3-10-6 Plate Bearing Test Results and Data Sheet

PLATE BEARING TEST RESULTS

Test Location: DA-1, P-1, TD 20.0m
Measuring Point: Invert
Loading Plate Radius: a = 15 cm
Date Measured: 24 Nov. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2B III (b)

Deformation Measurement Results

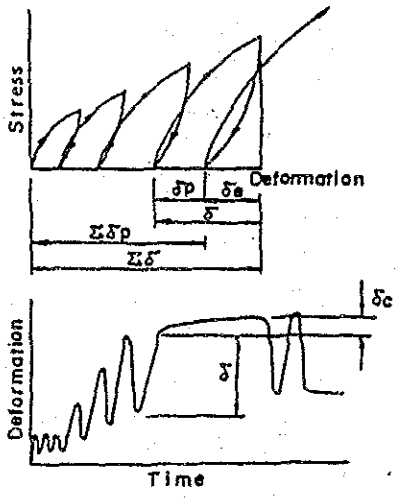
Stress (kg_f/cm^2)	Deformation ($\times 10^{-3}$ mm) δ	δ_e	δ_p	$\Sigma\delta$	$\Sigma\delta_p$	Remarks
15	6	3	3	6	3	
15	3	2	1	6	4	
15	5	2	3	9	7	
30	11	9	2	18	9	
45	21	19	2	30	11	
60	35	36	-1	46	10	
60	42 (61)	30 (59)	12 (2)	52 (71)	12	
65	43	38	5	55	17	
65	47	43	4	64	21	

Creep Deformation δc ($\times 10^{-3}$ mm)	Creep Factor Cf (%)
19	45

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

$= \frac{19}{42} \times 100$

$= 45$



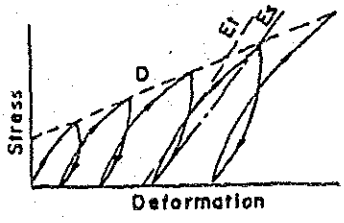
δ : Total deformation
δ_e : Elastic deformation
δ_p : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta_p$: Cumulative plastic deformation
δc : Creep deformation

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)
271,400	251,500	20 ~ 65	327,400

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

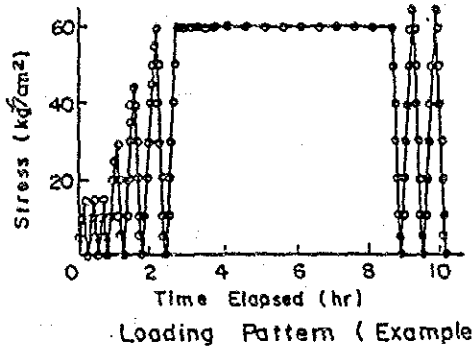


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg_f) ΔW : Deformation increment due to ΔF
$\Delta\sigma$: Stress increment (kg_f/cm^2) $\Delta\delta$: Deformation increment due to $\Delta\sigma$

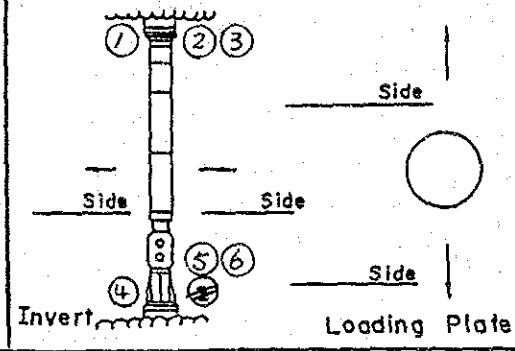
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-1, P-1, TD 20.0m | Measuring Point: Invert | Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm | Date Measured: 24 Nov. 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 (×10⁻³ mm) Displacement Gauge Reading ① ② ③	①+②+③ / 3	Σδ	Remarks
	0	0		0 0 0	0	0	
	2	5		3 2 3	2.7	2.7	
	4	10		3 2 1	2	4.7	
	6	15		2 1 2	1.7	6.4	
	10	15		0 0 0	0	6.4	
	12	5		−2 −2 −1	−1.7	4.7	
	14	0		−2 −1 −2	−2	2.7	
	18	0		0 0 0	0	2.7	
	20	10		4 1 3	1.3	4	
	22	15		3 1 2	2	6.0	
	26	15		0 1 0	0.3	6.3	
	28	5		−1 −1 −1	−1	5.3	
	30	0		−2 −1 −1	−1.3	4.0	
<1>	34	0		0 0 0	0	4.0	(4)
	36	10		5 1 2	2.7	6.7	
	38	15		3 2 3	2.7	9.4	
<2>	42	15		0 0 0	0	9.4	(9)
	44	5		−1 −1 −2	−1.3	8.1	
	46	0		−1 −1 −2	−1.3	6.8	
	50	0		−1 0 0	−0.3	6.5	
	52	10		3 2 2	2.3	8.8	
	54	15		3 2 2	2.3	11.1	
	56	20		2 4 1	2.3	13.4	
	58	25		6 1 1	2.7	16.1	
	1:00	30		4 1 1	2	18.1	
<3>	1:04	30		0 0 0	0	18.1	(18)
	1:06	20		−2 0 0	−0.7	17.4	
	1:08	10		−4 −3 −2	−3	14.4	
	1:10	5		−3 −4 −2	−3	11.4	
	1:12	0		−4 −1 −2	−2.3	9.1	
	1:16	0		−1 0 0	−0.3	8.8	
	1:18	10		0 0 0	0	8.8	
	1:20	20		7 2 2	3.7	12.5	

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 2 4	2.7	16.2	
	1:24	35		4 2 4	3.3	18.5	
	1:26	40		7 3 5	5	23.5	
	1:28	45		8 3 6	5.7	29.2	
<4>	1:32	45		0 3 0	1	30.2	(30)
	1:34	40		0 0 0	0	30.2	
	1:36	30		-2 -4 -3	-3	27.2	
	1:38	20		-6 -4 -7	-5.7	21.5	
	1:40	10		-6 -5 -2	-4.3	17.2	
	1:42	5		-3 -2 -3	-2.7	14.5	
	1:44	0		-6 -1 -2	-3	11.5	
	1:48	0		0 0 -1	-0.3	11.2	
	1:50	10		0 0 0	0	11.2	
	1:52	20		1 3 0	1.3	12.5	
	1:54	30		8 3 5	5.3	17.8	
	1:56	40		5 4 7	5.3	23.1	
	1:58	45		6 4 8	6	29.1	
	2:00	50		3 5 6	4.7	33.8	
	2:02	55		5 4 8	5.7	39.5	
	2:04	60		7 2 9	6	45.5	
<5>	2:08	60		0 0 1	0.3	45.8	(46)
	2:10	50		0 0 -1	-0.3	45.5	
	2:12	40		0 0 -4	-1.3	44.2	
	2:14	30		-6 -2 -8	-5.3	38.9	
	2:16	20		-13 -4 -9	-8.7	30.2	
	2:18	10		-16 -5 -10	-10.3	19.9	
	2:20	5		-13 -7 -11	-10.3	9.6	
	2:22	0		0 0 0	0	9.6	
<6>	2:26	0		0 0 0	0	9.6	(10)
	2:28	10		3 0 0	1	10.6	
	2:30	20		3 0 3	2	12.6	
	2:32	30		15 4 6	8.3	20.9	
	2:34	40		11 6 13	10	30.9	
	2:36	50		10 9 12	10.3	41.2	
<7>	2:38	60		12 7 12	10.3	51.5	(52)
	2:40	60		0 0 1	0.3	51.8	
	2:43	60		1 1 0	0.7	52.5	
	2:48	60		0 0 1	0.3	52.8	
	2:53	60		1 1 0	0.7	53.5	
	2:58	60		1 1 1	1	54.5	
	3:03	60		1 0 1	0.7	55.2	
	3:08	60		1 1 0	0.7	55.9	
	3:18	60		2 1 1	1.3	57.2	
	3:28	60		2 1 1	1.3	58.5	
	3:38	60		2 1 1	1.3	59.8	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ① ② Gauge Reading ③	①+②+③ / 3	Σδ	Remarks
	4:08	60		3 2 2	2.3	62.1	
	4:38	50		2 2 2	2	64.1	
	5:08	50		2 1 2	1.7	65.8	
	5:38	60		1 0 2	1	66.8	
	6:08	60		1 1 2	1.3	68.1	
	6:38	60		1 0 1	0.7	68.8	
	7:08	60		2 1 1	0.7	69.5	
	7:38	60		1 0 1	0.7	70.2	
	8:08	60		2 1 1	0.7	70.9	
<8>	8:38	60		2 0 1	0.3	71.2	(71)
	8:40	50		0 0 −1	−0.3	70.9	
	8:42	40		−3 0 −4	−2.3	68.6	
	8:44	30		−7 −3 −15	−8.3	60.3	
	8:46	20		−15 −6 −15	−12	48.3	
	8:48	10		−22 −9 −22	−17.7	30.6	
	8:50	5		−18 −9 −7	−11.3	19.3	
	8:52	0		−7 −4 −2	−4.3	15.0	
<9>	8:56	0		−2 −2 −4	−2.7	12.3	(12)
	8:58	10		0 0 0	0	12.3	
<10>	9:00	20		8 3 4	5	17.3	(17)
	9:02	30		12 4 7	7.7	25	
<11>	9:04	40		11 7 12	10	35	(35)
	9:06	50		8 7 9	8	43	
<12>	9:08	60		5 5 6	5.3	48.3	(48)
	9:10	65		7 5 5	5.7	54	
<13>	9:14	65		1 1 1	1	55	(55)
	9:16	60		0 −1 −2	−1	54	
	9:18	50		−2 −2 −2	−2	52	
	9:20	40		−6 −3 −5	−4.7	47.3	
	9:22	30		−7 −4 −7	−6	41.3	
	9:24	20		−8 −5 −7	−6.7	34.6	
	9:26	10		−9 −6 −9	−8	26.6	
	9:28	5		−9 −5 −7	−7	19.6	
	9:30	0		−3 −3 −3	−3	16.6	
<14>	9:34	0		0 0 0	0	16.6	(17)
	9:36	10		0 0 1	0.3	16.9	
<15>	9:38	20		5 2 2	3	19.9	(20)
	9:40	30		10 3 6	6.3	26.2	
<16>	9:42	40		12 9 17	12.7	38.9	(39)
	9:44	50		19 9 10	12.7	51.6	
<17>	9:46	60		10 9 10	9.7	61.3	(61)
	9:48	65		4 1 2	2.3	63.6	
<18>	9:52	65		0 0 0	0	63.6	(64)
	9:54	60		0 0 0	0	63.6	
	9:56	50		0 0 0	0	63.6	

PLATE BEARING TEST — DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④ ⑤ ⑥	⑤	⑥	(④+⑤+⑥)/3	Σδ	Remarks
	9:58	40		-2	-1	-5		-2.7	60.9	
	10:00	30		-5	-2	-6		-4.3	56.6	
	10:02	20		-12	-4	-14		-10	46.6	
	10:04	10		-15	-7	-16		-12.7	33.9	
	10:06	5		-10	-7	-6		-7.7	26.2	
	10:08	0		-8	-3	-3		-4.7	21.5	
<19>	10:12	0		0	-1	0		-0.3	21.2	(21)

