USE OF THESES

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APPENDIX E

DEFORMATIONAL RESPONSE
LOAD vs RELATIVE DISPLACEMENT

$\frac{3}{8}$ sq. blocks ($B_i$)

BLOCK LAYOUT & DISPLACEMENTS MEASURED

$Y$ (x-Sect. area = 2.06 sq. ins.)

Length $A-B = 4.13''$

$C-D = 3.75''$

LOADING SEQUENCE

Hydrostatic to 126 lb

only verticle $Y$ to 252 lb

LOAD

1st cycle

Scale 1" = 50 lb

100

200

300

DISPLACEMENT

Scale 1" = 0.01

$0 \rightarrow 0.01 \rightarrow 0.02 \rightarrow 0.03 \rightarrow 0.04 \rightarrow 0.05$
LOAD vs RELATIVE DISPLACEMENT

\[ \frac{1}{2} \text{ sq. blocks} (B_2) \]

**LOADING SEQUENCE**
- 1st X up to 126 lb
- then Y thereafter

**BLOCK, LOAD & DISP.**

- **A.B.** 2nd cycle
- **C.D.** 2nd cycle
- **Hor. Length** A.B. = 3.75"
- **Ver.** C.D. = 3.85"

**LAYOUT**

- Area = 3.0 sq. ins
- Area = 2.9 sq. ins

**DISPLACEMENT**

- Scale 1" = 0.01"
LOAD vs RELATIVE DISPLACEMENT

BLOCK, LOAD & DISP.
SYSTEM

\( \frac{1}{2} \) sq. blocks (B3)

area = 2.3 sq. ins.

Hor. Length A.B = 3.5"
Ver. " C.D = 3.8"

LOADING SEQUENCE
1st X up to 126 lb
then Y thereafter

---

DISPLACEMENT

Scale 1" = 0.005"

DISPLACEMENT

scale 1" = 0.01
LOAD vs RELATIVE DISPLACEMENT

3/4" sq. blocks (B₄)
BLOCK, LOAD & DISP SYSTEM

area = 1.65 sq. ins.

LENGTH A-B = 2.9"
" C-D = 3.8"

LOADING SEQUENCE.
1st X up to 126 lbs
then Y thereafter.

AB 1st cycle
AB 2nd cycle
CD 1st cycle
CD 2nd cycle

LOAD
Scale 1" = 50 lbs.
200
100

DISPLACEMENT
Scale 1" = 0.01"
LOAD vs RELATIVE DISPLACEMENT

BLOCK, LOAD & DISP SYSTEM

\[ \frac{3}{8} \text{ sq. blocks (B5)} \]

LENGTH A-B = 3.0"
CD = 3.8"

LOADING SEQUENCE
1st X up to 126 lbs
then Y thereafter.

1st cycle
2nd cycle

LOAD Scale 1" = 50 lbs.

DISPLACEMENT
Scale 1" = 0.01"
LOAD vs DISPLACEMENT (RELATIVE)

block, disp, & load system 1" x 2" rectangular blocks ($B_6$)

area = 6 sq. ins.

$\angle 30^\circ$

Hor. length A·B = 4.6"
" " C·D = 7"

LOADING SEQUENCE
1st X loading raised to 189 lbs
then Y load increased

DISPLACEMENT Scale 1" = 0.02"
LOAD vs Pt. DISPLACEMENT

1" x 2" rect. blocks (B6)

Displacement
Scale 1" = 0.02"

LOAD
Scale 1" = 100 lbs

Point B
Point A
LOAD vs RELATIVE DISPLACEMENT

1"x2" rect. blocks, 3 removed (Br)

Block, disp, & load system

Hor. Length A-B = 4.6"
Ver. " C-D = 7"

LOADING SEQUENCE
1st X loading raised to 189 lbs then Y load increased

DISPLACEMENT
Scale 1" - 0.02"
LOAD vs Pt. DISPLACEMENT

1" x 2" rect. blocks 3 removed. (B)
LOAD vs RELATIVE DISPLACEMENT

1" x 2" rect blocks, 5 removed (y2)

Block, load & disp. system

area = 0.012"

Hor. length AB = Ver. CD =

LOADING SEQUENCE
1st load X increased to 189 lbs, the Y increased thereafter.

