Job No. 83090
Doc. No. DC-5
Rev. 2

INDEPENDENT ASSESSMENT PROGRAM

ELECTRICAL SYSTEM REVIEW CRITERIA

FOR

COMANCHE PEAK STEAM ELECTRIC STATION

TEXAS UTILITIES SERVICES, INCORPORATED

Prepared by A. L. Moersfelder 09-20-84
A. Moersfelder Date

Independent Review by T. Martin 9-20-84
T. Martin Date

Approved by J. C. Minichiello 9-25-84
J. C. Minichiello Date

Cygna Energy Services
101 California Street, Suite 1000
San Francisco, California 94111

September, 1984

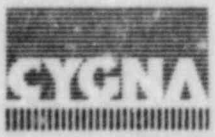


TABLE OF CONTENTS

1.0 INTRODUCTION

This document provides the criteria to be used in the review of the power distribution system associated with the RHR Train B pump and the control circuitry for the safety injection system valve located inside the valve isolation tank. This review criteria is a composite of Comanche Peak Steam Electric Station (CPSES) licensing commitments, CPSES requirements, and appropriate industry standards. It shall be used in conjunction with Work Instruction 1, "Assessment Procedures," for details on the review methodology and documentation.

2.0 SCOPE

2.1 The electrical scope includes the power supply from the 6900V Bus 1EA2 to the RHR pump motor TBX-RHAPRH-02 (refer to Exhibit 2.1). The review will assess:

- the adequacy of the cablings, switchgear breakers and buses, and the RHR Train B pump motor,
- the adequacy of the protective relaying for the pump motor,
- the physical aspects of the system design including the placement of the switchgear, the routing of cables and their physical separation from AEM redundant trains,
- the pump grounding system design,

- compliance with the licensing and project-specific commitments regarding the power distribution system,

- the design calculations for the switchgear and cable sizing,

- the adequacy of the design documents including the single line diagrams, relay and metering diagrams, grounding drawings, equipment specifications, cable tabulations, external connection diagrams, component listing, and tray/conduit routing drawings.

2.2 The control circuit scope includes the manual and automatic system logic that operates valve 1-8811B beginning with the secondary side of the control transformer in the motor control center (refer to Exhibit 2.2). The review will assess:

- compliance with the licensing and project-specific commitments for the control circuit, e.g., the compliance of the interlocks with valves 1-8701B, 1-8702B and 1-8812B with the requirements of the CPSES FSAR Section 7.6.5,

- the adequacy of the interconnecting cabling and the control circuit components,

- the adequacy of the design documentation including the logic diagrams, elementary diagrams, external connection diagrams, equipment specifications and the component list.

3.0 CODES, STANDARDS AND REFERENCES

This section lists the industry standards and design bases that were applicable during the design period and which should have been implemented on the project. These codes, standards and references provide the criteria that the design can be evaluated against.

3.1 NRC Regulatory Guides

3.1.1 NRC Regulatory Guide 1.29, Seismic Design Classification (Revision 1, 8/73).

3.1.2 NRC Regulatory Guide 1.30, Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment (8/11/72).

3.1.3 NRC Regulatory Guide 1.32, Use of IEEE Std. 308-1971, Criteria for Class 1E Electric Systems for Nuclear Power Generating Stations (8/11/72).

3.1.4 NRC Regulatory Guide 1.53, Application of the Single Failure Criterion to Nuclear Power Plant Protection Systems (6/73).

3.1.5 NRC Regulatory Guide 1.62, Manual Initiation of Protective Actions (10/73).

3.1.6 NRC Regulatory Guide 1.75, Physical Independence of Electric Systems (Revision 1, 1/75).

3.1.7 NRC Regulatory Guide 1.89, Qualification of Class 1E Equipment for Nuclear Power Plants (11/74).

3.1.8 NRC Regulatory Guide 1.93, Availability of Electric Power Sources (12/74).

3.1.9 NRC Regulatory Guide 1.106, Thermal Overload Protection for Electric Motors on Motor Operated Valves.

3.2. Institute of Electrical and Electronics Engineers (IEEE) Criteria

3.2.1 IEEE 279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations (Revision 1).

3.2.2 IEEE 308-1971, Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations.

3.2.3 IEEE 323-1974, Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations.

3.2.4 IEEE 334-1974, Standard for Type Tests of Continuous Duty Class 1E Motors for Nuclear Power Generating Stations.

3.2.5 IEEE 344-1975, Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.

3.2.6 IEEE 379-1972, Guide for the Application of the Single Failure Criterion to Nuclear Power Generating Station Protection Systems.

3.2.7 IEEE 382-1972 (ANSI N41.6), Guide for Type Test of Class 1 Electric Valve Operators for Nuclear Power Generating Stations.

3.2.8 IEEE 384-1974, Trial-Use Standard Criteria for Separation of Class 1E Equipment and Circuits.

3.2.9 IEEE 420-1973, Trail-Use Guide for Class 1E Control Switchboards for Nuclear Power Generating Stations.

3.2.10 IEEE 422-1973, Guide for the Design and Installation of Cable Systems in Power Generating Stations (Draft 3).

3.2.11 IEEE 494-1974, Standard Method for Identification of Documents Related to Class 1E Equipment and Systems for Nuclear Power Generating Stations.

3.3 Insulated Power Cable Engineers Association (IPCEA) Standards

3.3.1 IPCEA P-46-426 (IEEE S-135), Power Cable Ampacities (Volume I Copper, Volume II Aluminium).

3.3.2 IPCEA P-54-440 (NEMA WC 51-1975), Ampacities, Open-Top Cable Trays.

3.4 American National Standards Institute (ANSI)

3.4.1 ANSI C37, Power Switchgear.

3.4.2 ANSI C57, Transformers, Regulators, and Reactors.

3.5 National Electrical Manufacturers Association (NEMA)

3.5.1 NEMA SG 3-1971, Low Voltage Power Circuit Breakers (9/71).

3.5.2 NEMA ICS, Industrial Controls and Systems With Revision 6.

3.5.3 NEMA SG 5-1971, Power Switchgear Assemblies (3/71).

3.5.4 NEMA SG 6-1966, Power Switching Equipment.

3.5.5 NEMA MG 1-1972, Motors and Generators.

3.5.6 NEMA VE 1-1071, Cable Tray Systems.

3.5.7 NEMA AB 1-1975, Molded Case Circuit Breakers.

3.5.8 NEMA FU 1-1972, Low-Voltage Cartridge Fuses.

3.5.9 NEMA PB 1-1971, Panelboards with Revision 1.

3.5.10 NEMA PB 2-1972, Dead-Front Distribution Switchboards With Revision 1.

3.6 National Fire Protection Association (NFPA)

No. 70-1971, National Electrical Code.

3.7 Underwriters' Laboratories, Inc. (UL)

3.7.1 UL-50, Electrical Cabinets and Boxes (1975).

3.7.2 UL-67, Electric Panelboards (Revision, 1975).

3.7.3 UL-891, Dead Front Electrical Switchboards (1975).

3.8 Branch Technical Positions (BTP)

3.8.1 BTP-ICSB 18 (PSB), Application of the Single Failure Criterion to Manually-Controlled Electrically-Operated Valves.

4.0 DESIGN

4.1 RHR Pump #12 Electrical Power Distribution System

4.1.1 Electrical Power Distribution System

4.1.1.1 Verify that electrical and physical separation has been maintained between redundant Class 1E buses in accordance with IEEE Standards 308 and 384.

4.1.1.2 Review 6.9 KV Bus 1EA2 Voltage Profile calculation for compliance with voltage limits specified in IEEE standards.

4.1.2 Motor Power Quality Requirements

4.1.2.1 Verify that voltage and power source selection was based on motor horsepower rating as specified in appropriate project design criteria.

4.1.2.2 Review to assure that motor sizing is correct as specified in the appropriate project design criteria.

4.1.3 Power Cable Requirements

4.1.3.1 Review cable ampacity for adequacy with appropriate project design criteria.

- Current carrying capacity should be 25% above motor full load current rating.

- Cable should be derated according to type of raceways that it is routed in and the spacing of the trays.

4.1.3.2 Review the design to assure that the cable voltage drop is within the limits established by project criteria.

4.1.3.3 Verify that cable size shown on Cable Routing Schedule agrees with the size shown in the cable sizing calculation.

4.1.3.4 Verify that power cable construction conforms to cable requirements (conductor size, voltage rating, insulation and jacket material) defined by project design documents.

4.1.3.5 Power cable routing complies with Cable Routing Schedule and project design documents.

4.1.3.6 Power cable tray fill has not exceeded the fill limit defined by project design documents.

4.1.3.7 Configuration of cable tray supports conform with the latest revision of Gibbs & Hill cable tray plan drawings.

4.1.3.8 Cable tray identification agrees with the latest revision of Gibbs & Hill cable tray identification drawings.

4.1.4 Electrical Fault Protection

4.1.4.1 Verify that protective relaying and circuit breaker trip device shown on 6.9KV Bus 1EA2 one line diagram complies with protective relaying design documents.

4.1.4.2 Verify that interrupting capability circuit breaker of the 1APRH2 is reviewed for adequacy with Texas Utilities Services project design criteria.

- Three-phase short circuit current rating (interrupting capability) as shown on short circuit calculation agrees with 6.9KV switchgear procurement specification and purchase order.

- Interrupting capability is greater than the maximum 6.9KV system three-phase fault.

4.1.4.3 Verify that circuit breaker 1APRH2 and its relay setting records and coordination curves are reviewed for adequacy with the protective relaying philosphy, as follows.

- Setting of Bus 1EA2 circuit breaker agrees with breaker/relay setting records and the protective relaying documents.

- Relay coordination interval as defined by protective relaying criteria has been properly implemented.

- Time setting of undervoltage relay allows overcurrent relays and circuit breakers to clear any feeder or bus fault before the undervoltage relay trips the RHR Pump TBX-RHAPRH-02 motor.

4.2 Safety Injection Valve 1-8811B Control Circuit

4.2.1 Verify that the design of the control circuits complies with the appropriate regulations, industry standards and project-specific licensing requirements.

4.2.2 Verify that physical separation has been maintained between redundant safety-related equipment.

4.2.3 Verify that the control circuit implemented in accordance with the Gibbs & Hill control circuit documentation conforms to the design input submitted by Westinghouse Electric Corp.

4.2.4 Verify that design documents and specifications identify Nuclear Safety Related components as appropriate.

4.2.5 Check interconnecting control cable identification documentation.

4.2.6 Assess the design adequacy of the cable routing procedures, and conformance with the Cable Routing Schedule with the cable routing drawings.

4.2.7 Verify electrical isolation between nuclear safety-related and non-nuclear safety-related circuits.

4.2.8 Check component identification numbers with Master Component List, design drawings and other design documents.

5.0 EXHIBITS

Exhibit 2.1 RHR Pump TBX-RHAPRH-02 Motor Power Distribution System - Scope of Review

Exhibit 2.2 Safety Injection Valve 1-8811B - Scope of Review.

EXHIBIT 2.1

SCOPE OF REVIEW
RHR PUMP TBX-RHAPRH-02 MOTOR POWER DISTRIBUTION SYSTEM

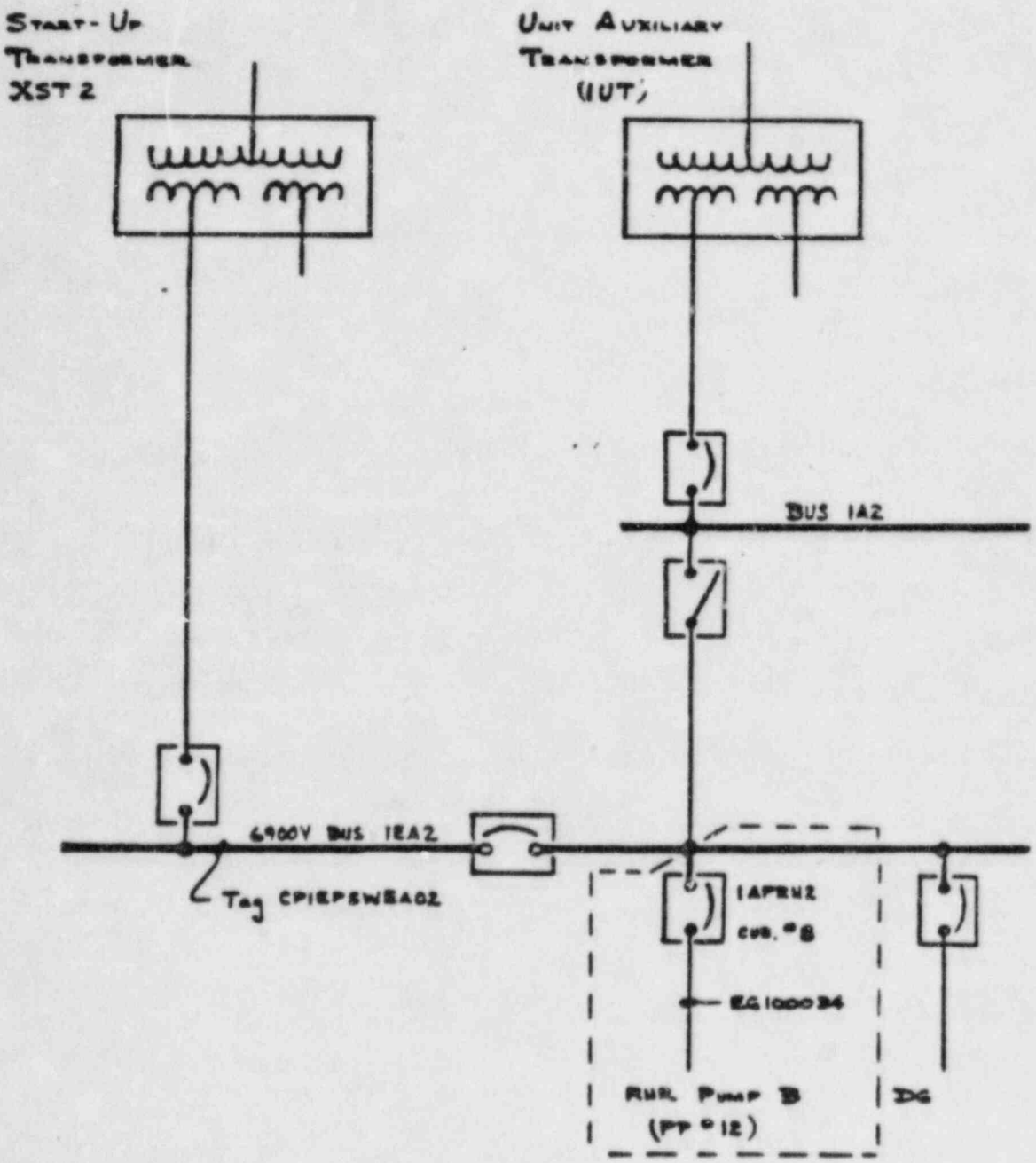
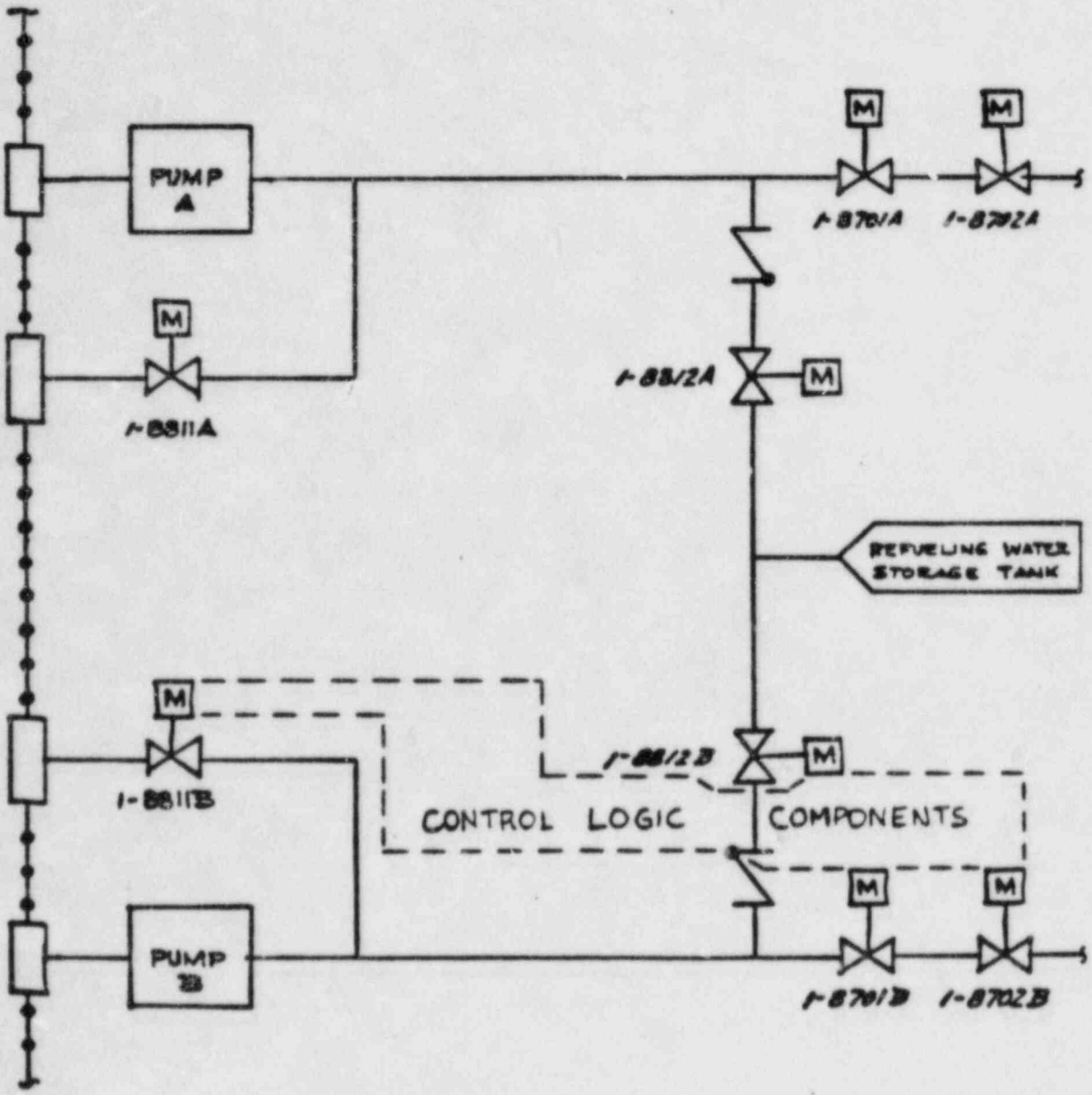


EXHIBIT 2.2

SCOPE OF REVIEW
SAFETY INJECTION VALVE 1-8811B



Observation Revision Status

Observation No.	Record Revision	Record Review (Attachment A) Revision
DC-01-01	0	2
DC-01-02	0	1
DC-01-03	0	1
DC-01-04	0	0
DC-02-01	0	0
DC-02-02	0	0
DC-02-03	0	0
PI-00-01	0	1
PI-00-02	1	1
PI-00-03	0	0
PI-01-01	1	1
PI-02-01	0	0
PI-02-02	1	0
PI-02-03	0	1
PI-02-04	0	0
PI-02-05	0	0
PI-03-01	0	0
PS-02-01	0	1
PS-09-01	1	0
PS-10-01	1	0
PS-12-01	1	0
CTS-00-01	0	0
CTS-00-02	1	1
CTS-00-03	1	1
CTS-00-04	1	1
CTS-00-05	0	0
CTS-00-06	1	1

Observation No.	Record Revision	Record R view (Attachment A) Revision
CTS-00-07	0	0
CTS-00-08	1	1
WD-01-01	0	0
WD-02-01	0	0
WD-02-02	0	0
WD-03-01	0	0
WD-07-01	0	0
WD-07-02	0	0
WD-07-03	1	0

CYGNA

Observation Record Review
Attachment A

Checklist No. DC-01-01	Revision No. 2
Observation No. DC-01-01	Sheet 1 of 3

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Probable Cause

Failure to implement procedures.

2.0 Resolution

The identification of this observation acts as a confirmation of the document control problems previously known to Texas Utilities through the various reviews and audits performed at CPSES. In fact, prior to the Cygna Independent Assessment Program, Texas Utilities began planning a new document control program which would alleviate the inaccuracies inherent in the existing system. The implementation of this new system entails establishing tighter control over document distribution and an accurate design change tracking system. The major elements of the new system are:

a. Centralization of existing document distribution points (file custodians) into six remote "Document Control Center (DCC) Satellite" stations.

b. Development of a computerized drawing and design change listing.

c. Performing a systematic verification of the computerized data base to ensure accuracy.

The centralization of the document distribution points has been instituted. A review to determine whether the institution of this new system resolved the distribution control problems was conducted the week ending 10/28/83 by Cygna. The results of this review are documented on Observation Review Record DC-01-02, Rev. 1.

The DCC computerized drawing and design change data base has been developed by the Texas Utilities Design Change Tracking Group (DCTG) using the Gibbs & Hill design verification tracking system as a base listing. Since the Gibbs & Hill system did not include piping and pipe support drawings, a manual tracking system continued to be used by DCC to control this group of drawings. Once the as-built drawings are completed, DCTG intends to add them to the data base as well.

III Approvals

Originator	D. Smallwood	Date 10/9/84
Project Engineer	J. Tschiello	Date 10/10/84
Project Manager	D.N. Williams	Date 10/10/84
Senior Review Team		Date 10/10/84

Observation Record

Checklist No.	WD-07	Revision No.	1
Observation No.	WD-07-03	Sheet	1 of 2
Originated By	J. Bonner	Date	9/12/84
Reviewed By	R. Hess	Date	9/12/84

1.0 Description

Of the six conduits checked, one instance was found where the Cable and Raceway Schedule identified the conduit between Spent Fuel Cooling Panel XLV-06 and T130FCZ33 as C-03015123. The installation and routing drawing identified this as conduit No. C-13015123.

2.0 Requirement

2.1 Brown & Root, Inc., Engineering Instruction EEI-7, Rev. 5, "Cable Pulling."

2.2 TUGCO Instruction No. QI-QP-11.3-23, Rev. 6.

2.3 TUGCO Instruction No. QI-QP-11.3-23.7, Rev. 4.

3.0 Document Reference

3.1 Cable and Raceway Schedule, Issue 308.

3.2 Gibbs & Hill Drawing No. 2323-E1-0800, Rev. 16.

4.0 Design Impact

The conduit identification number consists of the last five digits (i.e. 15123). This number is consistent with the reference documents and the installation. The first three numbers indicate unit, function, and voltage only. Since the only discrepency is the unit number, there is no safety impact.