PLATE BEARING TEST RESULTS

Test Location: DA-1, P-1, TD 20.0m
Measuring Point: Crown
Loading Plate Radius: a = 15 cm
Date Measured: 24 Nov. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2B III (b)

Deformation Measurement Results

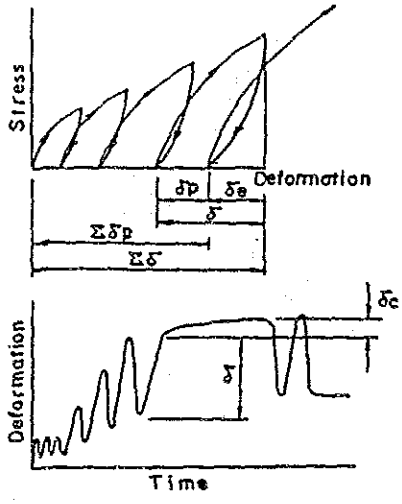
Stress (kgf/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	24	6	18	24	18	
15	9	5	4	27	22	
15	6	9	-3	28	19	
30	39	16	23	58	42	
45	49	33	16	91	58	
60	64	49	15	122	73	
60	54 (64)	44 (54)	10 (10)	127 (137)	83	
65	64	55	9	147	92	
65	59	57	2	151	94	

Creep Deformation δc (×10⁻³ mm)	Creep Factor Cf (%)
10	19

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

$= \frac{10}{54} \times 100$

$= 19$



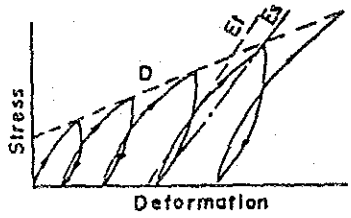
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

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)
107,700	189,200	20 ~ 65	239,500

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

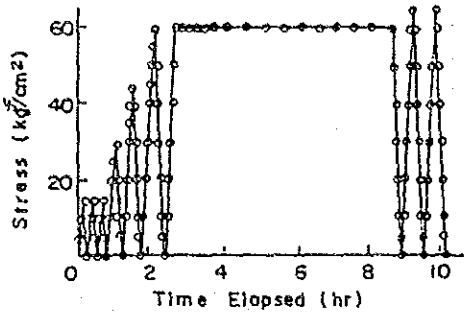


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kgf) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kgf/cm²) Δδ : Deformation increment due to Δσ

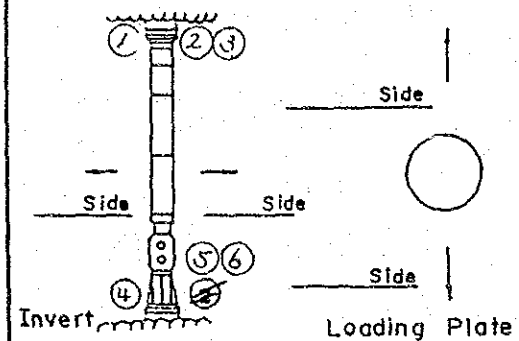
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-1, P-1, TD 20.0m — Measuring Point: Crown — Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm — Date Measured: 24. 11. 1988 — Rock Grade: CM (b)
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 (×10⁻³ mm) Displacement Gauge Reading ① ② ③	①+②+③ / 3	Σδ	Remarks
	0	0		0 0 0	0	0	
	2	5		-2 4 28	10	10	
	4	10		-1 10 3	4	14	
	6	15		5 13 9	9	23	
	10	15		0 2 2	1.3	24.3	
	12	5		0 -6 -5	-3.7	20.6	
	14	0		0 -3 -6	-3.0	17.6	
	18	0		0 0 0	0	17.6	
	20	10		0 2 5	2.3	19.9	
	22	15		2 8 8	6	25.9	
	26	15		0 2 1	1	26.9	
	28	5		0 -2 -2	-1.3	25.6	
	30	0		-1 -5 -5	-3.7	21.9	
<1>	34	0		0 -1 0	-0.3	21.6	(22)
	36	10		0 3 2	1.7	23.3	
	38	15		0 5 5	3.3	26.6	
<2>	42	15		0 2 1	1	27.6	(28)
	44	5		0 -2 -1	-1	26.6	
	46	0		0 -6 -6	-4	22.6	
	50	0		0 -10 0	-3.3	19.3	
	52	10		0 11 1	4	23.3	
	54	15		0 7 7	4.7	28	
	56	20		5 9 7	7	35	
	58	25		5 18 11	11.3	46.3	
	1:00	30		4 16 10	10	56.3	
<3>	1:04	30		0 2 3	1.7	58	(58)
	1:06	20		5 0 0	1.7	59.7	
	1:08	10		0 -2 -3	-1.7	58	
	1:10	5		-4 -17 -12	-11	47	
	1:12	0		-1 -8 -7	-5.3	41.7	
	1:16	0		0 0 0	0	41.7	
	1:18	10		-1 0 0	-0.3	41.4	
	1:20	20		0 14 9	7.7	49.1	

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 ② ③	①+②+③ / 3 δ	Σδ	Remarks
	1:22	30		8 14 15	12.3	61.4	
	1:24	35		3 15 5	7.6	69	
	1:26	40		6 16 10	10.6	79.6	
	1:28	45		7 15 10	10.6	90.2	
<4>	1:32	45		0 1 0	0.3	90.5	(91)
	1:34	40		0 0 0	0	90.5	
	1:36	30		0 0 0	0	90.5	
	1:38	20		0 -5 -3	-2.7	87.8	
	1:40	10		-4 -13 -12	-9.7	78.1	
	1:42	5		-8 -25 -13	-15.3	62.8	
	1:44	0		-1 -8 -7	-5.3	57.5	
	1:48	0		0 0 0	0	57.5	
	1:50	10		0 0 0	0	57.5	
	1:52	20		0 11 5	5.3	62.8	
	1:54	30		5 20 13	12.7	75.5	
	1:56	40		7 16 14	12.3	87.8	
	1:58	45		3 9 6	6	93.8	
	2:00	50		5 10 7	7.3	101.1	
	2:02	55		6 12 9	9	110.1	
	2:04	60		6 14 9	9.7	119.8	
<5>	2:08	60		1 3 1	1.7	121.5	(122)
	2:10	50		0 0 0	0	121.5	
	2:12	40		0 0 -2	-0.7	120.8	
	2:14	30		-2 -9 -8	-6.3	114.5	
	2:16	20		-3 -10 -11	-8	106.5	
	2:18	10		-8 -20 -9	-12.3	94.2	
	2:20	5		-9 -29 -16	-18	76.2	
	2:22	0		-1 -4 -4	-3	73.2	
<6>	2:26	0		0 0 0	0	73.2	(73)
	2:28	10		0 0 0	0	73.2	
	2:30	20		0 10 1	3.7	76.9	
	2:32	30		5 21 15	13.7	90.6	
	2:34	40		8 18 12	12.7	103.3	
	2:36	50		7 14 13	11.3	114.6	
<7>	2:38	60		8 17 12	12.3	126.9	(127)
	2:40	60		0 2 1	1	127.9	
	2:43	60		1 2 2	1.7	129.6	
	2:48	60		0 1 0	0.3	129.9	
	2:53	60		0 1 0	0.3	130.2	
	2:58	60		1 0 0	0.3	130.5	
	3:03	60		0 1 1	0.7	131.2	
	3:08	60		0 1 0	0.3	131.5	
	3:18	60		0 0 0	0	131.5	
	3:28	60		0 0 0	0	131.5	
	3:38	60		0 0 0	0	131.5	

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 ②	(①+②+③)/2	Σδ	Remarks
	4:08	60		0 1	0	0.3	131.8	
	4:38	60		0 0	0	0	131.8	
	5:08	60		0 1	1	0.7	132.5	
	5:38	60		1 1	0	0.7	133.2	
	6:08	60		0 1	1	0.7	133.9	
	6:38	60		1 2	1	1.3	135.2	
	7:08	60		0 1	1	0.7	135.9	
	7:38	60		0 1	0	0.3	136.2	
	8:08	60		1 0	1	0.7	136.9	
<8>	8:38	60		0 0	0	0	136.9	(137)
	8:40	50		0 0	0	0	136.9	
	8:42	40		0 1	-1	0	136.9	
	8:44	30		-1 2	-9	-2.7	134.2	
	8:46	20		-4 -23	-10	-12.3	121.9	
	8:48	10		-8 -23	-13	-14.7	107.2	
	8:50	5		-10 -30	-20	-20	87.2	
	8:52	0		-1 -8	-3	-4	83.2	
<9>	8:56	0		0 0	0	0	83.2	(83)
	8:58	10		0 0	0	0	83.2	
<10>	9:00	20		0 17	8	8.3	91.5	(92)
	9:02	30		5 20	14	13	104.5	
<11>	9:04	40		7 18	13	12.7	117.2	(117)
	9:06	50		7 15	11	11	128.2	
<12>	9:08	60		7 16	11	11.3	139.5	(140)
	9:10	65		4 7	8	6.3	145.8	
<13>	9:14	65		0 2	0	0.7	146.5	(147)
	9:16	60		0 0	0	0	146.5	
	9:18	50		0 0	0	0	146.5	
	9:20	40		0 -4	-5	-3	143.5	
	9:22	30		-4 -9	-9	-7.3	136.2	
	9:24	20		-5 -17	-11	-11	125.2	
	9:26	10		-8 -22	-14	-14.7	110.5	
	9:28	5		-7 -20	-11	-12.7	97.8	
	9:30	0		-2 -10	-5	-5.7	92.1	
<14>	9:34	0		0 0	0	0	92.1	(92)
	9:36	10		0 0	0	0	92.1	
<15>	9:38	20		0 13	4	5.7	97.8	(98)
	9:40	30		4 20	14	12.7	110.5	
<16>	9:42	40		8 17	12	12.3	122.8	(123)
	9:44	50		7 15	13	11.7	134.5	
<17>	9:46	60		7 15	11	11	145.5	(146)
	9:48	65		3 6	6	5	150.5	
<18>	9:52	65		0 0	0	0	150.5	(151)
	9:54	60		0 0	0	0	150.5	
	9:56	50		0 0	0	0	150.5	

PLATE BEARING TEST — DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10^{-3} mm) Displacement Gauge Reading ① ① ② ② ②	①+②+③ / 3	Σδ	Remarks
	9:58	40		0 −1 −5	−2	148.5	
	10:00	30		−2 −10 −9	−7	141.5	
	10:02	20		−6 −15 −11	−10.7	130.8	
	10:04	10		−9 −27 −15	−17	113.8	
	10:06	5		−8 −23 −14	−15	98.8	
	10:08	0		−2 −9 −4	−5	93.8	
<19>	10:12	0		0 0 0	0	93.8	(94)