Hor. load reduced to 189 lbs.

AB 1st cycle

CD 1st cycle

LOAD scale 1" = 50 lbs

DISPLACEMENT

scale 1" = 0.02"
LOAD vs. REL. DISPLACEMENT

1" sq. blocks with 8 blocks removed

LENGTH A.B. = 7"
" C.D. = 6"

LOADING SEQUENCE
Hydrostatic to 630 lbs then vertical loading thereafter.

LOAD
Scale 1" = 200 lbs

DISPLACEMENT
Scale 1" = 0.01"
LOAD vs Pt DISPLACEMENT

1" x 2" rect. blocks 5 removed ($\delta_2$)
1st loading cycle

LOAD
Scale 1" = 100 lbf, 200

DISPLACEMENT
Scale 1" = 0.02"
LOAD vs. RELATIVE DISPLACEMENT

Rect. blocks of varying sizes (\( \frac{1}{2} \))
disp of large blocks

2 blocks removed.
LOAD vs RELATIVE DISPLACEMENT

Rect. blocks of varying sizes (ca.)
disp of large blocks
5 blocks removed.

A.B.
1st cycle

C.D.
1st cycle

LOAD
Scale 1" = 100 lbs

DISPLACEMENT
Scale 1" = 0.01"
LOAD vs Pt DISPLACEMENT

1/2" sq. blocks (65)

DISPLACEMENT
Scale 1"=0.02"

Pt A
Pt B
Pt D
Pt C

Scale 1"=200 lbs.

0.02 0.04 0.06 0.08 0.1 0.12
LOAD vs RELATIVE DISPLACEMENT
1½" sq. blocks, 3 removed \( \delta_4 \)

LENGTH \( AB = 3'' \)
\( CD = 6'' \)

LOADING SEQUENCE
1st hydrostatic load to 504 lbs.
then load increased in \( Y \) direction only.

LOAD
scale 1''=200 lbs
600
1000

DISPLACEMENT
scale 1''=0.02''
LOAD vs Pt. DISPLACEMENT

1½" sq. blocks (V₀)
3 blocks removed.
LOAD vs RELATIVE DISPLACEMENT

1/2" sq. blocks with 5 removed (C7)

LENGTH A.B. = 9"
" C.D. = 6"

LOADING SEQUENCE
Hydrostatic for all loads.

LOAD
scale 1" = 200 lbs

800

600

400

200

0.02
0.04
0.06
0.08
0.1

DISPLACEMENT
scale 1" = 0.02"
LOAD vs RELATIVE DISPLACEMENT (hanging wall)

$1\frac{1}{2}$ sq. blocks with 4 removed ($\theta$)

\[ \text{area} = 93.3 \text{ sq. ins.} \]

\[ \text{area} = 863 \text{ sq. ins.} \]

LENGTH AB = 9"
LENGTH CD = 3"

\[ CD, 1^{st} \text{ cycle} \]

\[ AB, 1^{st} \text{ cycle} \]

DISPLACEMENT

Scale 1" = 0.02"
LOAD vs RELATIVE DISPLACEMENT

1½" sq blocks with 5 blocks removed (63)

LENGTH AB = 9''
LENGTH CD = 3''

LOADING SEQUENCE
Hydrostatic loading for all loads.
LOAD vs. RELATIVE DISPLACEMENT

1½" blocks. δ11

area = 8.63 in²

HOR. AB = 5"
VER. CD = 5½"

LOADING SEQUENCE
Hydrostatic loading for all loads.

