PLATE BEARING TEST — DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ① ② ③	①+②+③ ÷3	Σδ	Remarks
	9:58	40		-5 1 2	-0.7	222	
	10:00	30		-7 -3 0	-3.3	218.9	
	10:02	20		-17 -13 -3	-11.0	207.9	
	10:04	10		-18 -13 -17	-16.0	191.9	
	10:06	5		-22 -12 -18	-17.3	174.6	
	10:08	0		-17 -4 -12	-11.0	163.6	
<19>	10:12	0		0 0 0	0	163.6	(164)

PLATE BEARING TEST RESULTS

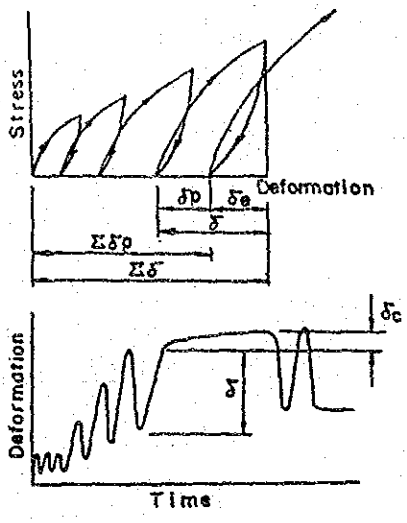
Test Location: DA-1, P-3, TD(B) 2.1m
Measuring Point: Right wall
Loading Plate Radius: a = 15 cm
Date Measured: 26 Aug. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2B III (D)

Deformation Measurement Results

Stress (kg/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	34	16	18	34	18	
15	19	9	10	37	28	
15	14	7	7	42	35	
30	35	30	5	70	40	
45	51	39	12	91	52	
60	69	57	12	121	64	
60	58 (73)	47 (62)	11 (11)	122 (137)	75	
65	66	49	17	141	92	
65	70	68	2	162	94	

Creep Deformation δc (×10⁻³mm)	Creep Factor Cf (%)
15	26

$Cf = \frac{\delta c}{\delta} \times 100 = \frac{15}{58} \times 100 = 25.9$



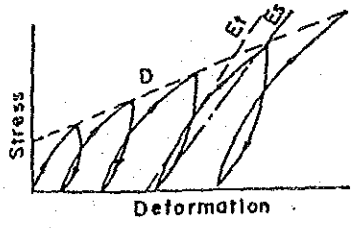
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kg/cm²)	Tangential Modulus of Elasticity Et (kg/cm²)	Stress Level (kg/cm²)	Secant Modulus of Elasticity Es (kg/cm²)
131,000	220,600	20 ~ 65	216,400

Modulus of Deformation, Modulus of Elasticity Calculation Formula

$$D \text{ or } E = \frac{(1-\nu^2)}{2a} \cdot \frac{\Delta F}{\Delta W} = \frac{\pi a (1-\nu^2)}{2} \cdot \frac{\Delta \sigma}{\Delta \delta}$$

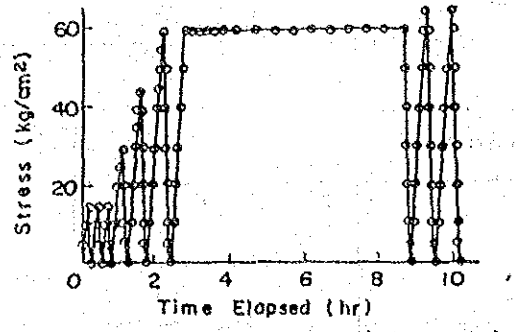


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kg/cm²) Δδ : Deformation increment due to Δσ

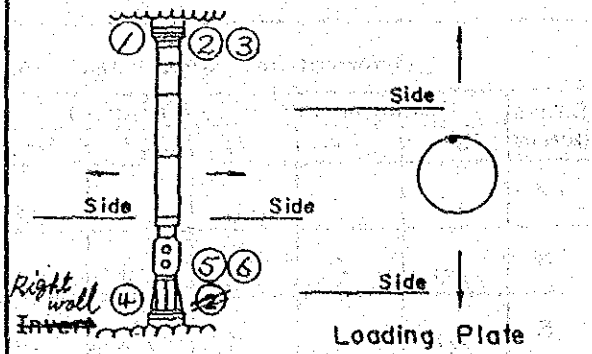
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-1, P-3, TD(B) 2.1m | Measuring Point: Right wall | Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm | Date Measured: 26 Aug. 1988 | Rock Grade: 2BIII ⑥
Jack Capacity: 200 ton | Max. Oil Pressure: 1100 kg/cm² | Measured by:
Ram Diameter: ϕ 15.24 cm



Loading Pattern (Example)



Loading Plate

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation Displacement Gauge Reading (x 10⁻³ mm) ④ ① ⑤ ⑥ ③	(④+①+⑤+②+⑥)/23	Σδ	Remarks
	0	0		0 0 0	0	0	
	2	5		5 0 24	9.7	9.7	
	4	10		10 0 31	13.6	23.3	
	6	15		5 0 25	10.0	33.3	
	10	15		0 0 3	1.0	34.3	
	12	5		1 0 -33	-10.6	23.7	
	14	0		-2 0 -12	-4.7	19.0	
	18	0		0 0 -2	-0.7	18.3	
	20	10		1 2 22	8.4	26.7	
	22	15		3 1 24	9.3	36.0	
	26	15		0 0 2	0.7	36.7	
	28	5		0 0 -15	-5.0	31.7	
	30	0		-2 0 -9	-3.7	28.0	
<1>	34	0		0 0 0	0	28.0	(28)
	36	10		0 1 13	4.7	32.7	
	38	15		3 1 24	9.3	42.0	
<2>	42	15		0 0 1	0.3	42.3	(42)
	44	5		0 0 -9	-3.0	39.3	
	46	0		-3 0 -11	-4.6	34.7	
	50	0		0 1 -1	0	34.7	
	52	10		0 0 17	5.6	40.3	
	54	15		3 1 23	9.0	49.3	
	56	20		1 1 17	6.4	55.7	
	58	25		3 1 17	7.0	62.7	
	1:00	30		6 0 17	7.6	70.3	
<3>	1:04	30		0 0 0	0	70.3	(70)
	1:06	20		0 0 0	0	70.3	
	1:08	10		0 0 -34	-11.3	59.0	
	1:10	5		-3 0 -34	-12.4	46.6	
	1:12	0		-4 0 -15	-6.3	40.3	
	1:16	0		0 0 -1	-0.3	40.0	
	1:18	10		0 0 16	5.3	45.3	
	1:20	20		3 0 42	15.0	60.3	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress σ (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement ④	⑤	Gauge Reading ⑥	⑦	$\Sigma\delta$	Remarks
	1:22	30		5	0	27	10.7	71.0	
	1:24	35		2	0	10	4.0	75.0	
	1:26	40		3	1	14	6.0	81.0	
	1:28	45		4	4	16	8.0	89.0	
<4>	1:32	45		1	1	3	1.6	90.6	(91.)
	1:34	40		0	0	0	0	90.6	
	1:36	30		0	2	-2	0	90.6	
	1:38	20		0	0	-21	-7.0	83.6	
	1:40	10		-1	0	-29	-10.0	73.6	
	1:42	5		-5	0	-31	-12.0	61.6	
	1:44	0		-5	0	-24	-9.6	52.0	
	1:48	0		0	0	0	0	52.0	
	1:50	10		0	0	50	16.6	68.6	
	1:52	20		2	-1	14	5.0	73.6	
	1:54	30		4	0	35	13.0	86.6	
	1:56	40		4	0	23	9.0	95.6	
	1:58	45		2	2	11	5.0	100.6	
	2:00	50		3	2	13	6.0	106.6	
	2:02	55		3	3	13	6.4	113.0	
	2:04	60		3	2	13	6.0	119.0	
<5>	2:08	60		1	2	4	2.3	121.3	(121.)
	2:10	50		0	2	0	0.7	122.0	
	2:12	40		0	1	-6	-1.7	120.3	
	2:14	30		-1	0	-15	-5.3	115.0	
	2:16	20		-1	0	-26	-9.0	106.0	
	2:18	10		-4	0	-56	-20.0	86.0	
	2:20	5		-4	0	-35	-13.0	73.0	
	2:22	0		-3	0	-20	-7.7	65.3	
<6>	2:26	0		0	0	-5	-1.6	63.7	(64)
	2:28	10		0	-1	8	2.3	66.0	
	2:30	20		1	-1	48	16.0	82.0	
	2:32	30		3	0	35	12.6	94.6	
	2:34	40		5	0	26	10.4	105.0	
	2:36	50		4	1	23	9.3	114.3	
<7>	2:38	60		4	1	19	8.0	122.3	(122)
	2:40	60		1	2	1	1.3	123.6	
	2:43	60		0	0	1	0.4	124.0	
	2:48	60		1	1	2	1.3	125.3	
	2:53	60		0	0	0	0	125.3	
	2:58	60		0	0	0	0	125.3	
	3:03	60		0	0	3	1.0	126.3	
	3:08	60		1	0	0	0.3	126.6	
	3:18	60		1	1	1	1.0	127.6	
	3:28	60		0	0	0	0	127.6	
	3:38	60		0	0	0	0	127.6	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ④ ① ⑤	Gauge Reading ⑥ ②	(④+①+⑤+②)/2.3	Σδ	Remarks
	4:08	60		1	1	4	2.0	129.6	
	4:38	60		0	6	2	2.7	132.3	
	5:08	60		2	3	7	4.0	136.3	
	5:38	60		0	0	0	0	136.3	
	6:08	60		0	0	1	0.3	136.6	
	6:38	60		1	0	0	0.3	136.9	
	7:08	60		0	1	0	0.4	137.3	
	7:38	60		0	0	1	0.3	137.6	
	8:08	60		0	0	0	0	137.6	
<8>	8:38	60		0	-1	0	-0.3	137.3	(137)
	8:40	50		0	0	0	0	137.3	
	8:42	40		0	0	-2	-0.7	136.6	
	8:44	30		-2	0	-19	-7.0	129.6	
	8:46	20		-2	0	-29	-10.3	119.3	
	8:48	10		-2	-1	-54	-19.0	100.3	
	8:50	5		-4	0	-44	-16.0	84.3	
	8:52	0		-5	-2	-22	-9.7	74.6	
<9>	8:56	0		0	0	0	0	74.6	(75)
	8:58	10		1	-7	17	3.7	78.3	
<10>	9:00	20		2	0	52	18.0	96.3	(96)
	9:02	30		3	0	35	12.6	108.9	
<11>	9:04	40		3	0	25	9.4	118.3	(118)
	9:06	50		5	4	20	9.6	127.9	
<12>	9:08	60		4	2	19	8.4	136.3	(136)
	9:10	65		3	1	8	4.0	140.3	
<13>	9:14	65		1	0	2	1.0	141.3	(141)
	9:16	60		0	2	-2	0	141.3	
	9:18	50		0	2	-2	0	141.3	
	9:20	40		0	2	-6	-1.4	139.9	
	9:22	30		-1	0	-9	-3.3	136.6	
	9:24	20		-4	-1	-23	-9.3	127.3	
	9:26	10		-2	-1	-48	-17.0	110.3	
	9:28	5		-5	-1	-30	-12.0	98.3	
	9:30	0		-3	0	-15	-6.0	92.3	
<14>	9:34	0		-1	0	0	-0.4	91.9	(92)
	9:36	10		0	-2	17	5.0	96.9	
<15>	9:38	20		3	-3	52	17.4	114.3	(114)
	9:40	30		3	0	38	13.6	127.9	
<16>	9:42	40		4	1	25	10.0	137.9	(138)
	9:44	50		5	4	21	10.0	147.9	
<17>	9:46	60		3	3	20	8.7	156.6	(157)
	9:48	65		3	0	8	3.7	160.3	
<18>	9:52	65		0	2	2	1.6	161.9	(162)
	9:54	60		0	0	0	0	161.9	
	9:56	50		0	1	-2	-0.3	161.6	

PLATE BEARING TEST — DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ④ ① ⑤ ⑥ ②	④+①+⑤+⑥+② ε3	Σδ	Remarks
	9:58	40		0 2 -8	-2.0	159.6	
	10:00	30		-1 0 -19	-6.7	152.9	
	10:02	20		-4 -2 -32	-12.6	140.3	
	10:04	10		-2 -1 -58	-20.4	119.9	
	10:06	5		-5 0 -43	-16.0	103.9	
	10:08	0		-5 0 -26	-10.3	93.6	
(197)	10:12	0		0 0 0	0	93.6	(94)

PLATE BEARING TEST RESULTS

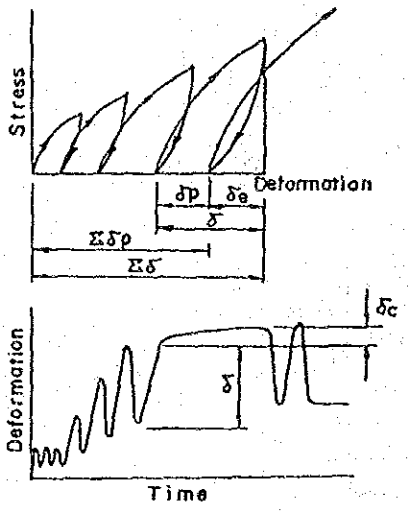
Test Location: ĐA-1, P-4, TD(B) 4.0m
Loading Plate Radius: a = 15 cm
Geological Classification: Ophiolite
Rock Grade: 2B III ⑥
Measuring Point: Invert
Date Measured: 25 Aug. 1988
Measured by:

Deformation Measurement Results

Stress (kgf/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	17	-1	18	17	18	
15	8	1	7	26	25	
15	6	3	3	31	28	
30	29	9	20	57	48	
45	31	17	14	79	62	
60	47	42	5	109	67	
60	40 (50)	26 (36)	14 (14)	107 (117)	81	
65	50	41	9	131	90	
65	46	42	4	136	94	

Creep Deformation δc (×10⁻³ mm)	Creep Factor Cf (%)
10	25

$Cf = \frac{\delta c}{\delta} \times 100 = \frac{10}{40} \times 100 = 25$



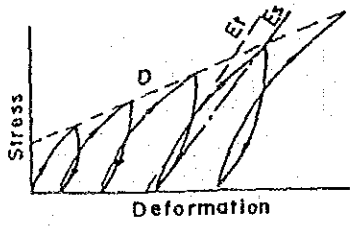
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kgf/cm²)	Tangential Modulus of Elasticity Et (kgf/cm²)	Stress Level (kgf/cm²)	Secant Modulus of Elasticity Es (kgf/cm²)
132,100	239,600	20~65	306,900

Modulus of Deformation, Modulus of Elasticity Calculation Formula

$$D \text{ or } E = \frac{(1-\nu^2)}{2a} \cdot \frac{\Delta F}{\Delta W} = \frac{\pi a (1-\nu^2)}{2} \cdot \frac{\Delta \sigma}{\Delta \delta}$$

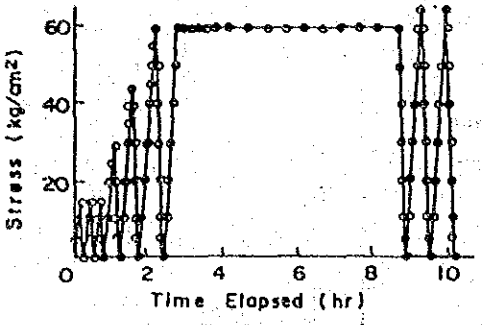


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kgf) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kgf/cm²) Δδ : Deformation increment due to Δσ

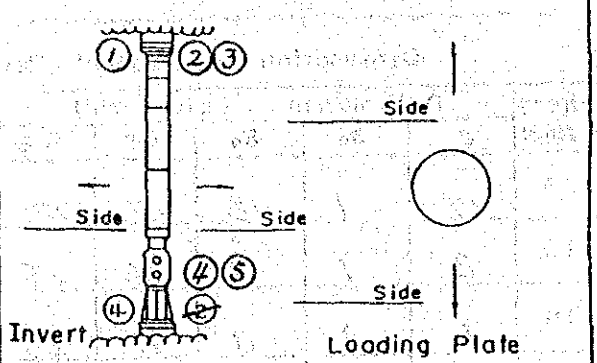
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-1, P-4, TD(B) 4.0m — Measuring Point: Invert — Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm — Date Measured: 25 Aug. 1988 — Rock Grade: 2BM (b)
Jack Capacity: 200 ton — Max. Oil Pressure: 1,100 kg/cm² — Measured by:
Ram Diameter: ϕ 15.24cm



Loading Pattern (Example)