Attachment

A. Observation Record Review.

Extent			
Isolated	X	Extensive	Other (Specify)

CYGNA

Observation Record Review
Attachment A

Checklist No. General	**Revision No.** 1
Observation No. PI-00-01	**Sheet** 1 **of** 3

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Probable Cause

Inadequate procedures.

2.0 Resolution

Cygna is concerned primarily with welds at elbow to pipe joints and welds between pieces of straight pipe for the following reasons:

a. Welds at reducers will be taken care of by the reducer, SIF = 2.0.

b. Welds at tapered transition joints (TTJ) will be taken care of by the TTJ, SIF = 1.9.

Welds at Elbows/Pipe Joints

In response to Cygna's comment, Gibbs and Hill referenced NUREG/CR-0371 "Stress Indices for Girth Fillet Welded Joints Including Radial Weld Shrinkage, Mismatch and Tapered Wall Transitions" by E.C. Rodabaugh and S.E. Moore (1978). In it, Rodabaugh and Moore state that mismatch should be considered for stress indices only for $t < 0.237"$. This was adopted by the ASME Code in the Summer 1981 addenda for transition joints (para. NB-3683.5(a)) and welds (para. NB-3683.4). While it has not yet been changed in subsection NC, pargraph NC-3673.2(b) does allow the SIF (i) to be calculated based on the stress indices (C_2 and K_2) using

$$i = C_2K_2/2.$$

Therefore, for butt welds with $t > 0.237"$

$$C_2 = 1 \qquad K_2 = 1.8$$

$$i = 0.9 < 1 \text{ therefore } i = 1.0$$

Approvals

Originator		**Date** 10/8/84
Project Engineer		**Date** 10/9/84
Project Manager		**Date** 10/10/84
Senior Review Team		**Date** 10/10/84

CYGNA

Observation Record Review
Attachment A

Checklist No. General	**Revision No.** 1
Observation No. PI-00-01	**Sheet** 2 **of** 3

	Yes	No
Valid Observation	X	
Closed	X	

Comments

For welds with t < .1875, Gibbs and Hill has used an SIF of 1.8, so it is only those welds on piping where .1875 < t < .237 which may have unconservative SIF's. From the piping specification, this situation involves only 3" sch 40 and 4" sch 40 piping. For these, the SIF for an elbow (1.8 and 2.0, respectively) are equal to or greater than the SIF for the butt weld. Thus, welds at elbows have acceptable SIF's.

Welds Between Pieces of Straight Pipe

For butt welds between pieces of straight pipe, the same logic presented above holds for all piping other than 3 or 4 inch schedule 40. Since later ASME Codes (Winter, 1981) direct the analyst to use stress indices for primary stress checks, Cygna compared the results from the Gibbs and Hill practice to those from the later Codes.

$$\frac{B_1 PDo}{2t} + \frac{B_2 M_A}{Z} < 1.5\ S_H \qquad \text{(Eq. 8, Winter 1981 Code)}$$

$$\frac{B_1 PDo}{2t} + \frac{B_2 (M_A + M_B)}{Z} < 1.8\ S_H \qquad \text{(Eq. 9, Winter 1981 Code)}$$

For a butt weld

$B_1 = 0.5 \qquad B_2 = 1.0$

Therefore, the new Equations 8 and 9 become

$$\frac{PDo}{4t} + \frac{M_A}{Z} < 1.5\ S_H \qquad \text{(Eq. 8)}$$

$$\frac{PDo}{4t} + \frac{M_A + M_B}{Z} < 1.8\ S_H \qquad \text{(Eq. 9)}$$

III Approvals

Originator		**Date** 10/8/84
Project Engineer		**Date** 10/9/84
Project Manager		**Date** 10/10/84
Senior Review Team		**Date** 10/10/84

CYGNA

Observation Record Review
Attachment A

Checklist No. General	**Revision No.** 1
Observation No. PI-00-01	**Sheet** 3 **of** 3

	Yes	No
Valid Observation	X	
Closed	X	

Comments

Comparing with Equations 8 and 9 as used by Gibbs and Hill:

$$\frac{PDo}{4t} + \frac{M_A}{Z} < S_H \qquad \text{(Eq. 8 with .75i = 1.0)}$$

$$\frac{PDo}{4t} + \frac{M_A + M_B}{Z} < 1.2\ S_H \qquad \text{(Eq. 9 with .75i = 1.0)}$$

We see that Gibbs and Hill does meet the primary stress requirements of the later code. The only area of concern, then, is in the secondary stress/fatigue check (Equations 10 or 11). It is Cygna's experience that welds which are not at elbows, tees or transition joints occur where moment levels are small, i.e., in long straight runs.

To check this for maximum secondary effects, Cygna reviewed results for all 3 and 4 inch schedule 40 high energy piping (above 200°F) and a sample of 3 and 4 inch piping passing between buildings. The maximum corrected ratio for equation 11 of paragraph NC-3652.3, with a SIF = 1.8 at an intermediate butt weld, is

$$\frac{S_{Max}}{S_{Allow}} = \frac{18700}{41675} = 0.45$$

As expected, the stress levels at intermediate weld locations are not large and, in most cases, are less than 5000 psi. Therefore, the use of an SIF of 1.0, rather than 1.8, has no impact on the piping design. For this reason, Cygna considers the observation closed.

III Approvals

Originator		**Date** 10/8/84
Project Engineer	John C. Stanchfield	**Date** 10/9/84
Project Manager	M.H. Williams	**Date** 10/10/84
Senior Review Team		**Date** 10/10/84

Observation Record

Checklist No.	General	Revision No.	1
Observation No.	PI-00-02	Sheet	1 of 1
Originated By	L.J. Weingart	Date	9/12/84
Reviewed By	J.C. Minichiello	Date	9/12/84

1.0 Description

Gibbs & Hill uses an increase in the upset and emergency condition allowables when considering welded attachment stresses in combination with general piping stresses.

2.0 Requirement

The allowable for upset and emergency conditions is contained in the ASME Code, Section III, Paragraphs NC-3611.3(b) and (c), respectively.

3.0 Document Reference

Gibbs & Hill Engineering Guide AEG-511, Rev. 0, June 1981.

4.0 Potential Design Impact

Use of an increased allowable (1.5 S_H and 2.16 S_H) may result in actual stress levels above the appropriate allowables (1.2.S_H and 1.8 S_H).

Attachments

A. Observation Review Record

Extent		
Isolated	Extensive X	Other (Specify)

Texas Utilities Service, Inc.
Independent Assessment Program; 83090

CYGNA

Observation Record Review
Attachment A

Checklist No.	General	**Revision No.**	1
Observation No.	PI-00-02	**Sheet**	1 of 2

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Probable Cause

Code Interpretation

2.0 Resolution

The Code of Record does not address allowables for local pipe stresses due to welded attachments. The only guidance is in paragraph NC-3645 "Attachments" which cautions the designer against geometries which cause excessive localized bending stress. In order to evaluate the local stresses, Gibbs and Hill utilized a computer program, "CYLNOZ", which is based on Welding Research Council Bulletin 107, a method used in the industry for evaluating attachments to shells. Cygna concurs with the Gibbs and Hill approach to this evaluation.

In combining these localized stresses with the general piping stresses, Gibbs and Hill had only the general guidance of NC-3645. Therefore, when evaluating the two normal condition comparisons, i.e., equations 8 and 10 (or 11, if necessary) of paragraph NC-3650, Gibbs and Hill used the allowables directly from the Code of Record. No increase was taken for the inclusion of the localized effects. Cygna concurs with this approach.

For upset conditions, Gibbs and Hill used on allowable of 1.5 S_H versus the 1.2 S_H allowable for equation 9 of paragraph NC-3650 of the Code. Cygna noted that this allowable is identical to the typical allowable in the Code of Record for vessel design:

$P_L + P_B < 1.5\ S_H$, where

P_L = Local Primary Membrane stress
P_B = General Primary Bending stress

III Approvals

Originator		**Date** 10/8/84
Project Engineer		**Date** 10/9/84
Project Manager		**Date** 10/10/84
Senior Review Team		**Date**

CYGNA

Observation Record Review
Attachment A

Checklist No. General	**Revision No.** 1
Observation No. PI-00-02	**Sheet** 2 of 2

	Yes	No
Valid Observation	X	
Closed	X	

Comments

Finally, the increase of 20% in allowable for emergency conditions, from 1.8 S_H to 2.16 S_H is reasonable in light of the above comparison of the increase for upset conditions from 1.2 to 1.5 S_H. This rationale allows Gibbs and Hill to meet the intent on NC-3645, which is to limit localized bending effects. It should be noted that the analytic method used by Gibbs and Hill conforms with that used by other organizations within the industry.

Based on the above reasoning as well as the low stress levels found in the RHR system for upset and emergency conditions, Cygna believes that the Gibbs and Hill approach does meet the intent of the Code and considers the observation closed.

III Approvals

Originator	[signature]	Date 10/8/84
Project Engineer	[signature]	Date 10/9/84
Project Manager	[signature]	Date 10/10/84
Senior Review Team	[signature]	Date 10/10/84

Observation Record

Checklist No.	PI-01	Revision No.	1
Observation No.	PI-01-01	Sheet	1 of 1
Originated By	L. J. Weingart	Date	9/12/84
Reviewed By	J.C. Minichiello	Date	9/12/84

1.0 Description

The wall thickness used for the computer analysis piping segments 16"-SI-074-151R-2 and 16"-SI-073-151R-2 was 0.5 inches. The correct value is 0.375 inches.

2.0 Requirement

Gibbs & Hill Specification 2323-M-200, Rev. 3, "Design Specification for all ASME Section III, Code Class 2 and 3 Piping," Appendix 3, which contains Gibbs & Hill 2323-MS-43A by reference.

3.0 Document Reference

Gibbs & Hill QA Binder AB-1-69, Revision 0, Sheet 6 "Analytical Data - Pipe Material and Properties."

4.0 Potential Design Impact

For deadweight and seismic loading, stresses will increase by approximately 33%. For thermal expansion, stress levels will remain basically unchanged, since the loads are directly related to the thicknesses, while stresses are inversely related.

Attachments

A. Observation Review Record

Extent			
Isolated	X	Extensive	Other (Specify)

CYGNA

Observation Record Review
Attachment A

Checklist No. PI-01	Revision No. 1
Observation No. PI-01-01	Sheet 1 of 2

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Probable Cause

Analysis oversight.

2.0 Resolution

For these two segments, Cygna has recalculated the stresses for the most significant design case, that being postulation of a through wall crack per the NRC Standard Review Plan. In this recalculation, Cygna assumed the pressure, deadweight, OBE, and thermal expansion stresses would increase by .5/.375 (see calculations below). Since stress levels are still below .4 ($1.2S_H + S_A$) and equation 9 (OBE) is well below 1.2 S_H (approximately 25% of allowable), the error in thickness has no design impact. Since this was the only error in thickness out of 38 piping segments (problems 1-69 and 1-70) Cygna concludes that the error is isolated.

CONTAINMENT ISOLATION

Per Section 6.2.4.1.3 of the FSAR, the guard pipe past containment, the isolation tank, and bellows are no longer needed as part of containment since stresses between the flued head and valve are below .4 ($1.2\ S_H + S_A$). Cygna checked the results independently:

BI Approvals		
Originator		Date 10/8/84
Project Engineer		Date 10/9/84
Project Manager		Date 10/10/84
Senior Review Team		Date 10/10/84

Checklist No. PI-01	**Revision No.** 1
Observation No. PI-01-01	**Sheet** 2 **of** 2

	Yes	No
Valid Observation	X	
Closed	X	

Comments

Joints 701-706 (Train A) (corrected t = 0.375)

Maximum equation 9 = 3158 x $\frac{.5}{.375}$ = 4210 psi (pt. 706)

Maximum equation 10 = 9778 x $\frac{.5}{.375}$ = 13037 (pt. 1705)

Sum = 17247 psi

1.2 S_H + S_A = 1.2 (16600) + 27650 = 47570

Ratio = $\frac{17250}{47570}$ = 0.36 < .4, OK

731-1735 (Train B)

Maximum equation 9 = 1265 x $\frac{.5}{.375}$ = 1687 psi (pt. 1735)

Maximum equation 10 = 11449 x $\frac{.5}{.375}$ = 15265 psi (pt. 735)

Sum = 16950 psi

Ratio = $\frac{16950}{47570}$ = 0.36 < .4 OK

∴ There will be no breaks postulated between the penetrations and the isolation valves.

Approvals		
Originator		Date 10/8/84
Project Engineer		Date 10/9/84
Project Manager	W H Williams	Date 10/10/84
Senior Review Team		Date 10/10/84

Observation Record

Checklist No.	PI-02	Revision No.	1
Observation No.	PI-02-02	Sheet	1 of 1
Originated By	L. J. Weingart	Date	9/12/84
Reviewed By	J.C. Minichiello	Date	9/12/84

1.0 Description

Support RH-1-064-010-S22R (previous tag number RH-1-062-001-S22R) is modelled 14 inches downstream from its correct, as-built location on piping segment 8"-RH-1-064-601R-2.

2.0 Requirement

The tolerance for support design location is ± 2" per TUSI Verification Procedure CP-EI-4.5-1, Section 3.2.4.

3.0 Document Reference

a) Brown and Root drawing BRHL-RH-1-SB-003, Rev. 1.
b) Gibbs and Hill QA Binder AB-1-70, Rev. 0.

4.0 Potential Design Impact

Stresses due to deadweight and seismic will increase approximately 10-20% in this region due to the increase in span.

Attachment

A. Observation Record Review

Extent			
Isolated	X	Extensive	Other (Specify)

CYGNA

Observation Record Review
Attachment A

Checklist No. PI-02	**Revision No.** 1
Observation No. PI-02-03	**Sheet** 1 **of** 1

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Root Cause

Possible misunderstanding of the Gibbs and Hill procedure

2.0 Resolution

Using the range for the 3 rigid restraints, Cygna calculated the following:

Support	Load Range	CYLNOZ Stress	General Stress	Total	Allow
SI-1-032-003-S32R	2700	10362	6763	17125	45000
RH-1-064-007-S22R	1300	5172	5128	10300	44000
RH-1-016-001-S32R	8615	11225	9328	20555	44000

The remaining 4 restraints are springs or snubbers and have no thermal load. Thus, there is no increase in stress above allowables.

Cygna also noted that the correct method was used for the welded attachments in anchors of Problem 1-70 and in all supports in Problem 1-69. Based on this, Cygna considers the error isolated. In addition, the RHR system will probably show the largest percentage difference (between maximum load and range), since it has many modes of operation. Thus, Cygna expects the error would have the most impact on this system. As the new calculations show, the impact on design is negligible and the observation is closed.

III Approvals

Originator		**Date** 10/8/84
Project Engineer		**Date** 10/9/84
Project Manager		**Date** 10/10/84
Senior Review Team		**Date** 10/10/84

Observation Record Review
Attachment A

Checklist No.	PS-02, PS-03	Revision No.	1
Observation No.	PS-02-01	Sheet	1 of 2

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Probable Cause

Failure to revise drawing information to reflect new data shown in the design calculations.

2.0 Resolution

Discussion and further review with Texas Utilities has shown the following procedure was in place:

- When designing a new support with preliminary loads (such as the initial pipe stress analyses), the designers specify on the pipe support drawing the minimum acceptable embedment for the Hilti bolt.

- When installing the HILTI bolt, construction and QC follow the Brown and Root Installation Procedure CEI-20. Per that procedure, the embedment depth used would be the maximum of

  a) that shown on the pipe support drawing, or

  b) the minimum for a standard Hilti (4.5 bolt diameters) or a Hilti Super Kwik-Bolt (6.5 bolt diameters), or

  c) that necessary to meet the torquing requirements given in CEI-20.

- When subsequently reviewing a pipe support for later loads (as-built, revised routings), the designers calculate the minimum possible embedment for the length Hilti bolt specified on the drawing. This embedment length, "E", is defined as

III Approvals

Originator	S. Luo	Date 10-9-84
Project Engineer	John C. Mauchello	Date 10-9-84
Project Manager	W.H. Williams	Date 10/10/84
Senior Review Team		Date 10/10/84

CYGNA

Observation Record Review
Attachment A

Checklist No. PS-02, PS-03	Revision No. 1
Observation No. PS-02-01	Sheet 2 of 2

	Yes	No
Valid Observation	X	
Closed	X	

Comments

E = bolt length - thread length - plate thickness - grout (if any) - topping (if any) + 1 diameter

The addition of the one bolt diameter is based on the following logic:

1) Hilti defines the embedment length as the length prior to torquing the bolt. Hilti also states that bolt setting typically requires 4 to 5 turns of the nut.

2) Brown & Root procedure CEI-20 requires that the change in bolt length due to tightening be limited to one nut height, which is approximately equal to one bolt diameter.

Therefore, construction must ensure that sufficient threads remain below the plate surface to allow the CEI-20 torque requirements to be met. Engineering has taken this as approximately one bolt diameter, which is reasonable.

- In the event that this minimum possible length does not provide sufficient allowable loads, engineering can request a field measurement of the amount of thread above the nut. This will give the actual embedment after torquing, which is conservative when HILTI's definition of embedment is considered.

Based on this explanation, Cygna concurs that the embedment lengths shown in the revised calculations are not minimum required, but are minimum possible based on the installed length of bolt. Therefore, Cygna considers the observation closed since the drawing does reflect the later calculation by specifying the overall bolt length.

III Approvals

Originator	S. Luo	Date 10-9-84
Project Engineer	John C. Schmidello	Date 10-9-84
Project Manager	W. H. Williams	Date 10/10/84
Senior Review Team		Date 10/10/84

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

CYGNA

Observation Record

Checklist No. PS-09	Revision No. 1
Observation No. PS-09-01	Sheet 1 of 2
Originated By S. Luo S. Luo	Date 9/12/84
Reviewed By J. Minichiello J. Minichiello	Date 9/12/84

1.0 Description

The working range (i.e. top up or bottom out) for spring hanger nos. SI-1-079-001-S32S and RH-01-010-002-S22S was not checked to ensure that the travel due to seismic movement was within the working range of the hanger.

2.0 Requirement

Cygna Design Criteria 83090-DC-2, Section 4.1.4, requires the design to consider the effects of seismic motion.

3.0 Document Reference

Texas Utilities calculation for Hanger Nos. SI-1-079-001-S32S and RH-1-010-002-S22S.

4.0 Potential Design Impact

Combined seismic and thermal movements exceeding the working range of the spring hanger may result in an ineffective design due to loss of spring action.

Attachment

A. Observation Review Record.

Extent		
Isolated	Extensive X	Other (Specify)

CYGNA

Observation Record

Checklist No.	PS-10	Revision No.	1
Observation No.	PS-10-01	Sheet	1 of 2
Originated By	S. Luo S. Luo	Date	4/6/84
Reviewed By	J. Minichiello J. Minichiello	Date	4/6/84

1.0 Description

The design input data for support RH-1-064-001-S22R contained an error in the X displacement sign (+.395 " vs. -.395"). This error appears on the form transmitted from the pipe stress group to the pipe support group for use in the design.

2.0 Requirement

Cygna Design Criteria 83090-DC-2, Section 4.1.7, requires the use of correct design inputs.

3.0 Document Reference

TUSI pipe support calculation RH-1-064-001-S22R, Rev 3.

4.0 Potential Design Impact

The transmittal of incorrect loads or displacements to the pipe support group may lead to underdesigned or improperly designed supports.

Attachment

A. Observation Review Record

Extent			
Isolated	X	Extensive	Other (Specify)

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

Observation Record

Checklist No.	PS-12	Revision No.	1
Observation No.	PS-12-01	Sheet	1 of 2
Originated By	S. Luo	Date	9/12/84
Reviewed By	J. Minichiello	Date	9/12/84

1.0 Description

The allowables for a "PUH" style U-bolt were used in the design calculation. The bill of materials calls out a "PUS" style U-bolt.

2.0 Requirement

2.1 Gibbs & Hill specification 2323-MS-46A, Revision 3, Section 3.6.2.2.1.

2.2 NPSI Catalog, LCD tables which list allowables for U-bolts.

3.0 Document Reference

TUSI pipe support calculation RH-1-064-011-S22R, Rev 5 (formerly RH-1-062-002-S22R).

4.0 Potential Design Impact

Since the allowables for a "PUH" style U-bolt are approximately twice as high as for a "PUS" style U-bolt, use of the correct allowables may lead to hardware failure.

Attachment

A. Observation Review Record

Extent		
Isolated X	Extensive	Other (Specify)

Observation Record

Checklist No.	Various	**Revision No.**	1
Observation No.	CTS-00-02	**Sheet**	1 of 2
Originated By	J.P. Russ	**Date**	4/6/84
Reviewed By	J.C. Minichiello	**Date**	4/6/84

1.0 Description

Gibbs & Hill performed the calculation of total resultants for component loads as follows:

a. For anchor bolts, Gibbs & Hill included the dead load in the square root of the sum of the squares (SRSS) combination of component seismic forces. This resultant is 9% less than the actual combination where the dead load effects are added absolutely to the SRSS of the seismic forces.

b. Combined component member loads were calculated from various static and dynamic loads (i.e., dead and seismic) using the algebraic summation method for the following cable tray supports:

Standard Details A_i, B_i, C_i, and D_i (where i = 1 to 5, depending on the number of tray levels), details A, B, C, and D of drawing no. 2323-E1-0601-01-S, which are based on Standard Detail D_i, and Standard Details 4, 5 and 7.

2.0 Requirement

2.1 Standard design practice requires that the dead weight effects should be separated from the seismic effects and combined appropriately in order to obtain the worst case.

2.2 Standard design practice requires that if the algebraic summation method is used, the static and dynamic loads should be combined to obtain the worst case loading for the components.

2.3 Cygna Design Criteria 83090-DC-3, Rev. 1, Section 4.2, lists the proper method for combining dead, live, and seismic loads (live load = 0).

2.4 CPSES FSAR, Section 3.7B.2.6 requires that any combined total response due to seismic loads be combined by the square root of the sum of the squares method.

3.0 Document Reference

a1. Improper combination by SRSS was performed in all Gibbs & Hill cable tray calculations within the Cygna scope except those for Type SP-7.