LOAD vs. DISPLACEMENT

Scale 1" = 0.01"

0.01  0.02  0.03  0.04

200  400  600  800  1000
LOAD vs. RELATIVE DISPLACEMENT
1" x 2" rectangular blocks ($\theta_{12}$)

LENGTH AB = 6"
" CD = 6"
LOADING SEQUENCE
Hydrostatic loading for all loads

LOAD
Scale 1"/100 lb

DISPLACEMENT
Scale 1" = 0.02
LOAD vs Pt. DISPLACEMENT

1" x 2" rectangular blocks. (δ12)

LOAD
Scale 1" = 200 lbs

DISPLACEMENT
Scale 1" = 0.02"
LOAD vs RELATIVE DISPLACEMENT.

1" x 2" rectangular blocks. ($\theta_{13}$) 2

LENGTH AB = 6"
LENGTH CD = 6"

LOADING SEQUENCE
Hydrostatic loading for all loads.

LOAD
Scale 1" = 100 lbs

DISPLACEMENT
Scale 1" = 0.01"
LOAD vs Pt. DISPLACEMENT

1" x 2" rectangular blocks (9/2) 2nd
LOAD vs DISPLACEMENT (pt.)
Rect blocks of varying sizes (Y31)

Pt A
Pt B
Pt D disp. of small blocks
Pt C

LOAD
200 Scale 1" = 5016
100

DISPLACEMENT
Scale 1" = 0.01"
LOAD VS RELATIVE DISPLACEMENT

rect. blocks of varying sizes. (V31)
disp. of small blocks

DISPLACEMENT
Scale 1" = 0.01"
LOAD vs RELATIVE DISPLACEMENT.

Rect. blocks of varying sizes (\( \sigma_{52} \))
disp. of large blocks.
LOAD vs RELATIVE DISPLACEMENT

1" sq. blocks. (S1)

LENGTH AB = 7"
LENGTH CD = 6"

LOADING SEQUENCE
Hydrostatic loading for all loads
LOAD vs. Pt. DISPLACEMENT

1" sq blocks with 8 removed
Mt. ISA, N°2 & 4 ore body
configuration.

Pt D

Pt C

Pt B

Pt A

LOAD
Scale 1" = 200 lbs.

DISPLACEMENT
Scale 1" = 0.02"
LOAD VS. REL. DISPLACEMENT.

1" sq. blocks. 2 blocks removed. (85)

LENGTH AB = 4"
" CD = 2"

LOADING SEQUENCE
Hydrostatic loading up to 630 lbs.
then vertical loading thereafter.
LOAD vs Pt. DISPLACEMENT

1" sq blocks, 8 removed (Sf)
LOAD vs. Pt. DISPLACEMENT

1" sq. blocks with 11 blocks removed (δσ)

LOAD
scale 1" = 200 lb

600
800
1000
1200
1400

DISPLACEMENT
scale 1" = 0.01"

Pt A
Pt B
LOAD vs. Pt. DISPLACEMENT

1" sq. blocks with 15 blocks removed (S6)

Pt A
Pt B
Pt C

Scale 1" = 200 lb
Scale 1" = 0.01"
LOAD vs. Pt. DISPLACEMENT
MOUNT ISA PROFILE (εi)
LOAD vs. RELATIVE DISPLACEMENT

MOUNT ISA No. 2 & 5 ORE BODIES (E.)

LOAD
Scale 1" = 200 lbs

DISPLACEMENT
Scale 1" = 0.005"
LOAD vs. Pt. DISPLACEMENT

MOUNT ISA N°2 & S ORE BODIES (E₂)

LOAD

scale 1" = 200 lbs

0.01

Pt D

Pt A

Pt B

Pt C

DISPLACEMENT

scale 1" = 0.01"
LOAD vs. REL. DISPLACEMENT

MOUNT ISA NO. 2 & 5 ORE BODIES (ε_2)
LOAD vs. Pt DISPLACEMENT

MOUNT ISA Nº 2 & 5 ORE BODIES (E3)

Pt D
Pt C
Pt B
Pt A

LOAD
Scale 1" = 200 lbs

DIsPLACEMENT
Scale 1" = 0.01"
LOAD vs Pt. DISPLACEMENT.

