INTERIM TECHNICAL REPORT ON ADDITIONAL VERIFICATION AND ADDITIONAL SAMPLING

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PROGRAM MANAGER'S PREFACE

DIABLO CANYON NUCLEAR POWER PLANT - UNIT 1 '

INDEPENDENT DESIGN VERIFICATION PROGRAM

INTERIM TECHNICAL REPORT

This is the first of a series of Interim Technical Reports prepared by the DCNPP-IDVP for the purpose of providing a conclusion of the program.

This particular report provides the present conclusions of the IDVP with respect to the additional verification and the additional sampling required for completion of the Phase I Program. It is based on the present status of the R.L. Cloud and Associates, Inc. (RLCA) evaluation of the initial (generic) samples defined by the Phase I Engineering Program Plan. As the RLCA initial efforts are completed, it may be necessary to revise this report. Information provided by PG&E in response to the concerns expressed herein may modify the presently anticipated distribution of effort, but is not expected to result in revision to this report.

As IDVP Program Manager, Teledyne Engineering Services has reviewed and approved this ITR, and has also approved the initiation of RLCA work in response to this report. The methodology followed by TES in performing this review and evaluation is described by Appendix I to this report.

ITR Reviewed and Approved IDVP Program Manager Teledyne Engineering Services

R. Wrav

Assistant Project Manager

1.0 INTRODUCTION

This Interim Technical Report summarizes the status of the generic sample, delineates recommendations for additional verification and additional sampling for the RLCA portion of Phase I.

Section 3.0 summarizes the status of the initial (generic) sample. For all categories of items, the EOIs which resulted in Error Reports or which are still unresolved have been listed. These EOIs form the basis for present concerns. In most cases, a recommendation for additional verification and additional sampling has been provided to address present concerns both generic and specific.

EOI status is indicated in Progress Report Number 14. Final review by TES, as Program Manager, may result in changes of the classifications of different EOIs. In addition, PGandE may provide information in response to the EOI that may help determine the classification. Therefore, if the classification and/or significance of any EOI changes, the present concerns and consequently the recommendations for additional verification and additional sampling may be altered. In spite of somewhat preliminary nature of the recommendations this report may serve as a reference point to identify and schedule the remaining RLCA Phase I tasks.

2.0 BACKGROUND, METHODOLOGY AND PHILOSOPHY

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Additional verification and additional sampling is defined in Attachment C and the former is more explicitly defined in Section 5.3 of the Phase I Engineering Program Plan (DCNPP-IDVP-PP-001). Additional verification is performed if deficiencies are found by means of either the QA review or the independent calculations. Both the QA review and the independent calculations determine the adequacy of the selected sample to provide a level of confidence for the given set of items.

The QA reviews will be considered in a separate Interim Technical Report.

A negative QA review conversely would tend to indicate a low level of consistency in the given set of items. This might require a more extensive sampling approach before a level of confidence for this group can be achieved.

Independent calculations and the subsequent comparison with the design analysis provide the means by which the acceptability of the sample may be judged. Deficiencies resulting from the independent calculations may affect the sampling level. Should a concern for generic items arise, then RLCA would recommend steps to be taken to address the generic concerns. In other cases, the reasons for the discrepancies may not be clear and additional sampling may be recommended to better judge the possible problems.

The Program Plan includes a discussion of the various types of additional verification that may be recommended by RLCA. Additional efforts resulting from discrepencies found by means of independent calculations will consist of either additional samples for independent calculation to clarify the reason for the discrepencies and/or additional verification of identified concerns. In either case the object of the additional verification will be to achieve a level of confidence that the plant meets the licensing basis criteria.

Section 3.0 delineates the basic groups of Phase I items. In light of deficiencies resulting from the independent calculations, RLCA is recommending that additional verification and additional sampling be performed. At the conclusion of the recommended additional verification and additional sampling, RLCA will have achieved a level of confidence that the Diablo Canyon Unit I design meets the criteria delineated in the applicable licensing documents.

The indicated distribution of the recommended additional work between PGandE, RLCA and TES is not considered to be firm. All information provided by PGandE will be considered by the IDVP and the schedule for the PGandE efforts will affect both the schedule and the distribution of the work done within the IDVP. Schedule may be established by the IDVP following the development of the scope and schedule to be undertaken by PGandE.

3.0 TECHNICAL EFFORTS INCLUDED IN THE PHASE I PROGRAM

The status, open items and recommendations for additional verification for all technical efforts included in the Phase I Program or additional sampling are discussed. In an abbreviated format, Figures 3-1 through 3-10 show the status of the generic sample, errors and unresolved open items issued as a result of the independent calculations, generic concerns and recommendations for additional verification and additional sampling.

Rather than attempting to deal with a large number of individual IDVP File Numbers, the results to date have been grouped in accordance with either the type of structure or component or the nature of the technical consideration. PGandE Open Items as identified by the PGandE semimonthly reports, have been identified with the appropriate groups. In each group there are between one and thirty File Numbers or PGandE Open Items, ranging in state of resolution. All items presently determined to be Errors, Potential Errors or still Open Items are included. For each group the resulting concerns are defined; the additional verification or additional sampling required to resolve the concern is identified; the information required from, or actions required by, PGandE to provide the information needed for IDVP resolution is stated; and the required IDVP action is listed.

The Error and Open Item (EOI) definitions are included in Attachment B.

3.1 BUILDINGS

3.1.1 TASK AND INITIAL SAMPLE

The Auxiliary/Fuel Handling Building is designated as the sample in Section 5.4.1 of the Phase I Engineering Plan.

3.1.2 STATUS

The North-South (N-S) and East-West (EW) models have been run to generate floor response spectra. In addition, a draft report for these models has been prepared. Professor Holley has reviewed this report.

Property calculations for the vertical model have not been completed.