PLATE BEARING TEST RESULTS

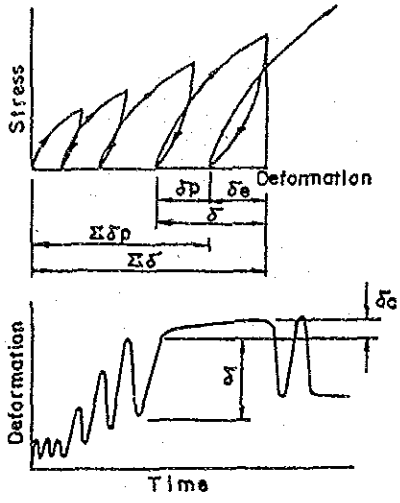
Test Location: DA-1, P-2, TD 40.5m
Measuring Point: Invert
Loading Plate Radius: a = 15 cm
Date Measured: 30 Aug. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2BN ©

Deformation Measurement Results

Stress (kg/cm^2)	Deformation ($\times 10^{-3}$ mm) δ	δ_e	δ_p	$\Sigma\delta$	$\Sigma\delta_p$	Remarks
15	21	2	19	21	19	
15	11	1	10	30	29	
15	9	3	6	38	35	
30	39	21	18	74	53	
45	62	42	20	115	73	
60	90	67	23	163	96	
60	78 (84)	81 (87)	−3 (−3)	174 (180)	93	
65	92	74	18	185	111	
65	88	79	9	199	120	

Creep Deformation δc ($\times 10^{-3}$ mm)	Creep Factor Cf (%)
6	8

$$Cf = \frac{\delta c}{\delta} \times 100 = \frac{6}{78} \times 100 = 8$$



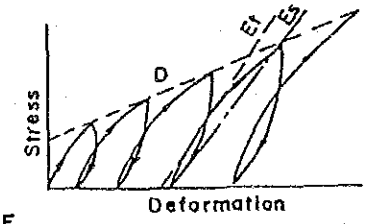
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta p$: Cumulative plastic deformation
δc : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kg/cm^2)	Tangential Modulus of Elasticity Et (kg/cm^2)	Stress Level (kg/cm^2)	Secant Modulus of Elasticity Es (kg/cm^2)
81,200	137,400	20 ~ 65	163,500

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

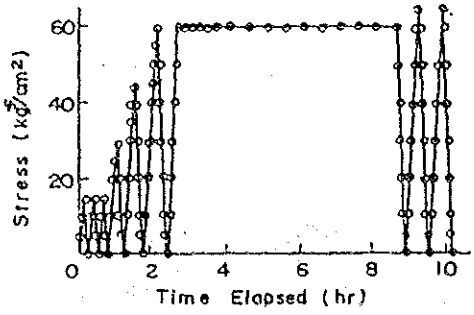


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg) ΔW : Deformation increment due to ΔF
$\Delta\sigma$: Stress increment (kg/cm^2) $\Delta\delta$: Deformation increment due to $\Delta\sigma$

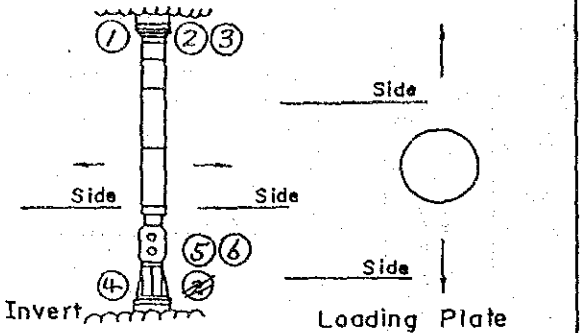
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-1, P-2, TD 405m — Measuring Point: Invert — Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm — Date Measured: 30 Aug. 1988 — Rock Grade: 2BN ⑥
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 Displacement Gauge Reading (×10⁻³ mm) ④ ① ⑤	⑥ ②	⑥+② / 2	Σδ	Remarks
	0	0		0	0	0		0	
	2	5		0	5	0	1.7	1.7	
	4	10		3	12	0	5.0	6.7	
	6	15		8	10	+13	10.3	17.0	
	10	15		4	6	3	4.3	21.3	
	12	5		1	-1	-2	-0.7	20.6	
	14	0		0	-3	-2	-1.7	18.9	
	18	0		0	0	0	0	18.9	
	20	10		1	3	2	2	20.9	
	22	15		6	8	6	6.7	27.6	
	26	15		4	2	1	2.3	29.9	
	28	5		-1	0	-1	-0.7	29.2	
	30	0		0	-1	0	-0.3	28.9	
<1>	34	0		0	1	0	0.3	29.2	(29)
	36	10		1	1	0	0.7	29.9	
	38	15		6	4	4	4.7	34.6	
<2>	42	15		2	5	3	3.3	37.9	(38)
	44	5		0	-2	-2	-1.3	36.6	
	46	0		-1	-2	-1	-1.3	35.3	
	50	0		0	0	0	0	35.3	
	52	10		0	1	1	0.7	36.0	
	54	15		5	6	3	4.7	40.7	
	56	20		8	7	13	9.3	50.0	
	58	25		7	10	18	11.7	61.7	
	1:00	30		5	9	19	11.0	72.7	
<3>	1:04	30		1	1	2	1.3	74.0	(74)
	1:06	20		0	0	-1	-0.3	73.7	
	1:08	10		-6	-5	-16	-9.0	64.7	
	1:10	5		-5	-10	-13	-9.3	55.4	
	1:12	0		-1	-3	-2	-2.0	53.4	
	1:16	0		0	0	0	0	53.4	
	1:18	10		0	0	0	0	53.4	
	1:20	20		11	11	15	12.3	65.7	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation Displacement Gauge Reading (×10⁻³ mm) ④ ⑤ ⑥	⑧ ③	Σδ	Remarks
	1:22	30		8 14 24	15.3	81.0	
	1:24	35		6 7 13	8.6	89.6	
	1:26	40		9 11 19	13.0	102.6	
	1:28	45		7 7 16	10.0	112.6	
<4>	1:32	45		2 2 4	2.7	115.3	(115)
	1:34	40		0 0 0	0	115.3	
	1:36	30		1 -1 -3	-1.0	114.3	
	1:38	20		-5 -6 -17	-9.3	105.0	
	1:40	10		-12 -13 -25	-16.7	88.3	
	1:42	5		-7 -11 -12	-10.0	78.3	
	1:44	0		-5 -6 -4	-5.0	73.3	
	1:48	0		1 0 -1	0	73.3	
	1:50	10		0 0 1	0.3	73.6	
	1:52	20		10 12 15	12.3	85.6	
	1:54	30		20 21 26	22.3	108.2	
	1:56	40		10 13 23	15.3	123.5	
	1:58	45		3 4 11	6.0	129.5	
	2:00	50		5 14 20	13.0	142.5	
	2:02	55		12 1 11	8.0	150.5	
	2:04	60		10 8 17	11.7	162.2	
<5>	2:08	60		0 0 3	1.0	163.2	(163)
	2:10	50		0 0 -1	-0.3	162.9	
	2:12	40		-5 0 -5	-3.3	159.6	
	2:14	30		-3 -8 -16	-9.0	150.6	
	2:16	20		-9 -5 -22	-12.0	138.6	
	2:18	10		-19 -19 -35	-24.3	114.3	
	2:20	5		-13 -14 -18	-11.7	102.6	
	2:22	0		-5 -7 -2	-4.7	97.9	
<6>	2:26	0		-1 -2 -2	-1.7	96.2	(96)
	2:28	10		0 0 0	0	96.2	
	2:30	20		8 +11 12	10.3	106.5	
	2:32	30		12 18 29	19.7	126.2	
	2:34	40		10 15 28	17.7	143.9	
	2:36	50		15 15 23	17.7	161.6	
<7>	2:38	60		10 8 20	12.7	174.3	(174)
	2:40	60		5 3 2	3.3	177.6	
	2:43	60		0 0 +1	0.3	177.9	
	2:48	60		0 0 0	0	177.9	
	2:53	60		0 0 1	0.3	178.2	
	2:58	60		0 0 0	0	178.2	
	3:03	60		0 0 0	0	178.2	
	3:08	60		1 0 1	0.7	178.9	
	3:18	60		0 1 0	0.3	179.2	
	3:28	60		0 0 0	0	179.2	
	3:38	60		0 0 0	0	179.2	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation Displacement Gauge Reading (×10⁻³ mm) ④	⑤	⑥	(①+②+③)/3	Σδ	Remarks
	4:08	60		0	0	0	0	179.2	
	4:38	60		0	0	0	0	179.2	
	5:08	60		0	0	0	0	179.2	
	5:38	60		0	1	1	0.7	179.9	
	6:08	60		-1	0	0	-0.3	179.6	
	6:38	60		0	0	0	0	179.6	
	7:08	60		0	1	0	0.3	179.9	
	7:38	60		0	0	0	0	179.9	
	8:08	60		0	0	0	0	179.9	
<8>	8:38	60		0	0	0	0	179.9	(180)
	8:40	50		-3	0	-2	-1.7	178.2	
	8:42	40		-8	-4	-9	-7.0	171.2	
	8:44	30		-1	-15	-18	-11.3	159.9	
	8:46	20		-14	-12	-26	-17.3	142.6	
	8:48	10		-17	-19	-34	-23.3	119.3	
	8:50	5		-20	-23	-17	-20.0	99.3	
	8:52	0		-5	-7	-6	-6.0	93.3	
<9>	8:56	0		0	0	0	0	93.3	(93)
	8:58	10		0	0	0	0	93.3	
<10>	9:00	20		10	15	14	13.0	106.3	(106)
	9:02	30		16	20	30	22.0	128.3	
<11>	9:04	40		12	15	28	18.3	146.6	(147)
	9:06	50		10	11	21	14.0	160.6	
<12>	9:08	60		15	11	17	14.3	174.9	(175)
	9:10	65		5	6	9	6.7	181.6	
<13>	9:14	65		6	2	1	3.0	184.6	(185)
	9:16	60		0	1	-1	0	184.6	
	9:18	50		0	1	-1	0	184.6	
	9:20	40		-5	-1	-6	-4.0	180.6	
	9:22	30		-6	-6	-16	-9.3	171.3	
	9:24	20		-5	-14	-24	-14.3	157.0	
	9:26	10		-20	-21	-38	-26.3	130.7	
	9:28	5		-10	-13	-17	-13.3	117.4	
	9:30	0		-5	-6	-5	-5.3	112.1	
<14>	9:34	0		0	-2	-2	-1.3	110.8	(111)
	9:36	10		0	0	0	0	110.8	
<15>	9:38	20		13	16	18	15.7	126.5	(127)
	9:40	30		12	17	31	20.0	146.5	
<16>	9:42	40		10	17	27	18.0	164.5	(165)
	9:44	50		10	11	19	13.3	177.8	
<17>	9:46	60		12	8	17	12.3	190.1	(190)
	9:48	65		7	6	9	7.3	197.4	
<18>	9:52	65		1	1	2	1.3	198.7	(199)
	9:54	60		0	-2	-1	-1.0	197.7	
	9:56	50		-1	1	-1	-0.3	197.4	