MOUNT ISA NO 2 & 5 ORE BODIES ($E_i$)

LOAD

Scale 1" = 200 lbs.

800

600

400

200

Pt D

Pt C

Pt A

Pt B

DISPLACEMENT

Scale 1" = 0.01"
LOAD vs Pt. DISPLACEMENT

MOUNT ISA NO. 2 & ORE BODIES (η₄)

LOAD

scale 1" = 200 lbs

DISPLACEMENT

scale 1" = 0.01"

Pt A
Pt B
Pt C
Pt D
LOAD VS. REL. DISPLACEMENT

MOUNT ISA No 2 & ORE BODIES ($\eta_4$)
LOAD vs. Pt. DEFLECTION

MOUNT ISA N° 2 & 5 ORE BODIES (η₅)

LOAD
scale 1" = 200 lbs.

DEFLECTION
scale 1" = 0.01"
LOAD vs. REL. DEFLECTION.
MOUNT ISA No. 2 & 5 ORE BODIES

DEFLECTION
scale 1" = 0.01

LOAD
scale 1" = 200 lb.
LOAD vs REL DISPLACEMENT
SOLID ARALDITE BLOCK ($\eta_B$)
LOAD vs. Pt. DISPLACEMENT

Solid Araldite block with thin (approx. 1/8") surround of silicon rubber.

2nd load cycle

E\text{\textit{eo}} (\text{elastic}) = 3.7 \times 10^5 \text{ p.s.i.}

LOADING SEQUENCE

Hydrostatic up to 158 lb, then vertical loading thereafter.

1st load cycle

E\text{\textit{eo}} (\text{elastic}) = 3.6 \times 10^5 \text{ p.s.i.}
LOAD vs. Pt. DISPLACEMENT

Solid Araldite block with thick (1/4") surround of silicon rubber.

LENGTH AB = 3"
CD = 3"

LOADING SEQUENCE
Hydrostatic loading up to 158 lb then vertical loading thereafter.

1st loading cycle

E_\text{ca (elastic)} = 3.9 \times 10^5 \text{psi}

2nd loading cycle

E_\text{ca (elastic)} = 3.4 \times 10^5 \text{psi}
LENGTH AB
LENGTH CD
LOADING SEQUENCE
Equal loading increments in the X & Y directions up to 630 lbs, then Y increments thereafter. 
LENGTH AB.
LENGTH CD.
LOADING SEQUENCE
Equal loading increments in the X & Y directions (630%)
in increments in Y direction thereafter

LOAD VS. PT. DEFLECTION
1 x 2 ft. rectangular blocks (46)

DISPLACEMENT scale 1" = 0.01"
LOAD vs. Pt. DISPLACEMENT

1" x 2" rect blocks with 7 blocks removed (ML)
MOUNT ISA No. 2 & 5 ORE BODIES.

LENGTH AB
LENGTH CD
LOADING SEQUENCE
Hydrostatic loading in the X & Y directions up to 620 lbs.
then vertical thereafter.

Y creep
scale 1" = 0.01"
LOAD vs. Pt. DISPLACEMENT

1" x 2" rectangular blocks with 4 blocks removed (A9)

LENGTH AB = 10"
LENGTH CD = 4"
LOADING SEQUENCE
Equal loading in the X & Y directions up to 630 lbs then vertical loading thereafter.

DISPLACEMENT scale 1" = 0.02"
LOAD

Scale 1" = 100 lbs.

DEFLECTION

Scale 1" = 0.01"

LOADING SEQUENCE
Hydrostatic loading to 221 lbs., then vertical loading thereafter.

LENGTH AB = 3"
" CD = 4"

area = 2.06 sq. ins

60°
LOAD VS. Pt DISPLACEMENT

1/2" sq. blocks with 10 blocks removed (47)

LENGTH AB. = 1"
" CD. = 2.5"

LOADING SEQUENCE
Hydrostatic loading up to 221 lbs. then vertical loading thereafter.
LOAD vs. Pt. DEFLECTION

LENGTH AB = 1"
LENGTH CD = 4"

LOADING SEQUENCE
Hydrostatic loading up to 221 lb then vertical thereafter.