3.1.3 EOIS AND GENERIC CONCERNS

Five EOI Reports have been issued as a result of the Auxiliary/Fuel Handling Building analysis. Four of these EOIs are considered by RLCA to involve design control issues: 1027 - Slotted Joint Holes in the Fuel Handling Building, 1029-Differences in the building properties, 1079 - Cross beam shown on drawing is absent and 1091-Inconsistent cross bracing drawings. The Auxiliary/ Fuel Handling Building was dynamically analyzed by URS/ Blume three times, 1/71, 6/77 and 10/79. For each analysis, the building properties used in the dynamic model were identical. RLCA drawing reviews show changes in the building layout. In the mid-1971 period, the ventilation buildings on either side of the Fuel Handling Buildings were constructed. In 1977 certain joints in the Fuel Handling Building were slotted. In addition, significant cross bracing was added to the Fuel Handling Building frames.

The URS/Blume input properties were computed by PGandE based on the 1970 building configuration. RLCA properties were calculated using 1982 field-verified drawings. This difference alone explains many of the property differences.

3.1.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

The generic concern noted above can be addressed by these two items:

RLCA

- Review all changes made to the safety-related buildings to determine the impact these changes have on the building seismic qualification.
- Review selected changes in the field to verify concurrence with drawings.

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Program Plan Section 5.4.1	TASK AND INITIAL	SAMIE		STATUS				SCHEDULED DATE OF CONFLETION	EOIs (See-Attachment_B)	CENERIC CONCERNS	RECOMMENDATIONS FOR ADDITIONAL VERIFICATION
-	Auxiliary /	inde1s	Properties	Frequencies	st388.	Spectre	a Report	· · · ·			
	Fuel Handling Building	NS	x	x	x	x	(draft)	June 30	1027 - Slotted Holes	Design Control related to building changes	RLCA: 1. Review changes in safety-related building draw-
	*	EW 5	x	x	x	×	(dra[t)	June 30	1029 - Auxiliary Building Froperties		ings for impact on seisuic qualification 2. Review selected chan-
		Vertical		•				July 15	1070 - Soll Springe		ges in the field to verily as- built concurrence with the drawings.
•		Building	Nembers - I	have not beer	n selecte	ed or an	nalyzed	July 15	1079 - Cross Beam		• • •
			- 41 1				ł		1091 - Inconsistent Gross- Bracing Drawings	•	
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3.2 PIPING

3.2.1 TASK AND INITIAL SAMPLE

Ten piping analyses have been chosen for independent analysis (Table II, Phase I Engineering Program Plan).

3.2.2 STATUS

Ten independent piping analyses have been completed by RLCA. Reasons for differences between RLCA and the design analysis have been noted. However, all such reasons have not yet been defined.

3.2.3 EOIs AND GENERIC CONCERNS

Figure 3-2 contains the list of Errors and unresolved EOIs corresponding to each piping analyses. These EOIs fall into three catagories: 79-14 Program, valve items and others.

About 30 EOIs corresponding to 79-14 differences are listed. One EOI, 932, has been classified as an Error • A . The balance of the 79-14 items, together with the EOI 932, have possible generic implications. With few exceptions, these items are seen as either deviations or errors. The one-way support referenced in EOI 932 is a field condition that was incorrectly noted on the 79-14 The balance of the 79-14 items also fit this isometric. description. EOI 932 happened to be located at a point on the pipe that contributed to an overstress. A generic concern arises due to the significance of EOI 932 (Class A Error) and the possibility of other field conditions falling into the same category, as well as the number of 79-14 EOIs in the 10 piping problems.

Six open items have been issued for remote operated

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valves. In one case, the eccentric mass of a remote operated valve was not included in the design analysis. This item 1069 resulted in an overstress. Two cases of incorrect remote operator valve orientation and several cases of incorrect remote operator valve weights have been identified. In addition, PGandE's Open Item #1 deals with six annulus valves which were found to be modeled incorrectly. The generic conern is based upon the overstress noted in EOI 1069 and the remote operator valve modeling problems (weights and orientation) in several other cases.

Seven independent analyses have been completed with two cases of overstress. Many 79-14 differences, several cases of incorrect valve modeling and several other items (spectra not available and equipment flexibility) have been reported. Based upon these findings, an additional sample of five RLCA piping analyses along with five TES reviews is required. The purpose of this additional sampling is to examine all catagories of piping. Attachment A gives the selection criteria and notes which areas have not been examined by RLCA. The additional ten problems will provide complete coverage of all the areas of piping.

The original verification plan was to consider specific piping problems from individual contractors. It was found that repeated re-analyses of the piping was performed by different contractors of the work of the others (and of PGandE). The piping analyses are now essentially homogeneous with regards to authorship.

3.2.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION AND ADDITIONAL SAMPLING

The generic concern about the 79-14 Program noted above can be addressed as follows:

PGandE: Review and revise as necessary all Piping Design Review Isometrics. Review and revise pipe and pipe support analyses as required.

RLCA: Selectively verify the PGandE action.

The generic concern about remote operated valve modeling noted above can be addressed as follows:

- PGandE: Check the documentation, weights, orientation and analytical models of all remote operated valves.
- RLCA: Selectively verify the PGandE action.

The generic concern about sample validity noted above can be addressed as follows:

RLCA: Select for independent analysis 5 additional samples for piping analyses. These lines will be selected to represent sections of piping unverified by RLCA. Examples will include: lines connected to large pipe analyzed by others, other systems, and field-run computer analyzed pipe.

TES:

Select for design review 5 additional piping analyses.

