## Design Analysis Cover Sheet

**Complete only applicable items.**

### 2. DESIGN ANALYSIS TITLE

**GENERATOR PAD FOUNDATIONS**

### 3. DOCUMENT IDENTIFIER (Including Rev. No.)

**BABBDA000-01717-0200-00005 REV 02**

### 4. REV. NO.

**02**

### 5. TOTAL PAGES

**8**

### 6. TOTAL ATTACHMENTS

**NONE**

### 7. ATTACHMENT NUMBERS - NO. OF PAGES IN EACH

**ESF**

### 8. SYSTEM ELEMENT

Complete only applicable items.

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<tr>
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<th>Signature</th>
<th>Date</th>
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<tbody>
<tr>
<td>T. Saltikov</td>
<td>[Signature]</td>
<td>4/26/95</td>
</tr>
<tr>
<td>M. Gomez</td>
<td>[Signature]</td>
<td>4/26/95</td>
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<td>T. Saltikov</td>
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<tr>
<td>J. Willis</td>
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<tr>
<td>G. Kimura</td>
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<td>4/27/95</td>
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### 14. REMARKS

A. QAP-3-9, Rev. 5 format was not used in this Design Analysis revision because Section 5.9 of QAP-3-9, Rev. 5 allows use of the format found in QAP-3-9, Rev. 4.

B. The Design Analysis was not reformatted per QAP-3-9 Rev. 5 because all elements of Attachment 1 are contained in the revised Design Analysis.

C. Matt Gomez was the originator of the original Design Analysis. Since the Design Analysis has been updated to be used for the new generators and Matt is familiar with the design, he was used as the checker.

D. Revised Section 1 "Purpose."
## Design Analysis Revision Record

### 2. DESIGN ANALYSIS TITLE

**GENERATOR PAD FOUNDATIONS**

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**BABBDA000-01717-0200-00005 REV 02**

### 4. REVISION NO.

**02**

### 5. Revision No. 6. Total Pages

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### 7. Description of Revision

- **Original Issue**
- Incorporate "Design Analysis Compliance Checklist" comments dated 1/27/95 as follows:
  - Revised Drawing No., Section 1
  - Added reference to Section 2
  - Removed items from Section 4
  - Revised Section 5
  - Added three references to Section 8
  - Revised Section 10
  - Revised page count
  - Added remarks B and C to Design Analysis Cover Sheet
  - Revised Section 2
  - Revised Section 3
  - Design Analysis was not reformatted.
  - See Remark B on Design Analysis Cover Sheet.
- Added drawing No. BABBDA000-01717-2100-23021 to Section 1 "Purpose."
1. PURPOSE

The purpose of this analysis is to design structural foundations for the Generator Pad. This analysis is in support of design drawing BABBDA000-01717-2100-23010 and BABBDA000-01717-2100-23021.

2. QUALITY ASSURANCE

The items considered within this analysis relate to temporary equipment foundations not included on the Q-list. There are no Q-Controls associated with this analysis (Reference 8.1 and 8.3). Quality Assurance Classification is "NONE."

3. METHOD

The equipment foundation shall be designed in Section 10 using standard foundation design hand calculations. The vertical loads reflect Mechanical/Electrical requirements. Lateral loads will be calculated using applicable codes. The soil bearing and foundation stresses will be analyzed using accepted engineering mechanics. The foundation will be designed using the Strength Design Method.

4. CODES AND STANDARDS

4.1 AMERICAN NATIONAL STANDARDS INSTITUTE, INC./AMERICAN SOCIETY OF CIVIL ENGINEERS (ANSI/ASCE):

ANSI/ASCE 7-88 Minimum Design Loads for Buildings and Other Structures

4.2 UNIFORM BUILDING CODE (UBC):

UBC, 1991

5. DESIGN INPUTS

5.1 Section 7.2.4.1 Subparagraph IV.C (Reference 8.2).

6. CRITERIA

6.1 The Exploratory Studies Facility Design Requirements (ESFDR) (YMP/CM-0019, Rev. 1)

6.2 Exploratory Studies Facility (ESF) Basis for Design (BFD) Document, Package 1D (BAB000000-01717-6300-00002, Rev. 05)
7. ASSUMPTIONS

Not Used.