Scale 1" = 0.01"
Area = 2.06 sq. in.

\[ \frac{1}{2} \text{ sq. blocks with 4 blocks removed (A)} \]
LOAD vs Pt. DISPLACEMENT

½" sq. blocks with 12 blocks removed (h9)

LENGTH CD = 3 sq. ins.
dial gauge B slipped
LOADING SEQUENCE
Hydrostatic up to 221 lbs.
then vertical loading thereafter

LOAD
scale 1" = 100 lbs.

DISPLACEMENT
scale 1" = 0.01"

area = 2.06 sq. ins.
area = 1.97 sq. ins.

Pt. D  Pt A  Pt C
LOAD VS. REL. DISPLACEMENT

$\frac{3}{6}$ sq. blocks with 26 blocks removed ($\bar{N}_d$)

MOUNT ISA Nº 2 & 5 ORE BODIES.

LENGTH AB = 2.25"
LENGTH CD = 1.125"
LOADING SEQUENCE
Hydrostatic loading up to 158 lbs then vertical loading thereafter.
LOAD vs. Pt. DISPLACEMENT

\( \frac{3}{8} \) sq. blocks with 26 blocks removed (\( \bar{A}_4 \))

MOUNT ISA No. 2 & 5 ORE BODIES


LOAD

\[ \text{scale } 1" = 500 \text{ lbs} \]

DISPLACEMENT

\[ \text{scale } 1" = 0.01" \]
LOAD VS. REL DISPLACEMENT

3.8" sq. blocks with 13 blocks removed (Δs)

MOUNT ISA Nº 2 & 5 ORE BODIES

LENGTH AB = 2.25"
LENGTH CD = 1.125"
LOADING SEQUENCE
Hydrostatic loading up to 158 lbs.
then vertical loading thereafter.
LOAD vs. Pt. DISPLACEMENT

$\frac{3}{8}$" sq. blocks with 13 blocks removed ($\bar{A}_e$)

MOUNT ISA No. 2 & 5 ORE BODIES

Pt. D

Pt. B

Pt. A

Pt. C

DISPLACEMENT

scale 1" = 0.01"
LOAD VS. PT. DISPLACEMENT

LENGTH AB. = 12"
LENGTH CD. = 6"
1st LOADING SEQUENCE (V252)
Equal load increments in the X & Y directions up to 252 lbs then vertical loading thereafter.

2nd LOADING SEQUENCE (V630)
Equal load increments in the X & Y directions up to 630 lbs then vertical loading thereafter.

DISPLACEMENT
scale 1" = 0.01"
LOAD VS REL. DISPLACEMENT

2" x 3" rectangular blocks with 3 blocks removed. (V₀)
LENGTH AB = 9"  
LENGTH CD = 4"  
1st LOADING SEQUENCE (V252)  
Equal load increments in the X & Y directions up to 25.2 lbs than vertical loading thereafter.

2nd LOADING SEQUENCE X  
Equal load increments in the X & Y directions up to 630 lbs than vertical loading thereafter.

LOAD Vs. DISPLACEMENT  
2"x3" rectangular blocks with 5 blocks removed (X,Y)
LOAD VS. REL. DISPLACEMENT

2" x 3" rectangular blocks with 2 blocks removed (Y9)

LENGTH AB. = 9"
LENGTH CD. = 4"

1st LOADING SEQUENCE (V452)
Equal load increments in the X & Y directions up to 252 lbs.
then vertical loading thereafter

2nd LOADING SEQUENCE (V530)
Equal load increments in the X & Y directions up to 630 lbs then vertical loading thereafter

DISPLACEMENT
scale 1" = 0.01"
LOAD vs. Pt. DISPLACEMENT
2"x3" rectangular blocks with 2 blocks removed (V_0)
LOAD vs Pt. DISPLACEMENT

Rect. blocks of varying sizes
disp of large blocks.