TASK INITI	AND AL SAHPLE	RICA AWAYSIS	ATUS REATORS FOR DIFFERENCES	SOFOR OF CO NWUYSI	an - Section Ald Date Flation S. Reachs	<u>1 5.4.2</u> Dis (See Atta	Flüre
'Ipingi	100	X ,	Partial		June 30	912 - Class A - Servert 1062 - Result Differences 9001A - 270 116 off	Separat location value , value 9002A - 93 lbs off
	101	x		****	July 7	946 - Class C - Dimension 947 - Class C - Valve Orien 1074 - Result Differences	ntation •
	102	x			July 15	937 - Fotential Class C 938 - Valve Orientation '937 - Fotential Class C	1054 - Repult Differences
	103	x	Fortial		July 7	933 - Class C Dizension	1080 - Result Differences
•	104	x			July 15	940 - Potential Class C 1021- COJ IX Flexibility 1025- Turbine Bidg Spectra 1081- Result Differences	
	105	x	Partial		June 15	959 - Potential Class C 961 - Field Differences	1009 - Elevation 165' Spectra 1085 - Result Differences
	106	x	X				
	107	x	Fartial		July 1	963 - Potential Class C 964 - Potential Class C 1750- Potential Class C	1063 - Result Differencess Value - 1600 lbs off Stewed supports Response System
	108	x		****	July 15	1014- Pipe Rock Spectra	1086 - Result Differences
	109	x	Fartial		July 1	913 - Fotential Class C 914 - Potential Class C 916 - Class C - Discretion 917 - Fotential Class C	958 - Potential Class C 1023- Valve Documentation 1031- Valve Documentation 1059- Potential Class A 1921- Scuit Differences

	ατιτίς ατάχε		RDAHINATIGS FOR ADDITIONL VERIFICATION AND ADDITIONL SANCLUS
	79-14 Program Ewis: EDI 932 Class A - Overstress Class C - 946, 947, 933, 936 Potential Class A - 1059 Fotential Class C - 959, 963, 964, 1050, 953, 954, 957, 958, 939, 939 Unreolved - 1074, 935, 1064, 1085, 1080 1081, 961, 1051, 1063, 1014, 1086, 1071, 1062.	1.	79-14 Program FornE: Review and review as reconnery Piping Dealan Review Incontrice. Review and review pipe and pipe apport analyses as required. ICant Lack 10141 mmy represent this same task RICA: Selectively verify the Name action.
2.	Remote Operated Valves (Documentation, Heights, Orientation and Analytical Hadels) Easis: EDI 1071 - Overstress - Valve Support 1062 - Valve SOOIA - 270 lin off Valve SOO7A - 93 liss off 947 - Class C - Valve Orientation 918 - Valve Orientation 1063 - Velen Valve - 1400 lin off France Open Item 1 - Six Analus valves were found to be siveled incorrectly	2.	Prote Gretated Values Non-E. Given the Accumutation, wrights, of circulation and analytical models of all runce operated values. NormE Task 10038 may represent this same task. RLCA: Selectively verify the NormE action.
3.	Other Concerns - Two cases of noted overstress EDI's 932 and 1069 RICA Analysis 105: 165 ft Containment erectra and presurizer supports RICA Analysis 106: Insbine Building arectra and COM IX Flexibility RICA Analysis 108: Fipe rack spectra	3.	Additional Sample RICA: Select for independent analysis 5 additional piping snalyses. These lines will be selected to represent sections of piping unverified by RICA. examples will includer lines connected to large pipe analyzed by others, other systems and lield-run connecte analyzed pipe.

TES: Select for design review five additional piping analyses.

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FICURE 3-3

Program Plan Section '5.4.3

	TASK AND INITIAL SAM	PLE STATUS	SCHEDULED DATE OF CONFLETION	EOls (See Attachment B)	CONCERNS	RECOMMENDATIONS FOR ADDITIONAL VERIFICATION	SCHEDULED DAT
•	20 Pipe Supports	Field Verification Complete Analysis not Complete	, July 15	1060 - FIFESD may compute lower support loads than ADLFIFE	 The two computer codes (ADLPIFE and PIFESD) may compute support loads dif- ferently. 79-14 Program cover 	RLCA:1. Document the methodol ogy exployed by each code to calculate support loads. 2. Run simple cases to verify 1.	liay 30
			· · · ·		ed. in piping.	3. Review one or more of the initial piping sample re- sults to determine if any sig- nificant contribution of load due to rigid response may be Bissed when only the response spectra (up to 33 Hz) samiysi. results are used for supports. This concern applies to sit- uations involving supports located at or adjacent to larg masses and for axial supports on long runs of pipe.	
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3.3 PIPE SUPPORTS

3.3.1 TASK AND INITIAL SAMPLE

Twenty pipe support have been chosen for field verification and independent analysis.

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3.3.2 STATUS

The field verification of the twenty supports is complete. Independent analysis of these supports . is not complete.

3.3.3

EOIs and CONCERNS

EOI 1060 has been issued concerning possible differences between ADLPIPE and PIPESD for support load calculational methods. In RLCA Piping Analysis 106, the pipe stresses agree within 8% but the support loads differed by more than 15%. RLCA has run the PGandE model on ADLPIPE, support loads agree within 3%.

In the pipe-support evaluation process for DCNPP, there is further concern that the load results from the response spectrum model superposition analysis, when used alone, may provide unconservative seismic inertia loads on piping supports for two specific situations. These are (1) where the support or anchor is located at or adjacent to a large mass(es) representing a valve(s) or other line supported components and (2) for axial supports on long runs of pipe and even short run(s) which contain large concentrated masses. The problem in both situations, to be more specific, is the possible missing inertia load contribution associated with the rigid response (>33 hertz) of large masses that are reacted directly by the appropriate supports. This is a particular concern for DCNPP because of the unusually high ZPA specified.

It is the IDVP recommendation to select from the generic sample of ten (10) piping problems one or more problems for a more detailed evaluation and assessment into the validity of this concern.

The generic concern with the 79-14 Program as it relates to pipe supports has been addressed in the piping section. 3.3.4 RECOMMENDATION FOR ADDITIONAL VERIFICATION

The concern about the differences in support load calculational methodologies between PIPESD and ADLPIPE will be addressed as follows: 13

RLCA: 1. Document the methology employed by each code to calculate support loads.

2. Run simple cases to verify 1.

3. Review one or more of the initial piping sample results to determine if any significant contribution of load due to rigid response may be missed when only the response spectra (up to 33 Hz) analysis results are used for supports. This concern applies to situations involving supports located at or adjacent to large masses and for axial supports on long runs of pipe.

