DATA 4.1.2

LABORATORY TEST
OF
EARTH CORE MATERIAL
FOR
DONG NAI No.4 DAM

PERMEABILITY TEST

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP 1D – 1
Depth : 2.0 – 2.5
Description of soil : Residual soil of basalt: Silty sandy clay, brown.
Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20°C} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	$\frac{\eta_T}{\eta_{20}}$	$K_{20°C}$ cm/sec
1D1-1	11.47	1	1	26 8 00	100	26 8 17	59.0	30	1050	1.88×10^{-5}	1.87×10^{-5}	0.8019	15×10^{-5}
			2	26 8 30	100	– 847	60.0		1020	1.87×10^{-5}			
			3	– 900	100	– 917	60.0		1020	1.87×10^{-5}			
1D1-2	12.25	2	1	26 8 30	102.5	26 905	62	30	2100	8.94×10^{-6}	3.08×10^{-6}	0.8019	7.28×10^{-6}
			2	26 10 00	100.0	26 035	60		2100	3.08×10^{-6}			
			3	26 10 40	101.0	26 1116	59		2160	9.29×10^{-6}			
1D1-3	12.98	3	1	26 800	100.8	26 920	60.5	30	4800	3.97×10^{-6}	3.97×10^{-6}	0.8019	3.18×10^{-6}
			2	– 930	100.0	– 1055	60.0		4800	3.97×10^{-6}			
			3	– 1050	100.0	– 1310	61.0		4800	3.84×10^{-6}			
1D1-4	13.07	4	1	25 1400	102	25 1610	60	30	13040	2.54×10^{-6}	2.54×10^{-6}	0.8019	2.04×10^{-6}
			2	26 800	100	26 1005	60		12540	2.54×10^{-6}			
			3	– 1010	101	– 1216	60		7560	2.57×10^{-6}			
1D1-5	12.10	5	1	26 8 00	101.2	26 931	61.3	30	5460	3.43×10^{-6}	3.48×10^{-6}	0.8019	2.80×10^{-6}
			2	– 9 40	100.0	– 1111	60.0		5460	3.49×10^{-6}			
			3	– 11 20	100.	– 1250	60.5		5400	3.47×10^{-6}			
1D1-6	11.52	1	1	26 1500	102.0	—	60.0	30	1700	1.16×10^{-5}	1.16×10^{-5}	0.8019	3.30×10^{-6}
			2	—	100.0	—	60.0		1680	1.14×10^{-5}			
			3	—	101.0	—	59.0		1710	1.17×10^{-5}			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER
Location of sample : TP1D – 2
Depth : 4.5 – 5.0
Description of soil : Residual soil : Brown silty sandy clay with laterit gravels
Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20°C} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	$\frac{\eta_T}{\eta_{20}}$	$K_{20°C}$ cm/sec
1D2-1	12.25	1	1	2 800	100	—	67		300	4.18×10^{-5}			
			2	—	100	—	66.9	30	300	5.0 –	5.0×10^{-5}	0.8019	4.0×10^{-5}
			3	—	100	—	67		300	5.0 –			
1D2-2	13.49	2	1	2 800	100	2 820	69.5		1200	1.13×10^{-5}			
			2	—	100	—	69.5	30	1200	1.13 –	1.13×10^{-5}	0.8019	9.1×10^{-6}
			3	—	100	—	69.5		1200	1.13 –			
1D2-3	14.53	3	1	2 800	102	2 900	63.6		3600	4.9×10^{-6}			
			2	900	102	1800	63.5	30	3600	4.91×10^{-6}	4.91×10^{-6}	0.8019	3.93×10^{-6}
			3	– 1000	100	– 1100	63.3		3600	4.91×10^{-6}			
1D2-4	14.61	4	1	2 1000	100	2 1130	60		5400	3.53×10^{-6}			
			2	– 1130	102	2 1300	58	30	5400	3.9×10^{-6}	3.9×10^{-6}	0.8019	3.13×10^{-6}
			3	– 1330	102	– 1500	58		5400	3.9×10^{-6}			
1D2-5	13.86	5	1	2 800	102	2820	75.8		1200	9.23×10^{-6}			
			2	—	102	—	75.8	—	1200	9.23	9.23×10^{-6}	—	7.4×10^{-6}
			3	—	101	—	75.0		1200	9.26			
1D2-6	12.99	1	1	2 900	100	2 940	66.9		600	2.5×10^{-5}			
			2		100		62.0	30	600	2.49×10^{-5}	2.49×10^{-5}	0.8019	2.0×10^{-5}
			3		100		67		600	2.49×10^{-5}			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI COMBINED HYDRO POWER
Location of sample : TP2D-1
Depth : 2.0 - 2.5
Description of soil : Residual soil of basalt : Brown silty sandy clay.

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe α : 0.28cm²
Formule of calculation :

$$K_T = \frac{\alpha L}{At} \ln \frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	$\frac{\eta_T}{\eta_{20}}$	K_{20^oC} cm/sec
2D1-1	11.98	1	1	7h30	101	7h40	60	30	630"	2.92×10^{-5}	2.4×10^{-5}	0.8019	1.92×10^{-5}
			2	8h00	100	8h11	59		660	2.40×10^{-5}			
			3	8h20	100	8h31	60		660	2.91×10^{-5}			
2D1-2	12.46	2	1	8h10	102	8h22	70	30	1320	8.53×10^{-6}	8.16×10^{-6}	0.8019	7.18×10^{-6}
			2	8h25	100	8h39	65		1440	8.96×10^{-6}			
			3	8h55	102	9h20	65		1500	1.02×10^{-5}			
2D1-3	12.96	3	1	9h00	102	9h52	70	30	3120	3.61×10^{-6}	3.61×10^{-6}	0.8019	2.9×10^{-6}
			2	10h00	100	10h50	75		3000	2.87×10^{-6}			
			3	11h00	100	12h00	60		3600	4.24×10^{-6}			
2D1-4	12.95	4	1	8h00	100	8h50	75	30	3000	2.97×10^{-6}	2.8×10^{-6}	0.8019	2.25×10^{-6}
			2	9h10	101	10h40	60		6000	2.6×10^{-6}			
			3	10h50	102	12h10	65		4500	2.8×10^{-6}			
2D1-5	12.3	5	1	9h00	101	9h15	60	30	4520	3.45×10^{-6}	3.5×10^{-6}	0.8019	2.8×10^{-6}
			2	10h00	100	10h43	76		2580	3.49×10^{-6}			
			3	11h00	100	11h40	65		2400	3.23×10^{-6}			
2D1-6	11.41	1	1	9h00	100	—	59	30	396	3.98×10^{-5}	3.94×10^{-5}	0.8019	3.16×10^{-5}
			2	9h00	100	—	60		400	3.81×10^{-5}			
			3	10h00	100	—	60		396	3.94×10^{-5}			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER
Location of sample : TP2D-2
Depth : 4.5 - 5.0
Description of soil : Reddish brown laterit gravel with sandy clay mixture

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe α : 0.28cm²
Formule of calculation :

$$K_T = \frac{\alpha L}{At} \ln \frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	$\frac{\eta_T}{\eta_{20}}$	K_{20^oC} cm/sec
2D2-1	12.99	1	1	—	100	—	60	30°	76	2.5×10^{-4}	2.5×10^{-4}	0.8019	2.0×10^{-4}
			2	—	100	—	60		76	2.5×10^{-4}			
			3	—	100	—	60		76	2.5 —			
2D2-2	13.67	2	1	—	102	—	60	—	750	2.69×10^{-5}	2.69×10^{-5}	—	2.15×10^{-5}
			2	—	103	—	60		748	2.69 —			
			3	—	103	—	60		751	2.69 —			
2D2-3	14.22	3	1	24h00	103	24h38	60	—	2880	7.0×10^{-6}	7.13×10^{-6}	—	5.68×10^{-6}
			2	— 13h50	102	— 1438	58		2880	7.32 —			
			3	— 1440	102.5	— 1528	60		2880	6.94 —			
2D2-4	14.12	4	1	24h00	102	24h44	60	—	2640	7.5×10^{-6}	7.5×10^{-6}	—	6.0×10^{-6}
			2	— 9h55	102	— 1033	58		2880	7.32 —			
			3	— 1040	102	— 1130	55		3000	7.6 —			
2D2-5	13.53	5	1	—	100	—	54	—	600	3.75×10^{-5}	3.75×10^{-5}	—	3.0×10^{-5}
			2	—	100	—	55		600	3.72 —			
			3	—	103	—	53		600	4.10 —			
2D2-6	12.69	1	1	—	100	—	60	—	60	3.17×10^{-4}	3.17×10^{-4}	—	2.54×10^{-4}
			2	—	100	—	60		60	3.14 —			
			3	—	100	—	60		60	3.18 —			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP3D-1
Depth : 2.0 – 2.5
Description of soil : Reddish brown silty sandy clay.

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

Type of sample : Remoulded to standard compression result
Date of testing :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	K_{20^oC} cm/sec
3D1-1	12.0	1	1	5 8 00	103	5 8 ~	60		165	1.15×10^{-4}	1.15×10^{-4}	0,8019	9.2×10^{-5}
			2	–	103	–	60	30°	165	1.15×10^{-4}			
			3	–	103	–	60		165	1.15×10^{-4}			
3D -2	12.56	2	1	5 8 20	103	5 8 3 4	60		840	2.40×10^{-5}	2.38×10^{-5}	—	1.91×10^{-5}
			2	– 8 3 5	102	– 8 4 5	58	—	840	2.36×10^{-5}			
			3	– 8 5 0	102.5	– 9 0 4	58		840	2.38×10^{-5}			
3D1-3	13.23	3	1	5 8 3 0	102	5 9 0 0	75		18 00	6.38×10^{-6}	6.38×10^{-6}	—	5.12×10^{-6}
			2	9 0 0	102	– 9 3 0	74.8	—	18 00	6.43×10^{-6}			
			3	– 9 3 0	102.5	– 10 00	74 0		1800	6.34 –			
3D1-4	13.55	4	1	5 10 00	101	5 11 3 0	74		54 00	2.15×10^{-6}	2.87×10^{-6}	—	2.3×10^{-6}
			2	11 3 0	100.5	– 13 3 0	67	—	54 00	2.80×10^{-6}			
			3	– 13 3 0	100	– 15 0 0	66		54 00	2.87×10^{-6}			
3D1-5	13.14	5	1	5 10 00	100	5 10 4 0	61.3		24 00	7.61×10^{-6}	7.70×10^{-6}	—	6.17×10^{-6}
			2	– 10 4 0	100	– 11 2 0	61.0	—	24 00	7.69 –			
			3	– 11 2 0	103	– 12 0 0	62.0		24 00	7.90 –			
3D1-6	12.35	1	1	5 10 3 0	100	5 10 5 0	61		360	5.1×10^{-5}	5.1×10^{-5}	—	4.1×10^{-5}
			2	– 10 5 0	101	– 11 1 0	62	—	360	5.06×10^{-5}			
			3	– 11 1 0	101	– 11 3 0	62		360	5.06×10^{-5}			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP3D-2
Depth : 4,5 – 5,0
Description of soil : Reddish brown laterit gravel with sandy clay mixture

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

Type of sample : Remoulded to standard compression result
Date of testing :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	K_{20^oC} cm/sec
3D2-1	13.72	1	1	25 8 00	100	—	60		53	3.6×10^{-4}	3.6×10^{-4}	0,8019	2.89×10^{-4}
			2	—	100	—	60	30°C	53	3.57 —			
			3	—	100	—	60		54	3.49 —			
3D2-2	14.70	2	1	—	100	—	60		510	3.74×10^{-5}	3.74×10^{-5}	—	2.99×10^{-5}
			2	—	100	—	60	—	510	3.74 —			
			3	—	100	—	60		510	—			
3D2-3	15.52	3	1	25 9 30	100	25 10 00	60		1800	1.06×10^{-5}	1.06×10^{-5}	—	8.48×10^{-6}
			2	– 10 00	100	– 10 30	60	—	1800	—			
			3	– 10 30	100	– 11 00	60		1800	—			
3D2-4	15.65	4	1	25 10 00	100	25 10 50	60		3000	6.35×10^{-6}	6.35×10^{-6}	—	5.1×10^{-6}
			2	– 11 00	100	– 11 50	60	—	3000	6.35×10^{-6}			
			3	– 11 50	100	– 12 40	60		3000	—			
3D2-5	15.08	5	1	25 13 00	100	25 13 2 1	60		1260			0,8019	1.21×10^{-5}
			2	– 13 30	100	– 13 51	60	30°C	1260	1.51×10^{-5}			
			3	– 13 5 5	100	– 14 16	60		1260				
3D2-6	14.09	6	1	—	100	—	60		66	2.88×10^{-4}	2.88×10^{-4}	—	2.3×10^{-5}
			2	—	100	—	60	—	66	—			
			3	—	100	—	60		66	—			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP 4 D – 1
Depth : 2.0 – 2.5
Description of soil : Residual soil: brown silty sandy clay
Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} \ln\frac{H_1}{H_2} \quad \& \quad K_{20°C} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	$K_{20°C}$ cm/sec
4D1-1	11,18	1	1	29 800	100	—	60	30	780	2.45×10^{-5}	2.45×10^{-5}	0,8019	1.15×10^{-5}
			2	—	100	—	60		785	2.43×10^{-5}			
			3	—	100	—	60		785	2.43×10^{-5}			
4D1-2	12.42	2	1	27808	101	27100	60	30	7200	2.7×10^{-6}	2.7×10^{-6}	0,8019	2.2×10^{-6}
			2	– 1000	100	– 1202	59		7320	2.7×10^{-6}			
			3	– 1210	100	– 1410	60		7320	2.6×10^{-6}			
4D1-3	13.13	3	1	28800	101	28133	60	30	19800	9.8×10^{-7}	9.8×10^{-7}	0,8019	7.9×10^{-7}
			2	29 800	102	29133	61		19860	9.7×10^{-7}			
			3										
4D1-4	13.42	4	1	28830	101	29 800	52	30	48600	5.1×10^{-7}	5.1×10^{-7}	0,8019	4.09×10^{-7}
			2	29830	101.2	29 1630	70		28800	4.8×10^{-7}			
			3										
4D1-5	12.99	5	1	28830	100	28 1348	65	30	20880	7.7×10^{-7}	7.6×10^{-7}	0,8019	6.1×10^{-7}
			2	28830	101.2	29 1560	60		25800	7.5×10^{-7}			
			3	30 900	100	30 1558	60		25 080	7.6×10^{-7}			
4D1-6	12.00	6	1	28800	101	28900	60	30	36000	5.4×10^{-6}	5.4×10^{-6}	0,8019	4.3×10^{-6}
			2	– 905	102.5	1004	61.5		36000	5.3 —			
			3	– 1010	100	– 1109	60		3560	5.4 —			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP4D – 2
Depth : 4,0 – 4,5
Description of soil : Residual soil of badalt: Brown silty sandy clay with fine gravels
Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} \ln\frac{H_1}{H_2} \quad \& \quad K_{20°C} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	$K_{20°C}$ cm/sec
4D2-1	12.13	1	1	1 800	100	—	56	30	600	3.6×10^{-5}	3.63×10^{-5}	0,8019	2.9×10^{-5}
			2	—	100	—	60		540	3.53 —			
			3	—	100	—	60		520	3.46 —			
4D2-2	12.86	2	1	1 800	102	1930	68	30	1800	8.4×10^{-6}	8.8×10^{-6}	0,8019	7.09×10^{-6}
			2	930	100	– 1000	65		1800	8.9 —			
			3	– 1000	101	– 1030	66		1800	8.8 —			
4D2-3	13.35	3	1	1 800	102	1 1000	60	30	7200	2.35×10^{-6}	2.77×10^{-6}	0,8019	2.22×10^{-6}
			2	– 1000	102	– 1200	59.5		7200	2.35×10^{-6}			
			3	– 1200	103	– 1405	59.0		7500	2.77×10^{-6}			
4D2-4	13.37	4	1	1 800	102	1 1000	66.2	30	7200	2.24×10^{-6}	2.24×10^{-6}	0,8019	1.80×10^{-6}
			2	– 1000	102	– 1200	66.3		7200	2.23×10^{-6}			
			3	– 1200	103	– 1405	65.7		7500	2.24×10^{-6}			
4D2-5	12.38	5	1	1 800	100	—	72.0	—	900	1.52×10^{-5}	1.41×10^{-5}	0,8019	1.13×10^{-5}
			2	—	102	—	72.6		900	1.41 —			
			3		102		72.5		900	1.41 —			
4D2-6	11,65	1	1	1 1000	100	—	47		300	9.39×10^{-5}	9.35×10^{-5}	0,8019	7.5×10^{-5}
			2	—	100	—	47.2	—	300	9.32 —			
			3		100		47.2		300	9.34 —			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER
Location of sample : TP5D-1
Depth : 2.0 – 2,5
Description of soil : Brown sandy silty clay of basalt

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} \ln\frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	K_{20^oC} cm/sec
5D1-1	11.27	1	1	6 8h	102	6 935	65		900	1.87×10^{-5}	1.87×10^{-5}	0,8019	1.5×10^{-5}
			2	– 825	102	– 840	65	30°	900	1.87 –			
			3	– 840	101	– 855	64		900	1.89 –			
5D1-2	12.16	2	1	6 880	100	6 930	69.6		5400	2.5×10^{-6}	2.53×10^{-6}	0,8019	2.0×10^{-6}
			2	– 930	101	– 1000	70.0	30	5400	2.53×10^{-6} –			
			3	– 1000	101	– 1230	70.0		5400	2.53×10^{-6} –			
5D1-3	12.75	3	1	6 1000	103	6 1300	88		5400	1.07×10^{-6}	1.1×10^{-6}	0,8019	8.82×10^{-7}
			2	– 1330	101	– 1500	86	30	5400	1.10 –			
			3	– 1500	102	– 1630	87		5400	1.10 –			
5D1-4	12.94	4	1	6 800	100	6 1000	84.1		7200	9.0×10^{-7}	9.0×10^{-7}	0,8019	7.2×10^{-7}
			2	– 1000	101.5	– 1200	84.5	–	7200	9.3 –			
			3	– 1200	100	– 1400	86		7200	9.0 –			
5D1-5	12.25	5	1	6 900	101	6 1000	82.3		3600	2.12×10^{-6}	2.1×10^{-6}	0,8019	1.68×10^{-6}
			2	– 1000	101	– 1100	82.5	–	3600	2.10 –			
			3	– 1100	101	– 1200	82.5		3600	2.10 –			
5D1-6	11.27	1	1	6 930	100	6 940	82		600	1.25×10^{-5}	1.25×10^{-5}	0,8019	1.0×10^{-5}
			2	– 940	100	– 950	81.8	–	600	1.25×10^{-5}			
			3	– 950	100	– 1000	81.8		600	1.25×10^{-5}			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER
Location of sample : TP5 D – 2
Depth :
Description of soil : Residual soil of basalt: Brown silty sandy clay.

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} \ln\frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	K_{20^oC} cm/sec
5D2-1	1.170	1	1	31 7 40	101	7 50	60		600	2.60×10^{-6}	2.78×10^{-6}	0.8019	2.23×10^{-6}
			2	– 8 00	100	8 09	60	30°	540	2.87×10^{-6}			
			3	– 8 10	100	8 19	60		550	2.78×10^{-6}			
5D2-2	1.250	2	1	30 9 30	102	10 10	72		2400	4.24×10^{-6}	5.7×10^{-6}	0,8019	4.6×10^{-6}
			2	– 10 20	100	1106	60	30	2760	5.54×10^{-6}			
			3	– 1120	100	1204	60		2640	5.80×10^{-6}			
5D2-3	1.324	3	1	30 7 30	102	10 30	60		10800	1.47×10^{-6}	1.48×10^{-6}	0,8019	1.12×10^{-6}
			2	30 10 30	101	1330	59	30	10800	1.49 –			
			3	– 1330	101.5	1631	59		10860	1.50 –			
5D2-4	1.333	4	1	30 8 40	100	10 26	70		8760	1.22×10^{-6}	1.24×10^{-6}	0,8019	9.9×10^{-7}
			2	– 1030	102	1268	68	30	9000	1.35×10^{-6}			
			3	– 1300	102	1525	71		8700	1.25×10^{-6}			
5D2-5	1.265	5	1	30 8 00	100	921	60		4860	3.24×10^{-6}	3.24×10^{-6}	0,8019	2.6×10^{-6}
			2	30 9 21	100	1043	58	30	4920	3.31×10^{-6}			
			3	– 1050	102	1210	65		4800	3.19×10^{-6}			
5D2-6	1.175	1	1	30 9 00	100	9 23	60		1380	1.11×10^{-5}	1.12×10^{-5}	0,8019	8.92×10^{-6}
			2	– 930	101	9 53	60	30	1390	1.13×10^{-5}			
			3	– 955	100	10 18	60		1390	1.13×10^{-5}			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP6D - 1
Depth : 2,0 - 2,5
Description of soil : Residual soil of basalt: Brown silty sandy clay.

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} \ln\frac{H_1}{H_2} \quad \& \quad K_{20°C} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	$\frac{\eta_T}{\eta_{20}}$	$K_{20°C}$ cm/sec
6D1-1	11.39	1	1	29 —	100	—	60	30°	552	3.49×10^{-5}	3.44×10^{-5}	0,8019	$2,8\times10^{-5}$
			2	—	100	—	60		550	3.46×10^{-5}			
			3	—	100	—	60		550	3.49 —			
6D1-2	12.35	2	1	29 800	100	29 951	60	30	6660	2.86×10^{-6}	2.87×10^{-6}	0.8019	$2,4\times10^{-6}$
			2	— 1000	100	— 1151	60		6660	2.87 —			
			3	— 12.00	101	— 1350	60		6630	2.93 —			
6D1-3	13.02	3	1	29 800	100	29 123.0	70	30	16200	8.2×10^{-7}	$8,52\times10^{-7}$	—	$6,5\times10^{-7}$
			2	— 123.0	102	— 1205	70		16500	8.52 —			
			3	30 800	102	30 1235	70		16500	8.52 —			
6D1-4	13,04	4	1	29 830	102	29 1630	61	30	28800	6.66×10^{-7}	$6,63\times10^{-7}$	0.8019	$5,31\times10^{-7}$
			2	29 1630	102.5	30 800	38		58800	6.63×10^{-7}			
			3	30 800	100	— 1630	58		30600	7.10×10^{-7}			
6D1-5	12.5	5	1	29 800	100	29 910	75	30	4200	2.56×10^{-6}	$2,56\times10^{-6}$	—	$2,0\times10^{-6}$
			2	29 920	100	— 1024	76		4140	2.48 —			
			3	29 1030	100	— 1140	75		4200	2.58 —			
6D1-6	11.64	6	1	29 —	100	—	60	30	1000	1.9×10^{-5}	$1,9\times10^{-5}$	—	$1,5\times10^{-5}$
			2		100	—	60		1005	1.89 —			
			3	—	100	—	60		1000	1.90 —			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP6D - 2
Depth : 4.3 - 4.8
Description of soil : Brown sandy silty clay.

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} \ln\frac{H_1}{H_2} \quad \& \quad K_{20°C} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	$\frac{\eta_T}{\eta_{20}}$	$K_{20°C}$ cm/sec
6D2-1	11.76	1	1	2 —	100	2 —	60	30	102	1.87×10^{-4}	$1,87\times10^{-4}$	0,8019	$1,5\times10^{-4}$
			2	—	100	—	60		102	1.87×10^{-4}			
			3	—	100		60		104	1.83×10^{-4}			
6D2-2	12.5	2	1	25 900	102	25 912	60	30	250	2.64×10^{-5}	$2,65\times10^{-5}$	—	$2,12\times10^{-5}$
			2	—	103	—	60		760	2.65 —			
			3	—	103	—	60		760	2.65 —			
6D2-3	12.99	3	1	25 1130	103	25 1248	60	30	4680	4.3×10^{-6}	$4,39\times10^{-6}$	0.8019	$3,52\times10^{-6}$
			2	— 1250	102	— 1410	58		4800	4.39 —			
			3	— 1420	102	— 1540	58		4800	4.39 —			
6D2-4	12.96	4	1	25 1000	102	25 1130	65	30	5400	3.44×10^{-6}	$3,12\times10^{-6}$	—	$2,5\times10^{-6}$
			2	— 1130	102	— 1300	65		5400	3.44×10^{-6}			
			3	— 1300	102	— 1430	64.8		5400	3.44×10^{-6}			
6D2-5	12.74	5	1	— 9.00	102	25 1000	56	30	3600	6.22×10^{-6}	$6,24\times10^{-6}$	—	$5,0\times10^{-6}$
			2	— 1000	102	11.00	55.0		3600	6.24 —			
			3	— 11.00	101	12.00	55.0		3600	6.26 —			
6D2-6	12.00	1	1	—	100	✓	60	30	380	5.0×10^{-5}	$5,0\times10^{-5}$	—	$4,0\times10^{-5}$
			2	—	100	✓	60		380	5.0 —			
			3		100	✓	60		380	5.0 —			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP7D-1
Depth : 2.0 – 2.5
Description of soil : Laterit gravels with clayey sand.

