COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure A) — **Test No : TP7U - 2**

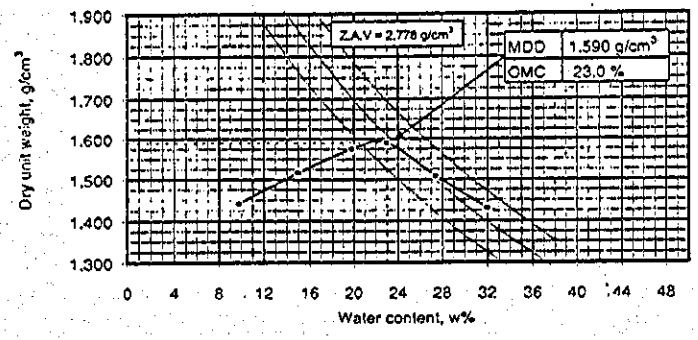
Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location : --
Descript : Yellowish grey mottle reddish brown silty clay - with fine gravels
Specific Gravity, Gs (g/cm³): 2.778 — Net weight of mold (g): 1650
Mold dimensions Diam.(cm) : 10.30 — Height (cm): 12.00 — Vol. (cm³) : 1000
Blow : 25 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

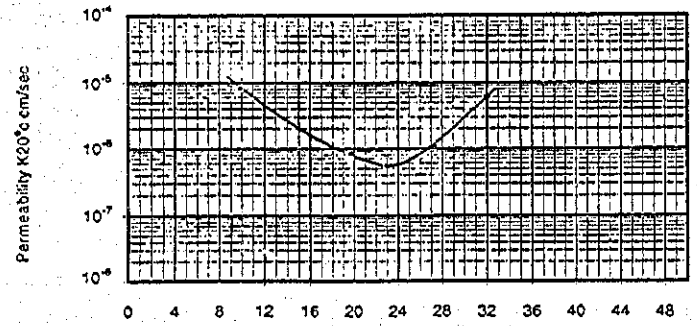
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no.	A20	A49	A11	A16	A73	A86	A83	A2	A66	A47	A46	A50
Wt. of can + wet soil, g	81.09	94.33	97.35	93.11	96.55	90.76	89.36	87.60	94.27	86.12	92.12	85.53
Wt. of can + dry soil, g	74.91	87.88	86.10	84.00	82.27	77.65	74.73	73.32	76.38	69.94	72.34	67.47
Wt. of water, g	6.18	6.45	11.25	9.11	14.28	13.11	14.63	14.28	17.89	16.18	19.78	18.06
Wt. of can, g	12.42	21.45	11.65	22.82	10.58	11.03	11.37	10.99	11.30	10.69	10.72	10.87
Wt. of dry soil, g	62.49	66.43	74.45	61.18	71.69	66.62	63.36	62.33	65.08	59.25	61.62	56.60
Water conten, w%	9.89	9.71	15.11	14.89	19.92	19.68	23.09	22.91	27.49	27.31	32.10	31.91

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten, w%	9.8	15.0	19.8	23.0	27.4	32.0
Wt. of soil + mold, g	3232	3393	3537	3606	3571	3536
Wt. of mold, g	1650	1650	1650	1650	1650	1650
Wt. of soil in mold, g	1582	1743	1887	1956	1921	1888
Wet unit wt., g/cm³	1.582	1.743	1.887	1.956	1.921	1.888
Dry unit wt., g/m³	1.441	1.516	1.575	1.590	1.508	1.430
Coeff. Permeab. cm/sec	9.20×10^{-6}	2.02×10^{-6}	6.50×10^{-7}	5.50×10^{-7}	4.10×10^{-6}	6.10×10^{-6}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure A) — **Test No : TP8U - 1**

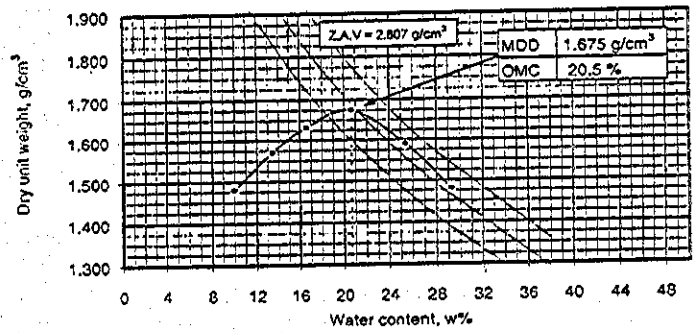
Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript : Light grey mottle yellowish reddish silty clay with fine gravels
Specific Gravity, Gs (g/cm³): 2.807 — Net weight of mold (g): 1650
Mold dimensions Diam.(cm) : 10.30 — Height (cm): 12.00 — Vol. (cm³) : 1000
Blow : 25 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

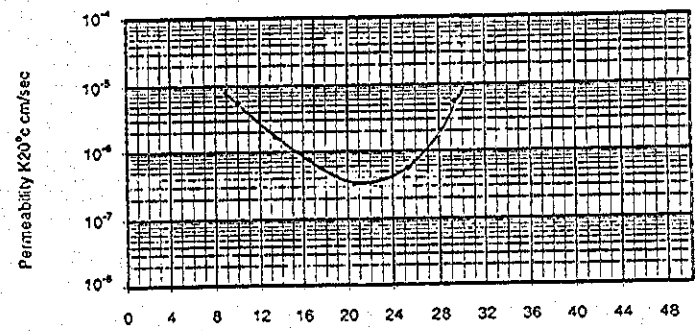
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no.	A23	A41	A48	A1	A52	A35	A28	A59	A44	A26	A6	A9
Wt. of can + wet soil, g	88.66	86.96	83.70	82.56	85.06	81.30	86.03	81.82	85.12	88.37	87.93	85.24
Wt. of can + dry soil, g	82.57	80.85	74.96	74.10	75.94	71.09	73.19	69.68	69.80	72.29	69.87	68.19
Wt. of water, g	6.09	6.11	8.74	8.46	9.12	10.21	12.84	12.14	15.32	16.08	18.06	17.05
Wt. of can, g	22.21	19.20	10.41	10.59	21.52	9.29	11.31	10.66	9.72	8.78	8.34	9.72
Wt. of dry soil, g	60.36	61.65	64.55	63.51	54.42	61.80	61.88	59.02	60.08	63.51	61.53	58.47
Water conten, w%	10.09	9.91	13.54	13.32	16.76	16.52	20.75	20.57	25.50	25.32	29.35	29.16

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten, w%	10.0	13.4	16.6	20.7	25.4	29.3
Wt. of soil + mold, g	3278	3431	3554	3671	3644	3563
Wt. of mold, g	1650	1650	1650	1650	1650	1650
Wt. of soil in mold, g	1628	1781	1904	2021	1994	1913
Wet unit wt., g/cm³	1.628	1.781	1.904	2.021	1.994	1.913
Dry unit wt., g/m³	1.480	1.571	1.693	1.674	1.590	1.480
Coeff. Permeab. cm/sec	5.40×10^{-6}	1.80×10^{-6}	7.36×10^{-7}	3.32×10^{-7}	5.66×10^{-7}	5.84×10^{-6}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure C) **Test No : TP9U - 1**

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript : Laterit gravels with sandy clay mixture

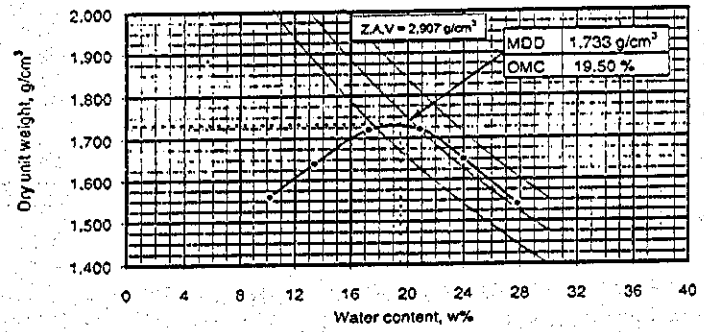
Specific Gravity, Gs (g/cm³): 2.907 — Net weight of mold (g): 2864
Mold dimensions Diam.(cm) : 15.24 — Height (cm): 11.64 — Vol. (cm³) : 2123
Blow : 56 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

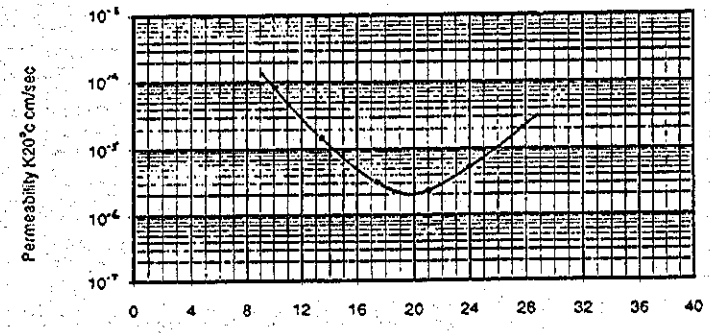
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no.	A70	A53	A69	A14	A57	A84	A30	A87	A75	A35	A36	A72
Wt. of can + wet soil, g	79,33	82,34	87,18	81,43	90,89	87,88	64,47	82,00	83,56	86,25	83,48	90,92
Wt. of can + dry soil, g	73,92	76,76	77,95	73,21	78,84	76,57	71,82	69,86	69,54	71,40	69,86	75,40
Wt. of water, g	5,41	5,58	9,23	8,22	12,05	11,31	12,65	12,14	14,02	14,85	13,62	15,52
Wt. of can, g	21,34	21,57	9,63	11,36	9,67	10,74	11,55	11,52	11,34	9,29	21,04	19,39
Wt. of dry soil, g	52,58	55,19	68,32	61,85	69,17	65,83	60,27	58,34	58,20	62,11	48,82	56,01
Water conten, w%	10,29	10,11	13,51	13,29	17,42	17,18	20,99	20,81	24,09	23,91	27,90	27,71

