REFERENCE C

ARCHITECT ENGINEER'S PROJECT PLAN

FOR THE

EVALUATION OF THE PRESSURIZER
SAFETY AND RELIEF VALVE
DISCHARGE PIPING SUBSYSTEM

Zion Station Units 1 and 2

Prepared for

COMMONWEALTH EDISON COMPANY
Chicago, Illinois 60690

Under P. O. NO. 805890

August 1986

Roland L. Rao 8-27-86
Prepared By/Date

S L Kaul 8/28/86
Quality Assurance/Date

Jarvis W Watson 8/28/86
Verified By/Date

Edward J Hampton 8/28/86
Approved By/Date

Marie K. Yazica 8/28/86
Project Secretary/Date

Approved CECo-SNED

O'DONNELL & ASSOCIATES, INC.
ENGINEERING DESIGN & ANALYSIS SERVICES

241 CURRY HOLLOW ROAD
PITTSBURGH, PENNSYLVANIA 15236
(412) 655-1200 (412) 653-6110
TWX 710-667-4657

Rev	01	02	03	
Date	9-86	10-86	10-86	
Appr	RJR	RJR	RJR	
QA	[illegible]	SAIC	SAIC	

1719-200-003-00

SPECIFICATION AND REPORT CHANGE RECORD FORM

ARCHITECT ENGINEER'S PLAN FOR THE
EVALUATION OF THE PRESSURIZER
SAFETY AND RELIEF VALVE
DISCHARGE PIPING SUBSYSTEM

Pages Changed	Description of Change
11	3.9 ADDED LAST PARAGRAPH (ERRONEOUSLY SUBMITTED AS PAGE 10 IN REV. 02)

Roland J. Russo 10-20-86
Engineer Date

[signature] 10/20/86
Project Manager Date

[signature] 10/20/86
Verifier Date

[signature] 10/20/86
Quality Assurance Date

[signature] 10/23/86
Approved CECo-SNED Date

Rev. 03 Change Record Page 1 of 1

SPECIFICATION AND REPORT CHANGE RECORD FORM

ARCHITECT ENGINEER'S PLAN FOR THE

EVALUATION OF THE PRESSURIZER
SAFETY AND RELIEF VALVE

DISCHARGE PIPING SUBSYSTEM

Pages Changed	Description of Change
8	3.3 ..... (Level D loading condition per ASME BPV Code Section III, Division 1).
9	Added paragraph after (4) and before 3.4
9	(1) Changed "based on B31.1, (1967 Edition)" to "and"
	(1) Added "through Winter of 1985"
	(2) Changed "B31.1," to "Allowables and methodology based on"
	(2) Added "(1983 Edition through Winter of 1985)"
	(3) Changed "B31.1," to "Allowables based on B31.1 (1967 Edition), methodology based on B31.1 (1967 Edition) and"
	(3) Added "(1983 Edition through Winter of 1985)"
	(4) Changed "B31.1," to "Allowables based on B31.1 (1967 Edition), methodology based on B31.1 (1967 Edition) and"
	(4) Added "(1983 Edition through Winter of 1985)"
10	3.9 added last paragraph
14	Changed page # to 15 and title, E.J. Kreh, Manager, Quality Assurance.

Roland J. Rucco 10-10-86
Engineer Date

[signature] 10/16/86
Project Manager Date

[signature] 10/10/86
Verifier Date

[signature] 10/11/86
Quality Assurance Date

[signature] 10/21/86
Approved CECo-SNED

Rev. 02 Change Record Page 1 of 2

SPECIFICATION AND REPORT CHANGE RECORD FORM

ARCHITECT ENGINEER'S PROJECT PLAN

FOR THE
EVALUATION OF THE PRESSURIZER
SAFETY AND RELIEF VALVE

DISCHARGE PIPING SUBSYSTEM

Pages Changed	Description of Change
2 and 3	Corrected page numbers for Sections 3.4, 3.5, 3.6, 3.8, 3.9, 3.11, 3.12, 3.13, 3.14, 3.15, 3.17, 3.18, 3.19, 3.22, 3.25, 3.26, 3.27, 3.28, 3.29