PLATE BEARING TEST — DATA SHEET (4)

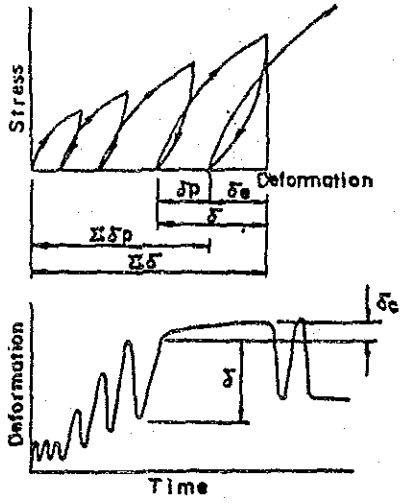
Time	Time Elapsed	Stress (kgf/cm²)	Jack Pressure (kgf/cm²)	Deformation Displacement Gauge Reading (×10⁻³ mm) ④ ⑤ ⑥	⑧ (①+②)/2	Σδ	Remarks
	9:58	40		-7 -2 -9	-6.0	191.4	
	10:00	30		-11 -10 -21	-14.0	177.4	
	10:02	20		-6 -12 -23	-18.7	163.7	
	10:04	10		-14 -20 -33	-19.0	144.7	
	10:06	5		-11 -14 -20	-15.0	129.7	
	10:08	0		-7 -10 -6	-7.7	122.0	
(19)	10:12	0		-1 -2 -2	-1.7	120.3	(120)

PLATE BEARING TEST RESULTS

Test Location: DA-1, P-2, TD 40.5 m
Measuring Point: Crown
Loading Plate Radius: a = 15 cm
Date Measured: 30 Aug. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: CBM (C)

Deformation Measurement Results

Stress (kgf/cm²)	Deformation (×10⁻³ mm) δ	δe	δp	Σδ	Σδp	Remarks
15	2	0	2	2	2	
15	2	0	2	4	4	
15	1	0	1	5	5	
30	7	2	5	12	10	
45	12	2	10	22	20	Creep Deformation δc (×10⁻³mm) / Creep Factor Cf (%)
60	12	5	7	32	27	
60	5 (9)	3 (7)	2 (2)	32 (36)	29	4 / 80
65	15	15	0	44	29	$Cf = \frac{\delta c}{\delta} \times 100 = \frac{4}{5} \times 100 = 80$
65	23	18	5	52	36	



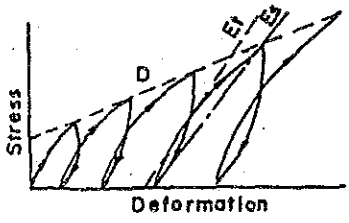
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

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)
370,400	856,000	20 ~ 65	809,700

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

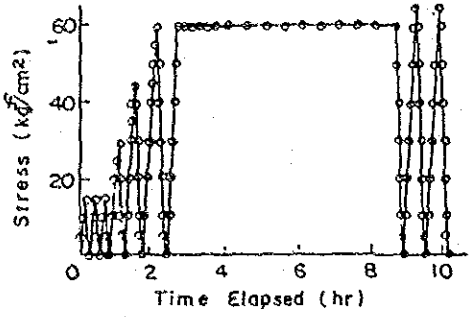


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kgf) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kgf/cm²) Δδ : Deformation increment due to Δσ

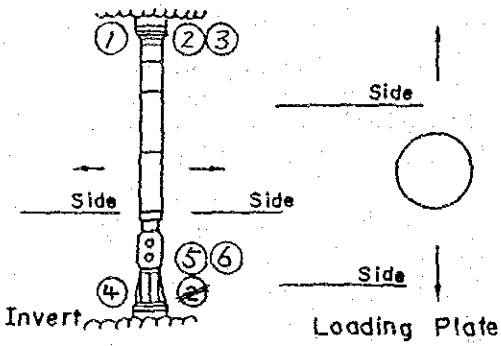
Remarks

PLATE BEARING TEST　　DATA SHEET (1)

Test Location: DA-1 P-2, 1040.5m　Measuring Point: Crown　Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm　Date Measured: 30 Aug. 1988　Rock Grade: 2BN ©
Jack Capacity: 200 ton　Max. Oil Pressure: 1100 kg/cm²　Measured by:
Ram Diameter: φ 15.2 cm



Loading Pattern (Example)



Loading Plate

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
	0	0		0	0	0	0	0	
	2	5		0	0	0	0	0	
	4	10		0	0	1	0.3	0.3	
	6	15		1	4	0	1.7	2.0	
	10	15		0	1	0	0.3	2.3	
	12	5		0	0	0	0	2.3	
	14	0		−1	0	0	−0.3	2.0	
	18	0		0	0	0	0	2.0	
	20	10		0	0	0	0	2.0	
	22	15		0	1	4	1.7	3.7	
	26	15		0	0	0	0	3.7	
	28	5		0	0	0	0	3.7	
	30	0		0	0	0	0	3.7	
<1>	34	0		0	0	0	0	3.7	(4)
	36	10		1	0	0	0.3	4.0	
	38	15		0	1	0	0.3	4.3	
<2>	42	15		0	1	0	0.4	4.7	(5)
	44	5		0	0	0	0	4.7	
	46	0		0	0	0	0	4.7	
	50	0		0	0	0	0	4.7	
	52	10		0	0	0	0	4.7	
	54	15		0	1	1	0.7	5.4	
	56	20		0	4	2	2.0	7.4	
	58	25		1	3	3	2.3	9.7	
	1:00	30		1	0	1	1.7	11.4	
<3>	1:04	30		1	0	0	0.3	11.7	(12)
	1:06	20		0	0	0	0	11.7	
	1:08	10		0	0	0	0	11.7	
	1:10	5		0	−2	0	−0.7	11.0	
	1:12	0		−1	−1	0	−0.7	10.3	
	1:16	0		0	0	0	0	10.3	
	1:18	10		0	0	0	0	10.3	
	1:20	20		1	3	0	1.4	11.7	

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		2	3	1	2.0	13.7	
	1:24	35		0	2	2	1.3	15.0	
	1:26	40		2	4	3	3.0	18.0	
	1:28	45		2	4	2	2.7	20.7	
<4>	1:32	45		1	2	2	1.6	22.3	(22)
	1:34	40		0	0	0	0	22.3	
	1:36	30		0	0	0	0	22.3	
	1:38	20		0	0	0	0	22.3	
	1:40	10		0	-1	0	-0.3	22.0	
	1:42	5		0	-3	0	-1.0	21.0	
	1:44	0		0	-2	0	-0.7	20.3	
	1:48	0		0	0	0	0	20.3	
	1:50	10		0	0	0	0	20.3	
	1:52	20		0	2	0	0.7	21.0	
	1:54	30		0	4	0	1.3	22.3	
	1:56	40		0	2	0	0.7	23.0	
	1:58	45		1	2	0	1.7	24.7	
	2:00	50		2	0	1	1.0	25.7	
	2:02	55		2	2	3	2.3	28.0	
	2:04	60		2	4	2	2.7	30.7	
<5>	2:08	60		2	1	0	1.0	31.7	(32)
	2:10	50		-1	1	0	0	31.7	
	2:12	40		0	0	0	0	31.7	
	2:14	30		0	0	0	0	31.7	
	2:16	20		0	0	-1	-0.3	31.4	
	2:18	10		0	-6	0	-2.0	29.4	
	2:20	5		0	-5	0	-1.7	27.7	
	2:22	0		0	-2	-1	-1.0	26.7	
<6>	2:26	0		0	0	0	0	26.7	(27)
	2:28	10		1	0	0	0.3	27.0	
	2:30	20		0	1	0	0.3	27.3	
	2:32	30		0	5	0	1.7	29.0	
	2:34	40		0	4	0	1.3	30.3	
	2:36	50		0	1	0	0.3	30.6	
<7>	2:38	60		0	3	2	1.7	32.3	(32)
	2:40	60		0	0	0	0	32.3	
	2:43	60		0	0	0	0	32.3	
	2:48	60		1	1	1	1.0	33.3	
	2:53	60		0	0	2	0.7	34.0	
	2:58	60		0	0	0	0	34.0	
	3:03	60		0	0	0	0	34.0	
	3:08	60		0	0	0	0	34.0	
	3:18	60		0	0	0	0	34.0	
	3:28	60		0	0	0	0	34.0	
	3:38	60		0	0	0	0	34.0	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ①	Displacement ②	Gauge Reading ③	①+②+③ / 3	Σδ	Remarks
	4:08	60		0	0	0	0	34.0	
	4:38	60		0	0	0	0	34.0	
	5:08	60		1	0	0	0.3	34.3	
	5:38	60		1	0	0	0.3	34.6	
	6:08	60		1	0	0	0.4	35.0	
	6:38	60		2	1	1	1.3	36.3	
	7:08	60		0	0	0	0	36.3	
	7:38	60		0	0	0	0	36.3	
	8:08	60		0	0	0	0	36.3	
<8>	8:38	60		0	0	0	0	36.3	(36)
	8:40	50		0	0	0	0	36.3	
	8:42	40		0	0	0	0	36.3	
	8:44	30		0	1	-1	0	36.3	
	8:46	20		0	0	-1	-0.3	36.0	
	8:48	10		0	-5	-1	-2.0	34.0	
	8:50	5		0	-7	-3	-3.3	30.7	
	8:52	0		-1	0	-3	-1.3	29.4	
<9>	8:56	0		0	-2	0	-0.7	28.7	(29)
	8:58	10		0	2	0	0.7	29.4	
<10>	9:00	20		0	14	-1	4.3	33.7	(34)
	9:02	30		0	-3	4	0.3	34.0	
<11>	9:04	40		0	5	4	3.0	37.0	(37)
	9:06	50		0	3	3	2.0	39.0	
<12>	9:08	60		1	2	6	3.0	42.0	(42)
	9:10	65		0	4	2	2.0	44.0	
<13>	9:14	65		0	0	0	0	44.0	(44)
	9:16	60		0	-1	0	-0.3	43.7	
	9:18	50		0	0	0	0	43.7	
	9:20	40		0	0	0	0	43.7	
	9:22	30		0	-1	-2	-1.0	42.7	
	9:24	20		0	-1	-1	-0.7	42.0	
	9:26	10		0	-5	0	-1.7	40.3	
	9:28	5		0	-14	-4	-6.0	34.3	
	9:30	0		0	-8	-5	-4.3	30.0	
<14>	9:34	0		0	-1	-1	-0.6	29.3	(29)
	9:36	10		0	4	1	1.7	31.0	
<15>	9:38	20		0	15	2	5.7	36.7	(37)
	9:40	30		0	10	6	5.3	42.0	
<16>	9:42	40		0	5	4	3.0	45.0	(45)
	9:44	50		0	2	3	1.7	46.7	
<17>	9:46	60		0	2	5	2.3	49.0	(49)
	9:48	65		1	2	2	1.6	50.6	
<18>	9:52	65		1	2	2	1.7	52.3	(52)
	9:54	60		0	0	0	0	52.3	
	9:56	50		0	0	0	0	52.3	