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten, w %	10,2	13,4	17,3	20,9	24,0	27,8
Wt. of soil + mold, g	6513	6813	7148	7278	7208	7042
Wt. of mold, g	2864	2864	2864	2864	2864	2864
Wt. of soil in mold, g	3649	3949	4284	4414	4344	4178
Wet unit wt., g/cm³	1,719	1,860	2,018	2,079	2,046	1,968
Dry unit wt., g/m³	1,560	1,640	1,720	1,720	1,650	1,540
Coeff. Permeab. cm/sec	8.6×10^{-5}	4.5×10^{-5}	2.08×10^{-4}	2.22×10^{-4}	3.5×10^{-4}	2.0×10^{-5}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure B) **Test No : TP9U - 2**

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript : Yellowish brown mottle greyish siltyncley with fine gravels

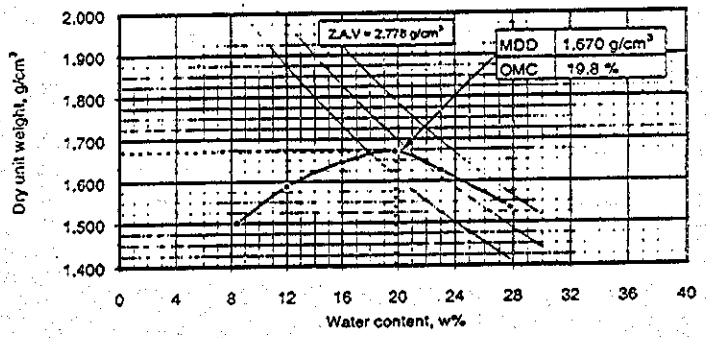
Specific Gravity, Gs (g/cm³): 2.778 — Net weight of mold (g): 1650
Mold dimensions Diam.(cm) : 10.30 — Height (cm): 12.00 — Vol. (cm³) : 1000
Blow : 25 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

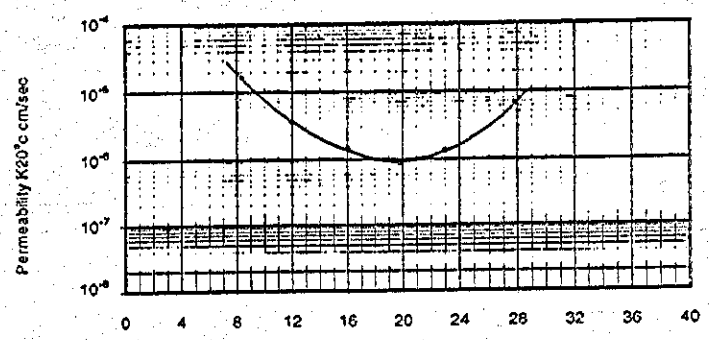
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no.	A10	A5	A84	A3	A20	A77	A9	A44	A54	A76	A56	A7
Wt. of can + wet soil, g	88,71	94,92	76,01	87,72	85,32	85,42	78,92	83,45	84,67	89,32	83,68	82,65
Wt. of can + dry soil, g	83,39	89,34	68,96	79,46	75,20	75,27	67,44	71,31	72,66	74,47	70,06	67,13
Wt. of water, g	5,32	5,58	7,05	8,26	10,12	10,15	11,48	12,14	12,01	14,85	13,62	15,52
Wt. of can, g	20,73	22,19	10,74	9,99	12,42	11,35	9,72	9,72	20,65	9,65	21,24	11,12
Wt. of dry soil, g	62,66	67,15	58,22	69,47	62,78	63,92	57,72	61,59	52,01	64,82	48,82	56,01
Water conten, w%	8,49	8,31	12,11	11,89	16,12	15,88	19,89	19,71	23,09	22,91	27,90	27,71

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten, w %	8,4	12,0	16,0	19,8	23,0	27,8
Wt. of soil + mold, g	3276	3429	3559	3651	3649	3612
Wt. of mold, g	1650	1650	1650	1650	1650	1650
Wt. of soil in mold, g	1626	1779	1909	2001	1999	1962
Wet unit wt., g/cm³	1,626	1,779	1,909	2,001	1,999	1,962
Dry unit wt., g/m³	1,500	1,586	1,646	1,670	1,625	1,535
Coeff. Permeab. cm/sec	1.8×10^{-5}	3.56×10^{-6}	1.48×10^{-6}	8.96×10^{-7}	1.46×10^{-6}	4.5×10^{-6}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure C) **Test No : TP10U - 1**

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript :

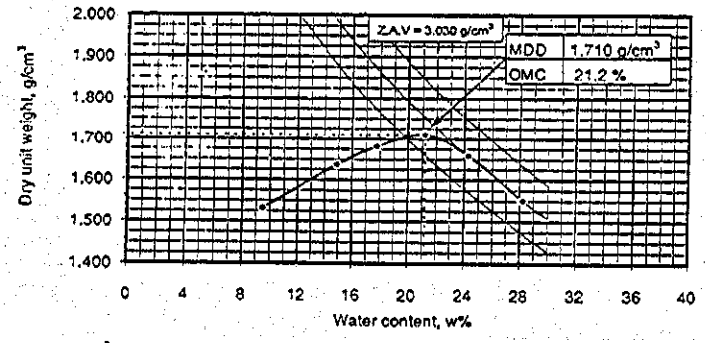
Specific Gravity, Gs (g/cm³): 3.030 — Net weight of mold (g): 2864
Mold dimensions Diam.(cm) : 15,24 — Height (cm): 11.64 — Vol. (cm³) : 2123
Blow : 56 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

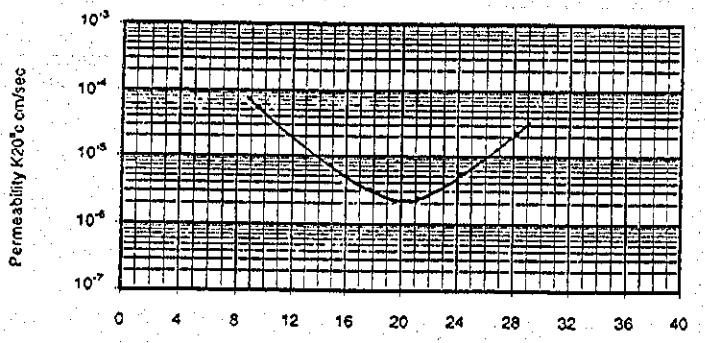
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no	A36	A55	A69	A2	A57	A66	A47	A88	A73	A71	A21	A27
Wt. of can + wet soil, g	91,83	86,19	63,65	75,10	76,26	78,86	76,09	79,70	71,83	87,37	68,21	81,33
Wt. of can + dry soil, g	76,51	80,61	56,60	66,84	66,14	68,71	64,61	67,56	59,82	72,52	54,59	65,61
Wt. of water, g	5,32	5,58	7,05	8,26	10,12	10,15	11,48	12,14	12,01	14,85	13,62	15,52
Wt. of can, g	21,04	21,31	9,63	10,99	9,67	11,30	10,69	10,05	10,58	11,18	6,46	10,60
Wt. of dry soil, g	55,47	59,30	46,97	55,85	56,47	57,41	53,92	57,51	49,24	61,34	48,13	55,21
Water conten, w%	9,59	9,41	15,01	14,79	17,92	17,68	21,29	21,11	24,39	24,21	28,30	28,11

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten, w%	9,5	14,9	17,8	21,2	24,3	28,2
Wt. of soil + mold, g	6426	6857	7070	7265	7242	7082
Wt. of mold, g	2864	2864	2864	2864	2864	2864
Wt. of soil in mold, g	3562	3993	4206	4401	4378	4218
Wet unit wt., g/cm³	1,678	1,881	1,981	2,073	2,062	1,987
Dry unit wt., g/m³	1,532	1,637	1,682	1,710	1,659	1,550
Coeff. Permeab. cm/sec	5.3×10^{-5}	7.0×10^{-6}	2.92×10^{-6}	2.2×10^{-6}	5.54×10^{-6}	2.4×10^{-5}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure C) **Test No : TP10U - 2**

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript :

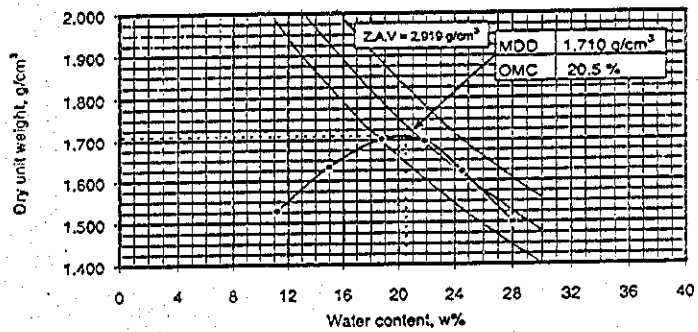
Specific Gravity, Gs (g/cm³): 2.919 — Net weight of mold (g): 2864
Mold dimensions Diam.(cm) : 15,24 — Height (cm): 11.64 — Vol. (cm³) : 2123
Blow : 56 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