Roland J. Rao 10-10-86
Engineer Date

[signature] 10/10/86
Project Manager Date

[signature] 10/10/86
Verifier Date

[signature] 10/11/86
Quality Assurance Date

[signature] 10/10/86 Rev. 2 Change Record Page 2 of 2
Approved CECo-SNED

SPECIFICATION AND REPORT CHANGE RECORD FORM

ARCHITECT ENGINEER'S PROJECT PLAN
FOR THE
EVALUATION OF THE PRESSURIZER
SAFETY AND RELIEF VALVE
DISCHARGE PIPING SUBSYSTEM

Pages Changed	Description of Change
5	Move ..for the postulated slug flow accident condition... to be before ...overstressed condition... as shown. Delete Stone & Webster and ...
7	Delete Stone & Webster and replace with Sargent & Lundy
9	Add (1983 Edition)
10	Add 'ambient' before air and delete outside of the piping that is in Paragraph 3.7

Roland L. Kuro 9-2-86
Engineer Date

Project Manager 9/2/86
Project Manager Date

Gerald L Jones 9/2/86
Verifier Date

Quality Assurance 9/2/86
Quality Assurance Date

Approved CECo-SNED 9/9/86 Rev. 01 Change Record Page 1 of 1

ARCHITECT ENGINEER'S PROJECT PLAN FOR THE EVALUATION OF THE PRESSURIZER SAFETY AND RELIEF VALVE DISCHARGE PIPING SUBSYSTEM Zion Station Units 1 and 2

TABLE OF CONTENTS

		Page
1.0	PROJECT DESCRIPTION	4
2.0	SCOPE OF WORK	5
3.0	DESIGN INPUT REQUIREMENTS	8
	3.1 Basic Functions to be Performed	8
	3.2 Performance Requirements	8
	3.3 Codes, Standards and Regulatory Requirements	8
	3.4 Final Safety Analysis Report and Technical Specifications	10
	3.5 Design Conditions	10
	3.6 Design Loads	10
	3.7 Environmental Conditions	10
	3.8 Interface System Requirements	11
	3.9 Material Requirements	11
	3.10 Mechanical Requirements	11
	3.11 Structural Requirements	12
	3.12 Hydraulic Requirements	12
	3.13 Chemistry Requirements	12
	3.14 Electrical Requirements	12
	3.15 Layout and Arrangements Requirements	12
	3.16 Operational Requirements and Review of Operation Procedures	12
	3.17 Instrumentation and Central Requirements	13
	3.18 Security and Security Lighting Requirements	13
	3.19 Redundancy and Separation Requirements	13
	3.20 Failure Effects	
	3.21 Test Requirements	
	3.22 Accessibility, Maintenance, Repair, and In-Service Inspection	13
	3.23 Cathodic Protection Requirements	13
	3.24 Transportability Requirements	13
	3.25 Fire Protection Requirements	14
	3.26 Handling, Storage and Shipping Requirements	14

3.27 Personnel Protection - ALARA Requirements 14
3.28 Communication (Telephone/Radio) Requirements 14
3.29 Industry Experience Requirements 14

4.0 PROJECT ORGANIZATION 15

5.0 PROJECT SCHEDULE 16

6.0 SAFETY-RELATED EQUIPMENT LIST 16

REFERENCES 17

ARCHITECT ENGINEER'S PROJECT PLAN
FOR THE
EVALUATION OF THE PRESSURIZER
SAFETY AND RELIEF VALVE
DISCHARGE PIPING SUBSYSTEM
Zion Station Units 1 and 2

1.0 PROJECT DESCRIPTION

The pressurizer safety and relief valve discharge piping system for the pressurized water reactors (PWRs) provides overpressure protection for the reactor coolant system. A water-loop seal is maintained upstream of each pressurizer safety valve to prevent a steam interface at the valve seat. This water seal essentially eliminates the possibility of safety valve leakage.