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	K_{20^oC} cm/sec
7D1-1	13.09	1	1		100		60	30°C	28'	6.8×10^{-4}			
			2		103		60		29'	6.72 –	6.72×10^{-4}	0.8019	5.4×10^{-4}
			3		103		60		28	6.72 –			
7D1-2	13.63	2	1	8'40.00	100	8'51.0	60	–	600	3.17×10^{-5}			
			2		100		60		600	3.17×10^{-5}	3.17×10^{-5}	–	2.54×10^{-5}
			3		100		60		600	3.17 –			
7D1-3	14.07	3	1	8'11.00	100	8'12.05	60	–	3780	5.04×10^{-6}			
			2	12.10	102	13.16	60		3816	5.14×10^{-6}	5.14×10^{-6}	–	4.12×10^{-6}
			3	13.30	101	13.35	60		3780	5.14×10^{-6}			
7D1-4	14.21	4	1	8'11.00	102	8'12.30	60	–	5400	3.68×10^{-6}			
			2	12.50	101	13.00	59.5		5400	3.66×10^{-6}	3.67×10^{-6}	–	2.94×10^{-6}
			3	13.00	101.5	13.30	59.7		5400	3.67×10^{-6}			
7D1-5	13.82	5	1	8'13.00	103	8'15.30	65.6	–	1800	9.35×10^{-6}			
			2	13.30	102	14.00	66.0		1800	9.02×10^{-6}	9.36×10^{-6}	–	7.5×10^{-6}
			3	14.00	103	14.30	65.6		1800	9.36×10^{-6}			
7D1-6	12.86	6	1		102	–	60	–	160	1.25			
			2	–	102	–	60		160	1.25	1.25×10^{-4}	–	1.0×10^{-4}
			3	–	102	–	60		160	1.25 –			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP7D-2
Depth : 2.0 – 2.50
Description of soil : Reddish brown laterit gravels with silty clayey sand.

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	K_{20^oC} cm/sec
7D2-1	11.88	1	1	–	103	–	60	30°	22	9.17×10^{-4}			
			2	–	103	–	60		22	9.17 –	9.17×10^{-4}	0.8019	7.35×10^{-4}
			3	–	103	–	60		24	8.4 –			
7D2-2	12.84	2	1	–	101	–	60.	30	360	5.4×10^{-5}			
			2	–	102	–	60.4		360	5.93×10^{-5}	5.40×10^{-5}	0.8019	4.33×10^{-5}
			3	–	101	–	60		360	5.4×10^{-5}			
7D2-3	13.63	3	1	10'11.00	103	10'11.25	60.8	30	1500	1.26×10^{-5}			
			2	11.25	103	11.50	61.0		1500	1.20×10^{-5}	1.24×10^{-5}	–	1.05×10^{-5}
			3	11.55	103	13.20	60.8		1500	1.24×10^{-5}			
7D2-4	13.6	4	1	10'10.00	102	10'14.00	52.6	–	3600	6.86×10^{-6}			
			2	11.00	103	12.00	52.9		3600	6.90 –	6.86×10^{-6}	–	5.5×10^{-6}
			3	13.00	102	14.00	52.6		3600	6.67 –			
7D2-5	13.00	5	1	10'8.00	101	10'9.26	47	30	1560	1.83×10^{-5}			
			2	11.00	101	11.22	53		1320	1.83 –	1.83×10^{-5}	–	1.47×10^{-5}
			3	11.25	102	11.50	47		1560	1.85 –			
7D2-6	12.16	1	1	–	103	–	60	–	240	8.4×10^{-5}			
			2	–	103	–	60		240	8.4×10^{-5}	8.4×10^{-5}	0.8019	6.74×10^{-5}
			3	–	100	–	58		240	8.4×10^{-5}			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 x 4 COMBINED HYDROPOWER
Location of sample : TP8D-1
Depth : 2.0 – 2.5
Description of soil : Reddish brown silty sandy clay.

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

Type of sample : Remoulded to standard compression result
Date of testing :

$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2}$ & $K_{20°C} = K_T \frac{\eta_T}{\eta_{20}}$ cm/sec

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	$K_{20°C}$ cm/sec
BD1-1	11.27	1	1	3.800	101	–	60	30	300	6.48×10^{-5}	6.20×10^{-5}	0.8019	5.0×10^{-5}
			2	–	100	–	61		300	6.15 –			
			3	–	102	–	62		300	6.19 –			
BD1-2	12.1	2	1	3.800	102.5	3.838	70	30°	2280	6.24×10^{-6}	7.0×10^{-6}	0.8019	5.61×10^{-6}
			2	– 840	103.5	– 919	65		2340	6.95 –			
			3	– 920	102.0	– 1000	65		2400	7.01 –			
BD1-4 ④	12.63	3	1	3.800	101.0	3.1100	29.0	30	10800	8.49×10^{-7}	8.5×10^{-7}	0.8019	6.82×10^{-7}
			2	– 1100	102	– 1200	80.0		10800	8.40 –			
			3	– 1400	102	– 1700	79.5		10800	8.61 –			
BD1-3 ⑤	12.99	4	1	3.800	100	3.940	75	–	6000	1.79×10^{-6}	1.83×10^{-6}	–	1.47×10^{-6}
			2	– 950	107	– 1130	76		6000	1.83×10^{-6}			
			3	– 1130	102	– 1340	76		6000	1.83×10^{-6}			
BD1-5	12.65	5	1	3.900	103	3.1040	80.0	–	6000	1.57×10^{-6}	1.59×10^{-6}	–	1.28×10^{-6}
			2	– 1050	103	– 1230	79.8		6000	1.59 –			
			3	– 1230	103	– 1410	79.8		6000	1.59 –			
BD1-6	12.25	1	1	3.930	103	3.1000	70	–	1800	8.01×10^{-6}	8.0×10^{-6}	–	6.42×10^{-6}
			2	– 1000	103	– 1230	68.8		1800	8.10×10^{-6}			
			3	– 1030	103	– 1100	70		1800	8.01×10^{-6}			

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A - 457

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 x 4 COMBINED HYDROPOWER
Location of sample : TP8D-2
Depth : 4.5 – 5.0
Description of soil : Reddish brown silty sandy clay.

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

Type of sample : Remoulded to standard compression result
Date of testing :

$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2}$ & $K_{20°C} = K_T \frac{\eta_T}{\eta_{20}}$ cm/sec

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	$K_{20°C}$ cm/sec
BD2-1	12.00	1	1	✓	101	✓	60		240	7.83×10^{-5}	7.93×10^{-5}	0.8019	6.4×10^{-5}
			2	✓	101		60	30°	240	✓			
			3	✓	101		60		240	✓			
BD2-2	12.74	2	1	4.900	102	4.915	78	30°	900	1.1×10^{-5}	1.1×10^{-5}	–	8.8×10^{-6}
			2	– 915	102	– 930	78		900	1.1×10^{-5}			
			3	– 930	103	– 945	79		900	1.1×10^{-5}			
BD2-3	13.15	3	1	4.1000	103	4.1130	54	30	5400	3.58×10^{-6}	3.63×10^{-6}	0.8019	2.91×10^{-6}
			2	– 1130	102	– 1300	53		5400	3.63 –			
			3	– 1330	103	– 1500	52		5400	3.79 –			
BD2-4	13.18	4	1	4.1100	102	4.1230	68	–	5400	2.80×10^{-6}	2.75×10^{-6}	–	2.2×10^{-6}
			2	– 1300	102	– 1430	68.5		5400	2.75 –			
			3	– 1430	101	– 1600	69		5400	2.63 –			
BD2-5	12.65	5	1	4.1000	102	4.1240	63	–	2400	7.5×10^{-6}	7.5×10^{-6}	–	6.01×10^{-6}
			2	– 1300	102	– 1340	63		2400	7.5 –			
			3	– 1400	102	– 1440	63		2400	7.5 –			
BD2-6	11.86	1	1	4.1030	102	– 1060	55.8	–	600	3.25×10^{-6}	3.73×10^{-6}	0.8019	2.99×10^{-6}
			2	– 1050	102	– 1100	56		600	3.73 –			
			3	– 1100	102	– 1110	56		600	3.73 –			

- 140 b -

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 x 4 COMBINED HYDRO POWER
Location of sample : TP9D-1
Depth : 2.0 - 2.5
Description of soil : Brown sandy silty clay.

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20°C} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	$K_{20°C}$ cm/sec
9D1-1	11.76	1	1	7 800	102	7 806	60	30°C	240	8.25×10^{-5}	8.25×10^{-5}	0.8019	6.62×10^{-5}
			2	"	102	"	60		240	8.25 "			
			3	"	101	"	60.5		240	9.7 "			
9D1-2	12.50	2	1	7 1100	102	7 1130	65.0	30	1800	9.34×10^{-6}	9.34×10^{-6}	—	7.49×10^{-6}
			2	1130	102	1200	64.8		1800	9.4×10^{-6}			
			3	1300	102	1330	65.0		1800	9.34 "			
9D1-3	13.09	4	1	7 1100	102.5	7 1330	73.4	30	9000	1.17×10^{-6}	1.17×10^{-6}	—	9.38×10^{-7}
			2	1330	101.0	1600	76.5		9000	1.15×10^{-6}			
			3	1600	103.0	1800	81.9		7200	1.19×10^{-6}			
9D1-4	13.33	3	1	7 900	102	7 1200	76.5	30	10800	9.94×10^{-7}	9.94×10^{-7}	—	7.97×10^{-7}
			2	1200	102	1500	76.4		10800	9.94 "			
			3	1500	102	1730	80.3		9000	9.92 "			
9D1-5	13.25	5	1	7 1100	102	7 1230	75	30	5400	2.12×10^{-6}	2.17×10^{-6}	—	1.74×10^{-6}
			2	1300	102	1430	74.8		5400	2.17 "			
			3	1430	102	1600	74.6		5400	2.17 "			
9D1-6	12.45	1	1	7 900	102.4	930	60	30	1800	1.11×10^{-5}	1.12×10^{-5}	—	9.0×10^{-6}
			2	930	102	1000	59.5		1800	1.12×10^{-5}			
			3	1000	102	1030	59.5		1800	1.12×10^{-5}			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3 x 4 COMBINED HYDRO POWER
Location of sample : TP9D-2
Depth : 4.0 - 4.5
Description of soil : Brown sandy silty clay

Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm²; *Height L* : 4cm
Volume V : 120cm³; *Height of standpipe* : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20°C} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	$K_{20°C}$ cm/sec
9D2-1	11.52	1	1	8 —	100	—	60	30	660	2.89×10^{-5}	2.90×10^{-5}	0.8019	2.33×10^{-5}
			2	—	100	—	60		660	2.90 —			
			3	—	100	—	60		660	2.90 —			
9D2-2	12.40	2	1	8 800	100	8 930	69.7	—	5400	2.50×10^{-6}	2.50×10^{-6}	—	2.0×10^{-6}
			2	930	100	1100	69.7	—	5400	2.50 —			
			3	1100	100	1300	61.7		7200	2.57 —			
9D2-3	13.00	3	1	8 800	103	8 930	77.7		12600	8.55×10^{-7}	8.40×10^{-7}	0.8019	6.73×10^{-7}
			2	930	102	1500	76.8	30	12600	8.40 —			
			3	1500	102	1830	76.7		12600	8.44			
9D2-4	12.87	4	1	8 800	103	8 930	69.2	30	12600	1.18×10^{-6}	1.18×10^{-6}	—	9.45×10^{-7}
			2	930	103	1500	69.2		12600	1.18×10^{-6}			
9D2-5	12.25	5	1	8 1000	103	8 1050	65.7	30	3000	5.6×10^{-6}	5.61×10^{-6}	—	4.5×10^{-6}
			2	1000	103	1050	65.6		3000	5.61 —			
			3	1300	102	1330	65.0		3000	5.61 —			
9D2-6	11.27	1	1	8 900	102	—	60	30	380	5.01×10^{-5}	5.0×10^{-5}	—	4.0×10^{-5}
			2	—	102	—	60		380	5.01 —			
			3	—	102	—	60		386	4.96			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3x4 COMBINED HYDRO POWER
Location of sample : TP10D-1
Depth : 2.0 - 2.5
Description of soil : Reddish brown laterit gravels silty clayey sand mixture.
Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	K_{20^oC} cm/sec
10D1-1	13.71	1	1	-	100	-	60		35	5.45×10^{-4}			
			2	-	100	-	60	30°C	35	5.45×10^{-4}	5.45×10^{-4}	0.8019	4.37×10^{-4}
			3	-	100	-	60		35	5.45 -			
10D1-2	14.74	2	1	-	100	-	60		150	1.26×10^{-4}			
			2	-	103	-	62	30	154	1.23 -	1.23×10^{-4}	-	9.9×10^{-5}
			3	-	103	-	62.1		154	1.23 -			
10D1-3	15.47	3	1	11.804	103	-	58.5		480	4.4×10^{-5}			
			2		103	-	58.5	-	480	4.4 -	4.4×10^{-5}	-	3.53×10^{-5}
			3		103	-	59.0		488	4.33 -			
10D1-4	15.8	4	1	11.815	101	11.830	60		900	2.16×10^{-5}			
			2	830	102	865	60	30	900	22 -	2.05×10^{-5}	0.8019	1.64×10^{-5}
			3	850	102	907	56		1020	1.94 -			
10D1-5	15.06	5	1	-	103	-	59.8		360	5.64×10^{-5}			
			2	-	103	-	60.0	-	360	5.60 -	5.6×10^{-5}	-	4.48×10^{-5}
			3	-	103	-	60.0			5.60 -			
10D1-6	13.96	2	1	-	103	-	60		80	2.5×10^{-4}			
			2	-	103	-	60	30	80	2.52×10^{-4}	2.52×10^{-4}	-	2.02×10^{-4}
			3	-	103	-	60		80	2.52 -			

COEFFICIENT OF PERMEABILITY TEST (Falling head method)
THÍ NGHIỆM HỆ SỐ THẤM (Phương pháp đầu nước biến đổi)

Project : DONG NAI 3x4 COMBINED HYDROPOWER
Location of sample : TP10D-2
Depth : 4.5 - 5.0
Description of soil : Reddish brown laterit gravels with silty clayey sand mixture.
Type of sample : Remoulded to standard compression result
Date of testing :

Data of sample and apparatus :
Diameter : 6.18cm; Area A : 30cm²; Height L : 4cm
Volume V : 120cm³; Height of standpipe : 100cm
Area of standpipe a : 0.28cm²
Formule of calculation :

$$K_T = \frac{aL}{At} Ln\frac{H_1}{H_2} \quad \& \quad K_{20^oC} = K_T \frac{\eta_T}{\eta_{20}} \text{ cm/sec}$$

Test data

Test & Job No	Dry Unit Wt. KN/m³	No of Standp.	Time N°	Initial of W.L D-h-m	Initial of W.L H_1 (cm)	Final of W.L D-h-m	Final of W.L H_2 (cm)	Temp. °C	Time elapsed t (sec)	Coeff. Per. K_T (cm/sec)	Average K_T (cm/sec)	η_T/η_{20}	K_{20^oC} cm/sec
10D2-1	14.7	1	1	-	100	-	60		10	1.9×10^{-2}			
			2	-	100	-	60	30	10	1.9 -	1.9×10^{-3}	0.8019	1.52×10^{-3}
			3	-	100	-	59		10	1.9 -			
10D2-2	15.69	2	1	-	100	-	60.0		90	2.12×10^{-4}			
			2	-	103	-	62.4	30	90	2.08 -	2.10×10^{-4}	-	1.68×10^{-4}
			3	-	103	-	62.5		90	2.07 -			
10D2-3	16.31	3	1	-	103	-	57.8		480	4.49×10^{-5}			
			2	-	103	-	58.0	30	480	4.47 -	4.48×10^{-5}	-	3.59×10^{-5}
			3	-	103	-	58.0		480	4.47 -			
10D2-4	16.33	4	1	12.820	102	12.828	59		480	4.4×10^{-5}			
			2	830	103	-	55	-	520	4.5×10^{-5}	4.4×10^{-5}	0.8019	3.53×10^{-5}
			3		103		50.8		600	4.4×10^{-5}			
10D2-5	15.69	5	1	-	103	-	60		160	1.25×10^{-4}			
			2	-	103	-	60	-	160	1.26 -	1.26×10^{-4}	-	1.01×10^{-4}
			3	-	103	-	60		160	1.26 -			
10D2-6	14.56	2	1	-	100	-	60		19	1.0×10^{-3}			
			2	-	100	-	60	-	19	1.0 -	1×10^{-3}	-	8.04×10^{-4}
			3	-	100	-	60		19	1.0 -			

DATA 4.1.2

LABORATORY TEST
OF
EARTH CORE MATERIAL
FOR
DONG NAI No.4 DAM

TRIAXIAL COMPRESSION TEST IN THE CONDITION UNCONSOLIDATED, UNDRAINED (UU)

TRIAXIAL COMPRESSION TEST

(SUMMARY AND REPORT DATA SHEET)

THÍ NGHIỆM NÉN BA TRỤC

(BÁO CÁO TỔNG HỢP)

TEST N° TP2D-2

TEST TYPE UU

SOIL DESCRIPTION : Reddish brown laterite gravels sandy clay mixture

TYPE OF SAMPLE : Remoulded to 0,95 MDD on wet branch

SHEARING RATE : 0.600 mm/min DATE : 25 July 1999

PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER

BOREHOLE N° : TP2D

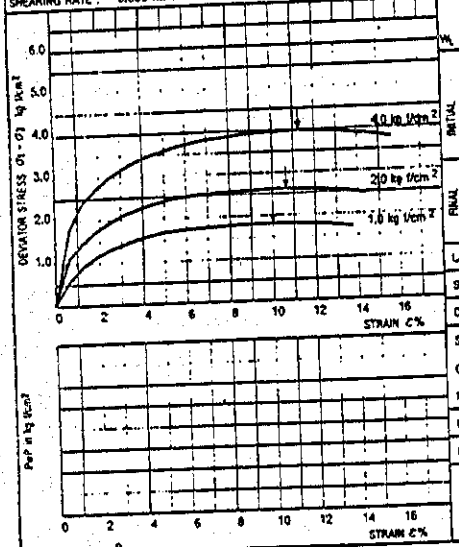
DEPTH OF SAMPLE : 4,5 - 5,0 m

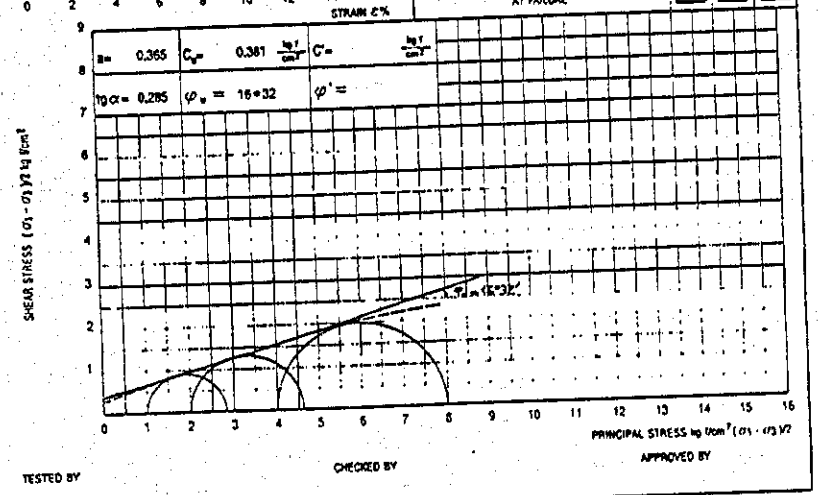
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

W_L 59.6 I_p 23,9 B -0,01 Ho 80 mm Do 39 mm

SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w g/cm³	1,871	1,871	1,871
	MOISTURE	W %	35,4	35,4	35,4
	DRY DENSITY	γ_d g/cm³	1,382	1,382	1,382
FINAL	WET DENSITY	γ_w g/cm³			
	MOISTURE	W %			
	DRY DENSITY	γ_d g/cm³			
LATERAL STRESS		σ_3 kg f/cm²	1,0	2,0	4,0
STRAIN		ε %	10,00	10,63	11,25
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	1,819	2,615	3,986
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$	0,909	1,307	1,993
CENTER MOHR CIRCLE		$(\sigma_1 + \sigma_3)/2$ kg f/cm²	1,909	3,307	5,993
PWP		U			
EFFECTIVE MOHR		$(\sigma_1 + \sigma_3)/2$			
MAX TOTAL STRESS		σ_1	2,819	4,615	7,986

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE





TESTED BY CHECKED BY APPROVED BY

TRIAXIAL COMPRESSION TEST

(SUMMARY AND REPORT DATA SHEET)

THÍ NGHIỆM NÉN BA TRỤC

(BÁO CÁO TỔNG HỢP)

TEST N° TP4D-1

TEST TYPE UU

SOIL DESCRIPTION : Brown silty sandy clay

TYPE OF SAMPLE : Remoulded to 0,95 MDD on wet branch

SHEARING RATE : 0.600 mm/min DATE : 17 July 1999

PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER

BOREHOLE N° : TP4D

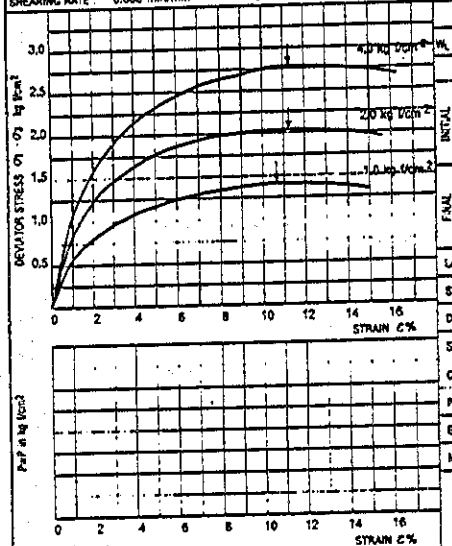
DEPTH OF SAMPLE : 2,0-2,5 m

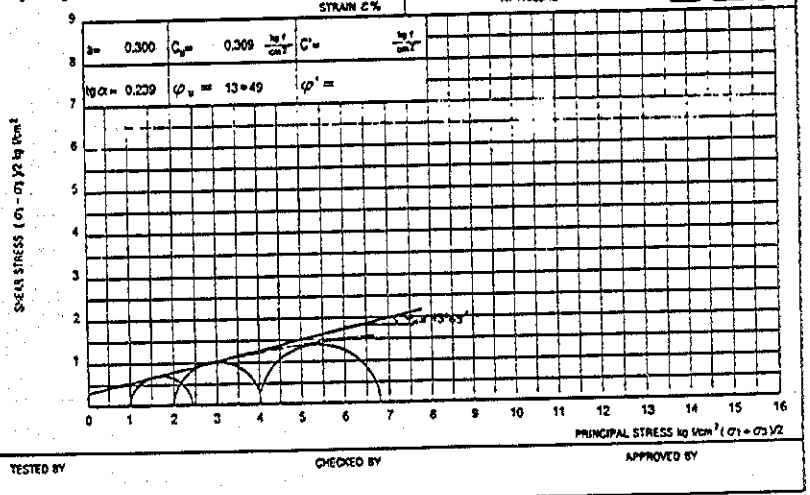
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

W_L 72,6 I_p 31,6 B -0,03 Ho 80 mm Do 39 mm

SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w g/cm³	1,820	1,820	1,820
	MOISTURE	W %	40,0	40,0	40,0
	DRY DENSITY	γ_d g/cm³	1,300	1,300	1,300
FINAL	WET DENSITY	γ_w g/cm³			
	MOISTURE	W %			
	DRY DENSITY	γ_d g/cm³			
LATERAL STRESS		σ_3 kg f/cm²	1,0	2,0	4,0
STRAIN		ε %	10,63	11,25	11,25
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	1,415	2,043	2,786
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$	0,708	1,022	1,393
CENTER MOHR CIRCLE		$(\sigma_1 + \sigma_3)/2$ kg f/cm²	1,708	3,022	5,393
PWP		U			
EFFECTIVE MOHR		$(\sigma_1 + \sigma_3)/2$			
MAX TOTAL STRESS		σ_1	2,415	4,043	6,786

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE





TESTED BY CHECKED BY APPROVED BY

TRIAXIAL COMPRESSION TEST
(SUMMARY AND REPORT DATA SHEET)
THÍ NGHIỆM NÉN BA TRỤC
(BÁO CÁO TỔNG HỢP)

TEST N° TP6D-2
TEST TYPE UU

SOIL DESCRIPTION : Brown silty sandy clay
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.600 mm/min DATE : 17 July 1999

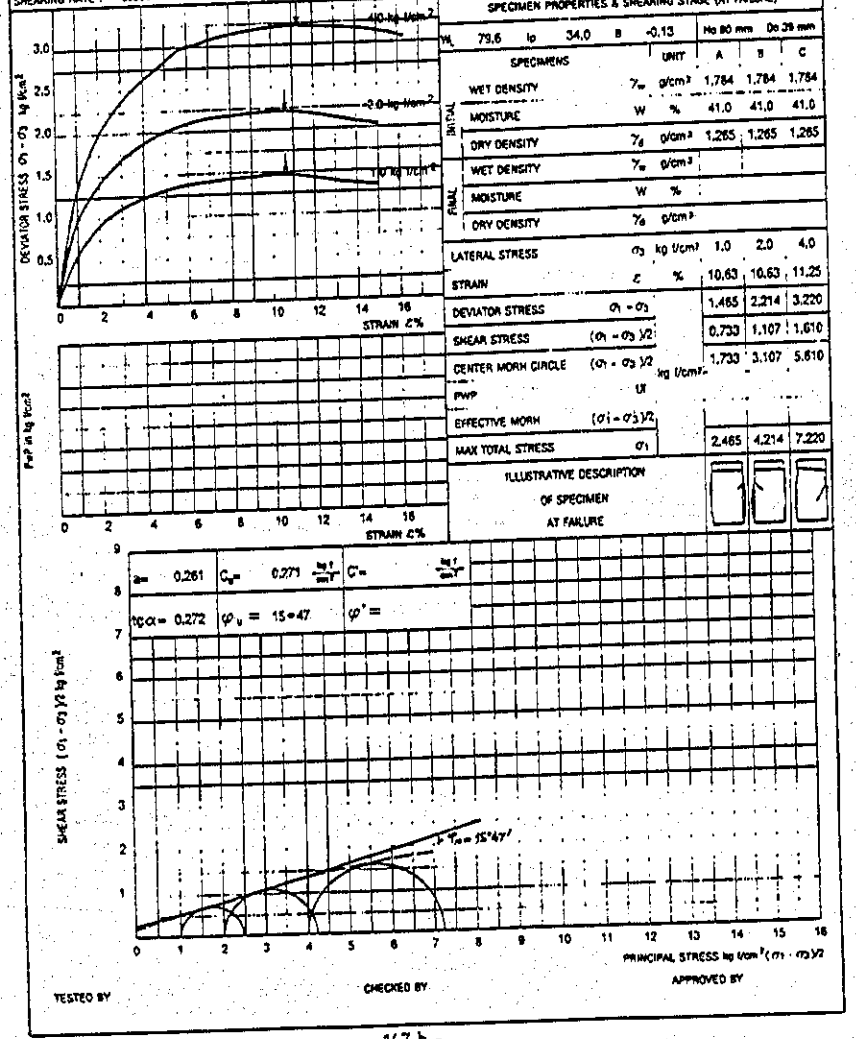
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N°: TP6D
DEPTH OF SAMPLE : 4.3 - 4.8 m

SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

W_L 79.6 Ip 34.0 B -0.13 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	1.784	1.784	1.784
	MOISTURE	W	%	41.0	41.0	41.0
	DRY DENSITY	γ_d	g/cm³	1.265	1.265	1.265
FINAL	WET DENSITY	γ_w	g/cm³			
	MOISTURE	W	%			
	DRY DENSITY	γ_d	g/cm³			
LATERAL STRESS		σ_3	kg f/cm²	1.0	2.0	4.0
STRAIN		ε	%	10.63	10.63	11.25
DEVIATOR STRESS		$\sigma_1 - \sigma_3$		1.465	2.214	3.220
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$		0.733	1.107	1.610
CENTER MORH CIRCLE		$(\sigma_1 + \sigma_3)/2$	kg f/cm²	1.733	3.107	5.610
PWP		Uf				
EFFECTIVE MORH		$(\sigma_1 - \sigma_3)/2$				
MAX TOTAL STRESS		σ_1		2.465	4.214	7.220

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE



TESTED BY CHECKED BY APPROVED BY

- 147 b -

TRIAXIAL COMPRESSION TEST
(SUMMARY AND REPORT DATA SHEET)
THÍ NGHIỆM NÉN BA TRỤC
(BÁO CÁO TỔNG HỢP)

TEST N° TP9D-2
TEST TYPE UU

SOIL DESCRIPTION : Brown silty sandy clay
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.600 mm/min DATE : 17 July 1999

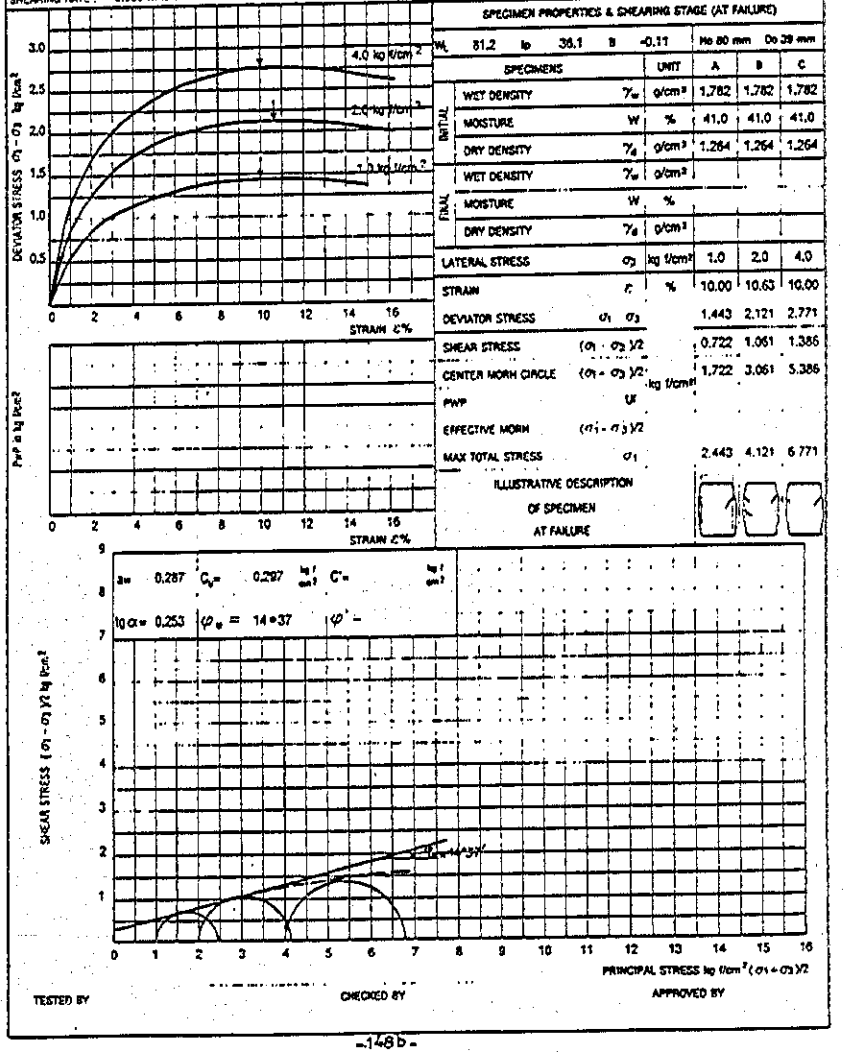
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N°: TP9D
DEPTH OF SAMPLE : 4.0 - 4.5 m

SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

W_L 81.2 Ip 36.1 B -0.11 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	1.782	1.782	1.782
	MOISTURE	W	%	41.0	41.0	41.0
	DRY DENSITY	γ_d	g/cm³	1.264	1.264	1.264
FINAL	WET DENSITY	γ_w	g/cm³			
	MOISTURE	W	%			
	DRY DENSITY	γ_d	g/cm³			
LATERAL STRESS		σ_3	kg f/cm²	1.0	2.0	4.0
STRAIN		ε	%	10.00	10.63	10.00
DEVIATOR STRESS		$\sigma_1 - \sigma_3$		1.443	2.121	2.771
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$		0.722	1.061	1.386
CENTER MORH CIRCLE		$(\sigma_1 + \sigma_3)/2$	kg f/cm²	1.722	3.061	5.386
PWP		Uf				
EFFECTIVE MORH		$(\sigma_1 - \sigma_3)/2$				
MAX TOTAL STRESS		σ_1		2.443	4.121	6.771

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE



TESTED BY CHECKED BY APPROVED BY

-148b-

TRIAXIAL COMPRESSION TEST
(SUMMARY AND REPORT DATA SHEET)
THÍ NGHIỆM NÉN BA TRỤC
(BÁO CÁO TỔNG HỢP)

TEST N° TP10D-2
TEST TYPE UU

SOIL DESCRIPTION : Reddish brown laterite gravels sandy clay
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.600 mm/mn DATE : 25 July 1999

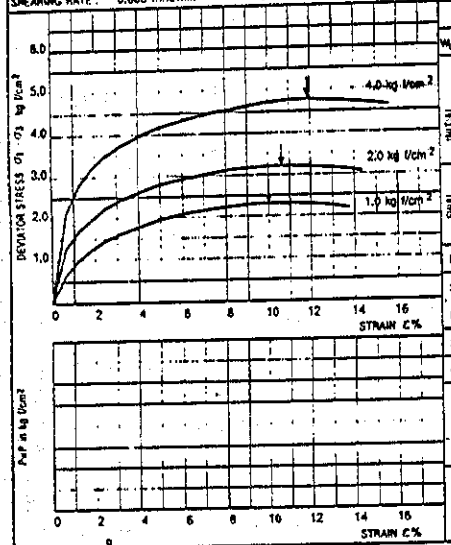
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N° : TP10D
DEPTH OF SAMPLE : 4.5 - 5.0 m

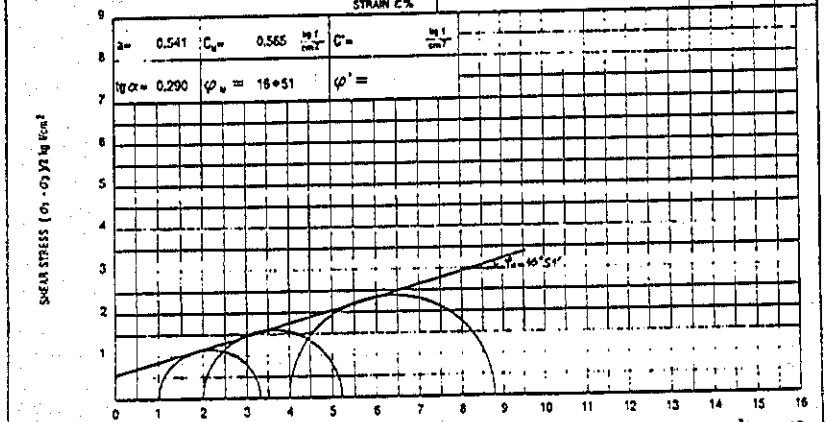
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

Wi Ip B Ho 80 mm De 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	2.030	2.030	2.030
	MOISTURE	W	%	27.6	27.6	27.6
	DRY DENSITY	γ_d	g/cm³	1.591	1.591	1.591
FINAL	WET DENSITY	γ_w	g/cm³			
	MOISTURE	W	%			
	DRY DENSITY	γ_d	g/cm³			
LATERAL STRESS		σ_3	kg f/cm²	1.0	2.0	4.0
STRAIN		ε	%	10.00	10.03	11.88
DEVIATOR STRESS	σ_1 σ_3			2.310	3.211	4.777
SHEAR STRESS	$(\sigma_1 - \sigma_3)/2$			1.155	1.605	2.389
CENTER MOHR CIRCLE	$(\sigma_1 + \sigma_3)/2$		kg f/cm²	2.155	3.605	6.389
PWP	UI					
EFFECTIVE MOHR	$(\sigma'_1 + \sigma'_3)/2$					
MAX TOTAL STRESS	σ_1			3.310	5.211	8.777

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE





TESTED BY CHECKED BY APPROVED BY

DATA 4.1.2

LABORATORY TEST
OF
EARTH CORE MATERIAL
FOR
DONG NAI No.4 DAM

TRIAXIAL COMPRESSION TEST IN THE CONDITION CONSOLIDATED, UNDRAINED (CU)

TRIAXIAL COMPRESSION TEST
(SUMMARY AND REPORT DATA SHEET)
THÍ NGHIỆM NÉN BA TRỤC
(BÁO CÁO TỔNG HỢP)

TEST N° : TP2D-2
TEST TYPE : CU-PwP

SOIL DESCRIPTION : Reddish brown laterite gravels sandy clay mixture
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0,180 mm/min DATE : 22-24 July 1999

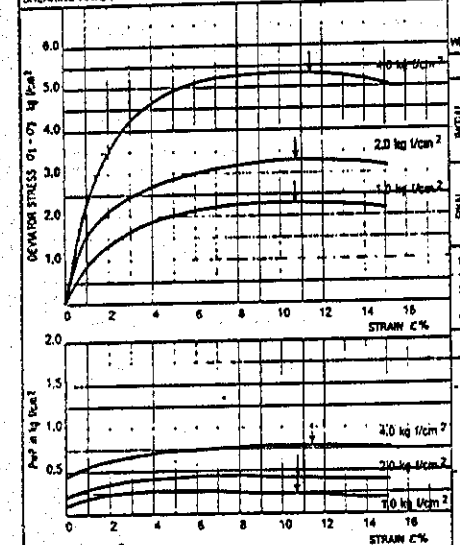
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N°: TP2D
DEPTH OF SAMPLE : 4,5 - 5.0m

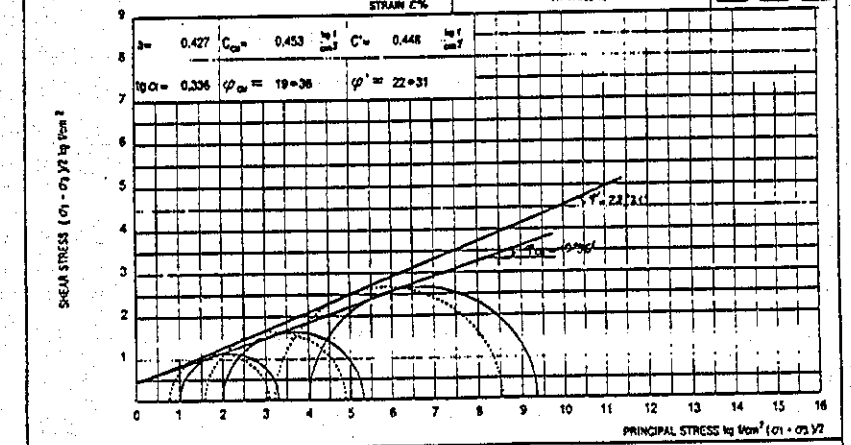
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

Ht 59.6 hp 23.9 B -0.01 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	1,871	1,871	1,871
	MOISTURE	W	%	35,40	35,40	35,40
	DRY DENSITY	γ_d	g/cm³	1,382	1,382	1,382
FINAL	WET DENSITY	γ_w	g/cm³	1,885	1,896	1,906
	MOISTURE	W	%	34,20	33,40	32,60
	DRY DENSITY	γ_d	g/cm³	1,405	1,421	1,437
LATERAL STRESS		σ_3	kg f/cm²	1,00	2,00	4,00
STRAIN		ε	%	10,68	10,72	11,40
DEVIATOR STRESS		$\sigma_1 - \sigma_3$		2,299	3,300	5,330
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$		1,150	1,650	2,665
CENTER MORH CIRCLE		$(\sigma_1 + \sigma_3)/2$	kg f/cm²	2,150	3,650	6,665
PWP		U		0,23	0,42	0,79
EFFECTIVE MORH		$(\sigma_1 + \sigma_3)/2$		1,920	3,230	5,875
MAX TOTAL STRESS		σ_1		3,299	5,300	9,330

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE





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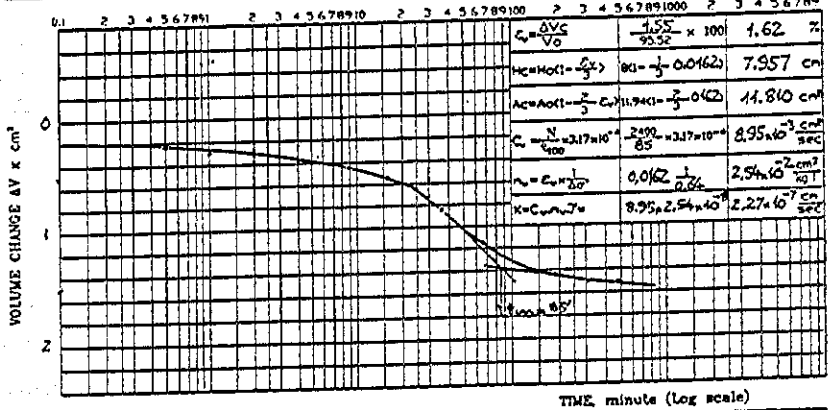
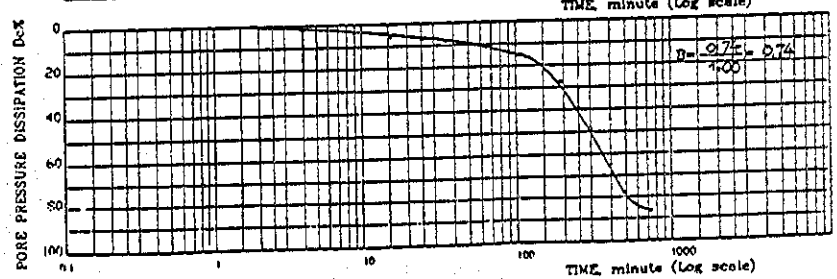
TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N° : TP 2D-2 TEST TYPE : CU - PWP DATE STARTED : 22-7-99
PROJECT : DONG NAI 3 & 4 COMBINED HYDROPOWER ROAD RING N° :

TEST TYPE CU — WITH / WITHOUT SIDE DRAINS

		DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
CELL PRESSURE	1,0 kg f/cm²	22-7	6.30	0		29,00	0,00	0,74	0	0
VERTICAL STRESS	1,0			30"		28,75	0,25	0,74	0	0
BACK STRESS	0			1'		28,70	0,30	0,74	0	0
Pwp AFTER BUILD UP				2		28,70	0,30	0,74	0	0
DIFFERENCE				4		28,65	0,35	0,73	0,01	1,4
EFFECTIVE PRESSURE				9		28,55	0,45	0,72	0,02	2,7
$\sqrt{t_{100}}$ =	t_{100} = 85 min.			16		28,45	0,55	0,70	0,04	5,4
$t_v = a \cdot t_{100} = 0,51 \times 85 = 43,4$				25		28,35	0,65	0,69	0,05	6,8
				36		28,20	0,80	0,68	0,06	8,1
RATE OF DISPLACEMENT				64'		27,80	1,20	0,66	0,08	10,8
$\frac{\Sigma_{1,2} H_{pi}}{100 \cdot t_{1,2}} = 0,10 \times \frac{79,57}{43,4} = 0,185$				2h		27,65	1,35	0,63	0,11	14,9
				3		27,55	1,45	0,54	0,20	27,0
select v = 0,180 mm/min				5		27,50	1,50	0,38	0,36	48,6
				8		27,50	1,50	0,16	0,58	78,4
		-	18 30	12		27,45	1,55	0,10	0,64	86,5
				24h						





TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP2D-2 Test type: CU - PwP Depth: 4.5-5.0m

Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 22 July 1999

Test type: CU | Load ring constant | Without side drains | Cell pressure σ_3 = 1.00 kg f/cm²

Rate: 0.180 mm/min | CR = 0.833 Kg/Div | Vertical stress σ_1 = 1.00 kg f/cm²

Specimen prior to shearing | Back pressure Pb = 0 kg f/cm²

Height H_{ss} = 7.957 cm | Area A_{ss} = 11.810 cm² | Volume V_{ss} = 93.979 cm³ | Eff. cell pressure σ_3' = 1.00 kg f/cm²

Strain		Load		U	A	Deviator stress kg f/cm²			Stresses kg f/cm²					
Div. 0.01	ε %	Div. 0.01	Load Kg	kg f/cm²	cm²	Stress	Memb. corr.	$\sigma_1-\sigma_3$	σ_1'	σ_3'	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3')/2$	σ_1/σ_3'
0	0.00	0.00	0.00	0.10	11.810	0.000		0.000	0.900	0.900	0.000	1.000	0.900	1.000
50	0.63	9.50	7.91	0.17	11.885	0.666		0.666	1.496	0.830	0.333	1.333	1.163	1.802
100	1.26	15.00	12.50	0.20	11.960	1.045		1.045	1.845	0.800	0.522	1.522	1.322	2.306
150	1.89	19.00	15.83	0.23	12.037	1.315		1.315	2.085	0.770	0.657	1.657	1.427	2.708
200	2.51	22.00	18.33	0.25	12.114	1.513		1.513	2.263	0.750	0.756	1.756	1.506	3.017
250	3.14	25.00	20.83	0.26	12.193	1.708		1.708	2.448	0.740	0.854	1.854	1.594	3.308
300	3.77	27.00	22.49	0.27	12.273	1.833		1.833	2.563	0.730	0.916	1.916	1.646	3.510
350	4.40	29.00	24.16	0.28	12.353	1.955		1.955	2.675	0.720	0.978	1.978	1.698	3.716
400	5.03	30.20	25.16	0.28	12.435	2.023		2.023	2.743	0.720	1.012	2.012	1.732	3.810
450	5.66	31.50	26.24	0.28	12.518	2.096		2.096	2.816	0.720	1.048	2.048	1.768	3.911
500	6.28	32.60	27.16	0.28	12.602	2.155		2.155	2.875	0.720	1.077	2.077	1.797	3.993
550	6.91	33.50	27.91	0.27	12.687	2.200		2.200	2.930	0.730	1.100	2.100	1.830	4.013
600	7.54	34.40	28.66	0.26	12.773	2.243		2.243	2.983	0.740	1.122	2.122	1.862	4.032
650	8.17	35.00	29.16	0.25	12.861	2.267		2.267	3.017	0.750	1.134	2.134	1.884	4.023
700	8.80	35.50	29.57	0.24	12.949	2.284		2.284	3.044	0.760	1.142	2.142	1.902	4.005
750	9.43	35.90	29.90	0.23	13.039	2.293		2.293	3.063	0.770	1.147	2.147	1.917	3.979
800	10.05	36.20	30.15	0.23	13.130	2.297		2.297	3.067	0.770	1.148	2.148	1.918	3.983
850	10.68	36.50	30.40	0.23	13.222	2.299		2.299	3.069	0.770	1.150	2.150	1.920	3.986
900	11.31	36.60	30.49	0.23	13.316	2.290		2.290	3.060	0.770	1.145	2.145	1.915	3.973
950	11.94	36.70	30.57	0.22	13.411	2.280		2.280	3.060	0.780	1.140	2.140	1.920	3.922
1000	12.57	36.80	30.65	0.21	13.508	2.269		2.269	3.059	0.790	1.135	2.135	1.925	3.873
1050	13.20	36.80	30.65	0.20	13.605	2.253		2.253	3.053	0.800	1.127	2.127	1.927	3.816
1100	13.82	36.80	30.65	0.19	13.705	2.237		2.237	3.047	0.810	1.118	2.118	1.928	3.761
1150	14.45	36.50	30.40	0.19	13.805	2.202		2.202	3.012	0.810	1.101	2.101	1.911	3.719
1200	15.08	36.00	29.99	0.19	13.907	2.156		2.156	2.966	0.810	1.078	2.078	1.888	3.662

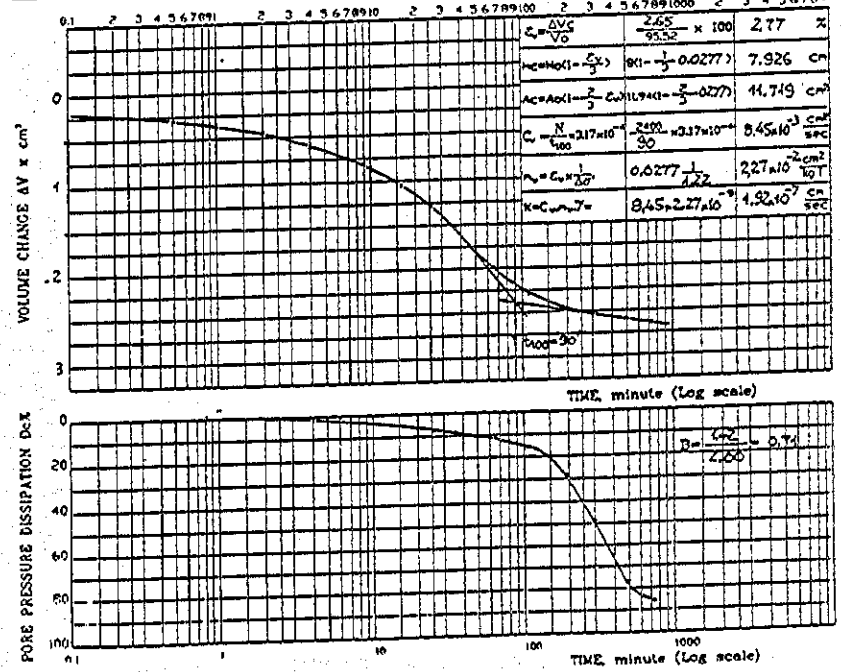
TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP2D-2 TEST TYPE: CU - PWP DATE STARTED: 23-7-99

PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER LOAD RING N°:

TEST TYPE CU — WITH / WITHOU SIDE DRAINS

						VOLUME CHANGE		PORE PRESSURE		
	DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$		gauge cm³	Diff. cm³	reading kg f/cm²	Diff. kg f/cm²	Diss. %
CELL PRESSURE 2.0 kg f/cm²	23-7	6.30	0			30.00	0.00	1.42	0	0
VERTICAL STRESS 2.0			30"			29.70	0.30	1.42	0	0
BACK STRESS 0			1'			29.65	0.35	1.42	0	0
Pwp AFTER BUILD UP			2			29.55	0.45	1.42	0	0
DIFFERENCE			4			29.40	0.60	1.40	0.02	1.4
EFFECTIVE PRESSURE			9			29.20	0.80	1.38	0.04	2.8
$\sqrt{t_{100}}$ = t_{100} = 90 min.			16			28.95	1.05	1.35	0.07	4.9
t_r = 8 , t_{100} = 0.51 x 90 = 45.9			25			28.70	1.30	1.33	0.09	6.3
			36			28.65	1.55	1.30	0.12	8.5
RATE OF DISPLACEMENT			64'			28.00	2.00	1.26	0.16	11.3
$\frac{E_{tr}.H_{ss}}{100.t_{tr}} = 0.10 \times \frac{79.26}{45.9} = 0,173$			2h			27.70	2.30	1.21	0.21	14.8
			3			27.55	2.45	1.01	0.41	28.9
			5			27.45	2.55	0.72	0.70	49.3
select v = 0,180 mm/min			8			27.40	2.60	0.32	1.10	77.5
	-	18 30	12			27.35	2.65	0.20	1.22	85.9
			24h							



$\varepsilon_v = \frac{\Delta V_s}{V_o} = \frac{2.65}{95.52} \times 100 = 2.77$ %

$H_c = H_o(1-\frac{\varepsilon_v}{3}) = 8(1-\frac{1}{3}0.0277) = 7.926$ cm

$A_c = A_o(1-\frac{2}{3}\varepsilon_v) = 11.94(1-\frac{2}{3}0.0277) = 11.749$ cm²

$C_v = \frac{N}{t_{100}} \times 2.17\times10^{-4} = \frac{2400}{90} \times 2.17\times10^{-4} = 8.45\times10^{-3}$ cm²/sec

$m_v = \varepsilon_v \times \frac{1}{\Delta\sigma'} = 0.0277 \frac{1}{1.22} = 2.27\times10^{-2}$ cm²/kg

