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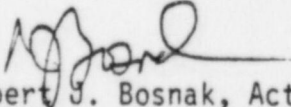
Docket No: 50-323

MEMORANDUM FOR: Thomas M. Novak, Assistant Director  
for Licensing  
Division of Licensing

FROM: Robert J. Bosnak, Acting Assistant Director  
Components and Structures Engineering  
Division of Engineering

SUBJECT: EVALUATION OF ALLEGATIONS ON DIABLO CANYON UNITS 1  
AND 2

The Mechanical Engineering Branch has evaluated the following assigned allegations: 1642 through 1646 and 1648. These evaluations are shown in the enclosure.

  
Robert J. Bosnak, Acting Assistant Director  
Components and Structures Engineering  
Division of Engineering

Enclosures: As stated

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Task: Allegation or Concern No. 1642

ATS No:

BN No:

### Characterization

The most limiting combination of various piping loads were not always used as input for gang support calculations.

### Implied Significance to Plant Design, Construction, or Operation

If gang frames are not designed to the most limiting load combinations an overstress of member stresses and/or overload of supports/building interface could result. Depending on the magnitude of overload in the gang supports, an overstress of safety related piping systems beyond code limits could result due to excessive deformation of supports.

### Assessment of Safety Significance

Based on audits performed at the San Francisco office of piping supports design and evaluation, overloads of gang pipe support frames are unlikely since:

1. Present project procedure considers numerous combinations of piping loads, such as thirty two load combinations in "STRUDL" analyzed single pipe supports and an adequate number of combinations for gang supports. These combinations include all plus and minus values of piping loads, and all plus values from some pipes and all minus values from other pipes.
2. Peak piping loads are assumed to occur simultaneously.

### Staff Position

The present PG&E project procedure for design and evaluation of gang pipe supports is considered adequate for determining the most limiting design condition. This allegation is considered resolved.

### Action Required

None.

Task: Allegation or Concern No. 1643

ATS No.:

BN No:

Characterization

Unusual structural components such as intermediate plates were not always analyzed because they appeared too complex.

Implied Significance to Plant Design, Construction, or Operation

Potential overstress problems could exist when intermediate plates are use to connect pipe support members to building steel to facilitate welding.

Assessment of Safety Significance

Safety significance would be in those cases where intermediate plates are used to connect two structural members of widely varying sizes. For those cases, a specific analysis is required to determine the plate thickness. PG&E response addressed this condition in a more general form.

Staff Position

The content of the allegation is very broad and lacks specificity. The examples provided by the alleger (e.g., intermediate plates) didn't identify any specific cases of design deficiency. The staff considers the PG&E response to be adequate considering the generality of the allegation and consider this allegation resolved.

Action Required ◀

None.



Task: Allegation or Concern No. 1644

ATS No.:

BN No:

Characterization

The weld stresses are not always analyzed for all weld configurations of a pipe support and were not always properly modeled.

Implied Significance to Plant Design, Construction, or Operation

Both concerns are applicable to pipe support design activity for safety related piping systems. Improper weld design practices such as miscalculation of weld properties or lack of consideration for governing load conditions could result in overstressing of weld beyond code limits, which could result, in some cases, in the failure of the support welds.

Assessment of Safety Significance

PG&E response which was confirmed by staff audit of pipe support design activities is as follows:

1. Welds were either modeled to conform to the actual configurations or to a more conservative configuration in order to simplify the analysis. Conservative configurations would have less weld than actual.
2. Analysis of worst case welds or the use of enveloped loads were done in lieu of performing an analysis for each case.

Staff Position

PG&E response was determined to be acceptable and was confirmed by the review of many pipe support design packages during the staff audits. This allegation is considered resolved.

Action Required

None.

Task: Allegation or Concern No. 1645

ATS No:

BN No:

Characterization

Flare bevel welds are not analyzed for shear in the base metal.

Implied Significance to Plant, Construction, or Operation

An overstress in the base metal is possible if the following two conditions exist at the same time.

1. Effective throat thickness is equal to the width of the weld connected to the base metal (at the fusion line).
2. Shear stress is equal to or greater than the normal stress, and the combined resultant stress is equal to the allowable stress value.

Assessment of Safety Significance

The PG&E response addressing this concern indicated the following:

1. Effective throat size utilized in design is equal to  $5/16R$ .
2. Project tests had demonstrated that actual effective throat in flare level welds was larger than  $5/16R$ .
3. The likelihood of subjecting the welded connections to shear stresses higher than the normal stresses, and combined normal and shear stresses equal to the allowable limit is very low.

Staff Position

The above assessment is viable when considering other factors such as:

1. Treating flare bevel welds as partial penetration groove welds would account for much larger effective throat.
2. Weld lengths are usually rounded off to the nearest practical dimension. When all of the above factors are considered, it can be reasonably assumed that flare bevel welds are adequately proportioned for anticipated design loads. This allegation is considered resolved.

Action Required

None.

Task: Allegation or Concern No. 1646

ATS No:

BN No:

Characterization

The design of pipe supports using wide flange beams or channels did not always include the effects of torsion.

Implied Significance to Plant Design, Construction, or Operation

Ignoring the effects of restrained torsion in the design of open sections of pipe support structural members could result in a significant increase of member stresses, particularly those related to warping normal stresses, when superimposed on the normal stresses induced by simple bending.

Assessment of Safety Significance

This concern was addressed in item 7 of Licensing Condition 2.C.11 for Diablo Canyon Unit No. 1. These effects were also considered for Unit No. 2 in project instruction I-59, "Instruction for the evaluation of Licensing Condition No. 7 concerns."

Staff Position

The project instruction and its application in many pipe design packages were reviewed by the staff and were found to be acceptable. This allegation is considered resolved.

Action Required

None.



Task: Allegation or Concern No. 1648

ATS No:

BN No:

Characterization

1. Allowable stress values for lug attachments to piping may not be based on the maximum operating temperature of the pipe.
2. Stresses in welds may be underestimated due to improper weld geometry.

Implied Significance to Plant Design, Construction, or Operation

1. Overstress of piping as a result of using a higher allowable stress than that corresponding to maximum operating temperature.
2. Overstress of welds stress on lugs attachments due to improper consideration of weld geometry.

Assessment of Safety Significance

1. Local stresses in piping at lug attachments are computed by utilizing the forces and moments established from the applicable piping thermal analysis results. The stress evaluation is accomplished using the computer code ME210, which which utilizes the formulations of Welding Research Council (WRC-Bulletin #107). The total stresses in the piping from primary, secondary and local stresses are evaluated to allowable limits obtained from ASME Code Case N-318 for the maximum operating pipe temperature.
2. Lug attachments to piping are typically oriented such that the lug length is parallel to the longitudinal axis of the pipe. This enables proper fillet or penetration weld between the lug and pipe wall.

Staff Position

Based on the above, and on similar conclusions of the Independent Design Verification Program (IDVP) review of the same topic for Unit No. 1, it is concluded that lug attachments to piping are properly designed and evaluated. This allegation is considered resolved.

Action Required

None.