The original pressurizer safety and relief valve discharge piping subsystem was designed by Sargent & Lundy. Subsequent to the Three Mile Island incident, the Nuclear Regulatory Commission issued NUREG-0737, Section II.D.1 [Reference 5], "Performance Testing of BWR and PWR Relief and Safety Valves." This required that all operating plant licensees and applicants conduct testing to qualify the reactor coolant relief and safety valves under expected operating conditions for design basis transients and accidents. In addition to the qualification of valves, the functionability and structural integrity of the as-built discharge piping subsystem and supports must be demonstrated on a plant-specific basis.

Under the new accident conditions postulated by NUREG-0737, the possibility of a slug flow condition exists in the discharge piping subsystem. In the unlikely event that all three safety valves are actuated simultaneously, the water seal driven by high-pressure steam forces a slug of water through the discharge piping subsystem. This

slug of water can generate substantial thermal hydraulic forces on the discharge piping subsystem and its supports.

Stone & Webster [Reference 1] and Sargent & Lundy [Reference 2] performed the plant specific analysis of the Zion Units 1 & 2 safety and relief valve discharge piping subsystem as part of the NRC IE Bulletin 79-14 effort. Their conclusions were that several components of the piping system would be overstressed. Sargent & Lundy [Reference 2] concluded that the postulated slug flow accident condition overstressed condition could not be eliminated by additional or relocated supports, and that a portion of the piping must be rerouted. Sargent & Lundy also proposed that the safety valves and all of the piping upstream of the safety valves be insulated in order to maintain a higher water temperature in the loop seals.

The purpose of this project, to be conducted by O'Donnell & Associates, is to review and the Sargent & Lundy analysis and determine whether, and, if so, where excess conservatism was used with respect to the Zion Units 1 and 2 of CECo. As shown by Reference 16, the portion of the discharge piping system from the pressurizer to the safety/relief valves, including the valves, is safety-related (Class 1 piping). The remainder of the piping system is nonsafety-related (Class 3 piping). O'Donnell & Associates will reanalyze the discharge piping subsystem using more realistic assumptions and analysis techniques. The refined evaluation may result in a satisfactory piping system in its current configuration, thereby avoiding the necessity of rerouting any piping and adding the proposed insulation.

2.0 SCOPE OF WORK

The O'Donnell & Associates work scope for the evaluation of the pressurizer safety and relief valve discharge piping subsystem will be divided into two phases. Two phases are required since satisfactory

completion of Phase 1 has the potential of eliminating the need for Phase 2. The following tasks are to be completed as part of the Phase 1 activities:

(a) An independent detailed study and review of the Stone & Webster and Sargent & Lundy reports. This review will focus on those areas where overconservative assumptions and/or techniques were used.

(b) Once the review (a) is complete, the thermal hydraulic analysis will be redone using the RELAP5/MOD1 [Reference 7] and REPIPE [Reference 8] programs. Undue conservatism identified in Part (a) will be removed from this reanalysis. The result of this analysis will be the appropriate dynamic forces acting on the discharge piping system as a result of the slug flow event.

(c) The dynamic forces determined in Part (b) will be used as input to the ANSYS Finite Element program [Reference 9]. A linear elastic finite element analysis of the discharge piping subsystem will be performed. Again, undue conservatism will be omitted from this analysis.

(d) The results of Part (c) will be compared against the applicable section of the ASME Boiler and Pressure Vessel Code. If satisfactory results are obtained, O'Donnell & Associates will aid Commonwealth Edison Company in preparing a position to be presented to the United States Nuclear Regulatory Commission.

(e) O'Donnell & Associates will also provide Commonwealth Edison Company with detailed answers to questions 12 and 13 proposed by the NRC in Reference 14. These questions pertain to the analysis

performed by Sargent & Lundy and the analysis carried out as part of this work scope.