Loading Plate

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④ ① ⑤ ⑥ ②	(④+⑤)/2 − ③	Σδ	Remarks
	0	0		0 0 0	0	0	
	2	5		-1 0 13	4.0	4.0	
	4	10		7 -5 19	7.0	11.0	
	6	15		7 3 4	4.7	15.7	
	10	15		0 1 4	1.7	17.4	
	12	5		0 0 -2	−0.6	16.8	
	14	0		-4 6 -5	1.0	17.8	
	18	0		0 0 0	0	17.8	
	20	10		0 0 13	4.3	22.1	
	22	15		4 2 4	3.3	25.4	
	26	15		0 0 1	0.3	25.7	
	28	5		0 0 0	0	25.7	
	30	0		-2 2 -2	−0.7	25.0	
⟨1⟩	34	0		0 0 0	0	25.0	(25)
	36	10		1 0 5	3	28.0	
	38	15		3 0 5	2.7	30.7	
⟨2⟩	42	15		0 0 1	0.3	31.0	(31)
	44	5		-1 0 0	−0.3	30.7	
	46	0		-1 0 -5	−2.0	28.7	
	50	0		-1 0 0	−0.3	28.4	
	52	10		0 0 10	3.3	31.7	
	54	15		3 0 2	1.7	33.4	
	56	20		2 0 7	3.0	36.4	
	58	25		5 0 9	4.7	41.1	
	1:00	30		4 26 15	15.7	56.8	
⟨3⟩	1:04	30		0 0 [illegible]	0	56.8	(57)
	1:06	20		0 0 -1	−0.3	56.5	
	1:08	10		0 [illegible] -2	−0.7	55.8	
	1:10	5		-4 [illegible] [illegible]	−2.7	53.1	
	1:12	0		-3 0 [illegible]	−3.7	49.4	
	1:16	0		0 [illegible] -5	−1.6	47.8	
	1:18	10		-1 5 [illegible]	3.3	51.1	
	1:20	20		6 0 5	3.7	54.8	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ④ ⑤ ⑥	④+⑤+⑥ ÷3	Σδ	Remarks
	1:22	30		2 1 4	2.3	57.1	
	1:24	35		1 3 11	5.0	62.1	
	1:26	40		1 6 15	7.3	69.4	
	1:28	45		1 6 16	7.6	77.0	
⟨4⟩	1:32	45		0 3 4	2.3	79.3	(79)
	1:34	40		0 0 0	0	79.3	
	1:36	30		0 0 -2	-0.7	78.6	
	1:38	20		0 0 -12	-4.0	74.6	
	1:40	10		0 0 -7	-2.3	72.3	
	1:42	5		-3 -5 -9	-5.7	66.6	
	1:44	0		-2 -3 -8	-4.3	62.3	
	1:48	0		0 0 -2	-0.7	61.6	
	1:50	10		0 0 3	1.0	62.6	
	1:52	20		5 0 1	2.0	64.6	
	1:54	30		4 4 14	7.3	71.9	
	1:56	40		1 8 18	9.0	80.9	
	1:58	45		0 4 11	5.0	85.9	
	2:00	50		1 4 11	5.3	91.2	
	2:02	55		0 5 17	7.3	98.5	
	2:04	60		0 8 15	7.7	106.2	
⟨5⟩	2:08	60		0 5 2	2.3	108.5	(109)
	2:10	50		0 -4 0	-1.3	107.2	
	2:12	40		1 -1 -3	-1.0	106.2	
	2:14	30		2 0 -15	-4.3	101.9	
	2:16	20		0 -3 -18	-7.0	94.9	
	2:18	10		-1 -11 -14	-8.7	86.2	
	2:20	5		-5 -9 -13	-9.0	77.2	
	2:22	0		-5 -2 -22	-9.7	67.5	
⟨6⟩	2:26	0		0 0 -3	-1.0	66.5	(67)
	2:28	10		0 -9 10	0.3	66.8	
	2:30	20		2 0 4	2.0	68.8	
	2:32	30		5 7 15	9.0	77.8	
	2:34	40		2 9 22	11.0	88.8	
	2:36	50		0 8 20	9.3	98.1	
⟨7⟩	2:38	60		1 6 21	9.3	107.4	(107)
	2:40	60		0 3 7	1.3	108.7	
	2:43	60		0 1 0	0.3	109.0	
	2:48	60		0 0 0	0	109.0	
	2:53	60		0 3 2	1.7	110.7	
	2:58	60		0 1 0	0.3	111.0	
	3:03	60		0 0 0	0	111.0	
	3:08	60		0 0 1	0.3	111.3	
	3:18	60		0 0 0	0	111.3	
	3:28	60		0 0 0	0	111.3	
	3:38	60		0 0 1	0.3	111.6	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kgf/cm²)	Jack Pressure (kgf/cm²)	Deformation (×10⁻³ mm) Displacement ④	Displacement ⑤	Gauge Reading ⑥	⑤+⑥	Σδ	Remarks
	4:08	60		0	-1	1	0	111.6	
	4:38	60		1	1	2	1.3	112.9	
	5:08	60		0	0	2	0.7	113.6	
	5:38	60		0	0	5	1.7	115.3	
	6:08	60		0	1	5	2.0	117.3	
	6:38	60		0	0	0	0	117.3	
	7:08	60		0	0	0	0	117.3	
	7:38	60		0	0	0	0	117.3	
	8:08	60		0	0	0	0	117.3	
⟨8⟩	8:38	60		0	0	0	0	117.3	(117)
	8:40	50		0	0	-1	-0.3	117.0	
	8:42	40		-1	-1	-3	-1.7	115.3	
	8:44	30		0	0	-7	-2.3	113.0	
	8:46	20		0	-1	-22	-7.7	105.3	
	8:48	10		-1	-9	-10	-6.7	98.6	
	8:50	5		-7	-10	-14	-10.3	88.3	
	8:52	0		-2	0	-19	-7.0	81.3	
⟨9⟩	8:56	0		0	0	0	0	81.3	(81)
	8:58	10		0	0	13	4.3	85.6	
⟨10⟩	9:00	20		0	0	5	1.7	87.3	(87)
	9:02	30		3	2	15	6.7	94.0	
⟨11⟩	9:04	40		3	12	23	12.7	106.7	(107)
	9:06	50		1	9	21	10.3	117.0	
⟨12⟩	9:08	60		0	7	17	8.0	125.0	(125)
	9:10	65		0	2	16	6.0	131.0	
⟨13⟩	9:14	65		0	0	0	0	131.0	(131)
	9:16	60		0	0	0	0	131.0	
	9:18	50		0	0	0	0	131.0	
	9:20	40		0	0	-10	-3.3	127.7	
	9:22	30		0	0	-16	-5.3	122.4	
	9:24	20		0	-2	-21	-7.6	114.8	
	9:26	10		-1	-13	-15	-9.7	105.1	
	9:28	5		-3	-11	-7	-7.0	98.1	
	9:30	0		-3	-1	-20	-8.0	90.1	
⟨14⟩	9:34	0		0	0	-1	-0.3	89.8	(90)
	9:36	10		0	0	8	2.7	92.5	
⟨15⟩	9:38	20		0	0	4	1.3	93.8	(94)
	9:40	30		2	6	16	8.3	102.1	
⟨16⟩	9:42	40		2	12	23	12.3	114.4	(114)
	9:44	50		1	0	18	6.3	120.7	
⟨17⟩	9:46	60		0	13	19	10.7	131.4	(131)
	9:48	65		0	5	10	5.0	136.4	
⟨18⟩	9:52	65		0	0	0	0	136.4	(136)
	9:54	60		0	0	0	0	136.4	
	9:56	50		0	0	0	0	136.4	

PLATE BEARING TEST

DATA SHEET (4)

Time	Time Elapsed	Stress $\frac{t}{(kg/cm^2)}$	Jack Pressure $\frac{t}{(kg/cm^2)}$	Deformation (x 10^{-3} mm) Displacement Gauge Reading (4) (5) (6)					Remarks
							#3	$\Sigma\delta$	
	9:58	40		0	0	-3	-3.0	133.4	
	10:00	30		0	0	-17	-5.7	127.7	
	10:02	20		0	-8	-22	-10.0	117.7	
	10:04	10		-1	-12	-12	-8.3	109.4	
	10:06	5		-4	-5	-10	-8.0	101.4	
	10:08	0		-2	-2	-17	-7.0	94.4	
<19>	10:12	0		0	0	-1	-0.3	94.1	(94)

PLATE BEARING TEST RESULTS

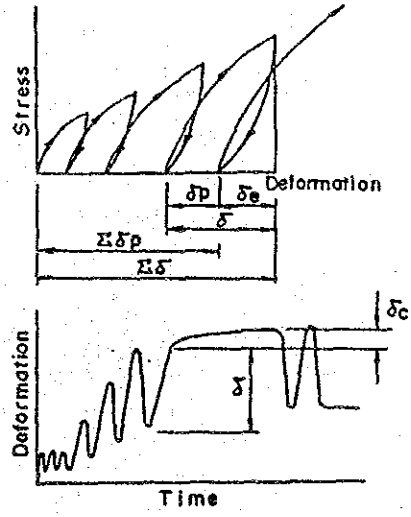
Test Location: DA-1, P-4, TD(B) 4.0m
Measuring Point: Crown
Loading Plate Radius: a = 15 cm
Date Measured: 25 Aug. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2BIII (D)

Deformation Measurement Results

Stress (kgf/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	52	26	26	52	26	
15	59	8	51	85	77	
15	11	10	1	88	78	
30	29	20	9	107	87	
45	37	24	13	124	100	
60	39	45	−6	139	94	
60	43 (49)	39 (45)	4 (4)	137 (143)	98	
65	50	34	16	148	114	
65	33	31	2	147	116	

Creep Deformation δc (×10⁻³mm)	Creep Factor Cf (%)
6	14

$Cf = \frac{\delta_c}{\delta} \times 100 = \frac{6}{43} \times 100 = 14$



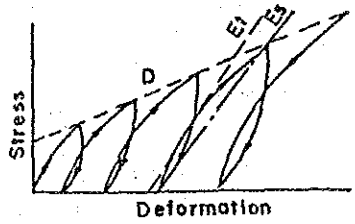
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kgf/cm²)	Tangential Modulus of Elasticity Et (kgf/cm²)	Stress Level (kgf/cm²)	Secant Modulus of Elasticity Es (kgf/cm²)
199,000	379,000	20 ~ 65	369,800

Modulus of Deformation, Modulus of Elasticity Calculation Formula

$$D \text{ or } E = \frac{(1-\nu^2)}{2a} \cdot \frac{\Delta F}{\Delta W} = \frac{\pi a (1-\nu^2)}{2} \cdot \frac{\Delta \sigma}{\Delta \delta}$$

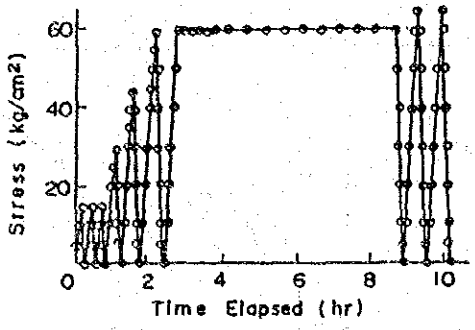


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kgf/cm²) Δδ : Deformation increment due to Δσ

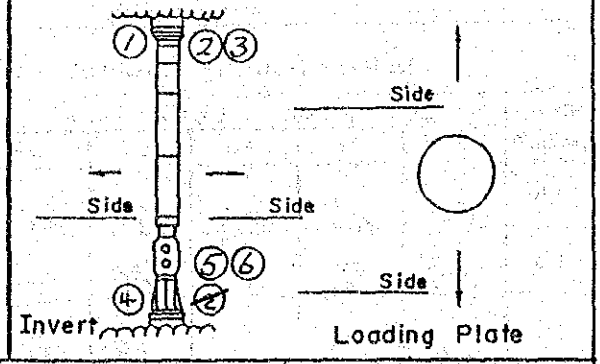
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-1, P-4, TD(B)40m Measuring Point: Crown Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm Date Measured: 25 Aug. 1988 Rock Grade: 2BIII ⑥
Jack Capacity: 200 ton Max. Oil Pressure: 1100 kg/cm² Measured by:
Ram Diameter: ϕ 15.24 cm



Loading Pattern (Example)



Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④ ① ⑤ ⑥ ②			①+②+③ / 3	Σδ	Remarks
	0	0		0	0	0	0	0	
	2	5		4	26	44	24.7	24.7	
	4	10		16	14	21	17.0	41.7	
	6	15		15	0	14	9.6	51.3	
	10	15		0	1	1	0.7	52.0	
	12	5		-6	-2	-1	-3.0	49.0	
	14	0		-9	-48	-3	-20.0	29.0	
	18	0		-12	1	1	-3.3	25.7	
	20	10		17	50	93	53.3	79.0	
	22	15		10	-1	9	6.0	85.0	
	26	15		0	0	1	0.3	85.3	
	28	5		-6	0	0	-2.0	83.3	
	30	0		-5	1	-15	-6.3	77.0	
<1>	34	0		-4	-1	4	-0.3	76.7	(77)
	36	10		7	2	5	4.6	81.3	
	38	15		8	6	5	6.4	87.7	
<2>	42	15		0	0	1	0.3	88.0	(88)
	44	5		-5	-1	0	-2.0	86.0	
	46	0		-9	-6	-8	-7.7	78.3	
	50	0		-1	-1	0	-0.6	77.7	
	52	10		8	1	4	4.3	82.0	
	54	15		6	7	4	5.7	87.7	
	56	20		7	8	6	7.0	94.7	
	58	25		5	5	7	5.6	100.3	
	1:00	30		6	8	7	7.0	107.3	
<3>	1:04	30		1	0	-1	0	107.3	(107)
	1:06	20		0	0	0	0	107.3	
	1:08	10		-2	-2	0	-1.3	106.0	
	1:10	5		-11	-7	0	-6.0	100.0	
	1:12	0		-13	-11	-15	-13.0	87.0	
	1:16	0		0	-1	0	-0.3	86.7	
	1:18	10		6	4	3	4.3	91.0	
	1:20	20		10	8	7	8.3	99.3	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ① ⊕ ②	③ ⊖	①+②+③ / 3	Σδ	Remarks
	1:22	30		7 9	6	7.3	106.6	
	1:24	35		5 6	5	5.4	112.0	
	1:26	40		5 5	6	5.3	117.3	
	1:28	45		6 6	7	6.3	123.6	
<4>	1:32	45		0 1	0	0.4	124.0	(124)
	1:34	40		0 0	0	0	124.0	
	1:36	30		0 −1	0	−0.4	123.6	
	1:38	20		−1 −1	−1	−1.0	122.6	
	1:40	10		−5 −5	−1	−3.6	119.0	
	1:42	5		−14 −12	−4	−10.0	109.0	
	1:44	0		−7 −7	−9	−7.7	101.3	
	1:48	0		−3 −1	0	−1.3	100.0	
	1:50	10		2 1	0	1.0	101.0	
	1:52	20		11 6	2	6.3	107.3	
	1:54	30		6 9	6	7.0	114.3	
	1:56	40		6 7	4	5.7	120.0	
	1:58	45		4 4	4	4.0	124.0	
	2:00	50		2 4	3	3.0	127.0	
	2:02	55		4 6	6	5.3	132.3	
	2:04	60		5 5	5	5.0	137.3	
<5>	2:08	60		2 2	0	1.3	138.6	(139)
	2:10	50		0 0	0	0	138.6	
	2:12	40		0 0	0	0	138.6	
	2:14	30		−2 0	0	−1.6	137.0	
	2:16	20		−2 −5	0	−2.4	134.6	
	2:18	10		−9 −11	−3	−7.6	127.0	
	2:20	5		−16 −11	−7	−11.3	115.7	
	2:22	0		−14 −21	−29	−21.3	94.4	
<6>	2:26	0		0 0	0	0	94.4	(94)
	2:28	10		6 3	10	6.3	100.7	
	2:30	20		10 13	9	10.6	111.3	
	2:32	30		8 9	5	7.4	118.7	
	2:34	40		6 9	5	6.6	125.3	
	2:36	50		6 7	6	6.4	131.7	
<7>	2:38	60		6 6	5	5.6	137.3	(137)
	2:40	60		2 3	0	1.7	139.0	
	2:43	60		0 0	0	0	139.0	
	2:48	60		0 0	0	0	139.0	
	2:53	60		−1 1	1	0.3	139.3	
	2:58	60		0 0	0	0	139.3	
	3:03	60		1 0	0	0.3	139.6	
	3:08	60		0 0	0	0	139.6	
	3:18	60		0 1	0	0.4	140.0	
	3:28	60		0 3	1	1.3	141.3	
	3:38	60		0 0	2	0.7	142.0	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress σ (kg/cm²)	Jack Pressure σ (kg/cm²)	Deformation (×10⁻³ mm) Displacement ① ⑴ ②	Gauge Reading ③ ⑵	①+②+③ / ε_3	$\Sigma\sigma$	Remarks
	4:08	60		0 1	3	1.3	143.3	
	4:38	60		1 1	−2	0	143.3	
	5:08	60		0 2	0	0	143.3	
	5:38	60		0 0	0	0	143.3	
	6:08	60		0 0	0	0	143.3	
	6:38	60		0 0	0	0	143.3	
	7:08	60		0 0	0	0	143.3	
	7:38	60		0 0	0	0	143.3	
	8:08	60		0 0	0	0	143.3	
⟨8⟩	8:38	60		0 0	0	0	143.3	(143)
	8:40	50		0 0	0	0	143.3	
	8:42	40		−1 0	0	−0.3	143.0	
	8:44	30		−5 −1	0	−2.0	141.0	
	8:46	20		−3 −7	0	−3.4	137.6	
	8:48	10		−8 −10	−2	−6.6	131.0	
	8:50	5		−19 −14	−10	−14.4	116.6	
	8:52	0		−13 −12	−29	−17.6	99.0	
⟨9⟩	8:56	0		−2 0	0	−0.7	98.3	(98)
	8:58	10		4 7	23	11.4	109.7	
⟨10⟩	9:00	20		10 13	9	10.6	120.3	(120)
	9:02	30		7 9	5	7.0	127.3	
⟨11⟩	9:04	40		3 8	5	5.3	132.6	(133)
	9:06	50		9 8	5	7.4	140.0	
⟨12⟩	9:08	60		4 6	5	5.0	145.0	(145)
	9:10	65		3 3	2	2.6	147.6	
⟨13⟩	9:14	65		0 1	0	0.4	148.0	(148)
	9:16	60		0 −1	0	−0.4	147.6	
	9:18	50		0 0	0	0	147.6	
	9:20	40		0 0	−1	−0.3	147.3	
	9:22	30		−1 0	0	−0.3	147.0	
	9:24	20		−3 −5	0	−2.7	144.3	
	9:26	10		−6 −11	−1	−6.0	138.3	
	9:28	5		−15 −9	−6	−10.0	128.3	
	9:30	0		−12 −16	−14	−14.0	114.3	
⟨14⟩	9:34	0		0 0	0	0	114.3	(114)
	9:36	10		7 −2	0	1.7	116.0	
⟨15⟩	9:38	20		3 9	2	4.6	120.6	(121)
	9:40	30		7 9	6	7.4	128.0	
⟨16⟩	9:42	40		5 9	2	5.3	133.3	(133)
	9:44	50		5 7	5	5.7	139.0	
⟨17⟩	9:46	60		5 4	5	4.6	143.6	(144)
	9:48	65		3 5	1	3.0	146.6	
⟨18⟩	9:52	65		0 0	0	0	146.6	(147)
	9:54	60		0 0	0	0	146.6	
	9:56	50		0 0	0	0	146.6	