Extent		
Isolated	**Extensive** X	**Other (Specify)**

Observation Record

Checklist No.		Revision No.	1
Observation No.	CTS-00-02	Sheet	2 of 2
Originated By	J. Russ	Date	4/6/84
Reviewed By	J. C. Minichiello	Date	4/6/84

b1. Computer Output Binder DMI-5P, approved 10 November 1978. Applicable sections as below:

Standard Detail	Binder Section
Ai	Reg. Cases A_1 to A_3
Di	Reg. Cases D_1 to D_5

b2. Calculation Binders

Standard Detail	Calculation No.
4, 5, 7	SCS-104C, Set 4, Shts. 4, 6, 9, 40, 41, 43

4.0 Potential Design Impact

The improper use of either the SRSS or algebraic sum method could result in unconservative levels of load or stress which may affect support integrity.

Attachment

A. Observation Review Record

Extent		
Isolated	Extensive X	Other (Specify)

Observation Record Review
Attachment A

Checklist No. Various	Revision No. 1
Observation No. CTS-00-02	Sheet 1 of 1

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Probable Cause

The probable cause of this observation may be attributed to use of simplifying analytical assumptions which yield unconservative results.

2.0 Resolution

The deficiencies noted in Section 1.0 have been resolved as follows:

a. To evaluate the use of unconservative component load resultants, Gibbs & Hill compared their original resultants to those developed from the correct combinations of dead and seismic loading for all plant elevations where cable tray supports are located. These recalculated resultants exceeded the original values by a maximum of 3 percent. This is an acceptable tolerance for an SRSS combination (Reference: Cygna Technical File 11.2.1.50, Pgs. 4-13).

b. A further review determined that care was consistently taken to ensure that the maximum member load combination, equal to the absolute sum of the dead and each seismic load component, was selected for use in the member design. A properly applied algebraic summation methodology is conservative.

Because of the foregoing statements, part (a) is closed and part (b) is considered invalid.

!!! Approvals		
Originator	J. P. Rem	Date 5 OCT '84
Project Engineer	John C. Palmucello	Date 10-9-84
Project Manager	W. H. Williams	Date 10/10/84
Senior Review Team		Date 10/10/84

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

Observation Record

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-03	Sheet	1 of 3
Originated By	J.P. Russ	Date	9/14/84
Reviewed By	J. Minichiello	Date	9/14/84

1.0 Description

In the review of cable tray support calculations, Cygna discovered the following deficiencies in the modeling assumptions for frame analyses:

a. Cable tray Standard Details A_i, B_i, C_i and D_i, where i = 1 to 5 depending on the number of tray levels, and Details A, B, C and D on Gibbs & Hill drawing 2323-E1-0601-01-S which are based on Standard Detail D_i, are modeled as plane frames. Two basic configurations are analyzed. The first configuration consists of two vertical members, called hangers, connected by horizontal members, called beams, which support the cable trays. This configuration is typical for Standard Details A_i, B_i and C_i. The second configuration consists of one vertical hanger and one to four beams which are attached to the hanger at one end and a concrete surface at the other. This second case it typical of Standard Detail D_i and the related Details A, B, C and D. All anchorage points were modeled as pinned in the plane of the frame.

Both support configurations are modeled with vertical and horizontal cable tray loads at the beam to hanger joints instead of at the beam tray support points. The total horizontal and vertical load distribution was assumed to be split equally between the beam support points.

The above assumptions are deficient for the following reasons:

1. Placing tray loads at the beam-hanger joints does not reflect the actual loading configuration thereby eliminating the effects of local bending and torsion on the beams.

2. For Standard Detail D_i, where loads were placed at the beam ends which were connected to the concrete surface (these points being modeled as simple supports), load effects were totally removed from the structure.

Extent		
Isolated	Extensive X	Other (Specify)

CYGNA

Observation Record

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-03	Sheet	2 of 3
Originated By	J.P. Russ	Date	9/14/84
Reviewed By	J. Minichiello	Date	9/14/84

b. Hanger ceiling connections consisting of angles anchored to concrete by either one or two bolts were modeled as hinges in the cable tray support frame analysis. Although this assumption is acceptable for the frame analysis, the assumption of a fixed joint is more appropriate for the evaluation of the base angle and anchor bolts.

2.0 Requirement

Since the conditions described above do not properly model the local effects due to actual loading in the frame members or the actual geometry and load distribution in the connections, the requirements set forth in Cygna Design Criteria 83090-DC-3, Rev. 1, Section 4.1, are not met.

3.0 Document Reference

a1. Computer Output Binder DMI-5P, approved 10 November 1978. Applicable sections as below:

Standard Detail	Binder Section
A_i	Reg. Cases A_1 to A_3
D_i (Details A, B, C, D)	Reg. Cases D_1 to D_5

b1. Calculation Binders

Detail	Calculation Binder Ref.
Standard A_1	SCS-101C, Set 1, Shts. 7,30,72,73,94 SCS-122C, Set 3, Shts. 9,10,11
Standard A_2	SCS-101C, Set 1, Shts. 8,30,72,73,74,95 SCS-122C, Set 3, Shts. 9,10,11
Standard A_3	SCS-101C, Set 1, Shts. 9,10,30,72,73,75,96 SCS-122C, Set 1, Shts. 9,10,11
Standards D_1 to D_5	SCS-104C, Set 1, Shts. 5,6,10,34,35
Standards A, B, C, D	SCS-104C, Set 1, Shts. 5,6,10,34,35

Extent		
Isolated	Extensive X	Other (Specify)

Observation Record

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-03	Sheet	3 of 3
Originated By	J.P. Russ	Date	9/14/84
Reviewed By	J. Minichiello	Date	9/14/84

b1. Gibbs & Hill Drawing 2323-S-0903, Rev. 5.

b2. Gibbs & Hill Calculation No. SCS-101C, Set 1.

4.0 Potential Design Impact

Support integrity may be affected for the following reasons:

a. More appropriate modeling techniques may result in higher calculated member and connection stresses.

b. An inappropriate assumption concerning joint fixity may lead to an unconservative design of support base connections.

Attachment

A. Observation Review Record

Extent		
Isolated	Extensive X	Other (Specify)

CYGNA

Observation Record Review
Attachment A

Checklist No. Various	**Revision No.** 1
Observation No. CTS-00-03	**Sheet** 1 **of** 1

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Probable Cause

The probable cause of this observation is a lack of documentation and/or justification of the modeling assumptions. For the frame members this may be concluded from the fact that although the beams were underloaded, the hangers were conservatively loaded by the analysis assumptions. The analysis package did not address the appropriateness of the assumptions for the end connection fixity.

2.0 Resolution

The deficiencies described in Section 1.0 were resolved as follows:

a. Gibbs & Hill reevaluated the supports in question incorporating Cygna's comments utilizing a response spectrum modal analysis to reduce some conservatisms implicit in the original spectral peak analysis. The results of these analysis revealed that although the support members as designed were highly stressed, stresses did not exceed allowable levels (Reference: Cygna Technical File 11.2.1.50, Pgs. 31-69). In addition, Gibbs & Hill made calculations available to Cygna which addressed the local bending and torsion affects not considered in the computer model due to the load placement.

b. Further analysis by Cygna indicated that the difference between fixed and pinned connections for one or two bolt base angles does not alter the acceptability of the support.

Therefore, Cygna considers this observation closed.

III Approvals

Originator	J. P. Reen	**Date** 5 Oct 84
Project Engineer	John C. Tabuchi	**Date** 10/9/84
Project Manager	M. T. Williams	**Date** 10/10/84
Senior Review Team		**Date** 10/10/84

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

CYGNA

Observation Record

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-04	Sheet	1 of 2
Originated By	J.P. Russ	Date	4/6/84
Reviewed By	J. Minichiello	Date	4/6/84

1.0 Description

Cable tray Standard Details A_i, B_i, C_i and D_i, where i = 1 to 5, depending on the number of tray levels, Details A, B, C and D on Gibbs & Hill drawing 2323-E1-0601-01-S which are based on Standard Detail D_i, and Standard Details 4, 5 and 7 were modeled as plane frames. Frame analysis and design were based upon a single ratio of height to width, whereas the ratio varies over the range of frames installed. Tray loads were placed in various directions in an attempt to simulate the worst case combination for the frame members. For Standard Detail D_i and Details A, B, C and D, an analysis of the base plate/angle and the anchor bolts included only loads with the largest acceleration factors.

The above analysis procedures are deficient for the following reasons:

1. If generic analyses are being performed for the design of cable tray group supports, care must be taken to ensure that the worst case configuration is evaluated. No basis was found to ensure that the analysis reflected the worst case aspect ratio.

2. The use of loads with the largest acceleration values in the analysis of the base plate/angle and anchor bolt system is unconservative if it precludes the possibility of vertical loads being directed upward, i.e. opposite gravity. The imposition of upward forces on one beam and downward forces on an adjacent beam coupled appropriately with other forces could result in anchor bolts with higher loads than those used in the original calculations.

2.0 Requirements

If standard details are selected as the design method, proper consideration should be given to ensuring the evaluation of the worst case. Since the conditions described above do not consider the range of height to width ratios and all possible combinations of loadings, the supports modeled thusly do not meet the requirements set forth in the Cygna Design Criteria, DC-3, Rev. 1, Section 2.0, Scope, Section 4.1, Physical Requirements and Section 4.2, Loads and Load Combinations.

Extent		
Isolated	Extensive X	Other (Specify)

Observation Record

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-04	Sheet	2 of 2
Originated By	J.P. Russ	Date	4/6/84
Reviewed By	J. Minichiello	Date	4/6/84

3.0 Document Reference

A. Computer Output Binder DMI-5P, Approved 10 November 1978. Applicable sections as below:

Standard Detail	Binder Section
A_i	Reg. Cases A_1 to A_3
D_i (A,B,C,D)	Reg. Cases D_1 to D_5

B. Calculation Binders

Detail	Calculation Binder References
Standard A_1	SCS-101C, Set 1, Shts. 7,30,72,73,94 SCS-122C, Set 3, Shts. 9,10,11
Standard A_2	SCS-101C, Set 1, Shts. 8,30,72,73,74,95 SCS-122C, Set 3, Shts. 9,10,11
Standard A_3	SCS-101C, Set 1, Shts. 9,10,30,72,73,75,96 SCS-122C, Set 1, Shts. 9,10,11
Standard D_1 to D_5	SCS-104C, Set 1, Shts. 5,6,10,34,35
A, B, C, D	SCS-104C, Set 1, Shts. 5,6,10,34,35
Standard 4, 5, 7	SCS-104C, Set 4, Shts. 4,6,9,40,41,43

4.0 Potential Design Impact

By not ensuring that the analysis employed the worst case aspect ratio and by not considering the effect of differing load directions on anchor bolt forces, both member stresses and anchor forces may be undervalued. Cable tray support designs based upon these lower load values may be overstressed and fail locally when actual tray loads are applied.

Attachments

A. Observation Review Record

Extent				
Isolated		Extensive	X	Other (Specify)

Observation Record Review
Attachment A

Checklist No. Various	Revision No. 1
Observation No. CTS-00-04	Sheet 1 of 1

	Yes	No
Valid Observation		X
Closed	X	

Comments

1.0 Probable Cause

The use of "engineering judgement" in the initial phases of cable tray design may have precluded the consideration of the worst case height to width ratio when analyzing the cable tray supports.

"Engineering judgement" may also be given as the reason for failure to consider the loading combination described above which may result in higher anchor bolt loads.

2.0 Resolution

Since standard cable tray widths and standard bolted clamp spacings are used for the installation, there is a limited range of height to width ratios possible. Further review ensured that the worst case ratio was used by Gibbs & Hill in the analysis.

Further evaluation of the baseplate/angle and anchor bolt loading revealed that the maximum vertical seismic acceleration is less than or equal to the acceleration due to gravity. Assuming the seismic acceleration to be upward results in a net downward acceleration or no acceleration depending on the building elevation. Therefore, since vertical loads will not be directed upward, using the largest sum of the seismic and gravity accelerations applied downward is appropriate.

Further review has resulted in this observation being invalidated.

III Approvals

Originator	J. P. Kuo	Date 5 OCT '84
Project Engineer	J. C. Finnell	Date 10-10-84
Project Manager	W. H. Williams	Date 10/10/84
Senior Review Team		Date 10/10/84

Observation Record

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-06	Sheet	1 of 1
Originated By	J.P. Russ	Date	9/12/84
Reviewed By	J.C. Minichiello	Date	9/12/84

1.0 Description

The analysis and design of Details A, B, C and D on Gibbs & Hill drawing 2323-E1-0601-01-S was based upon the analysis and design of Standard Detail D_i, where i = 1 to 5 depending on the number of tray levels. The orientation of the major axis of the C6 x 8.2 section, used as a hanger for both support series, differs by 90 degrees. The major axis for Standard Detail D_i is out of the plane of the frame while for Details A, B, C and D it is in the plane of the frame. As a consequence, Details A, B, C and D are more flexible than Standard Detail D_i. This was not considered in the analysis. In addition the changes in the design of the beam connections to the hanger were not evaluated.

2.0 Requirements

Cygna Design Criteria 83090-DC-3, Rev. 1, Section 4.1 requires that the analytical model accurately reflect the actual support geometry.

3.0 Document Reference

3.1 Gibbs and Hill Computer Output Binder DMI-5P, Approved 10 November 1978, Section: "Reg. Cases D_1 to D_5."

3.2 Gibbs and Hill Calculation No. SCS-104C, Set 1, Shts. 5, 6, 10, 34, 35.

4.0 Potential Design Impact

Since the member orientation in details A, B, C and D is rotated 90° from Detail D_i, the results of the D_i analysis are not directly applicable. Use of the actual orientation may result in members being overstressed.

Attachments

A. Observation Review Record

Extent		
Isolated	Extensive X	Other (Specify)

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

Observation Record Review
Attachment A

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-06	Sheet	1 of 1

	Yes	No
Valid Observation	X	
Closed	X	

Comments

1.0 Probable Cause

The observation described above may be attributed to the use of "engineering judgement" which precluded a detailed evaluation of the various design considerations (i.e., connections), and differences between the support types.

2.0 Resolution

Although the difference between the actual configuration and the referenced standard detail used as a basis of qualification constituted a potential design deficiency, further analysis by Gibbs & Hill (see Cygna Tech. File 11.2.1.50, ppg. 31-69), incorporating Cygna's comments, revealed that sufficient design margin existed to compensate for the increased stress levels. Therefore, the observation is closed.

III Approvals		
Originator	J. P. Reece	Date 5 OCT 84
Project Engineer	John C Thrumchaello	Date 10/9/84
Project Manager	M H Williams	Date 10/10/84
Senior Review Team		Date 10/10/84

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

Observation Record

Checklist No.	Various	**Revision No.**	1
Observation No.	CTS-00-08	**Sheet**	1 of 2
Originated By	J.P. Russ	**Date**	9/14/84
Reviewed By	J. Minichiello	**Date**	9/14/84

1.0 Description

The cumulative effect of the following analysis techniques and/or procedures may have a potential impact on plant safety:

Observation No.	Description	Checklist No.
CTS-00-01	Neglect of self-weight excitation of Cable Tray Support.	CTS-11, -13, -24, -25, -32, -33, -34, -35, -37, -38, -39
CTS-00-02	Improper load combination by the SRSS method.	All
CTS-00-03	Computer modeling assumptions which resulted in improper load placement and the assumptions that a rigid one- or two-bolt base angle acts as a pinned rather than a fixed connection.	CTS-2, -3, -10, -11 -13, -24, -25, -26, -27, -28, -29, -30, -32, -33, -34, -35, -36, -37, -38, -39
CTS-00-05	Cantilever member with a two-bolt base connection assumed to act as a three- way restraint.	CTS-6, -14, -15, -16, -17, -18, -19 -20, -21, -22
CTS-00-06	Extrapolation of specific details from generic analyses which assume different member orientation.	CTS-11, -13,
CTS-00-07	Unconservative assumption for base plate behavior.	CTS-11, -13

Extent		
Isolated	Extensive X	Other (Specify)

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

CYGNA

Observation Record

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-08	Sheet	2 of 2
Originated By	J.P. Russ	Date	9/14/84
Reviewed By	J. Minichiello	Date	9/14/84

2.0 Requirement

2.1 Cygna Design Criteria 83909-DC-3, Rev. 1.
2.2 Gibbs & Hill, Texas Utilities Cable Tray Supports Design Criteria SCS-101C, Set 5, Rev. 2.

3.0 Document Reference

Gibbs & Hill Calculation Binders:

SCS-101C	SCS-146C
SCS-122C	SCS-187C
SCS-104C	SCS-125C

4.0 Potential Design Impact

Acting alone or in combination, the deficiencies described in Section 1.0 may lead to unacceptable support loads or stresses. If these or similar deficiencies exist for supports outside the review scope, such potentially generic deficiencies may have a significant safety impact.

Attachment

A. Observation Record Review.

Extent		
Isolated	Extensive X	Other (Specify)

CYGNA

Observation Record Review
Attachment A

Checklist No.	Various	Revision No.	1
Observation No.	CTS-00-08	Sheet 1 of 1	

	Yes	No
Valid Observation	X	
Closed		X

Comments

1.0 Probable Cause

Inadequate procedures and documentation.

2.0 Resolution

See Potential Finding Report PFR-01.

III Approvals

Originator	J. P. R[illegible]	Date	5 Oct 84
Project Engineer	John C. [illegible]	Date	10/9/84
Project Manager	N. H. Williams	Date	10/10/84
Senior Review Team	[illegible]	Date	10/10/84

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

CYGNA

Potential Finding Report

PFR No. 01	Revision No. 1
Observation No. CTS-00-08	Sheet 1 of 6

I Description

See Attachment A (sheet 4 of 5).

Requirement

1. Cygna Design Criteria 83090-DC-3, Rev. 1.
2. Gibbs & Hill, Cable Tray Support Design Criteria SCS-101C, Set 5, Rev. 2.

Reference Documents

Gibbs & Hill Calculation Binders:

SCS-101C	SCS-146C
SCS-122C	SCS-187C
SCS-104C	SCS-125C

Extent

Isolated	Extensive X	Other (Specify)

Potential Finding Report

PFR No. 01 | Revision No. 1

Observation No. CTS-00-08 | Sheet 2 of 6

Design Impact

Acting alone or in combination, the deficiencies described above may lead to unacceptable support loads or stresses. If these or similar deficiencies exist for supports outside the review scope, such potentially generic deficiencies may have a significant safety impact.

Potential Safety Impact

See Attachment B (sheet 5 of 5).

Originated By Cognizant Group Leader J. P. Rees Date 5 OCT. 84

Approved By Project Engineer John C. Thornhill Date 10-9-84

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

Potential Finding Report

PFR No. 05 | Revision No. 1

Observation No. CTS-00-08 | Sheet 3 of 6

II Senior Review

	Yes	No
Further Review Required		X
Valid Observation	X	
Potential Safety Impact		X

Comments

Approved By Cognizant Senior Reviewer — Date 10/10/84

III Project Manager

Comments

Approved By Project Manager — Date 10/10/84

Texas Utilities Services, Inc.
Independent Assessment Program; 83090

POTENTIAL FINDING REPORT NO. 01

ATTACHMENT A

The cumulative effect of the following analysis techniques and/or procedures may have a potential impact on plant safety:

Observation No.	Description	Checklist No.
CTS-00-01	Neglect of self-weight excitation of Cable Tray Support.	CTS-11, -13, -24, -25, -32, -33, -34, -35, -37, -38, -39
CTS-00-02	Improper load combination by the SRSS method.	All
CTS-00-03	Computer modeling assumptions which resulted in improper load placement and the assumptions that a rigid one- or two-bolt base angle acts as a pinned rather than a fixed connection.	CTS-2, -3, -10, -11 -13, -24, -25, -26, -27, -28, -29, -30, -32, -33, -34, -35, -36, -37, -38, -39
CTS-00-05	Cantilever member with a two-bolt base connection assumed to act as a three- way restraint.	CTS-6, -14, -15, -16, -17, -18, -19 -20, -21, -22
CTS-00-06	Extrapolation of specific details from generic analyses which assume different member orientation.	CTS-11, -13,
CTS-00-07	Unconservative assumption for base plate behavior.	CTS-11, -13

The generic implications of these observations on cable tray supports throughout the plant should also be addressed.

POTENTIAL FINDING REPORT NO. 01

ATTACHMENT B

The resolution to Observations CTS-00-01 through CTS-00-07 shows that each observation, when considered on an individual basis only, has no impact on plant safety.

To evaluate the cumulative effect of these observations on tray supports across the plant, four factors were considered:

1. The margins to allowable stress and load levels in members and anchor bolts as determined by the Gibbs & Hill reanalysis effort.
2. The percentage of the total number of supports in the plant that were reviewed by Cygna.
3. The process by which field deviations from the original support design are reviewed.
4. The overall conservatisms in the design process for cable tray supports.

Each of these considerations is discussed below.

In response to the noted Observation, Gibbs & Hill reanalyzed a large percentage of the tray supports reviewed by Cygna. Their reanalysis incorporated (1) Cygna's comments, (2) more detailed modeling, and (3) specific response spectra (Reference: Cygna Technical File 11.2.1.50). An examination of the results shows that there is more than a 10% design margin in the support components, and, it should be noted, this reanalysis used conservative loadings.

Based on a survey by Gibbs & Hill, it was determined that the Cygna review covered a major portion of CPSES cable tray supports. Specifically, Cygna reviewed 60% of the generic support designs, which accounts for 70% of the designs. The remaining support designs are special application, of which Cygna reviewed 5%. In total then, 43% of the plant's support designs were reviewed. This quantity is sufficient to draw substantive conclusions concerning the overall design adequacy and plant safety.

Field deviations to the original support designs are satisfactorily addressed on CPSES. When a support with a deviation from the original design is installed, a Design Change Deviation (DCA) or a Component Modification Card (CMC) is issued by site personnel. These documents are reviewed by Gibbs & Hill to ensure that the deviations are acceptable and do not prevent the support from meeting its functional requirements. In the case of several

POTENTIAL FINDING REPORT NO. 01

ATTACHMENT B

changes to any particular support, all previous change documents are listed on each subsequent CMC or DCA. The document trail, as described, provides a basis to evaluate the support's ability to meet its functional requirement.

Overall, the design process for cable tray supports provides for plant safety. In addition to the above considerations, this conclusion is substantiated by the following items:

The Gibbs & Hillll reanalyses used assumed tray weights which are more than 20% greater than the actual weights.