(f) If the results of the Phase 1 work effort indicate that the piping system does not meet the applicable Codes, O'Donnell & Associates will issue a nonsafety-related report to CECo on the Phase 1 work.

After completion of Phase 1, if the resulting stresses meet the applicable Code limits, a safety-related report will be issued, and there is no reason to proceed further. However, our preliminary investigation of the work done by Sargent & Lundy [Reference 2] suggests that insufficient margin will be realized by the linear elastic analysis with reduced conservatism. Therefore, it is most likely that the second phase of this project will be required to satisfactorily analyze the piping system. The Phase 2 effort will use the results of Phase 1 and will be safety-related for the appropriate portion of the piping system as delineated in Section 1.0. The major task of the Phase 2 effort will be a nonlinear inelastic analysis. Properly executed, inelastic analyses are acceptable for both ASME Code purposes and regulatory (NRC) purposes. The following tasks, as applicable, will comprise Phase 2 of this work scope:

(g) Perform a nonlinear inelastic piping analysis of the complete pressurizer safety and relief valve discharge piping subsystem. This analysis will use discrete beam and nonlinear finite elements to represent the piping and supports. All data generated during Phase 1 which will be used as inputs for the Phase 2 effort will be verified in accordance with safety-related requirements.

(h) As required by the results of Part (g), detailed three-dimensional finite element inelastic analyses will be made of the areas of high stress.

(i) The results of the inelastic analyses will be compared with the appropriate Code Limits and NRC Requirements.

(j) Issue a safety-related report to CECo on the Phase 2 work.

(k) Aid Commonwealth Edison Company in preparing a report to the NRC based upon the results of Phase 2.

3.0 DESIGN INPUT REQUIREMENTS

The following requirements define the major technical objectives, restraints, and regulatory requirements for the scope of work associated with the analysis of the pressurizer safety and relief valve discharge piping subsystem.

3.1 Basic Functions to be Performed

Analyze the pressurizer safety and relief valve discharge piping subsystem for Zion Station, Units 1 and 2 under the case of all three safety valves being actuated simultaneously (hereafter referred to as the "event analyzed"), NUREG 0737, Item II.D.1.

3.2 Performance Requirements

There are no performance requirements associated with this work scope.

3.3 Codes, Standards and Regulatory Requirements

The purpose of the analyses is to assure the functionability and structural integrity of the as-built discharge piping in the event that all three safety valves should actuate simultaneously per NUREG-0737, Section II.D.1 and thus result in a faulted condition (Level D loading condition per ASME BPV Code Section III, Division 1). The allowable stresses and design criteria and methodology equations for the piping are as given by the following:

(1) Phase 1, Class 1 Piping
Allowables and methodology based on ASME BPV Code Section III, Division 1, Subsection NB (1983 Edition through Winter of 1985).

(2) Phase 1, Class 3 Piping
Allowables and methodology based on ASME BPV Code Section III, Division 1, Subsection ND (1983 Edition through Winter of 1985).

(3) Phase 2, Class 1 Piping
Allowables based on B31.1 (1967 Edition), methodology based on B31.1 (1967 Edition) and ASME BPV Code Section III, Division 1, Subsection NB and Appendix F (1983 Edition through Winter of 1985).

(4) Phase 2, Class 3 Piping
Allowables based on B31.1 (1967 Edition), methodology based on B31.1 (1967 Edition) and ASME BPV Code Section III, Division 1, Subsection ND and Appendix F (1983 Edition through Winter of 1985).

The pressurizer safety and relief valve discharge piping subsystem contains both safety-related and nonsafety-related components (see last paragraph of Section 1.0). For purposes of this scope of work, all analyses which require interaction of the entire piping subsystem and/or those which deal directly with the safety-related portions of the subsystem will be treated as safety-related analyses. Analyses which deal entirely with the nonsafety-related portion of the piping subsystem and whose performance does not affect the overall piping system will be considered as nonsafety-related analyses.