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3.4 SMALL BORE PIPING (to include pipe under six inches in diameter supported using spacing criteria)

3.4.1 TASK AND INITIAL SAMPLE

3 runs of Small Bore Piping were chosen for field verification and a review of the spacing criteria performed.

3.4.2 STATUS

The review of the spacing criteria and field verific-

3.4.3 EOIs and GENERIC CONCERNS

Figure 3-4 contains the list of unresolved EOIs issued concerning small bore piping. These EOIs fall into two catagories: 79-14 Program and criteria items.

The generic concern with the 79-14 Program is governed by EOIs 1043, 1044, 1045, 1046, and 1047. The logic relevent to the concern with the isometrics is presented in the piping section.

The spacing criteria was found to contain possible deficiencies in the area of axial lugs. A generic concern with the lugs is based on independent lug

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stress calculations that show the criteria may not be conservative for all areas and loadings. In addition, several situations are not explicitly covered by the spacing criteria. Typical situations not covered include valve bypass stations, heavy valves and equipment nozzle loads. These types of items are handled by applied "engineering judgement".

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3.4.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

The generic concern about the 79-14 Program noted above can be addressed as follows:

PGandE: Review and revise as necessary Small Bore Piping Design Review Isometrics. Review and revise as necessary application of spacing criteria. RLCA: Selectively verify the PGandE action.

The generic concern about the situations not explicitly covered by the spacing criteria can addressed as follows:

RLCA: Five examples of axial pipe runs and lug designs will be reviewed to assess lug stress.

RLCA: Five examples of small bore lines will be rigorously analyzed to verify the adequacy of "engineering judgement" used in treatment of conditions other that those covered by PGandE criteria. Specific items to be covered include valve bypass stations, heavy valves and equipment nozzle loads.

F	ICURE	3-4
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J runs of Small Bore Fiping (to include pipe under six inches in dismeter supported using spacing criteria and review of spacing criteria. Engineering complete IO43 - Field Differences in Croblems in Certain sreas in	RLCA: 1. Five examples of axial pipe runs and lug of designs will be re- viewed to assess lug atress 2. Five examples of small bore lines will be rigorously analyzed to verify the adequacy of "engineering judge- sement" used in treatment of conditions other than those covered by ern fGendE criteria. Spe- eld cific items to be co- vered include valve bypass stations, heavy valves and equipment nozzle loads. FGandZ: Review and revise as necess- ary all Smill Bore Fiping Design Review isometrics. Re- view and revise as necess- ary all smill bore Fiping Design Review isometrics. Re- view and revise as necessary application of specing the rGandZ RLCA: Scittively wrify the rGandZ

PROGRAM PLAN SECTION 5.4.4

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3.5 EQUIPMENT ANALYSIS

3.5.1 VALVES

3.5.1.1 TASK AND INITIAL SAMPLE

Two valves have been selected for the independent analysis sample. These are valves FCV-95 and FCV-41.

3.5.1.2 STATUS

The independent analysis and comparison of valve FCV-95 has been completed.

PGandE is expected to supply information to allow completion of the independent analysis of FCV-41.

3.5.1.3 EOIs and GENERIC CONCERNS

• EOI 950 has been issued as a Class C Error for a FCV-95 modification not installed per design. There are no generic concerns related to this individual item.

3.5.2 ELECTRICAL EQUIPMENT

3.5.2.1 TASK AND INITIAL SAMPLE

Two items of electrical equipment have been selected for the independent analysis sample. These are the Main Annunciator Cabinet and the Hot Shutdown Remote Control Panel.

3.5.2.2 STATUS

The Hot Shutdown Remote Control Panel independent analysis is complete.

The Main Annunciator Cabinet analysis and comparison has been completed.

3.5.2.3 EOIs and CONCERNS

Two EOIs were issued for the Main Annunciator Cabinet. EOI 1008 involves the use of preliminary spectra in the design analysis. EOI 949 cites the incorrect design assumption of a rigid cabinet in the North-South direction.

3.5.2.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

The main control board is the only other major item of electrical equipment qualified by analysis. As a result of the EOIs discussed above and the significance of EOI 949, it is recommended that the analytical qualification of the main control board be reviewed by RLCA.

3.5.3 TANKS

3.5.3.1 TASK AND INITIAL SAMPLE

Three tanks have been chosen for the independent analysis sample. These include the Boric Acid Tank, the Diesel-Generators Fuel Oil Priming Tank and the Diesel-Generators Starting Air Receiver Tank.

3.5.3.2 STATUS

The independent analysis has been completed for all three tanks in the selected sample.

3.5.3.3 EOIs and GENERIC CONCERNS

Comparison with the design calculations have resulted in the issuance of three unresolved EOIs. Of the three EOIs , two concern the use of inapplicable seismic inputs. These involve the use of preliminary spectra and spectra not contained in the Hosgri Report.

Another concern involved the thoroughness of the PGandE analysis of the tanks. Examples of the areas not explicitly covered in the PGandE analysis are buckling of the tank skirt, effects of sloshing on the tank roof; etc. The RLCA analysis indicates no significant stress result in the tanks considered.

3.5.3.9 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

Additional verification for seismic inputs is discussed in Section 3.9.

The recommendation to address the generic concern of certain areas of tanks not evaluated is as follows: RLCA to review the related analyses of the remaining Hosgri required tanks. These tanks are the Underground Fuel Oil Storage Tanks and the Outdoor Water Storage Tanks.
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3.5.4 HEAT EXCHANGERS

3.5.4.1 TASK AND INITIAL SAMPLE

The Component Cooling Water Heat Exchanger has been selected for the independent analysis sample.

3.5.4.2 STATUS

The Component Cooling Water Heat Exchanger analysis has been completed.

3.5.5.3 EOIs and CONCERNS

EOI 1088 has been issued to report bolt overstress.

3.5.4.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

EOI 1088 will be resolved.

No further verification is required, since there are no other Hosgri required heat exchangers in the PGandE or service contractors' scope.