PLATE BEARING TEST — DATA SHEET (4)

Time	Time Elapsed	Stress (kgf/cm²)	Jack Pressure (kgf/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ① ④ ② ③ ⑤	(①+②+③)/3	Σ1'	Remarks
	9:58	40		0 −1 0	−0.3	146.3	
	10:00	30		−1 0 0	−0.3	146.0	
	10:02	20		−4 −4 0	−2.7	143.3	
	10:04	10		−7 −11 −1	−6.3	137.0	
	10:06	5		−11 −9 −6	−8.7	128.3	
	10:08	0		−13 −14 −11	−12.7	115.6	
<19>	10:12	0		0 0 0	0	115.6	(116)

PLATE BEARING TEST RESULTS

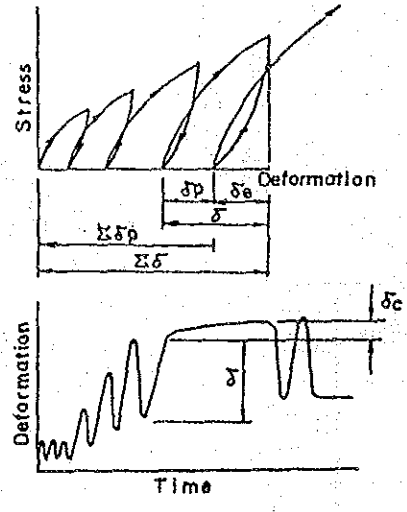
Test Location: DA-2. P-1, TD 16.3m
Measuring Point: Invert
Loading Plate Radius: a = 15 cm
Date Measured: 4 Oct. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: CBN ©

Deformation Measurement Results

Stress (kg^f/cm^2)	Deformation ($\times 10^{-3}$ mm) δ	δ_e	δ_p	$\Sigma\delta$	$\Sigma\delta_p$	Remarks
15	31	21	10	31	10	
15	26	17	9	36	19	
15	31	17	14	50	33	
30	49	39	10	82	43	
45	77	14	63	120	106	
60	119	57	62	225	168	
60	143 (156)	66 (79)	77 (77)	311 (324)	245	
65	153	44	109	398	354	
65	78	49	29	432	383	

Creep Deformation δc ($\times 10^{-3}$ mm)	Creep Factor Cf (%)
13	9

$$Cf = \frac{\delta c}{\delta} \times 100 = \frac{13}{143} \times 100 = 9$$



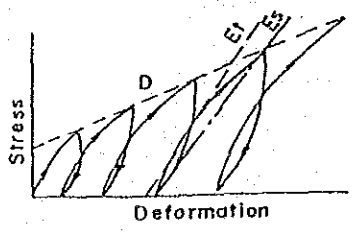
δ : Total deformation
δ_e : Elastic deformation
δ_p : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta_p$: Cumulative plastic deformation
δ_c : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kg^f/cm^2)	Tangential Modulus of Elasticity Et (kg^f/cm^2)	Stress Level (kg^f/cm^2)	Secant Modulus of Elasticity Es (kg^f/cm^2)
55,000	179,700	20 ~ 65	142,300

Modulus of Deformation, Modulus of Elasticity Calculation Formula

$$D \text{ or } E = \frac{(1-\nu^2)}{2a} \cdot \frac{\Delta F}{\Delta W} = \frac{\pi a (1-\nu^2)}{2} \cdot \frac{\Delta\sigma}{\Delta\delta}$$

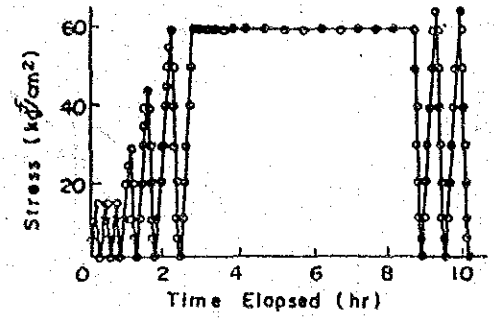


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg^f) ΔW : Deformation increment due to ΔF
$\Delta\sigma$: Stress increment (kg^f/cm^2) $\Delta\delta$: Deformation increment due to $\Delta\sigma$

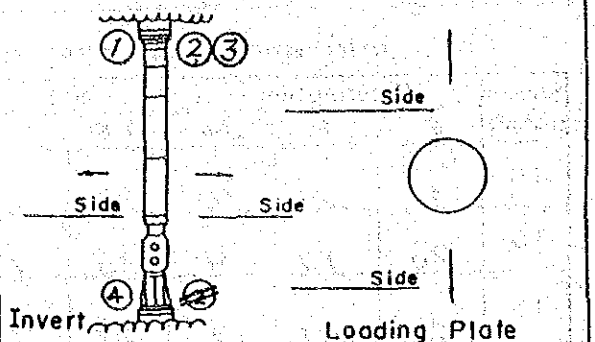
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-2, P-1, TD 16.3 m — Measuring Point: Invert — Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm — Date Measured: 4 Oct. 1988 — Rock Grade: 2BM ©
Jack Capacity: 200 ton — Max. Oil Pressure: 1,100 kgf/cm² — Measured by:
Ram Diameter: φ 15.24 cm



Loading Pattern (Example)



Time	Time Elapsed	Stress (kgf/cm²)	Jack Pressure (kgf/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④ ① ⑤ ⑥ ②	①+②+③	Σδ	Remarks
	0	0		0 0 0	0	0	
	2	5		7 4 9	6.7	6.7	
	4	10		13 9 10	10.7	17.4	
	6	15		15 14 12	13.7	31.1	
	10	15		0 1 0	0.3	31.4	
	12	5		-20 -10 -16	-15.3	16.1	
	14	0		-8 -5 -4	-5.7	10.4	
	18	0		0 0 0	0	10.4	
	20	10		13 15 15	16.0	26.4	
	22	15		11 8 10	9.7	36.1	
	26	15		0 0 0	0	36.1	
	28	5		-20 -6 -4	-10.0	26.1	
	30	0		-4 -6 -8	-6.0	20.1	
<1>	34	0		-1 0 -1	-0.7	19.4	(19)
	36	10		21 18 20	19.7	39.1	
	38	15		13 7 10	10.0	49.1	
<2>	42	15		2 0 1	1.0	50.1	(50)
	44	5		-17 -14 -13	-14.7	35.4	
	46	0		-3 -1 -2	-2.0	33.4	
	50	0		0 0 0	0	33.4	
	52	10		10 9 9	9.3	42.7	
	54	15		10 9 7	8.7	51.4	
	56	20		9 9 7	8.3	59.7	
	58	25		15 12 9	12.0	71.7	
	1:00	30		10 8 8	8.7	80.4	
<3>	1:04	30		3 2 0	1.7	82.1	(82)
	1:06	20		-1 0 0	-0.3	81.8	
	1:08	10		-15 -16 -11	-14.0	67.8	
	1:10	5		-15 -13 -11	-13.0	54.8	
	1:12	0		-11 -11 -3	-10.3	44.5	
	1:16	0		0 -3 -2	-1.6	42.9	
	1:18	10		21 20 5	15.3	58.2	
	1:20	20		35 14 20	23.0	81.2	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ④ ① ⑤ ⑥ ②	(④+①+⑤+⑥+②)/2.3	Σδ	Remarks
	1:22	30		3 8 9	10.0	91.2	
	1:24	35		3 6 4	6.0	97.2	
	1:26	40		13 11 9	11.0	108.2	
	1:28	45		11 10 8	9.7	117.9	
<4>	1:32	45		3 2 2	2.3	120.2	(120)
	1:34	40		-2 -1 0	-1.3	118.9	
	1:36	30		-4 -3 -1	-2.7	116.2	
	1:38	20		-5 -5 -5	-5.0	111.2	
	1:40	10		-3 -3 -2	-2.7	108.5	
	1:42	5		-1 -1 -1	-1.0	107.5	
	1:44	0		-2 -1 -2	-1.7	105.8	
	1:48	0		-1 0 0	-0.3	105.5	
	1:50	10		26 30 19	28.3	133.8	
	1:52	20		25 30 26	30.3	164.1	
	1:54	30		4 12 12	12.7	176.8	
	1:56	40		9 8 7	8.0	184.8	
	1:58	45		10 8 7	8.3	193.1	
	2:00	50		9 7 4	6.7	199.8	
	2:02	55		10 9 7	8.7	208.5	
	2:04	60		12 11 9	14.0	222.5	
<5>	2:08	60		3 3 2	2.7	225.2	(225)
	2:10	50		-1 -1 0	-0.7	224.5	
	2:12	40		-6 -4 -1	-3.7	220.8	
	2:14	30		-10 -8 -5	-7.7	213.1	
	2:16	20		-19 -17 -13	-16.3	196.8	
	2:18	10		-5 -3 -2	-3.3	193.5	
	2:20	5		-25 -25 -10	-20.0	173.5	
	2:22	0		-8 -5 -3	-5.3	168.2	
<6>	2:26	0		0 0 0	0	168.2	(168)
	2:28	10		44 28 25	32.3	200.5	
	2:30	20		45 30 26	33.7	234.2	
	2:32	30		39 33 30	34.0	268.2	
	2:34	40		17 13 13	14.3	282.5	
	2:36	50		15 10 7	10.7	293.2	
<7>	2:38	60		22 20 11	17.7	310.9	(311)
	2:40	60		0 0 0	0	310.9	
	2:43	60		1 1 0	0.7	311.6	
	2:48	60		2 2 1	1.7	313.3	
	2:53	60		0 0 0	0	313.3	
	2:58	60		1 0 0	0.3	313.6	
	3:03	60		2 2 1	1.0	314.6	
	3:08	60		2 1 0	0.7	315.3	
	3:18	60		0 0 0	0	315.3	
	3:28	60		0 1 1	0.3	315.6	
	3:38	60		0 0 0	0	315.6	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ④ ⑦ ⑤	Gauge Reading ⑥ ②	(④+⑦+⑤+⑥+②)/2	Σδ	Remarks
	4:08	60		2	1 0	1.0	318.6	
	4:38	60		1	1 1	1.0	317.6	
	5:08	60		1	0 1	0.7	318.3	
	5:38	60		1	1 0	0.7	319.0	
	6:08	60		2	0 0	0.7	319.7	
	6:38	60		0	0 1	0.3	320.0	
	7:08	60		1	1 1	1.0	321.0	
	7:38	60		3	2 1	2.0	323.0	
	8:08	60		1	0 1	0.7	323.7	
<8>	8:38	60		1	0 0	0.3	324.0	(324)
	8:40	50		0	0 0	0	324.0	
	8:42	40		-3	-2 0	-1.7	322.3	
	8:44	30		-4	-3 -3	-3.3	319.0	
	8:46	20		-20	-18 -15	-17.7	301.3	
	8:48	10		-35	-27 -29	-30.3	271.0	
	8:50	5		-23	-16 -17	-18.7	252.3	
	8:52	0		-9	-6 -6	-7.0	245.3	
<9>	8:56	0		0	0 0	0	245.3	(245)
	8:58	10		45	28 29	34.0	279.3	
<10>	9:00	20		43	32 30	35.0	314.3	(314)
	9:02	30		35	37 34	35.3	349.6	
<11>	9:04	40		20	18 21	19.7	369.3	(369)
	9:06	50		16	8 12	12.0	381.3	
<12>	9:08	60		13	6 8	9.0	390.3	(390)
	9:10	65		6	5 3	4.7	395.0	
<13>	9:14	65		2	3 5	3.3	398.3	(398)
	9:16	60		0	0 0	0	398.3	
	9:18	50		0	0 0	0	398.3	
	9:20	40		-2	-2 0	-1.3	397.0	
	9:22	30		-6	-4 -4	-4.7	392.3	
	9:24	20		-20	-12 -14	-15.3	377.0	
	9:26	10		-11	-9 -9	-9.7	367.3	
	9:28	5		-8	-10 -7	-8.3	359.0	
	9:30	0		-8	-3 -3	-4.7	354.3	
<14>	9:34	0		-1	0 0	-0.3	354.0	(354)
	9:36	10		25	16 18	19.7	373.7	
<15>	9:38	20		12	13 15	15.3	389.0	(389)
	9:40	30		21	9 13	14.3	403.3	
<16>	9:42	40		11	8 10	9.7	413.3	(413)
	9:44	50		7	3 4	4.7	417.7	
<17>	9:46	60		12	6 9	9.0	426.7	(427)
	9:48	65		5	3 2	3.3	430.0	
<18>	9:52	65		2	2 3	2.3	432.3	(432)
	9:54	60		0	0 0	0	432.3	
	9:56	50		0	-1 0	-0.3	432.0	

PLATE BEARING TEST

DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④ ① ⑤	⑥ ②	(①+②)/2 − ③	Σδ	Remarks
	9:58	40		-4 -3	0	-2.3	429.7	
	10:00	30		-23 -6	-14	-14.3	415.4	
	10:02	20		-9 -12	-8	-9.7	405.7	
	10:04	10		-10 -9	-12	-10.3	395.4	
	10:06	5		-8 -5	-6	-6.3	389.1	
	10:08	0		-8 -6	-3	-5.7	383.4	
<19>	10:12	0		-1 0	0	-0.3	383.1	(383)

PLATE BEARING TEST RESULTS

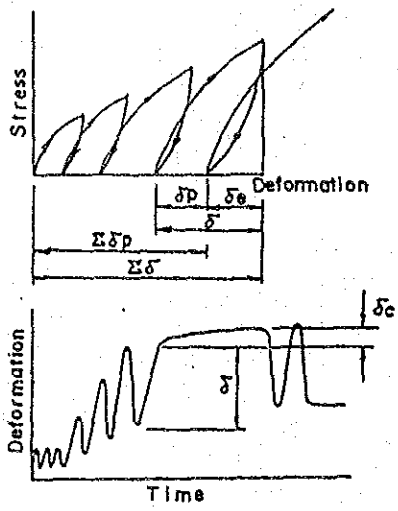
Test Location: DA-2, P-1, TD 16.3m
Loading Plate Radius: a = 15 cm
Geological Classification: Ophiolite
Rock Grade: 2BN ©
Measuring Point: Crown
Date Measured: 4 Oct. 1988
Measured by:

Deformation Measurement Results

Stress (kg/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	45	6	39	45	39	
15	12	2	10	51	49	
15	22	9	13	71	62	
30	67	29	38	129	100	
45	83	47	36	183	136	
60	117	72	45	253	181	
60	99 (116)	97 (114)	2 (2)	280 (297)	183	
65	85	93	-8	268	175	
65	145	100	45	320	220	

Creep Deformation δc (×10⁻³ mm)	Creep Factor Cf (%)
17	17

$Cf = \frac{\delta c}{\delta} \times 100 = \frac{17}{99} \times 100 = 17$



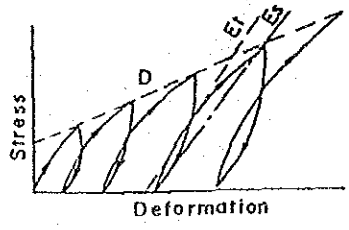
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kg/cm²)	Tangential Modulus of Elasticity Et (kg/cm²)	Stress Level (kg/cm²)	Secant Modulus of Elasticity Es (kg/cm²)
56,400	126,400	20 ~ 65	137,200

Modulus of Deformation, Modulus of Elasticity Calculation Formula

$$D \text{ or } E = \frac{(1-\nu^2)}{2a} \cdot \frac{\Delta F}{\Delta W} = \frac{\pi a (1-\nu^2)}{2} \cdot \frac{\Delta \sigma}{\Delta \delta}$$

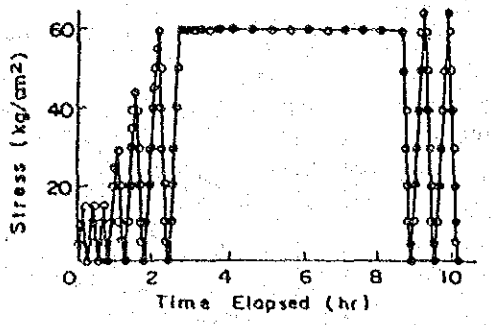


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kg/cm²) Δδ : Deformation increment due to Δσ

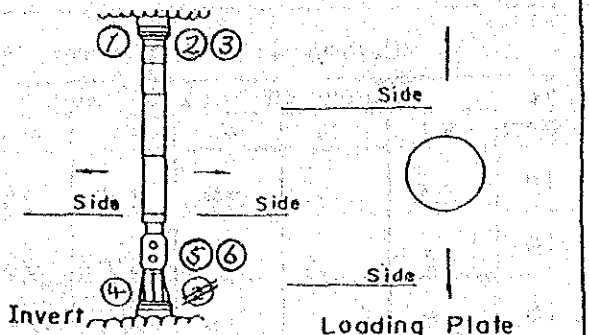
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-2, P-1, TD16.3m | Measuring Point: Crown | Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm | Date Measured: 4 Oct. 1988 | Rock Grade: 2BN ©
Jack Capacity: 200 ton | Max. Oil Pressure: 1100 kg/cm² | Measured by:
Ram Diameter: φ 15.24cm



Loading Pattern (Example)