3.4 Final Safety Analysis Report and Technical Specifications

For the analysis of the events described in Section 3.1, certain unrelated conditions (for example, the seismic loads) given in the Final Safety Analysis Report are not applicable. The appropriate conditions used in the analysis will be compatible with FSAR requirements. Should any condition (e.g., peak pressure) be found to be more severe than the FSAR requirement, the more severe condition will be used.

3.5 Design Conditions

The setpoint pressure (2499.7 psia) of the safety valve will be used for the pressurizer with the steam in the pressurizer at saturation temperature (668°F) [Page 15 of Reference 2]. The temperature distribution of the loop-seal water is as measured by CECo on 10-06-82 [Reference 17].

3.6 Design Loads

The analyses will include the deadweight of the piping [References 3 and 4] and insulation [Reference 11]. Time history thermal hydraulic loads derived from RELAP5/REPIPE will be applied to the ANSYS piping model.

3.7 Environmental Conditions

The volume of the relief tank is 1800 ft^3 and it contains 1440 ft^3 of water at ambient temperature, assumed to be 80°F [Page 6 of Reference 2]. The piping, water vapor inside the piping and ambient air outside of the containment will be assumed to be 80°F [Page 6 of Reference 6]. The piping, water vapor inside the piping ambient and air inside the containment and downstream of the safety/relief valves is at 110°F [Reference 17].

3.8 Interface System Requirements

Because of the type of event analyzed, no interface systems need to be considered.

3.9 Material Requirements

The material requirements [References 3 and 4] are as follows:

(1) Seamless austentic steel pipe per ASTM A312

SIZE	GRADE	SCHEDULE	STANDARD
1/2 through 6"	TP304	40S	USAS B36.19

(2) Seamless austentic steel pipe per ASTM A376

3" and smaller	TP304 or 316	160	USAS B36.10
6"	TP316	160	USAS B36.10

(3) Fusion welded austentic steel pipes per ASTM A358, Class 1

12"	316	40	USAS B36.10

Values for the modulus of elasticity and the thermal expansion for the piping material will be as specified in the ASME Code for Pressure Piping, B31.1, 1983 Edition for Phase 1 and as specified in the ASME Code for Pressure Piping, B31.1, 1967 Edition for Phase 2.

3.10 Mechanical Requirements

The analysis will include the mechanical requirements for all of the piping components, i.e. straight pipe, elbows, tees, reducers, valves, supports, hangers, anchors, and snubbers. Because of the short duration of the slug flow event (1.25 seconds) [Exhibit 19 of Reference 2], the heat transfer from the slug of water to the pipe walls is insignificant and hence will be neglected.

3.11 Structural Requirements

The analyses will demonstrate the structural integrity of the piping system under consideration.

3.12 Hydraulic Requirements

The analyses will demonstrate the functionability of the piping system for the event considered. The analysis will use values of 0.88 second and 0.014 second for the simmer and pop periods for the safety valves [Page 15 of Reference 2] and a steady state steam flow rate of 129.5 lb/sec [Page 9 of Reference 2] (111% of rating) through the safety valves as required by the ASME Code.

3.13 Chemistry Requirements

Because of the function of the system, chemistry requirements are not applicable.

3.14 Electrical Requirements

Because of the type of event analyzed, electrical requirements are not applicable.

3.15 Layout and Arrangements Requirements

The analyses will be based on the as-built piping system [References 10, 11, 12, and 13]. The Stone & Webster support modification drawings 79-14 [Reference 13] take precedence over the Sargent & Lundy Reactor Coolant System Support drawings [Reference 12] and the Kellogg drawings [Reference 10] take precedence over the Sargent & Lundy drawing [Reference 11].

3.16 Operational Requirements and Review of Operation Procedures

Because of the type of event analyzed, operational requirements and operational procedures are not applicable.

3.17 Instrumentation and Control Requirements

Because of the type of event analyzed, instrumentation and control requirements are not applicable.