8. REFERENCES

8.1 Determination of Importance Evaluation (DIE) for ESF North Portal Pad (BABB00000-01717-2200-00001, Rev. 05)

8.2 ESF BFD Document, (BAB000000-01717-6300-00002, Rev. 05)

8.3 DIE for ESF Surface Compressed Air and Standby Power Systems, (BABBDO000-01717-2200-00022 Rev. 00)

9. COMPUTER PROGRAMS

Not Used.

10. DESIGN ANALYSIS

10.1 This analysis was initially performed under Revision 0, Interim Change Number (ICN) 1 of the ESFDR, with Seismic Zone 4. Revision 0, ICN 2 of the ESFDR revised the lowered criteria to Seismic Zone 3. The initial design is conservative, with foundation sizes based on physical requirements. Therefore, the analysis will reflect the higher criteria of Zone 4.

(Reference pages 5, 6, and 7 for hand calculations)
10. DESIGN ANALYSIS (Cont)

10.6 GENERATOR FOUNDATION

- WEIGHT = 29,740 lb SAY 30 k

- SIZE = 6' x 20' x 9' 6" high (ENCLOSURE)

-LATERAL FORCES

A) WIND: F = \( 9.6 \cdot G \cdot C_{FA} \) (ANSL/ASCE 7-88)

\[ F = 151.5 \cdot 1.3 \cdot 2 \] \( = 271.7 \text{k} \)

- AF = 9' (WD) = 180° (TRANSVERSE)

\[ F = 151.5 \cdot 180 = 4995 \text{k} \]

B) SEISMIC: \( F_p = 2.1 C_{PL} \cdot F_{p0} \)

\[ F_p = 0.45 \cdot 20 = 9 \text{k} \]

- SEISMIC GENERNS
**Yucca Mountain Site Characterization Project**

Civilian Radioactive Waste Management System
Management & Operating Contractor

**Contract No. DE-AC01-98W00045**

Subject: **Generator FDNG**

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**Overturning:**

Assume \( F_p \) acts at \( 3/4h \) as \( 0 \)

Foundation Size: \( 16' \times 30' \times 1'8'' \)

\( F_r = 135 \text{ kN} \)

\( N_t = 30 + 10(30)(0.61)(1.5) = 150 \text{ kN} \)

\( M_t = 13.5 \text{ kN}(8') = 110 \text{ kN} \)

\( M_r = 150 \text{ kN}(10') = 1200 \text{ kN} \)

Stability Ratio: \( 1200/110 = 10.9 \) OK

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**Soil Bearing**

\[ e = \frac{M_p}{F_r} = \frac{110/100}{135} = 0.752 \]

\[ c = B = \frac{1}{1 + 0.5e} = \frac{150}{1030} = 0.14 \]

\[ S_B = 400 \text{ psf} < 1.33(2000) = 2667 \text{ psf} \] MAX

**Reinforcing:** Maximum Cantilever = 0

\[ W_{max} = 1.1(1.7)(15)(50) = 700 \text{ psf} \]

\[ M_u = 7(0.6)/2 = 2.1 \text{ kN} \]

\[ K_u = \frac{12.6(1200)}{12(16.5)^2} = 16.5 \]

\[ E = 1.33(0.013) = 0.017 \text{ -- Governing} \]

\[ d = 20 - 3.5 = 16.5 \]
\[
A_2 = 0.007(12 \times 1.65) = 0.34 \text{ in}^2/\text{ft}
\]

Use #7 @ 12" C.E.W.

\[
A_2 = 0.40 \text{ in}^2/\text{ft}
\]
11. CONCLUSIONS

The design shows that a concrete foundation that has minimum dimensions of 16' x 30' x 1'-8" thick, reinforced with #7 @ 12" o/c each way, is adequate to support the proposed Generator Pad.

12. ATTACHMENTS

Not Used.