3.5.5 PUMPS

3.5.5.1 TASK AND INITIAL SAMPLE

Three pumps have been selected for the independent analysis sample. These include the Turbine-Driven Auxiliary Feedwater Pump, the Auxiliary Saltwater Pump and the Component Cooling Water Pump.

3.5.5.2 STATUS

The independent analyses and comparisons for the Turbine-Driven Auxiliary Feedwater Pump and the Auxiliary Saltwater Pump have been completed.

The independent analysis of the Component Cooling Water Pump will be completed following receipt of information from PGandE.

3.5.5.3 EOIs and CONCERNS

Three EOIs are unresolved for the pump analyses and comparisons completed to date. (1022, 1072 and 1073) Overstress was found in the motor mounting bolts for the Auxiliary Saltwater Pump, EOI 1073. These bolts were not evaluated in the Design Analysis. Concerns that result from the independent calculations involve the use of applicable seismic input and lack of documentation for evaluation of certain areas. 3.5.5.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

wa¢agia. Néna≹in Based upon the above discussion, the following additional verification is recommended:

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• Verify seismic inputs (see section 3.9)

 RLCA to review the analysis of the remaining two Hosgri safety related pumps.

3.5.6 HVAC COMPONENTS

3.5.6.1 TASK AND INITIAL SAMPLE

Two HVAC components have been selected for the analysis sample. These are Supply Fan S-31 and Volume Damper 7A.

3.5.6.2 STATUS

The independent analysis of Volume Damper 7A is complete.

Sufficient information and documentation to allow the independent analysis of Fan S-31 to be performed is unavailable. RLCA is scheduled to make a site visit to prepare sufficient field detail drawings to allow an independent analysis to be performed.

3.5.6.3 EOIs and GENERIC CONCERNS

EOI 1083 has been issued that deals with incorrect detailing of flange thickness, motor orientation, and weld size & type of Volume Damper 7A. EOI 1083 Revision 1 reports overstress of motor bracket support welds.

3.5.6.4 RECOMMENDATIONS FOR ADDITIONAL SAMPLING

The discrepencies found in the independent calculations present no clear pattern. In order to better understand the quality of the engineering work applied to HVAC components an additional sample of two HVAC components is recommended for independent calculation.

		,	•	۴				•		
	TASK AND	INITIAL SAMPLE	STATUS	F	IGURE 3-5 SCIEDULED DATE OF CONFLETION	,]	EOIs (See Attachment	В.,	CENERIC CONCERNS	RECONDENDATIONS ADDITIONAL VERIFI ND ADDITIONAL SAM
Equipment Valves	Analysis FCV 41		PCandE to provide	information	4 weeks follow- ine receipt of information.				Analysis not Complete	
f	FCV 95		Complet	•		950 - Cla	ss C - Plate Thickn	688	No generic concerns	
Electr	cal Equipmen	te Hain Annunciator	Panel Complete	e *	****	1008 - Fot - 949 - Bol	ential Class C - Fre t Overstream	Hainary Spectre	1. Seismic Inputs 2. Frequency Cal- culations	1. Seismic Inpu covered by sect
		liot Shutdown Pane	1 Complete	•						_imi toon mili
' Tankeı	Diesel-Geno	erators Oil Priming 7	ank Complet	•		1011 - Pr 1017 - Po We	eliminary Spectra Stential Class C - S Sight	ite Glass	 Seismic Inputs The evaluation of certain cri- tical 	 Seismic Inputs covered by Sec 3.9 RLCA to review Buried Tanks Outdoor Tanks
	Diesel-Gene Receiver Tr	erators Starting Air	Complet	2		1053 - Sp	ectra and Damping		incomplete.	
· ·	Boric Acid	Tank	Complet	c						
lleat E	changer: Co	exponent Cooling Wate at Exchanger	r Complete	•	••••	1068 - Ov	verstress		Bolt Overstress	Resolve EOI
Fumpse	Component (Cooling Water	FCandi to provide	information 4	wis following				1. Selemic Inputs	1. Seismic Inpu
	Auxiliary S	Saltwater	Complet	•	<	1072 - Spec 1073 - Bolt	ctra at 8 Feet t Stress Exoreds Allows	ble	2. The evaluation of certain areas	covered by section 2. RLCA to review analysis of the t remaining Hosgri
	Auxiliary I	feedwater - Turbine	Complet	2	·	1072 - 152	Difference, Spectra & F	requircy	ed.	
HVACI	Fan S-31	•	RICA to prepare fi FGandE and manufac unable to provide	eld drawing - turer have bee information	June 15 en				The discrepencies RICA to per found in the indep- endent calculations additional	RICA to perform the dependent analysis additional samples
· ·	Damper 7A		Complet			1083 - FL	eld Items and Weld	Overstress	present no clear	corporents.

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3.6 EQUIPMENT QUALIFIED BY SHAKE TABLE TESTING

3.6:1 TASK AND INITIAL SAMPLE

7 groups of equipment qualified by shake table testing have been selected for review of seismic inputs, test procedure, location and mounting.

3.6.2 STATUS

This task has been completed

3.6.3 EOIs and GENERIC CONCERNS

Three EOIs have been issued and are unresolved concerning equipment qualified by shake table testing: EOI - 1013 test spectra lower than the required response spectra, EOI - 1049 Main Annunciator Typewriter located in the control room, and EOI 1078 Ventilation Panel screws missing.

The concern in this area of qualification focuses on the question of whether the applicable response spectra, consistent with the location in the building of the equipment to be tested, were furnished in the test procedure. EOIs 1013 and 1049 identify specification of inapplicable spectra. Subsequent review of the test output, equipment characteristics, and the applicable spectra showed the tests did qualify the equipment.

3.6.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

The generic concern noted above can be addressed by these two items:

- RLCA: 1. Confirm field locations and mountings of all equipment seismically qualified by shake table testing (excluding NSSS vendor).
 - Verify that the correct test spectra were specified for all qualification shake table tests conducted on equipment.