3.18 Security and Security Lighting Requirements

Because of the type of event analyzed, security and security lighting requirements are not applicable.

3.19 Redundancy and Separation Requirements

Because of the type of event analyzed, redundancy and separation effects are not applicable.

3.20 Failure Effects

Because of the type of event analyzed, failure effects are not applicable.

3.21 Test Requirements

Because of the type of event analyzed, test requirements are not applicable.

3.22 Accessibility, Maintenance, Repair, and In-Service Inspection Requirements

Because of the type of event analyzed, accessibility, maintenance, repair and in-service inspection requirements are not applicable.

3.23 Cathodic Protection Requirements

Because of the type of event analyzed, cathodic protection requirements are not applicable.

3.24 Transportability Requirements

Because of the type of event analyzed, transportability requirements are not applicable.

3.25 Fire Protection Requirements

Because of the type of event analyzed, fire protection requirements are not applicable.

3.26 Handling, Storage and Shipping Requirements

Because of the type of event analyzed, handling, storage, and shipping requirements are not applicable.

3.27 Personnel Protection - ALARA Requirements

Because of the type of event analyzed, personnel protection - ALARA requirements - are not applicable.

3.28 Communication (Telephone/Radio) Requirements

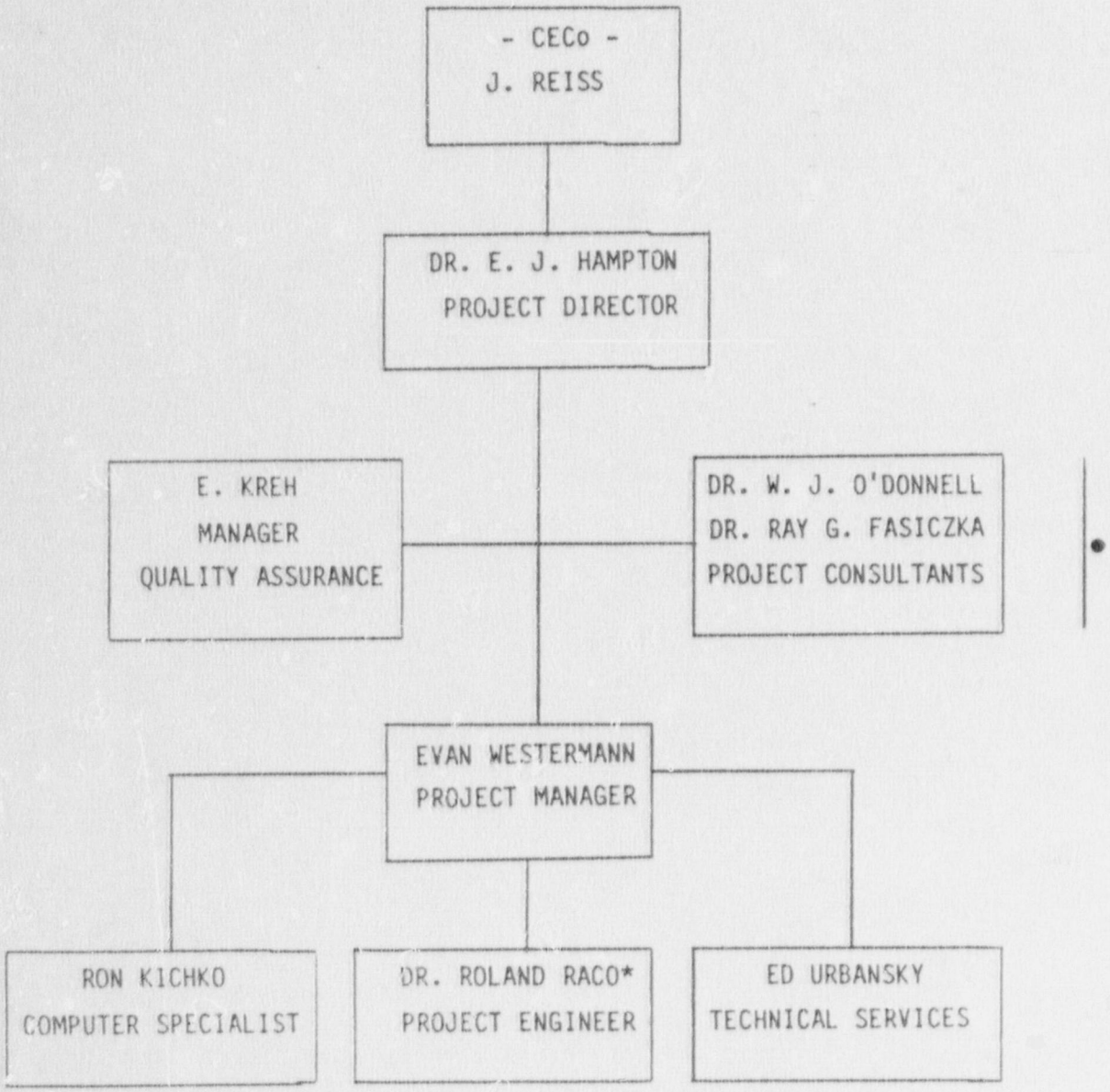
Because of the type of event analyzed, communication (telephone/radio) requirements are not applicable.