The reanalyses employed conventional damping values. Such flexible frames, especially if highly stressed, would be candidates for higher damping values.

Cable tray support systems are typically ductile, with considerable load-sharing capabilities. Thus, local overstressed conditions can potentially be accomodated by the overall system.

Based on all the above, Cygna has concluded that this potential finding has no impact on overall plant design or safety. The potential finding is closed.

Independent Design Review Checklist

PIPING AND PIPE SUPPORTS

Reviewer S. Dillon, R. Hess R. V. Hess

Checklist No. WD-01 1 11

7/19/83 Date

Item	Satisfactory Yes	Satisfactory No	Comments
STRESS PROBLEM 1-151-C			
Starting at Spent Fuel Pool Suction Screen (CPI-SFSRSF-02)			
1. Screen to penetration			Measured from top of pool.
a. Dimensional agreement	x		No vertical dimension taken.
b. Piping orientation	x		
2. Penetration to 90° elbow turn to east and 24° down			
a. Dimensional agreement	x		
b. Piping orientation	x		
3. Elbow to support SF-X-032-012-F53K (D.P. 3109)			A PSA snubber was used. Further review
a. Dimensional agreement	x		shows it has an equivalent rating to
b. Piping orientation	x		the NPSI snubber specified in the bill of
c. FVR		x	materials.
4. Support SF-X-032-012-F53K to 90° elbow turn to north			
a. Dimensional agreement	x		
b. Piping orientation	x		
5. Elbow to support SF-X-032-013-F53K (D.P. 3108)			A PSA snubber was used. Further review
a. Dimensional agreement	x		shows it has an equivalent rating to
b. FVR		x	the NPSI snubber specified in the bill of materials.

As-Built Assessment Checklist

PIPING AND PIPE SUPPORTS

Reviewer(s) S. Dillon, R. Hess R. W. Hess

Checklist No. WD-02 Page 1 of 10

Review Date 7/21/83

Item	Satisfactory Yes	Satisfactory No	Comments
STRESS PROBLEM 1-151-A			
Starting at Pump CPX-SFAPSF-01 Discharge			
1. Pump discharge flange to branch line			
a. Dimensional agreement	x		
b. Piping orientation	x		
2. Branch line to valve XSF-003			
a. Dimensional agreement	x		
b. Valve orientation	x		
3. Valve XSF-003 to branch line			
a. Dimensional agreement	x		
b. Piping orientation	x		
4. Branch line to support SF-X-003-002-F43S (D.P. 1108)			Support is located 1" closer to branch in order to avoid elbow weld, still meets ± 2" tolerance of MS-100, Rev. 6.
a. Dimensional agreement	x		
b. FVR	x		
5. Support SF-X-003-002-F43S to support SF-X-003-006-F43K (D.P. 0028)			Snubber is installed inverted from support drawing depiction. See Observation WD-02-02.
a. Dimensional agreement		x	
b. FVR	x		

As-Built Assessment Checklist

PIPING AND PIPE SUPPORTS

Reviewer(s) S. Dillon, R. Hess R. W. Hess

Checklist No. WD-03 Page 1 of 12

Review Date 7/21/83

Item	Satisfactory Yes	Satisfactory No	Comments
STRESS PROBLEM 1-086A			
Starting at Spent Fuel Pool Heat Exchanger CPX-SPAHSF-01			
1. Heat exchanger to 90° elbow up.			
a. Dimensional agreement	x		
b. Piping orientation	x		
2. Elbow to branch connector			
a. Dimensional agreement	x		
b. Piping orientation	x		
3. Branch connector to support SF-X-005-015-F43S (D.P. 0004)			
a. Dimensional agreement	x		
b. FVR	N/A		Inaccessible.
4. Support SF-X-005-015-F43S to branch connector			
a. Dimensional agreement	x		
b. Piping orientation	x		
5. Branch connector to 90° elbow to north			
a. Dimensional agreement	x		
b. Piping orientation	x		

As--Built Assessment Checklist

PIPING AND PIPE SUPPORTS

Reviewer(s) S. Dillon, R. Hess R. W. Hess

Checklist No. WD-04 Page 1 of 2

Review Date 7/21/83

Item	Satisfactory Yes	Satisfactory No	Comments
STRESS PROBLEM 1-086C			
Starting at embedded plate			
1. Plate to 90° elbow to west			Inaccessible due to height. Visually O.K.
a. Dimensional agreement	x		
b. Piping orientation	x		
2. Elbow to support SF-X-033-010-F53R (D.P. 196)			Support SF-X-033-010-F53R
a. Dimensional agreement	x		deleted by Rev 3. of Dwg.
b. FVR	N/A		BRHL-SF-X-FB-027
3. Support SF-X-033-010-F53R to support SF-X-033-009-F53R (D.P. 98)			Inaccessible due to height. Visually O.K.
a. Dimensional agreement	x		
b. Drawing check	x		
4. Support SF-X-033-009-F53R to tee at El. 840'-2"			Inaccessible due to height. Visually O.K.
a. Dimensional agreement	x		
b. Piping orientation	x		
5. Tee to support SF-X-033-003-F53R (D.P. 116)			Inaccessible due to height. Visually O.K.
a. Dimensional agreement	x		
b. Drawing check	x		

CYGNA

As-Built Assessment Checklist

PIPING AND PIPE SUPPORTS

Reviewer(s) S. Dillon, R. Hess R. V. Hess

Checklist No. WD-05 **Page** 1 of 2

Review Date 7/21/83

Item	Satisfactory Yes	Satisfactory No	Comments
STRESS PROBLEM 1-086B			
Starting at backing plate			
1. Plate to 90° elbow to west			Inaccessible due to height. Visually O.K.
a. Dimensional agreement	x		
b. Piping orientation	x		
2. Elbow to support SF-X-005-031-F53R (D.P. 171)			Inaccessible due to height. Visually O.K.
a. Dimensional agreement	x		
b. Drawing check	x		
3. Support SF-X-005-031-F53R to TEE at El. 840'-2"			Inaccessible due to height. Visually O.K.
a. Dimensional agreement	x		
b. Piping orientation	x		
4. TEE to support SF-X-005-001-F53R (D.P. 179)			Inaccessible due to height. Visually O.K.
a. Dimensional agreement	x		
b. Drawing check	x		
5. Support SF-X-005-001-F53R to end cap to east			
a. Dimensional agreement	x		
b. Piping orientation	x		

As-Built Assessment Checklist
STRUCTURAL WALKDOWN

Reviewer(s) N.H. Williams

Checklist No. WD-06 Page 1 of 2

Review Date 7/19-21/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Unit 1 spent fuel pool cooling pump room El. 810'-6".			Walls, ceiling, and floors painted.
a. Floor	X		Formwork O.K. Concrete work outside
b. Walls	X		of pump rooms was not painted and
c. Ceiling	X		exhibited good workmanship.
2. Pump CPX-SFAPSF-01 foundation			Reference Dwg. 2323-S-0800, Rev. 5.
a. Location	X		
b. Size	X		
c. Finish and grout	X		
3. Heat Exchanger CPX-SFAHSF-01 foundation			Reference Dwg. 2323-S-0800, Rev. 5.
a. Location	X		
b. Size	X		
c. Finish and Grout	X		
4. Fuel pool pump suction penetration from pool			Visual inspection only.
a. Location	X		
b. Size	X		
5. Fuel pool pump discharge penetration from pool			Visual inspection only.
a. Location	X		
b. Size	X		

As-Built Assessment Checklist

ELECTRICAL WALKDOWN

Reviewer(s) John P. Bonner

Checklist No. WD-07 Page 1 of 6

Review Date 7/19-21/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Equipment Review			
a. Pump Motor Name Plate agrees with Pump Motor Data Sheet	x		
b. Pump distribution equipment is in agreement with one line diagram	x		
c. Control components type and models are in agreement with elementaries	x		
d. Local instrument types and models are in agreement with instrument list	N/A		Instrument list with model number data was not available.
e. Remote instrument types and models are in agreement with instrument list	N/A		
2. Equipment Installation Review			
a. Pump is installed at location shown on:			Pump is installed with single ground not double grounds. See observation WD-07-01.
• Equipment arrangement drawing	x		
• Equipment list	x		
• Pump is grounded in accordance with grounding drawing		x	
• Electrical erection specification (4.6.2)	x		

Reviewer(s)	John P. Bonner	Checklist No.	WD-07	Page	4 of 6
		Review Date	7/19-21/83		

Item	Satisfactory Yes	Satisfactory No	Comments
f. Control and alarm cables are terminated in accordance with wiring diagrams	x		Cable EØ014537 does not agree with drawing due to cable termination worn in progress
g. Instrument cable numbers are in accordance with:			
• Cable schedule	x		
• Wiring drawings	x		
h. Instrument cable constructions agrees with Cable Schedule			Could not be verified due to installation of cables in conduit.
• Number of conductors	x		
• Conductor size	x		
• Jacket and insulation	N/A		
• Voltage rating	N/A		
i. Instrument cables are terminated in accordance with wiring diagrams	N/A		Cables associated with JB-1A1730 not installed. To be installed later.
4. Raceway Installation Review			
a. Conduit associated with pump circuit cables are installed in accordance with:			Conduit C-02011928 installation revised per DCA-10,480.
• Conduit plans and details	x		
• Conduit support and drawing	x		

Design Control Process Assessment Checklist

Reviewer(s) P. Toner/M. Maire/D. Smedley D. Smedley

Checklist No. DC-01-01 **Page** 1 **of** 8

Organization/Activities Reviewed

TUSI Design Control General

Review Dates 7/11/83 - 7/18/83, 7/25/83

Personnel Contacted

J. Finneran, J.R. Van, P. Chang, B. Hill, K. Williams, P. Patel, R. Baker, G. McPheeters, M. Strange, C. Moehlman, L. Popplewell, G. Creamer, A. Vega, D. Walsh

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Where design change interfaces exist, have the following been prepared?	CP-EP-4.0 ¶3.2.2				Materials reviewed for this and all remaining checklists DC-01-03 through DC-01-08 are attached.
	a. Identification of Titles and responsibilities of key personnel.		X			Key personnel or organizations in procedures
	b. Establishment of lines of communication and controls.		X			Procedural coverage (EP, EI procedures)
	c. Control and distribution of documentation.		X			Procedural
2.	Have design change inputs been identified, documented, reviewed and approved on a timely basis?	CP-EP-4.0 ¶3.3	X			Design changes were reviewed. Note design changes were not generally incorporated (e.g. structural, architectual) in a timely manner into drawings & specifications.
3.	Are incoming documents received by PSE devices verified and receipt acknowledged?	CP-EI-4.0-1 ¶3.1.1	X			Reviewed a sample of incoming documents. In each case, the procedure was followed.

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
4.	Has an engineering committee been appointed by PSE for the review of in-house engineering data?	CP-EI-4.0-1 ¶3.2.1	X			The committee was composed of a Head, both Chief Engineers, 4 Lead Designers, QA representative plus 2 others depending upon discipline.
5.	Do PSE design package files consist of: a. Cover sheet? b. Design verification sheet? c. Finished sketches? d. Calculation sheets? e. Check copies of drawings? f. Computer input/output sheets (if applicable)? g. Final drawing(s)? h. Other documents, as applicable?	CP-EI-4.0-1 ¶3.2.3 DHE-3 DHE-6 DHE-4 DHE-5	X			Item e (Drawings) maintained in all active packages only.
6.	Has the engineer initialled and dated the cover sheet and each calculation sheet?	CP-EI-4.0-1 ¶3.2.6	X			For those calculations reviewed in support of design changes, the engineers intials were included as required.
7.	Has the PSE design verifier: a. Initialled sketches (DHE-4)? b. Initialled each calculation sheet (DHE-5)? c. Signed and dated the design verification sheet (DHE-6)? d. Initialled and dated the cover sheet (DHE-3)?	CP-EI-4.0-1 ¶3.2.6	X			Per procedure for those verified.

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
8.	Has the PSE drafter initialled the finished drawing and dated and initialled the cover sheet (DHE-3)?	CP-EI-4.0-1 ¶3.4.2	X			Per procedure for those verified.
9.	Has the PSE drafting checker high-lighted the drawings, indicating corrections in red and initialled and dated the check copy?	CP-EI-4.0-1 ¶3.4.3	X			Per procedure for those verified.
10.	Has the PSE drafting checker initialled each final drawing and intialled and dated the cover sheet (DHE-3)?	CP-EI-4.0-1 ¶3.4.5	X			1. Per procedure for those applicable drawings reviewed. 2. See Attachment 1 for a list of drawings reviewed.
11.	Has the PSE design verifier signified final completion (including final drawings) by: a. Printing name, signing and dating design verification? b. Initialling and dating cover sheet (DHE-6)? c. Initialling each check copy?	CP-EI-4.0-1 ¶3.5.1 and Figure 1	X			1. Per procedure for those applicable drawings reviewed. 2. See Attachment 1 for a list of drawings reviewed.
12.	Has the lead PSE engineer initialled and dated each final drawing and the cover sheet (DHE-3)?	CP-EI-4.0-1 ¶3.6	X			1. Per procedure for those applicable drawings reviewed. 2. See Attachment 1 for a list of drawings reviewed.

Design Control Process Assessment Checklist (cont.)

DC-01-01 | Checklist No. | Page 4 of 8

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
13.	Is a card index maintained of all drawings received from G&H by the Field Design Group which indicates the drawing number, current revision number, the transmittal letter which forwarded the drawing, and the date the drawing was received?	CP-EI-4.0-3 ¶3.2.3	X			Either cards or sheets maintained.
14.	Does FSEG document, in writing, any changes in criteria or new criteria to CPECM?	CP-EI-4.0-4 ¶2.4.2	X			1. CMC used for a specific one time change. 2. DCA used for a Generic/New Item
15.	Does the FSEG supervisor maintain a list of persons qualified and authorized to check, approve and design review documents?	CP-EI-4.0-4 ¶2.5.1	X			A list exists and is maintained by the FSFG supervisor.
16.	Are FSEG design change documents initialled by the draftsman or preparer?	CP-EI-4.0-4 ¶3.5	X			Per procedure for sample reviewed.
17.	Has the FSEG engineer performing review and/or design calculations initialled each document?	CP-EI-4.0-4 ¶3.6	X			Review of CMC/DCA disclosed that he initials each calculation and performs the design review.
18.	Are FSEG documents approved, in initialling, by an authorized approver?	CP-EI-4.0-4 ¶3.7	X			FSEG approves changes and drawings only; calculations are reviewed and checked by G&H/NY.

CYGNA

Design Control Process Assessment Checklist (cont.)

DC-01-01 | Checklist No. | Page 5 of 8

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
19.	Are all FSEG controlled drawings stamped and given a control number?	CP-EI-4.0-4 ¶3.8 and Figure 6	X			Per procedure as noted in Document Control Center # 65
20.	Is a log maintained indicating the controlled distribution, the number of copies issued, issue dates of revisions and receipt acknowledgement date?	CP-EI-4.0-4 ¶3.8 and Figure 1	X			1. Per procedure for sample reviewed. 2. 50 copies are generally issued to craft, 20 to QC and copies to DCC 18 and G&H/NY.
21.	Are FSEG documents issued by transmittal form?	CP-EI-4.0-4 ¶3.9 and Figure 2	X			Per procedure for sample reviewed.
22.	Has each FSEG design change document been reviewed?	CP-EI-4.0-4 ¶3.11.1	X			Per procedure for sample reviewed.
23.	Is a design review log maintained that indicates document and revision number, design review responsibility, design review date and design reviewer?	CP-EI-4.0-4 ¶3.11.2	X			1. Design Reviews by G&H. 2. The log states "G&H".
24.	For off-site design review, has FSEG informed the review organization in writing and has the review organization formally acknowledged review completion?	CP-EI-4.0-4 ¶3.11.3	X			Per procedure for sample reviewed.

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
25.	Does FSEG maintain a log for each drawing that shows any deviations for that drawing?	CP-EI-4.0-4 ¶3.12.4 and Figure 4			X	2323-S-910 series drawings/ design changes were not reviewed. See Item #11 of check-list DC-01-02 and attachment #7 of DC-01-01 for drawings/design changes reviewed.
26.	Does the FSEG file custodian acknowledge DCA/CMCs by initialling and dating the deviation distribution sheet?	CP-EI-4.0-4 ¶3.12.5 and Figure 5	X			Per procedure for sample reviewed.
27.	Do FSEG controlled copy holders audit their design change logs bi-annually by coming to FSEG for a log comparison followed by an audit of their files vs. the log? Are these audits confirmed in writing?	CP-EI-4.0-4 ¶3.13.1, 3.13.2 and 3.13.3	X			Reviewed Audit file for FSEG audits performed.
28.	Does IEG maintain a log for each drawing indicating the applicable CMC's and review status?	CP-EI-4.0-6 ¶2.5	X			Log indicated applicable CMCs
29.	Are I&C FSIs modified by CMCs or drawing revisions and approved by designated persons?	CP-EI-4.0-6 ¶3.1.4	X			Per procedure for sample reviewed.

CYGNA

Design Control Process Assessment Checklist (cont.)

DC-01-01 | Checklist No. | Page 7 of 8

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
30.	Does IEG forward design changes to PSDG for engineering evaluation?	CP-EI-4.0-6 ¶3.1.4			X	No changes identified as applicable to PSDG.
31.	Are 2323-I-001 package drawings modified by CMC or drawing revisions and does the CPPI&C engineer make a determination, if the modification is a design change?	CP-EI-4.0-6 ¶3.2.4	X			Per procedure for sample reviewed.
32.	Are 2323-I-001 modifications approved by designated personnel and, if design changes, forwarded to PSDG for engineering evaluation?	CP-EI-4.0-6 ¶3.2.4	X			Per procedure for sample reviewed.
33.	Are 2323-I-002 design changes:	CP-EI-4.0-6				These are exceptions to designs and will not be incorporated.
	a. modified by CMC or drawing revision?		X			Per procedure for sample reviewed.
	b. approved by CPPI&C Engineer?		X			Per procedure for sample reviewed.
	c. transmitted to EDS for design review?		X			Per procedure for sample reviewed.
34.	Are design change documents from vendors to TSMD logged in?	CP-EI-4.0-22 ¶3.1	X			A card file is established per the procedure and includes drawing #, revision #, date received, date released, Letter Transmittal #.
35.	Are BRPs initialled by the drafter and reviewer?	CP-EI-4.0-22 ¶3.2.1	X			Per procedure for sample reviewed.

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
36.	Is a log maintained indicating all outstanding design changes against BRPs?	CP-EI-4.0-22 ¶3.3		X		Discrepancies noted between log and design change status at DCC.TSMD group was aware of condition and was correcting log status at time of review.
37.	Are all documents which have been incorporated into BRPs referenced?	CP-EI-4.0-22 ¶3.3	X			Per procedure noted on two BRPs in production.
38.	Are changes to drawings "clouded" with the new revision number indicated in a small triangle? Are all previous "clouds" and revision numbers removed?	CP-EI-4.0-22 ¶3.3	X			Per procedure for sample reviewed.
39.	Has the checker initialled all drawings?	CP-EI-4.0-22 ¶3.3	X			Per procedure for sample reviewed.
40.	Are "as-built" BRPs initialled by both the drafting approver and the TSAB coordinator?	CP-EI-4.0-22 ¶3.4			X	None observed
41.	Have BRHs prepared from FMHSs and VCDIs had the Brown & Root logo and revision block added, annotated with "blueline" and been initialled by the drafter, checker and approver?	CP-EI-4.0-22 ¶3.5.1 and Attachment A	X			Per procedure for sample reviewed.
42.	Have "bluelines" been initialled by engineering?	CP-EI-4.0-22 ¶3.5.1 and Attachment A	X			Per procedure for sample reviewed, either signed or initialed.

CYGNA

Design Control Process Assessment Checklist

Reviewer(s) J. P. Toner

Checklist No. DC-01-02 Page 1 of 5

Organization/Activities Reviewed

CPSES Site Document Control

Review Dates 7/11 & 12/83

Personnel Contacted

F. Strand, R. Smith, P. Parker, S. Brown, K. Norman, D. Hatley, D. Bleeker, H. Hutchinson

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
	DISTRIBUTION OF DOCUMENTS					See Attachments to Checklist DC-01-01 for a list of documents reviewed.
1.	Are controlled document recipients identified by their respective control numbers on the Distribution Routing Control List (DRCL)?	Brown & Root DCP-3 ¶3.1.1.1	X			The DRCL is on computer output. See sample format in Attachment 6 to Checklist DC-01-01.
2.	Does the Document Disposition Form list recipient control numbers, document number, and the quantities distributed?	DCP-3 ¶3.1.1.1 Attachment 2	X			Per procedure but also includes the signature of recipient.
3.	Are all design changes distributed to holders of affected controlled documents?	DCP-3 ¶3.1.1.1	X			Refer to Attachment 7 in Checklist DC-01-01 for Design Change distribution.
4.	Are issuance and receipt of design changes documented on the Document Distribution Log by signature or initial of the file custodian?	DCP-3 ¶3.1.1.1 Attachment 5	X			The initials of the recipient appear on the form.

Design Control Process Assessment Checklist

Reviewer(s) J. P. Toner, D. Smedley, M. Maire

Checklist No. DC-01-03 Page 1 of 7

Organization/Activities Reviewed

TUSI Drawing Update Activities

Review Dates 7/12, 7/13, 7/18/83

Personnel Contacted

M. Strange, S. Ellis, R. Williams

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
						See Attachments to checklist DC-01-01 for a list of documents reviewed.
1.	Has the nuclear engineering manager established, documented and implemented a program for the review and approval of design changes?	CP-EP-4.9 ¶2.3	X			Each individual engineering department is responsible for review and approval of design changes.
2.	Has the DCTG incorporated field design changes into design drawings in accordance with the following criteria?	CP-EP-4.9 ¶3.1				
	a. The G&H DCA/CMC checklist (Ref. 1-C) specifies incorporation or,		X			Per procedure for sample reviewed.
	b. DESIGN CHANGE AUTHORIZATIONS (DCA's) state the change "will be incorporated in design documents," or,		X			Per procedure for sample reviewed. However, each DCA is further reviewed for incorporation and the initial determination can change.