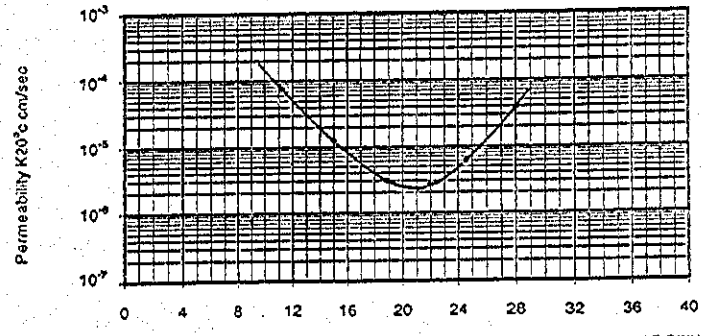
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no	A19	A25	A69	A2	A57	A66	A47	A88	A73	A71	A4	A42
Wt. of can + wet soil, g	74,25	77,51	63,34	74,72	73,31	75,82	74,38	77,85	71,33	86,74	84,01	80,54
Wt. of can + dry soil, g	68,93	71,93	56,29	66,46	63,19	65,67	62,90	65,71	59,32	71,89	70,39	65,02
Wt. of water, g	5,32	5,58	7,05	8,26	10,12	10,15	11,48	12,14	12,01	14,85	13,62	15,52
Wt. of can, g	21,77	21,66	9,63	10,99	9,67	11,30	10,69	10,05	10,58	11,18	21,92	9,41
Wt. of dry soil, g	47,16	50,27	46,66	55,47	53,52	54,37	52,21	55,66	48,74	60,71	48,47	55,61
Water conten, w%	11,28	11,10	15,11	14,89	18,91	18,67	21,99	21,81	24,64	24,46	28,10	27,91

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten, w%	11,2	15,0	18,8	21,9	24,6	28,0
Wt. of soil + mold, g	6471	6853	7157	7256	7152	6940
Wt. of mold, g	2864	2864	2864	2864	2864	2864
Wt. of soil in mold, g	3607	3989	4293	4392	4288	4076
Wet unit wt., g/cm³	1,699	1,879	2,022	2,069	2,020	1,920
Dry unit wt., g/m³	1,528	1,634	1,702	1,697	1,621	1,500
Coeff. Permeab. cm/sec	7.64×10^{-5}	4.2×10^{-5}	3.0×10^{-5}	2.5×10^{-4}	6.0×10^{-4}	4.0×10^{-5}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure B) **Test No : TP11U - 1**

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript : Brown silty clay with laterit gravels

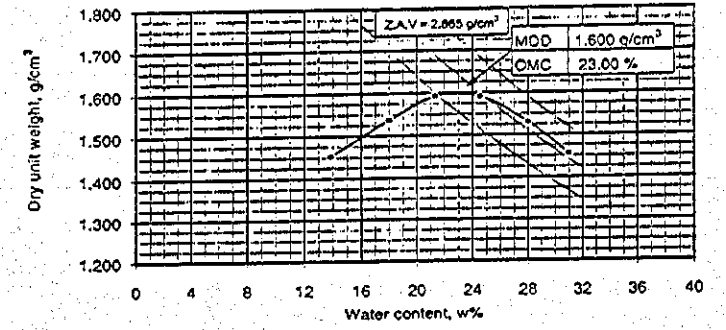
Specific Gravity, Gs (g/cm³): 2.865 — Net weight of mold (g): 1650
Mold dimensions Diam.(cm) : 10.30 — Height (cm): 12.00 — Vol. (cm³) : 1000
Blow : 25 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

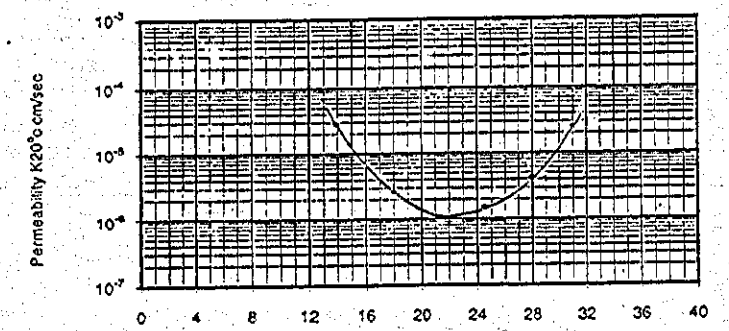
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no.	A5	A17	A51	A32	A15	A73	A4	A59	A49	A55	A31	A36
Wt. of can + wet soil, g	73,03	74,72	89,25	92,02	85,10	88,04	66,85	80,31	82,01	82,13	79,47	81,22
Wt. of can + dry soil, g	66,79	66,77	77,11	79,77	71,96	74,48	71,02	69,63	69,73	68,66	63,00	67,01
Wt. of water, g	6,24	7,95	12,14	12,25	13,14	13,56	15,24	13,68	13,28	13,27	16,47	14,21
Wt. of can, g	22,19	9,20	10,03	11,30	10,73	10,58	9,72	10,65	21,45	21,31	10,04	21,04
Wt. of dry soil, g	44,60	57,57	67,03	68,47	61,23	63,90	61,90	55,97	47,20	47,55	52,92	45,97
Water conten. w/%	13,99	13,81	18,11	17,89	21,46	21,22	24,62	24,44	28,09	27,91	31,10	30,91

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten. w/%	13,9	16,0	21,3	24,5	29,0	31,0
Wt. of soil + mold, g	3304	3464	3582	3631	3608	3556
Wt. of mold, g	1650	1650	1650	1650	1650	1650
Wt. of soil in mold, g	1654	1814	1932	1981	1958	1906
Wet unit wt., g/cm³	1,654	1,814	1,932	1,981	1,958	1,906
Dry unit wt., g/m³	1,452	1,537	1,593	1,591	1,530	1,455
Coeff. Permeab. cm/sec	1.97×10^{-5}	2.78×10^{-6}	1.08×10^{-6}	4.63×10^{-7}	4.5×10^{-6}	2.58×10^{-5}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure B) **Test No : TP12U - 1**

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript : Reddish brown laterit gravels with silty clay

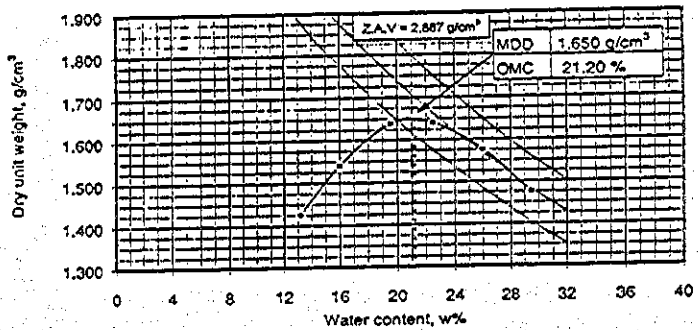
Specific Gravity, Gs (g/cm³): 2.687 — Net weight of mold (g): 1650
Mold dimensions Diam.(cm) : 10.30 — Height (cm): 12.00 — Vol. (cm³) : 1000
Blow : 25 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

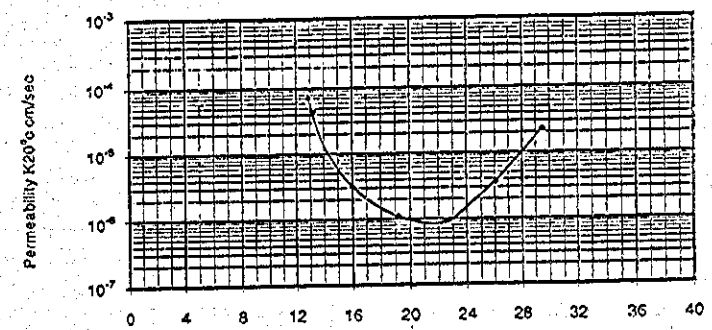
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no.	A7	A8	A18	A10	A52	A13	A82	A61	A77	A2	A38	A39
Wt. of can + wet soil, g	80,25	75,93	74,48	81,34	86,59	73,66	81,76	77,13	76,88	83,15	81,51	84,33
Wt. of can + dry soil, g	72,14	67,75	67,33	73,03	77,57	63,51	68,62	64,99	63,32	68,30	65,30	70,05
Wt. of water, g	8,11	7,58	7,15	8,31	11,02	10,15	13,14	12,14	13,56	14,85	16,21	14,28
Wt. of can, g	11,12	9,93	22,95	20,73	21,52	11,24	10,45	10,62	11,35	10,99	10,54	21,50
Wt. of dry soil, g	61,02	57,82	44,38	52,30	56,05	52,27	58,17	54,17	51,97	57,31	54,76	48,55
Water conten. w/%	13,29	13,11	16,11	15,89	19,66	19,42	22,59	22,41	26,09	25,91	29,60	29,41

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten. w/%	13,2	16,0	19,5	22,5	26,0	29,5
Wt. of soil + mold, g	3263	3436	3509	3559	3535	3500
Wt. of mold, g	1650	1650	1650	1650	1650	1650
Wt. of soil in mold, g	1613	1786	1959	2009	1985	1910
Wet unit wt., g/cm³	1,613	1,786	1,959	2,009	1,985	1,910
Dry unit wt., g/m³	1,425	1,540	1,639	1,640	1,575	1,475
Coeff. Permeab. cm/sec	4.44×10^{-5}	3.07×10^{-6}	4.62×10^{-6}	8.50×10^{-7}	3.50×10^{-6}	2.2×10^{-5}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure C) **Test No : TP13U - 1**