3.29 Industry Experience Requirements

The personnel involved with the project shown in the following Section meet the industry experience requirements.

4.0 PROJECT ORGANIZATION

The organizational structure employed by O'Donnell & Associates for this project is as follows:



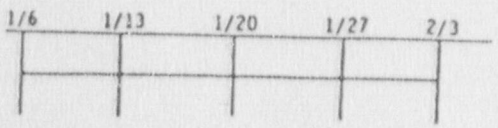
*Work will be independently verified per ANSI N45.2.11.

5.0 PROJECT SCHEDULE

The following is the schedule for the pertinent activities associated with the analysis of the pressurizer safety and relieve valve discharge piping subsystem:

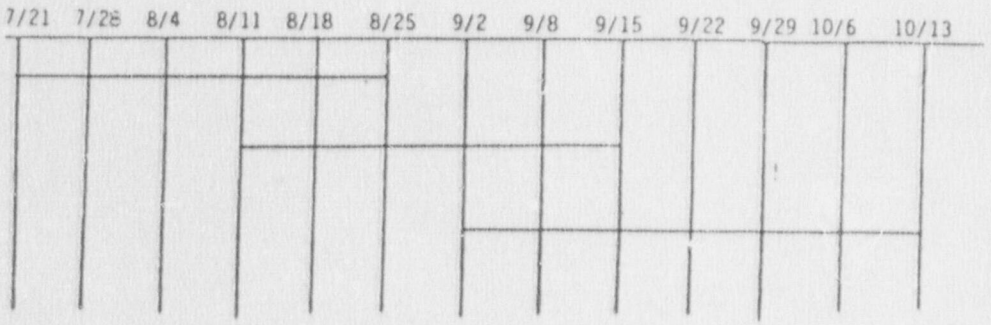
PHASE 1

- RESPOND TO NRC QUESTIONS AND PHASE 1 REPORT



PHASE 2

- DETAILED 3-D ANALYSES
- COMPARE RESULTS TO CODE
- FINAL REPORT AND NRC PRESENTATION



6.0 SAFETY-RELATED EQUIPMENT LIST

As shown by Reference 16, only the portion of the discharge piping subsystem upstream of the safety and relief valves is safety-related; however, all of the analysis effort associated with this project will be controlled by the requirements of 10CFR50, Appendix B and ANSI N45.2.11. In addition, the requirements of the O'Donnell & Associates Quality Assurance Manual [Reference 15] and Commonwealth Edison Company Supplement will also be involved.

REFERENCES

1. Books 1 through 6, inclusive, of Stone & Webster, "Zion Station Pipe Stress and Support Analysis Report," Number 13430RC - 2, 3, 4, 5, Revision 0, dated January 17, 1983, Commonwealth Edison Job Order 13430.01 for Reactor Coolant (Pressurizer 1RC002 to Pressurizer Relief Tank 1RC003).