$K = C_v \times m_v \times \gamma_w = 8.45\times2.27\times10^{-9} = 1.92\times10^{-7}$ cm/sec

$D_c = \frac{42}{2.60} = 0.74$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP2D-2 — Test type: CU - PwP — Depth: 4.5-5.0m

Project: DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N°: — Date: 23 July 1999

Test type: CU — Load ring constant — Without side drains — Cell pressure σ_3 = 2.00 kg f/cm²

Rate: 0.180 mm/min — CR = 0.833 Kg/Div — Vertical stress σ_1 = 2.00 kg f/cm²

Specimen prior to shearing — Back pressure Pb = 0 kg f/cm²

Height H_{ps} = 7.926 cm — Area A_{ps} = 11.719 cm² — Volume V_{ps} = 92.886 cm³ — Eff. cell pressure σ_3' = 2.00 kg f/cm²

Strain Div. 0.01	Strain ε %	Load Div. 0.01	Load Kg	U kg f/cm²	A cm²	Deviator stress kg/cm² Stress	Memb. corr.	$\sigma_1-\sigma_3$	σ_1'	σ_3'	Stresses kg/cm² $(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3')/2$	σ_1'/σ_3'
0	0.00	0.00	0.00	0.20	11.719	0.000		0.000	1.800	1.800	0.000	2.000	1.800	1.000
50	0.63	19.00	15.83	0.27	11.793	1.342		1.342	3.072	1.730	0.671	2.671	2.401	1.776
100	1.26	25.00	20.83	0.32	11.869	1.755		1.755	3.435	1.680	0.877	2.877	2.557	2.044
150	1.89	30.00	24.99	0.35	11.945	2.092		2.092	3.742	1.650	1.046	3.046	2.696	2.268
200	2.52	33.50	27.91	0.38	12.022	2.321		2.321	3.941	1.620	1.161	3.161	2.781	2.433
250	3.15	36.40	30.32	0.40	12.101	2.506		2.506	4.106	1.600	1.253	3.253	2.853	2.566
300	3.79	38.70	32.24	0.41	12.180	2.647		2.647	4.237	1.590	1.323	3.323	2.913	2.665
350	4.42	41.00	34.15	0.42	12.260	2.786		2.786	4.366	1.580	1.393	3.393	2.973	2.760
400	5.05	42.70	35.57	0.43	12.342	2.882		2.882	4.452	1.570	1.441	3.441	3.011	2.835
450	5.68	44.20	36.82	0.44	12.424	2.963		2.963	4.523	1.560	1.482	3.482	3.042	2.900
500	6.31	45.70	38.07	0.45	12.508	3.043		3.043	4.593	1.550	1.522	3.522	3.072	2.964
550	6.94	47.00	39.15	0.45	12.593	3.109		3.109	4.659	1.550	1.554	3.554	3.104	3.006
600	7.57	48.00	39.98	0.45	12.679	3.154		3.154	4.704	1.550	1.577	3.577	3.127	3.035
650	8.20	49.00	40.82	0.45	12.766	3.197		3.197	4.747	1.550	1.599	3.599	3.149	3.063
700	8.83	50.00	41.65	0.44	12.854	3.240		3.240	4.800	1.560	1.620	3.620	3.180	3.077
750	9.46	50.80	42.32	0.43	12.944	3.269		3.259	4.839	1.570	1.635	3.635	3.205	3.082
800	10.09	51.60	42.98	0.42	13.035	3.298		3.298	4.878	1.580	1.649	3.649	3.229	3.087
850	10.72	52.00	43.32	0.42	13.127	3.300		3.300	4.880	1.580	1.650	3.650	3.230	3.088
900	11.36	52.30	43.57	0.42	13.220	3.295		3.295	4.875	1.580	1.648	3.648	3.228	3.086
950	11.99	52.50	43.73	0.41	13.315	3.284		3.284	4.874	1.590	1.642	3.642	3.232	3.066
1000	12.62	52.70	43.90	0.41	13.411	3.273		3.273	4.863	1.590	1.637	3.637	3.227	3.059
1050	13.25	52.90	44.07	0.40	13.509	3.262		3.262	4.862	1.600	1.631	3.631	3.231	3.039
1100	13.88	53.00	44.15	0.40	13.607	3.244		3.244	4.844	1.600	1.622	3.622	3.222	3.028
1150	14.51	52.80	43.98	0.40	13.708	3.209		3.209	4.809	1.600	1.604	3.604	3.204	3.005
1200	15.14	52.40	43.65	0.40	13.810	3.161		3.161	4.761	1.600	1.580	3.580	3.180	2.975

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP2D-2 — TEST TYPE: CU - PWP — DATE STARTED: 24-7-99

PROJECT: DONG NAI 3 &4 COMBINED HYDROPOWER — LOAD RING N°:

TEST TYPE CU — WITH / WITHOU SIDE DRAINS

CELL PRESSURE 4.00 kg f/cm²

VERTICAL STRESS 4.00 kg f/cm²

BACK STRESS 0 kg f/cm²

Pwp AFTER BUILD UP

DIFFERENCE

EFFECTIVE PRESSURE

$\sqrt{t_{100}}$ = t_{100} = 90 min.

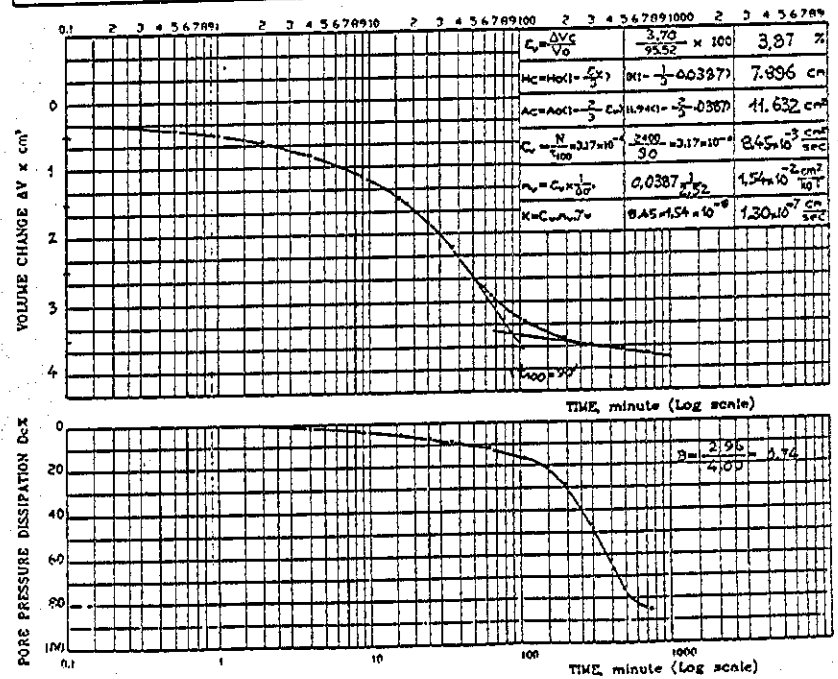
$t_v = a \cdot t_{100} = 0.51 \times 90 = 45.9$

RATE OF DISPLACEMENT

$\frac{E_{ir} \cdot H_{ps}}{100 \cdot \tau_{t,s}} = 0.10 \times \frac{78.96}{45.9} = 0.172$

select v = 0,180 mm/min

DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
24/7	6.40	0		32.00	0.00	2.96	0	0
		30"		31.55	0.45	2.96	0	-
		1'		31.50	0.50	2.96	0	-
		2		31.45	0.55	2.96	0	0
		4		31.20	0.80	2.92	0.04	1.4
		9		30.90	1.10	2.87	0.09	3.0
		16		30.50	1.50	2.81	0.15	5.1
		25		30.20	1.80	2.75	0.21	7.1
		36		29.80	2.20	2.71	0.25	8.4
		64'		29.10	2.90	2.63	0.33	11.1
		2h		28.70	3.30	2.50	0.46	15.5
		3		28.50	3.50	2.12	0.84	28.4
		5		28.40	3.60	1.72	1.24	41.9
		8		28.35	3.65	0.65	2.31	78.0
—	18.40	12		28.30	3.70	0.44	2.52	85.1
		24h						



$C_v = \frac{\Delta V_c}{V_o}$ = $\frac{3.70}{95.52} \times 100$ = 3.87 %

$H_c = H_o(1 - \frac{C_v}{3})$ = $H_o(1 - \frac{1}{3} \cdot 0.0387)$ = 7.896 cm

$A_c = A_o(1 - \frac{2}{3} C_v)$ = $11.941(1 - \frac{2}{3} \cdot 0.0387)$ = 11.632 cm²

$C_v = \frac{N}{t_{100}} = 3.17 \times 10^{-4}$ = $\frac{2400}{90} = 3.17 \times 10^{-4}$ = 8.45×10^{-3} cm²/sec

$m_v = C_v \times \frac{1}{\sigma_3'}$ = $0.0387 \frac{1}{2.52}$ = 1.54×10^{-2} cm²/kg

$K = C_v \cdot m_v \cdot \gamma_w$ = $8.45 \times 1.54 \times 10^{-6}$ = 1.30×10^{-7} cm/sec

$B = \frac{2.96}{4.00} = 0.74$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP2D-2 | Test type: CU - PwP | Depth: 4.5-5.0m
Project: DONG NAI 3&4 COMBINED HYDROPOWER | Load ring N°: | Date: 24 July 1999

Test type: CU	Load ring constant	Without side drains	Cell pressure σ_3 = 4.00 kg f/cm²
Rate: 0.180 mm/min	CR = 0.633 Kg/Div		Vertical stress σ_1 = 4.00 kg f/cm²
Specimen prior to shearing			Back pressure Pb = 0 kg f/cm²
Height H_{eo} = 7.896 cm	Area A_{eo} = 11.632 cm²	Volume V_{eo} = 91.843 cm³	Eff. cell pressure σ_3' = 4.00 kg f/cm²

Strain		Load		U	A	Deviator stress kg f/cm²			Stresses kg f/cm²					
Div. 0.01	ε %	Div. 0.01	Load kg	kg f/cm²	cm²	Stress	Memb. corr.	$\sigma_1-\sigma_3$	σ_1	σ_3'	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3')/2$	σ_1/σ_3'
0	0.00	0.00	0.00	0.44	11.632	0.000		0.000	3.560	3.560	0.000	4.000	3.560	1.000
50	0.63	24.00	19.99	0.52	11.706	1.708		1.708	5.188	3.480	0.854	4.854	4.334	1.491
100	1.27	39.00	32.49	0.58	11.781	2.758		2.758	6.178	3.420	1.379	5.379	4.799	1.806
150	1.90	49.00	40.82	0.62	11.857	3.442		3.442	6.822	3.380	1.721	5.721	5.101	2.018
200	2.53	57.00	47.48	0.65	11.934	3.979		3.979	7.329	3.350	1.989	5.989	5.339	2.188
250	3.17	62.50	52.06	0.68	12.012	4.334		4.334	7.654	3.320	2.167	6.167	5.487	2.305
300	3.80	66.50	55.39	0.70	12.091	4.581		4.581	7.881	3.300	2.291	6.291	5.591	2.388
350	4.43	70.00	58.31	0.72	12.172	4.791		4.791	8.071	3.280	2.395	6.395	5.675	2.461
400	5.07	73.00	60.81	0.73	12.253	4.963		4.963	8.233	3.270	2.481	6.481	5.751	2.518
450	5.70	75.00	62.48	0.74	12.335	5.065		5.065	8.325	3.260	2.532	6.532	5.792	2.554
500	6.33	77.00	64.14	0.75	12.418	5.165		5.165	8.415	3.250	2.583	6.583	5.833	2.589
550	6.97	78.50	65.39	0.76	12.503	5.230		5.230	8.470	3.240	2.615	6.615	5.855	2.614
600	7.60	79.50	66.22	0.77	12.589	5.261		5.261	8.491	3.230	2.630	6.630	5.860	2.629
650	8.23	80.50	67.06	0.78	12.675	5.290		5.290	8.510	3.220	2.645	6.645	5.865	2.643
700	8.87	81.40	67.81	0.79	12.764	5.313		5.313	8.523	3.210	2.656	6.656	5.866	2.655
750	9.50	82.20	68.47	0.79	12.853	5.327		5.327	8.537	3.210	2.664	6.664	5.874	2.660
800	10.13	83.00	69.14	0.79	12.943	5.342		5.342	8.552	3.210	2.671	6.671	5.881	2.664
850	10.76	83.50	69.56	0.79	13.035	5.336		5.336	8.546	3.210	2.668	6.668	5.878	2.662
900	11.40	84.00	69.97	0.79	13.128	5.330		5.330	8.540	3.210	2.665	6.665	5.875	2.660
950	12.03	84.30	70.22	0.79	13.223	5.311		5.311	8.521	3.210	2.655	6.655	5.865	2.654
1000	12.66	84.50	70.39	0.79	13.319	5.285		5.285	8.495	3.210	2.642	6.642	5.852	2.646
1050	13.30	84.50	70.39	0.78	13.416	5.247		5.247	8.457	3.220	2.623	6.623	5.843	2.629
1100	13.93	84.20	70.14	0.78	13.515	5.190		5.190	8.410	3.220	2.595	6.595	5.815	2.612
1150	14.56	83.60	69.64	0.77	13.615	5.115		5.115	8.345	3.230	2.557	6.557	5.787	2.584
1200	15.20	83.00	69.14	0.77	13.717	5.041		5.041	8.271	3.230	2.520	6.520	5.750	2.561

TRIAXIAL COMPRESSION TEST
(SUMMARY AND REPORT DATA SHEET)
THÍ NGHIỆM NÉN BA TRỤC
(BÁO CÁO TỔNG HỢP)

TEST N° TP4D-1
TEST TYPE CU-PwP

SOIL DESCRIPTION: Residual soil of basalt : Brown silty sandy clay
TYPE OF SAMPLE: Remoulded to 0.95 MDD on wet branch
SHEARING RATE: 0.180 mm/min DATE: 22-24 July 1999

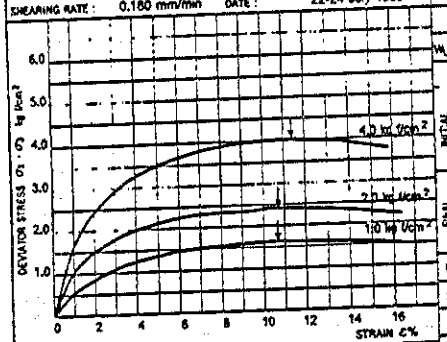
PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N°: TP4D
DEPTH OF SAMPLE: 2.0 - 2.5m

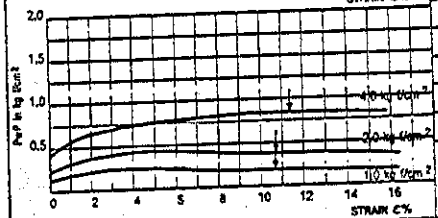
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

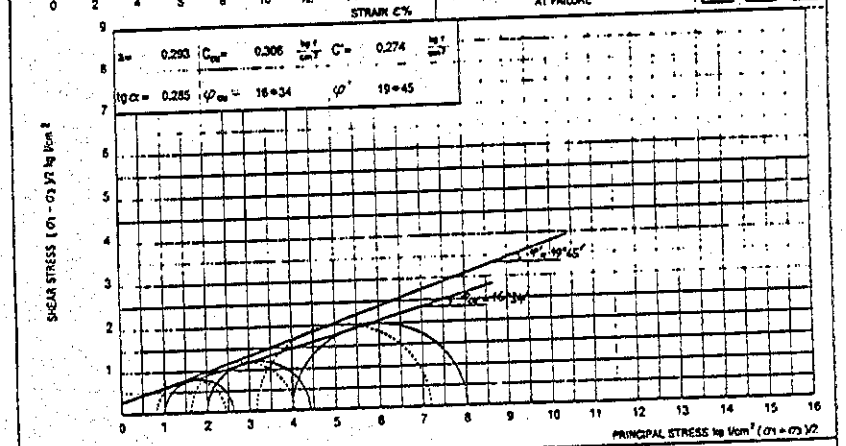
W_L 72.6 I_P 31.6 B -0.03 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	1.820	1.820	1.820
	MOISTURE	W	%	40.00	40.00	40.00
	DRY DENSITY	γ_d	g/cm³	1.300	1.300	1.300
FINAL	WET DENSITY	γ_w	g/cm³	1.831	1.840	1.849
	MOISTURE	W	%	39.00	38.10	37.40
	DRY DENSITY	γ_d	g/cm³	1.317	1.332	1.345
LATERAL STRESS		σ_3	kg f/cm²	1.00	2.00	4.00
STRAIN		ε	%	10.67	10.71	11.38
DEVIATOR STRESS		$\sigma_1-\sigma_3$	kg f/cm²	1.619	2.416	4.014
SHEAR STRESS		$(\sigma_1-\sigma_3)/2$		0.809	1.208	2.007
CENTER MOHR CIRCLE		$(\sigma_1+\sigma_3)/2$		1.809	3.208	6.007
PWP		U		0.19	0.38	0.84
EFFECTIVE MOHR		$(\sigma_1'+\sigma_3')/2$		1.619	2.828	5.167
MAX TOTAL STRESS		σ_1		2.619	4.415	8.014

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE







TESTED BY | CHECKED BY | APPROVED BY

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP4D-1 TEST TYPE: CU - PWP DATE STARTED: 22-7-99

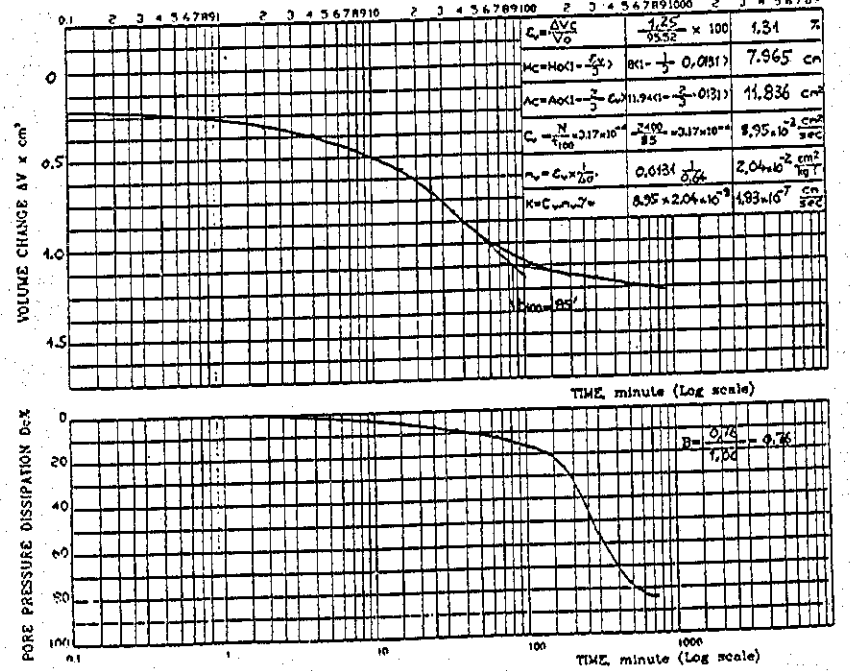
PROJECT: DONG NAI 3 & 4 COMBINED HYDROPOWER LOAD RING N°:

TEST TYPE CU	WITH / WITHOU SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	Diss. %
CELL PRESSURE 1.00		22/7	7h00	0		30.00	0.00	0.76	0	0
VERTICAL STRESS 1.00	kg f/cm²			30"		29.75	0.25	0.76	0	0
BACK STRESS 0				1'		29.70	0.30	0.76	0	0
Pwp AFTER BUILD UP				2		29.65	0.35	0.76	0	0
DIFFERENCE				4		29.60	0.40	0.75	0.01	1.3
EFFECTIVE PRESSURE				9		29.50	0.50	0.74	0.02	2.6
$\sqrt{t_{100}}$ =	t_{100} = 85 min.			16		29.40	0.60	0.72	0.04	5.3
$t_v = a \cdot t_{100} = 0.51 \times 85 = 43.4$				25		29.30	0.70	0.70	0.06	7.9
				36		29.15	0.85	0.68	0.07	9.2
				64'		29.00	1.00	0.67	0.09	11.8
				2h		28.90	1.10	0.63	0.13	17.1
				3		28.85	1.15	0.53	0.23	30.3
				5		28.80	1.20	0.33	0.43	56.6
				8		28.75	1.25	0.17	0.59	77.6
		—	19h00	12		28.75	1.25	0.12	0.64	84.2
				24h						

RATE OF DISPLACEMENT

$\frac{E_{50} \cdot H_{ps}}{100 \cdot t_{50}} = 0.10 \times \frac{79.65}{43.4} = 0.184$

select v = 0,180 mm/min



TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP4D-1 Test type: CU - PwP Depth: 2.0-2.5m

Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 22 July 1999

Test type: CU Load ring constant Without side drains Cell pressure σ_3 = 1.00 kg f/cm²

Rate 0.180 mm/min CR = 0.766 Kg/Div Vertical stress σ_1 = 1.00 kg f/cm²

Specimen prior to shearing Back pressure Pb = 0 kg f/cm²

Height H_{ps} = 7.965 cm Area A_{ps} = 11.836 cm² Volume V_{ps} = 94.272 cm³ Eff. cell pressure σ_3' = 1.00 kg f/cm²

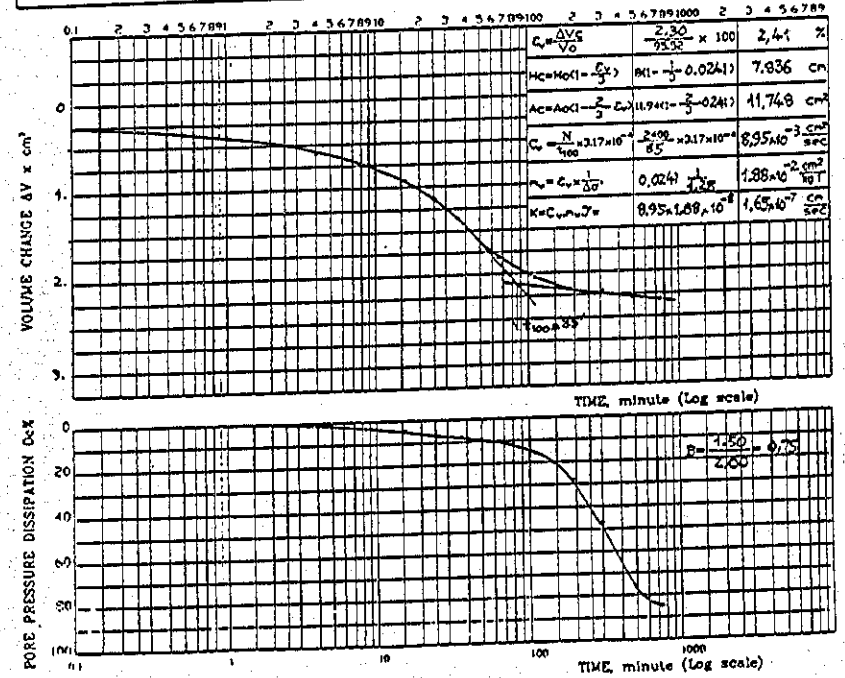
Strain Div.	Strain %	Load Div.	Load Kg	U kg f/cm²	A cm²	Deviator stress kg f/cm² Stress	Memb. corr.	$\sigma_1-\sigma_3$	σ_1'	σ_3'	Stresses kg f/cm² $(\sigma_1+\sigma_2)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1'+\sigma_3')/2$	σ_1'/σ_3'
0.01		0.01												
0	0.00	0.00	0.00	0.12	11.836	0.000		0.000	0.880	0.880	0.000	1.000	0.880	1.000
50	0.63	6.50	4.98	0.16	11.911	0.418		0.418	1.258	0.840	0.209	1.209	1.049	1.498
100	1.26	10.20	7.81	0.19	11.986	0.652		0.652	1.462	0.810	0.326	1.326	1.136	1.805
150	1.88	13.00	9.96	0.21	12.063	0.825		0.825	1.615	0.790	0.413	1.413	1.203	2.045
200	2.51	15.60	11.95	0.23	12.141	0.984		0.984	1.754	0.770	0.492	1.492	1.262	2.278
250	3.14	17.80	13.63	0.24	12.220	1.116		1.116	1.876	0.760	0.558	1.558	1.318	2.468
300	3.77	19.70	15.09	0.24	12.299	1.227		1.227	1.987	0.760	0.613	1.613	1.373	2.614
350	4.39	21.00	16.09	0.24	12.380	1.299		1.299	2.059	0.760	0.650	1.650	1.410	2.710
400	5.02	22.20	17.01	0.24	12.462	1.365		1.365	2.125	0.760	0.682	1.682	1.442	2.796
450	5.65	23.40	17.92	0.23	12.545	1.429		1.429	2.199	0.770	0.714	1.714	1.484	2.856
500	6.28	24.30	18.61	0.22	12.629	1.474		1.474	2.254	0.780	0.737	1.737	1.517	2.890
550	6.91	25.00	19.15	0.21	12.714	1.506		1.506	2.296	0.790	0.753	1.753	1.543	2.907
600	7.53	25.70	19.69	0.20	12.800	1.538		1.538	2.338	0.800	0.769	1.769	1.569	2.922
650	8.16	26.30	20.15	0.19	12.888	1.563		1.563	2.373	0.810	0.782	1.782	1.592	2.930
700	8.79	26.80	20.53	0.19	12.976	1.582		1.582	2.392	0.810	0.791	1.791	1.601	2.953
750	9.42	27.30	20.91	0.19	13.066	1.600		1.600	2.410	0.810	0.800	1.800	1.610	2.976
800	10.04	27.70	21.22	0.19	13.158	1.613		1.613	2.423	0.810	0.806	1.806	1.616	2.991
850	10.67	28.00	21.45	0.19	13.250	1.619		1.619	2.429	0.810	0.809	1.809	1.619	2.998
900	11.30	28.10	21.52	0.19	13.344	1.613		1.613	2.423	0.810	0.807	1.807	1.617	2.991
950	11.93	28.20	21.60	0.19	13.439	1.607		1.607	2.417	0.810	0.804	1.804	1.614	2.984
1000	12.55	28.30	21.68	0.19	13.535	1.602		1.602	2.412	0.810	0.801	1.801	1.611	2.977
1050	13.18	28.40	21.75	0.18	13.633	1.596		1.596	2.416	0.820	0.798	1.798	1.618	2.946
1100	13.81	28.50	21.83	0.18	13.733	1.590		1.590	2.410	0.820	0.795	1.795	1.615	2.939
1150	14.44	28.50	21.83	0.18	13.833	1.578		1.578	2.398	0.820	0.789	1.789	1.609	2.925
1200	15.07	28.50	21.83	0.17	13.936	1.567		1.567	2.397	0.830	0.783	1.783	1.613	2.887
1250	15.69	28.30	21.68	0.17	14.039	1.544		1.544	2.374	0.830	0.772	1.772	1.602	2.860
1300	16.32	28.00	21.45	0.17	14.145	1.516		1.516	2.346	0.830	0.758	1.758	1.588	2.827