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript : Reddish brown laterit gravels and silty clay mixture

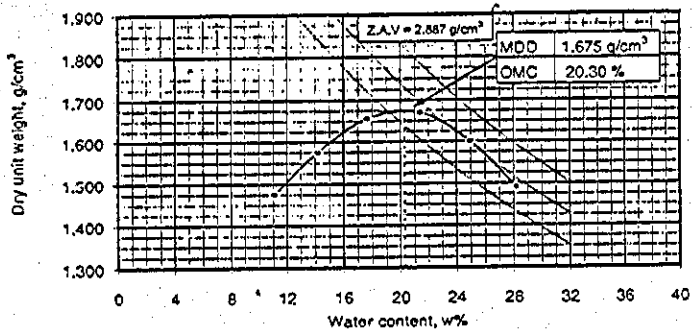
Specific Gravity, Gs (g/cm³): 2.887 — Net weight of mold (g): 2864
Mold dimensions Diam.(cm) : 15.24 — Height (cm): 11.64 — Vol. (cm³) : 2123
Blow : 56 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

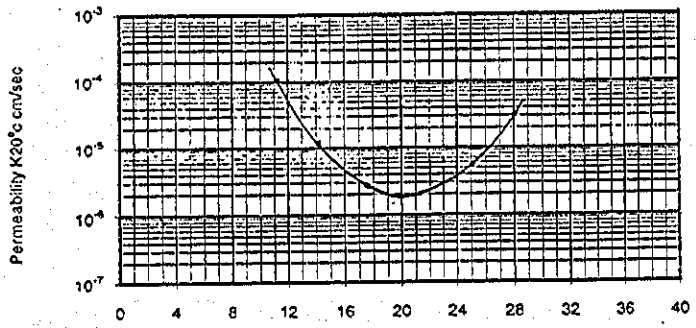
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no.	A63	A37	A14	A81	A64	A9	A42	A20	A53	A21	A26	A91
Wt. of can + wet soil, g	83,73	82,31	77,98	90,18	87,40	90,92	85,84	81,53	81,30	80,92	81,54	91,03
Wt. of can + dry soil, g	75,92	75,05	69,64	81,92	75,86	78,78	72,32	69,39	69,32	66,07	65,49	75,51
Wt. of water, g	7,81	7,26	8,34	8,26	11,54	12,14	13,52	12,14	11,98	14,85	16,05	15,52
Wt. of can, g	6,13	9,11	11,36	23,30	11,10	9,72	9,41	12,42	21,57	6,46	8,78	20,30
Wt. of dry soil, g	69,79	65,94	58,28	58,62	64,76	69,06	62,91	56,97	47,75	59,61	56,71	55,21
Water conten, w%	11,19	11,01	14,31	14,09	17,82	17,58	21,49	21,31	25,09	24,91	28,30	28,11

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten, w%	11,1	14,2	17,7	21,4	25,0	28,2
Wt. of soil + mold, g	6344	6683	7002	7167	7110	6919
Wt. of mold, g	2864	2864	2864	2864	2864	2864
Wt. of soil in mold, g	3480	3819	4138	4303	4246	4055
Wet unit wt., g/cm³	1,639	1,799	1,949	2,027	2,000	1,910
Dry unit wt., g/m³	1,475	1,575	1,656	1,670	1,600	1,490
Coeff. Permeab. cm/sec	1.02×10^{-4}	1.13×10^{-5}	2.83×10^{-6}	1.99×10^{-6}	5.24×10^{-6}	3.00×10^{-5}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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COMPACTION TEST & RELATION OF COEFFICIENT PERMEABILITY

(Method ASTM D698 - Procedure C) **Test No : TP13U - 2**

Project : DONG NAI 3 & 4 COMBINED HYDRO POWER PROJECT
Location :
Descript : Reddish brown laterit gravels and silty clay mixture

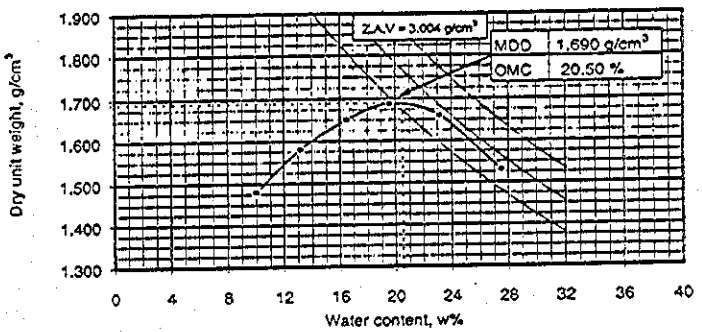
Specific Gravity, Gs (g/cm³): 3.004 — Net weight of mold (g): 2864
Mold dimensions Diam.(cm) : 15.24 — Height (cm): 11.64 — Vol. (cm³) : 2123
Blow : 56 — No. of Layer : 3 — Wt. of Rammer (KG): 2.5
Drop height (cm): 30.5

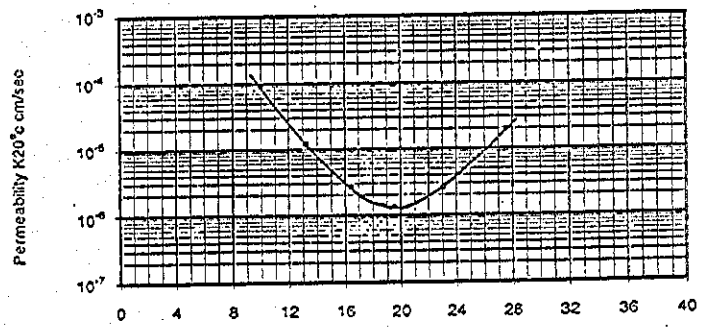
Water content Determination

Sample no	1		2		3		4		5		6	
Moisture can no.	A66	A46	A99	A84	A57	A69	A88	A11	A29	A40	A85	A60
Wt. of can + wet soil, g	84,40	80,59	80,77	82,10	87,56	81,75	83,85	86,01	83,15	87,91	83,56	95,65
Wt. of can + dry soil, g	77,70	74,29	72,57	73,84	76,46	71,60	71,71	73,87	69,53	73,06	69,94	80,13
Wt. of water, g	6,70	6,30	8,20	8,26	11,10	10,15	12,14	12,14	13,62	14,85	13,62	15,52
Wt. of can, g	11,30	10,72	10,96	10,74	9,67	9,63	10,05	11,65	10,87	8,61	20,59	23,51
Wt. of dry soil, g	66,40	63,57	61,61	63,10	66,79	61,97	61,66	62,22	58,66	64,45	49,35	56,62
Water conten, w%	10,09	9,91	13,31	13,09	16,62	16,38	19,69	19,51	23,22	23,04	27,60	27,41

Unit Weight Determination

No. of Trials	1	2	3	4	5	6
Water conten, w%	10,0	13,2	16,5	19,6	23,1	27,5
Wt. of soil + mold, g	6320	6662	6944	7150	7203	7006
Wt. of mold, g	2864	2864	2864	2864	2864	2864
Wt. of soil in mold, g	3456	3798	4080	4286	4339	4142
Wet unit wt., g/cm³	1,628	1,789	1,922	2,019	2,044	1,951
Dry unit wt., g/m³	1,480	1,580	1,650	1,688	1,660	1,530
Coeff. Permeab. cm/sec	9.5×10^{-5}	4.18×10^{-5}	2.80×10^{-6}	4.29×10^{-6}	2.59×10^{-6}	2.00×10^{-5}





TESTED BY : TIEN & MY — COMPUTED : TU TIEN — CHECKED : LE DINH BICH

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DATA 4.1.1

LABORATORY TEST
OF
EARTH CORE MATERIAL
FOR
DONG NAI No.3 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 2U-1
Depth : 1.0 - 2.5
Description of soil : Brown laterit gravel 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 a : 0.28cm²
Formule of calculation :

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

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
2U1-1	14.72	1	1		103		60	28	120	1.66×10^{-4}			
			2	✓	103	✓	60		120	1.68×10^{-4}	1.68×10^{-4}	0.833	1.40×10^{-4}
			3		103		60		120	1.68 —			
2U1-2	15.87	2	1	24 800	102	24 920	60		1200	1.65×10^{-5}			
			2	− 830	102	− 950	60	—	1200	1.65×10^{-5}	1.65×10^{-5}	—	1.37×10^{-5}
			3	− 900	102	− 920	60		1200	1.65 —			
2U1-3	16.71	3	1	24 800	102	24 900	58.5		3600	5.76×10^{-6}			
			2	− 900	102	− 1000	58.0	28	3600	5.85×10^{-6}	5.85×10^{-6}	0.833	4.87×10^{-6}
			3	− 1000	102	− 1100	58.0		3600	5.85×10^{-6}			
2U1-4	17.16	4	1	24 1000	103	24 1130	60		5400	3.74×10^{-6}			
			2	− 1130	103	− 1300	60	—	5400	3.74 —	3.74×10^{-6}	—	3.11×10^{-6}
			3	− 1300	103	− 1430	60		5400	3.74 —			
2U1-5	16.5	5	1	24 1030	103	24 1050	56		3000	7.58×10^{-6}			
			2	− 1100	103	− 1150	55	—	3000	7.81 —	7.81×10^{-6}	—	6.50×10^{-6}
			3	− 1300	103	− 1350	55		3000	7.81 —			
2U1-6	15.4	1	1		100		56		600	3.6×10^{-5}			
			2	✓	100	~	56	28	600	3.6 —	3.6×10^{-5}	0.833	3.0×10^{-5}
			3		100		56		600	3.6 —			