CYGNA

Design Control Process Assessment Checklist

Reviewer(s) J.P. Toner/M. Maire

Checklist No. DC-01-04 Page 1 of 9

Organization/Activities Reviewed

TUSI Field Design Change Control

Review Dates 7/11/83 - 7/18/83

Personnel Contacted

F. Strand, R. Hooten, G. Creamer, M. Stange, P. Patel, R. Baker, C. Moehlman, L. Poppleweli, J. Finneran

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
						Refer to Attachments to Checklist DC-01-01 for documents reviewed.
	GENERAL					
1.	Have all design changes/deviations to specified design/construction requirements been documented by a Design Change Authorization (DCA) or a Component Modification Card (CMC)?	CP-EP-4.6 ¶2.5	X			Currently only DCA's or CMC's are generated for design changes. Prior to current procedure requirements, design changes were also issued as DE/CD or DC/DDAs. See Attachment 5 to Checklist DC-01-01.
	DESIGN CHANGE AUTHORIZATION					
2.	Has the DCA form been completed as follows:	CP-EP-4.6 Attachment 1 & Figure 1				
	a) DCA Number - assigned by Administrative Services Office when DCA is ready for signature.		X			Per procedure for sample revised. See Attachment 3 to Checklist DC-01-01.

Design Control Process Assessment Checklist

Reviewer(s): J.P. Toner, M. Maire

Checklist No.: DC-01-05

Organization/Activities Reviewed: TUSI Design Control General

Review Dates: 7/11/83 - 7/13/83

Personnel Contacted: M. Strange, S. Ellis

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
						Refer to Attachments to Checklist DC-01-01 for documents reviewed.
1.	Have adequate TSG instructions been prepared to supplement the TSG Design Control procedure?	CP-EP-4.4 ¶2.4	X			1. TSG is now TNE; therefore, procedure requires revision. 2. See CP-EP-4.9 and Checklists DC-01-03 & DC-01-07.
2.	Has TSG maintained a record of designers acting for other individuals?	CP-EP-4.4 ¶2.4			X	Not observed during this review.
3.	Have personnel involved in the design change control program been trained and indoctrinated in accordance with CP-EP-2.0 and the records attesting to their proficiency being controlled by TSG?	CP-EP-4.5 ¶2.5	X			Personnel training records were not reviewed. However, personnel interviewed indicated knowledge of procedural requirements.

CYGNA

Design Control Process Assessment Checklist

Reviewer(s): J. P. Toner, M. Maire

Checklist No. DC-01-06 Page 1 of 4

Organization/Activities Reviewed: TUSI Design Verification (Design Changes)

Review Dates: 7/12/83 - 7/15/83

Personnel Contacted: C. Moehlman, L. Popplewell, R. Baker, K. Hooten, G. Creamer, P. Patel, J. Finneran

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
						See Attachments to Checklist DC-01-01 for a list of documents reviewed.
1.	Has Design Change Verification been done in accordance with instructions that outline the requirements and/or the methods to be used?	CP-EP-4.5 ¶3.1	X			1. Pipe support & I&E perform verification; G&H performs the balance. 2. See DC-02 Series Checklists for G&H reviews.
2.	Has Design Change Verification been performed by someone other than the one who performed the original calculation?	CP-EP-4.5 ¶3.1	X			Per procedure for sample reviewed.
3.	Has Design Change Verification included an evaluation of the effects of the change(s) on the overall design?	CP-EP-4.5 ¶3.1	X			Per procedure where applicable.
4.	When applicable, has the Design Change verification been verified by the original designer?	CP-EP-4.5 ¶3.1	X			Per procedure for sample reviewed.

CYGNA

Design Control Process Assessment Checklist

Reviewer(s) J. P. Toner
M. Maire

Checklist No. DC-01-07 Page 1 of 3

Organization/Activities Reviewed
TUSI Field Design Change Control - DCTG

Review Dates 7/12 - 13/83,

Personnel Contacted
M. Strange, C. Knight, S. Ellis

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
						Refer to Attachments to Checklist DC-01-01 for documents reviewed.
1.	Have DCAs and CMCs been received by DCTG from CPPE groups in the specified manner?	CP-EP-4.7 ¶3.1	X			Per procedure for sample reviewed but most are hand carried
2.	Has DCTG obtained the pertinent supporting documents?	CP-EP-4.7 ¶3.1	X			Per procedure for drawings reviewed
3.	Have conduit support field design changes been transmitted directly to G&H/NY by FSEG with a copy of the transmittal letter being sent to DCTG?	CP-EP-4.7 ¶3.2(c)	X			Per procedure for "S-910 Series" documents
4.	Have all other types of design changes been sent to DCTG for disposition as appropriate?	CP-EP-4.7 ¶3.2(A) (B)(D)(E)(F)	X			Cable/Pipe support for info only

Design Control Process Assessment Checklist

Reviewer(s) J.P. Toner, S. Bibo, M. Maire

Checklist No. DC-01-08 Page 1 of 7

Organization/Activities Reviewed

TUSI Interface Control

Review Dates 7/11/83 - 7/26/83

Personnel Contacted M. Strange, R. Kissinger, G. Creamer, A. Vega, C. Moehlman, R. Hooten, P. Patel, G. Purdy, J. Finneran, L. Popplewell, R. Williams, D. Walsh

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
						Refer to Attachments to Checklist DC-01-01 for documents reviewed.
1.	When an interface has been identified, have the following been established and approved: a. Titles and responsibilities of key personnel? b. Lines of communication and controls? c. Control and distribution of documentation?	CP-EP-4.0 ¶3.2.2	X			Refer to Checklist DC-01-01, Item No. 1
2.	Have persons installing expansion anchors not meeting the minimum separation requirements obtained engineering approval prior to installation and is that approval on the proper form?	CP-EP-4.3 ¶3.2.2 Attachment 6	X			Approval by EESV (Engineering Evaluation of Separation Variance), on a risk basis.

Design Control Process Assessment Checklist

Reviewer(s) S. L. Ribo SLR
S. C. White SCW

Checklist No. DC-02-01 Page 1 of 3

Organization/Activities Reviewed
Design Change - G&H Headquarters

Review Dates 7/18-7/22/83

Personnel Contacted
C. Chapman: G&H Project Engineer
B. Czarnogorski: G&H Project QA Engineer

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
	DESIGN CHANGES					
1.	Are changes or deviations that are made to a G&H design document after the document has been issued for fabrication or construction, documented on a Design/Engineering Change/Deviation (DE/CD) form?	G&H Procedure PC - 9 ¶2.2 and Appendix PC-9-1	X			See Attachment 1 to this Checklist.
2.	Has the originating discipline Job Engineer reviewed the change/deviation for 10CFR21 applicability and checked the appropriate block on the DE/CD form?	PC-9 ¶2.3	X			See Attachment 1
3.	Have all appropriate interdiscipline approvals been obtained on the DE/CD form?	PC-9 ¶2.4	X			See Attachment 1

Design Control Process Assessment Checklist

Reviewer(s): S. L. Bibo, S. C. White

Checklist No. DC-02-02 Page 1 of 5

Organization/Activities Reviewed: Processing of Design Changes (DCAs and CMCs)

Review Dates: 7/18-7/22/83

Personnel Contacted:
C. Chapman: G&H Project Engineer
B. Czarnogorski: G&H Project QA Engineer

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
	GENERAL					
1.	Are copies of CMC's/DCA's forwarded from the CPSES site to G&H New York?	G&H Project Guide (PG)-24 ¶C.1	X			Based on review of Project Coordinator Files
2.	Has the Project Coordinator (PC) for CMC's/DCA's logged the received date for each document on a form or entered it directly into the log by CRT, and indicated the distribution?	PG-24 ¶C.2	X			Based on Review of: 1. CMC Affected Document Report (CPR 501) dated 7/16/83 2. DCA Affected Document Report (CPR 501) dated 7/12/83
3.	Has the PC identified the received date and the CMC/DCA number on the "Change vertification Checklist for CMC's and DCA's" form (Attachment B) and attached this form to each DCA/CMC for distribution to the Lead Discipline Engineer?	PG-24 ¶C.3	X			See Attachment 1 for Review of Actual Checklists

Design Control Process Assessment Checklist

Reviewer(s): S. L. Bibo, S. C. White

Checklist No. DC-C2-03 Page 1 of 3

Organization/Activities Reviewed: G&H - Design Change Control - Specifications

Review Dates: 7/18-7/22/83

Personnel Contacted:
C. Chapman: G&H Project Engineer
B. Czarnogorski: G&H Project QA Engineer

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
	GENERAL					
1.	Are revisions/changes to specifications processed in the same manner as the original specification?	DC-5 ¶6.1	X			1. The following specifications were reviewed: MS13, MS29A, MS51, MS-64 2. All revisions and addenda were checked. Refer to Attachment 1 of this Checklist for details of the review.
2.	Are subsequent issues of specifications reviewed and approved by supporting disciplines when the new issue has revisions affecting their areas of responsibility?	DC-5 ¶6.2	X			
3.	Are the specification revision number and date conspicuously identified on the cover sheet directly below the original issue date?	DC-5 ¶6.4	X			

Design Control Process Assessment Checklist

Reviewer(s): S. L. Bibo SLB
S. C. White S.C.W. for SCW

Checklist No. DC-02-04 Page 1 of 7

Organization/Activities Reviewed: G&H Design Change Control - Calculations

Review Dates: 7/18-7/22/83

Personnel Contacted:
C. Chapman: G&H Project Engineer
B. Czarnogorski: G&H Project QA Engineer

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
	GENERAL					
1.	Does the Job Engineer maintain a file and index of calculations in his discipline?	DC-7 ¶3.1	X			Reviewed the following Calcs: Calc 235 Series: 235-1-Spent Fuel Pool Pressure drop 235-3-Spent Fuel Pool Skimmer 235-4-Cask Pit&Transfer Canal pump drc
2.	Are calculations which are classified as "Nuclear Safety Related" or "Non Nuclear Safety Related-QA Program Applicable" design reviewed?	DC-7 ¶2.2	X			Calc 235-1, Rev. 1, 2, 3
	PREPARATION					
3.	Are calculations (originated at G&H New York) prepared on G&H standard calc sheets (Appendix DC-7-II) in a neat and orderly manner so that assumptions, methods, and results can be readily checked?	DC-7 ¶4.1	X			Calc 235-1, 235-3, and 235-4

Design Control Process Assessment Checklist

Reviewer(s)
S. L. Bibo SLB
S. C. White SCW

Checklist No. DC-02-05 Page 1 of 2

Organization/Activities Reviewed
DC-3, Rev. 5, "Drawing Production Procedure"

Review Dates
7/18-7/22/83

Personnel Contacted
C. Chapman: G&H Project Engineer
B. Czarnogorski: G&H Project QA Engineer

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Is there evidence that all "nuclear safety related" drawings and changes thereto exhibit/display:					
	a. Evidence of the drawing being "checked" for: completeness, accuracy, correctness, adherence to design documents, correctness/adequacy of layout, and OSHA Requirements?	DC-3 ¶4.1	X			See Attachment 1 to this Checklist for a list of drawings.
	b. Evidence of approval by the squad leader of the originating discipline?	DC-3 ¶5.1	X			See Attachment 1.
	c. Evidence of a design review in accordance with DC-8 (design review procedure)?	DC-3 ¶5.3	X			See Attachment 1.
	d. The lead discipline job Engineer/Supervising Engineer approval for: conformity with established design concepts, satisfactory checking, adherence to SAR requirements, and adherence to codes and standards?	DC-3 ¶5.4	X			See Attachment 1.

Design Control Process Assessment Checklist

Reviewer(s): S. L. Bibo SLB
S. C. White SCW for SCW

Checklist No. DC-02-06 Page 1 of 3

Organization/Activities Reviewed

DC-8, Rev G. "Design Review Procedure - Calculations, Drawings, Specifications"

Review Dates: 7/18-7/22/83

Personnel Contacted

C. Chapman: G&H Project Engineer
B. Czarnogorski: G&H Project QA Engineer

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Is there evidence that design reviews are performed by qualified personnel and are such personnel identified on a list of designated design reviewers maintained by the Project Manager?	DC-8 ¶2.2	X			Reviewed List Maintained by P. M.: Design Reviewed / Discp / Document Reviewed Scheller / Elec / Dwg E1-0005 Renko / Elec / Dwg E1-0020 Giannuzzi / Mech / Specs Horovitz / Mech / Specs Morris / Mech / Specs Totten / Mech / Calcs
2.	Is there evidence that design reviewers are independent in that they have had no input into the design they are tasked with reviewing?	DC-8 ¶2.3	X			Based on not signing documents as preparer/checker & based on review of P. M. list and discussions with P. M., P. E. and Lead Discipline Engineers
3.	Are all design reviews performed utilizing a checklist applicable to each discipline and do the checklists establish the items to be addressed by the reviewer and identify the source documents?	DC-8 ¶3.1	X			Seperate checklists for each discipline (i.e. Mech, Struct, Elec. etc.) are used. In addition, within each discipline, there are specific checklists for each type of document (i.e. Specs, Calcs, Dwgs)

Design Control Process Assessment Checklist

Reviewer(s)
S. L. Bibo SLB
S. C. White SCW per SCW

Checklist No. DC-02-07 Page 1 of 3

Organization/Activities Reviewed
G&H Interface Control (G&H Project Guides, Section V)

Review Dates
7/18-7/26/83

Personnel Contacted
M. Strange (SITE), C. Chapman: G&H Project Engineer
B. Czarnogorski: G&H Project QA Engineer

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Are changes in disciplines' Q-Lists submitted to the mechanical-nuclear job engineer for incorporation into the project Q-List?	Sect. 4.a Page V-3	X			Amendment 38 to FSAR Section 17A was signed off by all disciplines including Mechanical Job Engineer
2.	Does G&H send drawings to TUSI for approval and, at the same time, aperture cards to DCC?	Sect. 4.b.(3) Page V-3a			X	Per PC-2, Rev. 2, TUSI Approval of dwgs is no longer required and cards no longer sent (Refer to Client letter TSG-1759 (12/30/82)
3.	Does G&H maintain an up to date listing of CPSES Nonconformance approval delegation?	Sect. 4.b.(6) Page V-3a	X			See Attachment 1 to this Checklist
4.	Are records of nonconformance approval by CPSES forwarded TO G&H?	Sect. 4.b.(6) Page V-3b	X			Via Distribution of DCA/CMC/DECD's
5.	Are disapproved documents returned by CPP Engineer to G&H/NY on a Status 2 document form?	Sect. 4.b.(8) Page V-3b	X			See Attachment 2 to this Checklist

Design Control Process Assessment Checklist

Reviewer(s): S. Bibo, J. Toner

Checklist No. DC-02-08 Page 1 of 7

Organization/Activities Reviewed: Gibbs & Hill/Analysis Control - Processing of Calculations (Electrical)

Review Dates: 9/12/83 thru 9/16/83

Personnel Contacted: P. Lalaji, S. Matirovich, B. Czarnogorski

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
	GENERAL					
1.	Does the Job Engineer maintain a file and index of calculations in his discipline?	DC-7 ¶3.1	X			Reviewed calculation index for electrical calculations filed in the G&H Job Book.
2.	Are calculations which are classified as "Nuclear Safety Related" or "Non-Nuclear Safety Related-QA Program Applicable" design reviewed?	DC-7 ¶2.2	X			Calculation IV-1 - "6.9 KV Bus Voltage Study" and Calculation VII-1 - "Cable Sizing Calculation" were both design reviewed.
	PREPARATION					
3.	Are calculations (originated at G&H New York) prepared on G&H standard calculation sheets (Appendix DC-7-II) in a neat and orderly manner so that assumptions, methods, and results can be readily checked?	DC-7 ¶4.1	X			Refer to Item No. 2 for calculations reviewed.

Design Control Process Assessment Checklist

Reviewer(s) S. Bibo SJB
J. Toner JTM

Checklist No. DC-02-09 Page 1 of 2

Organization/Activities Reviewed
Gibbs & Hill/Analysis Control - Design Review of Calculations (Electrical)

Review Dates 9/12/83 thru 9/16/83

Personnel Contacted
P. LaLaji
B. Czarnogorski

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Is there evidence that design reviews are performed by qualified personnel and are such personnel identified on a list of designated design reviewers maintained by the Project Manager?	DC-8 ¶2.2	X			Reviewed the 1/20/83 list of authorized design reviewers. Calculation IV-I and VII-I were design reviewed by B. Lusin who is on list of design reviewers.
2.	Is there evidence that design reviewers are independent in that they have had no input into the design they are tasked with reviewing?	DC-8 ¶2.3	X			Review of Calculation IV-1 and VII-I revealed that B. Lusin had no input.
3.	Are all design reviews performed utilizing a checklist applicable to each discipline and do the checklists establish the items to be addressed by the reviewer and identify the source documents?	DC-8 ¶3.1	X			Calculations IV-I and VII-I documented design reviews on checklist titled "Design Review Checklist - Electrical Calculations."

Design Control Process Assessment Checklist

Reviewer(s) S. Bibo, J. Toner

Checklist No. DC-02-10 Page 1 of 7

Organization/Activities Reviewed

Gibbs & Hill/Analysis Control - Processing of Calculations (Mechanical)

Review Dates 9/12/83 thru 9/16/83

Personnel Contacted

H. Mantel C. Chapman
W. Cristali B. Czarnogorski

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
	GENERAL					
1.	Does the Job Engineer maintain a file and index of calculations in his discipline?	DC-7 ¶3.1	X			Reviewed the piping calculation index "CPSES As-built Piping Analysis Tracking Report" dated 6/28/83 and the mechanical calculation index dated 7/6/83.
2.	Are calculations which are classified as "Nuclear Safety Related" or "Non-Nuclear Safety Related-QA Program Applicable" design reviewed?	DC-7 ¶2.2	X			Reviewed calculations AB-1-69 "RHR/Safety Injection System" and AB-1-70 "RHR System"
	PREPARATION					
3.	Are calculations (originated at G&H New York) prepared on G&H standard calculation sheets (Appendix DC-7-II) in a neat and orderly manner so that assumptions, methods, and results can be readily checked?	DC-7 ¶4.1	X			Reviewed Calculations AB-1-69 and AB-1-70.

Design Control Process Assessment Checklist

Reviewer(s) S. Bibo
J. Toner

Checklist No. DC-02-11 Page 1 of 2

Organization/Activities Reviewed

Gibbs & Hill/Analysis Control - Design Review of Calculations (Mechanical)

Review Dates 9/10/83 thru 9/16/83

Personnel Contacted H. Mantel B. Czarnogorski
C. Chapman

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Is there evidence that design reviews are performed by qualified personnel and are such personnel identified on a list of designated design reviewers maintained by the Project Manager?	DC-8 ¶2.2	X			Reviewed the 8/3/82 list of authorized design reviewers. Calculation AB-1-69 was design reviewed by P. Zarney and Calculation AB-1-70 was design reviewed by H.Y. Chang. Both individuals were on the list.
2.	Is there evidence that design reviewers are independent in that they have had no input into the design they are tasked with reviewing?	DC-8 ¶2.3	X			Review of Calculation AB-1-69 revealed that P. Zarney had no input. For Calculation AB-1-70 H.Y. Chang had no input.
3.	Are all design reviews performed utilizing a checklist applicable to each discipline and do the checklists establish the items to be addressed by the reviewer and identify the source documents?	DC-8 ¶3.1	X			Design review for calculation AB-1-69 and AB-1-70 were documented on checklists entitled "Design Review Checklist - Calculation and Analysis - Applied Mechanics."

Design Control Process Assessment Checklist

Reviewer(s) S. Bibo
J Toner

Checklist No. DC-02-12 Page 1 of 8

Organization/Activities Reviewed

Gibbs & Hill/Analysis Control - Processing of Calculations (Structural)

Review Dates 9/12/83 thru 9/16/83

Personnel Contacted P. Huang B. Czarnogorski
C. Chapman

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
	GENERAL					
1.	Does the Job Engineer maintain a file and index of calculations in his discipline?	DC-7 ¶3.1	X			Reviewed the structural master calculation index for cable tray and conduit supports.
2.	Are calculations which are classified as "Nuclear Safety Related" or "Non-Nuclear Safety Related-QA Program Applicable" design reviewed?	DC-7 ¶2.2	X			Calculations SCS-101C sets 1 and 3 and SCS-104C, sets 1, 4 and 5 were design reviewed.
	PREPARATION					
3.	Are calculations (originated at G&H New York) prepared on G&H standard calculation sheets (Appendix DC-7-II) in a neat and orderly manner so that assumptions, methods, and results can be readily checked?	DC-7 ¶4.1	X			Calculations SCS-101C sets 1 and 3 and SCS-104C sets 1, 4 and 5 were reviewed.

Design Control Process Assessment Checklist

Reviewer(s) S. Bibo
J. Toner

Checklist No. DC-02-13 Page 1 of 2

Organization/Activities Reviewed
Gibbs & Hill/Analysis Control - Design Review of Calculations (Structural)

Review Dates 9/12/83 thru 9/16/83

Personnel Contacted
Peter Huang
B. Czarnogorski

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Is there evidence that design reviews are performed by qualified personnel and are such personnel identified on a list of designated design reviewers maintained by the Project Manager?	DC-8 ¶2.2	X			See Attachment 1 to this checklist.
2.	Is there evidence that design reviewers are independent in that they have had no input into the design they are tasked with reviewing?	DC-8 ¶2.3	X			See Attachment 1 to this checklist.
3.	Are all design reviews performed utilizing a checklist applicable to each discipline and do the checklists establish the items to be addressed by the reviewer and identify the source documents?	DC-8 ¶3.1	X			All calculations reviewed (SCS-101C Sets 1 and 3 and SCS-104C, Sets 1, 4 and 5) were identified as being design reviewed on structural checklists for calculation review (form 722A dated 10/76).

Design Control Process Assessment Checklist

Reviewer(s) S. Bibo, J. Toner

Checklist No. DC-02-14 Page 1 of 3

Organization/Activities Reviewed: Gibbs & Hill/Analysis Control - Computer Usage

Review Dates: 9/13/83 and 9/14/83

Personnel Contacted: B. Fried, M. Tipishana, B.C. Zarnogorski

Item No.	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Has the Department Manager or Chief Engineer approved the Form F-736 for the use of the computer program?	EDP-10, Rev. 2 ¶3.c	X			The following programs were reviewed for approval: Program — Approver ADLPIPE/2C #5017 — C. Corban, 12/81 ADLPIPE/1C #5017 — C. Corban, 6/80 ANSYS, Rev. 3 (V67L) — C. Corban, 1/82 CYLNOZ, Version 2 — C. Corban, 3/82
2.	Have all Class A programs been verified?	EDP-10 ¶3.d	X			The programs identified as follows were verified. Program — Verification Date ADLPIPE/2C — 12/18/81 ADLPIPE/1C — 12/18/81 ANSYS, Rev. 3 — 12/18/81 CYLNOZ, Version 2 — 12/18/81
3.	Have the programs been verified on the basis of one of the following: • hand calculation? • benchmark to another program previously verified or accepted by the NRC? • standard test problems?	EDP-10 ¶4.0	X			a) ADLPIPE/2C, Test Run Job #1262 was compared with the Verification Job #504 for the verification of ADLPIPE/1C. b) ADLPIPE/1C was verified against ADLPIPE/1B via the sample problem 1-51D. c) ANSYS runs were compared with the Swanson Verification Manual.