2. Sargent & Lundy Report SL 4283 dated May 2, 1984, "Evaluation of the Pressurizer Safety and Relief Valve Discharge Piping System - Zion Stations 1 and 2."

3. "Zion Piping Design Table 'L' Stainless Steel," six pages dated February 15, 1969, revised December 30, 1970, numbered X-2242 and X-2245.

4. "Zion Piping Design Table 'E' Stainless Steel," five pages dated February 15, 1969, revised December 30, 1970, numbered X-2242 and X-2245.

5. NUREG 0737 - Item II D.1, NRC Docket Numbers 50 - 295 and 50 - 304, "Performance Testing of BWR and PWR Relief and Safety Valves."

6. Sargent & Lundy Report No. 037064, Project No. 6320-00. "Dynamic Analysis of Typical Pressurizer Safety and Relief Valve Discharge Piping Due to Valve Actuation." dated August, 1982.

7. Ransom, V. H. et al., "RELAP5/MOD1 Code Manual," Volumes 1-2, NUREG/CR-1826, EGG-2070, March 1982.

8. Norton, P. J., "User's Manual for Program REPIPE," Utilities Service Center, CDC, Rockville, Maryland.

9. ANSYS Engineering Analysis System, Revision 4.1, Swanson Analysis Systems, Inc., Houston, Pennsylvania.

10. Kellogg Company Power Piping Division, Job No. N8342, System #34 Reactor Coolant, Drawings:

    150 1-34-15 Rev. 2
    150 1-34-20 Rev. -
    150 1-34-21 Rev. 1
    150 1-34-22 Rev. 1
    150 1-34-23 Rev. 3
    150 1-34-24 Rev. 1

11. Sargent & Lundy Drawing M-418, Pressurizer Piping Analytical Data Isometric, Zion Station Unit 1, Sheet No. 1, Rev. D, dated July 31, 1979.

12. Sargent & Lundy Reactor Coolant System Support Drawings:

Hanger #	Date	Hanger #	Date
1RC146-FR1	8-25-77	RCH-1008	12-18-72
1RC146-SR1	4-21-77	RCH-1009	1-28-74
1RC147-SR1	4-21-77	RCH-1014	10-27-72
1RC147-SR2	4-21-77	RCRS-1112	11-20-72
1RC151-RV1	4-21-77	RCRS-1114	6-2-71
1RC157-RV1	8-25-77	RCRS-1115	11-20-72
1RC157-RV2	4-21-77	RCRS-1119	2-16-73
RCH-1005	10-27-72	RCRV-001	12-21-72
RCH-1007	1-12-73		

13. Stone & Webster Bulletin 79-14 Modification Support Drawings:

Hanger #	Date
RCH1006	2-10-81
RCH1010	1-30-81
RCRS1117	1-30-81
RCRS1118	1-30-81
RCRS1120	2-4-81
RCRS1121	1-30-81
RCRS1122	1-30-81
RCRS1123	2-4-81
RCRS1117A	7-22-81
RCRS1117B	7-22-81
RCRS1118A	7-22-81
RCS1011	--
RCS1012	--
RCS1013	--

14. NRC letter dated February 19, 1985, Docket No. 50-295 and 50-304 to Mr. D. L. Farrar, CECo from Mr. S. A. Varga, NRC Licensing Division.

15. O'Donnell & Associates, Inc. Quality Assurance Manual, Revision 5, dated January 15, 1985.

16. Sargent & Lundy, Diagram of Reactor Coolant Loops 3 and 4, Zion Station M-53, March 3, 1970.

17. Graesser, K.L., (Zion Station Superintendent) to Butterfield, L.D., (CECo), Letter November 9, 1982, "Unit 2 Pressurizer Safety Valve Loop Seal Temperature".

ATTACHMENT 2