criteria documents received by GAI will be reviewed and incorporated as appropriate.