. FIGURE 3-6

TASK AND	SCHEDULED DATE	EOIs	GENERIC	RECOMMENDATIONS FOR
INITIAL, SAMPLE STATUS	OF COMPLETION	(See Attachment B)	CONCERNS	ADDITIONAL VERIFICATION
Equipment Quali- Complete fied by Shake Table Test - 7 groups of equipment		 1013 - Test Spectra lower than require res- ponse spectra 1049 - Main Annuncia- tor Typewriter 1078 - Ventilation Panel - screws missing 	1. Test procedure inputs including spectra, field location and mounting	 RLCA: 1. Confirm field locations and mountings of all equipment seismically qualified by shake table testing (excludes NSSS vendor). 2. Verify that the correct test spectra were spe- cified for all qualifi- cation shake table tests conducted on electrical equipment

. PROGRAM PLAN - SECTION 5.4.6

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3.7 CONDUIT SUPPORTS

3.7.1 TASK AND INITIAL SAMPLE

Twenty supports have been chosen for field review. Twenty analysis samples have yet to be selected.

3.7.2 STATUS

The field review is complete. The analysis samples have not been selected or analyzed.

3.7.3 EOIs AND GENERIC CONCERNS

Three EOIs have been issued concerning electrical raceways EOI 910- field differences, EOI 930- Criteria, and EOI 983- spectra differences. Two generic concerns, tubing weight and field modifications are detailed in EOI 910.

In the first case a miscommunication between the field and design led to additional tubing weight being added to raceway supports. The second item dealt with design approval for field installation of larger members for details qualified with small struts.

The review of the raceway criteria led to the issuance of EOI 930.longitudinal support for conduits, the effect of adjacent supports, and span justification are among the generic concerns raised.

EOI 983 deals with inapplicable spectra inputs into raceway analyses.

3.7.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

The generic concerns raised about field installation in EOI 910 can be addressed in the following manner:

PGandE: Execute the field program developed to respond to the generic concerns.

RLCA: Selectively verify the PGandE program

The generic concerns about the criteria can be addressed in the following manner:

PGandE: Respond to EOI 930.

RLCA: Review the criteria changes or justification.

The seismic inputs are being addressed in section 3.9

FIGURE 3-7

PLAN 5.4.7	TASK AND INITIAL SAUTLE	STATUS	SCHEDULED DATE OF CONFLETION	(Sce Attachment B)	GENERIC CONCERNS	RECONSIGNATIONS FOR ADDITIONAL VERIFICATION	SCHEDULED DATE OF CORPLETION
	Conduit Supports 20 Supports - Field Review Analysis Sample	Complete Sample has not been selected or analyzed	S weeks following FGandE completion	910 Field Differences 930 Raceway Criteria 983 Spectra Differences	 Specific field Installation issues moted in EOI 910. Seismic Inputs (Covered in Section 3.9). Griteria Deficiencies. 	 FIELD ISSUES PGandE: Execute the Program developed to respond to EOI 910. NLCA: Selectively verify the program. SEISHIC INPUTS (Covered in Section 3.5) PGandE: Complete Task 70100 - Raceway Reanalysis sample. CRITERIA DEFICIENCIES PGandE: Respond to EOI 930 RLCA: Review the criteria changes or justifica- tion. 	l week follow- ing FCandE completion 7 weeks follow- ing FCandE complet 3 weeks-follow- ing FCandE completion

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PROGRAM PLAN SECTION 5.4.7

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#### 3.8 HVAC DUCT

## 3.8.1 TASK AND INITIAL SAMPLE

Two sections of HVAC Duct have been selected for field review and independent analysis

3.8.2 STATUS

The field review is complete and the analysis is continuing.

#### 3.8.3 EOIs and GENERIC CONCERNS

Two EOIs have been issued and are unresolved for HVAC Duct. EOI 1003-seismic inputs. EOI 1077-support analysis date. No generic concerns have been noted.

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# Figure 3-8

# PROGRAM PLAN - SECTION 5.4.8

| TASK AND<br>INITIAL SAMPLE   | - STATUS                                                 | SCHEDULED DATE<br>OF COMPLETION | EOIs<br>(See Attachment B)                                               | GENERIC CONCERN |
|------------------------------|----------------------------------------------------------|---------------------------------|--------------------------------------------------------------------------|-----------------|
| Two sections<br>of HVAC duct | Field Inspection<br>Complete<br>Analysis not<br>Complete | July 1                          | 1003 - Duct Support<br>Seismic Inputs<br>1077 - Support Analysis<br>date | ·<br>·          |

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#### 3.9 HOSGRI SPECTRA

#### 3.9.1 TASK AND INITIAL SAMPLE

The seismic inputs into design analyses are to be checked. In addition, the current URS/Blume seismic spectra are to be identified.

#### 3.9.2 STATUS

The task of identifying the current Blume spectra and checking the inputs into the design analyses is complete.

#### 3.9.3 EOIs and GENERIC CONCERNS

RLCA has issued 1 Error and 15 unresolved EOIs concerning seismic input. PGandE has issued four Open Items concerning seismic inputs. As a result it has been noted that the Hosgri Report does not include the most current Blume spectra.

Certain areas of the plant do not have response spectra available for use in piping, equipment, etc. analyses. In addition, preliminary and incorrect spectra have been used in design analyses for piping and equipment.

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#### 3.9.4 RECOMMENDATIONS FOR ADDITIONAL VERIFICATION

As a result of the generic concerns, the following recommendations for additional verification are made:

- PGandE: 1. Assemble the correct URS/Blume generated Hosgri spectra.
  - 2. Assign unique numbers to each of the spectra figures.
  - Control this set of design spectra and any future revisions.
  - 4. Review the spectra used in all Hosgri qualifications against this set of current, controlled spectra (This would include qualifications performed by the NSSS vendor).

RLCA:

Selectively verify the applicability of the new controlled spectra.