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 3U-1
Depth : 1.0 - 2.5
Description of soil : Brown laterit gravelé 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 a : 0.28cm²
Formule of calculation :

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

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
3U1-1	14.51	1	1		103		60		240	8.6×10^{-5}			
			2	✓	103	✓	60	28	240	8.4 —	8.4×10^{-5}	0.833	7.0×10^{-5}
			3		103		60		240	8.4 —			
3U1-2	15.69	2	1	25 800	103	25 840	60		2400	8.4×10^{-6}			
			2	− 850	103	− 930	60	28	2400	8.4×10^{-6}	8.4×10^{-6}	—	7.0×10^{-6}
			3	− 930	103	− 1010	60		2400	8.4×10^{-6}			
3U1-3	16.47	3	1	25 800	103	25 1000	71		7200	1.92×10^{-6}			
			2	− 1000	103	− 1200	71	28	7200	1.93×10^{-6}	1.93×10^{-6}	0.833	1.6×10^{-6}
			3	− 1200	103	− 1400	71		7200	1.93 —			
3U1-4	16.91	4	1	25 1000	103	25 1600	84.0		7200	1.06×10^{-6}			
			2	− 1200	103	− 1400	83.5	—	7200	1.09 —	1.06×10^{-6}	—	9.82×10^{-7}
			3	− 1400	103	− 1600	84.0		7200	1.06 —			
3U1-5	16.18	5	1	25 1000	102	25 1130	66		5400	3.0×10^{-6}			
			2	− 1200	102	− 1330	66	—	5400	3.01	3.01×10^{-6}	—	2.51×10^{-6}
			3	− 1330	102	− 1500	66		5400	3.01 —			
3U1-6	15.20	1	1	25 800	103	25 915	57.5		900	2.42×10^{-5}			
			2	− 910	103	− 935	57.6	28	900	2.41 —	2.42×10^{-5}	0.833	2.01×10^{-5}
			3	− 940	103	− 955	57.5		900	2.42 —			

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 : TP4U – 1
Depth : 1.0 – 2.5
Description of soil : Brown laterit gravels 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 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
4U1-1	15,29	1		18 800	102	✓	62.4		180	1.02×10^{-4}			
					102	✓	62.5	28	180	1.02 –	1.02×10^{-4}	0.833	8.46×10^{-5}
					102	✓	62.5		180	1.02 –			
4U1-2	16.13	2	1	18 800	101	18 815	80.0		1800	4.83×10^{-6}			
			2	845	101	– 930	80.1	–	1800	4.81 –	4.82×10^{-6}	–	4.02×10^{-5}
			3	– 830	101	– 845	80.1		1800	4.81			
4U1-3	16.78	3	1	18 830	102	18 1030	77.3		7200	1.44×10^{-6}			
			2	– 1100	102	– 1300	77.5	28	7200	1.42 –	1.42×10^{-6}	–	1.19×10^{-6}
			3	– 1300	102	– 1500	77.5		7200	1.42 –			
4U1-4	16.57	4	1	18 830	102	18 1030	64.2		7200	2.4×10^{-6}			
			2	11 000	102	– 11 200	64.0	–	7200	2.42 –	2.42×10^{-6}	0.833	2.01×10^{-6}
			3	13 00	102	– 15 00	64.0		7200	2.42 –			
4U1-5	15.80	5	1	18 900	102	19 930	72.0		1800	7.22×10^{-5}			
			2	– 930	102	– 1000	72.1	28	1800	7.21 –	7.22×10^{-6}	–	6.02×10^{-6}
			3	– 1030	102	– 1100	72.0		1800	7.22			
4U1-6	14.94	1	1		103		56.4		480	4.69×10^{-5}			
			2		103		56.5	–	480	4.68×10^{-5}	4.67×10^{-5}	–	3.9×10^{-5}
			3		103		56.5		480	4.67×10^{-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 : TP5U – 1
Depth : 1.0 – 2.5
Description of soil : Reddish brown laterit gravel 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 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
5U1-1	14.6	1	1	19 900	102	–	58.0		60	3.51×10^{-4}			
			2		102	–	57.8	28°	60	3.53 –	3.51×10^{-4}	0.833	2.92×10^{-5}
			3		102	–	58.0		60	3.51 –			
5U1-2	15,62	2	1		102		59.4		420	4.8×10^{-5}			
			2		102		60.0	28	420	4.72 –	4.72×10^{-5}	–	3.93×10^{-5}
			3		102		60.0		420	4.72 –			
5U1-3	16.42	3	1	19 900	100	19 930	56.6		1800	1.18×10^{-5}			
			2	– 930	100	– 1000	56.6	–	1800	1.18 –	1.18×10^{-5}	0.833	9.86×10^{-6}
			3	– 1030	100	– 1030	56.5		1800	1.18 –			
5U1-4	16.38	4	1	19 835	101	19 905	55.3		3600	6.25×10^{-6}			
			2	– 930	103	– 1030	56.4	28	3600	6.25×10^{-6}	6.25×10^{-6}	–	5.2×10^{-6}
			3	– 1030	102	– 1130	55.8		3600	6.25 –			
5U1-5	16.49	5	1	19 900	100	19 930	50		1800	1.44×10^{-5}			
			2	– 930	100	– 1000	50	–	1800	1.44×10^{-5}	1.44×10^{-5}	–	1.20×10^{-5}
			3	– 1030	100	– 1100	50		1800	1.44×10^{-5}			
5U1-6	15,44	1	1		103		60		200	1.01×10^{-4}			
			2		103		60	–	200	1.01 –	1.01×10^{-4}	–	8.4×10^{-5}
			3		103		60		200	1.01 –			

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 : TP5U-2
Depth : 2.5 - 5.0
Description of soil : Reddish brown laterit gravels 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 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
5U2-1	15.20	1	1	✓	100	✓	60		228	8.34×10^{-5}			
			2	✓	100	✓	60	28°C	230	8.28×10^{-5}	8.28×10^{-5}	0.833	6.9×10^{-5}
			3	✓	100	✓	60		230	8.28 –			
5U2-2	16.08	2	1	20.800	100	20.826	60	–	1560	1.22×10^{-5}			
			2	830	100	856	60	–	1560	1.22×10^{-5}	1.22×10^{-5}	–	1.02×10^{-5}
			3	900	102	926	61.5		1560	1.22 –			
5U2-3	16.79	3	1	20.815	100	20.1015	48.8		7200	3.72×10^{-6}			
			2	– 1020	100	– 1220	48.8	28°	7200	3.72 –	3.72×10^{-6}	–	3.10×10^{-6}
			3	– 1230	100	– 1430	49.0		7200	3.70 –			
5U2-4	17.14	4	1	20.815	101	20.1045	52.7		9000	2.70×10^{-6}			
			2	– 1050	103	– 1320	54.0	28	9000	2.68 –	2.70×10^{-6}	0.833	2.25×10^{-6}
			3	– 1330	102	– 1600	53.0		9000	2.72 –			
5U2-5	16.92	5	1	20.900	100	20.1020	55.3		5400	4.1×10^{-6}			
			2	1030	100	– 1200	55.0	–	5400	4.13×10^{-6}	4.13×10^{-6}	–	3.44×10^{-6}
			3	1500	100	– 1430	55.0		5400	4.13 –			
5U2-6	15.81	1	1	20.1000	102	–	57.6		5400	3.72×10^{-5}			
			2	–	103		60.0	–	5400	3.74 –	3.74×10^{-6}	–	3.11×10^{-5}
			3	–	103		60.0		5400	3.74			

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 : TP6U-1
Depth : 1.0 - 2.5
Description of soil : Reddish brown laterit gravels 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 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
6U1-1	13.69	1	1		100		60.5		86	2.22×10^{-4}			
			2	✓	100	✓	60.0	28°	86	2.20×10^{-4}	2.21×10^{-4}	0.833	1.84×10^{-4}
			3		100		60		86	221 –			
6U1-2	15.11	2	1	21.800	100	21.820	60	–	1200	1.59×10^{-5}			
			2	– 830	100	– 850	60	–	1200	1.59 –	1.59×10^{-5}	–	1.32×10^{-5}
			3	– 900	100	– 920	60		1200	1.60 –			
6U1-3	16.3	3	1	21.815	102	21.1015	65		7200	2.34×10^{-6}			
			2	– 1030	102	– 1230	65	28	7200	2.34×10^{-6}	2.34×10^{-6}	0.833	1.95×10^{-6}
			3	– 1300	102	– 1500	65		7200	2.34×10^{-6}			
6U1-4	16.42	4	1	21.815	101	21.1015	77.0		7200	1.91×10^{-6}			
			2	– 1030	101	– 1230	77.0	28	7200	1.90 –	1.91×10^{-6}	–	1.17×10^{-6}
			3	– 1300	102	– 1500	77.8		7200	1.90 –			
6U1-5	15.69	5	1	21.900	102	21.1030	51		5400	4.8×10^{-6}			
			2	– 1030	102	– 1200	51	–	5400	4.8	4.8×10^{-6}	–	4.0×10^{-6}
			3	– 1300	102	– 1430	51		5400	4.8			
6U1-6	14.59	1	1		100		62		720	2.48×10^{-5}			
			2	✓	100	✓	62	–	720	2.48 –	2.48×10^{-5}	–	2.07×10^{-5}
			3		100.5		61.7		720	2.53 –			