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		0	0	−1	−0.3	52.0	
	10:00	30		0	0	−2	−0.7	51.3	
	10:02	20		0	−1	−1	−0.6	50.7	
	10:04	10		0	−8	−3	−3.7	47.0	
	10:06	5		0	−6	−4	−3.3	43.7	
	10:08	0		−1	−10	−10	−7.0	36.7	
(19)	10:12	0		−1	−1	0	−0.7	36.0	(36)

PLATE BEARING TEST RESULTS

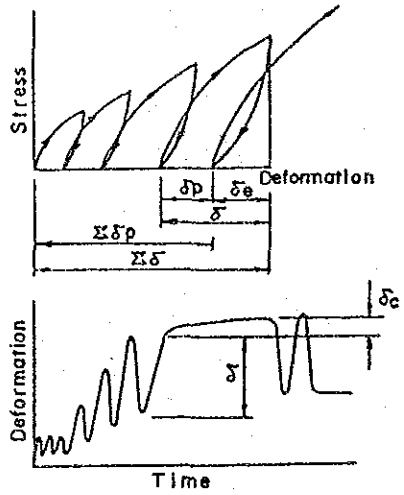
Test Location: ĐA-1, P-3, TĐ(B)2.1m
Measuring Point: Left wall
Loading Plate Radius: a = 15 cm
Date Measured: 26 Aug. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2BIII (b)

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	85	7	78	85	78	
15	11	6	5	89	83	
15	6	8	-2	89	81	
30	35	20	15	116	96	
45	49	35	14	145	110	
60	61	50	11	171	121	
60	61 (72)	52 (63)	9 (9)	182 (193)	130	
65	74	50	24	204	154	
65	68	58	10	222	164	

Creep Deformation δ_c ($\times 10^{-3}$ mm)	Creep Factor Cf (%)
11	18

$Cf = \frac{\delta_c}{\delta} \times 100 = \frac{11}{61} \times 100 = 18$



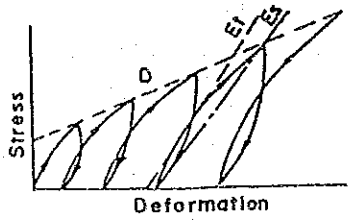
δ : Total deformation
δ_e : Elastic deformation
δ_p : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta_p$: Cumulative plastic deformation
δ_c : Creep deformation

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)
123,000	192,000	20 ~ 65	207,000

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

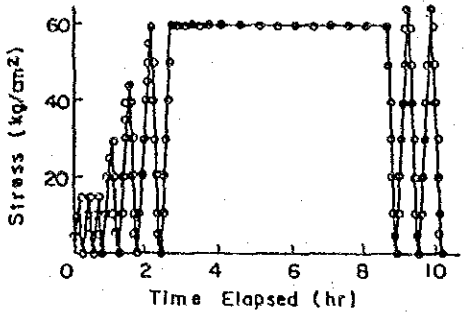


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg^f) ΔW : Deformation increment due to ΔF
$\Delta\sigma$: Stress Increment (kg^f/cm^2) $\Delta\delta$: Deformation increment due to $\Delta\sigma$

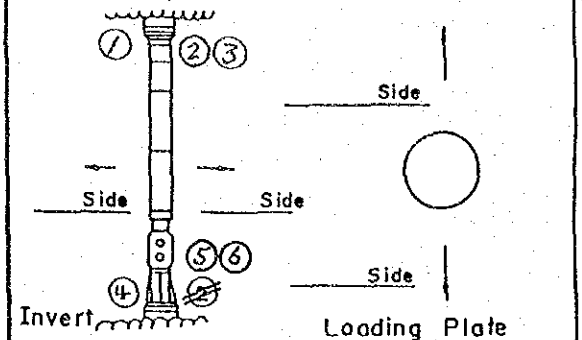
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA - 1, P-3, TD(B)2.1m | Measuring Point: Left 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 15.24cm



Loading Pattern (Example)



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
	0	0		0	0	0	0	0	
	2	5		27	125	2	51.3	51.3	
	4	10		27	27	12	22.0	73.3	
	6	15		11	4	8	7.7	81.0	
	10	15		4	5	3	4.0	85.0	
	12	5		-6	0	-2	- 2.7	82.3	
	14	0		-9	0	-4	- 4.3	78.0	
	18	0		0	0	0	0	78.0	
	20	10		7	0	1	2.7	80.7	
	22	15		11	7	7	8.3	89.0	
	26	15		0	0	0	0	89.0	
	28	5		-6	-1	0	- 2.3	86.7	
	30	0		-6	0	-5	- 3.7	83.0	
<1>	34	0		1	0	0	0.3	83.3	(83)
	36	10		3	0	0	1.0	84.3	
	38	15		8	0	5	4.3	88.6	
<2>	42	15		0	0	0	0	88.6	(89)
	44	5		-6	0	-2	- 2.7	85.9	
	46	0		-8	-1	-5	- 4.7	81.2	
	50	0		0	0	0	0	81.2	
	52	10		6	0	1	2.3	83.5	
	54	15		9	4	6	6.3	89.8	
	56	20		7	6	8	7.0	96.8	
	58	25		11	6	8	8.3	105.1	
	1:00	30		10	2	8	8.7	113.8	
<3>	1:04	30		2	2	1	1.7	115.5	(116)
	1:06	20		0	0	0	0	115.5	
	1:08	10		-5	0	0	- 1.7	113.8	
	1:10	5		-9	-6	10	- 8.3	105.5	
	1:12	0		-10	-3	9	- 9.0	96.5	
	1:16	0		-1	0	-1	- 0.7	95.8	
	1:18	10		6	0	0	2.0	97.8	
	1:20	20		18	8	12	12.7	110.5	

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 ② ③	④ ⑤	①+②+③ / 3	Σδ	Remarks
	1:22	30		13	8	10	10.3	120.8	
	1:24	35		8	4	6	6.0	126.8	
	1:26	40		11	7	8	8.7	135.5	
	1:28	45		10	7	8	8.3	143.8	
<4>	1:32	45		2	0	2	1.3	145.1	(145)
	1:34	40		0	0	0	0	145.1	
	1:36	30		0	0	2	0.7	145.8	
	1:38	20		-4	0	0	-1.3	144.5	
	1:40	10		-19	-3	-10	-12.7	131.8	
	1:42	5		-22	-11	-16	-16.3	115.5	
	1:44	0		-12	-3	0	-5.0	110.5	
	1:48	0		-1	0	0	-0.3	110.2	
	1:50	10		8	0	0	2.7	112.9	
	1:52	20		16	1	11	9.3	122.2	
	1:54	30		16	3	14	12.7	134.9	
	1:56	40		12	7	9	9.3	144.2	
	1:58	45		8	5	3	5.3	149.5	
	2:00	50		8	5	3	5.3	154.8	
	2:02	55		9	7	5	7.0	161.8	
	2:04	60		10	9	4	7.7	169.5	
<5>	2:08	60		3	0	2	1.7	171.2	(171)
	2:10	50		0	0	0	0	171.2	
	2:12	40		0	0	0	0	171.2	
	2:14	30		-5	0	0	-1.7	169.5	
	2:16	20		-2	-6	4	-1.3	168.2	
	2:18	10		-33	-18	-19	-23.3	144.9	
	2:20	5		-20	-15	-19	-18.0	126.9	
	2:22	0		-15	0	-3	-6.0	120.9	
<6>	2:26	0		0	0	0	0	120.9	(121)
	2:28	10		5	0	0	1.7	122.6	
	2:30	20		20	8	10	12.7	135.3	
	2:32	30		15	10	16	13.7	149.0	
	2:34	40		15	9	10	11.3	160.3	
	2:36	50		15	12	7	11.3	171.6	
<7>	2:38	60		14	11	5	10.0	181.6	(182)
	2:40	60		0	0	1	0.3	181.9	
	2:43	60		2	1	1	1.3	183.2	
	2:48	60		0	0	0	0	183.2	
	2:53	60		0	0	0	0	183.2	
	2:58	60		1	0	0	0.3	183.5	
	3:03	60		1	0	0	0.3	183.8	
	3:08	60		2	3	0	1.7	185.5	
	3:18	60		3	4	2	2.3	187.8	
	3:28	60		2	2	6	3.3	191.1	
	3:38	60		1	3	1	1.7	192.8	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ①	Displacement ①	Gauge Reading ②	Gauge Reading ③	(①+②+③)/3	Σδ	Remarks
	4:08	60		0	0	0		0	192.8	
	4:38	60		0	0	0		0	192.8	
	5:08	60		0	0	0		0	192.8	
	5:38	60		0	0	0		0	192.8	
	6:08	60		0	0	0		0	192.8	
	6:38	60		0	0	0		0	192.8	
	7:08	60		0	0	0		0	192.8	
	7:38	60		0	0	0		0	192.8	
	8:08	60		0	0	0		0	192.8	
<8>	8:38	60		0	0	0		0	192.8	(193)
	8:40	50		-1	-5	0		-2.0	190.8	
	8:42	40		-9	-8	-1		-6.0	184.8	
	8:44	30		-8	-10	0		-6.0	178.8	
	8:46	20		-0	-3	0		-4.3	174.5	
	8:48	10		-20	-17	-13		-16.7	157.8	
	8:50	5		-23	-11	-19		-17.7	140.1	
	8:52	0		-22	-1	-8		-10.3	129.8	
<9>	8:56	0		0	0	0		0	129.8	(130)
	8:58	10		6	0	1		2.3	132.1	
<10>	9:00	20		21	11	15		15.7	147.8	(148)
	9:02	30		20	11	15		15.3	163.1	
<11>	9:04	40		11	12	12		11.7	174.8	(175)
	9:06	50		15	14	6		11.7	186.5	
<12>	9:08	60		14	13	4		10.3	196.8	(197)
	9:10	65		6	5	2		4.3	201.1	
<13>	9:14	65		3	4	3		3.3	204.4	(204)
	9:16	60		1	0	1		0.7	205.1	
	9:18	50		-2	0	2		0	205.1	
	9:20	40		-2	0	2		0	205.1	
	9:22	30		-7	0	1		-2.0	203.1	
	9:24	20		-12	-7	-1		-6.7	196.4	
	9:26	10		-19	-16	-13		-18.0	178.4	
	9:28	5		-26	-13	-20		-19.7	158.7	
	9:30	0		-9	-1	-5		-5.0	153.7	
<14>	9:34	0		0	0	1		0.3	154.0	(154)
	9:36	10		3	0	0		1.0	155.0	
<15>	9:38	20		21	0	14		15.0	170.0	(170)
	9:40	30		13	3	17		16.3	186.3	
<16>	9:42	40		14	9	11		11.3	197.6	(198)
	9:44	50		14	8	5		9.0	206.6	
<17>	9:46	60		12	0	3		8.3	214.9	(215)
	9:48	65		5	5	1		3.7	218.6	
<18>	9:52	65		4	2	3		3.0	221.6	(222)
	9:54	60		0	0	1		0.3	221.9	
	9:56	50		0	0	3		1.0	222.9	