Pt D

Pt C

LOAD
Scale 1" = 50 lbs

DISPLACEMENT
Scale 1" = 0.01"

100
200
300
400

0.01
0.02
0.03
0.04
0.05
0.06
APPENDIX F

STRESS PATTERNS
HOR. Ld. = 126 lbs. x 2
VER. Ld. = 126 lbs. x 2

2 b
HOR. Ld. = 252 lbs. x 2
VER. Ld. = 252 lbs. x 2

3 b
HOR. Ld. = 315 lbs. x 2
VER. Ld. = 315 lbs. x 2

4 b
HOR. Ld. = 315 lbs. x 2
VER. Ld. = 378 lbs. x 2

5 b
HOR. Ld. = 315 lbs. x 2
VER. Ld. = 441 lbs. x 2

6 b
HOR. Ld. = 315 lbs. x 2
VER. Ld. = 567 lbs. x 2

7 b
HOR. Ld. = 315 lbs. x 2
VER. Ld. = 630 lbs. x 2

3" x 2" Rectangular Blocks
Multiple Openings
Post-loading applied
## APPENDIX G

### Classification of breaks in drill core

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Criteria</th>
<th>Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Pre-existing bedding or foliation break.</td>
<td>Shiny to dull, may have evidence of movement. Planar or undulatory.</td>
<td>α, β properties.</td>
</tr>
<tr>
<td>B2</td>
<td>Indefinite whether pre-existing or drilling break on bedding or foliation.</td>
<td>Dull, no evidence of movement. Generally planar or undulatory.</td>
<td>α, β properties.</td>
</tr>
<tr>
<td>B3</td>
<td>Drilling break along bedding or foliation.</td>
<td>Dull, clean, fresh surface. No evidence of movement.</td>
<td>α, β properties.</td>
</tr>
<tr>
<td>B4</td>
<td>Drilling break partly along bedding or foliation.</td>
<td></td>
<td>α, β properties.</td>
</tr>
<tr>
<td>J1</td>
<td>Pre-existing fracture, continuous across drill core.</td>
<td>Single plane, may have coating. May have evidence of movement. No cohesion.</td>
<td>α, β properties.</td>
</tr>
<tr>
<td>J2</td>
<td>Pre-existing partial fracture.</td>
<td>Terminated on bedding or foliation. No cohesion.</td>
<td>α, β properties.</td>
</tr>
<tr>
<td>J3</td>
<td>Pre-existing partial fracture.</td>
<td>Fracture dying-out in solid rock. Partly broken during drilling.</td>
<td>α, β properties.</td>
</tr>
<tr>
<td>J4</td>
<td>Drilling break on weakness other than bedding or foliation</td>
<td>Clean, fresh surface, residual coating indicating pre-existing weakness e.g. vein.</td>
<td>α, β properties.</td>
</tr>
<tr>
<td>F1</td>
<td>Fragments, due to rock condition.</td>
<td>Pre-existing fractures, may have coating. Fractures one or two particular kind and orientation.</td>
<td>Depth, depth to.</td>
</tr>
<tr>
<td>F2</td>
<td>Fragments, due to drilling.</td>
<td>Dull, clean, fresh surfaces, generally irregular breaks.</td>
<td>Depth, depth to.</td>
</tr>
<tr>
<td>F3</td>
<td>Intact shear or fracture zone, due to rock condition.</td>
<td>Fragments can be fitted together. Breaks generally one kind and orientation.</td>
<td>Depth, depth to, α, β properties.</td>
</tr>
<tr>
<td>X1</td>
<td>Irregular drilling break.</td>
<td>Clean, fresh, irregular, rough surface. No apparent pre-existing weakness plane.</td>
<td>(only record for E. of R., orientation, New ref.).</td>
</tr>
</tbody>
</table>