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#### FICURE 3-9

Program Plan Section 7.0

| 7.0 | TASK AND INITIAL SAMPLE                                                                                          | STATUS                                                                                                                                                                   | SCHEDULED DATE<br>OF CONFLETION         | EOIs<br>(See Attachment B)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CENERIC CONCERNS                                                                                                                                                                                                                                                                                                                                       | PEDITIONLY POR                                                                                                                                                                                                                                                                              |
|-----|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | Hosgri Spectra<br>Check inputs into the<br>qualification snalyses<br>and determine the current<br>Blume Spectra. | With the exception of piping,<br>the spectra used in the<br>qualification analysis of<br>completed asmples has been<br>checked against the applicable<br>Hosgri Spectra. | This task is<br>considered<br>complete. | 970 - Ibegri/Blune Report Differences (Aux)<br>967 - Ibmgri/Blune Report Differences (Intake)<br>978 - Reparcalive list Exchanger Spectra<br>939 - Recewa Spectra<br>1002 - IN/G Cort Spectra - Class B<br>1003 - IN/G Cort Spectra<br>1008 - Huin Arnunciator - Freliminway Spectra<br>1009 - 165' Containment - No Spectra<br>1010 - 165' Turbine - No Spectra<br>1010 - 165' Turbine - No Spectra<br>1011 - Diesel Triming Tark - Freliminary Spectra<br>1013 - Test Spectra - Potential Class B<br>1014 - Fipe Rack - No Spectra<br>1022 - Auxiliary Saltwater Pump - Spectra at 8'<br>1023 - Turbine Areas - No Spectra | <ol> <li>The Bisgri Report does not<br/>include the current Blum:<br/>Spectra: In addition, the<br/>spectra was not controlled<br/>by either Non-E or URS/<br/>Blume.</li> <li>Spectra are not available<br/>for certain areas.</li> <li>Freilminury and incorrect<br/>spectra have been used in<br/>quilification analyses for<br/>piping.</li> </ol> | NGRNE:<br>1. Assemble the correct URS<br>Blume Hosfri spectra.<br>2. Assign unique numbers to<br>all the spectra figures.<br>3. Control this design<br>spectra and any revisions<br>thereto.<br>4. Review spectra used for<br>all Hospri qualifications<br>(including NSSS vendor)<br>RLCA: |
|     |                                                                                                                  |                                                                                                                                                                          |                                         | 1063 - Fiping - Spectra Differences<br>FORTE Open Item 12 - Spectra Digitization<br>FORTE Open Item 10 - Arruius Spectra<br>FORTE Open Item 116 - Sciande Coefficient<br>FORTE Open Item 121 - INVC Duct Support -<br>Sciande Inputs                                                                                                                                                                                                                                                                                                                                                                                         | -                                                                                                                                                                                                                                                                                                                                                      | Selectively verify appli-<br>cability of new controlled<br>spectra                                                                                                                                                                                                                          |

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3.10 SEISMIC INPUT INTO NSSS VENDOR CALCULATIONS

3.10.1 TASK AND INITIAL SAMPLE

Selectivily verify a sample of input into Westinghouse analyses.

3.10.2 STATUS

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This task is in the TES scope.

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# FIGURE 3-10

# PROGRAM PLAN - SECTION 8.0

| TASKS                                            | STATUS                           |
|--------------------------------------------------|----------------------------------|
| Seismic Inputs into<br>NSSS vendor calculations. | . This task is in the TES scope. |
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## ATTACHMENT A ·

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#### RLCA SAMPLE SELECTION CRITERIA

#### PIPING

#### (Excludes Buried Piping)

#### Generic Items To Be Examined .

- A. Location of System Include major categories of defined spectra
  - 1. Interior Containment, Concrete
  - 2. Interior Containment, Annulus Steel
  - 3. Exterior Containment
  - 4. Auxiliary Building
  - \* 5. Auxiliary Building, Control Room Floor
    - 6. Turbine Building
- · B. · Original Design Process of System
  - 1. Detailed Analysis
  - \* 2. Restraint Spacing Criteria of "Field Run"
- C. <u>Piping Systems</u> Include major Hosgri required systems
  - 1. Feedwater
  - 2. Turbine Steam Supply
  - 3. Reactor Coolant
  - 4. Chemical Volume Control
  - 5. Safety Injection
  - 6. Residual Heat Removal
  - 7. Component Cooling Water
  - \* 8. Makeup Water
  - \* 9. Liquid Radwaste
  - 10. Containment Spray
  - \*11. Containment H<sub>2</sub> Purge

D. Classes of Piping Systems - Include all PGandE Classes within Design Class I

| 1.  | PGandE | Class | Α |
|-----|--------|-------|---|
| 2.  | PGandE | Class | B |
| 3.  | PGandE | Class | С |
| :4. | PGandE | Class | a |

### E. <u>Model Decoupling</u> - Examine criteria and implementation

System connected to rigid equipment analyzed by PGandE
 System connected to rigid equipment analyzed by others
 System connected to flexible equipment analyzed by PGandE
 System connected to flexible equipment analyzed by others
 System connected to large pipe analyzed by PGandE
 System connected to large pipe analyzed by others

- F. Model Overlap Examine implementation
- G. <u>Concentrated Weights Modeling</u> Examine implementation of correct weights
  - 1. Motor operated valves
  - 2. Equipment qualified as "in-line" component
- H. Support Modeling Examine correct implementation
  - 1. Support gap
  - 2. Support direction of restraint
- I. Originator
  - 1. PGandE
  - 2. URS/Blume
  - 3. Cygna (EES)
  - 4. EDS Nuclear

Specific Items to Diablo Canyon to be Examined

- J. <u>Undefined Spectra at Exterior Containment Pipe Rack</u>
- K. Undefined Spectra at Interior Containment Above El. 140'

\* Not covered by present RLCA sample

## ATTACHMENT B

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## ERROR AND OPEN ITEM DEFINITIONS

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DCNPP-IDVP-PP-003 REVISION 0

# DIABLO CANYON NUCLEAR POWER PLANT INDEPENDENT DESIGN VERIFICATION PROGRAM

## PROGRAM PROCEDURE

PREPARATION OF OPEN ITEM REPORTS, ERROR REPORTS, PROGRAM RESOLUTION REPORTS AND IDVP COMPLETION REPORTS

This Program Procedure, DCNPP-IDVP-PP-003 is issued for the purpose of implementing the Program Management Plan.