PLATE BEARING TEST — DATA SHEET (4)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ① ⊕ ②	③ ⊕ ④	①+②+③+④ / 2 3	Σδ	Remarks
	9:58	40		-5	1	2	-0.7	222.2	
	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

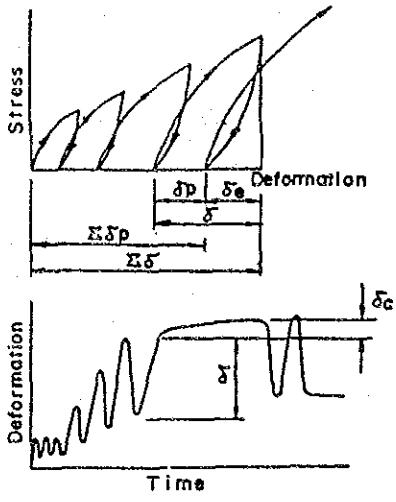
Test Location: ĐA-1, P-3, TD(B) 2.1m
Measuring Point: Right wall
Loading Plate Radius: a = 15 cm
Date Measured: 26 Aug. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2BIII (b)

Deformation Measurement Results

Stress (kg/cm²)	Deformation (x10⁻³ 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 (x10⁻³mm)	Creep Factor Cf (%)
15	26

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



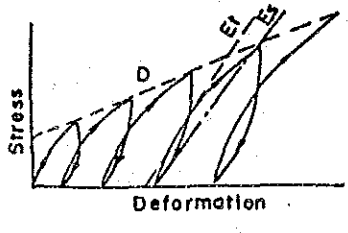
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

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

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

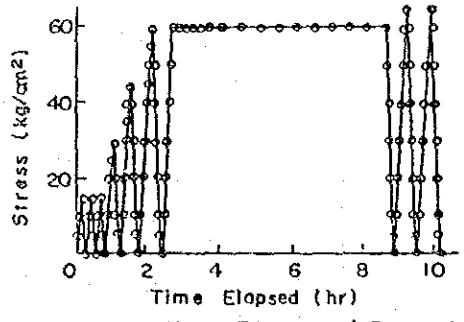


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kg/cm²) Δδ : Deformation increment due to Δσ

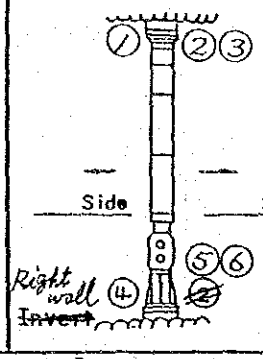
Remarks

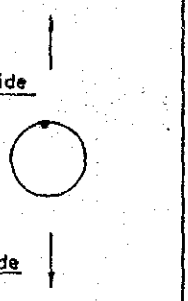
PLATE BEARING TEST — DATA SHEET (1)

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: 2BM (b)
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 f (kg/cm²)	Jack Pressure f (kg/cm²)	Deformation Displacement Gauge Reading ④	①	⑤	⑥	③	(④+①+⑤+②+⑥)/3	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 $\frac{f}{}$ (kg/cm²)	Jack Pressure $\frac{f}{}$ (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gauge Reading ④ ⑦ ⑤ ⑥ ⑧	(④+⑦+⑤+⑥+⑧)×3	Σδ	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 −⑥	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 σ (kg/cm²)	Jack Pressure σ (kg/cm²)	Deformation (x 10^{-3} mm) Displacement Gauge Reading ④ ① ⑤	⑥ ②	$\frac{④+①+⑤+②+⑥}{23}$	$\Sigma\delta$	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	
<19>	10:12	0		0 0	0	0	93.6	(94)

PLATE BEARING TEST RESULTS

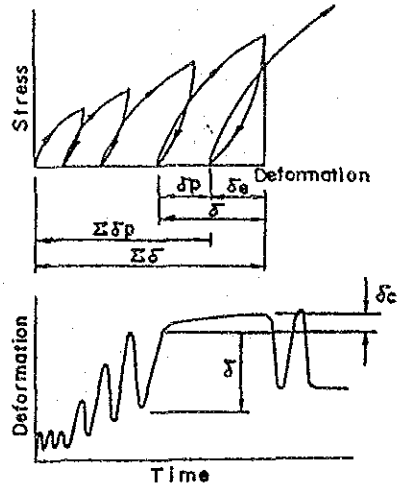
Test Location: DA-1, P-4, TD(B) 4.0m
Measuring Point: Invert
Loading Plate Radius: a = 15 cm
Date Measured: 25 Aug. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2BIII (b)

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 (×10⁻³mm)	Creep Factor Cf (%)
10	25

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



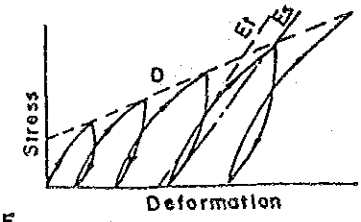
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

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

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

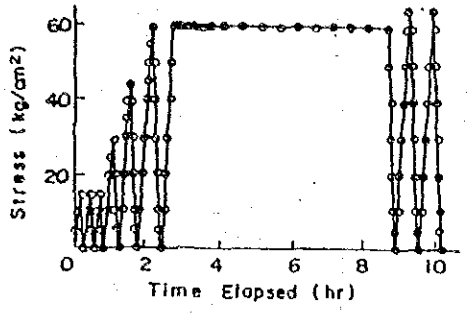


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load Increment (kgf) ΔW : Deformation Increment due to ΔF
Δσ : Stress Increment (kgf/cm²) Δδ : Deformation Increment due to Δσ

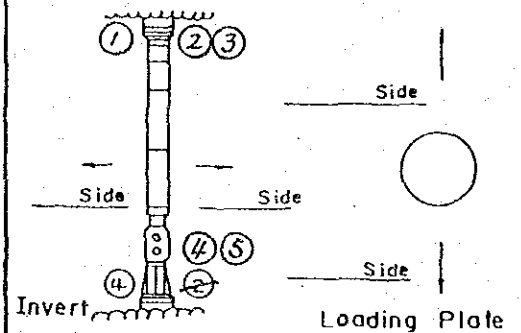
Remarks

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: 2BIII ⑥
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+①+②+⑥)/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 [illegible] [illegible]	3.3	51.1	
	1:20	20		6 0 [illegible]	3.7	54.8	

PLATE BEARING TEST — DATA SHEET (2)

Time	Time Elapsed	Stress δ (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10^{-3} mm) Displacement Gauge Reading ④ ⑤ ⑥	⑤+⑥	$\Sigma\delta$	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 1	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 (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ④	Displacement ⑤	Gauge Reading ⑥	Gauge Reading ⑧	④+⑤+⑥ / #3	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		3	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 (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement Gouge Reading (4)	(5)	(6)		(4)+(5)+(6) / 3	Σδ	Remarks
	9:58	40		0	0	-9		-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

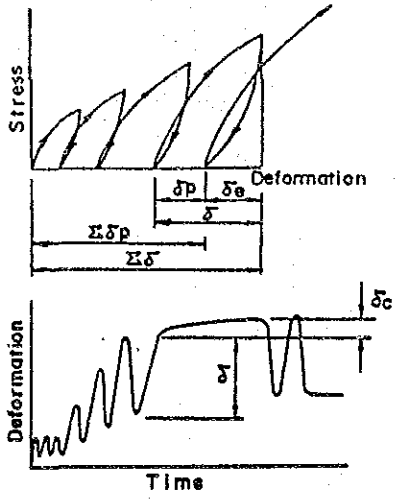
Test Location: DA-1, P-11, TD(B) 4.0m
Measuring Point: Crown
Loading Plate Radius: a = 15 cm
Date Measured: 25 Aug. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: 2BIII (D)

Deformation Measurement Results

Stress (kg^f/cm^2)	Deformation ($\times 10^{-3}$ mm) δ	δ_e	δ_p	$\Sigma\delta$	$\Sigma\delta_p$	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 δ_c ($\times 10^{-3}$ mm)	Creep Factor Cf (%)
6	14

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



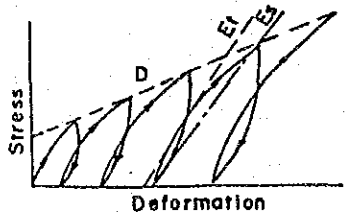
δ : Total deformation
δ_e : Elastic deformation
δ_p : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta_p$: Cumulative plastic deformation
δ_c : Creep deformation

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)
199,000	379,000	20 ~ 65	369,800

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

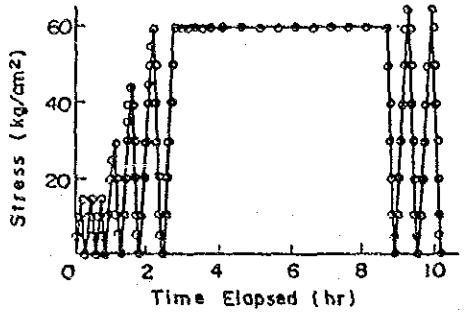


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg) ΔW : Deformation increment due to ΔF
$\Delta\sigma$: Stress increment (kg/cm^2) $\Delta\delta$: Deformation increment due to $\Delta\sigma$

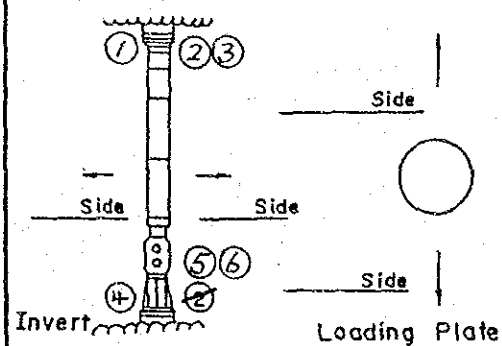
Remarks

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)



Loading Plate

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④	①	⑤	⑥	②	(⑥+①+⑤+②+④)/2.3	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		5.8	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 (x 10⁻³ mm) Displacement Gauge Reading ① ① ② ③ ②	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 (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ① (×)	②	Gauge Reading ③ (z)	①+②+③ / 3	Σδ	Remarks
	4:08	60		0	1	3	1.3	143.3	
	4:38	60		1	1	-2	0	143.3	
	5:08	60		0	0	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 (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (x 10⁻³ mm) Displacement ① ① ②	Gauge Reading ③ ②	(①+②+③)/3	Σδ	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