Design Control Process Assessment Checklist

Reviewer(s): S. L. Bibo

Checklist No.: DC-03-01

Page: 1 of 6

Organization/Activities Reviewed: Brown & Root Interface Control

Review Dates: 7/27-7/29/83

Personnel Contacted: G. Purdy, D. Wade, C. Bennetzen, R. Tolson

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Does the B&R site QA Manager review and approve owner provided procedures and instructions which affect code fabrication or installation	QAM ¶6.4.4	X			Reviewed procedure CP-SAP-6 Rev. 9 - "Control of work on station components after release from construction to TUGCO" & CP-SAP-3, Rev 12 - "Custody tagging of station components."
2.	Have NCRs dispositioned "Use as is" been approved by the engineer		X			1. NCR 2807 Rev. 0 & Rev. 1 reviewed. 2. See Attachment 1 to this Checklist.
3.	Has the Procurement and Surveillance Group (PSG) Supervisor established and executed a system for accomplishment and documentation and source surveillances?	CP-QAP-8.3 ¶2.1, 2.2			X	Per discussion with TUSI personnel a review of surveillance procedura system was determined to be out of scope of Brown & Root project responsibilities.
4.	Have hold/surveillance points been established during the life of the P.O. or contract?	CP-QAP-8.3 ¶3.1.2			X	See Item 3 above.
5.	Has the PSG Supervisor determined the extent of an established a plan for source inspection?	CP-QAP-.3 ¶3.1.3			X	See Item 3

Design Control Process Assessment Checklist

Reviewer(s) S. L. Bibo

Checklist No. DC-03-02 Page 1 of 5

Organization/Activities Reviewed

Brown & Root Interface Control

Review Dates 7/27-7/29/83

Personnel Contacted

G. Purdy, D. Wade, C. Bennetzen, R. Tolson

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
1.	Has the Quality Engineering Group performed site initiated qualification surveys and audits of vendors providing design services?	QAM ¶3.2.6.1			X	B&R has no responsibility for Auditing/Surveying vendors providing design services. B&R's only interface with vendors is to purchase bulk material.
2.	Have DCA's and/or CMC's been issued to the engineer when the design cannot be completed? NOTE: In general, DCA's reflect changes to specs, CMC's to change documents used directly in construction/fabrication.	QAM ¶4.3	X			Based on a review of discipline engineer group files and DCC computerized disposition lists. (Also see checklist DC-01-02 Item 8)
3.	Does the QE Group verify and document fabrication or installation design changes?	QAM ¶4.4	X			Reviewed the following: BRP-SF-X-054 Rev. 4 - CMC-91934 & CMC-81533 2323-MS-50, Rev. 1 - DCA-18058 2323-MS-51, Rev. 2 - DCA-18059 2323-M-801, Rev. 4 & BRP-CC-X-FB-001 Rev. 5, CMC-92150 2323-M-801, Rev. 4 & BRP-CC-1-FB-002 Rev. 9, CMC-94219

Design Control Process Assessment Checklist

Reviewer(s): J.P. Toner, M. Maire

Checklist No. DC-04-01 Page 1 of 4

Organization/Activities Reviewed: Supplier Design Change & Interface Control

Review Dates: 7/19/83 - 7/22/83

Personnel Contacted: R. Gentry, J. R. Yan, R. Wright, B. Jones, B. Hill, A. Vega, J. Gore, L. Smaney, D. Anderson

Item No	Review Attributes	Reference Document	SAT	UNSAT	NA	Comments
						Refer to Attachments to Checklist DC-01-01 for reviewed documents.
1.	Does the procurement document define the scope of design involvement for the selected company?	P.O./Specification Contract	x			1. Contained in specification 2. See Attachment 2 to Checklist DC-01-01 for specifications reviewed.
2.	Does the procurement document define applicable codes and standards and the specific revision?	P.O./Specification Contract	x			Contained in specification
3.	Do the codes/standards and the associated revisions contained in the procurement documents agree with committments of the FSAR?	FSAR 17.1 App. 1A(B)	x			1. ASME Revision OK for J. Oats per FSAR. 2. P.O.'s reviewed: CP-0046A, CP-0051, CP-0605, CP-0020B.1, CP020C
4.	Does the procurement document define interfaces?	P.O./Specification Contract	x			Reviewed P.O., specifications, and correspondence.

GENERAL NOTES TO PIPE STRESS CHECKLIST

1. Effect of Support Mass on Pipe Stress Results

In reviewing problems AB-1-69 and AB-1-70, Cygna found that Gibbs and Hill did not include the mass of hardware attached to the pipe in the pipe stress analysis. This has not been noted as an observation since the decision to include the support mass in the stress analysis varies according to design organization, policy and the judgment of the individual analyst. Some organizatons do include it in Class 1 analysis but not in Class 2 and 3. Cygna is not aware of any criteria available to the industry for the purpose of determining whether to include the support mass. In response to questions raised during the ASLB hearings, Cygna did rerun a portion of the RHR system between the pump and heat exchanger. This study included the added mass of all pipe supported hardware. Cygna's results show that the effect on natural frequency and pipe stress is small. The effect on support load is somewhat larger. However, this study did neglect the effects of the damping allowed for supports and of the true distribution of support mass. Based on this study, it remains Cygna's position that the effect of support mass on pipe stress results is not a significant factor.

2. Effect of Dual Supports on Piping and Support Results

In reviewing the pipe stress analyses, Cygna noted supports formed by welding two trunnions to the pipe and attaching a strut or snubber to the end of each trunnion. This arrangement can introduce some additional rotational restraint in the piping system, if one neglects the effect of any gaps in the support hardware. In the analysis, Gibbs and Hill had not modeled any rotational restraint at these points. Cygna does not believe this is incorrect and has seen both methods employed in the industry. One method is not necessarily more appropriate or conservative than the other. Each yields reasonable stress results. Loads in the remodeled support may increase; however, loads in other supports may decrease when the rotational restraint is added. Pipe stresses may increase or decrease with rotational restraint. Cygna believes the Gibbs & Hill approach is reasonable.

CYGNA

Independent Design Review Checklist

PIPE STRESS

Reviewer M. K. Mani M K Mani | Checklist No. PI-01

Stress Problem AB-1-69 | Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. System Boundaries			
a. Check that all required branch lines are included.	X		See attachment to this Checklist for reference documents.
b. Check that the attachment point is justified as an anchor if system starts at a branch attachment point.	X		
- Refer to Flow Diagrams and Criteria for Decoupling, Cygna Design Criteria DC-1, Section 4.3.3.			
2. Piping Classification			
- Check for consistency with Flow Diagrams and G&H Piping Design Specification 2323-MS-200.	X		
3. Design & Maximum Pressure			
- Check for consistency with G&H Design Specification 2323-MS-200, Appendix 7.	X		
4. Thermal Loading			
a. Maximum Temperature	X		
- Check for consistency with G&H Design Specification 2323-MS-200.			
b. Check if Operational Modes Considered	X		Three out of the seven thermal modes (numbers 3, 4, 7) were run. Since other modes are enveloped by these three modes this is considered acceptable.
- Refer to Appendix 8 in G&H Design Specification 2323-MS-200			
c. Check Equipment Nozzle Movements	X		
- Refer to equipment drawings and check any hand calculations.			

CYGNA

Independent Design Review Checklist

PIPE STRESS

Reviewer A. Klinger JCH for A. Klinger

Checklist No. PI-02

Stress Problem: AB-1-70

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. System Boundaries a. Check that all required branch lines are included. b. Check that the attachment point is justified as an anchor if system starts at a branch attachment point. - Refer to Flow Diagrams and Criteria for Decoupling, Cygna Design Criteria DC-1, Section 4.3.3.	X X		1. See references on the attachment to this Checklist. 2. Decoupling criteria satisfied.
2. Piping Classification - Check for consistency with Flow Diagrams and G&H Piping Design Specification 2323-MS-200.	X		
3. Design & Maximum Pressure - Check for consistency with G&H Design Specification 2323-MS-200, Appendix 7.	X		
4. Thermal Loading a. Maximum Temperature - Check for consistency with G&H Design Specification 2323-MS-200. b. Check Operational Modes Considered - Refer to Appendix 8 in G&H Design Specification 2323-MS-200	X X		See Note 1 on the Attachment to this checklist.

Independent Design Review Checklist

FLUED HEAD

Reviewer J. Minichiello

Checklist No. PI-03

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Geometry Input			
a. Check that computer geometry (wall thicknesses, lengths of transition pieces) agree with Fig. 74-1 of 2323-MS-74 and the fabrication drawing.	X		1. Model is incorrect (see page 36) in inboard piping (Δ vs) near taper. This has no design impact on the head since all loads must go through the region and it is sufficiently removed from the head so the lower stiffness will have negligible effect. (El. 38-92)
b. Check that material properties agree with those from the Code of Record (1977 + S'77 addenda).	X		2. See Observation PI-03-01.
c. Check that there is sufficient detail to insure the validity of the solution.		X	
2. Stress Analysis			
a. Are all piping loads considered (per Project Design Specification 2323-MS-74?		X	The pipe weight load stress (1500 psi) required by specification 2323-MS-74, ¶ 3.6.4.3, was not added to the flued head "slice" stresses. Since the maximum ratio to allowable is only 0.25, this has no impact.
b. Is primary containment pressure considered per Para. 3.6.4.3.a of Appendix "A" of the specification?	X		
c. Are the pressure "end cap" loads considered?	X		

Independent Design Review Checklist

ELECTRICAL (POWER)

Reviewer A. Moersfelder/J. Dady

Checklist No. EE-01

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Has electrical and physical separation been maintained between redundant Class 1E buses in accordance with:			The following Gibbs & Hill drawings were reviewed: 2323-E1-0600-01, Rev. 16 2323-E1-0600-11, Rev. 3 2323-E1-0600, Rev. 15 2323-E1-0600-12, Rev. 2 2323-E1-0603-01, Rev. 19 2323-E1-0603-11, Rev. 3 2323-E1-0718-01, Rev. 17 2323-E1-0718-11, Rev. 3 2323-E1-0718, Rev. 7 2323-E1-1701, Rev. 10
a. IEEE Standards?	X		
b. Gibbs & Hill Cable and Raceway Schedule, Document No. 2323-E1-1700, Issue 301?	X		1. Note 11 references Criteria for Separation of Class 1E Equipment and Circuits. 2. Note 21 invokes Specification 2323-ES-100 to maintain separation of redundant cables.
c. Gibbs & Hill Criteria for Separation of Class 1E Equipment and Circuits, Rev. 0, dated 02/13/75?	X		References IEEE Stds. 279-1971, 308-1974, 384-1974 and 420-1973 and USAEC Reg. Guide 1.75.

Independent Design Review Checklist

ELECTRICAL (POWER)

Reviewer A. Moersfelder/J. Dady **Checklist No.** EE-01

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
			10. Specification cover sheet documented preparer, reviewer and approver procedure. 11. Verified interdisciplinary review.
b. Is the interrupting capability greater than the maximum 6.9 KV system three-phase fault?	X		1. Reviewed the following documents: • Gibbs & Hill Protective Relaying Calculation VIII-6, Rev. 1. • Appendix 1 entitled "Rating and Performance Requirements." • Gibbs & Hill Specification for 7.2 KV Switchgear and Accessories, Document No. 2323-ES-5, Rev. 1. 2. Specification clearly identified as Nuclear Safety Related. 3. Specification cover sheet documented preparer, reviewer and approver. 4. Evidence of interdisciplinary review. 5. See also Notes 5-11, above.

Independent Design Review Checklist

ELECTRICAL (INSTRUMENTS & CONTROL)

Reviewer A. Moersfelder/J. Dady

Checklist No. EE-02

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Does the design of the control circuits comply with the following regulations, industry standards and project-specific licensing requirements:			
a. Gibbs & Hill Instrumentation and Control Diagram 2323-M1-2263-06, Rev. 5?	X		Although the drawing is not marked Nuclear Safety Related, it is classified as Class 1.
b. CPSES/FSAR, Section 7?	X		Design of the control circuit for valve 1-8811B complies with FSAR Section 7.6.5. • Automatically opens when (2/4) RWST level signals are lower than the Lo-Lo setpoint in conjunction with an "S" signal. • Is interlocked such that it must be closed before valves 1-8701B, 1-8702B, and 1-8812B can be opened. Design of control circuits for valves 1-8701B and 1-8702B comply with FSAR Section 7.6.2.1. • Open circuits will not energize until RCS pressure is below approximately 425 psig. • Close circuits will automatically close when RCS pressure increases above approximately 425 psig.

Reviewer A. Moersfelder/J. Dady **Checklist No.** EE-02

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
c. Gibbs & Hill Instrumentation and Control Diagram 2323-M1-2260-05, Rev. 4?		X	1. Drawing is not marked Nuclear Safety Related, but is noted as Class 1. 2. Logic diagram for Loop Inlet Isolation Valve has no reference to Note 4 which describes Alternate Power Supply connections. 3. Loop A inlet/outlet isolation valve logic does not agree with Loop B after Alternate Shutdown capability change. FSAR section 7.6 indicates that inlet/outlet valve logic is identical for both loops. This discrepancy is due to modifications required to meet fire protection regulations.
d. Regulatory Guide 1.106 and BTP-ICSB18	X		Thermal overload contacts for the motor operators on valves 1-8811B, 1-8812B, 1-8701 and 1-8702B are used to annunciate an overload condition for the valve in the control room. They have not been included in the valve control circuits where they could possibly inhibit the valve from moving to its desired position.

Independent Design Review Checklist

ELECTRICAL (INSTRUMENTS & CONTROL)

Reviewer A. Moersfelder/J. Dady **Checklist No.** EE-02

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
2. Has physical separation been maintained between redundant safety-related equipment.	X		1. Note 21 invokes Specification 2323-ES-100 to maintain separation of redundant trains or channels. 2. The following Gibbs & Hill drawings were reviewed: 2323-E1-0601-02, Rev. 14 2323-E1-0601-11, Rev. 3 2323-E1-0700-01, Rev. 9 2323-E1-0700-12, Rev. 3 2323-E1-0700-02, Rev. 18 2323-E1-0701-12, Rev. 4 2323-E1-0701-10, Rev. 8 2323-E1-0712-01, Rev. 24 2323-E1-0712-12, Rev. 7 2323-E1-0715-01, Rev. 11 2323-E1-0712-02, Rev. 10 2323-E1-0712-16, Rev. 5 2323-E1-0712-03, Rev. 8 2323-E1-0713-12, Rev. 4 2323-E1-0713-01, Rev. 12 2323-E1-0713-02, Rev. 19 2323-E1-0708, Rev. 18 2323-E1-0700-12, Rev. 3 2323-E1-0601-01, Rev. 9 2323-E1-0716, Rev. 17 2323-E1-0716-01, Rev. 20 2323-E1-0716-12, Rev. 4

Independent Design Review Checklist

ELECTRICAL (INSTRUMENTS & CONTROL)

Reviewer A. Moersfelder/J. Dady

Checklist No. EE-02

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
			2323-E1-0722, Rev. 10 2323-E1-0712-11, Rev. 7 2323-E1-0607, Rev. 22 2323-E1-0602-01, Rev. 20 2323-E1-0602-11, Rev. 1 2323-E1-0718, Rev. 7 2323-E1-0717-11, Rev. 2 2323-E1-0601-03, Rev. 16 2323-E1-0718, Rev, 17
			3. The criteria for Separation of Class 1E Equipment and circuits, Rev. 0 references 10CFR50, Regulatory Guides and appropriate IEEE standards. Appendix 2 tabulates electrical equipment which requires separation.
			4. Westinghouse Criteria for Electrical Circuit Physical Separation-Recommended Design Basis E-EPS-1, Issue 5 Westinghouse clarification letter GTN-1280 provides further guidance.

Independent Design Review Checklist

ELECTRICAL (INSTRUMENTS & CONTROL)

Reviewer A. Moersfelder/J. Dady **Checklist No.** EE-02

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
3. Does the Gibbs & Hill control circuit conform to the design input submitted by Westinghouse Electric Corporation? Reference: Gibbs & Hill Instrumentation and Control Diagram 2323-M1-2263-06, Rev. 5 Westinghouse Diagram 271C336 Sheets 396 and 397 Rev. 2. and 401 thru 404, Rev. 3 Westinghouse Motor Control Schematics 271C336, Shts. 396 and 397, Rev. 2 and 401-404, Rev. 3	X		1. Setpoint information for Westinghouse instruments not available from control schematics 2. Control circuits comply with design basis information furnished by Westinghouse. 3. Instrument tag numbers for indicating lights are not shown on schematic diagram 2323-E1P0062, Sht. 23.
4. Do design documents and specifications identify Nuclear Safety Related components as appropriate?	X		1. The following Gibbs & Hill Drawings were reviewed: 2323-ES-5, Rev. 1 2323-ES-1D, Rev. 4 2323-ES-13A, Rev. 1 2323-E1-1700, Issue 30I 2323-ES-100, Rev. 2 2323-MS-605, Rev. 2 2323-ES-24, Rev. 1 2323-ES-7,

Reviewer A. Moersfelder/J. Dady **Checklist No.** EE-02

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
			2323-ES-5, Rev. 6 Calculations VIII-6, Rev. 1 Calculations VIII-1, Rev. 2 2. No indication of Nuclear Safety Related status on Solid State Isolation Equipment specification, Document No. 2323-ES-24, Rev. 1. It is indicated as Class 1.
5. Is there adequate interconnecting control cable identification documentation?	X		Reference documents: • Gibbs & Hill Design Control Procedure DC-5, Rev. 6. • Gibbs & Hill Cable and Raceway Schedule, Doc. 2323-E1-1700, Issue 301, Section 1. Note 7 defines cable numbering. Note 12 defines tray numbering. Note 13 defines conduit numbering.

Reviewer A. Moersfelder/J. Dady **Checklist No.** EE-02

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
			Note 16 defines spatial coordinate system for locating cable origins, destinations and raceway segments. Note 20 disclaims lighting system, cathodic protection heat tracing, fire protection and plant/equipment grounding from Cable and Raceway Schedule
6. Are cable routing procedures adequate, and is there conformance between the Cable Routing Schedule with the cable routing drawings?	X		The following Gibbs & Hill drawings were reviewed: 2323-E1-0601-02, Rev. 14 2323-E1-0601-11, Rev. 3 2323-E1-0700-01, Rev. 9 2323-E1-0700-12, Rev. 3 2323-E1-0700-02, Rev. 18 2323-E1-0701-12, Rev. 4 2323-E1-0701-10, Rev. 8 2323-E1-0712-01, Rev. 24 2323-E1-0712-12, Rev. 7 2323-E1-0715-01, Rev. 11 2323-E1-0712-02, Rev. 10 2323-E1-0712-16, Rev. 5 2323-E1-0712-03, Rev. 8 2323-E1-0713-12, Rev. 4 2323-E1-0713-01, Rev. 12 2323-E1-0713-02, Rev. 19

Reviewer A. Moersfelder/J. Dady **Checklist No.** EE-02

Date 9/27/83

	Item	Satisfactory Yes	Satisfactory No	Comments
				2323-E1-0708, Rev. 18 2323-E1-0700-12, Rev. 3 2323-E1-0601-01, Rev. 9 2323-E1-0716, Rev. 17 2323-E1-0716-01, Rev. 20 2323-E1-0716-12, Rev. 4 2323-E1-0722, Rev. 10 2323-E1-0712-11, Rev. 7 2323-E1-0607, Rev. 22 2323-E1-0602-01, Rev. 20 2323-E1-0602-11, Rev. 1 2323-E1-0718, Rev. 7 2323-E1-0717-11, Rev. 2 2323-E1-0601-03, Rev. 16 2323-E1-0718-01, Rev. 17
7.	Is adequate electrical isolation provided between nuclear safety-related and non-nuclear safety-related circuits?	X		1. Reviewed Gibbs & Hill Solid State Isolation Equipment Specification 2323-ES-24, Rev. 1. (Title page not marked Nuclear Safety Related as required by Design Control Procedure DC-5.)

Reviewer A. Moersfelder/J. Dady **Checklist No.** EE-02

Date 9/27/83

Item	Satisfactory Yes	Satisfactory No	Comments
			2. Criteria for Separation of Class 1E Equipment and Circuits, Rev. 0 states that: "Isolation shall be through relays in specially designed relay racks. Isolation in analog circuits shall be achieved through signal converters in analog instrument racks."
8. Check component identification numbers with Master Component List and the following design documents:			
a. Westinghouse Control Schematics 271C336, Shts. 396 and 397, Rev. 2 and Shts. 401-404, Rev. 3.	X		Considered the design input.
b. Gibbs & Hill Functional Diagram for the Safety Injection System, Doc. No. 2323-M1-2263-06, Sht. 3?	X		Diagrams contain references to two pressure sensing instruments on another diagram, cross-references do not distinguish between instruments by tag number.
c. Gibbs & Hill Criteria for Separation of Class 1E Equipment and Circuits, Rev. 0, Appendix 2?	X		Tabulates all electrical equipment requiring physical separation by equipment number.