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 : TP 6U-2
Depth : 2,5 – 4,0
Description of soil : Reddish brown laterit gravels 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 :

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

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
6U2-1	14.21	1	1		102		61		200	9.6×10^{-5}			
			2	✓	102	✓	60	28	200	9.9×10^{-5}	9.9×10^{-5}	0,833	8.25×10^{-5}
			3		102		60		200	9.9 –			
6U2-2	15.59	2	1	26 900	103	26 850	60		2400	8.9×10^{-6}			
			2	– 850	103	930	60	28	2400	8.9 –	8.9×10^{-6}	0,833	7.0×10^{-6}
			3	– 980	103	1010	60		2400	8.9 –			
6U2-3	16.55	3	1	26 800	103	26 000	79.8		7200	1.32×10^{-6}			
			2	– 1000	103	– 1200	79.0	28	7200	1.37 –	1.32×10^{-6}	–	1.1×10^{-6}
			3	– 1200	103	– 1400	79.8		7200	1.32 –			
6U2-4	16.52	4	1	26 800	103	26 1100	77.6		10800	9.8×10^{-7}			
			2	– 1100	103	– 1400	78.0	28	10800	9.61 –	9.61×10^{-7}	0,833	8.0×10^{-7}
			3	– 1400	103	– 1700	78.6		10800	9.61 –			
6U2-5	15.67	5	1	26 830	102	26 930	61.7		5400	3.98×10^{-5}			
			2	930	102	1100	61.6	28	5400	3.99 –	3.98×10^{-5}	–	2.8×10^{-5}
			3	1200	102	1330	61.7		5400	3.99 –			
6U2-6	14.70	1	1		103		60		600	3.36×10^{-5}			
			2	✓	103	✓	60	28	600	3.36 –	3.36×10^{-5}	0,833	2.8×10^{-5}
			3		103		60		600	3.36 –			

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 : TP 7U-1
Depth : 1,0 – 2,5
Description of soil : Light yellowish mottle reddish brown silty 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 :

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

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
7U1-1	14.16	4	1	14 930	101	14 1000	50.0		5400	4.86×10^{-6}			
			2	– 1000	102	– 1130	50.5	28	5400	4.86 –	4.86×10^{-6}	0,833	4.05×10^{-6}
			3	– 1130	102	– 1300	51.0		5400	4.74 –			
7U1-2	14.83	3	1	14 800	101.5	14 1000	70.1		7200	1.92×10^{-6}			
			2	– 1000	101.0	– 1200	70.0	28	7200	1.90 –	1.92×10^{-6}	–	1.6×10^{-6}
			3	– 1300	102.0	– 1500	70.4		7200	1.92 –			
7U1-3	15.39	2	1	14 800	102	14 1000	83.8		7200	1.04×10^{-6}			
			2	– 1000	102	– 1200	84.0	28	7200	1.01 –	1.02×10^{-6}	–	8.5×10^{-7}
			3	– 1300	102	– 1500	84.0		7200	1.01 –			
7U1-4	15.53	1	1	14 800	102	14 1000	86.7		7200	8.73×10^{-7}			
			2	– 1000	103	– 1200	87.4	28	7200	8.52 –	8.48×10^{-7}	0,833	7.06×10^{-7}
			3	– 1300	102	– 1500	86.6		7200	8.48 –			
7U1-5	14.80	5	1	14 800	102	14 1000	80.6		7200	1.22×10^{-6}			
			2	– 1000	103	– 1200	81.4	28	7200	1.22 –	1.22×10^{-6}	–	1.02×10^{-6}
			3	– 1500	103	– 1500	81.5		7200	1.21 –			
7U1-6	13.72	4	1	14 1400	100	14 1600	60.0		7200	2.64×10^{-6}			
			2	– 1600	101	– 1800	60.6	28	7200	2.65×10^{-6}	2.65×10^{-6}	–	2.2×10^{-6}
			3	– 1800	101	– 2000	60.6		7200	2.65×10^{-6}			

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 7U – 2
Depth : 2.5 – 5.0
Description of soil : yellowish grey mottle reddish brown silty clay, little fine gravels.

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)	$\frac{\eta_T}{\eta_{20}}$	K_{20^oC} cm/sec
7U2-1	14,13	4	1	15 13 00	100	15 13 30	62.2	28	1800	9.84	9.84×10^{-6}	0,833	8.20×10^{-6}
			2	– 13 30	100	– 13 00	62.2		1800	9.84×10^{-6}			
			3	– 13 00	101	– 12 30	62.8		1800	9.85			
7U2-2	14,86	5	1	15 8 00	102	– 9 00	80.8	28	3600	2.93×10^{-6}	2.42×10^{-6}	–	2.02×10^{-6}
			2	– 9 10	102	– 10 10	80.7		3600	2.92 –			
			3	– 10 10	102	– 11 10	80.8		3600	2.92 –			
7U2-3	15,44	1	1	15 9 00	102	15 11 30	79.8	–	9000	1.92×10^{-6}	1.02×10^{-6}	0,833	8.5×10^{-7}
			2	– 11 30	102	– 14 00	79.9		9000	1.01 –			
			3	– 14 00	103	– 16 30	80.0		9000	1.01 –			
7U2-4	15.59	2	1	15 9 00	102	15 11 30	87.0	28	9000	6.6×10^{-7}	6.62×10^{-7}	–	5.5×10^{-7}
			2	– 11 30	103	– 14 00	87.8		9000	6.62×10^{-7}			
			3	– 14 00	103	– 16 30	87.9		9000	6.62×10^{-7}			
7U2-5	14.75	3	1	15 8 00	101	15 10 00	78.3	–	7200	1.32×10^{-6}	1.32×10^{-6}	–	1.10×10^{-6}
			2	– 10 00	100	– 12 00	77.5		7200	1.32×10^{-6}			
			3	– 12 00	100	– 14 00	77.5		7200	1.32 –			
7U2-6	14,02	4	1	15 9 00	101	15 9 40	63.0	28	2400	7.32×10^{-6}	7.32×10^{-6}	–	6.10×10^{-6}
			2	– 9 50	102	– 10 30	63.7		2400	7.32 –			
			3	– 10 30	102	– 11 10	63.7		2400	7.32 –			

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 8U – 1
Depth : 1.0 – 2.5
Description of soil : light grey mottle yellow reddish silty clay, little fine gravels

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)	$\frac{\eta_T}{\eta_{20}}$	K_{20^oC} cm/sec
8U1-1	14.51	1	1	13 8 00	101	13 8 50	58.5	28	3000	6.58×10^{-6}	6.48×10^{-6}	0,833	5.4×10^{-6}
			2	– 9 00	101	– 9 50	60.0		3000	6.48 –			
			3	– 10 00	101	– 10 50	60.0		3000	6.48 –			
8U1-2	15.40	2	1	13 8 00	102	13 9 30	75.0	28	5400	2.12×10^{-6}	2.16×10^{-6}	–	1.8×10^{-6}
			2	– 9 30	102	– 11 00	74.6		5400	2.16 –			
			3	– 11 00	102	– 12 30	74.6		5400	2.16			
8U1-3	16.60	3	1	– 7 00	102	13 10 00	79	–	10800	9.83×10^{-7}	8.83×10^{-7}	0,833	7.36×10^{-7}
			2	– 10 00	102	– 13 00	79		10800	8.83×10^{-7}			
			3	– 13 00	102	– 16 00	79		10800	8.83×10^{-7}			
8U1-4	16.41	4	1	13 7 00	102	13 10 00	90.9	28	10800	3.98×10^{-7}	3.98×10^{-7}	–	3.32×10^{-7}
			2	– 10 00	101	– 13 00	90.0		10800	3.98 –			
			3	– 13 00	102	– 16 00	90.8		10800	4.02 –			
8U1-5	15,59	5	1	13 7 00	102	13 10 00	83.8	–	10800	6.79×10^{-7}	6.8×10^{-7}	0,833	5.64×10^{-7}
			2	– 10 00	102	– 13 00	83.8		10800	6.78×10^{-7}			
			3	– 13 00	102	– 16 00	83.7		10800	6.83×10^{-7}			
8U1-6	14.57	1	1	13 11 00	102	13 14 40	65.2	28	2400	6.56×10^{-6}	7.0×10^{-6}	–	5.84×10^{-6}
			2	– 12 00	102	– 12 40	65.0		2400	7.00×10^{-6}			
			3	– 14 00	102	– 14 40	65.0		2400	7.00×10^{-6}			

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 : TP 9U-1
Depth : 1.0 - 2.5
Description of soil : Reddish brown laterit gravels, 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 :

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

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
9U1-1	15.29	1	1		103		60		200	1.0×10^{-4}			
			2	✓	103	✓	60	28	200	1.0×10^{-4}	1.0×10^{-4}	0,833	8.4×10^{-5}
			3		103		60		200	1.0 —			
9U1-2	16.08	2	1	22'800	103	22'915	66.7		900	1.8×10^{-5}			
			2	— 820	102	— 835	66.0	28	900	1.8 —	1.8×10^{-5}	—	1.5×10^{-5}
			3	— 840	102	— 855	66.0		900	1.8 —			
9U1-3	16.86	3	1	22'800	102	22'960	71.4		3600	3.7×10^{-6}			
			2	900	102	— 1000	71.5	—	3600	3.79×10^{-6}	3.74×10^{-6}	—	3.08×10^{-6}
			3	— 1000	103	— 1100	71.5		3600	3.74×10^{-6}			
9U1-4	16.86	4	1	22'900	103	22'1000	61.0		7200	2.72×10^{-6}			
			2	— 1000	103	— 1200	61.8	—	7200	2.65 —	2.67×10^{-6}	0,833	2.22×10^{-6}
			3	— 1300	103	— 1500	64.4		7200	2.68 —			
9U1-5	16.18	5	1	22'900	103	22'940	67.4		2400	6.6×10^{-6}			
			2	— 950	103	— 1030	67.4	28	2400	6.6×10^{-6}	6.6×10^{-6}	—	5.50×10^{-6}
			3	— 1030	103	— 1110	67.5		2400	6.59×10^{-6}			
9U1-6	15.10	1	1		102		66.7		660	2.4×10^{-5}			
			2	✓	102	✓	66.5	28°	660	2.42×10^{-5}	2.42×10^{-5}	0,833	2.0×10^{-5}
			3		102		66.5		660	2.42×10^{-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 : TP 9U-2
Depth : 2.5 - 5.0
Description of soil : yellowish brown & gray silty clay with gravels.