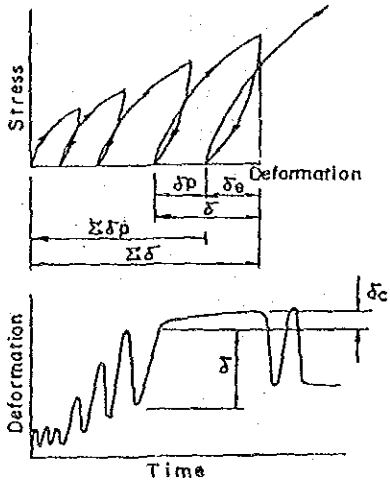
Test Location: DA-2. P-1, TD 16.3m
Measuring Point: Invert
Loading Plate Radius: a = 15 cm
Date Measured: 4 Oct. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: CBN ©

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

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



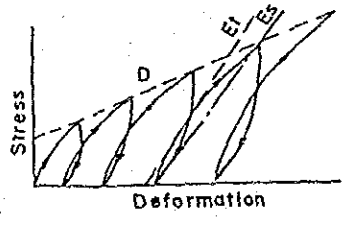
δ : Total deformation
δ_e : Elastic deformation
δ_p : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta_p$: Cumulative plastic deformation
δ_c : Creep deformation

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

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

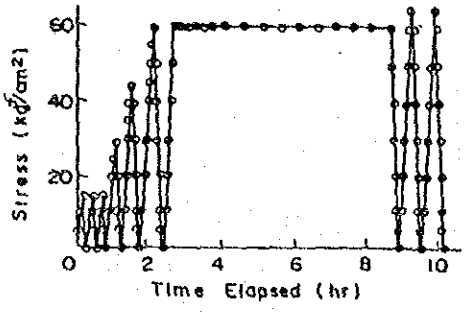


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load Increment (kg^f) ΔW : Deformation Increment due to ΔF
$\Delta\sigma$: Stress Increment (kg^f/cm^2) $\Delta\delta$: Deformation Increment due to $\Delta\sigma$

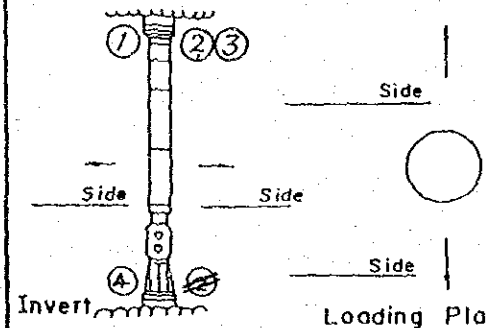
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-2, P-1, TD 16.3m | Measuring Point: Invert | Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm | Date Measured: 4 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	①+②+③+⑤+⑥ −2③	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		18 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 -9	-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 ③	④+①+⑤+③+⑥ ×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		35 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 0 1	1.0	314.6	
	3:08	60		2 0 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	316.6	
	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		18	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)

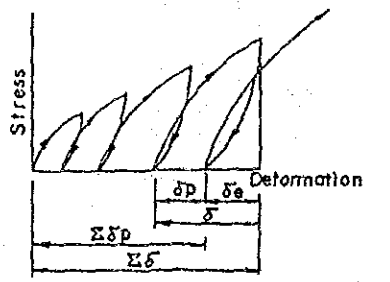
Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④ ① ⑤ ⑥ ②	(①+⑤+②)/3	Σδ	Remarks
	9:58	40		-4 -3 0	-2.3	429.7	
	10:00	30		-23 -6 -14	-14.3	415.4	
	10:02	20		-3 -12 -8	-9.7	405.7	
	10:04	10		-10 -9 -12	-10.3	395.4	
	10:06	5		-8 -5 -6	-6.3	389.1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

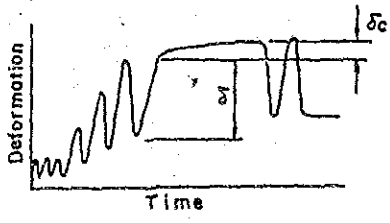
PLATE BEARING TEST RESULTS

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

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	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	Creep Deformation δ_c ($\times 10^{-3}$mm):
60	117	72	45	253	181	Creep Factor Cf (%):
60	99 (116)	97 (114)	2 (2)	280 (297)	183	17 / 17
65	85	93	-8	268	175	$Cf = \frac{\delta_c}{\delta} \times 100 = \frac{17}{99} \times 100 = 17$
65	145	100	45	320	220	





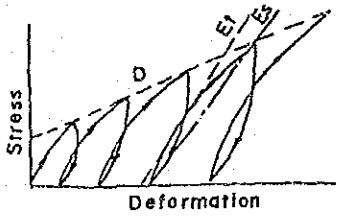
δ : Total deformation
δ_e : Elastic deformation
δ_p : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta_p$: Cumulative plastic deformation
δ_c : Creep deformation

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)
56,400	126,400	20 ~ 65	137,200

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

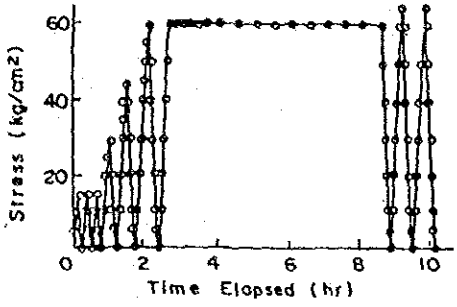


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg^f) ΔW : Deformation increment due to ΔF
$\Delta\sigma$: Stress increment (kg^f/cm^2) $\Delta\delta$: Deformation increment due to $\Delta\sigma$

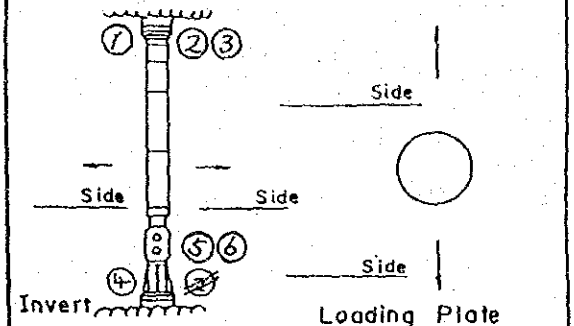
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-2, P-1, 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)



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	2.3	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 (x 10^{-3} mm) Displacement Gauge Reading ① ④ ② ③ ⑤	①+②+④ / 3	Σδ	Remarks
	1:22	30		32 10 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		26 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	-1.3	293.1	

PLATE BEARING TEST — DATA SHEET (3)

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement ① ④	②	Gauge Reading ③ ⑤		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		27	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	237.1	
<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		13	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	319.8	(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 + ②	③ + ②	(① + ② + ③)/3	Σδ	Remarks
	9:58	40		-10	0	0	-3.3	317.1	
	10:00	30		-17	-7	-2	-7.3	309.8	
	10:02	20		-33	-15	-23	-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	-38	0	-15.7	220.7	
<19>	10:12	0		-1	0	0	-0.3	220.4	(220)

PLATE BEARING TEST RESULTS

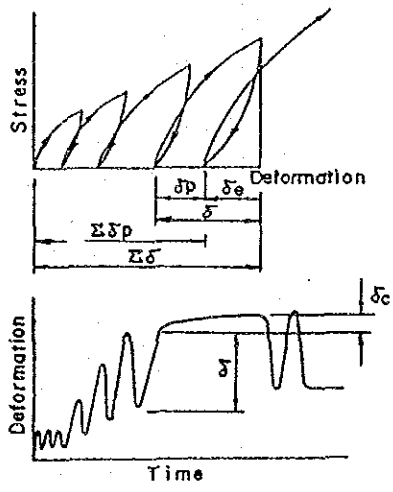
Test Location: DA-2, P-2, TD 17.0m
Measuring Point: Invert
Loading Plate Radius: a = 15 cm
Date Measured: 1 Oct. 1988
Geological Classification: Ophiolite
Measured by:
Rock Grade: ZBM ©

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	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 δ_c ($\times 10^{-3}$ mm)	Creep Factor Cf (%)
29	41

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



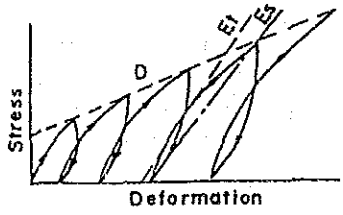
δ : Total deformation
δ_e : Elastic deformation
δ_p : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta_p$: Cumulative plastic deformation
δ_c : Creep deformation

Coefficients Related to Deformation

Modulus of Deformation D (kg_f/cm^2)	Tangential Modulus of Elasticity Ei (kg_f/cm^2)	Stress Level (kg_f/cm^2)	Secant Modulus of Elasticity Es (kg_f/cm^2)
103,100	167,700	20 ~ 65	189,800

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

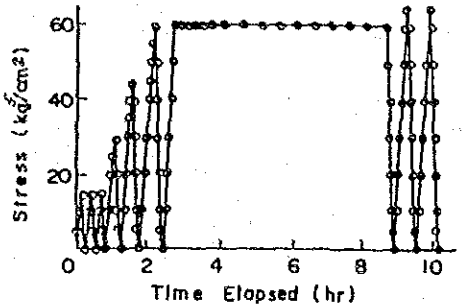


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg_f) ΔW : Deformation increment due to ΔF
$\Delta\sigma$: Stress increment (kg_f/cm^2) $\Delta\delta$: Deformation increment due to $\Delta\sigma$

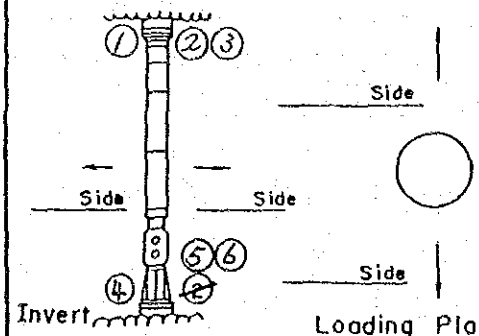
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-2, P-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	(④+①+⑤+⑥+②)/3	Σδ	Remarks
	0	0		0	0	0	0	
	2	5		1	0	0.3	0.3	
	4	10		16	0	5.3	5.6	
	6	15		19	0	7.3	12.9	
	10	15		2	0	0.7	13.6	
	12	5		-18	0	-6.0	7.6	
	14	0		-9	0	-3.0	4.6	
	18	0		0	0	0	4.6	
	20	10		16	0	5.3	9.9	
	22	15		13	2	5.0	14.9	
	26	15		1	0	0.3	15.2	
	28	5		-18	0	-6.0	9.2	
	30	0		-8	0	-2.7	6.5	
⟨1⟩	34	0		0	0	0	6.5	(7)
	36	10		15	0	5.0	11.5	
	38	15		12	0	4.0	15.5	
⟨2⟩	42	15		0	0	0	15.5	(16)
	44	5		-17	0	-5.3	10.2	
	46	0		-5	0	-1.7	8.5	
	50	0		0	0	0	8.5	
	52	10		9	0	3.0	11.5	
	54	15		17	0	4.0	15.5	
	56	20		4	1	2.0	17.5	
	58	25		30	4	13.3	30.8	
	1:00	30		17	5	9.0	39.8	
⟨3⟩	1:04	30		0	1	1.0	40.8	(41)
	1:06	20		-2	-1	-1.0	39.8	
	1:08	10		-35	0	-14.7	28.1	
	1:10	5		-19	0	-6.3	21.8	
	1:12	0		-7	0	-2.6	19.2	
	1:16	0		0	0	0	19.2	
	1:18	10		9	0	1.0	20.2	
	1:20	20		33	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	③ ②	(④+①+⑤+②+③)/2	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		23	7	2	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	3	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 mm) Displacement ④ ① ⑤	Gauge Reading ⑥ ②	③	(①+②+③)/3	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	②	③	⑤ ⑥	Σδ	Remarks
	9:58	40		-13	0	-7	-6.7	149.0	
	10:00	30		-22	-3	-2	-12.3	136.7	
	10:02	20		-32	-11	-14	-18.3	118.4	
	10:04	10		-46	-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