Loading Plate

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ① ① ② ③ ②	①+②+③ ÷3	Σδ	Remarks
	0	0		0 0 0	0	0	
	2	5		10 10 1	7.0	7.0	
	4	10		26 14 5	15.0	22.0	
	6	15		25 26 10	20.3	42.3	
	10	15		3 5 1	3.0	45.3	
	12	5		-12 -4 0	-5.3	40.0	
	14	0		-4 0 0	-1.3	38.7	
	18	0		0 0 0	0	38.7	
	20	10		9 -1 0	2.7	41.4	
	22	15		15 6 2	7.7	49.1	
	26	15		2 3 2	2.8	51.4	
	28	5		-5 0 0	-1.7	49.7	
	30	0		0 -1 -1	-0.6	49.1	
⟨1⟩	34	0		0 0 0	0	49.1	(49)
	36	10		24 0 1	8.3	57.4	
	38	15		16 8 2	8.7	66.1	
⟨2⟩	42	15		7 4 3	4.7	70.8	(71)
	44	5		-20 1 0	-6.3	64.5	
	46	0		-9 0 1	-2.7	61.8	
	50	0		0 0 0	0	61.8	
	52	10		24 1 1	8.7	70.5	
	54	15		17 10 4	10.3	80.8	
	56	20		20 15 6	13.7	94.5	
	58	25		25 19 8	17.3	111.8	
	1:00	30		22 11 6	13.0	124.8	
⟨3⟩	1:04	30		5 5 3	4.3	129.1	(129)
	1:06	20		-1 0 0	-0.3	128.8	
	1:08	10		-18 0 0	-6.0	122.8	
	1:10	5		-33 -11 0	-16.0	106.8	
	1:12	0		-16 -2 -1	-6.3	100.5	
	1:16	0		0 -1 0	-0.3	100.2	
	1:18	10		24 5 -1	9.3	109.5	
	1:20	20		33 1 1	11.7	121.2	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ① ② ③				①+②+③ / 3	Σδ	Remarks
	1:22	30		32	20	8		20.0	141.2	
	1:24	35		15	11	5		10.3	151.5	
	1:26	40		16	8	8		10.7	162.2	
	1:28	45		24	18	7		16.3	178.5	
<4>	1:32	45		5	5	3		4.3	182.8	(183)
	1:34	40		1	0	1		0.7	183.5	
	1:36	30		-3	1	-1		-1.7	181.8	
	1:38	20		-14	1	0		-4.3	177.5	
	1:40	10		-31	-12	-1		-14.7	162.8	
	1:42	5		-38	-15	-3		-18.7	144.1	
	1:44	0		-15	-4	-4		-7.7	136.4	
	1:48	0		0	0	0		0	136.4	
	1:50	10		13	4	1		9.3	145.7	
	1:52	20		50	6	4		20.0	165.7	
	1:54	30		33	28	6		22.3	188.0	
	1:56	40		24	12	0		12.7	200.7	
	1:58	45		16	10	15		13.7	214.4	
	2:00	50		15	11	4		10.0	224.4	
	2:02	55		17	11	5		11.0	235.4	
	2:04	60		20	12	8		13.0	248.4	
<5>	2:08	60		8	2	4		4.7	253.1	(253)
	2:10	50		0	-4	1		-1.0	252.1	
	2:12	40		-5	-3	-2		-3.3	248.8	
	2:14	30		-12	-2	-4		-6.0	242.8	
	2:16	20		-23	-8	0		-10.3	232.5	
	2:18	10		-43	-12	-10		-21.7	210.8	
	2:20	5		-45	-13	-4		-20.6	190.2	
	2:22	0		-14	-10	-5		-9.7	180.5	
<6>	2:26	0		0	0	0		0	180.5	(181)
	2:28	10		25	-1	0		8.0	188.5	
	2:30	20		40	11	4		18.3	206.8	
	2:32	30		37	51	6		31.3	238.1	
	2:34	40		32	6	10		16.0	254.1	
	2:36	50		22	8	8		12.7	266.8	
<7>	2:38	60		25	6	8		13.0	279.8	(280)
	2:40	60		3	2	2		2.3	282.1	
	2:43	60		5	5	2		4.0	286.1	
	2:48	60		2	3	0		1.7	287.8	
	2:53	60		1	1	1		1.0	288.8	
	2:58	60		1	1	2		1.3	290.1	
	3:03	60		1	1	0		0.7	290.8	
	3:08	60		2	2	0		1.3	292.1	
	3:18	60		3	2	2		2.3	294.4	
	3:28	60		0	0	0		0	294.4	
	3:38	60		-2	-1	1		-1.0	293.1	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ①	①	②	Gauge Reading ③	④	(①+②+③)/3	Σδ	Remarks
	4:08	60		0	4	-1			1.0	294.1	
	4:38	60		0	0	1			0.3	294.4	
	5:08	60		0	0	0			0	294.4	
	5:38	60		0	0	1			0.3	294.7	
	6:08	60		0	0	0			0	294.7	
	6:38	60		0	0	0			0	294.7	
	7:08	60		1	0	0			0.3	295.0	
	7:38	60		0	1	0			0.3	295.3	
	8:08	60		0	0	0			0	295.3	
<8>	8:38	60		5	0	0			1.7	297.0	(297)
	8:40	50		-17	-1	0			-6.0	291.0	
	8:42	40		-7	-2	-2			-3.7	287.3	
	8:44	30		-17	-8	-7			-10.7	276.6	
	8:46	20		-32	-18	-8			-22.7	253.9	
	8:48	10		-49	-26	-10			-28.3	225.6	
	8:50	5		-50	-45	-12			-35.7	189.9	
	8:52	0		-12	-2	-3			-7.3	182.6	
<9>	8:56	0		0	0	0			0	182.6	(183)
	8:58	10		18	0	0			6.0	188.6	
<10>	9:00	20		39	1	0			13.0	201.6	(202)
	9:02	30		37	17	2			18.7	220.3	
<11>	9:04	40		22	17	9			17.7	238.0	(238)
	9:06	50		19	11	7			12.3	250.3	
<12>	9:08	60		19	11	6			12.0	262.3	(262)
	9:10	65		7	6	3			5.3	267.6	
<13>	9:14	65		1	1	0			0.7	268.3	(268)
	9:16	60		0	-1	0			-0.3	268.0	
	9:18	50		-2	0	0			-0.7	267.3	
	9:20	40		-10	0	0			-3.3	264.0	
	9:22	30		-14	-2	-2			-6.0	258.0	
	9:24	20		-31	-14	-7			-17.3	240.7	
	9:26	10		-48	-24	-11			-27.7	213.0	
	9:28	5		-54	-27	-9			-30.0	183.0	
	9:30	0		-15	-5	-3			-7.6	175.4	
<14>	9:34	0		0	0	0			0	175.4	(175)
	9:36	10		21	5	0			29.0	204.4	
<15>	9:38	20		41	1	0			14.0	218.4	(218)
	9:40	30		36	17	3			18.7	287.1	
<16>	9:42	40		29	17	59			35.0	272.1	(272)
	9:44	50		20	12	19			17.0	289.1	
<17>	9:46	60		19	12	44			25.0	314.1	(314)
	9:48	65		6	5	4			5.0	319.1	
<18>	9:52	65		1	1	0			0.7	318.8	(320)
	9:54	60		0	0	-1			0.3	320.1	
	9:56	50		-1	0	0			0.3	320.4	

PLATE BEARING TEST — DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ① ④ ② ③ ⑤	①+②+③ / 3	Σδ	Remarks
	9:58	40		-10 0 0	-3.3	317.1	
	10:00	30		-17 -3 -2	-7.3	309.8	
	10:02	20		-33 -15 -29	-25.7	284.1	
	10:04	10		-55 -15 -10	-26.7	257.4	
	10:06	5		-47 -4 -12	-21.0	236.4	
	10:08	0		-9 -32 0	-15.7	220.7	
<19>	10:12	0		-1 0 0	-0.3	220.4	(220)

PLATE BEARING TEST RESULTS

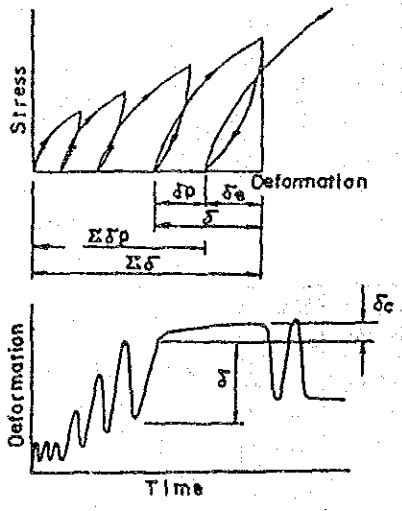
Test Location: DA-2, P-2, TD 17.0m
Loading Plate Radius: a = 15 cm
Geological Classification: Ophiolite
Rock Grade: ZBV ©
Measuring Point: Invert
Date Measured: 1 Oct. 1988
Measured by:

Deformation Measurement Results

Stress (kgf/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	14	10	4	14	5	
15	10	8	2	15	7	
15	9	7	2	16	9	
30	32	22	10	41	19	
45	58	45	13	77	32	
60	81	64	17	113	49	
60	70 (99)	43 (72)	27 (27)	119 (148)	76	
65	76	75	1	152	77	
65	79	75	4	156	81	

Creep Deformation δc (×10⁻³mm)	Creep Factor Cf (%)
29	41

$Cf = \frac{\delta c}{\delta} \times 100 = \frac{29}{70} \times 100 = 41.$



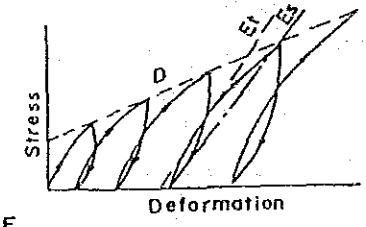
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kgf/cm²)	Tangential Modulus of Elasticity Et (kgf/cm²)	Stress Level (kgf/cm²)	Secant Modulus of Elasticity Es (kgf/cm²)
103,100	167,700	20 ~ 65	189,800

Modulus of Deformation, Modulus of Elasticity Calculation Formula

$$D \text{ or } E = \frac{(1-\nu^2)}{2a} \cdot \frac{\Delta F}{\Delta W} = \frac{\pi a (1-\nu^2)}{2} \cdot \frac{\Delta \sigma}{\Delta \delta}$$

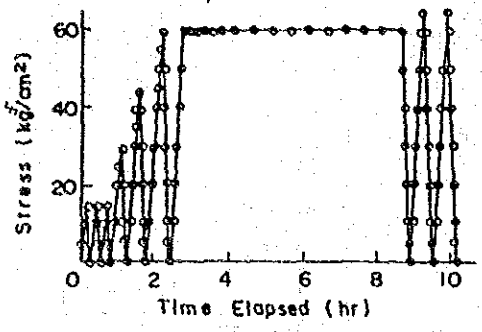


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kgf) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kgf/cm²) Δδ : Deformation increment due to Δσ

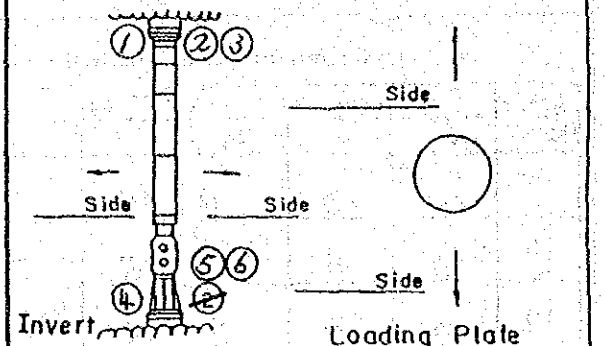
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-2, P-2, TD 190m | Measuring Point: Invert | Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm | Date Measured: 10 Oct. 1988 | Rock Grade: 2BT ©
Jack Capacity: 200 ton | Max. Oil Pressure: 1,100 kg/cm² | Measured by:
Ram Diameter: φ 15.24 cm



Loading Pattern (Example)



Loading Plate

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation Displacement Gauge Reading (×10⁻³ mm) ④ ① ⑤ ⑥ ②	②+①+②/3	Σδ	Remarks
	0	0		0 0 0	0	0	
	2	5		1 0 0	0.3	0.3	
	4	10		16 0 0	5.3	5.6	
	6	15		19 3 0	7.3	12.9	
	10	15		2 1 0	0.7	13.6	
	12	5		-18 0 0	-6.0	7.6	
	14	0		-9 0 0	-3.0	4.6	
	18	0		0 0 0	0	4.6	
	20	10		16 0 0	5.3	9.9	
	22	15		13 2 0	5.0	14.9	
	26	15		1 0 0	0.3	15.2	
	28	5		-18 0 0	-6.0	9.2	
	30	0		-8 0 0	-2.7	6.5	
⟨1⟩	34	0		0 0 0	0	6.5	(7)
	36	10		15 0 0	5.0	11.5	
	38	15		12 0 0	4.0	15.5	
⟨2⟩	42	15		0 0 0	0	15.5	(16)
	44	5		-17 1 0	-5.3	10.2	
	46	0		-5 0 0	-1.7	8.5	
	50	0		0 0 0	0	8.5	
	52	10		9 0 0	3.0	11.5	
	54	15		17 0 0	4.0	15.5	
	56	20		4 1 1	2.0	17.5	
	58	25		30 6 4	13.3	30.8	
	1:00	30		17 5 5	9.0	39.8	
⟨3⟩	1:04	30		0 2 1	1.0	40.8	(41)
	1:06	20		-2 0 -1	-1.0	39.8	
	1:08	10		-35 0 0	-11.7	28.1	
	1:10	5		-19 0 0	-6.3	21.8	
	1:12	0		-3 -1 0	-2.6	19.2	
	1:16	0		0 0 0	0	19.2	
	1:18	10		9 0 0	1.0	20.2	
	1:20	20		33 1 0	12.7	32.9	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ④ ①	⑤	⑥ ②	(④+⑤+⑥)/3	Σδ	Remarks
	1:22	30		25	4	4	11.0	43.9	
	1:24	35		15	7	6	9.3	53.2	
	1:26	40		17	7	10	11.3	64.5	
	1:28	45		13	7	7	9.0	73.5	
<4>	1:32	45		5	2	3	3.3	76.8	(77)
	1:34	40		-1	0	0	-0.3	76.5	
	1:36	30		-5	0	-1	-2.0	74.5	
	1:38	20		-22	0	-5	-9.0	65.5	
	1:40	10		-40	-6	-7	-17.7	47.8	
	1:42	5		-25	-3	-3	-10.3	37.5	
	1:44	0		-12	-2	-2	-5.3	32.2	
	1:48	0		0	0	0	0	32.2	
	1:50	10		12	0	0	4.0	36.2	
	1:52	20		38	0	0	12.7	48.9	
	1:54	30		29	4	3	12.0	60.9	
	1:56	40		33	7	12	14.0	74.9	
	1:58	45		10	4	5	6.3	81.2	
	2:00	50		10	8	8	8.7	89.9	
	2:02	55		11	4	8	7.7	97.6	
	2:04	60		12	12	12	12.0	109.6	
<5>	2:08	60		2	1	1	3.3	112.9	(113)
	2:10	50		0	0	0	0	112.9	
	2:12	40		-7	0	-2	-3.0	109.9	
	2:14	30		-18	-1	-9	-9.3	100.6	
	2:16	20		-27	-11	-14	-17.3	83.3	
	2:18	10		-42	-5	-6	-17.7	65.6	
	2:20	5		-32	-4	-6	-14.0	51.6	
	2:22	0		-4	-1	0	-1.7	49.9	
<6>	2:26	0		-1	-1	0	-0.7	49.2	(49)
	2:28	10		8	-1	0	2.3	51.5	
	2:30	20		41	0	0	13.7	65.2	
	2:32	30		33	0	1	11.3	76.5	
	2:34	40		27	11	15	17.7	94.2	
	2:36	50		37	7	12	18.7	112.9	
<7>	2:38	60		-4	8	13	5.7	118.6	(119)
	2:40	60		1	1	1	1.0	119.6	
	2:43	60		0	1	0	0.3	119.9	
	2:48	60		1	0	0	0.3	120.2	
	2:53	60		1	0	1	0.7	120.9	
	2:58	60		2	3	2	2.3	123.2	
	3:03	60		0	0	0	0	123.2	
	3:08	60		1	0	1	0.7	123.9	
	3:18	60		1	1	0	0.7	124.6	
	3:28	60		1	0	0	0.3	124.9	
	3:38	60		2	0	0	0.7	125.6	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ cm) Displacement ④ ① ⑤	Gauge Reading ⑥ ②	①②③ Σ	Σδ	Remarks
	4:08	60		3	5 2	3.3	128.9	
	4:38	60		4	1 3	2.7	131.6	
	5:08	60		4	5 2	3.7	135.3	
	5:38	60		3	3 0	2.0	137.3	
	6:08	60		3	2 3	2.7	140.0	
	6:38	60		2	2 0	1.3	141.3	
	7:08	60		3	1 1	1.7	143.0	
	7:38	60		3	1 1	1.7	144.7	
	8:08	60		2	2 1	1.7	146.4	
⟨8⟩	8:38	60		3	2 1	2.0	148.4	(148)
	8:40	50		-1	0 0	−0.3	148.1	
	8:42	40		-7	-1 -4	−3.0	145.1	
	8:44	30		-20	-4 -10	−11.3	133.8	
	8:46	20		-31	-9 -14	−18.0	115.8	
	8:48	10		-47	-6 -9	−20.7	95.1	
	8:50	5		-22	-11 -8	−13.7	81.4	
	8:52	0		-11	-2 -2	−5.0	76.4	
⟨9⟩	8:56	0		0	0 0	0	76.4	(76)
	8:58	10		11	0 0	3.7	80.1	
⟨10⟩	9:00	20		40	0 0	13.3	93.4	(93)
	9:02	30		32	4 7	10.7	104.1	
⟨11⟩	9:04	40		27	9 14	16.7	120.8	(121)
	9:06	50		19	9 12	13.3	134.1	
⟨12⟩	9:08	60		13	7 13	11.0	145.1	(145)
	9:10	65		6	5 6	5.7	150.8	
⟨13⟩	9:14	65		1	0 1	0.7	151.5	(152)
	9:16	60		0	0 0	0	151.5	
	9:18	50		0	0 -1	−0.3	151.2	
	9:20	40		-11	0 -6	−5.7	145.5	
	9:22	30		-20	-4 -13	−12.3	133.2	
	9:24	20		-33	-10 -14	−19.0	114.2	
	9:26	10		-40	-6 -7	−17.7	96.5	
	9:28	5		-26	-10 -8	−14.7	81.8	
	9:30	0		-11	-1 -2	−4.7	77.1	
⟨14⟩	9:34	0		0	0 0	0	77.1	(77)
	9:36	10		9	-2 0	2.3	79.4	
⟨15⟩	9:38	20		40	0 0	13.3	92.7	(93)
	9:40	30		32	6 6	14.7	107.4	
⟨16⟩	9:42	40		26	7 15	16.0	123.4	(123)
	9:44	50		20	10 12	14.0	137.4	
⟨17⟩	9:46	60		14	10 13	12.3	149.7	(150)
	9:48	65		8	2 7	5.7	155.4	
⟨18⟩	9:52	65		0	1 0	0.3	155.7	(156)
	9:54	60		0	0 0	0	155.7	
	9:56	50		0	0 0	0	155.7	