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 :

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

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
9U2-1	14.7	1	1	16'800	102	16'815	60.6		900				
			2	— 830	102	— 845	60.6	28°	900	2.46×10^{-5}		0,833	1.8×10^{-5}
			3	— 1000	102	— 1015	60.6		900				
9U2-2	15.57	2	1	16'800	101	16'900	67.4		3600	4.2×10^{-6}			
			2	900	102	1000	67.5	28	3600	4.3 —	4.3×10^{-6}	—	3.56×10^{-6}
			3	— 1000	102	— 1100	67.5		3600	4.3 —			
9U2-3	16.44	3	1	16'840	102	16'1040	72.8		7200	1.75×10^{-6}			
			2	— 1040	103	— 1240	73.0	28	7200	1.78 —	1.78×10^{-6}	—	1.48×10^{-6}
			3	— 1250	103	— 1450	73.0		7200	1.78 —			
9U2-4	16.37	4	1	16'840	102	16'1040	82.8		7200	1.08×10^{-6}			
			2	— 1040	102	— 1240	83	—	7200	1.07 —	1.07×10^{-6}	0,833	8.9×10^{-7}
			3	— 1250	103	— 1450	83		7200	1.07 —			
9U2-5	15.93	5	1	— 840	103	16'1040	74.5		7200				
			2	1040	103	— 1240	74.5	28	7200	1.68×10^{-6}		—	1.4×10^{-6}
			3	— 1250	103	— 1450	74.5		7200				
9U2-6	15.05	1	1	16'1200	102	16'1300	48		3600	7.6×10^{-6}			
			2	1300	102	— 1500	48	—	3600	7.82 —	7.8×10^{-6}	—	6.5×10^{-6}
			3	1400	102	— 1500	48.1		3600	7.79 —			

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

Project : DONGNAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP 10U - 1
Depth : 1.0 - 2.5
Description of soil : Reddish brown laterit gravel 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 α : 0.28cm²
Formule of calculation :

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

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

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
10U1-1	15.02	1	1		100		60.5		300	6.34×10^{-5}			
			2	✓	100	✓	60.0	28	300	6.35 –	6.35×10^{-5}	0.833	5.3×10^{-5}
			3		100		60.0		300	6.35 –			
10U1-2	16.05	2	1	22830	101	22850	77.0		1200	8.44×10^{-6}			
			2	– 850	101	– 910	77.0	28	1200	8.44 –	8.44×10^{-6}	–	7.0×10^{-6}
			3	– 920	101	– 940	77.1		1200	8.40 –			
10U1-3	16.49	3	1	22815	101	22955	72.2		3600	3.48×10^{-6}			
			2	– 920	101	1020	72.0	28	3600	3.50 –	3.50×10^{-6}	–	2.92×10^{-6}
			3	– 1030	101	– 1130	72.0		3600	3.56 –			
10U1-4	16.76	4	1	22815	101.5	22 1015	61,0		7200	2.64×10^{-6}			
			2	– 1030	101.0	1230	60.5	–	7200	2.66 –	2.64×10^{-6}	0.833	2.2×10^{-6}
			3	– 1300	103.0	1500	62.0		7200	2.63 –			
10U1-5	16.26	5	1	22.930	102	22.1000	74.2		1800	6.60×10^{-6}			
			2	– 1100	102	– 1130	74.0	–	1800	6.65 –	6.65×10^{-6}	–	5.5×10^{-6}
			3	– 1300	102	– 1330	74.0		1800	6.65 –			
10U1-6	15.20	1	1		100		60		660	2.88×10^{-5}			
			2	✓	100	✓	60	–	660	2.88 –	2.88×10^{-5}	–	2.4×10^{-5}
			3		100		60		660	2.88 –			

130g

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

Project : DONGNAI 3 & 4 COMBINED HYDROPOWER
Location of sample : TP 10U - 1
Depth : 1.0 - 2.5
Description of soil : Reddish brown laterit gravel 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 α : 0.28cm²
Formule of calculation :

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

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

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
10U1-1	15.02	1	1		100		60.5		300	6.34×10^{-5}			
			2	✓	100	✓	60.0	28	300	6.35 –	6.35×10^{-5}	0.833	5.3×10^{-5}
			3		100		60.0		300	6.35 –			
10U1-2	16.05	2	1	22830	101	22850	77.0		1200	8.44×10^{-6}			
			2	– 850	101	– 910	77.0	28	1200	8.44 –	8.44×10^{-6}	–	7.0×10^{-6}
			3	– 920	101	– 940	77.1		1200	8.40 –			
10U1-3	16.49	3	1	22815	101	22955	72.2		3600	3.48×10^{-6}			
			2	– 920	101	1020	72.0	28	3600	3.50 –	3.50×10^{-6}	–	2.92×10^{-6}
			3	– 1030	101	– 1130	72.0		3600	3.56 –			
10U1-4	16.76	4	1	22815	101.5	22 1015	61,0		7200	2.64×10^{-6}			
			2	– 1030	101.0	1230	60.5	–	7200	2.66 –	2.64×10^{-6}	0.833	2.2×10^{-6}
			3	– 1300	103.0	1500	62.0		7200	2.63 –			
10U1-5	16.26	5	1	22.930	102	22.1000	74.2		1800	6.60×10^{-6}			
			2	– 1100	102	– 1130	74.0	–	1800	6.65 –	6.65×10^{-6}	–	5.5×10^{-6}
			3	– 1300	102	– 1330	74.0		1800	6.65 –			
10U1-6	15.20	1	1		100		60		660	2.88×10^{-5}			
			2	✓	100	✓	60	–	660	2.88 –	2.88×10^{-5}	–	2.4×10^{-5}
			3		100		60		660	2.88 –			

130g

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 11U-1
Depth :
Description of soil : Brown silty clay with 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
11U1-1	1	14,23	1	7 1000	101	7 1052	64		720	$2,37\times10^{-5}$			
			2		102	–	65	28°	720	2,37 –	$2,37\times10^{-5}$	0,833	$1,97\times10^{-5}$
			3		103		65		720	2,37 –			
11U1-2	2	15,07	1	7 815	103	7 915	74,5		3600	$3,36\times10^{-6}$			
			2	920	102	– 1020	74,0	28	3600	3,33 –	$3,33\times10^{-6}$	0,833	$2,78\times10^{-6}$
			3	1020	102	– 1125	72,0		3900	3,33 –			
11U1-3	3	15,62	1	7 800	102	7 045	72,0		9900	$1,37\times10^{-6}$			
			2	11 000	103	– 1350	70,0	28	10200	1,41 –	$1,9\times10^{-6}$	–	$1,08\times10^{-6}$
			3	– 1400	102	1645	72,5		9900	1,39 –			
11U1-4	4	15,60	1	7 800	103	7 1000	71,0		7200	$1,92\times10^{-6}$			
			2	1000	102	12 05	69,5	28	7500	1,93 –	$1,95\times10^{-6}$	–	$1,63\times10^{-6}$
			3	– 13 00	103	1510	68,5		7800	1,95 –			
11U1-5	5	15,80	1	7 815	102	7 915	60,6		3600	$5,7\times10^{-6}$			
			2	– 920	103	– 1020	60,6	28	3600	$5,5\times10^{-6}$	$5,4\times10^{-6}$	–	$4,5\times10^{-6}$
			3	– 1020	103	– 1125	58,2		3900	$5,3\times10^{-6}$			
11U1-6	1	14,26	1	7 940	101	7 950	62,4		600	$3,0\times10^{-5}$			
			2	955	102	– 1055	62,0	28	600	3,1 –	$3,1\times10^{-5}$	0,833	$2,55\times10^{-5}$
			3	–	102	–	62,0		600	3,1 –			