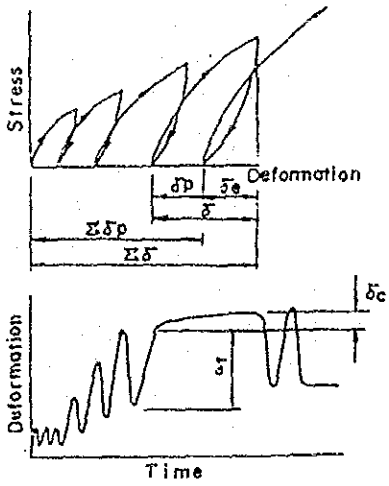
Test Location: DA-2 P-2, TD. 7.5m | Measuring Point: Crown
Loading Plate Radius: a = 15 cm | Date Measured: 1 Oct. 1988
Geological Classification: Ophiolite | Measured by:
Rock Grade: 2BN ©

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

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



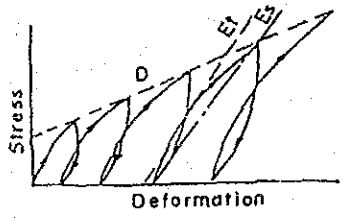
δ : Total deformation
δe : Elastic deformation
δp : Plastic deformation
Σδ : Cumulative total deformation
Σδp : Cumulative plastic deformation
δc : Creep deformation

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

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

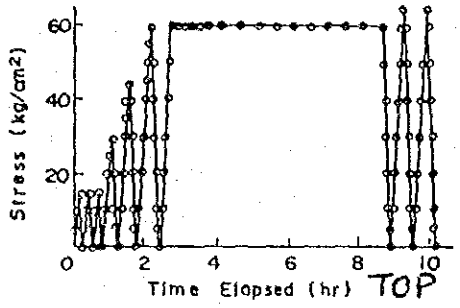


ν : Poisson's ratio (0.2~0.3) a : Plate radius (cm)
ΔF : Load increment (kg) ΔW : Deformation increment due to ΔF
Δσ : Stress increment (kg/cm²) Δδ : Deformation increment due to Δσ

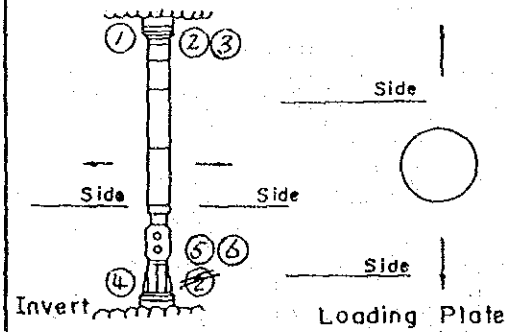
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: ~~AD~~ DA-2, P2, TD190m Measuring Point: Crown Geological Classification: Ophiolite
Loading Plate Radius: a = 15 cm Date Measured: ~~1-10-1988~~ 1 Oct. 1989 Rock Grade: 2BH ©
Jack Capacity: 200 ton Max. Oil Pressure: ~~200~~ kg/cm² 1,100 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		16 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 ① ①	②	Gauge Reading ③ ②		①+②+③ / 3	Σ	Remarks
	1:22	30		20	25	30		25.0	396.2	
	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		3	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	②	Gauge Reading ③	④	⑤	⑥	(①+②+③)/3	Σδ	Remarks
	4:08	60		0	2	4				2.0	649.5	
	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	666.2	
	6:08	60		-3	0	0				-1.0	665.2	
	6:38	60		0	0	0				0	665.2	
	7:08	60		0	0	0				0	665.2	
	7:38	60		0	0	0				0	665.2	
	8:08	60		0	0	0				0	665.2	
<8>	8:38	60		0	0	0				0	665.2	(665)
	8:40	50		-11	-6	-7				-8.0	657.2	
	8:42	40		-9	-6	-12				-9.0	648.2	
	8:44	30		-9	-9	-19				-12.3	635.9	
	8:46	20		-14	-14	-28				-18.7	617.2	
	8:48	10		-39	-42	-55				-45.3	571.9	
	8:50	5		-24	-43	-40				-35.7	536.2	
	8:52	0		-18	-55	-26				-33.0	503.2	
<9>	8:56	0		0	0	-1				-0.3	502.9	(503)
	8:58	10		10	57	33				33.3	536.2	
<10>	9:00	20		40	43	44				42.3	578.5	(578)
	9:02	30		23	23	33				26.3	604.8	
<11>	9:04	40		16	14	28				19.3	623.1	(624)
	9:06	50		11	13	23				15.7	638.8	
<12>	9:08	60		9	10	18				12.3	651.1	(652)
	9:10	65		3	34	8				15.0	666.1	
<13>	9:14	65		0	0	0				0	666.1	(667)
	9:16	60		0	0	0				0	666.1	
	9:18	50		0	0	4				1.3	667.4	
	9:20	40		-4	-1	-21				-8.7	658.7	
	9:22	30		-8	-38	-19				-21.7	637.0	
	9:24	20		-19	-16	-32				-22.3	614.7	
	9:26	10		-29	-32	-44				-35.0	579.7	
	9:28	5		-34	-50	-40				-41.3	538.4	
	9:30	0		-18	-39	-31				-29.3	509.1	
<14>	9:34	0		0	-1	0				-0.3	508.8	(510)
	9:36	10		14	44	31				29.7	538.5	
<15>	9:38	20		39	44	42				41.7	580.2	(581)
	9:40	30		25	22	35				27.3	607.5	
<16>	9:42	40		16	16	28				20.0	627.5	(628)
	9:44	50		13	12	22				15.7	643.2	
<17>	9:46	60		10	10	20				13.3	656.5	(657)
	9:48	65		5	5	8				6.0	662.5	
<18>	9:52	65		0	0	0				0	662.5	(663)
	9:54	60		0	0	0				0	662.5	
	9:56	50		0	0	-3				-1.0	661.5	

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) / 2 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

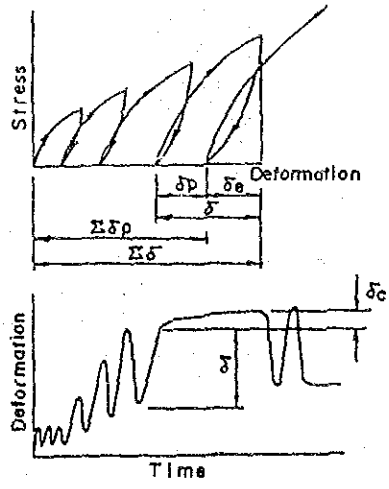
Test Location: DF-2, P-3 TD(B)5.8 | Measuring Point: Invert
Loading Plate Radius: a = 15 cm | Date Measured: 22 Sep. 1988
Geological Classification: Yoziolite | Measured by:
Rock Grade: 2BN (C)

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	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 δ_c ($\times 10^{-3}$ mm)	Creep Factor Cf (%)
27	8

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



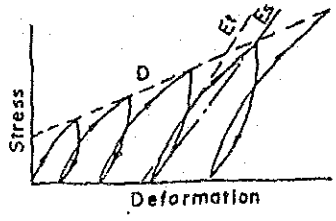
δ : Total deformation
δ_e : Elastic deformation
δ_p : Plastic deformation
$\Sigma\delta$: Cumulative total deformation
$\Sigma\delta_p$: Cumulative plastic deformation
δ_c : Creep deformation

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)
19,200	57,500	20 – 65	46,400

Modulus of Deformation, Modulus of Elasticity Calculation Formula

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

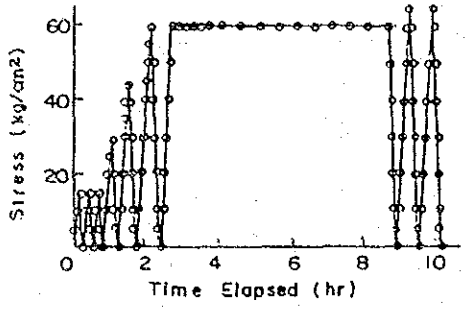


ν : Poisson's ratio (0.2~0.3) | a : Plate radius (cm)
ΔF : Load increment (kg_f) | ΔW : Deformation increment due to ΔF
$\Delta\sigma$: Stress increment (kg_f/cm^2) | $\Delta\delta$: Deformation increment due to $\Delta\sigma$

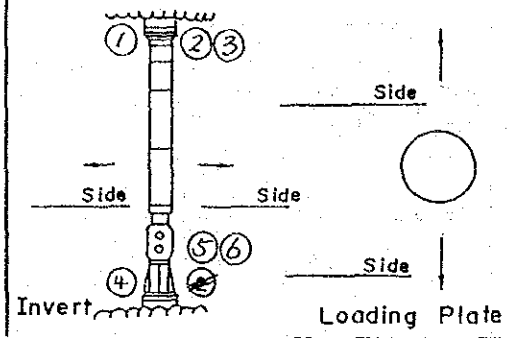
Remarks

PLATE BEARING TEST — DATA SHEET (1)

Test Location: DA-2, P-3, TD 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)



Loading Plate

Time	Time Elapsed	Stress (kg/cm²)	Jack Pressure (kg/cm²)	Deformation (×10⁻³ mm) Displacement Gauge Reading ④ ① ⑤ ⑥ ③	(④+⑥)/2 − 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	274.8	
	1:10	5		-21 -34 -71	-42.0	232.4	
	1:12	0		-13 -55 -82	-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 σ (kg/cm²)	Deformation Displacement Gauge Reading (×10⁻³ mm) ⑨ ① ⑤ ⑥ ②	① + ⑤ + ⑥ + ② ÷ 3	$\Sigma\delta$	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		-19 -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 (×10⁻³ mm) Displacement ①	Displacement ⑤	Gauge Reading ⑥ ②	①+⑤+② ×3	Σ↑	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		-94	-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 ⑦ ⑤	③ ⑧	(④+⑤+⑥)/2 3	Σδ	Remarks
	9:58	40		-15	-2	-9.0	372.5	
	10:00	30		-25	-2	-16.7	856.8	
	10:02	20		-55	-2	-36.7	820.1	
	10:04	10		-92	-37	-61.3	758.8	
	10:06	5		-152	-52	-102.7	656.1	
	10:08	0		-82	-20	-63.0	593.1	
<19>	10:12	0		-1	0	-0.3	592.8	(593)