Independent Design Review Checklist

EQUIPMENT QUALIFICATION

Reviewer A. Cowell *A. Cowell*

Checklist No. EQ-01

Date 9/21/83

Item	Satisfactory Yes	Satisfactory No	Comments
Calculations			
1. Is modeling of equipment appropriate and justifiable (Refer to assembly and detail drawings)?			
a. Pump (casing, shaft, impeller)			
- Geometry	X		
- Mass distribution	X		
- Support conditions	X		
- Attached piping	X		Considered by applying nozzle loads
- If a static analysis is used, is it justified?	X		
b. Motor (rotor, stator, shaft, casing)			
- Geometry	X		
- Mass distribution	X		
- Support conditions	X		
- Attached piping (heat exchanger)			N/A
- If a static analysis is used, is it justified?	X		
c. Auxiliary equipment (seal cooler)			
- Geometry	X		
- Mass distribution	X		
- Support conditions	X		
- If a static analysis is used, is it justified?	X		

GENERAL NOTES TO CABLE TRAY SUPPORTS CHECKLISTS

1. Use of Normalization Procedure for SSE and 1/2 SSE (OBE)

Gibbs & Hill calculation SCS-101C, Set 5, derives the applicable load combinations and shows that, for seismic loadings, the 1/2 SSE (OBE) condition controls. Since the supports were designed to OBE loads, the members were checked against the normal allowables with no increase for seismic loads. Inherent in this normalization process is the fact that normal strength allowables may be increased for SSE loadings. Since, unlike structural member allowables, anchor bolt allowables remain constant (i.e., no increase) for SSE loadings, Cygna questioned the acceptability of this design approach. Gibbs & Hill had evaluated this concern in 1979 and arrived at the conclusion that the anchor bolts would be acceptable with a safety factor of 3 for SSE. Cygna has done an independent calculation that demonstrates the lowest resulting safety factor is 3. This calculation is based on 5% damping for SSE while Regulatory Guide 1.61 allows 7% damping for bolted structures. The consideration of higher damping values will reduce the acceleration and increase the safety factor.

2. Use of 4% Damping for Cable Trays

USNRC Regulatory Guide 1.61 specifies that bolted structures may be evaluated using 4% of critical damping for OBE and 7% for SSE. Although some connections in the cable tray support system are welded, Cygna believes that cable trays act like bolted structures when the entire system, including the cables and tray sections, is considered. This is consistent with the Gibbs & Hill design assumptions. This is appropriate for the following reasons:

The lower damping value for all welded structures recognizes that such a structure will dissipate less energy than structures with mechanical connections. In the case of the cable trays, there are many significant mechanisms for dissipating energy, e.g., the cables are loosely connected to the trays, the trays are connected mechanically to the structural frames, and the frames are bolted to the concrete.

Various test results show that cable tray systems exhibit damping values much greater than 4%.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Chen for C. Liu **Checklist No.** CTS-01

Frame CSM-59 **Date** 10/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-187C, Set 1. 2. Refer to G&H Drawing No. 2323-S-0910; IN-CSM-53a, Rev. 2; IN-CSM-53b, Rev. 4; IN-CSM-53c, Rev. 2; IN-CSM-53d, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SCS-187C, Set 1.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J.P. Chen for C. Liu

Checklist No. CTS-02

Support 12586, Detail SP-7 with Brace, L=2'-3"; El. 784'-6"

Date 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 4, Sht. 10; Calculation No. SCS-101C, Set 3, Sht. 65. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 2; CMC-64346; DCA-12106; 2323-S-0903, Rev. 5.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. Refer to Calculation No. SCS-146C(II), Set 4, Sht. 10; Calculation No. SCS-101C, Set 3, Sht. 65.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2	X		
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J.P. Rum for C. Liu **Checklist No.** CTS-03

Support 244 Type: SP-7 with brace, L=2'-0", El. = 779'-6" **Date** 9/28/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 4, Sht. 10. 2. Refer to G&H Drawing No. E1-0600-01-S, Rev. 2; FSE-00181, Rev. 6; 2323-S-0903, Rev. 5.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. Refer to Calculation No. SCS-146C(II), Set 4, Sht. 10.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2	X		
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

Independent Design Review Checklist
CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Bhan for C. Liu **Checklist No.** CTS-04

Support 899, Detail "E", L=2' 5", El. 782'-0" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. 146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. E1-0600-S, Rev. 2; E1-0601-01-S, Rev. 4; CMC-93279; FSE-00178, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2.		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Liu for C. Liu — **Checklist No.** CTS-05

Support 901, Detail "E", L=2'-5", El. 782'-0" — **Date**

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0600-S, Rev. 2; 2323-E1-0601-01-S, Rev. 4; FSE-00178, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. 146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu for C. Liu

Checklist No. CTS-06

Support 683, Detail "E", L=2'-5", El. 797'-8"

Date 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. 146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawings No. 2323-E1-0601-01-S, Rev. 4; FSE-00176, Rev. 11.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-05. 2. Refer to Calculation No. 146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J.P. Nuss for C. Liu

Checklist No. CTS-07

Support 943, Detail "C" L=2'-5", El. 784'-8"

Date 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-125C, Set 1, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0600-S, Rev. 2; FSE-00178, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SCS-125C, Set 1, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Chen for C. Liu **Checklist No.** CTS-08

Support 943, Detail "C", L=2'-5", El. 790'-0" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-125C, Set 1, Sht. 21. 2. Refer to G&H Drawings No. 2323-E1-0600-S, Rev. 2; FSE-00178, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SCS-125C, Set 1, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2.		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Blume for C. Liu **Checklist No.** CTS-09

Support 5362, Detail "F", L_1 = 2'-4", L_2 = 1'-11", El. 801'-4" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. 146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; CMC-77697, Rev. 11.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. 146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Shen for C. Liu **Checklist No.** CTS-10

Support 779, Detail "H" with brace, $L_1=L_2=L_3=L_4=2'-5"$, El. 801'-4" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. 146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; FSE-00176, Rev. 11.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. 146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer John Russ J. P. Russ **Checklist No.** CTS-11

Support 778 Type: Detail "D", L=3'-10 1/4", h_2=9'-10", h_3=8'-6", h_4=7'-2", El. 801'-4" **Date** 9/26/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-06. 2. See Observation No. CTS-00-01. 3. Refer to Computer output binder DMI-5P, approved 10 Nov. 1978, Section "Reg. Case D_1 to D_5;" Calculation No. SCS-104C, Shts. 5, 6. 4. Refer to G&H Drawing Nos. 2323-E1-601-01-S, Rev. 4; 2323-E1-S-0903, Rev. 5; FSE-00176, Rev. 11.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. See Observation No. CTS-00-07. 3. Modelling assumed pinned at Nodes 1, 6, and 8. Base connections are semi-fixed. Therefore a fixed support should have been assumed to consider induced moments. See Observation No. CTS-00-03. 4. No sensitivity study was performed to show that the configuration analyzed was the worst case. See Observation No. CTS-00-04.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu for C. Liu **Checklist No.** CTS-12

Support 777. Detail "E", L=2'-5", El. 8091'-4" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-104C(I), Set 1, Sht. 7; Calculation No. SCS-146C (II) Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; FSE-00176, Rev. 11.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SCS-146(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer John Russ J. P. Russ **Checklist No.** CTS-13

Support 776 Type: Detail "C", L=5'-2 1/4", h_1=11'-2", h_2=9'-10", h_3=8'-6", El. 801'-4" **Date** 9/26/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-06. 2. See Observation No. CTS-00-01. 3. Refer to Computer output binder DMI-5P, approved 11/10/78, Section "Reg. Case D_1 to D_5;" Calculation No. SCS-104C, Shts. 5, 6, 10, 34, 35. 4. Refer to G&H Drawing Nos. 2323-E-1-601-01-S, Rev. 4; 2323-S-0903, Rev. 5; FSE-00176, Rev. 11.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-07. 2. Modeling assumed pinned supports at Nodes 1, 2, 4, 6 and 8. Base connections are semi-fixed. Therefore a fixed support should have been assumed to consider induced moments. See Observation No. CTS-00-03. 3. No sensitivity study was performed to show that the configuration analyzed was the worst case. See Observation No. CTS-00-04.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Shen for C. Liu

Checklist No. CTS-14

Support 679, Detail "E", L=3'-5", El. 806'-8"

Date 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; CMC-8524, FSE-00176, Rev. 11.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-05. 2. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.		X	See Item 2.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Rum for C. Liu **Checklist No.** CTS-15

Support 1100, Detail "E", L=2'-6", El. 814'-0" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 26. 2. Refer to G&H Drawing No. 2323-E1-0602-01-S, Rev. 2, 2323-E1-0601-01-S, Rev. 4, FSE-00187, Rev. 6
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation CTS-00-03. 2. Refer to Calculation No. SCS-146C(III), Set 8, Sht. 26.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J.P. Rum for C. Liu **Checklist No.** CTS-16

Support 1099, Detail "E", L-2'-5", El. 822'-0" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 26. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; 2323-E1-0602-01-S, Rev. 2; DCA-3612, CMC-88304; FSE-00187, Rev. 6.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-05. 2. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 26.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Chen for C. Liu **Checklist No.** CTS-17

Support 1078, Detail "E", E=2'-5", El. 830'-0" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 26. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; 2323-E1-0602-01-S, Rev. 2; FSE-00187, Rev. 6; CMC-88304; DCA-3612; CMC-3424; CMC-88503.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-05. 2. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu *J. P. Reen for C. Liu*

Checklist No. CTS-18

Support 2778, Detail "E", L=2'-5", El. 836'-0"

Date 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 28. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; CMC-88467; 2323-E1-0602-03-S, Rev. 2; FSE-00212, Rev. 4; CMC-88306; CMC-88467.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-05. 2. Refer to Calculation No. SCS-146C(II), Sht. 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2.	X		
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Reuss for C. Liu **Checklist No.** CTS-19

Support 2722, Detail "F", L=2'-5", El. 844'-0" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; 2323-E1-0602-03-S, Rev. 2; FSE-00212, Rev. 4; CMC-88306; CMC-88466.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-05. 2. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2	X		
4. Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.		X	See Item 2.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Liu for C. Liu **Checklist No.** CTS-20

Support 2777, Detail "E", L=2'-5", El. 850'-0" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; 2323-E1-0602-03-S, Rev. 2; CMC-88306, FSE-00212, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-05. 2. Refer to Calculation No. SCS-146C (II) Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.		X	See Item 2.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu C. Liu for C. Liu **Checklist No.** CTS-21

Support 5437, Detail "E", L=2'-5", El. 856'-6" **Date** 10/06/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; 2323-E1-0602-03-S, Rev. 2; MC-88271, FSE-00202, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-05. 2. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2.	X		See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.		X	See Item 2.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Shen for C. Liu **Checklist No.** CTS-22

Support 5436, Detail "E", L=2'-5", El. 864'-9" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4 2323-E1-0602-03-S, Rev. 2; FSE-00202, Rev. 3; CMC-88516; CMC-88271
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation CTS-00-05. 2. Refer to Calculation No. SCS-146C (II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2	X		See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. C. Liu for C. Liu **Checklist No.** CTS-23

Support 5439, Detail "E" L=2'-5", El. 866'-6" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C(II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; 2323-E1-0602-03-S, Rev. 2; FSE-00202, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. 146C(II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ J. P. Russ **Checklist No.** CTS-24

Support 1988 Type: A_3, L=3'-3", H=5'-10", x=4'-6", El. 866'-6" **Date** 9/22/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-01. 2. Refer to Computer output binder DMI-5P, approved 11/10/78, Section "Reg. Case A_3"; Calculation No. SCS-101C, Set 1, Shts. 9, 10, 75, 96, 72, 73, 30; Calculation No. SCS-122C, Set 3, Shts. 9, 10, 11. 3. Refer to G&H Drawing Nos. 2323-E1-0603-01-S, Rev. 2; 2323-S-0901, Rev. 4; 2323-S-0902, Rev. 5; 2323-S-0903, Rev. 5; 2323-S-0909, Rev. 1; FSE-00202, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. Modeling assumed pinned supports. Base plates used are stiff angles which act as a semi-fixed connection. Therefore, a fixed connection should have been assumed to consider induced moments. See Observation No. CTS-00-03.

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ

Checklist No. CTS-25

Support 1987 Type: A_2, L=3'-3", H=3'-11", ℓ=2'-7"

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-01. 2. Refer to Computer output binder DMI-5P, approved 11/10/78, Section "Reg. Case A_2"; Calculation No. SCS-101C, Set 1, Shts. 8, 30, 72, 73, 74, 95; Calculation No. SCS-122C, Set 3, Shts. 9, 10, 11. 3. Refer to G&H Drawing Nos. 2323-E1-0603-01-S, Rev. 2; 2323-S-0901, Rev. 4; 2323-S-0902, Rev. 5; 2323-S-0903, Rev. 5; 2323-S-0909, Rev. 1; FSE-00202, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. Modeling assumed pinned supports. Base plates used are stiff angles which act as a semi-fixed connection. Therefore, a fixed connection should have been assumed to consider induced moments. See Observation No. CTS-00-03.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. C. Reeves for C. Liu **Checklist No.** CTS-26

Support 1990, Detail "SP-7" with Brace, L=3'-0", El. 868'-5" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C (II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; 2323-E1-0603-01-S, Rev. 2; CMC-90711, FSE-00202, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. Refer to Calculation No. SCS-146C (II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2	X		
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Reen for C. Liu **Checklist No.** CTS-27, 28, 29

Support 1779, 1782 and 1786 Detail "SP-7" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C (II), Set 8, Sht. 21. 2. Refer to G&H Drawing No. 2323-E1-0601-01-S, Rev. 4; FSE-00202, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. Refer to Calculation No. SCS-146C (II), Set 8, Sht. 21.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J.P. Rose for C. Liu **Checklist No.** CTS-30

Support # 2652, Detail "A" w/brace, L_1 = 3'-6", El. 868'-8" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-104C(II), Set 5, Sht. 1. 2. Refer to G&H Drawing No. 2323-E1-0718-S, Rev. 1; FSE-00206, Rev. 4; 2323-E1-0700-01-S.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. Refer to Calculation No. SCS-104C(II), Set 5, Sht. 1.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2	X		
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu

Checklist No. CTS-31

Support #2640, Detail "B", L = 3'-9", El. 867'-4"

Date 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-104C(II), Set 5, Sht. 2. 2. Refer to G&H Drawing No. 2323-E1-0700-01-S; 2323-E1-0718-S, Rev. 1; FSE-00206, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SCS-104C(II), Set 5, Sht. 2.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		
5. Restraints: Check whether the design suits application requirements.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ J.P. Russ **Checklist No.** CTS-32

Support 2641 Type: Detail "5", L=6'-0 1/2", h_1=10'-3", h_2=8'-11", h_3=6'-3", h_4=4'-3", h_5=2'-11", a=2'-1 1/2" **Date** 9/26/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-01. 2. Refer to Calculation No. SCS-104C (I), Set 4, Shts. 6, 41. 3. Refer to G&H Drawing No. 2323-E1-0718-S, Rev. 1, 2323-S-0903, Rev. 5; 2323-S-0907, Rev. 2; 2323-S-0909, Rev. 1; FSE-00206, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. No sensitivity study was performed to show that the configuration analyzed was the worst case. See Observation No. CTS-00-04. 3. Refer to Calculation No. SCS-104C (I), Set 4, Shts. 6, 41.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3,		X	See Observation No. CTS-00-02.
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ **Checklist No.** CTS-33

Support 2645: Detail "4", L=6'-1 1/2", h_1=8'-11", h_2=7'-7", h_3=6'-3", h_4=2'-11", a=2'-1 1/2", a=2'-1 1/2" **Date** 9/26/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-01. 2. Refer to Calculation No. SCS-104C (I), Set 4, Shts. 6, 41. 3. Refer to G&H Drawing No. 2323-E1-0718-S, Rev. 1; 2323-S-0903, Rev. 5; 2323-S-0907, Rev. 2; 2323-S-0909, Rev. 1; FSE-00206, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. No sensitivity study was performed to show that the configuration analyzed was the worst case. See Observation No. CTS-00-04. 3. Refer to Calculation No. SCS-104C (I), Set 4, Shts. 6, 41.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2.		X	See Observation No. CTS-00-02.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ

Checklist No. CTS-34

Support #2666 Type: Detail "4", l=6'-1 1/2", h_1=8'-11", h_2=7'-7", h_3=6'-3", h_4=2'-11", a=2'-1 1/2"

Date 9/26/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-01. 2. Refer to Calculation No. SCS-104C (I), Set 4, Shts. 6, 41. 3. Refer to G&H Drawing No. 2323-E1-0718-S, Rev. 1; 2323-S-0903, Rev. 5; 2323-S-0907, Rev. 2; 2323-S-0909, Rev. 1.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. No sensitivity study was performed to show that the configuration analyzed as the worst case. See Observation No. CTS-00-04. 3. Refer to Calculation No. SCS-104C (I), Set 4, Shts. 6, 41.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2.		X	See Observation No. CTS-00-02.

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ J. R. Russ **Checklist No.** CTS-35

Support 2563 Type: A_2, L=5'-7 7/8", h=2'-11", ℓ = 1'-7" **Date** 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. See Observation No. CTS-00-01. 2. Refer to Computer output binder DMI-5P, Approved 11/10/78, Section "Reg. Case A_2;" Calculation No. SCS-101C, Set 1, Shts. 8, 30, 72, 73, 74, 95; Calculation No. SCS-122C, Set 3, Shts. 9, 10, 11. 3. Refer to G&H Drawing No. 2323-E1-0603-01-S, Rev. 2; 2323-S--0901, Rev. 4; 2323-S-0902, Rev. 5; 2323-S-0903, Rev. 5; 2323-S-0909, Rev. 1; FSE-00206, Rev.4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. Modeling assumed pinned supports. Base plates used are stiff angles which act as a semi-fixed connection. Therefore, a fixed connection should have been assumed to consider induced moments. See Observation No. CTS-00-03.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer C. Liu J. P. Bhan for C. Liu **Checklist No.** CTS-36

Support 2157, Detail "SP-7" with Brace, L=4'-6", El. 868'-8" **Date** 10/6/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SCS-146C (II), Set 4, Sht. 10. 2. Refer to G&H Drawing No. 2323-E1-0718-S, Rev. 1; 2323-S-0903, Rev. 3; FSE-00206, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. Refer to Calculation No. SCS-146C (II), Set 4, Sht. 10; Calculation No. SCS-101C, Set 3, Sht 65.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2	X		
4. Support Spacing: Check for compliance with Cygna Criteria 83090-DC-3 Section 4.1.	X		

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ

Checklist No. CTS-37

Support 2542 Type: A_1, L=3'-6", H=1'-4"

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.			1. See Observation No. CTS-00-01. 2. Refer to Computer output binder DMI-5P, approved 11/10/78, Section "Reg. Case A_2"; Calculation No. SCS-101C, Set 1, Shts. 8, 30,72, 73, 74, 95; Calculation No. SCS-122C, Set 3, Shts. 9, 10, 11. 3. Refer to Drawing Nos. 2323-E1-0718-S, Rev. 2; 2323-S-0901, Rev. 4; 2323-S-0902, Rev. 5; 2323-S-0903, Rev. 5; 2323-S-0909, Rev. 1; and FSE-00206, Rev. 4.
2. Design Assumptions and Design Methods: Check the acceptability of the original design.		X	1. Modeling assumed pinned support. Base plates used are stiff angles which act as a semi-fixed connection. Therefore, a fixed support should have been assumed to consider induced moments.See Observation No. CTS-00-03.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ **Checklist No.** CTS-38

Support #2643 Type: Detail "7", L=5'-2", h_1=8'-11", h_2=7'-7", h_3=6'-3", h_4=2'-11", h_5=1'-9" **Date** 9/26/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-01. 2. Refer to Calculation No. SCS-104C(I), Set 4, Shts. 6, 41. 3. Refer to G&H Drawing No. 2323-E1-0718-S, Rev. 1; 2323-S-0903, Rev. 1; 2323-S-0907, Rev. 2; 2323-S-0909, Rev. 1; FSE-00206, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. No sensitivity study was performed to show that the configuration analyzed was the worst case. See Observation No. CTS-00-04. 3. Refer to Calculation No. SCS-104C(I), Set 4, Shts. 6, 41.
3. Loading Combinations: Check or compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.

CYGNA

Independent Design Review Checklist

CABLE TRAY SUPPORT

Reviewer J. Russ J. P. Russ **Checklist No.** CTS-39

Support 2545 Type: Detail "7", L=5'-2", h_1=8'-11", h_2=7'-7", h_3=6'-3", h_4=2'-11", h_5=1'-9" **Date** 9/26/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. See Observation No. CTS-00-01. 2. Refer to Calculation No. SCS-104C(I), Set 4, Shts. 9, 43. 3. Refer to G&H Drawing No. 2323-E1-0718-S, Rev. 1; 2323-S-0903, Rev. 5; 2323-S-0907, Rev. 2; 2323-S-0909, Rev. 1; FSE-00206, Rev. 4.
2. Design Assumptions and Design Methods: Check the acceptability of the original design.		X	1. See Observation No. CTS-00-03. 2. No sensitivity study was performed to show that the configuration analyzed was the worst case. See Observation No. CTS-00-04. 3. Refer to Calculation No. SCS-104C(I), Set 4, Shts. 9, 43.
3. Loading Combinations: Check for compliance with Cygna Criteria 83090-DC-3, Section 4.2		X	See Observation No. CTS-00-02.

GENERAL NOTES TO PIPE SUPPORT CHECKLISTS

1. Use of U-Bolts as Pipe Clamps

In the review of the supports for problems AB-1-69 and AB-1-70, Cygna noted instances where a U-bolt was used in place of the standard pipe clamp. Since Cygna had not reviewed the installation procedures for these U-bolts, Cygna did not consider that the pretension of the U-bolt would be significant. Since Cygna's reviewers had judged the effects to be small, Cygna did not assess stresses in the pipe due to such pretension.

As a result of information made available at the ASLB hearings, Cygna has determined that the amount of pretension can be significant, depending on the thickness and size of the pipe. Cygna is currently reviewing a detailed test/analysis performed by TUGCO to determine the overall effects of this use of U-bolts. Cygna will issue their findings when that review is completed.

2. Local Effects in Tube Walls

In the supports reviewed, Cygna noted instances where either a support bracket is welded to a tube, or two tubes are welded in a "T" fashion (stepped tube). In most cases, the punching shear on the tube wall was not checked explicitly. Cygna independent calculations show this is not of concern, since the tube wall must be equal to at least the fillet weld size. In addition, Cygna did not find any instances wherein the local flexibility of the tube wall was included in a stiffness calculation. However, Cygna also believes the effect is small in comparison to the overall flexibility in the support. In addition, Cygna believes it is accepted practice not to consider such detail in standard support design. Thus, Cygna has found TUGCO's design approach to tube steel acceptable per Cygna's criteria.

