TITLE	PREPARATION OF CALCULATIONS					

NUMBER	DAP-13					

Revision	Prepared	Date	Reviewed	Date	Approved	Date
0	T. Snyder	9/30/85		9/13/85		10/4/85
1	T. Snyder	5/27/86		5/27/86		5/28/86

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1.0 PURPOSE

This procedure establishes the requirements for the preparation and control of calculations that are developed as part of the Design Adequacy Program (DAP).

2.0 SCOPE

This procedure is applicable to all calculations that are prepared under the DAP.

3.0 DEFINITIONS AND RESPONSIBILITIES

3.1 Definitions

3.1.1 Calculations

Calculations are a means of documenting specific quantitative information that is developed and/or used in the process of DAP review activities. Calculations typically involve the execution of mathematical formulas to produce specific quantitative data. Within the DAP, calculations are generally used to establish or verify specific design criteria, input parameters, design results and code compliance. Calculations may be used as supporting documentation for specific review activities and engineering evaluations. Calculations performed by the DAP are not part of the design basis of the plant. Calculations prepared by the DAP are classified as either alternate calculations or supporting calculations. Where the term "calculation" is used in this procedure without modifiers, the reference shall be applicable to both types of calculations.

3.1.2   Alternate Calculation

An alternate calculation is a calculation performed by the DAP under this procedure for the purpose of verifying a design using the "alternate calculation" method of N45.2.11. Alternate calculations require independent checking.

3.1.3   Supporting Calculation

A supporting calculation is an mathematical operation other than simple operations (e.g., addition, subtraction, etc.) that is used to document portions of the DAP review of a design. A supporting calculation may not be used as the sole or primary means of verifying a design. Supporting calculations are incorporated into other documents (e.g., checklists, engineering evaluations) and are approved as a package. Simple checks for mathematical accuracy of a project (Gibbs & Hill, TNE, SWEC, etc.) calculation may be described in checklists or engineering evaluations without formally repeating the calculation.

3.1.4   Certified Computer Program

A computer program is considered certified if the following conditions are met:

o   The version used has been verified for use in nuclear safety-related applications by the organization that "owns" (or is licensed to use) the software involved. This verification shall have been done under a QA program appropriate for this purpose.

o   The hardware and operating system on which the program is to be run is the same as that used to certify the program. Alternatively, the user may demonstrate equivalence by running benchmark programs.

o   The user has received training to use the program as required by the certifier.

3.2 Responsibilities

3.2.1 Reviewers

Third party design adequacy personnel shall prepare and check alternate calculations. Preparation and checking shall be performed by different individuals. Reviewers may perform supporting calculations as required and shall ensure that such calculations are incorporated into appropriate DAP documentation (e.g., checklists, engineering evaluations).

3.2.2 Discipline Coordinators

Discipline Coordinators have the following responsibilities:

o   Establish the scope of alternate calculations to be performed within their respective disciplines.

o   Assign qualified reviewers to prepare and check alternate calculations.

o   Approve alternate calculations prepared within their discipline. Except for calculations associated with the assessment of safety significance, this responsibility may be delegated to a qualified reviewer who is independent of the preparation and checking of the calculation.

o   Assign control identification number to each completed alternate calculation and maintain the master calculation log.

The Discipline Coordinator may originate or check calculations while retaining the approval authority. He may not both originate and check the same calculation.

4.0   INSTRUCTIONS

4.1   Preparation

4.1.1   Performance and Documentation

Each calculation shall be prepared using accepted engineering practice and shall include problem statement and input requirements such as assumptions, basic criteria, methodology, data referenced to the source, and applicable codes and standards. The source of major equations and the source or derivation of any uncommon equations introduced in the calculation shall be stated. Where supporting calculations are performed to verify a specific aspect of a CPSES evaluation, the methodology used and references to the corresponding CPES calculation may be stated in lieu of the above.

Calculations shall be complete and orderly and shall include sufficient sketches, notes and explanatory information to allow any person not familiar with the work, but technically qualified, to understand it without extensive additional inquiry and research.