PLATE BEARING TEST

DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④ ① ⑤ ③ ②	④+①+⑤+③+②+⑥ / 2.3	Σδ	Remarks
	9:58	40		-13 0 -7	-6.7	149.0	
	10:00	30		-22 -3 -12	-12.3	136.7	
	10:02	20		-33 -11 -14	-18.3	118.4	
	10:04	10		-4- -7 -9	-20.3	98.1	
	10:06	5		-26 -11 -9	-15.3	82.8	
	10:08	0		-5 0 0	-1.7	81.1	
<19>	10:12	0		0 0 0	0	81.1	(81)

PLATE BEARING TEST RESULTS

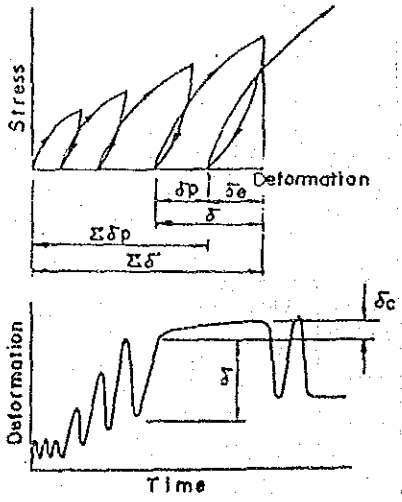
Test Location: DA-2, P-2, TD. 7.0m | Measuring Point: Crown
Loading Plate Radius: a = 15 cm | Date Measured: 1 Oct. 1988
Geological Classification: Ophiolite | Measured by:
Rock Grade: 2 2 N ©

Deformation Measurement Results

Stress (kg/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	223	40	183	223	183	
15	90	75	15	273	198	
15	93	24	69	291	267	
30	104	75	29	371	296	
45	162	99	63	458	359	
60	186	122	64	545	423	
60	171 (242)	91 (162)	80 (80)	594 (665)	503	
65	164	157	7	667	510	
65	153	138	15	663	525	

Creep Deformation δc (×10⁻³mm)	Creep Factor Cf (%)
71	42

$$Cf = \frac{\delta c}{\delta} \times 100 = \frac{71}{171} \times 100 = 41.5 \fallingdotseq 42$$



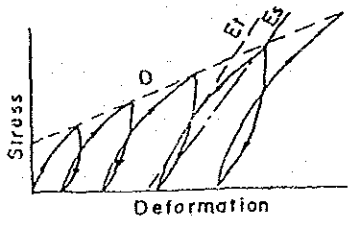
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kg/cm²)	Tangential Modulus of Elasticity Et (kg/cm²)	Stress Level (kg/cm²)	Secant Modulus of Elasticity Es (kg/cm²)
39,900	120,700	20 ~ 65	92,900

Modulus of Deformation, Modulus of Elasticity Calculation Formula

$$D \text{ or } E = \frac{(1-\nu^2)}{2a} \cdot \frac{\Delta F}{\Delta W} = \frac{\pi a (1-\nu^2)}{2} \cdot \frac{\Delta \sigma}{\Delta \delta}$$

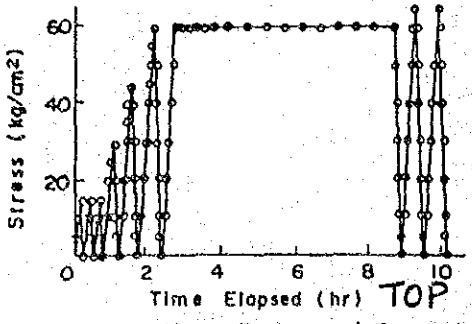


ν : Poisson's ratio (0.2~0.3) | a : Plate radius (cm)
ΔF : Load increment (kg) | ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kg/cm²) | Δδ : Deformation increment due to Δσ

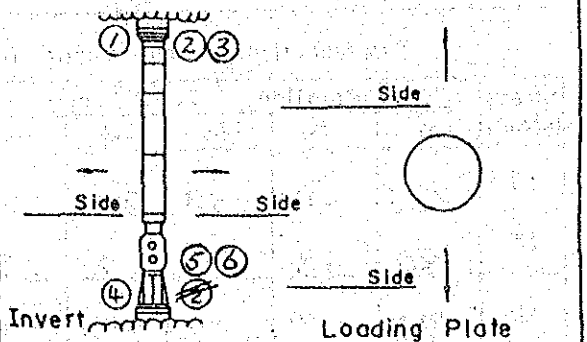
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: ~~AD~~ DA-2, P2, TD190 m | Measuring Point: Crown | Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm | Date Measured: ~~1-10-1988~~ 1 Oct. 1993 | Rock Grade: 2BM ©
Jack Capacity: 200 ton | Max. Oil Pressure: ~~200~~ 1,100 kg/cm² | Measured by:
Ram Diameter: ϕ 15.24 cm



Loading Pattern (Example)



Loading Plate

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ① ① ② ③ ②	①+②+③ / 3	Σδ	Remarks
	0	0		0 0 0	0	0	
	2	5		120 65 151	112.0	112.0	
	4	10		18 95 54	55.7	167.7	
	6	15		10 81 61	50.7	218.4	
	10	15		3 6 5	4.7	223.1	
	12	5		-4 -29 -20	-17.7	205.4	
	14	0		-15 -3 -50	-22.7	182.7	
	18	0		0 0 0	0	182.7	
	20	10		22 127 63	70.7	253.4	
	22	15		13 23 18	18.0	271.4	
	26	15		2 2 2	2.0	273.4	
	28	5		-7 -28 -20	-18.3	255.1	
	30	0		-17 -103 -50	-56.7	198.4	
<1>	34	0		0 -1 0	-0.3	198.1	(198)
	36	10		24 130 62	72.0	270.1	
	38	15		14 17 16	15.7	285.8	
<2>	42	15		+6 6 4	5.3	291.1	(291)
	44	5		-6 -24 -16	-15.3	275.8	
	46	0		-3 -15 -9	-9.0	266.8	
	50	0		0 -1 0	-0.3	266.5	
	52	10		13 42 20	25.0	291.5	
	54	15		15 22 19	18.7	310.2	
	56	20		11 20 20	17.0	327.2	
	58	25		15 24 26	21.7	348.9	
	1:00	30		4 21 20	15.0	363.9	
<3>	1:04	30		12 3 5	6.7	370.6	(371)
	1:06	20		1 0 0	0.3	370.9	
	1:08	10		-13 -18 -32	-21.0	349.9	
	1:10	5		-25 -50 -34	-36.3	313.6	
	1:12	0		-8 -31 -14	-17.7	295.9	
	1:16	0		0 0 0	0	295.9	
	1:18	10		17 61 28	35.3	331.2	
	1:20	20		33 45 42	40.0	371.2	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ① ① ② ③ ②				①+②+③ / 3	Σ	Remarks
	1:22	30		20	25	30		25.0	376.2	
	1:24	35		12	17	19		16.0	412.2	
	1:26	40		13	18	21		17.3	429.5	
	1:28	45		13	19	20		17.3	446.8	
<4>	1:32	45		10	13	9		10.7	457.5	(458)
	1:34	40		0	0	0		0	457.5	
	1:36	30		0	1	-5		-1.3	456.2	
	1:38	20		-3	-7	-17		-9.0	447.2	
	1:40	10		-23	-23	-32		-26.0	421.2	
	1:42	5		-26	-58	-45		-43.0	378.2	
	1:44	0		-13	-30	-15		-19.3	358.9	
	1:48	0		0	0	0		0	358.9	
	1:50	10		21	55	30		35.3	394.2	
	1:52	20		37	50	44		43.7	437.9	
	1:54	30		22	24	30		25.3	463.2	
	1:56	40		18	21	28		22.3	485.5	
	1:58	45		9	10	14		11.0	496.5	
	2:00	50		11	15	16		14.0	510.5	
	2:02	55		7	10	16		11.0	521.5	
	2:04	60		11	13	21		15.0	536.5	
<5>	2:08	60		8	10	6		8.0	544.5	(545)
	2:10	50		2	3	0		1.7	546.2	
	2:12	40		0	0	-5		-1.7	544.5	
	2:14	30		-1	0	-15		-5.3	539.2	
	2:16	20		-7	-5	-22		-11.3	527.9	
	2:18	10		-25	-26	-41		-30.7	497.2	
	2:20	5		-67	-61	-44		-57.3	439.9	
	2:22	0		-5	-30	-15		-16.7	423.2	
<6>	2:26	0		-1	0	0		-0.3	422.9	(423)
	2:28	10		16	55	28		33.0	455.9	
	2:30	20		41	51	44		45.3	501.2	
	2:32	30		26	25	35		28.7	529.9	
	2:34	40		18	22	31		23.7	553.6	
	2:36	50		16	19	27		20.7	574.3	
<7>	2:38	60		14	19	26		19.7	594.0	(594)
	2:40	60		2	4	3		2.7	596.7	
	2:43	60		5	6	3		4.7	601.4	
	2:48	60		2	1	3		2.0	603.4	
	2:53	60		7	8	6		7.0	610.4	
	2:58	60		10	10	7		9.0	619.4	
	3:03	60		5	5	4		4.7	624.1	
	3:08	60		4	5	4		4.3	628.4	
	3:18	60		14	12	8		11.3	639.7	
	3:28	60		6	5	4		5.0	644.7	
	3:38	60		0	3	1		1.3	646.0	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ①	Gauge Reading ②	Gauge Reading ③	①+②+③ / 3	Σδ	Remarks
	4:08	60		0	2	4	2.0	648.2	
	4:38	60		14	13	10	12.3	660.5	
	5:08	60		6	6	5	5.7	666.2	
	5:38	60		0	0	0	0	666.0	
	6:08	60		-3	0	0	-1.0	665.0	
	6:38	60		0	0	0	0	665.0	
	7:08	60		0	0	0	0	665.0	
	7:38	60		0	0	0	0	665.0	
	8:08	60		0	0	0	0	665.0	
<8>	8:38	60		0	0	0	0	665.0	(665)
	8:40	50		-11	-6	-7	-8.0	657.0	
	8:42	40		-9	-6	-12	-9.0	648.0	
	8:44	30		-9	-9	-19	-12.3	635.7	
	8:46	20		-14	-14	-28	-18.7	617.0	
	8:48	10		-39	-42	-55	-45.3	571.7	
	8:50	5		-24	-43	-40	-35.7	536.0	
	8:52	0		-18	-55	-26	-33.0	503.0	
<9>	8:56	0		0	0	-1	-0.3	502.7	(503)
	8:58	10		10	57	33	33.3	536.0	
<10>	9:00	20		40	43	44	42.3	578.3	(578)
	9:02	30		23	23	33	26.3	604.6	
<11>	9:04	40		16	14	28	19.3	623.9	(624)
	9:06	50		11	13	23	15.7	639.6	
<12>	9:08	60		9	10	18	12.3	651.9	(652)
	9:10	65		3	34	8	15.0	666.9	
<13>	9:14	65		0	0	0	0	666.9	(667)
	9:16	60		0	0	0	0	666.9	
	9:18	50		0	0	4	1.3	668.2	
	9:20	40		-4	-1	-21	-8.7	659.5	
	9:22	30		-8	-38	-19	-21.7	637.8	
	9:24	20		-19	-16	-32	-22.3	615.5	
	9:26	10		-29	-32	-44	-35.0	580.5	
	9:28	5		-34	-50	-40	-41.3	539.2	
	9:30	0		-18	-39	-31	-29.3	509.9	
<14>	9:34	0		0	-1	0	-0.3	509.6	(510)
	9:36	10		14	44	31	29.7	539.3	
<15>	9:38	20		39	44	42	41.7	581.0	(581)
	9:40	30		25	22	35	27.3	608.3	
<16>	9:42	40		16	16	28	20.0	628.3	(628)
	9:44	50		13	12	22	15.7	644.0	
<17>	9:46	60		10	10	20	13.3	657.3	(657)
	9:48	65		5	5	8	6.0	663.3	
<18>	9:52	65		0	0	0	0	663.3	(663)
	9:54	60		0	0	0	0	663.3	
	9:56	50		0	0	-3	-1.0	662.3	

PLATE BEARING TEST

DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement ① + ②	Gauge Reading ③ + ②	(① + ② + ③)/3	Σδ	Remarks
	9:58	40		-5	0	-12	-5.3	657.0	
	10:00	30		-10	-7	-19	-12.0	645.0	
	10:02	20		-19	-19	-33	-23.7	621.3	
	10:04	10		-33	-33	-46	-37.3	584.0	
	10:06	5		-33	-50	-42	-41.7	542.3	
	10:08	0		-15	-21	-16	-17.3	525.0	
<19>	10:12	0		0	0	0	0	525.0	(525)

PLATE BEARING TEST RESULTS

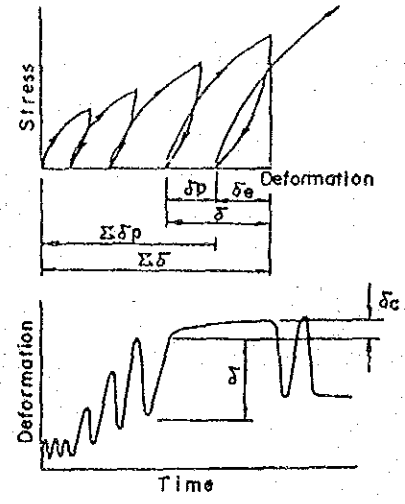
Test Location: DF-2, P-3 TD(B)5.8 — Measuring Point: Invert
Loading Plate Radius: a = 15 cm — Date Measured: 22 Sep. 1988
Geological Classification: Hornfels — Measured by:
Rock Grade: CBM (C)

Deformation Measurement Results

Stress (kgf/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	151	84	67	151	67	
15	102	74	28	169	95	
15	50	86	-36	145	59	
30	255	133	122	314	181	
45	323	240	83	504	264	
60	407	247	160	671	424	
60	327 (354)	258 (285)	69 (69)	751 (778)	493	
65	322	244	78	815	571	
65	312	290	22	883	593	

Creep Deformation δc (×10⁻³mm)	Creep Factor Cf (%)
27	8

$Cf = \frac{\delta c}{\delta} \times 100 = \frac{27}{327} = 8.3 \fallingdotseq 8$



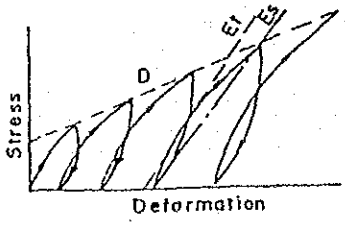
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kgf/cm²)	Tangential Modulus of Elasticity Et (kgf/cm²)	Stress Level (kgf/cm²)	Secant Modulus of Elasticity Es (kgf/cm²)
19.200	57.500	20 – 65	46.400

Modulus of Deformation, Modulus of Elasticity Calculation Formula

$$D \text{ or } E = \frac{(1-\nu^2)}{2a} \cdot \frac{\Delta F}{\Delta W} = \frac{\pi a (1-\nu^2)}{2} \cdot \frac{\Delta \sigma}{\Delta \delta}$$

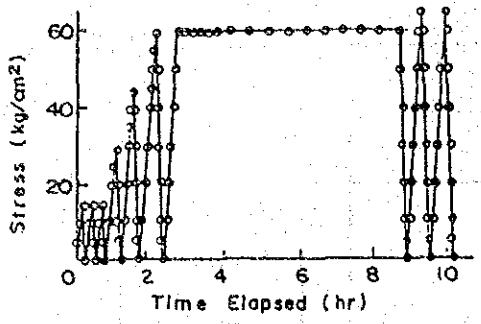


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kgf) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kgf/cm²) Δδ : Deformation increment due to Δσ

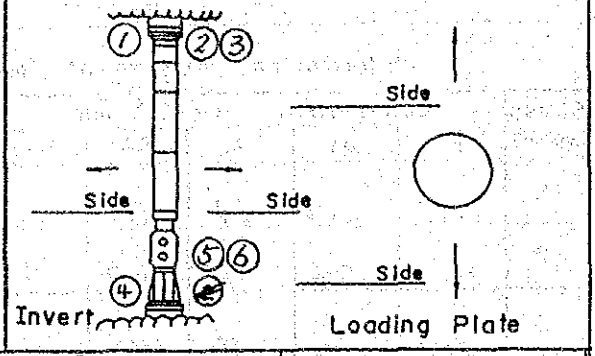
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-2, P-3, ID 5.8m — Measuring Point: Invert — Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm — Date Measured: 22 Sep. 1988 — Rock Grade: 2BM ©
Jack Capacity: 200 ton — Max. Oil Pressure: 1100 kg/cm² — Measured by:
Ram Diameter: ϕ 15.24cm