3. Effect of Support Dead Weight

As a matter of general practice, the TUGCO pipe support design organizations do not include the weights of standard components (struts, snubbers, clamps, etc.) in their pipe support design calculations. They do, however, include the weight of frame members when using the Strudl program to perform frame analysis. While general purpose structural design codes do specify that dead load shall be considered in the design of structures, the significance of the various components of dead load in the design of a structure varies with the type of structure. In the case of a piping system, dead load is considered in the design of pipe supports. This includes the piping dead weight and the weight of all material attached to or integral with the piping, such as insulation, valves, etc. Since the dead weight of the pipe support itself is generally very small compared to the piping dead load, thermal load and seismic load for which the support is designed, it is neglected. Cygna believes that neglecting this specific component of dead load (i.e., support dead weight) is also consistent with standard practice.

4. Effect of Pipe Radial Expansion on Anchors and Frames

In designing supports with 0" gap box frames and with trunnions welded to the pipe to form anchors, the TUGCO design organizations do not include the loads due to pipe radial expansion in the support design. These loads, being induced by imposed displacement, are secondary in nature and would be compared to three times the normal allowable from the ASME Code (paragraph NF3213.10 and NF3231.1a of Section III). Cygna has performed calculations on a number of these configurations (SI-1-325-002-S32R and SI-1-037-005-S32A, for example) and found stresses within acceptable limits. It is Cygna's position that these effects have no impact on design.

5. Effect of Bolt Hole Size on Bolt Shear Distribution

In designing baseplate/bolted connections for the CPSES pipe supports, the TUGCO design organizations assume all bolts equally share the shear load in a bearing connection. This assumption is consistent with standard design practice throughout both the standard and nuclear construction industries. In response to questions raised during the ASLB hearings, Cygna has performed calculations which show that the effect for a 1" bolt with a 1/8" oversized hole in a 4 bolt baseplate under the most adverse condition is a 4% reduction in safety factor. Thus, Cygna has shown that, while the conventional method does not provide rigorously exact results when compared to nonlinear analysis, it provides an adequate basis for design.

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-003-S22R)

Reviewer J. C. Minichiello J C Minichiello

Checklist No. PS-01

Date 9/15/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-064-003-S22R. 2. Refer to B&R Drawing No. RH-1-064-003-S22R, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-003-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Revision 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-325-002-S32R)

Reviewer S. Luo S. Luo

Checklist No. PS-02

Date 9/22/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. Refer to Calculation No. SI-1-325-002-S32R. 2. Refer to B&R Drawing No. SI-1-325-002-S32R, Rev. 1. 3. The minimum embedment length for 1-1/4" Super Hilti Kwik Bolts should be 8-1/8". A 6-1/2" embedment was shown on the drawing. 4. See Observation PS-02-01.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-325-002-S32R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2.	X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-325-002-S32R)

Reviewer S. Luo **Checklist No.** PS-02

Date 9/22/83

Item	Satisfactory Yes	Satisfactory No	Comments
b. Does the gap accommodate thermal and seismic movements in unrestrained directions?	X		
5. Restraints: Check whether the design suits application requirements.	X		Clip angle may be overstressed due to cinching of U-bolt to provide support stability. However, the frame which is specified to have "0" clearance will develop sufficient clamping force to maintain stability.
6. Spring Supports (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.4. b. Cygna Criteria 83090-DC-2, Section 4.1.4.			N/A
7. Hanger Rods (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.2. b. Cygna Criteria 83090-DC-2, Section 4.1.5.			N/A

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-325-002-S32R)

Reviewer S. Luo **Checklist No.** PS-02

Date 9/22/83

Item	Satisfactory Yes	Satisfactory No	Comments
8. Snubbers (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.6. b. Cygna Criteria 83090-DC-2, Section 4.1.6.			N/A
9. Strut (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.1. b. Cygna Criteria 83090-DC-2, Section 4.1.7.	X X		
10. Base Plates and Anchor Bolts: Check consistency with Cygna Criteria 83090-DC-2, Section 4.1.8.	X		
11. Design Interface Requirements: a. Stiffness: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.1? b. Stresses: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.4?	 X	X	1. $\Delta < 0.0625$" (See Note 2 on Checklist PS-01.)

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-325-002-S32R)

Reviewer S. Luo **Checklist No.** PS-02

Date 9/22/83

Item	Satisfactory Yes	Satisfactory No	Comments
12. Inspect Loadings for reasonableness (see Cygna Criteria 83090-DC-2 for definitions):			
a. Dead Load (DL)	X		
b. Thermal (TH)	X		
c. Safe Shutdown Earthquake (SSE)		X	See Note 1 on Checklist PS-01.
d. Pipe Whip (PI)			N/A
e. Jet Impingment (JI)			N/A
f. Friction (FL)			N/A
13. Design Output:			
a. Does the design meet the functional requirements?	X		Design calculations do not consider the effects of pipe radial expansion on the support. CYGNA calculations show no significant effect.
b. Does the design reflect correctly all the physical arrangements shown on B&R drawing(s) SI-1-325-002-S32R, Rev. 1?	X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-021-001-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-03

Date 9/19/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-021-001-S22R). 2. Refer to B&R Drawing No. RH-1-021-001-S22R, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-021-001-S22R
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?	X X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-007-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-04

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-064-007-S22R. 2. Refer to B&R Drawing No. RH-1-064-007-S22R, Rev. 2.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-007-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

Independent Design Review Checklist

PIPE SUPPORT (RH-1-010-003-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-05

Date 9/16/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-010-003-S22R. 2. Refer to B&R Drawing No. RH-1-010-003-S22R, Rev. 3. 3. Since the rear bracket was dimensioned incorrectly, the weld properties changed from 6" to 9" for lw. However, the weld sizing calculations were conservative, since they are based on a 6" length rather than a 9" length.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-010-003-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-002-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-06

Date 9/19/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-064-002-S22R). 2. Refer to B&R Drawing No. RH-1-064-002-S22R, Rev. 4. 3. TO_2 for SPC-08-80 should be 9", however, 10" was used in design calculation. This will change the calculated C-C dimension from 17-3/8" to 18-3/8" which is still within the allowable C-C value. 4. A set of conservative loads from a previous piping analysis were used in the design. These loads were higher than the final as-built loads.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-002-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-038-013-S22A)

Reviewer S. Luo S. Luo

Checklist No. PS-07

Date 9/21/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-038-013-S22A. 2. Refer to B&R Drawing No. SI-1-038-013-S22A, Rev. 2.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-038-013-S22A.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-325-001-S32R)

Reviewer S. Luo S. Luo

Checklist No. PS-08

Date 9/18/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-325-001-S32R. 2. Refer to B&R Drawing No. SI-1-325-001-S32R, Rev. 2. 3. Both base plates were qualified using the loads from the worst case base plate.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-325-001-S32R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

Independent Design Review Checklist

PIPE SUPPORT (SI-1-079-001-S32S)

Reviewer S. Luo S. Luo

Checklist No. PS-09

Date 9/20/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-079-001-S32S. 2. Refer to B&R Drawing No. SI-1-079-001-S32S, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-079-001-S32S.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.
5. Restraints: Check whether the design suits requirements of the functional application.	X		

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-001-S22R)

Reviewer J. C. Minichiello J C Minichiello **Checklist No.** PS-10

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. Refer to Calculation No. RH-1-064-001-S22R. 2. Refer to B&R Drawing No. RH-1-064-001-S22R, Rev. 3. 3. The pipe displacement in the X-direction was shown as -.395" on the transmittal (GTN #60910) to the pipe support group. It should be +.395". The support group has used -.395" as input for the their design. The error is minor, however, and does not effect the design. See Observation PS-10-01.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		1. Refer to Calculation No. RH-1-064-001-S22R. 2. Bolts noted as unacceptable on the calculation. The designer waited for as-built loads for a final determination of acceptability as part of the as-built program. The final loads did decrease to acceptable levels.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-001-S22R)

Reviewer J. C. Minichiello

Checklist No. PS-10

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.
5. Restraints: Check whether the design suits requirements of the functional application.	X		
6. Spring Supports (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.4. b. Cygna Criteria 83090-DC-2, Section 4.1.4.			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-001-S22R)

Reviewer J. C. Minichiello

Checklist No. PS-10

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
7. Hanger Rods (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.2. b. Cygna Criteria 83090-DC-2, Section 4.1.5.			N/A.
8. Snubbers (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.6. b. Cygna Criteria 83090-DC-2, Section 4.1.6.			N/A.
9. Strut (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.1. b. Cygna Criteria 83090-DC-2, Section 4.1.7.	X X		
10. Base Plates and Anchor Bolts: Check consistency with Cygna Criteria 83090-DC-2, Section 4.1.8.	X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-001-S22R)

Reviewer J. C. Minichiello **Checklist No.** PS-10

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
11. Design Interface Requirements:			
a. Stiffness: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.1?		X	1. No check on stiffness was provided in the support calculation. (See Note 2 on attachment to Checklist PS-01.)
b. Stresses: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.4?	X		
12. Inspect Loadings for reasonableness (see Cygna Criteria 83090-DC-2 for definitions):			
a. Dead Load (DL)	X		
b. Thermal (TH)	X		
c. Safe Shutdown Earthquake (SSE)		X	See Note 1 on attachment to Checklist PS-01.
d. Pipe Whip (PI)			N/A
e. Jet Impingment (JI)			N/A
f. Friction (FL)			N/A
13. Design Output:			
a. Does the design meet the functional requirements?	X		
b. Does the design reflect correctly all the physical arrangements shown on B&R drawing(s) RH-1-064-010S22R, Rev. 3.	X		

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-009-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-11

Date 9/16/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. Refer to Calculation No. RH-1-064-009-S22R. 2. Refer to B&R Drawing No. RH-1-064-009-S22R, Rev. 3. 3. The forces used to qualify the weld between Elements 1 and 2 were not correct (see attached sheet). This error will not effect the adequacy of the weld since the as-built loads are small.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-009-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2.			N/A.

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-011-S22R)

(formerly RH-1-062-002-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-12

Date 9/15/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.		X	1. Refer to Calculation No. RH-1-064-011-S22R. 2. Refer to B&R Drawing No. RH-1-064-011-S22R, Rev. 4. 3. The designer used a type "PUH" U-bolt allowable to check a type "PUS" U-bolt. However, the as-built load (3915 lb) is still less than the "PUS" allowable (3620 x 1.3 = 4706 lb). 4. See Observation PS-12-01.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-011-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Revision 3, Section 3.6.2.2.	X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-011-S22R)

(formerly RH-1-062-002-S22R)

Reviewer S. Luo **Checklist No.** PS-12

Date 9/15/83

Item	Satisfactory Yes	Satisfactory No	Comments
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?	X X		
5. Restraints: Check whether the design suits requirements of the functional application.	X		
6. Spring Supports (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Revision 3, Section 3.6.2.2.4. b. Cygna Criteria 83090-DC-2, Section 4.1.4.			N/A.
7. Hanger Rods (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Revision 3, Section 3.6.2.2.2. b. Cygna Criteria 83090-DC-2, Section 4.1.5.			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-011-S22R)

(formerly RH-1-062-002-S22R)

Reviewer S. Luo **Checklist No.** PS-12

Date 9/15/83

Item	Satisfactory Yes	Satisfactory No	Comments
8. Snubbers (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Revision 3, Section 3.6.2.2.6. b. Cygna Criteria 83090-DC-2, Section 4.1.6.			N/A.
9. Strut (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Revision 3, Section 3.6.2.2.1. b. Cygna Criteria 83090-DC-2, Section 4.1.7.	X X		
10. Base Plates and Anchor Bolts: Check consistency with Cygna Criteria 83090-DC-2, Section 4.1.8.	X		
11. Design Interface Requirements: a. Stiffness: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.1?		X	No check on stiffness was provided in the support calculation. (See Note 2 on attachment to Checklist PS-01.)

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-011-S22R)

(formerly RH-1-062-002-S22R)

Reviewer S. Luo

Checklist No. PS-12

Date 9/15/83

Item	Satisfactory Yes	Satisfactory No	Comments
b. Stresses: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.4?	X		
12. Inspect Loadings for reasonableness (see Cygna Criteria 83090-DC-2 for definitions):			
a. Dead Load (DL)	X		
b. Thermal (TH)	X		
c. Safe Shutdown Earthquake (SSE)		X	See Note 1 on attachment to Checklist PS-01.
d. Pipe Whip (PI)			N/A
e. Jet Impingment (JI)			N/A
f. Friction (FL)			N/A
13. Design Output:			
a. Does the design meet the functional requirements?	X		
b. Does the design reflect correctly all the physical arrangements shown on B&R drawing(s) RH-1-062-002-S22R, Rev. 4?	X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-010-S22R)

Reviewer S. Luo S. Luo **Checklist No.** PS-13

Date 9/20/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-064-010-S22R. 2. Refer to B&R Drawing No. RH-1-064-010-S22R, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-010-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Revision 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

Independent Design Review Checklist

PIPE SUPPORT (SI-1-073-700-S32R)

Reviewer S. Luo S. Luo

Checklist No. PS-14

Date 9/17/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-073-700-S32R. 2. Refer to B&R Drawing No. SI-1-073-700-S32R. 3. The design calculation includes a pipe bearing stress calculation although this is not required for general pipe support design. 4. This support was designed by a site engineer.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-073-700-S32R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Revision 3, Section 3.6.2.2.	X		Enveloped loads were conservatively used in the design calculation.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-042-002-S22K)

Reviewer S. Luo S. Luo

Checklist No. PS-15

Date 9/21/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-042-002-S22K. 2. Refer to B&R Drawing No. SI-1-042-002-S22K.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-042-002-S22K.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?	X X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-075-001-S22R)

Reviewer S. Luo S. Luo **Checklist No.** PS-16

Date 9/17/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-075-001-S22R. 2. Refer to B&R Drawing No. SI-075-001-S22R. Rev. 2.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-075-001-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		The consideration of friction forces under emergency condition is conservative.
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?	X X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-075-003-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-17

Date 9/16/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-075-003-S22R. 2. Refer to B&R Drawing No. SI-1-075-003-S22R, Rev. 3
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-075-003-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-008-007-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-18

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-008-007-S22R. 2. Refer to B&R Drawing No. RH-1-008-007-S22R, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-008-007-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-006-S22K)

Reviewer S. Luo S. Luo

Checklist No. PS-19

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-064-006-S22K. 2. Refer to B&R Drawing No. RH-1-064-006-S22K, Rev. 3. 3. The design loads were higher than the as-built loads. The calculation is acceptable.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-006-S22K.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-005-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-20

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-064-005-S22R. 2. Refer to B&R Drawing No. RH-1-064-005-S22R, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-005-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-010-004-S22K)

Reviewer S. Luo S. Luo

Checklist No. PS-21

Date 9/13/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X X		1. Refer to Calculation No. RH-1-010-004-S22K. 2. Refer to B&R Drawing No. RH-1-010-004-S22K, Rev. 2. 3. For design calculation, also refer to calculations RH-1-010-002-S22S, (Checklist PS-23).
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-010-004-S22K.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-004-S22K)

Reviewer S. Luo S. Luo

Checklist No. PS-22

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-064--004-S22K. 2. Refer to B&R Drawing No. RH-1-064-004-S22K Rev. 4. 3. Design loads were much higher than as-built loads. The calculation is conservative.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-004-S22K.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?	X X		

Independent Design Review Checklist

PIPE SUPPORT (RH-1-010-002-S22S)

Reviewer S. Luo S. Luo

Checklist No. PS-23

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-010-002-S22S. 2. Refer to B&R Drawing No. RH-1-010-002-S22S, Rev. 4.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-010-002-S22S.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-010-002-S22S)

Reviewer S. Luo **Checklist No.** PS-23

Date 9/14/83

Item	Satisfactory Yes	Satisfactory No	Comments
5. Restraints: Check whether the design suits requirements of the functional application.	X		
6. Spring Supports (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.4. b. Cygna Criteria 83090-DC-2, Section 4.1.4.	X	X	Design Hot Load shown on the drawing was 1032 lb. which did not match the value 1037 lb. in the design calculation. The effect is negligible. Seismic movement not considered in the spring design calculation. See Observation PS-09-01.
7. Hanger Rods (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.2. b. Cygna Criteria 83090-DC-2, Section 4.1.5.			N/A.

Independent Design Review Checklist

PIPE SUPPORT (SI-1-079-007-S42K)

Reviewer S. Luo S. Luo

Checklist No. PS-24

Date 9/18/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-079-007-S42K. 2. Refer to B&R Drawing No. SI-1-079-007-S42K, Rev. 2.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-079-007-S42K.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-008-S22K)

Reviewer J. C. Minichiello J C Minichiello **Checklist No.** PS-25

Date 9/15/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-064-008-S22K. 2. Refer to B&R Drawing No. RH-1-064-008-S22K, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-064-008-S22K.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-064-008-S22K)

Reviewer J. C. Minichiello **Checklist No.** PS-25

Date 9/15/83

Item	Satisfactory Yes	Satisfactory No	Comments
9. Strut (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.1. b. Cygna Criteria 83090-DC-2, Section 4.1.7.			N/A.
10. Base Plates and Anchor Bolts: Check consistency with Cygna Criteria 83090-DC-2, Section 4.1.8.		X	In the FUB II analysis for item 6, the input shown in the sketch on the input form agrees with the latest drawing. In the "memory register" table on the lower right side of the input form, incorrect data is shown for the "Y" dimensions. The correct location of the attachment center should be about 1" farther away from bolts 3 and 4. This will not affect the design since the ratio to allowable is small.
11. Design Interface Requirements: a. Stiffness: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.1? b. Stresses: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.4?	X	X	No check on stiffness was provided in the support calculation. (See Note 2 on attachment to Checklist PS-01.)

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-037-005-S32A)

Reviewer S. Luo S. Luo **Checklist No.** PS-26

Date 9/22/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-037-005-S32A. 2. Refer to B&R Drawing No. SI-1-037-005-S32A, Rev. 1.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-037-005-S32A.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-037-005-S32A)

Reviewer S. Luo **Checklist No.** PS-26

Date 9/22/83

Item	Satisfactory Yes	Satisfactory No	Comments
12. Inspect Loadings for reasonableness (see Cygna Criteria 83090-DC-2 for definitions):			1. Each load case was run separately and combined positively and negatively with the other cases (64 cases). This result was then conservatively enveloped.
a. Dead Load (DL)	X		
b. Thermal (TH)	X		
c. Safe Shutdown Earthquake (SSE)		X	2. See Note 1 on attachment to Checklist PS-01.
d. Pipe Whip (PI)			N/A
e. Jet Impingment (JI)			N/A
f. Friction (FL)			N/A
13. Design Output:			Design calculations do not consider the effects of pipe radial expansion on the support. CYGNA calculations show no significant effect.
a. Does the design meet the functional requirements?	X		
b. Does the design reflect correctly all the physical arrangements shown on B&R drawing(s) SI-1-037-005-S32A, Rev. 1?	X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-070-007-S22A)

Reviewer S. Luo S. Luo

Checklist No. PS-27

Date 9/22/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-070-007-S22A. 2. Refer to B&R Drawing No. SI-1-070-007-S22A, Rev. 1.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-070-007-S22A.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-024-011-S22A)

Reviewer S. Luo S. Luo

Checklist No. PS-28

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-024-011-S22A. 2. Refer to B&R Drawing No. RH-1-024-011-S22A, Rev. 1.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-024-011-S22A.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-075-002-S22K)

Reviewer S. Luo S. Luo

Checklist No. PS-29

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-075-002-S22K. 2. Refer to B&R Drawing No. SI-1-075-002-S22K. Rev. 3. 3. The frame and base plate analyses were based on previous loads which were larger than the as-built loads. The design calculation is, therefore, conservative and acceptable.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-075-002-S22K.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2.			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-030-003-S32A)

Reviewer S. Luo S. Luo

Checklist No. PS-30

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. SI-1-030-003-S32A. 2. Refer to B&R Drawing No. SI-1-030-003-S32A, Rev. 1.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. SI-1-030-003-S32A.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?			N/A.

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-030-003-S32A)

Reviewer S. Luo **Checklist No.** PS-30

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
9. Strut (if applicable): Check consistency with: a. G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.1. b. Cygna Criteria 83090-DC-2, Section 4.1.7.			N/A.
10. Base Plates and Anchor Bolts: Check consistency with Cygna Criteria 83090-DC-2, Section 4.1.8.	X		1. SA-193-B7 through bolts were used. 2. A conservative bolt interaction formula was used for rod "bolt."
11. Design Interface Requirements: a. Stiffness: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.1? b. Stresses: Does the design meet the requirements of Cygna Criteria 83090-DC-2, Section 4.4?		X	No check on stiffness was provided in the support calculation. (See Note 2 on attachment to Checklist PS-01.)

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (SI-1-030-003-S32A)

Reviewer S. Luo **Checklist No.** PS-30

Date 9/23/83

Item	Satisfactory Yes	Satisfactory No	Comments
12. Inspect Loadings for reasonableness (see Cygna Criteria 83090-DC-2 for definitions):			
a. Dead Load (DL)	X		
b. Thermal (TH)	X		
c. Safe Shutdown Earthquake (SSE)		X	See Note 1 on attachment to Checklist PS-01.
d. Pipe Whip (PI)			N/A
e. Jet Impingment (JI)			N/A
f. Friction (FL)			N/A
13. Design Output:			
a. Does the design meet the functional requirements?	X		Design calculations do not consider the effects of pipe radial expansion on the support. CYGNA calculations show no significant effect.
b. Does the design reflect correctly all the physical arrangements shown on B&R drawing(s) SI-1-030-003-S32A, Rev. 1?	X		

CYGNA

Independent Design Review Checklist

PIPE SUPPORT (RH-1-010-001-S22R)

Reviewer S. Luo S. Luo

Checklist No. PS-31

Date 9/12/83

Item	Satisfactory Yes	Satisfactory No	Comments
1. Design Input Data: Check that all data is used correctly.	X		1. Refer to Calculation No. RH-1-010-001-S22R. 2. Refer to B&R Drawing No. RH-1-010-001-S22R, Rev. 3.
2. Design Assumptions & Design Methods: Check the acceptability of the original design.	X		Refer to Calculation No. RH-1-010-001-S22R.
3. Loading Combinations: Check for consistency with G&H Specification No. 2323-MS-46A, Rev. 3, Section 3.6.2.2.	X		The friction forces were conservatively included in seismic load case.
4. Gap (if applicable): a. Check for consistency with Cygna Criteria 83090-DC-2, Section 4.1.2. b. Does the gap accommodate thermal and seismic movements in unrestrained directions?	X		