4.1.2   References

Calculations shall include references to sources of information or data used in the calculation. References shall be listed and identified sufficiently to allow easy recovery. Title, revision number or date, author, copyright date, edition, etc., shall be included as appropriate.

4.1.3   Page Identification and Cover Sheet (Alternate Calculations)

All final alternate calculations shall be made on standard Control Sheets (Attachment A) or on sheets stamped with the Control Stamp (Attachment B)

with all required information completed by the originator. Alternate forms may be used provided that all essential information called for on the Control Sheet is included on the alternate form. A Cover Sheet (Attachment C) shall also be prepared and attached to each finished alternate calculation prior to checking and approval. The originator shall sign and date the Cover Sheet. Other required information shall be completed, including the number of sheets of the attached calculation and its revision number.

4.1.4   Computer Calculation Documentation

Computer calculations (not incorporated into another calculation) shall be identified by a Cover Sheet with attachments as necessary to define the calculation being performed, the assumptions and input data used, basic mathematical models applied and references as appropriate. The computer calculation package shall include input and output listings which are identified by the same Calculation ID Number as the Cover Sheet. Note: all computer calculations shall be considered alternate calculations.

4.2   Checking and Approval of Alternate Calculations

4.2.1   Status

Alternate calculations are preliminary until checked and subsequently approved by the Discipline Coordinator or his designated representative. A supporting calculation shall become final with the completion of checking and approval of the relevant documentation into which it is incorporated. Preliminary calculations not upgraded to final calculation status shall be maintained separately.

4.2.2   Checking

4.2.2.1   The Checker

Each finished alternate calculation shall be checked by an individual who has qualifications at least sufficient to perform the calculation. The checker shall not be the originator and shall not have specified a singular analytical approach for that aspect being checked.

4.2.2.2   Extent of Checking

The extent of checking required is a function of the importance of the calculation, its importance to safety, its complexity, degree of standardization and relation to the state-of-the-art. Based on these considerations, the depth of checking can range from a detailed check of the whole calculation to a limited check of the calculation approach with an alternate or simplified calculational technique.

4.2.2.3   Check of Alternate Calculations

Checking shall consist of the following, as applicable, and to the extent appropriate:

o   Review calculation's inputs for conformance to design requirements (e.g., applicability to the bases of design, design method, design concept, design criteria, and assumption).

o   Check relevant parameters against source or reference documents (e.g., loads, forces, flows, material properties, and other data), and ensure that data is adequately referenced.

o   Assure that the methodology and assumptions are clearly given.

o   Check appropriateness of analytical method and the required accuracy of the calculation.

o   Check results at appropriate steps.

o   Compare results with other sources.

o   Perform mechanical mathematical checks of results step-by-step or only at critical points.

o   Perform alternate or simplified calculations.

o   Ensure that the calculation is otherwise satisfactorily prepared and documented per this procedure.

o   Ensure that referenced supporting DAP-produced documentation, calculations, and engineering evaluations are approved.

4.2.2.4   Check of Computer Calculations

In addition to the applicable steps performed above, those checking a computer analysis shall determine whether the program is certified, and if the certified program capabilities are applicable to the problem statement. The calculation package shall contain or reference the program's certification. The input model shall also be verified as an accurate and appropriate representation of the problem.

In the case of non-certified programs, an individual computer calculation may be checked in the same manner as a hand calculation (e.g., performing mathematical checks of results, alternate hand calculations, etc.). In all cases, the checker shall assure that the computer calculation package includes appropriately identified input and output listings.

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4.2.3   Documentation of Check (Alternate Calculation)

4.2.3.1   General

To provide a basis for Discipline Coordinator approval and future traceability, the extent and method of checking shall be clearly indicated by such methods as check marks on the original calculation and a description of the check scope on the Cover Sheet. The checker shall flag all errors. However, only the originator may alter the original calculation. Where alternate analyses or calculations are used during the checking process, the purpose and nature of the analysis shall be stated along with a clear comparison between the results of the main and alternate analyses.

In all cases when the propagation of the error is not corrected in the calculation or later in the design review process, the originator shall clearly discuss its significance either on the cover sheet or on the original calculation.