N.E. Coop - 820331

Approved/Program Manager/Date

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### DCNPP-IDVP-PP-003

**6** TELEDYNE

**ENGINEERING SERVICES** 

# PREPARATION OF OPEN ITEM REPORTS, ERROR REPORTS, PROGRAM RESOLUTION REPORTS AND IDVP COMPLETION REPORTS

### **1.0 DEFINITIONS**

1.1 An <u>Open Item</u> is a concern that has not been verified, fully understood and its significance assessed. The forms of program resolution of an Open Item are recategorization as an Error, as a Deviation, or as a Closed Item.

1.2 An <u>Error</u> is a form of program resolution of an Open Item indicating an incorrect result that has been verified as such. It may be due to mathematical mistake, use of wrong analytical method, omission of data, or use of inapplicable data.

Each Error shall be classified as one of the following:

1.2.1 Class A - An Error is considered Class A if design criteria or operating limits of safety related equipment are exceeded as a result, and physical modifications or changes in operating procedures are required. Any PG&E corrective action is subject to verification by the IDVP.

1.2.2 Class B - An Error is considered Class B if design criteria or operating limits of safety related equipment are exceeded, but are resolvable by means of more realistic calculations or retesting. Any PG&E corrective action is subject to verification by the IDVP.

1.2.3 Class C - An Error is considered Class C if incorrect engineering or installation of safety related equipment is found, but no design criteria or operating limits are exceeded. No physical modifications are required, but if any are applied they are subject to verification by the IDVP. 1.2.4 Class D - An Error is considered Class D if safetyrelated equipment is not affected. No physical modifications are required, but if any are applied they are subject to verification by the IDVP.

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1.3 A <u>Deviation</u> is a form of program resolution of an Open Item indicating a departure from standard procedure which is not a mistake in analysis, design or construction. No physical modifications are required, but if any are applied they are subject to verification by the IDVP.

1.4 A <u>Closed Item</u> is a form of program resolution of an Open Item which indicates that the reported aspect is neither an Error nor a Deviation. No further IDVP action is required.

1.5 The <u>Program Resolution Report</u> is used to indicate that the specific item is no longer active in the IDVP. It indicates whether the resolution is as a Closed Item, a Deviation, or that responsibility for an Open Item has been transferred to the PG&E Technical Program. Further IDVP action is required upon completion of the associated PG&E Technical Program Task if the IDVP transfers an Open Item to PG&E or if physical modifications are applied by PG&E with respect to a deviation.

1.6 An <u>Error Report</u> is used to indicate that a specific item is no longer active in the IDVP. It indicates the Error Class as defined by 1.2.1 through 1.2.4. Further IDVP action is required for Class A and Class B Errors; further action is required for Class C and Class D errors only if . physical modifications are applied by PG&E.

1.7 The <u>Potential Program Resolution Report</u> and <u>Potential Error Re-</u> <u>port</u> forms are used only for communication within the IDVP.

1.8 An <u>IDVP Completion Report</u> is used to indicate that the IDVP effort related to the Open Item identified by the File Number is complete.

# ATTACHMENT C

# ADDITIONAL VERIFICATION AND ADDITIONAL SAMPLING DEFINITIONS

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#### ADDITIONAL VERIFICATION

Additional verifications are performed if deficiencies are found with respect to the structures or components within the initial sample systems by means of either the QA Audits and Reviews or the engineering design verification process. Such discrepancies are identified by Open Item Reports. The requirement that additional verification be performed does not necessarily imply an additional sample.

The selection of techniques for additional verification is the responsibility of the assigned IDVP participant, but will be monitored by the Program Manager. Based on the results of this additional verification, the assigned IDVP participant will submit either a Potential Program Resolution Report or a Potential Error Report to the Program Manager for approval. The Potential Program Resolution Report may include a recommendation for an additional sample.

Of specific interest and concern in performing an additional verification is the identification of generic concerns. Should such concerns be identified, specific steps will be identified in a Potential Program Resolution Report or a Potential Error Report. These steps may include the evaluation of the generic concern on structures and components within the initial sample systems other than those structures and components previously considered, or may include evaluation of the generic concern for structures and components in other systems. Either is considered to be additional verification, not additional.sampling.

#### ADDITIONAL SAMPLING

Additional sampling is performed when either:

- (a) Significant QA findings are identified with respect to an organization which is not a participant in the design chain applicable to the initial sample systems.
- (b) The reasons for the discrepancies found during design process verification are not clear and additional information is required.

As stated in the additional verification definition above, the evaluation of an identified generic concern on additional safety-related structures or components, whether or not they are within the initial sample's systems, is not considered to be additional sampling as the term is used here. The purpose of additional sampling is the performance of a broad-based investigation subject to the acceptance criteria applicable to the initial sample.

The selection of additional samples and the establishment of acceptance criteria in addition to those included in DCNPP-IDVP-PP-001 is subject to approval by the Program Manager.



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APPENDIX I



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### APPENDIX I PROGRAM MANAGER'S SECTION

As IDVP Program Manager, Teledyne Engineering Services (TES) has established a total of eight TES Review and Evaluation Teams, each headed by a qualified team leader, as described in Section 7.4.6 of the IDVP Phase I Program Management Plan. Each of the assigned team leaders have visited the RLCA offices and have personally discussed and reviewed in detail the previous work performed by RLCA including his procedures and methodology, field trip files, analyses, calculations etc. In addition, the TES Team Leaders have reviewed the Open Items Files pertaining to their areas of responsibilities and in particular, those files which RLCA has issued a Potential Program Resolution Report or a Potential Error Report, and on the basis of their evaluation recommended to the IDVP Program Manager the appropriate resolution.

Based on this review and evaluation process to date, the Team Leaders along with the TES Program Management Team, have studied and have concurred with Phase I generic concerns and recommendations for additional verification and additional sampling as outlined by RLCA in this ITR.

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