Loading Pattern (Example)
BOTTOM



Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④	⑤	⑥	(⑥+⑦)/2	Σδ	Remarks
	0	0		0	0	0		0	
	2	5		30	7	16	17.7	17.7	
	4	10		86	42	54	60.7	78.4	
	6	15		84	45	57	65.3	143.7	
	10	15		8	7	8	7.7	151.4	
	12	5		-85	-1	-39	-41.7	109.7	
	14	0		-72	-21	-36	-43.0	66.7	
	18	0		0	0	0	0	66.7	
	20	10		110	15	57	60.7	127.4	
	22	15		51	23	36	36.7	164.1	
	26	15		5	4	5	4.7	168.8	
	28	5		-88	-4	-43	-45.0	123.8	
	30	0		-49	-9	-28	-28.7	95.1	
<1>	34	0		0	0	0	0	95.1	(95)
	36	10		0	5	51	18.7	113.8	
	38	15		45	17	20	27.3	141.1	
<2>	42	15		1	0	12	4.3	145.4	(145)
	44	5		-86	-6	-40	-44.0	101.4	
	46	0		-69	-16	-42	-42.3	59.1	
	50	0		-1	0	0	-0.3	58.8	
	52	10		23	13	62	32.7	91.5	
	54	15		41	16	28	28.3	119.8	
	56	20		51	26	37	38.0	157.8	
	58	25		92	60	72	74.7	232.5	
	1:00	30		84	57	73	71.3	303.8	
<3>	1:04	30		12	8	10	10.0	313.8	(314)
	1:06	20		-13	0	-1	-4.7	309.1	
	1:08	10		-57	-6	-26	-29.7	279.4	
	1:10	5		-21	-34	-71	-42.0	237.4	
	1:12	0		-13	-55	-87	-53.7	183.7	
	1:16	0		-1	-1	-5	-2.3	181.4	
	1:18	10		37	30	83	50.0	231.4	
	1:20	20		22	44	68	44.7	276.1	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress σ (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ⑨	①	⑤	⑥	② ((①+⑤)/2)−⑥ e 3	Σδ	Remarks
	1:22	30		83	51	68		67.3	343.4	
	1:24	35		46	32	40		39.3	382.7	
	1:26	40		68	47	66		60.3	443.0	
	1:28	45		59	41	57		52.3	495.3	
<4>	1:32	45		10	8	9		9.0	504.3	(504)
	1:34	40		0	-1	0		-0.3	504.0	
	1:36	30		-10	0	-3		-4.3	499.7	
	1:38	20		-39	-2	-22		-21.0	478.7	
	1:40	10		-84	-23	-43		-50.0	428.7	
	1:42	5		-128	-49	-75		-84.0	344.7	
	1:44	0		-100	-39	-96		-78.3	266.4	
	1:48	0		-2	-3	-1		-2.0	264.4	
	1:50	10		154	18	87		86.3	350.7	
	1:52	20		104	41	69		71.3	422.0	
	1:54	30		81	41	57		59.7	481.7	
	1:56	40		54	32	47		44.3	526.0	
	1:58	45		32	23	34		29.7	555.7	
	2:00	50		34	22	37		31.0	586.7	
	2:02	55		40	25	43		36.0	622.7	
	2:04	60		44	32	43		39.7	662.4	
<5>	2:08	60		9	4	12		8.3	670.7	(671)
	2:10	50		0	0	0		0	670.7	
	2:12	40		-13	0	-6		-6.3	664.4	
	2:14	30		-25	-2	-21		-16.0	648.4	
	2:16	20		-60	-13	-33		-35.3	613.1	
	2:18	10		-78	-33	-44		-51.7	561.4	
	2:20	5		-53	-59	-98		-70.0	491.4	
	2:22	0		-81	-26	-88		-65.0	426.4	
<6>	2:26	0		-3	0	-3		-2.0	424.4	(424)
	2:28	10		120	1	82		67.7	492.1	
	2:30	20		120	44	76		80.0	572.1	
	2:32	30		75	38	60		57.7	629.8	
	2:34	40		52	32	45		43.0	672.8	
	2:36	50		43	24	40		35.7	708.5	
<7>	2:38	60		48	31	47		42.0	750.5	(751)
	2:40	60		3	1	3		2.3	752.8	
	2:43	60		1	1	1		1.0	753.8	
	2:48	60		2	0	1		1.0	754.8	
	2:53	60		1	1	0		0.7	755.5	
	2:58	60		3	3	3		3.0	758.5	
	3:03	60		3	2	1		2.7	761.2	
	3:08	60		0	1	1		0.7	761.9	
	3:18	60		1	0	1		0.7	762.6	
	3:28	60		1	0	0		0.3	762.9	
	3:38	60		0	0	0		0	762.9	

PLATE BEARING TEST — DATA SHEET (3)

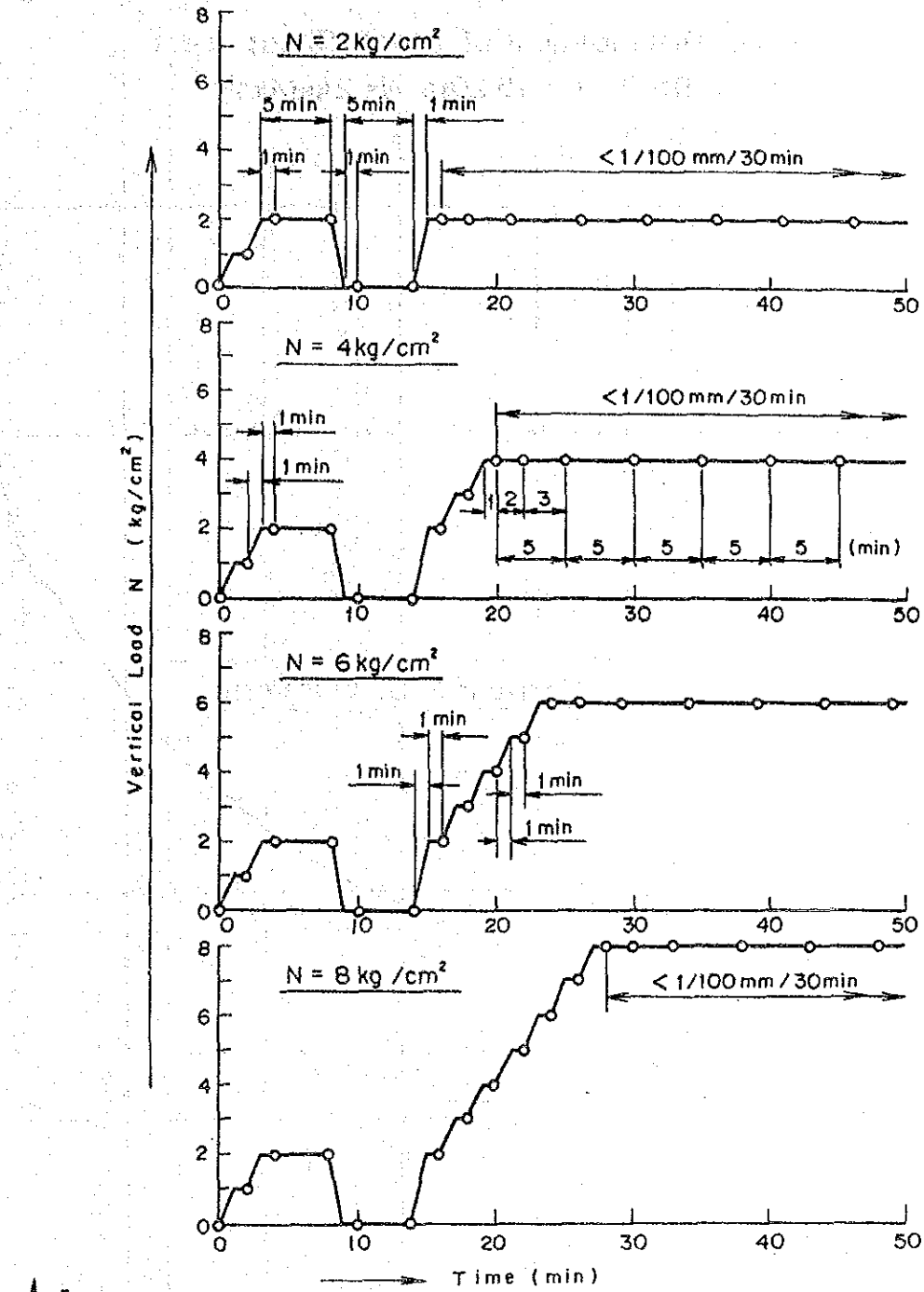
Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³mm) Displacement ④	①	⑤	Gauge Reading ⑥	②	×3	Σf	Remarks
	4:08	60		1		2	1		1.3	764.2	
	4:38	60		2		0	2		1.3	765.5	
	5:08	60		2		0	2		1.7	767.2	
	5:38	60		3		1	0		1.3	768.5	
	6:08	60		2		0	0		0.7	769.2	
	6:38	60		1		4	0		1.7	770.9	
	7:08	60		2		0	0		0.7	771.6	
	7:38	60		3		5	3		3.7	775.3	
	8:08	60		0		3	3		2.0	777.3	
⟨8⟩	8:38	60		2		0	0		0.7	778.0	(778)
	8:40	50		0		0	0		0	778.0	
	8:42	40		-13		0	-12		-8.3	769.7	
	8:44	30		-24		-3	-18		-15.0	754.7	
	8:46	20		-46		-15	-30		-30.3	724.4	
	8:48	10		-80		-31	-45		-52.0	672.4	
	8:50	5		-147		-47	-81		-91.7	580.7	
	8:52	0		-105		-33	-124		-87.7	493.0	
⟨9⟩	8:56	0		0		0	0		0	493.0	(493)
	8:58	10		113		5	76		64.7	557.7	
⟨10⟩	9:00	20		118		30	77		75.0	632.7	(633)
	9:02	30		82		38	57		59.0	691.7	
⟨11⟩	9:04	40		51		27	50		42.7	734.4	(734)
	9:06	50		34		24	33		30.3	764.7	
⟨12⟩	9:08	60		36		23	37		32.0	796.7	(797)
	9:10	65		19		12	20		17.0	813.7	
⟨13⟩	9:14	65		4		0	1		1.7	815.4	(815)
	9:16	60		0		0	0		0	815.4	
	9:18	50		-4		0	0		-1.3	814.1	
	9:20	40		-16		0	-10		-8.7	805.4	
	9:22	30		-24		0	-18		-14.0	791.4	
	9:24	20		-50		-18	-33		-33.7	757.7	
	9:26	10		-34		-40	-60		-64.7	693.0	
	9:28	5		-62		-46	-99		-69.0	624.0	
	9:30	0		-62		-20	-75		-52.3	571.7	
⟨14⟩	9:34	0		-2		0	0		-0.7	571.0	(571)
	9:36	10		99		15	64		59.3	630.3	
⟨15⟩	9:38	20		120		35	80		78.3	708.6	(709)
	9:40	30		84		33	60		59.0	767.6	
⟨16⟩	9:42	40		5		30	45		42.0	809.6	(810)
	9:44	50		34		21	33		29.3	838.9	
⟨17⟩	9:46	60		31		21	30		27.3	866.2	(866)
	9:48	65		17		12	17		15.3	881.5	
⟨18⟩	9:52	65		2		0	2		1.3	882.8	(883)
	9:54	60		0		0	0		0	882.8	
	9:56	50		-4		0	0		-1.3	881.5	

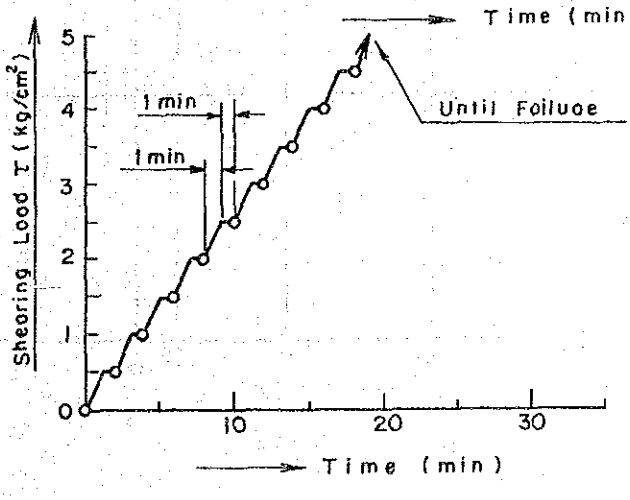
PLATE BEARING TEST — DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ④	⑤	⑥	(④+⑤+⑥)/3	Σδ	Remarks
	9:58	40		-15	-1	-2	-9.0	372.5	
	10:00	30		-25	-2	-20	-15.7	856.8	
	10:02	20		-55	-2	-24	-36.7	820.1	
	10:04	10		-92	-37	-55	-61.3	758.8	
	10:06	5		-152	-52	-104	-102.7	656.1	
	10:08	0		-82	-20	-87	-63.0	593.1	
<19>	10:12	0		-1	0	0	-0.3	592.8	(593)