4.2.3.2   Limited Checks

In cases where only certain aspects of a calculation were checked either due to the perceived need or any limitations in the qualifications of the checker, such limitations shall be stated explicitly on the Calculation Cover Sheet or attachments as necessary.

4.2.3.3   Checker Signoff

After checking, the checker shall sign and date the Calculation Cover Sheet and each calculation sheet indicating his concurrence with the completeness and correctness of the calculation. When more than one person contributes to checking a calculation (for example when one checks the methodology and the other checks the math) only one of them should take responsibility for the full

check by signing the Cover Sheet. In order to enhance traceability and accountability in the checking process, the roles of other checkers may be described in the verification space of the Cover Sheet or by their signatures on the pages which they checked. Any comments shall be resolved with the originator prior to signoff.

4.2.4   Approval

The calculation shall then be passed to the Discipline Coordinator or his designated representative for approval. The extent and method of checking must be reviewed and determined to be satisfactory prior to signoff. The Discipline Coordinator or his designated representative will sign only the cover sheet, in the case of supporting calculations, checking and approval of the primary document (e.g., checklists) shall constitute approval of associated DAP supporting calculations.

5.0   DOCUMENTATION CONTROL

5.1   Assignment

Responsibility for performance of alternate calculations shall be made by the Discipline Coordinator or his designated representatives. Discipline Coordinators shall also assign the qualified reviewers to check the calculations.

5.2   Completion

Upon completion of the alternate calculation, the originator and reviewer shall sign off the Calculation Cover Sheet (Attachment C) and submit the calculation for approval to the Discipline Coordinator.

Approval shall be documented on the cover sheet.

5.3 Identification

After approval has been obtained, the final alternate calculation shall be assigned a control identification number by the Discipline Coordinator or his designated representative. This identification number shall be of the following format:

DAP-C-XX-YYY
└─Sequential Number
└─Discipline/Subject Code (see Attachment D)

The Discipline Coordinator shall enter all assigned calculations on the Calculations Log (Attachment E). This log shall include the identification number, title and revision level of all calculations. Supporting calculations shall be identified as appropriate (e.g., referenced as an attachment to a checklist) but shall not use identification numbers of the format for alternate calculations.

5.4 Retention

The original copy of all final alternate calculations shall be maintained and filed by the Discipline Coordinator or his designated representative. Supporting calculations shall be filed with the associated DAP review checklist.

5.5 Revisions

Revisions to calculations may be required to add additional information or clarify and correct misinformation (e.g., inputs).

Revisions shall be prepared, checked and approved in the same manner as the original calculation.

Superseded final calculations shall either be identified as such on each page or securely bound with at least the cover page so identified. The Calculation Log shall also note this occurrence. Superseded calculations shall be retained in the files for historical reference.

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COMANCHE PEAK DESIGN ADEQUACY PROGRAM
CALCULATION SHEET

Title _____

_____

Calculation I.D. No. _____

Rev. _____

Prepared By _____ Date _____

Checked By _____ Date _____

Sheet _____ of _____ Sheet

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DAP13, Rev. 0

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ATTACHMENT B

CONTROL STAMP

Calculation ID No.
Prepared By/Date
Verified By/Date
Page _____ of _____

Title _____

_____

DAP Discipline _____

Calculation ID. No. DAP-C- _____ - __

No. of Shts. _____

DAP Action Plan No. _____

Purpose/Description _____

Description of Document Verification

Rev. No.	Rev. Descrip	Originator (Signature)	Date	Verified By (Signature)	Date	Approved By (Signature)	Date

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ATTACHMENT D

COMANCHE PEAK DESIGN ADEQUACY PROGRAM

DISCIPLINE/SUBJECT CODES

Code	Discipline
C/S	Civil/Structural
P	Piping and Supports
M	Mechanical
EIC	Electrical/Instrumentation
PGI	Programmatic/Generic Implications

COMANCHE PEAK DESIGN ADEQUACY PROGRAM
CALCUATION LOG

CONTROL ID. NO.	SUPERSEDED BY	TITLE	REVISION DATE						
			0	1	2	3	4	5	6

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