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP4D-1 TEST TYPE: CU - PWP DATE STARTED: 23-7-99

PROJECT: DONG NAI 3&4 COMBINED HYDRO POWER LOAD RING N°:

TEST TYPE CU	SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
CELL PRESSURE 2,00	kg f/cm²	23-7	6h10	0		31,00	0,00	1,50	0	0
VERTICAL STRESS 2,00				30"		30,65	0,35	1,50	0	-
BACK STRESS 0				1'		30,60	0,40	1,50	0	-
Pwp AFTER BUILD UP				2		30,50	0,50	1,50	0	0
DIFFERENCE				4		30,40	0,60	1,48	0,02	1,3
EFFECTIVE PRESSURE				9		30,25	0,75	1,46	0,04	2,7
$\sqrt{t_{100}}$ =	t_{100} = 85 min.			16		30,10	0,90	1,43	0,07	4,7
$t_0 = a \cdot t_{100} = 0,51 \times 85 = 43,4$				25		29,85	1,15	1,40	0,10	6,7
				36		29,65	1,35	1,37	0,13	8,7
RATE OF DISPLACEMENT				64'		29,20	1,80	1,35	0,15	10,0
$\frac{E_{rr} \cdot H_{ps}}{100 \cdot t_{rs}} = 0,10 \times \frac{79,36}{43,4} = 0,183$				2h		28,95	2,05	1,26	0,24	16,0
				3		28,80	2,20	1,10	0,40	26,7
select v = 0,180 mm/min				5		28,75	2,25	0,80	0,70	46,7
				8		28,70	2,30	0,36	1,14	76,0
			16h10	12		28,70	2,30	0,22	1,28	85,3
				24h						



$C_v = \frac{\Delta V_s}{V_o} = \frac{2,30}{95,55} \times 100 = 2,41$ %

$H_c = H_o(1 - \frac{\varepsilon_v}{3}) = 8(1 - \frac{1}{3} \times 0,024) = 7,936$ cm

$A_c = A_o(1 - \frac{2}{3}\varepsilon_v) = 11,94(1 - \frac{2}{3} \times 0,024) = 11,748$ cm²

$C_v = \frac{N}{t_{100}} \times 3,17 \times 10^{-4} \times \frac{2400}{85} \times 3,17 \times 10^{-4} = 8,95 \times 10^{-3}$ cm²/sec

$m_v = \varepsilon_v \times \frac{1}{\Delta\sigma} = 0,024 \times \frac{1}{1,28} = 1,88 \times 10^{-2}$ cm²/kg

$K = C_v \cdot m_v \cdot \gamma_w = 8,95 \times 1,88 \times 10^{-6} = 1,65 \times 10^{-7}$ cm/sec

$t_{100} = 85'$

$B = \frac{1,50}{2,00} = 0,75$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP4D-1 Test type: CU - PwP Depth: 2.0-2.5m

Project: DONG NAI 3&4 COMBINED HYDROPOWER Lead ring N°: Date: 23 July 1999

Test type: CU | Load ring constant | Without side drains | Cell pressure σ_3 = 2.00 kg f/cm²

Rate: 0.180 mm/min | CR = 0.766 Kg/Div | Vertical stress σ_1 = 2.00 kg f/cm²

Specimen prior to shearing | Back pressure Pb = 0 kg f/cm²

Height H_{ps} = 7.936 cm | Area A_{ps} = 11.748 cm² | Volume V_{ps} = 93.235 cm³ | Eff. cell pressure σ_3 = 2.00 kg f/cm²

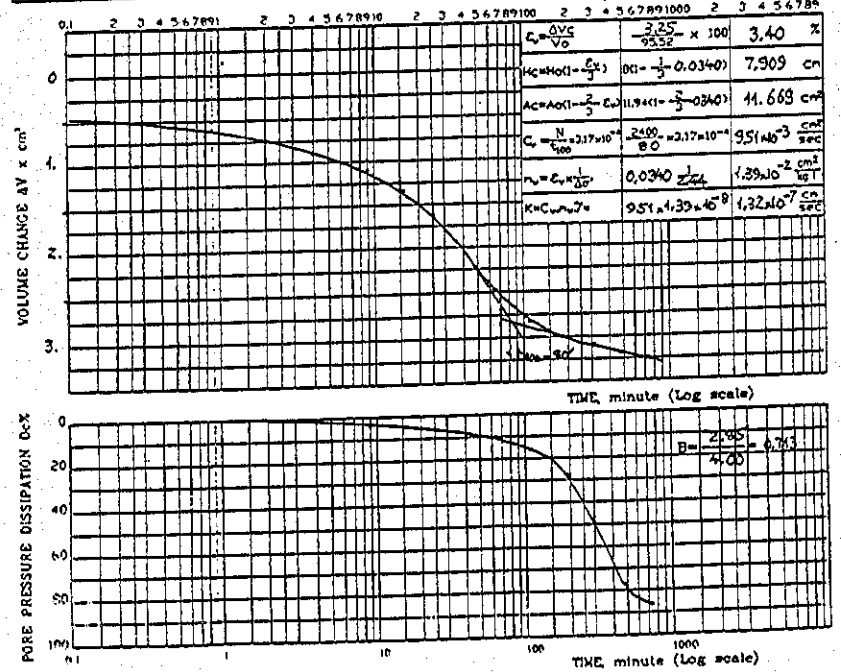
Strain Div. 0.01	Strain ε %	Load Div. 0.01	Load Kg	U kg f/cm²	A cm²	Deviator stress kg/cm² Stress	Memb. corr.	$\sigma_1-\sigma_3$	Stresses kg/cm² σ_1	σ_3	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	σ_3/σ_3
0	0,00	0,00	0,00	0,22	11,748	0,000		0,000	1,780	1,780	0,000	2,000	1,780	1,000
50	0,63	13,00	9,96	0,29	11,822	0,842		0,842	2,552	1,710	0,421	2,421	2,131	1,493
100	1,26	19,00	14,55	0,33	11,898	1,223		1,223	2,893	1,670	0,612	2,612	2,282	1,732
150	1,89	23,00	17,62	0,37	11,974	1,471		1,471	3,101	1,630	0,736	2,736	2,366	1,903
200	2,52	26,00	19,92	0,39	12,052	1,653		1,653	3,263	1,610	0,826	2,826	2,436	2,026
250	3,15	29,00	22,21	0,41	12,130	1,831		1,831	3,421	1,590	0,916	2,916	2,506	2,152
300	3,78	31,00	23,75	0,43	12,210	1,945		1,945	3,515	1,570	0,972	2,972	2,542	2,239
350	4,41	33,00	25,28	0,44	12,290	2,057		2,057	3,617	1,560	1,028	3,028	2,588	2,318
400	5,04	34,50	26,43	0,44	12,372	2,136		2,136	3,696	1,560	1,068	3,068	2,628	2,369
450	5,67	36,00	27,58	0,44	12,454	2,214		2,214	3,774	1,560	1,107	3,107	2,667	2,419
500	6,30	37,20	28,50	0,43	12,538	2,273		2,273	3,843	1,570	1,136	3,136	2,706	2,448
550	6,93	38,00	29,11	0,42	12,623	2,306		2,306	3,886	1,580	1,153	3,153	2,733	2,459
600	7,56	38,60	29,57	0,41	12,709	2,327		2,327	3,917	1,590	1,163	3,163	2,753	2,463
650	8,19	39,10	29,95	0,40	12,796	2,341		2,341	3,941	1,600	1,170	3,170	2,770	2,463
700	8,82	39,50	30,26	0,39	12,884	2,348		2,348	3,958	1,610	1,174	3,174	2,784	2,459
750	9,45	39,90	30,56	0,38	12,974	2,356		2,356	3,976	1,620	1,178	3,178	2,798	2,454
800	10,08	41,20	31,56	0,38	13,065	2,416		2,416	4,036	1,620	1,208	3,208	2,828	2,491
850	10,71	41,50	31,79	0,38	13,157	2,416		2,416	4,036	1,620	1,208	3,208	2,828	2,491
900	11,34	41,70	31,94	0,38	13,251	2,411		2,411	4,031	1,620	1,205	3,205	2,825	2,488
950	11,97	41,80	32,02	0,38	13,346	2,399		2,399	4,019	1,620	1,200	3,200	2,820	2,481
1000	12,60	41,90	32,10	0,38	13,442	2,388		2,388	4,008	1,620	1,194	3,194	2,814	2,474
1050	13,23	42,00	32,17	0,38	13,539	2,376		2,376	3,996	1,620	1,188	3,188	2,808	2,467
1100	13,86	41,80	32,02	0,37	13,638	2,348		2,348	3,978	1,630	1,174	3,174	2,804	2,440
1150	14,49	41,50	31,79	0,37	13,739	2,314		2,314	3,944	1,630	1,157	3,157	2,787	2,420
1200	15,12	41,00	31,41	0,36	13,841	2,269		2,269	3,909	1,640	1,135	3,135	2,775	2,384
1250	15,75	40,70	31,18	0,35	13,944	2,236		2,236	3,886	1,650	1,118	3,118	2,768	2,355
1300	16,38	40,50	31,02	0,34	14,049	2,208		2,208	3,868	1,660	1,104	3,104	2,764	2,330

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP4D-1 TEST TYPE: CU - PWP DATE STARTED: 24-7-99

PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER LOAD RING N°:

TEST TYPE CU	with / without SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	√t	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	Diss. %
CELL PRESSURE 4,00	kg f/cm²	24.7	6'00	0		32,00	0,00	2,85	0	0
VERTICAL STRESS 4,00				30"		31,45	0,55	2,85	–	–
BACK STRESS 0				1'		31,35	0,65	2,85	–	–
Pwp AFTER BUILD UP				2		31,25	0,75	2,85	0	0
DIFFERENCE				4		31,10	0,90	2,81	0,04	1,4
EFFECTIVE PRESSURE				9		30,90	1,10	2,76	0,09	3,2
$\sqrt{t_{100}}$ =	t_{100} = 60 min.			16		30,65	1,35	2,73	0,12	4,2
$t_f = 8 \cdot t_{100} = 0,51 \times 80 = 41$				25		30,40	1,60	2,68	0,17	6,0
				36		30,10	1,90	2,61	0,24	8,4
RATE OF DISPLACEMENT				64'		29,50	2,50	2,55	0,30	10,5
$\frac{\varepsilon_{tr} \cdot H_{ps}}{100 \cdot t_{f,a}} = 0,10 \times \frac{79,09}{41,0} = 0,193$				2h		29,20	2,80	2,42	0,43	15,1
				3		29,00	3,00	2,04	0,81	28,4
select v = 0,180 mm/min				5		28,90	3,10	1,37	1,41	49,5
				8		28,80	3,20	0,65	2,20	77,2
		–	18'00	12		28,75	3,25	0,41	2,44	85,6
				24h						



TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N° TP4D-1 Test type: CU - PwP Depth: 2.0-2.5m

Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 24 July 1999

Test type CU Load ring constant Without side drains Cell pressure σ_3 = 4.00 kg f/cm²

Rate: 0.180 mm/min CR.= 0.766 Kg/Dv Vertical stress σ_1 = 4.00 kg f/cm²

Specimen prior to shearing Back pressure Pb = 0 kg f/cm²

Height H_{ps} = 7.909 cm Area A_{ps} = 11.669 cm² Volume V_{ps} = 92.291 cm³ Eff. cell pressure σ_3' = 4.00 kg f/cm²

Strain Div. 0.01	Strain ε %	Load Div. 0.01	Load Kg	U kg f/cm²	A cm²	Deviator stress kg f/cm² Stress	Memb. corr.	$\sigma_1-\sigma_3$	Stresses kg f/cm² σ_1'	σ_3'	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3')/2$	σ_1'/σ_3'
0	0.00	0.00	0.00	0.41	11.669	0.000		0.000	3.590	3.590	0.000	4.000	3.590	1.000
50	0.63	19.50	14.94	0.53	11.743	1.272		1.272	4.742	3.470	0.636	4.636	4.106	1.367
100	1.26	30.00	22.98	0.60	11.818	1.944		1.944	5.344	3.400	0.972	4.972	4.372	1.572
150	1.90	37.00	28.34	0.65	11.895	2.383		2.383	5.733	3.350	1.191	5.191	4.541	1.711
200	2.53	42.50	32.56	0.68	11.972	2.719		2.719	6.039	3.320	1.360	5.360	4.680	1.819
250	3.16	47.40	36.31	0.71	12.050	3.013		3.013	6.303	3.290	1.507	5.507	4.797	1.916
300	3.79	51.00	39.07	0.73	12.129	3.221		3.221	6.491	3.270	1.610	5.610	4.880	1.985
350	4.43	54.00	41.36	0.75	12.209	3.388		3.388	6.638	3.250	1.694	5.694	4.944	2.042
400	5.06	56.50	43.28	0.77	12.291	3.521		3.521	6.751	3.230	1.761	5.761	4.991	2.090
450	5.69	58.70	44.96	0.78	12.373	3.634		3.634	6.854	3.220	1.817	5.817	5.037	2.129
500	6.32	60.50	46.34	0.79	12.456	3.720		3.720	6.930	3.210	1.860	5.860	5.070	2.159
550	6.95	62.40	47.80	0.80	12.541	3.811		3.811	7.011	3.200	1.906	5.906	5.106	2.191
600	7.59	63.80	48.87	0.81	12.627	3.870		3.870	7.060	3.190	1.935	5.935	5.125	2.213
650	8.22	65.00	49.79	0.82	12.714	3.916		3.916	7.096	3.180	1.958	5.958	5.138	2.232
700	8.85	66.00	50.56	0.83	12.802	3.949		3.949	7.119	3.170	1.975	5.975	5.145	2.246
750	9.48	67.00	51.32	0.84	12.891	3.981		3.981	7.141	3.160	1.991	5.991	5.151	2.260
800	10.12	67.80	51.93	0.84	12.982	4.000		4.000	7.160	3.160	2.000	6.000	5.160	2.266
850	10.75	68.50	52.47	0.84	13.074	4.013		4.013	7.173	3.160	2.007	6.007	5.167	2.270
900	11.38	69.00	52.85	0.84	13.167	4.014		4.014	7.174	3.160	2.007	6.007	5.167	2.270
950	12.01	69.20	53.01	0.84	13.262	3.997		3.997	7.157	3.160	1.998	5.998	5.158	2.265
1000	12.64	69.50	53.24	0.84	13.358	3.985		3.985	7.145	3.160	1.993	5.993	5.153	2.261
1050	13.28	69.60	53.31	0.84	13.455	3.962		3.962	7.122	3.160	1.981	5.981	5.141	2.254
1100	13.91	69.50	53.24	0.83	13.554	3.928		3.928	7.098	3.170	1.964	5.964	5.134	2.239
1150	14.54	69.00	52.85	0.83	13.654	3.871		3.871	7.041	3.170	1.935	5.935	5.105	2.221
1200	15.17	68.40	52.39	0.82	13.756	3.809		3.809	6.989	3.180	1.904	5.904	5.084	2.198
1250	15.80	68.00	52.09	0.82	13.859	3.758		3.758	6.938	3.180	1.879	5.879	5.059	2.182

TRIAXIAL COMPRESSION TEST
(SUMMARY AND REPORT DATA SHEET)
THÍ NGHIỆM NÉN BA TRỤC
(BÁO CÁO TỔNG HỢP)

TEST N°: TP6D-2
TEST TYPE: CU-PwP

SOIL DESCRIPTION: Residual soil of basalt : Brown silty sandy clay
TYPE OF SAMPLE: Remoulded to 0.95 MDD on wet branch
SHEARING RATE: 0.240 mm/min DATE: 19-21 July 1999

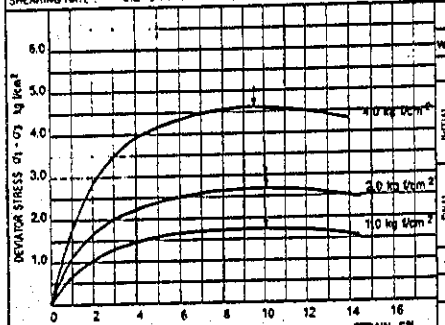
PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N°: TP6D
DEPTH OF SAMPLE: 4.3 - 4.8m

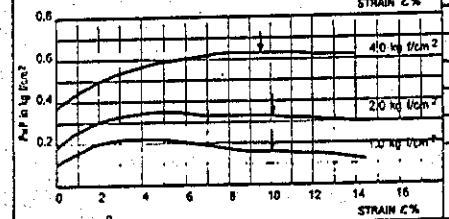
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

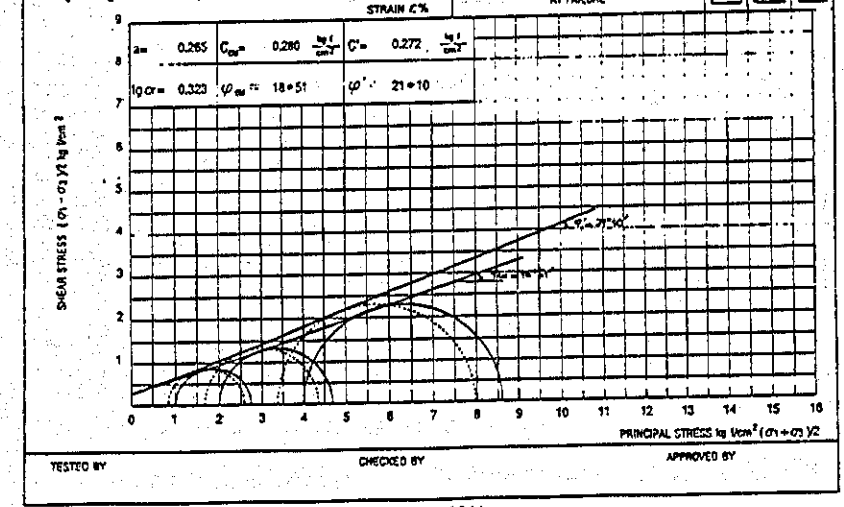
Wi 79.6 Ip 34.0 B +0.13 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	1.784	1.784	1.784
	MOISTURE	W	%	41.00	41.00	41.00
	DRY DENSITY	γ_d	g/cm³	1.265	1.265	1.265
FINAL	WET DENSITY	γ_w	g/cm³	1.794	1.804	1.813
	MOISTURE	W	%	39.80	38.80	37.80
	DRY DENSITY	γ_d	g/cm³	1.284	1.299	1.316
LATERAL STRESS		σ_3	kg f/cm²	1.00	2.00	4.00
STRAIN		ε	%	10.05	10.09	9.50
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	kg f/cm²	1.744	2.683	4.605
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$		0.872	1.342	2.302
CENTER MOHR CIRCLE		$(\sigma_1 + \sigma_3)/2$		1.872	3.342	6.302
PWP		U		0.16	0.33	0.63
EFFECTIVE MOHR		$(\sigma_1 + \sigma_3)/2$		1.712	3.012	5.672
MAX TOTAL STRESS		σ_1		2.744	4.683	8.605

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE





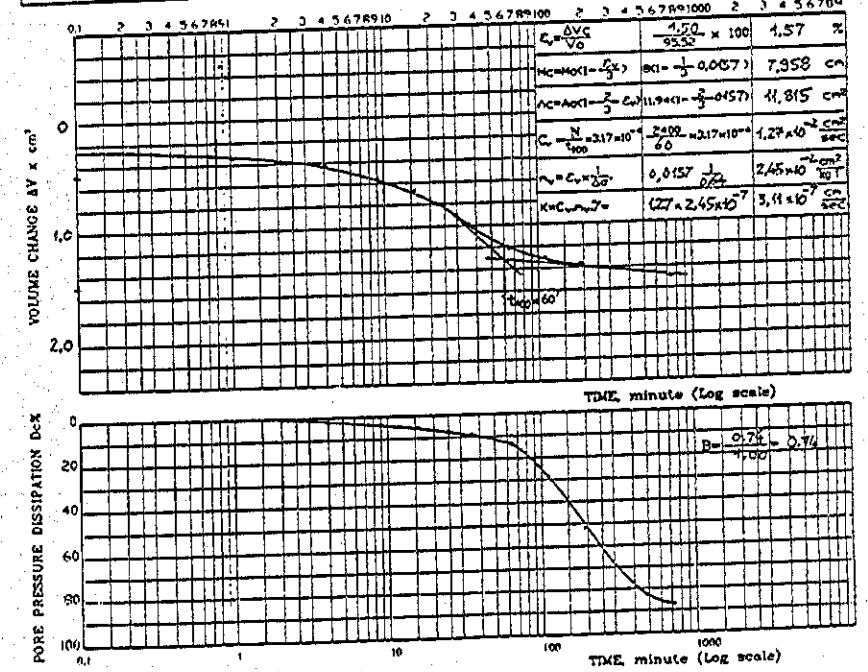


TESTED BY CHECKED BY APPROVED BY

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP6D-2 TEST TYPE: CU - PWP DATE STARTED: 21-7-1999
PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER LOAD RING N°:

TEST TYPE CU	WITH / WITHOU SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
CELL PRESSURE 1.00	kg f/cm²	21/7	7h00	0		30.00	0.00	0.74	0	0
VERTICAL STRESS 1.00				30"		29.70	0.30	0.74	-	-
BACK STRESS 0				1'		29.65	0.35	0.74	-	-
Pwp AFTER BUILD UP				2		29.60	0.40	0.74	0	0
DIFFERENCE				4		29.55	0.45	0.73	0.01	1.4
EFFECTIVE PRESSURE				9		29.45	0.55	0.72	0.02	2.7
$\sqrt{t_{100}}$ =	t_{100} = 60 min.			16		29.35	0.65	0.70	0.04	5.4
$t_s = a \cdot t_{100} = 0.51 \times 60 = 30.6$				25		29.20	0.80	0.68	0.06	8.1
				36		29.00	1.00	0.67	0.07	9.5
RATE OF DISPLACEMENT				64'		28.80	1.20	0.66	0.10	13.5
$\frac{E_{10} \cdot H_{ps}}{100 \cdot t_{50}} = 0.10 \times \frac{79.58}{30.6} = 0.26$				2h		28.70	1.30	0.53	0.21	28.4
				3		28.65	1.35	0.36	0.38	51.4
select v = 0,240 mm/min				5		28.60	1.40	0.24	0.50	67.6
				8		28.55	1.45	0.12	0.62	83.8
		21/7	19h00	12		28.50	1.50	0.10	0.64	86.5
				24h						



$\varepsilon_v = \frac{\Delta V_c}{V_o} = \frac{1.50}{95.52} \times 100 = 1.57$ %

$H_c = H_o(1 - \frac{\varepsilon_v}{3})$ $80(1 - \frac{1.57}{3}) = 7.958$ cm

$\Delta_c = A_o(1 - \frac{\varepsilon_v}{3}) C_v$ $11.94(1 - \frac{1.57}{3}) = 11.815$ cm³

$C_c = \frac{N}{t_{100}} = 3.17 \times 10^{-4}$ $\frac{2402}{60} = 3.17 \times 10^{-4}$ 1.27×10^{-2} cm²/sec

$m_v = C_v \times \frac{1}{\sigma_d}$ $0.0157 \times \frac{1}{0.64}$ 2.45×10^{-2} cm²/kg f

$K = C_v \cdot m_v \cdot \gamma_w$ $(127 \times 2.45 \times 10^{-7})$ 3.11×10^{-7} cm/sec

$B = \frac{0.74}{1.00} = 0.74$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP6D-2 — Test type: CU - PwP — Depth: 4.3-4.8m

Project: DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N°: — Date: 21 July 1999

Test type: CU — Load ring constant — Without side drains — Cell pressure σ_3 = 1.00 kg f/cm²

Rate: 0.240 mm/min — CR = 0.833 Kg/Div — Vertical stress σ_1 = 1.00 kg f/cm²

Specimen prior to shearing — Back pressure Pb = 0 kg f/cm²

Height H_{ps} = 7.958 cm — Area A_{ps} = 11.815 cm² — Volume V_{ps} = 94.024 cm³ — Eff. cell pressure $\sigma_{3'}$ = 1.00 kg f/cm²