3-11 Block Shear Test

3-11-1 Loading Diagram of Block Shear Test

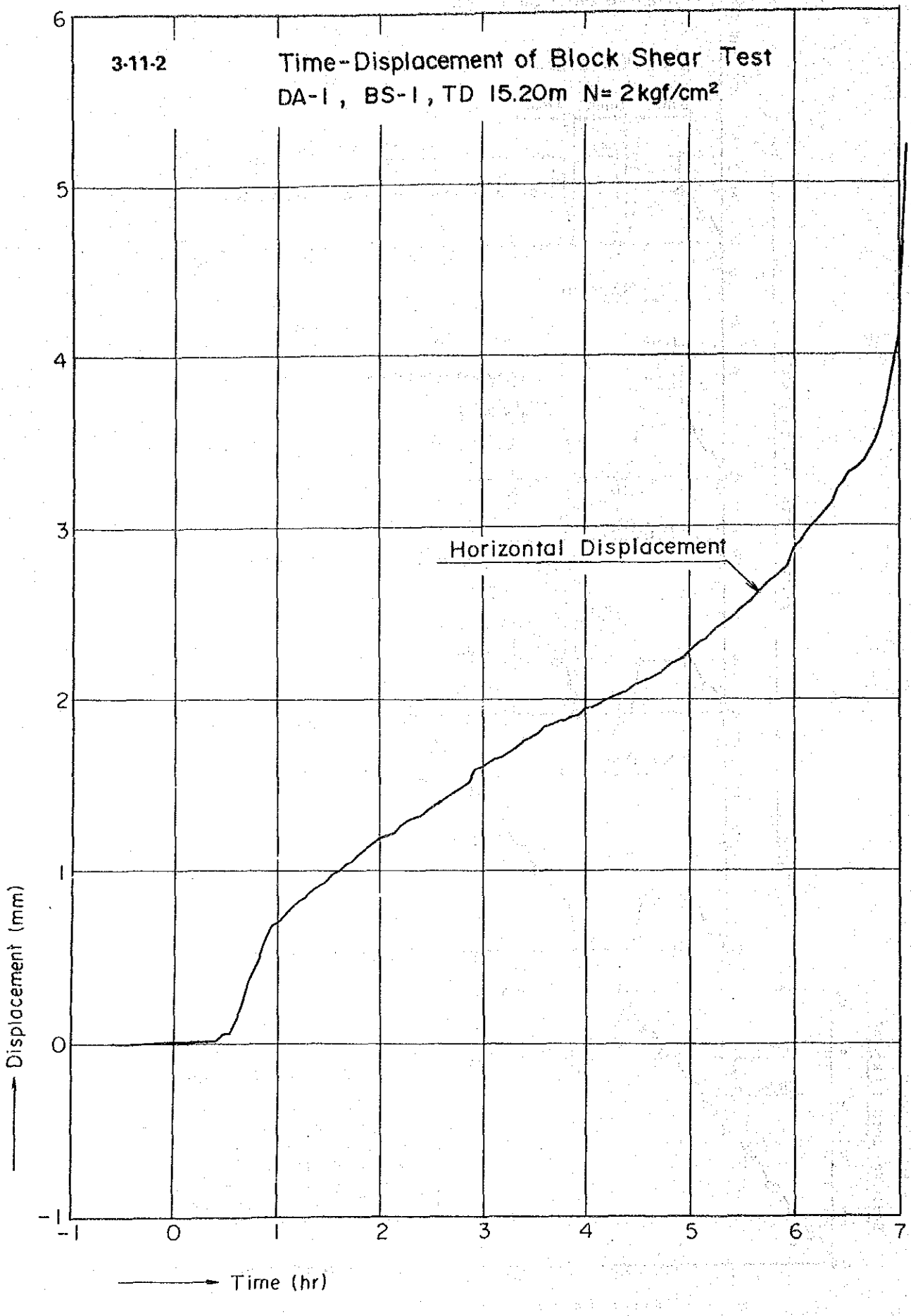




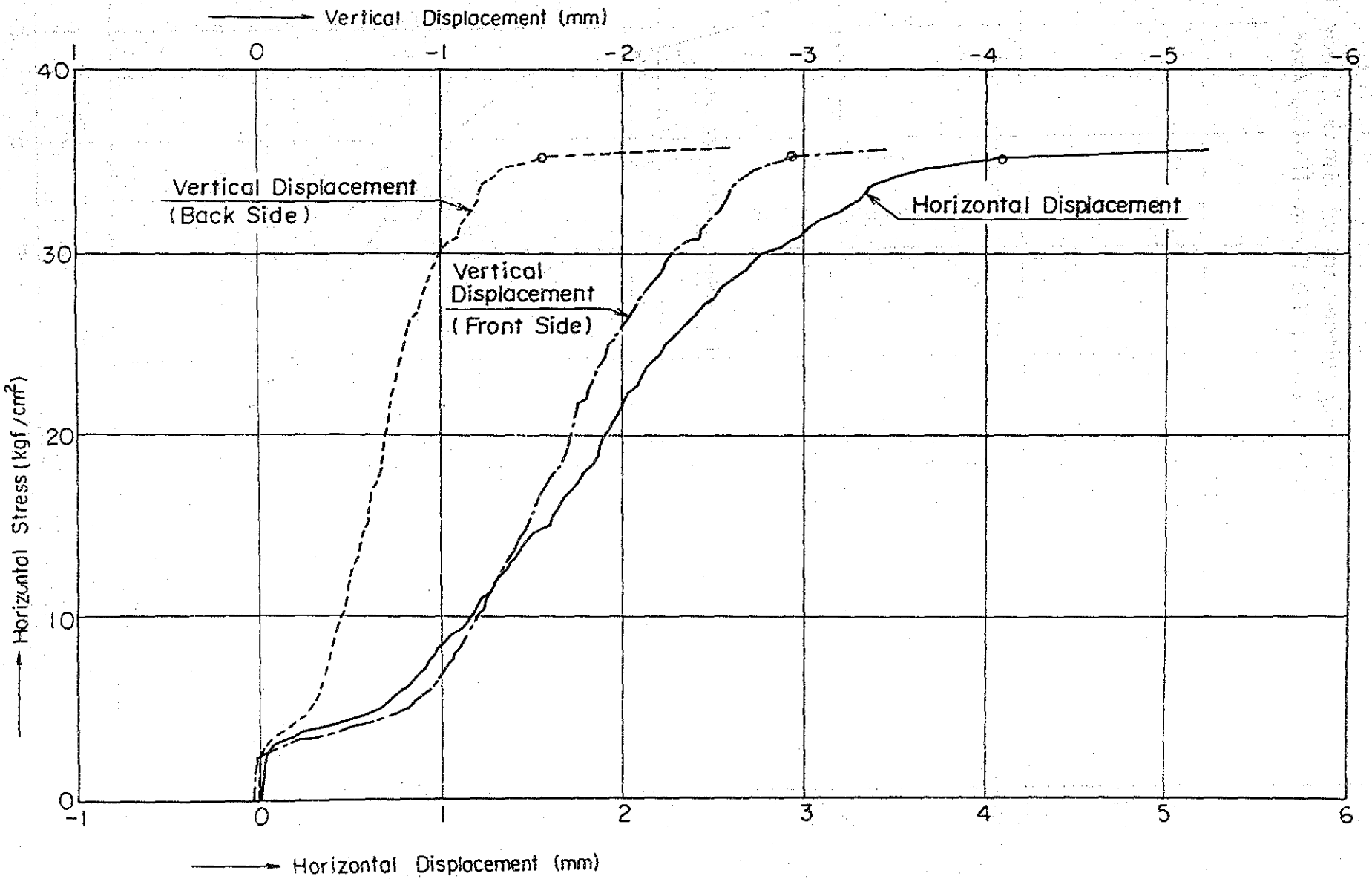
Rote of Looding

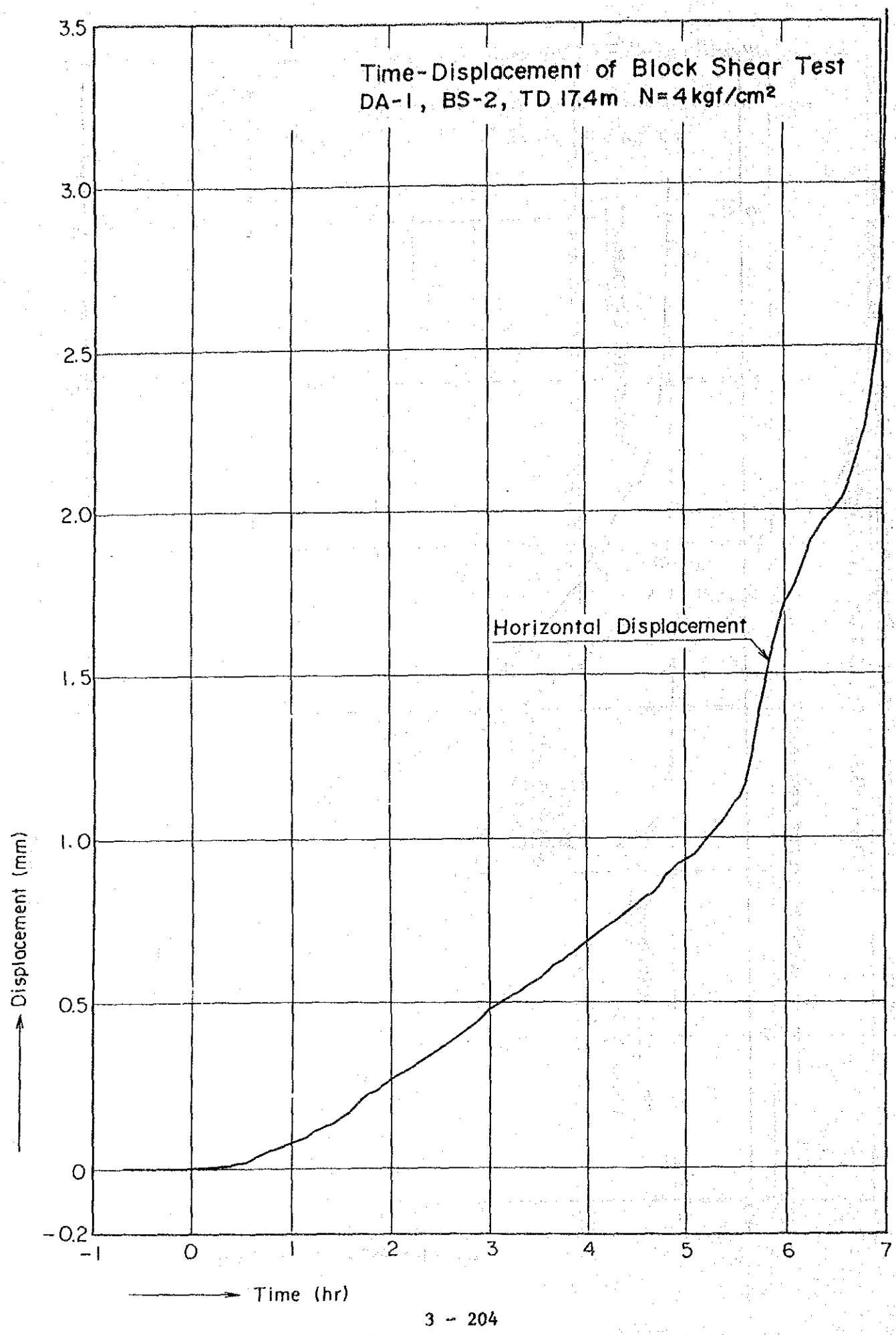
Verticol Lood		Shearing Lood
Virgin Lood	1 kg/cm²/min	0.5 kg/cm²/min
Hysteresis Lood	2 kg/cm²/min	

° : Mesurement Point

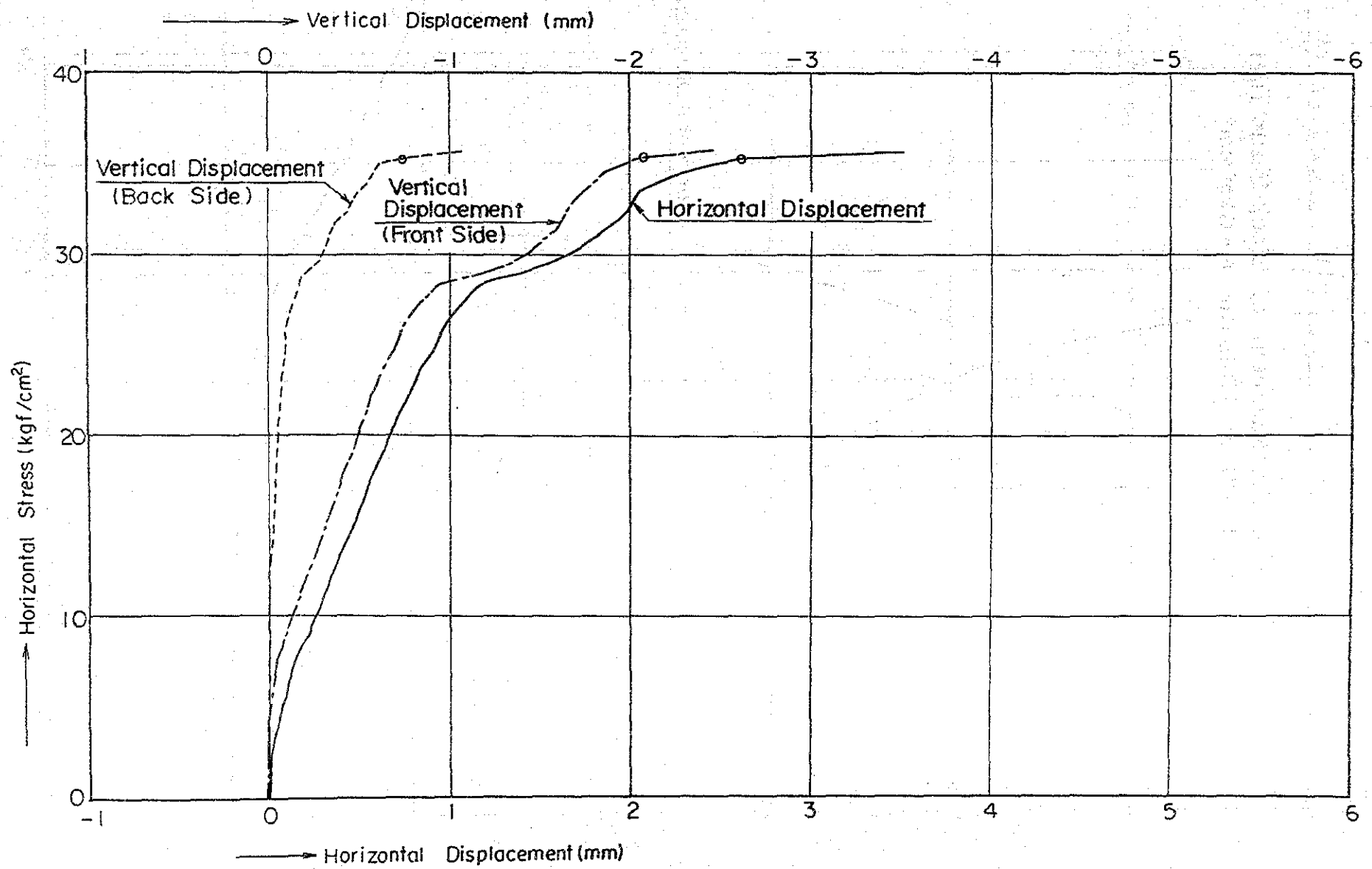

3-11-2
Time-Displacement of Block Shear Test
DA-1 , BS-1 , TD 15.20m N= 2kgf/cm²
Horizontal Displacement
Displacement (mm)
Time (hr)
6
5
4
3
2
1
0
-1
-1
0
1
2
3
4
5
6
7

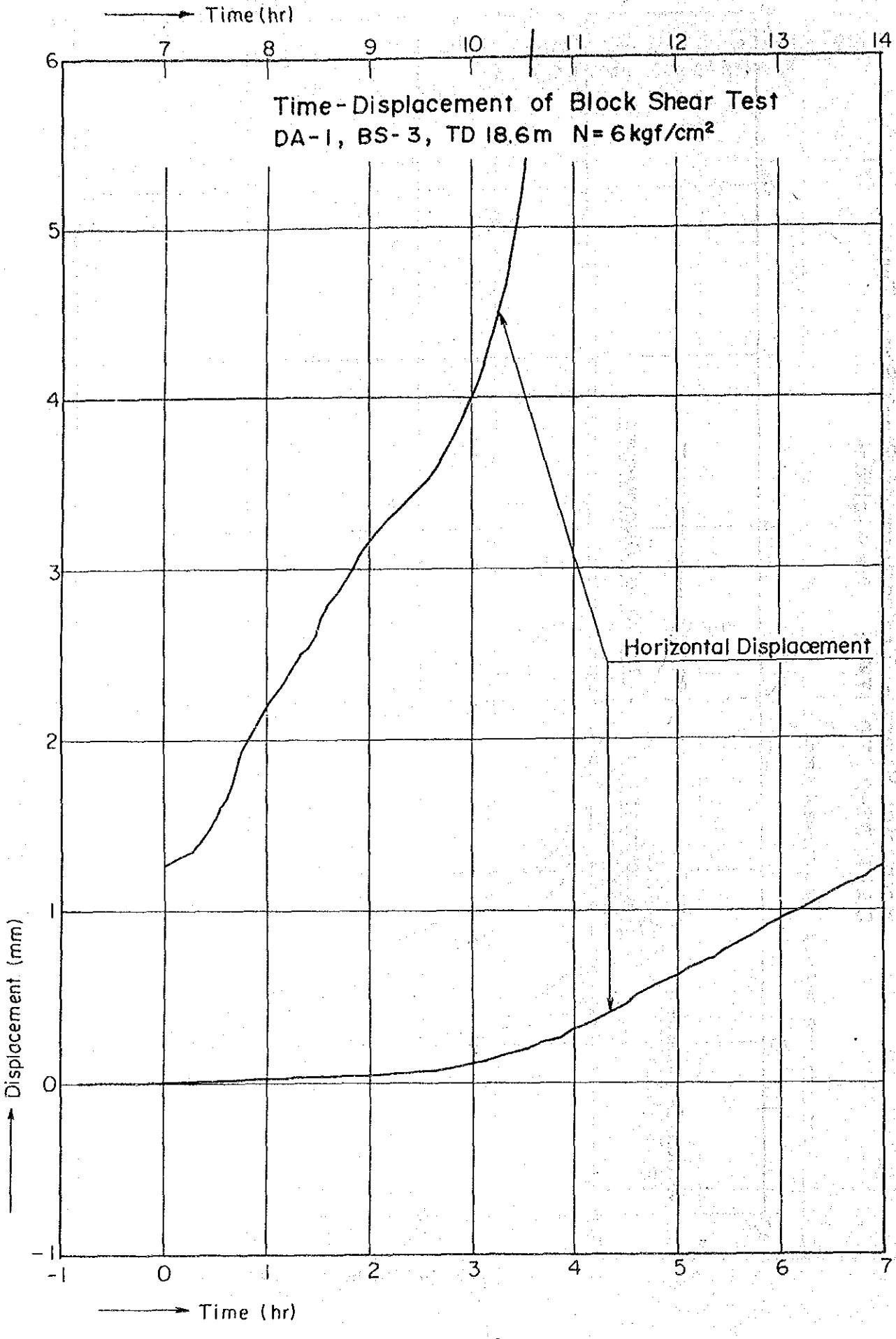
3-11-3 Horizontal Stress – Displacement of Block Shear Test
DA-1, BS-1, TD.15.20m N = 2 kgf/cm²




Time-Displacement of Block Shear Test
DA-1, BS-2, TD 17.4m N=4kgf/cm²
Horizontal Displacement
Displacement (mm)
Time (hr)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
-0.2
-1
0
1
2
3
4
5
6
7

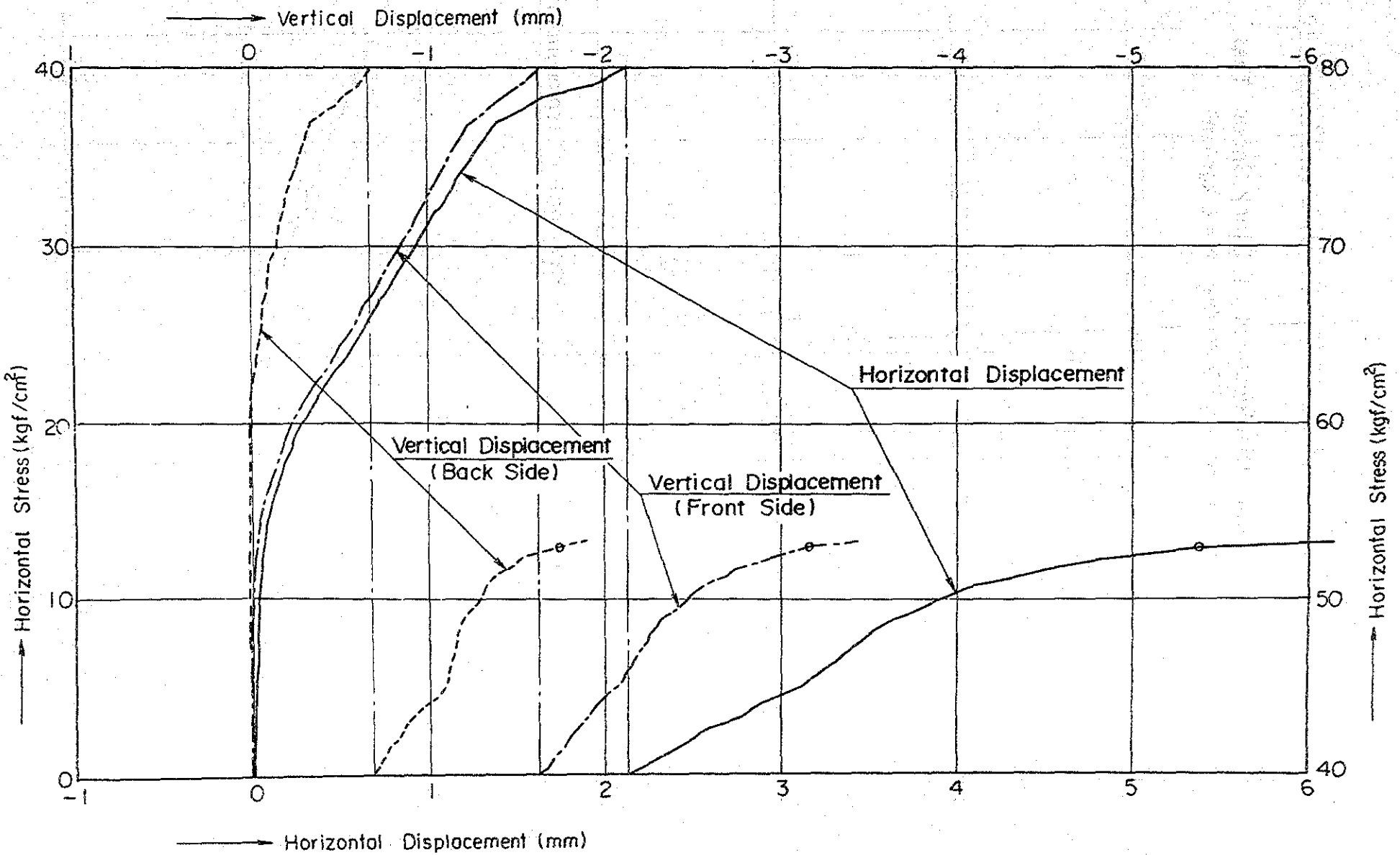
Horizontal Stress - Displacement of Block Shear Test
DA-1, BS-2, T.D. 17.4 m N = 4 kgf/cm²