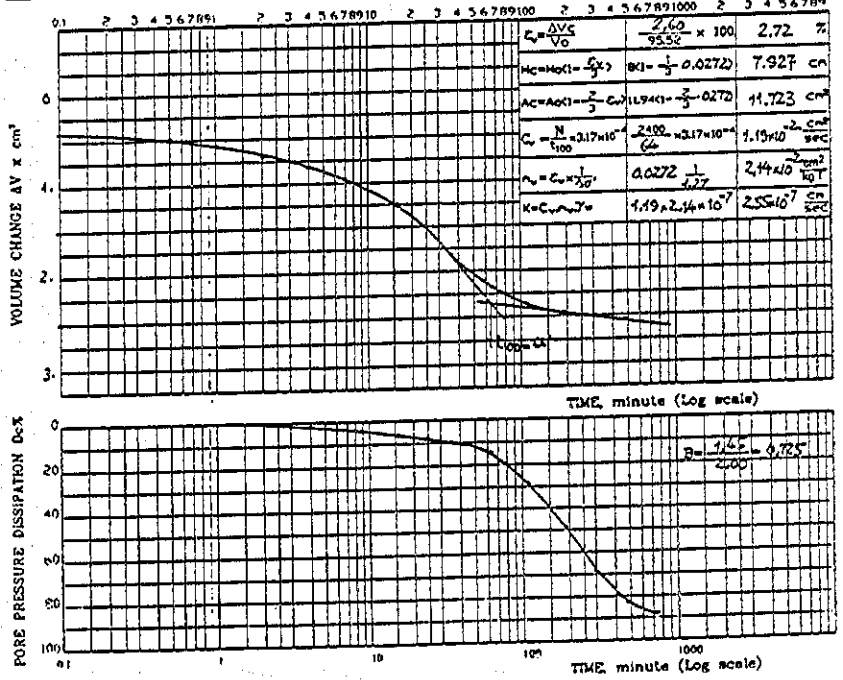
Strain Div. 0.01	ε %	Load Div. 0.01	Load Kg	U kg f/cm²	A cm²	Deviator stress kg f/cm² Stress	Memb. corr.	$\sigma_1-\sigma_3$	$\sigma_{1'}$	$\sigma_{3'}$	Stresses kg f/cm² $(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_{3'})/2$	$\sigma_{1'}/\sigma_{3'}$
0	0.00	0.00	0.00	0.10	11.815	0.000		0.000	0.900	0.900	0.000	1.000	0.900	1.000
50	0.63	7.00	5.83	0.14	11.890	0.490		0.490	1.350	0.860	0.245	1.245	1.105	1.570
100	1.26	11.50	9.58	0.17	11.965	0.801		0.801	1.631	0.830	0.400	1.400	1.230	1.965
150	1.88	14.50	12.08	0.20	12.042	1.003		1.003	1.803	0.800	0.502	1.502	1.302	2.254
200	2.51	17.40	14.49	0.21	12.120	1.196		1.196	1.986	0.790	0.598	1.598	1.388	2.514
250	3.14	19.50	16.24	0.22	12.198	1.332		1.332	2.112	0.780	0.666	1.666	1.446	2.707
300	3.77	21.00	17.49	0.22	12.278	1.425		1.425	2.205	0.780	0.712	1.712	1.492	2.827
350	4.40	22.60	18.83	0.22	12.359	1.523		1.523	2.303	0.780	0.762	1.762	1.542	2.953
400	5.03	23.70	19.74	0.22	12.440	1.587		1.587	2.367	0.780	0.793	1.793	1.573	3.035
450	5.65	24.70	20.58	0.21	12.523	1.643		1.643	2.433	0.790	0.821	1.821	1.611	3.080
500	6.28	25.30	21.07	0.20	12.607	1.672		1.672	2.472	0.800	0.836	1.836	1.636	3.090
550	6.91	25.80	21.49	0.19	12.692	1.693		1.693	2.503	0.810	0.847	1.847	1.657	3.090
600	7.54	26.20	21.82	0.18	12.778	1.708		1.708	2.528	0.820	0.854	1.854	1.674	3.083
650	8.17	26.60	22.16	0.17	12.866	1.722		1.722	2.552	0.830	0.861	1.861	1.691	3.075
700	8.80	26.90	22.41	0.16	12.955	1.730		1.730	2.570	0.840	0.865	1.865	1.705	3.059
750	9.42	27.20	22.66	0.16	13.044	1.737		1.737	2.577	0.840	0.868	1.868	1.708	3.068
800	10.05	27.50	22.91	0.16	13.135	1.744		1.744	2.584	0.840	0.872	1.372	1.712	3.076
850	10.68	27.50	22.91	0.16	13.228	1.732		1.732	2.572	0.840	0.866	1.866	1.706	3.062
900	11.31	27.60	22.99	0.15	13.322	1.726		1.726	2.576	0.850	0.863	1.863	1.713	3.030
950	11.94	27.60	22.99	0.15	13.417	1.714		1.714	2.564	0.850	0.857	1.857	1.707	3.016
1000	12.57	27.40	22.82	0.15	13.513	1.689		1.689	2.539	0.850	0.845	1.845	1.695	2.987
1050	13.19	27.10	22.57	0.14	13.611	1.659		1.659	2.519	0.860	0.829	1.829	1.689	2.929
1100	13.82	26.50	22.07	0.13	13.710	1.610		1.610	2.480	0.870	0.805	1.805	1.675	2.851
1150	14.45	26.00	21.66	0.12	13.811	1.568		1.568	2.448	0.880	0.784	1.784	1.664	2.782

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP6D-2 — TEST TYPE: CU - PWP — DATE STARTED: 20-7-99

PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER — LOAD RING N°:

TEST TYPE CU	With / Without SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	Diss. %
CELL PRESSURE 2,00		20/7	7h	0		31,00	0,00	1,45	0	0
VERTICAL STRESS 2,00				30"		30,50	0,50	1,45	-	-
BACK STRESS 0	kg f/cm²			1'		30,40	0,60	1,45	-	-
Pwp AFTER BUILD UP				2		30,35	0,65	1,45	0	0
DIFFERENCE				4		30,20	0,80	1,43	0,02	1,4
EFFECTIVE PRESSURE				9		30,00	1,00	1,40	0,05	3,4
$\sqrt{t_{100}}$ =	t_{100} = 64 min.			16		29,75	1,25	1,36	0,09	6,2
$t_s = a \cdot t_{100} = 0.51 \times 64 = 32,6$				25		29,50	1,50	1,33	0,12	8,3
				36		29,20	1,80	1,31	0,14	9,7
RATE OF DISPLACEMENT				64'		28,80	2,20	1,26	0,19	13,1
$\frac{E_{11}.H_{ps}}{100.t_{ts}} = 0.10 \times \frac{79,27}{32,6} = 0,243$				2h		28,65	2,35	1,04	0,41	28,3
				3		28,55	2,45	0,74	0,71	49,0
				5		28,50	2,50	0,45	1,00	69,0
select v = 0,240 mm/min				8		28,45	2,55	0,25	1,20	82,8
		—	19 00	12		28,40	2,60	0,18	1,27	87,5
				24h						



$\varepsilon_v = \frac{\Delta V_S}{V_0}$ — $\frac{2,60}{95,52} \times 100$ — 2,72 %

$H_c = H_0(1 - \frac{\varepsilon_v}{3})$ — $8(1 - \frac{1}{3} 0,0272)$ — 7,927 cm

$A_c = A_0(1 - \frac{2}{3}\varepsilon_v)$ — $11,94(1 - \frac{2}{3} 0,0272)$ — 11,723 cm²

$C_v = \frac{N}{t_{100}} = 3,17 \times 10^{-4}$ — $\frac{2400}{64} \times 3,17 \times 10^{-4}$ — $1,19 \times 10^{-2}$ cm²/sec

$m_v = C_v \times \frac{1}{\Delta\sigma'}$ — $0,0272 \frac{1}{1,27}$ — $2,14 \times 10^{-2}$ cm²/kg f

$K = C_v \cdot m_v \cdot \gamma_w$ — $1,19 \times 2,14 \times 10^{-7}$ — $2,55 \times 10^{-7}$ cm/sec

$B = \frac{1,42}{2,00} = 0,725$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP6D-2 — Test type: CU - PwP — Depth: 4.3-4.8m

Project: DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N°: — Date: 20 July 1999

Test type: CU — Load ring constant — Without side drains — Cell pressure σ_3 = 2.00 kg f/cm²

Rate: 0.240 mm/min — CR = 0.833 Kg/Div — Vertical stress σ_1 = 2.00 kg f/cm²

Back pressure Pb = 0 kg f/cm²

Specimen prior to shearing — Eff. cell pressure σ_3' = 2.00 kg f/cm²

Height H_{eq} = 7.927 cm — Area A_{eq} = 11.723 cm² — Volume V_{eq} = 92.932 cm³

Strain		Load		U	A	Deviator stress kg/cm²			Stresses kg/cm²					
Div. 0.01	ε %	Div. 0.01	Load Kg	kg f/cm²	cm²	Stress	Memb. corr.	$\sigma_1-\sigma_3$	σ_1	σ_3	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3')/2$	σ_1/σ_3'
0	0.00	0.00	0.00	0.18	11.723	0.000		0.000	1.820	1.820	0.000	2.000	1.820	1.000
50	0.63	12.50	10.41	0.24	11.797	0.883		0.883	2.643	1.760	0.441	2.441	2.201	1.501
100	1.26	18.60	15.49	0.27	11.873	1.305		1.305	3.035	1.730	0.652	2.652	2.382	1.754
150	1.89	23.40	19.49	0.30	11.949	1.631		1.631	3.331	1.700	0.816	2.816	2.516	1.960
200	2.52	27.00	22.49	0.32	12.026	1.870		1.870	3.550	1.680	0.935	2.935	2.615	2.113
250	3.15	30.00	24.99	0.33	12.105	2.064		2.064	3.734	1.670	1.032	3.032	2.702	2.236
300	3.78	32.00	26.66	0.34	12.184	2.188		2.188	3.848	1.660	1.094	3.094	2.754	2.318
350	4.42	34.00	28.32	0.35	12.265	2.309		2.309	3.959	1.650	1.155	3.155	2.805	2.400
400	5.05	35.60	29.65	0.35	12.346	2.402		2.402	4.052	1.650	1.201	3.201	2.851	2.456
450	5.68	37.00	30.82	0.35	12.429	2.480		2.480	4.130	1.650	1.240	3.240	2.890	2.503
500	6.31	38.20	31.82	0.34	12.512	2.543		2.543	4.203	1.660	1.272	3.272	2.932	2.532
550	6.94	39.10	32.57	0.33	12.597	2.586		2.586	4.256	1.670	1.293	3.293	2.963	2.548
600	7.57	40.00	33.32	0.33	12.683	2.627		2.627	4.297	1.670	1.314	3.314	2.984	2.573
650	8.20	40.60	33.82	0.33	12.770	2.648		2.648	4.318	1.670	1.324	3.324	2.994	2.586
700	8.83	41.10	34.24	0.33	12.858	2.663		2.663	4.333	1.670	1.331	3.331	3.001	2.594
750	9.46	41.60	34.65	0.33	12.948	2.676		2.676	4.346	1.670	1.338	3.338	3.008	2.603
800	10.09	42.00	34.99	0.33	13.039	2.683		2.683	4.353	1.670	1.342	3.342	3.012	2.607
850	10.72	42.10	35.07	0.32	13.131	2.671		2.671	4.351	1.680	1.335	3.335	3.015	2.590
900	11.35	42.20	35.15	0.32	13.224	2.658		2.658	4.338	1.680	1.329	3.329	3.009	2.582
950	11.98	42.20	35.15	0.32	13.319	2.639		2.639	4.319	1.680	1.320	3.320	3.000	2.571
1000	12.62	41.90	34.90	0.31	13.415	2.602		2.602	4.292	1.690	1.301	3.301	2.991	2.539
1050	13.25	41.50	34.57	0.31	13.513	2.558		2.558	4.248	1.690	1.279	3.279	2.969	2.514
1100	13.88	41.00	34.15	0.30	13.612	2.509		2.509	4.209	1.700	1.255	3.255	2.955	2.476
1150	14.51	40.30	33.57	0.30	13.712	2.448		2.448	4.148	1.700	1.224	3.224	2.924	2.440

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP6D-2 — TEST TYPE: CU - PWP — DATE STARTED: 19-7-99

PROJECT: DONG NAI 3 & 4 COMBINED HYDROPOWER — LOAD RING N°:

TEST TYPE CU — with / with CU SIDE DRAINS

CELL PRESSURE 4,00 kg f/cm²

VERTICAL STRESS 4,00

BACK STRESS 0

Pwp AFTER BUILD UP

DIFFERENCE

EFFECTIVE PRESSURE

$\sqrt{t_{100}}$ = t_{100} = 65 min.

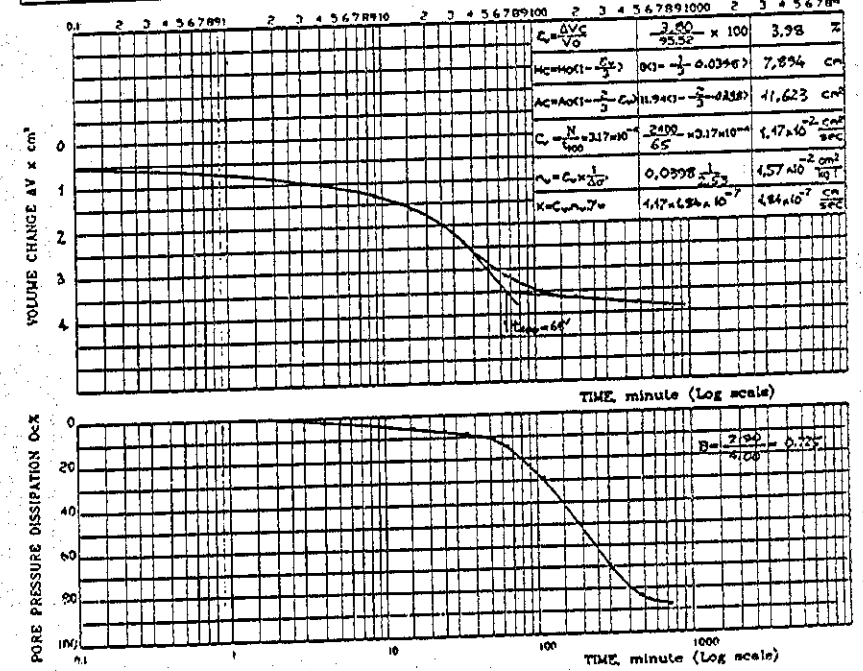
$t_s = a \cdot t_{100} = 0.51 \times 65 = 33.15$

RATE OF DISPLACEMENT

$\frac{E_{1T} \cdot H_{eq}}{100 \cdot t_{1s}} = 0.10 \times \frac{78,94}{33,15} = 0,238$

select v = 0,240 mm/min

DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
19/7	6.00	0		30.00	0.00	2.90	0	0
		30"		29.35	0.65	2.90	-	-
		1'		29.25	0.75	2.90	-	-
		2		29.15	0.85	2.90	0	0
		4		29.00	1.00	2.86	0.04	1.4
		9		28.70	1.30	2.81	0.09	3.1
		16		28.60	1.60	2.76	0.14	4.8
		25		28.00	2.00	2.70	0.20	6.9
		36		27.60	2.40	2.64	0.26	9.0
		64'		26.90	3.20	2.47	0.43	14.8
		2h		26.50	3.50	2.04	0.86	29.7
		3		26.40	3.60	1.45	1.45	50.0
		5		26.30	3.70	0.90	2.00	69.0
		8		26.25	3.75	0.49	2.41	83.1
19-7	18.00	12		26.20	3.80	0.37	2.53	87.2
		24h						



TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP6D-2 — Test type: CU - PwP — Depth: 4.3-4.8m

Project: DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N°: — Date: 19 July 1999

Test type: CU — Load ring constant — Without side drains — Cell pressure σ_3 = 4.00 kg f/cm²

Rate: 0.240 mm/min — CR = 0.833 Kg/Div — Vertical stress σ_1 = 4.00 kg f/cm²

Specimen prior to shearing — Back pressure Pb = 0 kg f/cm²

Height H_{ps} = 7.894 cm — Area A_{ps} = 11.623 cm² — Volume V_{ps} = 91.753 cm³ — Eff. cell pressure $\sigma_{3'}$ = 4.00 kg f/cm²

Strain		Load		U	A	Deviator stress kg f/cm²			Stresses kg f/cm²				
Div.		Div.	Load			Stress	Memb. corr.	$\sigma_1-\sigma_3$	$\sigma_{1'}$	$\sigma_{3'}$	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_{3'})/2$	$\sigma_1/\sigma_{3'}$
0.01	ε %	0.01	Kg	kg f/cm²	cm²									
0	0.00	0.00	0.00	0.37	11.623	0.000		0.000	3.630	3.630	0.000	4.000	3.630	1.000
50	0.63	19.00	15.83	0.42	11.697	1.353		1.353	4.933	3.580	0.677	4.677	4.257	1.378
100	1.27	30.00	24.99	0.46	11.772	2.123		2.123	5.663	3.540	1.061	5.061	4.601	1.600
150	1.90	39.50	32.90	0.49	11.848	2.777		2.777	6.287	3.510	1.389	5.389	4.899	1.791
200	2.53	46.40	38.65	0.52	11.925	3.241		3.241	6.721	3.480	1.621	5.621	5.101	1.931
250	3.17	51.50	42.90	0.54	12.003	3.574		3.574	7.034	3.460	1.787	5.787	5.247	2.033
300	3.80	56.40	46.98	0.56	12.082	3.888		3.888	7.328	3.440	1.944	5.944	5.384	2.130
350	4.43	59.00	49.15	0.58	12.162	4.041		4.041	7.461	3.420	2.020	6.020	5.440	2.182
400	5.07	61.50	51.23	0.59	12.243	4.184		4.184	7.594	3.410	2.092	6.092	5.502	2.227
450	5.70	63.50	52.90	0.60	12.326	4.292		4.292	7.692	3.400	2.146	6.146	5.546	2.262
500	6.33	65.50	54.56	0.61	12.409	4.397		4.397	7.787	3.390	2.198	6.198	5.588	2.297
550	6.97	67.00	55.81	0.62	12.493	4.467		4.467	7.847	3.380	2.234	6.234	5.614	2.322
600	7.60	68.50	57.06	0.63	12.579	4.536		4.536	7.906	3.370	2.268	6.268	5.638	2.346
650	8.23	69.60	57.98	0.63	12.666	4.577		4.577	7.947	3.370	2.289	6.289	5.659	2.358
700	8.87	70.50	58.73	0.63	12.754	4.605		4.605	7.975	3.370	2.302	6.302	5.672	2.366
750	9.50	71.00	59.14	0.63	12.843	4.605		4.605	7.975	3.370	2.302	6.302	5.672	2.366
800	10.13	71.30	59.39	0.63	12.934	4.592		4.592	7.962	3.370	2.296	6.296	5.666	2.363
850	10.77	71.50	59.56	0.63	13.026	4.573		4.573	7.943	3.370	2.286	6.286	5.656	2.357
900	11.40	71.50	59.56	0.63	13.119	4.540		4.540	7.910	3.370	2.270	6.270	5.640	2.347
950	12.03	71.40	59.48	0.62	13.213	4.501		4.501	7.881	3.380	2.251	6.251	5.631	2.332
1000	12.67	71.10	59.23	0.62	13.309	4.450		4.450	7.830	3.380	2.225	6.225	5.605	2.317
1050	13.30	70.60	58.81	0.62	13.406	4.387		4.387	7.767	3.380	2.193	6.193	5.573	2.298
1100	13.93	70.00	58.31	0.62	13.505	4.318		4.318	7.698	3.380	2.159	6.159	5.539	2.277

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TRIAXIAL COMPRESSION TEST

(SUMMARY AND REPORT DATA SHEET)

THÍ NGHIỆM NÉN BA TRỤC

(BÁO CÁO TỔNG HỢP)

TEST N° TP9D-2

TEST TYPE CU-PwP

SOIL DESCRIPTION: Residual soil of basalt : Brown silty sandy clay

TYPE OF SAMPLE: Remoulded to 0.95 MDD on wet branch

SHEARING RATE: 0.240 mm/min DATE: 19-21 July 1999

PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER

BOREHOLE N°: TP9D

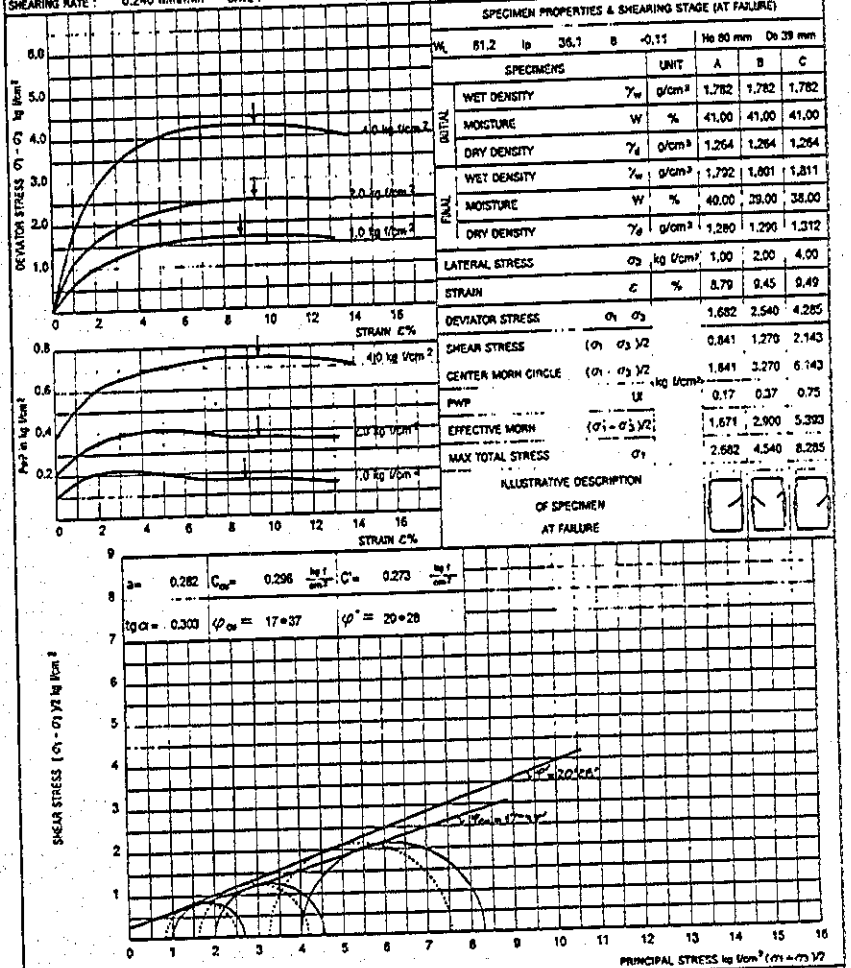
DEPTH OF SAMPLE: 4.0 - 4.5m

SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

W_L 61.2 Ip 36.1 B -0.11 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	1.782	1.782	1.782
	MOISTURE	W	%	41.00	41.00	41.00
	DRY DENSITY	γ_d	g/cm³	1.264	1.264	1.264
FINAL	WET DENSITY	γ_w	g/cm³	1.792	1.801	1.811
	MOISTURE	W	%	40.00	39.00	38.00
	DRY DENSITY	γ_d	g/cm³	1.280	1.290	1.312
LATERAL STRESS		σ_3	kg f/cm²	1.00	2.00	4.00
STRAIN		ε	%	8.79	9.45	9.49
DEVIATOR STRESS		$\sigma_1-\sigma_3$		1.682	2.540	4.285
SHEAR STRESS		$(\sigma_1-\sigma_3)/2$		0.841	1.270	2.143
CENTER MOHR CIRCLE		$(\sigma_1+\sigma_3)/2$	kg f/cm²	1.841	3.270	6.143
PWP		U		0.17	0.37	0.75
EFFECTIVE MOHR		$(\sigma_1-\sigma_3')/2$		1.671	2.900	5.393
MAX TOTAL STRESS		σ_1		2.682	4.540	8.285

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE

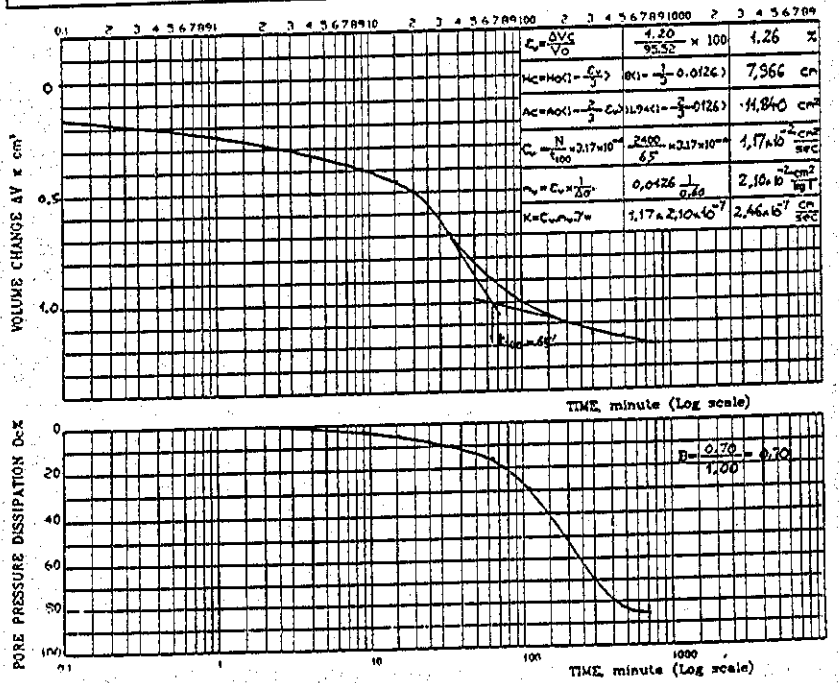


TESTED BY CHECKED BY APPROVED BY

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP9D-2 TEST TYPE: CU - PWP DATE STARTED: 21-7-99
PROJECT: DONG NAI 3&4 COMBINED HYDRO POWER LOAD RING N°:

TEST TYPE CU	SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	√t	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
CELL PRESSURE 1.00	kg f/cm²	21-7	7h00	0		33.00	0.00	0.70	0	0
VERTICAL STRESS 1.00				30"		32.80	0.20	0.70	-	-
BACK STRESS 0				1'		32.75	0.25	0.70	-	-
Pwp AFTER BUILD UP				2		32.70	0.30	0.70	0	0
DIFFERENCE				4		32.65	0.35	0.69	0.01	1.4
EFFECTIVE PRESSURE				9		32.60	0.40	0.68	0.02	2.9
$\sqrt{t_{100}}$ =	t_{100} = 65 min.			16		32.55	0.45	0.67	0.03	4.3
$t_f = a \cdot t_{100} = 0.51 \times 65 = 33.2$				25		32.45	0.55	0.65	0.05	7.1
				36		32.30	0.70	0.63	0.07	10.0
RATE OF DISPLACEMENT				64'		32.10	0.90	0.59	0.11	15.7
$\frac{\varepsilon_{tf} \cdot H_{ps}}{100 \cdot t_{fs}} = 0.10\% \frac{79.66}{33.2} = 0.241$				2h		32.00	1.00	0.49	0.21	30.0
				3		31.80	1.10	0.35	0.35	50.0
				5		31.85	1.15	0.21	0.49	70.0
select v = 0,240 mm/min				8		31.85	1.15	0.12	0.58	82.9
		-	19h00	12		31.80	1.20	0.10	0.60	85.7
				24h						



$C_v = \frac{\Delta V_S}{V_O}$ = $\frac{1.20}{95.52} \times 100$ = 1.26 %
$H_c = H_o(1 - \frac{C_v}{3})$ $\theta(1) = \frac{1}{3} - 0.0126)$ = 7,966 cm
$A_c = A_o(1 - \frac{2}{3} C_v)$ $1.94(1 - \frac{2}{3} - 0126)$ = 11,840 cm²
$C_v = \frac{N}{t_{100}} \times 2.17 \times 10^{-4}$ = $\frac{2400}{65} \times 2.17 \times 10^{-4}$ = $1,17 \times 10^{-2}$ cm²/sec
$m_v = C_v \times \frac{1}{2\sigma'}$ = $0,0426 \frac{1}{0,80}$ = $2,10 \times 10^{-2}$ cm²/kg f
$K = C_v \cdot m_v \cdot \gamma_w$ = $1,17 \times 2,10 \times 10^{-7}$ = $2,46 \times 10^{-7}$ cm/sec

$B = \frac{0.70}{1,00} = 0,70$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP9D-2 Test type: CU - PwP Depth: 4.0-4.5m
Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 21 July 1999

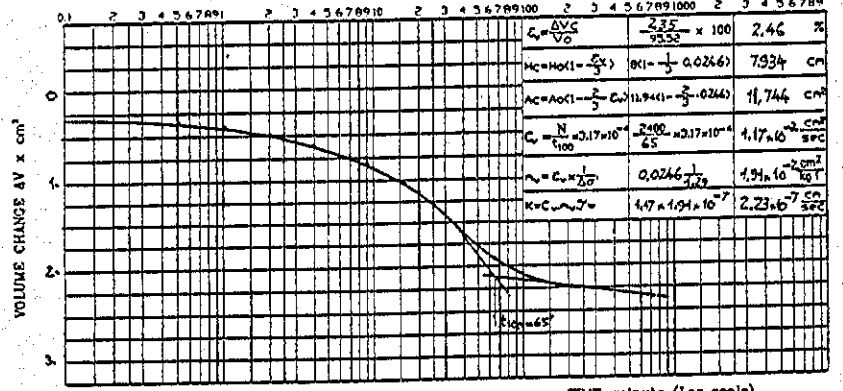
Test type: CU | Load ring constant | Without side drains | Cell pressure σ_3 = 1.00 kg f/cm²
Rate: 0.240 mm/min | CR = 0.766 Kg/Div | | Vertical stress σ_1 = 1.00 kg f/cm²
Specimen prior to shearing | | | Back pressure Pb = 0 kg f/cm²
Height H_{ps} = 7.966 cm | Area A_{ps} = 11.840 cm² | Volume V_{ps} = 94.315 cm³ | Eff. cell pressure $\sigma_{3'}$ = 1.00 kg f/cm²

Strain Div.	Strain %	Load Div	Load Kg	U kg f/cm²	A cm²	Deviator stress kg f/cm² Stress	Memb. corr.	$\sigma_1 - \sigma_3$	$\sigma_{1'}$	$\sigma_{3'}$	Stresses kg f/cm² $(\sigma_1 - \sigma_3)/2$	$(\sigma_1 + \sigma_3)/2$	$(\sigma_{1'} + \sigma_{3'})/2$	$\sigma_{1'}/\sigma_{3'}$
0.01		0.01												
0	0.00	0.00	0.00	0.10	11.840	0.000		0.000	0.900	0.900	0.000	1.000	0.900	1.000
50	0.63	7.00	5.36	0.15	11.915	0.450		0.450	1.300	0.850	0.225	1.225	1.075	1.529
100	1.26	11.70	8.96	0.19	11.991	0.747		0.747	1.557	0.810	0.374	1.374	1.184	1.923
150	1.88	15.40	11.80	0.21	12.067	0.978		0.978	1.768	0.790	0.489	1.489	1.279	2.237
200	2.51	18.00	13.79	0.22	12.145	1.135		1.135	1.915	0.780	0.568	1.568	1.348	2.455
250	3.14	20.30	15.55	0.22	12.224	1.272		1.272	2.052	0.780	0.636	1.636	1.416	2.631
300	3.77	22.20	17.01	0.22	12.303	1.382		1.382	2.162	0.780	0.691	1.691	1.471	2.772
350	4.39	24.50	18.77	0.21	12.384	1.515		1.515	2.305	0.790	0.758	1.758	1.548	2.916
400	5.02	25.00	19.15	0.20	12.466	1.536		1.536	2.336	0.800	0.768	1.768	1.568	2.920
450	5.65	26.00	19.92	0.19	12.549	1.587		1.587	2.397	0.810	0.794	1.794	1.604	2.959
500	6.28	26.80	20.53	0.18	12.633	1.625		1.625	2.445	0.820	0.813	1.813	1.633	2.982
550	6.90	27.40	20.99	0.17	12.718	1.650		1.650	2.480	0.830	0.825	1.825	1.655	2.988
600	7.53	27.90	21.37	0.17	12.804	1.669		1.669	2.499	0.830	0.835	1.835	1.665	3.011
650	8.16	28.20	21.60	0.17	12.892	1.676		1.676	2.506	0.830	0.838	1.838	1.668	3.019
700	8.79	28.50	21.83	0.17	12.981	1.682		1.682	2.512	0.830	0.841	1.841	1.671	3.026
750	9.42	28.70	21.98	0.17	13.071	1.682		1.682	2.512	0.830	0.841	1.841	1.671	3.026
800	10.04	28.90	22.14	0.17	13.162	1.682		1.682	2.512	0.830	0.841	1.841	1.671	3.026
850	10.67	29.00	22.21	0.17	13.254	1.676		1.676	2.506	0.830	0.838	1.838	1.668	3.019
900	11.30	29.00	22.21	0.16	13.348	1.664		1.664	2.504	0.840	0.832	1.832	1.672	2.981
950	11.93	28.80	22.06	0.16	13.443	1.641		1.641	2.481	0.840	0.821	1.821	1.661	2.954
1000	12.55	28.50	21.83	0.15	13.540	1.612		1.612	2.462	0.850	0.806	1.806	1.656	2.897
1050	13.18	28.00	21.45	0.15	13.638	1.573		1.573	2.423	0.850	0.786	1.786	1.636	2.850

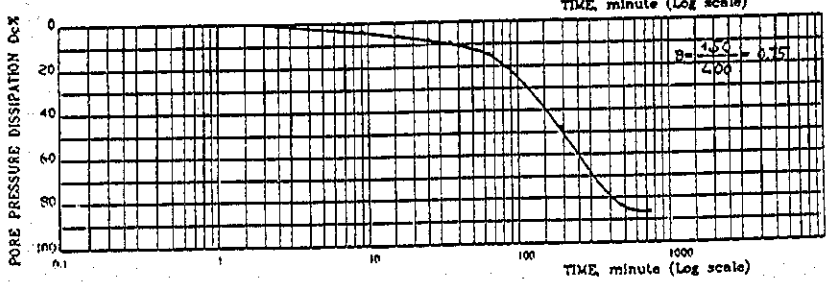
TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP9D-2 TEST TYPE: CU - PWP DATE STARTED: 20-7-99
PROJECT: DONG NAI 3&4 COMBINED HYDRO POWER LOAD RING N°:

TEST TYPE CU	WITH / WITHOUT SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	√t	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	Diss. %
CELL PRESSURE 2,00		20/7	7h00	0		32,00	0,00	1,50	0	0
VERTICAL STRESS 2,00				30"		31,65	0,35	1,50	-	-
BACK STRESS 0	kg f/cm²			1'		31,40	0,40	1,50	-	-
Pwp AFTER BUILD UP				2		31,50	0,50	1,50	0	0
DIFFERENCE				4		31,40	0,60	1,48	0,02	1,3
EFFECTIVE PRESSURE				9		31,20	0,80	1,44	0,06	4,0
√t100 = t100 = 65 min.				16		30,95	1,05	1,41	0,09	6,0
t = a . t100 = 0,51 x 65 = 33,2				25		30,70	1,30	1,39	0,11	7,3
RATE OF DISPLACEMENT				36		30,45	1,55	1,36	0,14	9,3
				64'		30,10	1,90	1,29	0,21	14,0
$\frac{E_{16}.H_{ps}}{100.t_{r.s}} = 0,10 \times \frac{79,34}{33,2} = 0,240$				2h		29,85	2,15	1,07	0,43	28,7
				3		29,80	2,20	0,77	0,73	48,7
				5		29,75	2,25	0,47	1,03	68,7
select v = 0,240 mm/min				8		29,70	2,30	0,26	1,24	82,7
		-	19h00	12		29,65	2,35	0,21	1,29	86,0
				24h						



$C_v = \frac{\Delta V_c}{V_o}$ $\frac{2,35}{95,52} \times 100$ 2,46 %
$H_c = H_o(1-\frac{\varepsilon_v}{3})$ $80(1-\frac{1}{3}\,0,0246)$ 7,934 cm
$A_c = A_o(1-\frac{2}{3}\varepsilon_v)$ $11,944(1-\frac{2}{3}\,0,0246)$ 11,744 cm²
$C_v = \frac{N}{t_{100}} = 3,17\times10^{-4}$ $\frac{2400}{65} = 3,17\times10^{-4}$ $4,17\times10^{-2}\ \frac{cm^2}{sec}$
$m_v = C_v \times \frac{1}{\Delta\sigma}$ $0,0246\,\frac{1}{12,89}$ $1,91\times10^{-2}\ \frac{cm^2}{kgf}$
$K = C_v \cdot m_v \cdot \gamma_w$ $4,17\times1,91\times10^{-7}$ $2,23\times10^{-7}\ \frac{cm}{sec}$



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TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP9D-2 Test type: CU - PwP Depth: 4,0-4,5m
Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 20 July 1999

Test type: CU | Load ring constant | Without side drains | Cell pressure σ_3 = 2.00 kg f/cm²
Rate: 0.240 mm/min | CR = 0.766 Kg/Div | Vertical stress σ_1 = 2.00 kg f/cm²
Specimen prior to shearing | Back pressure Pb = 0 kg f/cm²
Height H_{ps} = 7.934 cm | Area A_{ps} = 11.744 cm² | Volume V_{ps} = 93.178 cm³ | Eff. cell pressure σ_3 = 2.00 kg f/cm²

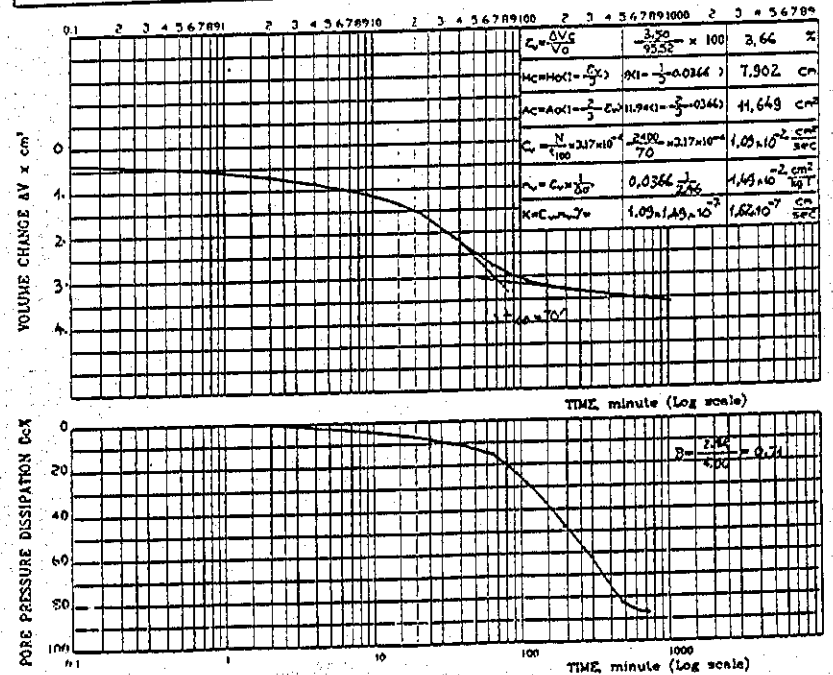
Strain Div. 0.01	Strain ε %	Load Div. 0.01	Load Kg	U kg f/cm²	A cm²	Deviator stress kg/cm² Stress	Memb. corr.	$\sigma_1-\sigma_3$	Stresses kg/cm² σ_1	σ_3	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	σ_1/σ_3
0	0.00	0.00	0.00	0.21	11.744	0.000		0.000	1.790	1.790	0.000	2 000	1.790	1 000
50	0.63	14.00	10.72	0.27	11.818	0.907		0.907	2.637	1.730	0.454	2.454	2.184	1 525
100	1.26	20.00	15.32	0.32	11.894	1.288		1.288	2.968	1.680	0.644	2.644	2.324	1.767
150	1.89	24.50	18.77	0.35	11.970	1.568		1.568	3.218	1.650	0.784	2.784	2.434	1 950
200	2.52	28.40	21.75	0.38	12.048	1.806		1.806	3.426	1.620	0.903	2.903	2.523	2 115
250	3 15	31.00	23.75	0.39	12.126	1.958		1.958	3.568	1.610	0.979	2.979	2.589	2.216
300	3 78	33.50	25.66	0.40	12 206	2.102		2 102	3 702	1.600	1.051	3.051	2.651	2 314
350	4.41	35.40	27.12	0.41	12.286	2.207		2 207	3.797	1.590	1.104	3.104	2.694	2 388
400	5.04	37.00	28.34	0.41	12 368	2.292		2 292	3.882	1.590	1 146	3.146	2 736	2 441
450	5.67	38.50	29.49	0.41	12.450	2.369		2.369	3.959	1.590	1.184	3 184	2.774	2 490
500	6.30	39.70	30.41	0.40	12.534	2.426		2.426	4.026	1.600	1.213	3.213	2.813	2 516
550	6 93	40.40	30.95	0.39	12.619	2.452		2.452	4.062	1.610	1.226	3.226	2.836	2.523
600	7 56	41.30	31.64	0.38	12.705	2.490		2 490	4 110	1.620	1.245	3.245	2.865	2 537
650	8.19	41.90	32.10	0.37	12.792	2.509		2.509	4.139	1.630	1.255	3 255	2.885	2 539
700	8.82	42.50	32.56	0.37	12.880	2.527		2 527	4.157	1.630	1.264	3.264	2.894	2 551
750	9.45	43.00	32.94	0.37	12.970	2.540		2.540	4.170	1.630	1.270	3.270	2.900	2 558
800	10.08	43.20	33.09	0.37	13.061	2.534		2.534	4.164	1.630	1.267	3.267	2.897	2 554
850	10.71	43.40	33.24	0.37	13 153	2.527		2.527	4.157	1.630	1.264	3.264	2.894	2 551
900	11 34	43.50	33.32	0.36	13.247	2 515		2 515	4 155	1.640	1 258	3.258	2 898	2 534
950	11.97	43.60	33.40	0.36	13.341	2.503		2 503	4.143	1.640	1.252	3.252	2.892	2 526
1000	12.60	43.60	33.40	0.36	13.438	2.485		2.485	4.125	1.640	1.243	3.243	2.883	2 515
1050	13.23	43.60	33.40	0.36	13.535	2.467		2.467	4.107	1.640	1.234	3.234	2.874	2.505

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP9D-2 TEST TYPE: CU - PWP DATE STARTED: 19 - 7 - 99

PROJECT: DONG NAI 3+4 COMBINED HYDROPOWER, LOAD RING N°:

TEST TYPE CU	WITH / WITHOUT SIDE DRAINS		DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
CELL PRESSURE	4.00	kg f/cm²	19/7	6h00	0		33.00	0.00	2.94	0	0
VERTICAL STRESS	4.00				30"		32.50	2.60	2.84	–	–
BACK STRESS	0				1'		32.40	0.60	2.94	–	–
Pwp AFTER BUILD UP					2		32.30	0.70	2.84	0	0
DIFFERENCE					4		32.15	0.85	2.80	0.04	1.4
EFFECTIVE PRESSURE					9		31.90	1.10	2.73	0.11	3.9
$\sqrt{t_{100}}$ =	t_{100} = 70 min.				16		31.70	1.30	2.67	0.17	6.0
$t_1 = a$, $t_{100} = 0.51 \times 70 = 35.7$					25		31.30	1.70	2.60	0.24	8.5
					36		30.90	2.10	2.54	0.30	10.6
RATE OF DISPLACEMENT					64'		30.25	2.75	2.44	0.40	14.1
$\frac{\varepsilon_{1f} \cdot H_{ps}}{100 \cdot t_{fs}} = 0.10 \times \frac{79.02}{35.7} = 0.221$					2h		29.90	3.10	2.04	0.80	28.2
					3		29.70	3.30	1.48	1.36	47.9
					5		29.60	3.40	1.08	1.76	62.0
select v = 0,240 mm/min					8		29.55	3.45	0.51	2.33	82.0
			19-7	18.00	12		29.50	3.50	0.39	2.46	86.6
					24h						



$C_v = \frac{\Delta V_c}{V_o}$ $\frac{3.50}{95.55} \times 100$ 3,66 %

$H_c = H_o(1 - \frac{\varepsilon_v}{3})$ $(\varepsilon_1 = \frac{1}{3} 0.0366)$ 7.902 cm

$A_c = A_o(1 - \frac{2}{3}\varepsilon_v)$ $11.94(1 - \frac{2}{3} 0.0366)$ 11,649 cm²

$C_v = \frac{N}{t_{100}} = \frac{0.217 \times 10^{-4}}{70} = \frac{2400}{70} = 2.17 \times 10^{-4}$ 1.09×10^{-2} cm²/sec

$m_v = C_v \frac{1}{2\sigma_3}$ $0.0366 \frac{1}{2.56}$ 1.43×10^{-2} cm²/kg f

$K = C_v \cdot m_v \cdot \gamma_w$ $1.09 \times 1.43 \times 10^{-2}$ 1.62×10^{-7} cm/sec

$B = \frac{2.80}{4.00} = 0.71$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP9D-2 Test type: CU - PwP Depth: 4.0-4.5m

Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 19 July 1999

Test type: CU Load ring constant Without side drains Cell pressure σ_3 = 4.00 kg f/cm²

Rate: 0.240 mm/min CR = 0.766 Kg/Dv Vertical stress σ_1 = 4.00 kg f/cm²

Specimen prior to shearing Back pressure Pb = 0 kg f/cm²

Height H_{ps} = 7.902 cm Area A_{ps} = 11.549 cm² Volume V_{ps} = 92.050 cm³ Eff. cell pressure σ_3 = 4.00 kg f/cm²

Strain Dv.	Strain	Load Dv.	Load	U	A	Deviator stress kg f/cm² Stress	Memb. corr.	$\sigma_1 - \sigma_3$	Stresses kg f/cm² σ_r	σ_z	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	σ_1/σ_3
0.01	ε %	0.01	Kg	kg f/cm²	cm²								
0	0.00	0.00	0.00	0.38	11.649	0.000		0.000	3.620	3.620	0.000	4.000	1.000
50	0.63	21.00	16.09	0.48	11.723	1.372		1.372	4.892	3.520	0.686	4.686	1.390
100	1.27	33.50	25.66	0.54	11.798	2.175		2.175	5.635	3.460	1.087	5.087	1.529
150	1.90	43.00	32.94	0.61	11.874	2.774		2.774	6.164	3.390	1.387	5.387	1.818
200	2.53	50.00	38.30	0.64	11.951	3.205		3.205	6.565	3.360	1.602	5.602	1.954
250	3.16	55.50	42.51	0.66	12.030	3.534		3.534	6.874	3.340	1.767	5.767	2.058
300	3.80	59.50	45.58	0.68	12.109	3.764		3.764	7.084	3.320	1.882	5.882	2.134
350	4.43	62.50	47.88	0.70	12.189	3.928		3.928	7.228	3.300	1.964	5.964	2.190
400	5.06	65.00	49.79	0.71	12.270	4.058		4.058	7.348	3.290	2.029	6.029	2.233
450	5.69	67.00	51.32	0.72	12.352	4.155		4.155	7.435	3.280	2.077	6.077	2.267
500	6.33	68.50	52.47	0.73	12.436	4.219		4.219	7.489	3.270	2.110	6.110	2.290
550	6.96	69.50	53.24	0.74	12.520	4.252		4.252	7.512	3.260	2.126	6.126	2.304
600	7.59	70.40	53.93	0.75	12.606	4.278		4.278	7.528	3.250	2.139	6.139	2.316
650	8.23	71.00	54.39	0.75	12.693	4.285		4.285	7.535	3.250	2.142	6.142	2.318
700	8.86	71.50	54.77	0.75	12.781	4.285		4.285	7.535	3.250	2.143	6.143	2.318
750	9.49	72.00	55.15	0.75	12.871	4.285		4.285	7.535	3.250	2.143	6.143	2.318
800	10.12	72.30	55.38	0.75	12.961	4.273		4.273	7.523	3.250	2.136	6.136	2.315
850	10.76	72.50	55.54	0.75	13.053	4.255		4.255	7.505	3.250	2.127	6.127	2.309
900	11.39	72.40	55.46	0.74	13.146	4.219		4.219	7.479	3.260	2.109	6.109	2.294
950	12.02	72.00	55.15	0.74	13.241	4.165		4.165	7.425	3.260	2.083	6.083	2.278
1000	12.66	71.40	54.69	0.73	13.337	4.101		4.101	7.371	3.270	2.050	6.050	2.254
1050	13.29	70.80	54.23	0.72	13.434	4.037		4.037	7.317	3.280	2.018	6.018	2.231
1100	13.92	69.80	53.47	0.71	13.533	3.951		3.951	7.241	3.290	1.975	5.975	2.201

TRIAXIAL COMPRESSION TEST
(SUMMARY AND REPORT DATA SHEET)
THÍ NGHIỆM NÉN BA TRỤC
(BÁO CÁO TỔNG HỢP)

TEST N° TP10D-2
TEST TYPE CU-PwP

SOIL DESCRIPTION : Reddish brown laterite gravels sandy clay mixture
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.180 mm/min DATE : 26-28 July 1999

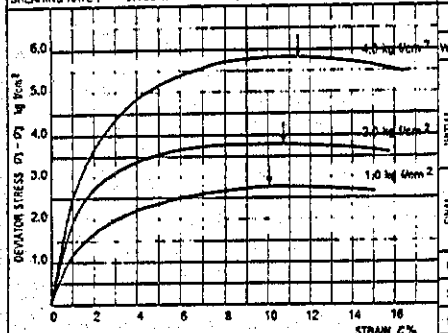
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N°: TP10D
DEPTH OF SAMPLE : 4.5 - 5.0m

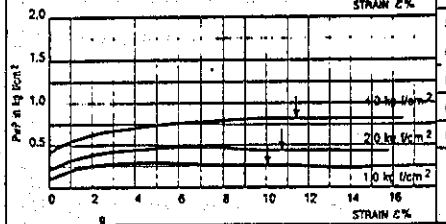
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

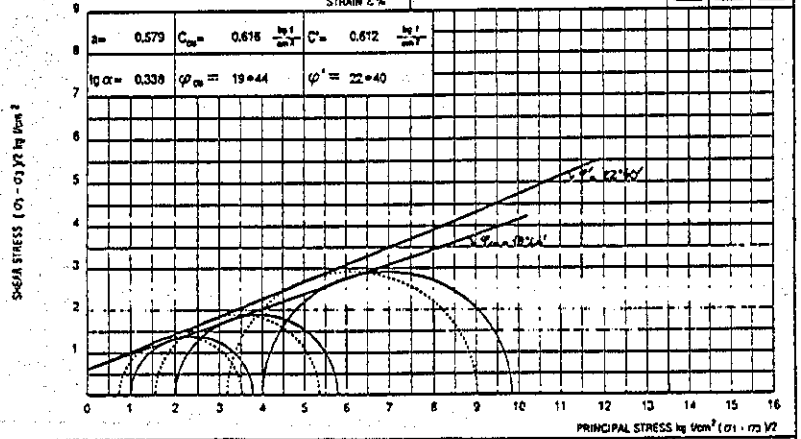
W_L 56.0 I_p 24.4 B -0.16 Ho 80 mm De 39 mm

			UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	2.030	2.030	2.030
	MOISTURE	W	%	27.60	27.60	27.60
	DRY DENSITY	γ_d	g/cm³	1.591	1.591	1.591
FINAL	WET DENSITY	γ_w	g/cm³	2.045	2.058	2.070
	MOISTURE	W	%	26.60	25.90	25.30
	DRY DENSITY	γ_d	g/cm³	1.615	1.634	1.652
LATERAL STRESS		σ_3	kg f/cm²	1.00	2.00	4.00
STRAIN		ε	%	10.05	10.72	11.39
DEVIATOR STRESS		$\sigma_1 - \sigma_3$		2.769	3.791	5.831
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$		1.385	1.895	2.915
CENTER MORH CIRCLE		$(\sigma_1 + \sigma_3)/2$	kg f/cm²	2.385	3.895	6.915
PWP		U		0.26	0.44	0.82
EFFECTIVE MORH		$(\sigma_1 + \sigma_3)/2$		2.125	3.455	6.095
MAX TOTAL STRESS		σ_1		3.769	5.791	9.831

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE







TESTED BY CHECKED BY APPROVED BY

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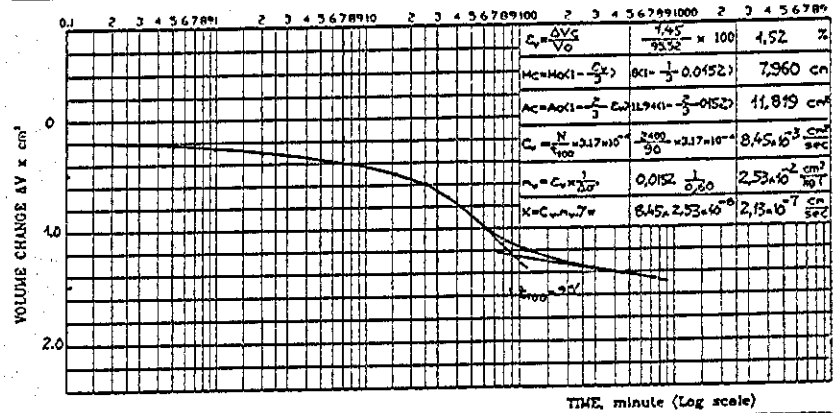
TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP10D-2 TEST TYPE: CU - PWP DATE STARTED: 28-7-99
PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER LOAD RING N°:

TEST TYPE CU	WITH / WITHOU SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
CELL PRESSURE 1.00		28-7	6h20	0		28.00	0.00	0.70	0	0
VERTICAL STRESS 1.00	kg f/cm²			30"		27.75	0.25	0.70	-	-
BACK STRESS 0				1'		27.75	0.25	0.70	-	-
Pwp AFTER BUILD UP				2		27.70	0.30	0.70	0	0
DIFFERENCE				4		27.65	0.35	0.69	0.01	1.4
EFFECTIVE PRESSURE				9		27.60	0.40	0.68	0.02	2.9
$\sqrt{t_{100}}$ =	t_{100} = 90 min.			16		27.50	0.50	0.67	0.03	4.3
$t_f = 8 . t_{100} = 0.51 \times 90 = 45.9$				25		27.40	0.60	0.66	0.04	5.7
				36		27.30	0.70	0.64	0.06	8.6
RATE OF DISPLACEMENT				64'		27.00	1.00	0.62	0.08	11.4
$\frac{E_{ff}.H_{ps}}{100.t_{fs}} = 0.10 \times \frac{79.60}{45.9} = 0.173$				2h		26.80	1.20	0.59	0.11	15.7
				3		26.70	1.30	0.50	0.20	28.6
				5		26.65	1.35	0.35	0.35	50.0
select v = 0,180 mm/min				8		26.60	1.40	0.16	0.54	77.1
		-	18 20	12		26.55	1.45	0.10	0.60	85.7
				24h						



$\varepsilon_v = \frac{\Delta V_c}{V_o}$ $\frac{1.45}{95.52} \times 100$ 4,52 %

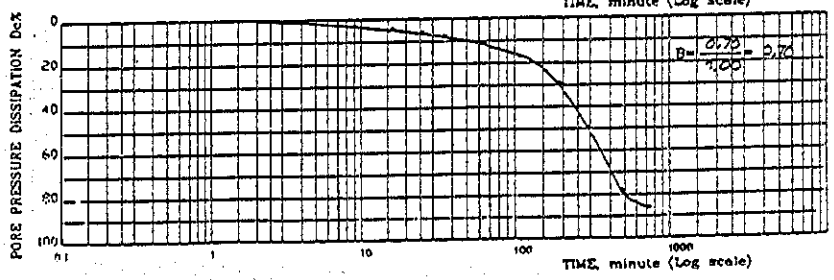
$H_c = H_o(1 - \frac{\varepsilon_v}{3})$ $8(1 - \frac{1}{3} \cdot 0.0152)$ 7,960 cm

$A_c = A_o(1 - \frac{2}{3}\varepsilon_v)$ $11.941(1 - \frac{2}{3} \cdot 0152)$ 11,819 cm²

$C_v = \frac{N}{t_{100}} = 3.17 \times 10^{-4}$ $\frac{2400}{90} = 3.17 \times 10^{-4}$ $8,45 \times 10^{-3}$ cm²/sec

$m_v = C_v \times \frac{1}{\Delta\sigma'}$ $0,0152 \cdot \frac{1}{0,60}$ $2,53 \times 10^{-2}$ cm²/kgf

$K = C_v . m_v . \gamma_w$ $8,45 \times 2,53 \times 10^{-6}$ $2,13 \times 10^{-7}$ cm/sec



TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP10D-2 | Test type: CU - PwP | Depth: 4.5-5.0m

Project: DONG NAI 3&4 COMBINED HYDROPOWER | Load ring N°: | Date: 28 July 1999

Test type: CU	Load ring constant	Without side drains	Cell pressure σ_3 = 1.00 kg f/cm²
Rate: 0.180 mm/mn	CR = 0.766 Kg/Dv		Vertical stress σ_1 = 1.00 kg f/cm²
Specimen prior to shearing			Back pressure Pb = 0 kg f/cm²
Height H_{ps} = 7.960 cm	Area A_{ps} = 11.819 cm²	Volume V_{ps} = 94.079 cm³	Eff. cell pressure σ_3' = 1.00 kg f/cm²

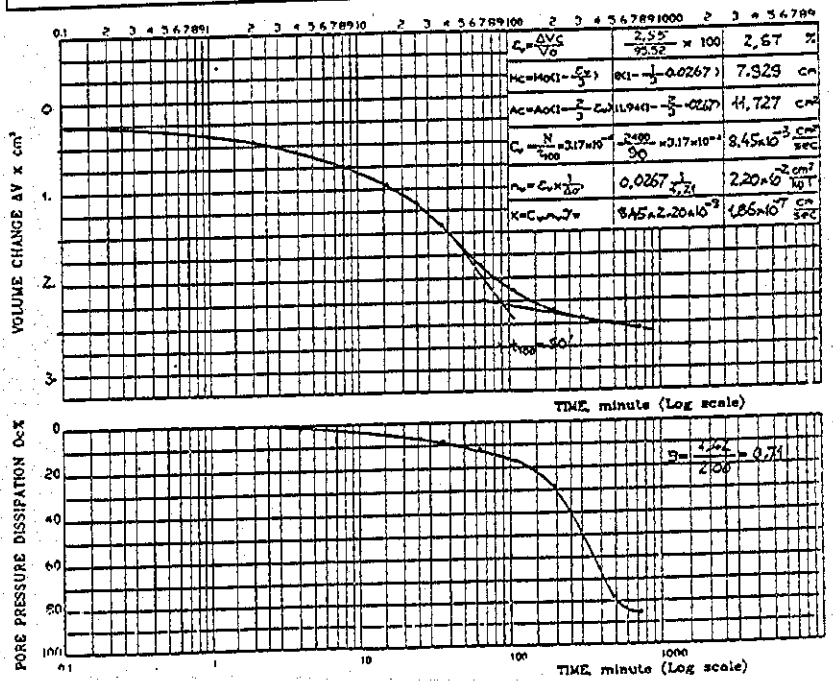
Strain		Load		U	A	Deviator stress kg f/cm²		Stresses kg f/cm²					
Dv.		Dv.	Load			Stress	Memb. corr.	$\sigma_1-\sigma_3$	σ_1'	σ_3'	$(\sigma_1+\sigma_3)/2$	$(\sigma_1'+\sigma_3')/2$	σ_1'/σ_3'
0.01	ε %	0.01	Kg	kg f/cm²	cm²								
0	0.00	0.00	0.00	0.10	11.819	0.000		0.000	0.900	0.900	0.000	1.000	0.900	1.000
50	0.63	15.00	11.49	0.17	11.894	0.966		0.966	1.796	0.830	0.483	1.483	1.313	2.164
100	1.26	21.00	16.09	0.22	11.969	1.344		1.344	2.124	0.780	0.672	1.672	1.452	2.723
150	1.88	26.00	19.92	0.25	12.046	1.653		1.653	2.403	0.750	0.827	1.827	1.577	3.204
200	2.51	29.50	22.60	0.27	12.124	1.864		1.864	2.594	0.730	0.932	1.932	1.662	3.553
250	3.14	32.40	24.82	0.28	12.202	2.034		2.034	2.754	0.720	1.017	2.017	1.737	3.825
300	3.77	34.80	26.66	0.29	12.282	2.170		2.170	2.880	0.710	1.085	2.085	1.795	4.057
350	4.40	37.00	28.34	0.29	12.363	2.293		2.293	3.003	0.710	1.146	2.146	1.856	4.229
400	5.03	38.50	29.49	0.29	12.444	2.370		2.370	3.080	0.710	1.185	2.185	1.895	4.338
450	5.65	40.30	30.87	0.29	12.527	2.464		2.464	3.174	0.710	1.232	2.232	1.942	4.471
500	6.28	41.80	32.02	0.28	12.611	2.539		2.539	3.259	0.720	1.269	2.269	1.989	4.526
550	6.91	43.00	32.94	0.27	12.696	2.594		2.594	3.324	0.730	1.297	2.297	2.027	4.554
600	7.54	44.00	33.70	0.26	12.783	2.637		2.637	3.377	0.740	1.318	2.318	2.058	4.563
650	8.17	45.00	34.47	0.26	12.870	2.678		2.678	3.418	0.740	1.339	2.339	2.079	4.619
700	8.79	46.00	35.24	0.26	12.959	2.719		2.719	3.459	0.740	1.360	2.360	2.100	4.674
750	9.42	46.90	35.93	0.26	13.048	2.753		2.753	3.493	0.740	1.377	2.377	2.117	4.721
800	10.05	47.50	36.39	0.26	13.140	2.769		2.769	3.509	0.740	1.385	2.385	2.125	4.742
850	10.68	47.80	36.61	0.26	13.232	2.767		2.767	3.507	0.740	1.384	2.384	2.124	4.739
900	11.31	48.00	36.77	0.26	13.326	2.759		2.759	3.499	0.740	1.380	2.380	2.120	4.729
950	11.93	48.20	36.92	0.25	13.421	2.751		2.751	3.501	0.750	1.376	2.376	2.126	4.668
1000	12.56	48.30	37.00	0.24	13.517	2.737		2.737	3.497	0.760	1.369	2.369	2.120	4.601
1050	13.19	48.40	37.07	0.23	13.615	2.723		2.723	3.493	0.770	1.362	2.362	2.132	4.536
1100	13.82	48.50	37.15	0.23	13.714	2.709		2.709	3.479	0.770	1.354	2.354	2.124	4.518
1150	14.45	48.50	37.15	0.23	13.815	2.689		2.689	3.459	0.770	1.345	2.345	2.115	4.492
1200	15.08	48.20	36.92	0.24	13.917	2.653		2.653	3.413	0.760	1.326	2.326	2.085	4.491

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP 10 D-2 | TEST TYPE: CU - PWP | DATE STARTED: 27-7-99

PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER | LOAD RING N°:

TEST TYPE CU	WITH / WITHOU SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
CELL PRESSURE 2,00	kg f/cm²	27-7	6.00	0		31,00	0,00	1,42	0	0
VERTICAL STRESS 2,00				30"		30,65	0,35	1,42	0	0
BACK STRESS 0				1'		30,60	0,40	1,42	0	0
Pwp AFTER BUILD UP				2		30,55	0,45	1,42	0	0
DIFFERENCE				4		30,45	0,55	1,40	0,02	1,4
EFFECTIVE PRESSURE				9		30,25	0,75	1,38	0,04	2,8
$\sqrt{t_{100}}$ = t_{100} = 90 min.				16		30,05	0,95	1,35	0,07	4,9
$t_s = a \cdot t_{100} = 0.51 \times 90 = 45,9$				25		29,80	1,20	1,32	0,10	7,0
				36		29,60	1,40	1,30	0,12	8,5
RATE OF DISPLACEMENT				64		29,20	1,80	1,26	0,16	11,3
$\frac{\varepsilon_{tf} \cdot H_{ps}}{100 \cdot t_{tf}} = 0,10\% \frac{79,29}{45,9} = 0,173$				2h		28,85	2,15	1,19	0,24	16,9
				3		28,65	2,35	1,04	0,40	28,2
select v = 0,180 mm/min				5		28,55	2,45	0,72	0,70	49,3
				8		28,50	2,50	0,34	1,11	78,2
				12		28,45	2,55	0,21	1,21	85,2
				24h						



TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP10D-2 — Test type: CU - PwP — Depth: 4.5-5.0m

Project: DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N°: — Date: 27 July 1999

Test type: CU	Load ring constant	Without side drains	Cell pressure σ_3 = 2.00 kg f/cm²
Rate: 0.180 mm/min	CR = 0.766 Kg/Div		Vertical stress σ_1 = 2.00 kg f/cm²
Specimen prior to shearing			Back pressure Pb = 0 kg f/cm²
Height H_{ps} = 7.929 cm	Area A_{ps} = 11.727 cm²	Volume V_{ps} = 92.983 cm³	Eff. cell pressure $\sigma_{3'}$ = 2.00 kg f/cm²

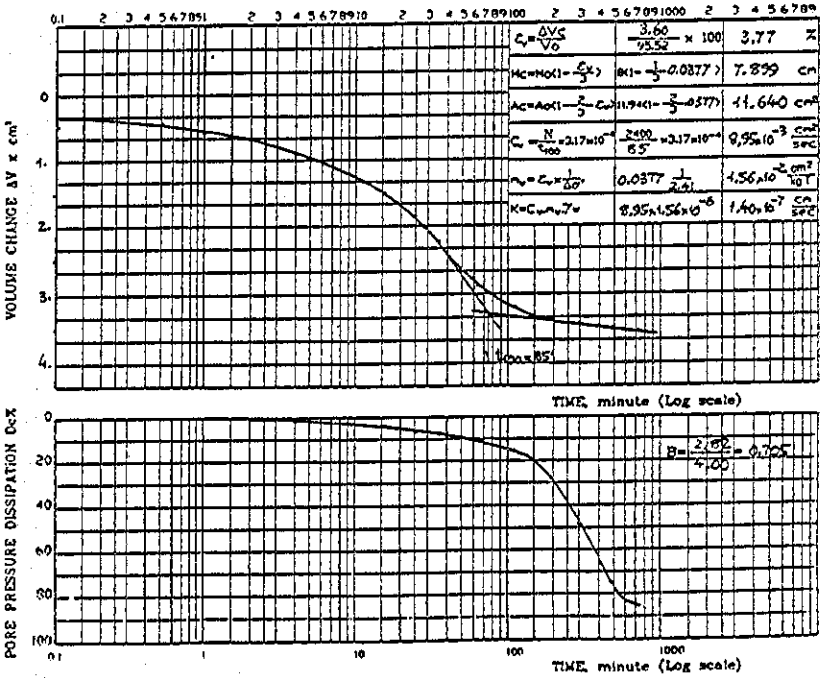
Strain		Load		U	A	Deviator stress kg/cm²			Stresses kg/cm²					
Div. 0.01	ε %	Div. 0.01	Load Kg	kg f/cm²	cm²	Stress	Memb. corr.	$\sigma_1-\sigma_3$	σ_1	σ_3	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	σ_1/σ_3
0	0.00	0.00	0.00	0.21	11.727	0.000		0.000	1.790	1.790	0.000	2.000	1.790	1.000
50	0.63	24.00	18.38	0.29	11.801	1.558		1.558	3.268	1.710	0.779	2.779	2.489	1.911
100	1.26	35.00	26.81	0.34	11.877	2.257		2.257	3.917	1.660	1.129	3.129	2.789	2.360
150	1.89	42.00	32.17	0.38	11.953	2.692		2.692	4.312	1.620	1.346	3.346	2.966	2.661
200	2.52	46.50	35.62	0.41	12.030	2.961		2.961	4.551	1.590	1.480	3.480	3.070	2.862
250	3.15	50.20	38.45	0.43	12.109	3.176		3.176	4.746	1.570	1.588	3.588	3.158	3.023
300	3.78	53.00	40.60	0.44	12.188	3.331		3.331	4.891	1.560	1.665	3.665	3.225	3.135
350	4.41	55.50	42.51	0.45	12.269	3.465		3.465	5.015	1.550	1.733	3.733	3.283	3.236
400	5.04	57.40	43.97	0.46	12.350	3.560		3.560	5.100	1.540	1.780	3.780	3.320	3.312
450	5.68	59.00	45.19	0.47	12.433	3.635		3.635	5.165	1.530	1.818	3.818	3.348	3.376
500	6.31	60.40	46.27	0.47	12.516	3.697		3.697	5.227	1.530	1.848	3.848	3.378	3.416
550	6.94	61.50	47.11	0.47	12.601	3.738		3.738	5.268	1.530	1.869	3.869	3.399	3.443
600	7.57	62.40	47.80	0.47	12.687	3.767		3.767	5.297	1.530	1.884	3.884	3.414	3.462
650	8.20	63.00	48.26	0.46	12.774	3.778		3.778	5.308	1.540	1.889	3.889	3.429	3.453
700	8.83	63.50	48.64	0.45	12.863	3.782		3.782	5.332	1.550	1.891	3.891	3.441	3.440
750	9.46	64.00	49.02	0.44	12.952	3.785		3.785	5.345	1.560	1.893	3.893	3.453	3.426
800	10.09	64.50	49.41	0.44	13.043	3.788		3.788	5.348	1.560	1.894	3.894	3.454	3.428
850	10.72	65.00	49.79	0.44	13.135	3.791		3.791	5.351	1.560	1.895	3.895	3.455	3.430
900	11.35	65.30	50.02	0.44	13.229	3.781		3.781	5.341	1.560	1.891	3.891	3.451	3.424
950	11.98	65.50	50.17	0.44	13.323	3.766		3.766	5.326	1.560	1.883	3.883	3.443	3.414
1000	12.61	65.70	50.33	0.44	13.419	3.750		3.750	5.310	1.560	1.875	3.875	3.435	3.404
1050	13.24	65.90	50.48	0.44	13.517	3.735		3.735	5.295	1.560	1.867	3.867	3.427	3.394
1100	13.87	66.00	50.56	0.43	13.616	3.713		3.713	5.283	1.570	1.856	3.856	3.426	3.365
1150	14.50	66.00	50.56	0.43	13.716	3.686		3.686	5.256	1.570	1.843	3.843	3.413	3.348
1200	15.13	65.80	50.40	0.43	13.818	3.648		3.648	5.218	1.570	1.824	3.824	3.394	3.323
1250	15.76	65.20	49.94	0.43	13.922	3.587		3.587	5.157	1.570	1.794	3.794	3.364	3.285

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP 10D-2 — TEST TYPE: CU - PWP

PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER — LOAD RING N°: — DATE STARTED: 26-7-99

TEST TYPE CU	WITH / WITHOU SIDE DRAINS	DATE	CLOCK TIME	TIME t minutes	$\sqrt{t}$	VOLUME CHANGE gauge cm³	VOLUME CHANGE Diff. cm³	PORE PRESSURE reading kg f/cm²	PORE PRESSURE Diff. kg f/cm²	PORE PRESSURE Diss. %
CELL PRESSURE 4,00	kg f/cm²	26/7	6h20	0		32,00	0,00	2,82	0,0	0
VERTICAL STRESS 4,00				30"		31,55	0,45	2,82	0	0
BACK STRESS 0				1'		31,45	0,55	2,82	0	0
Pwp AFTER BUILD UP				2		31,35	0,65	2,82	0	0
DIFFERENCE				4		31,20	0,80	2,78	0,04	1,4
EFFECTIVE PRESSURE				9		30,80	1,20	2,74	0,08	2,9
$\sqrt{t_{100}}$ = t_{100} = 85 min.				16		30,50	1,50	2,70	0,12	4,3
$t_f = a \cdot t_{100} = 0.51 \times 85 = 43,4$				25		30,20	1,80	2,65	0,17	6,0
				36		29,75	2,25	2,61	0,21	7,4
RATE OF DISPLACEMENT				64'		29,45	2,85	2,57	0,30	10,6
$\frac{E_{1f} \cdot H_{ps}}{100 \cdot t_{f,s}} = 0.10 \times \frac{78,92}{43,4} = 0,182$				2h		28,75	3,25	2,41	0,41	14,5
				3		28,60	3,40	2,03	0,79	28,0
select v = 0,180 mm/min				5		28,50	3,50	1,44	1,38	48,9
				8		28,45	3,55	0,71	2,11	74,8
		—	18h26	12		28,40	3,60	0,41	2,41	85,1
				24h						



TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP100-2 | Test type: CU - PwP | Depth: 4.5-5.0m

Project: DONG NAI 3&4 COMBINED HYDROPOWER | Load ring N°. | Date: 26 July 1999

Test type: CU	Load ring constant	Without side drains	Cell pressure σ_3 = 4.00 kg f/cm²
Rate: 0.180 mm/min	CR = 0.766 Kg/Div		Vertical stress σ_1 = 4.00 kg f/cm²
Specimen prior to shearing			Back pressure Pb = 0 kg f/cm²
Height H_{eq} = 7.899 cm	Area A_{eq} = 11.640 cm²	Volume V_{eq} = 91.944 cm³	Eff. cell pressure $\sigma_{3'}$ = 4.00 kg f/cm²

Strain		Load		U	A	Deviator strees kg f/cm²			Stresses kg f/cm²					
Div. 0.01	ε %	Div. 0.01	Load Kg	kg f/cm²	cm²	Stress	Memb. corr.	$\sigma_1-\sigma_3$	$\sigma_{1'}$	$\sigma_{3'}$	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_{3'})/2$	$\sigma_1/\sigma_{3'}$
0	0.00	0.00	0.00	0.41	11.640	0.000		0.000	3.590	3.590	0.000	4.000	3.590	1.000
50	0.63	30.00	22.98	0.52	11.714	1.962		1.962	5.442	3.480	0.981	4.981	4.461	1.564
100	1.27	45.00	34.47	0.57	11.789	2.924		2.924	6.354	3.430	1.462	5.462	4.892	1.852
150	1.90	56.00	42.90	0.62	11.865	3.615		3.615	6.995	3.380	1.808	5.808	5.188	2.070
200	2.53	64.00	49.02	0.66	11.942	4.105		4.105	7.445	3.340	2.053	6.053	5.393	2.229
250	3.16	70.00	53.62	0.68	12.020	4.461		4.461	7.781	3.320	2.230	6.230	5.550	2.344
300	3.80	75.50	57.83	0.70	12.100	4.780		4.780	8.080	3.300	2.390	6.390	5.690	2.448
350	4.43	79.50	60.90	0.72	12.180	5.000		5.000	8.280	3.280	2.500	6.500	5.780	2.524
400	5.06	83.00	63.58	0.74	12.261	5.185		5.185	8.445	3.260	2.593	6.593	5.853	2.591
450	5.70	86.00	65.88	0.76	12.343	5.337		5.337	8.577	3.240	2.669	6.669	5.909	2.647
500	6.33	88.50	67.79	0.77	12.427	5.455		5.455	8.685	3.230	2.728	6.728	5.958	2.689
550	6.96	91.00	69.71	0.78	12.511	5.572		5.572	8.792	3.220	2.786	6.786	6.006	2.730
600	7.60	93.40	71.54	0.79	12.597	5.680		5.680	8.890	3.210	2.840	6.840	6.050	2.769
650	8.23	95.00	72.77	0.80	12.684	5.737		5.737	8.937	3.200	2.869	6.869	6.069	2.793
700	8.86	96.30	73.77	0.81	12.772	5.776		5.776	8.968	3.190	2.888	6.888	6.078	2.811
750	9.49	97.40	74.61	0.82	12.861	5.801		5.801	8.981	3.180	2.901	6.901	6.081	2.824
800	10.13	98.50	75.45	0.82	12.952	5.826		5.826	9.006	3.180	2.913	6.913	6.093	2.832
850	10.76	99.30	76.06	0.82	13.044	5.832		5.832	9.012	3.180	2.916	6.916	6.096	2.834
900	11.39	100.00	76.60	0.82	13.137	5.831		5.831	9.011	3.180	2.915	6.915	6.095	2.834
950	12.03	100.40	76.91	0.82	13.231	5.812		5.812	8.992	3.180	2.906	6.906	6.086	2.828
1000	12.66	100.70	77.14	0.82	13.327	5.788		5.788	8.968	3.180	2.894	6.894	6.074	2.820
1050	13.29	100.90	77.29	0.82	13.424	5.757		5.757	8.937	3.180	2.879	6.879	6.059	2.810
1100	13.93	101.00	77.37	0.82	13.523	5.721		5.721	8.901	3.180	2.860	6.860	6.040	2.799
1150	14.56	101.00	77.37	0.82	13.623	5.679		5.679	8.859	3.180	2.839	6.839	6.019	2.786
1200	15.19	100.50	76.98	0.82	13.725	5.609		5.609	8.789	3.180	2.804	6.804	5.984	2.764
1250	15.82	100.00	76.60	0.82	13.828	5.539		5.539	8.719	3.180	2.770	6.770	5.950	2.742
1300	16.46	99.40	76.14	0.82	13.933	5.465		5.465	8.645	3.180	2.732	6.732	5.912	2.718