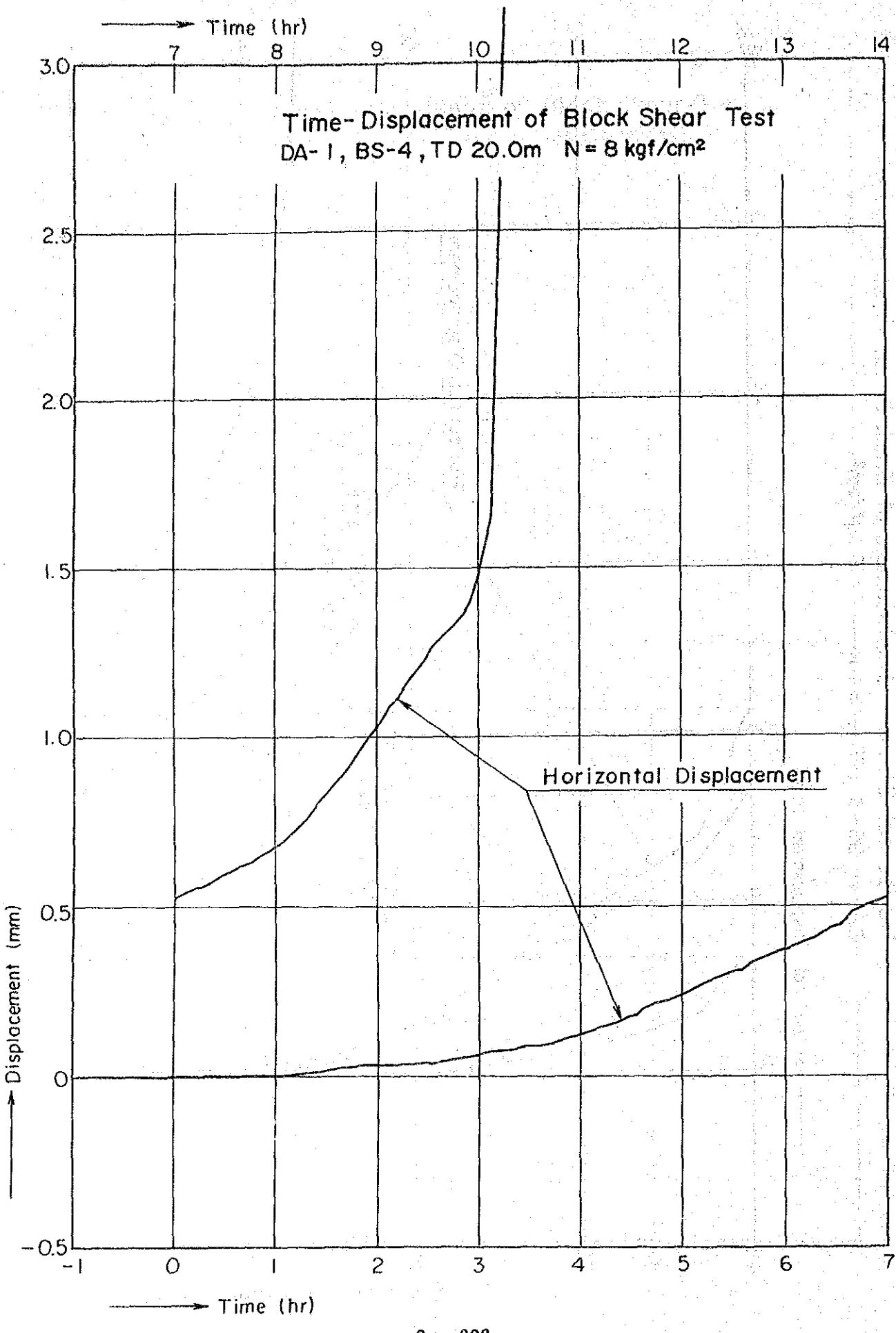


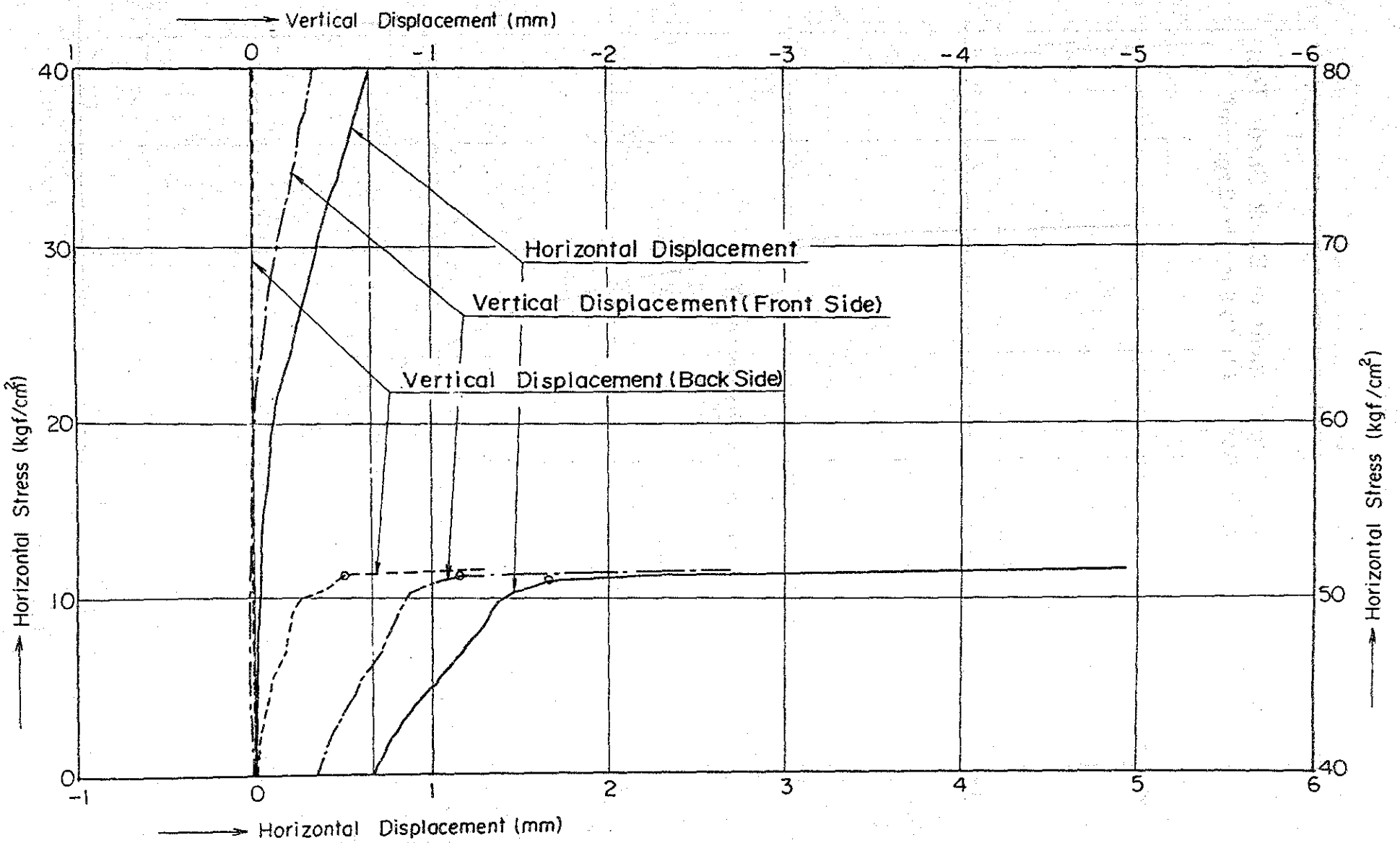

Time (hr)
7
8
9
10
11
12
13
14
Time-Displacement of Block Shear Test
DA-1, BS-3, TD 18.6m N=6kgf/cm²
Horizontal Displacement
Displacement (mm)
6
5
4
3
2
1
0
-1
-1
0
1
2
3
4
5
6
7
Time (hr)

Horizontal Stress — Displacement of Block Shear Test

DA-1, BS-3, TD. 18.6m N = 6 kgf/cm²




Time (hr)
7
8
9
10
11
12
13
14
Time-Displacement of Block Shear Test
DA-1, BS-4, TD 20.0m N = 8 kgf/cm²
3.0
2.5
2.0
1.5
1.0
0.5
0
-0.5
Horizontal Displacement
Displacement (mm)
-1
0
1
2
3
4
5
6
7
Time (hr)


Horizontal Stress – Displacement of Block Shear Test
DA-1, BS-4, TD.20.0m N=8 kgf/cm²
Vertical Displacement (mm)
1
0
-1
-2
-3
-4
-5
-6
40
30
20
10
0
80
70
60
50
40
Horizontal Displacement
Vertical Displacement (Front Side)
Vertical Displacement (Back Side)
Horizontal Stress (kgf/cm²)
Horizontal Stress (kgf/cm²)
-1
0
1
2
3
4
5
6
Horizontal Displacement (mm)

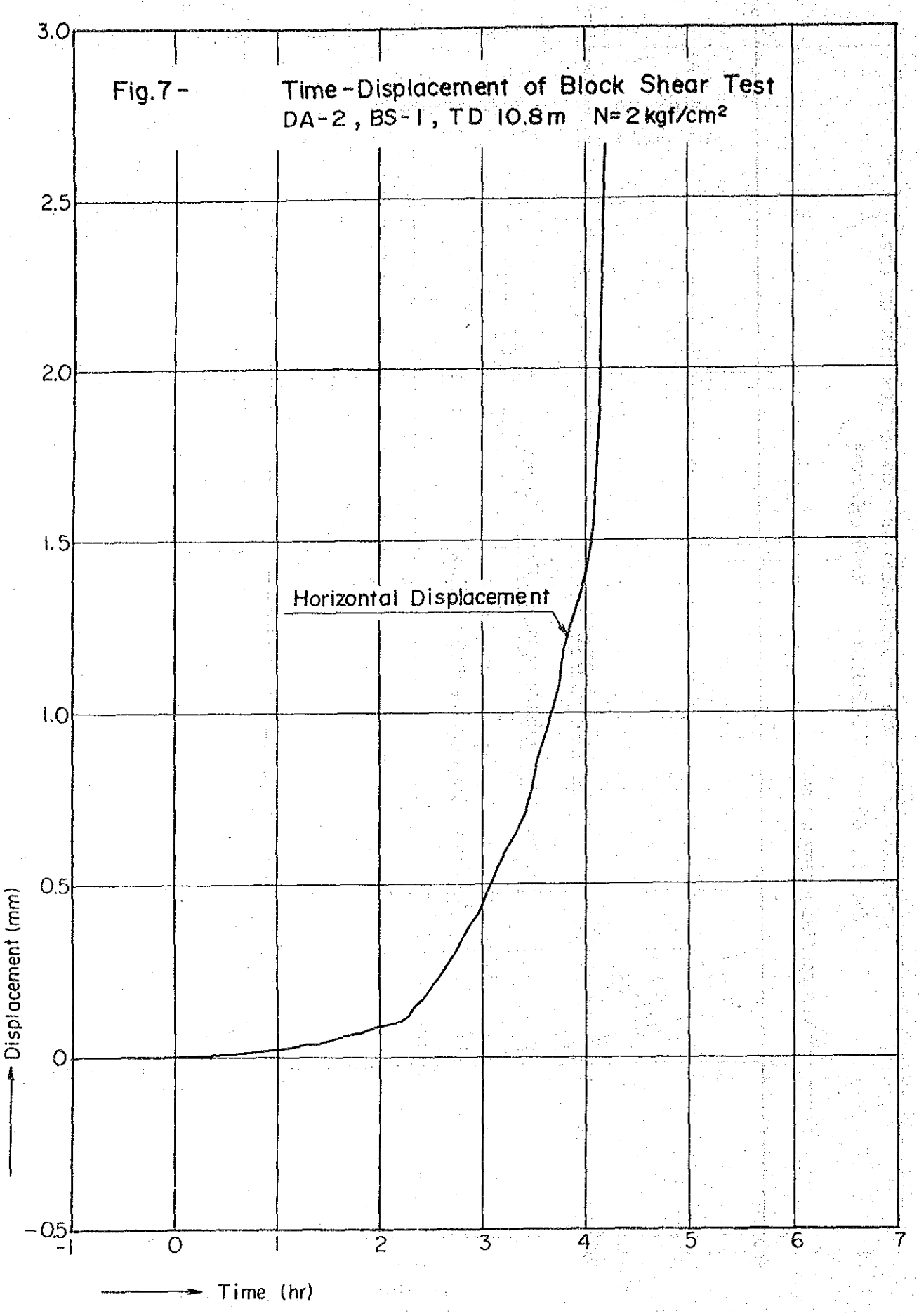
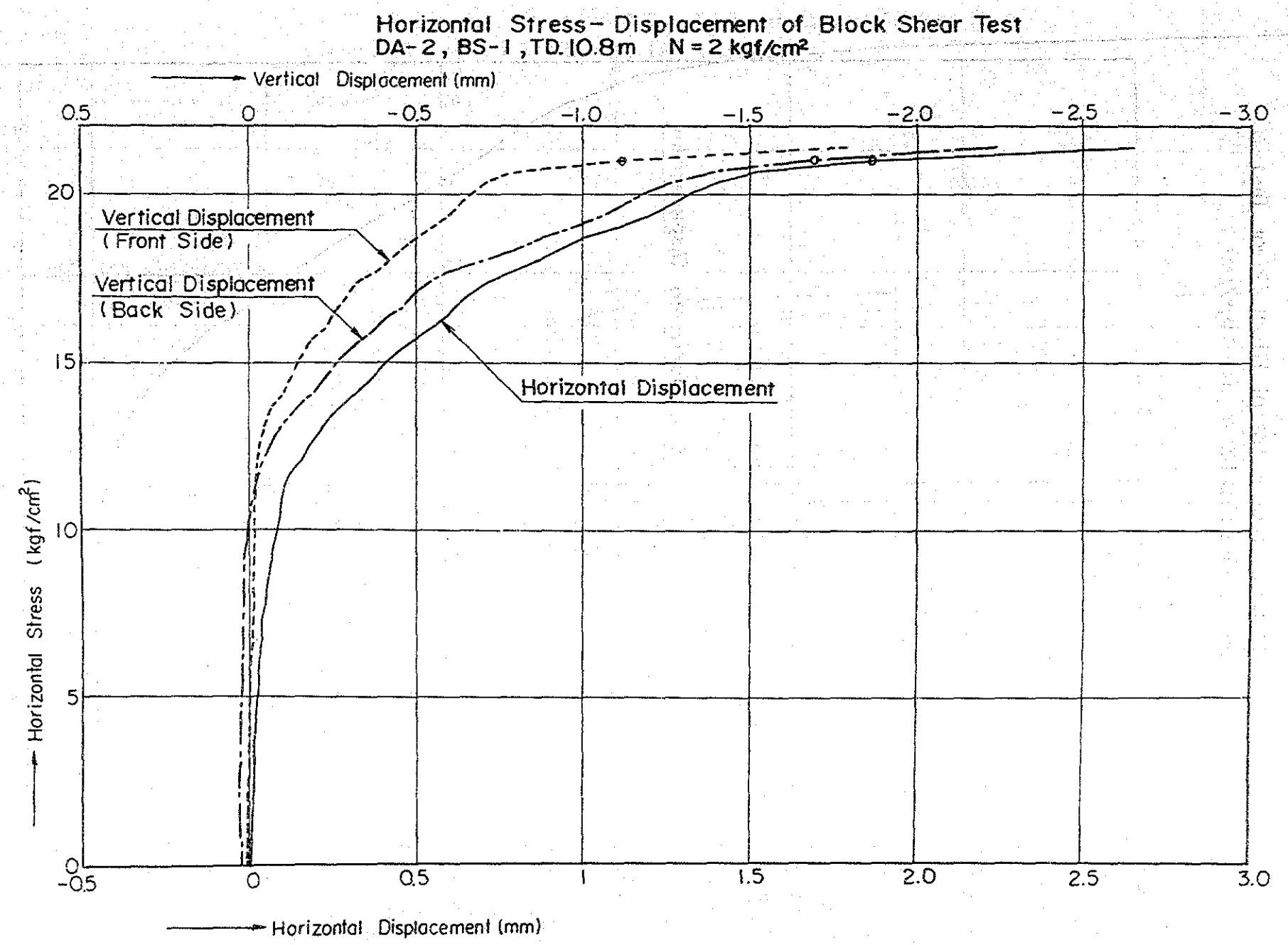


Fig.7 - Time-Displacement of Block Shear Test
DA-2, BS-1, TD 10.8m N=2 kgf/cm²
Horizontal Displacement
Displacement (mm)
Time (hr)
3.0
2.5
2.0
1.5
1.0
0.5
0
-0.5
-1
0
1
2
3
4
5
6
7


Horizontal Stress- Displacement of Block Shear Test
DA-2, BS-1, TD. 10.8m N = 2 kgf/cm²
Vertical Displacement (mm)
0.5
0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
20
15
10
5
0
Vertical Displacement (Front Side)
Vertical Displacement (Back Side)
Horizontal Displacement
Horizontal Stress (kgf/cm²)
-0.5
0
0.5
1
1.5
2.0
2.5
3.0
Horizontal Displacement (mm)

Time-Displacement of Block Shear Test
DA-2, BS-2, TD 12.0m, N = 4 kgf/cm²