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 12U-1
Depth :
Description of soil : Yellowish reddish silty clay with 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
12U1-1	13,98	1	1	8 800	103		60		360	$5,6\times10^{-5}$			
			2		103	–	60	28	360	5,5 –	$5,6\times10^{-5}$	0,833	$4,66\times10^{-5}$
			3		102		60		360	5,5 –			
12U1-2	15,10	2	1	8 830	103	8 930	72,0		3600	$3,72\times10^{-6}$			
			2	930	102	– 1030	71,5	28	3600	3,68 –	$3,68\times10^{-6}$	–	$3,07\times10^{-6}$
			3	1030	102	– 1130	71,4		3600	3,68 –			
12U1-3	16,10	3	1	8 800	102	8 930	83,0		4600	$1,35\times10^{-6}$			
			2	930	102	11 00	86,5	28	4600	1,40 –	$1,35\times10^{-6}$	0,833	$1,12\times10^{-6}$
			3	– 11 00	102	1230	87,0		4400	1,35 –			
12U1-4	16,10	4	1	8 800	103	8 1000	82,8		7200	$1,03\times10^{-6}$			
			2	– 1000	102	– 1200	83,0	28	7200	1,07 –	$1,07\times10^{-6}$	–	$8,9\times10^{-7}$
			3	– 1200	102	– 1400	83,0		7200	1,07 –			
12U1-5	15,44	5	1	8 8 00	103	8 9 00	68,7		3600	$4,20\times10^{-6}$			
			2	900	103	– 1000	69,0	28	3600	4,15 –	$4,20\times10^{-6}$	0,833	$3,5\times10^{-6}$
			3	10 000	103	– 1100	68,1		3600	4,21 –			
12U1-6	14,46	1	1	8 1010	103		62,4		600	$2,64\times10^{-5}$			
			2		103	–	62,5	–	600	2,63	$2,63\times10^{-5}$	–	$2,2\times10^{-5}$
			3	–	103		62,5		600	2,63			

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 : TP 13U-1
Depth :
Description of soil : Reddish brown laterit gravels with silty clay mixture

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm; *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 :

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

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
13U-1	14,46	1	1	9 1010	103	—	60		165	1.22×10^{-4}	1.22×10^{-4}	0,833	1.02×10^{-4}
			2	—	103	—	60	28	165	1.22			
			3		103	—	60		165	1.22			
13U-2	15,44	2	1	9 9.00	103	9 9.25	60		1500	1.34×10^{-5}	1.36×10^{-5}	—	1.13×10^{-5}
			2	— 9.30	102	— 9.55	59	28	1500	1.36			
			3	— 9.00	102	— 9.30	50		1800	1.48			
13U-3	16.24	3	1	9 8.45	103	9 10.45	74.5		3600	3.36×10^{-6}	3.4×10^{-6}	—	2.83×10^{-6}
			2	— 10.50	103	— 12.50	76.5	—	3600	3.36			
			3	— 13.00	103	— 15.00	74.0		3600	3.65			
13U-4	16.37	4	1	9 9.00	102	9 11.00	80.9		3600	2.4×10^{-6}	2.39×10^{-6}	0,833	1.99×10^{-6}
			2	— 11.00	102	— 13.00	81.0	28	3600	2.39			
			3	— 13.00	102	— 15.00	81.0		3600	2.35			
13U-5	15,69	5	1	9 9.20	102	9 10.80	74.0		1800	6.65×10^{-6}	6.65×10^{-6}	—	5.54×10^{-6}
			2	— 10.00	102	— 10.30	74.0	—	1800	6.65			
			3	— 11.00	102	— 11.30	74.0		1800	6.65			
13U-6	14,6	1	1	9 10.20	103		57.8		600	3.6×10^{-5}	3.6×10^{-5}	0,833	3.0×10^{-5}
			2	—	103	—	57.5	28	600	3.63			
			3		103		58.0		600	3.57			

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 : TP 13U-2
Depth :
Description of soil : Reddish brow laterit gravels and silty clay mixture.

Data of sample and apparatus :
Diameter : 6.18cm; *Area A* : 30cm; *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 :

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

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
13U-1	14,51	1	1	11 9.00	103		59.5		180	1.13×10^{-4}	1.12×10^{-4}	0,833	9.3×10^{-5}
			2	—	103	—	60.0	28	180	1.12			
			3		103		60.0		180	1.12			
13U-2	15,49	2	1	11 9.00	103	11 9.30	51.5		1800	1.44×10^{-5}	1.42×10^{-5}	—	1.18×10^{-5}
			2	— 9.30	103	— 10.00	52.0	28	1800	1.42			
			3	— 10.00	103	— 10.30	52.0		1800	1.42			
13U-3	16,18	3	1	10 15.00	103	10 17.00	54		7200	3.35×10^{-6}	3.36×10^{-6}	—	2.8×10^{-6}
			2	11 8.00	103	11 10.00	54	—	7200	3.35			
			3	— 10.00	103	— 12.00	53.5		7200	3.38			
13U-4	16.55	4	1	10 15.00	102.0	10 17.00	75.5		7200	1.56×10^{-6}	1.55×10^{-6}	—	1.29×10^{-6}
			2	11 8.00	102.5	11 10.00	76.0	28	7200	1.55			
			3	— 10.00	102.0	— 12.00	76.0		7200	1.55			
13U-5	16.27	5	1	11 8.00	102	11 9.30	65.0		5400	3.1×10^{-6}	3.1×10^{-6}	—	2.57×10^{-6}
			2	9.30	102	— 11.00	65.0	28	5400	3.11			
			3	— 11.00	102	— 12.30	65.0		5400	3.11			
13U-6	15,00	1	1		102		72.0		540	2.4×10^{-5}	2.4×10^{-5}	0.833	2.0×10^{-5}
			2	—	102	—	72.0	—	540	2.4			
			3										

DATA 4.1.1

LABORATORY TEST
OF
EARTH CORE MATERIAL
FOR
DONG NAI No.3 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° : TP2U-1
TEST TYPE : UU

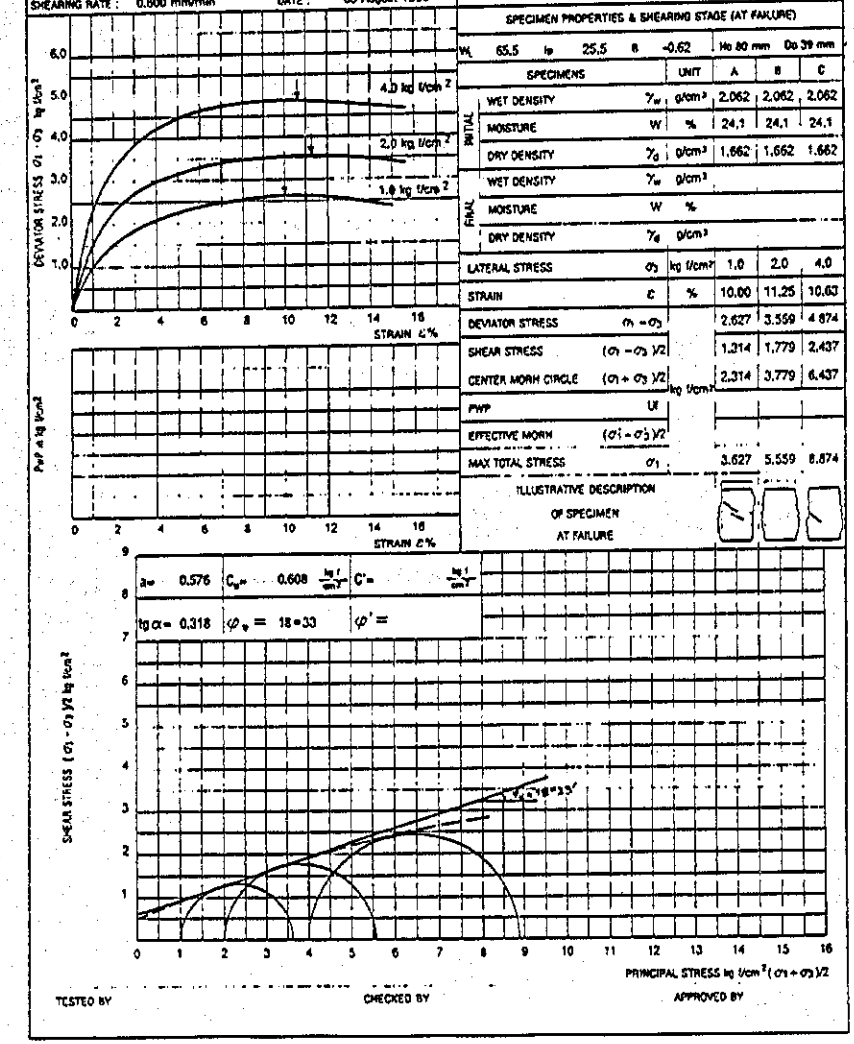
SOIL DESCRIPTION : Brown laterite gravels sandy clay mixture
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.600 mm/min DATE : 05 August 1999
BOREHOLE N°: TP2U
DEPTH OF SAMPLE : 1.0 - 1.5 m

SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

W_L 65.5 I_p 25.5 B -0.62 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	2.062	2.062	2.062
	MOISTURE	W	%	24.1	24.1	24.1
	DRY DENSITY	γ_d	g/cm³	1.662	1.662	1.662
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	11.25	10.63
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	kg f/cm²	2.627	3.559	4.874
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$	kg f/cm²	1.314	1.779	2.437
CENTER MOHR CIRCLE		$(\sigma_1 + \sigma_3)/2$	kg f/cm²	2.314	3.779	6.437
PWP		U				
EFFECTIVE MOHR		$(\sigma'_1 - \sigma'_3)/2$				
MAX TOTAL STRESS		σ_1		3.627	5.559	8.874

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE



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136a

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

TEST N° : TP5U-2
TEST TYPE : UU

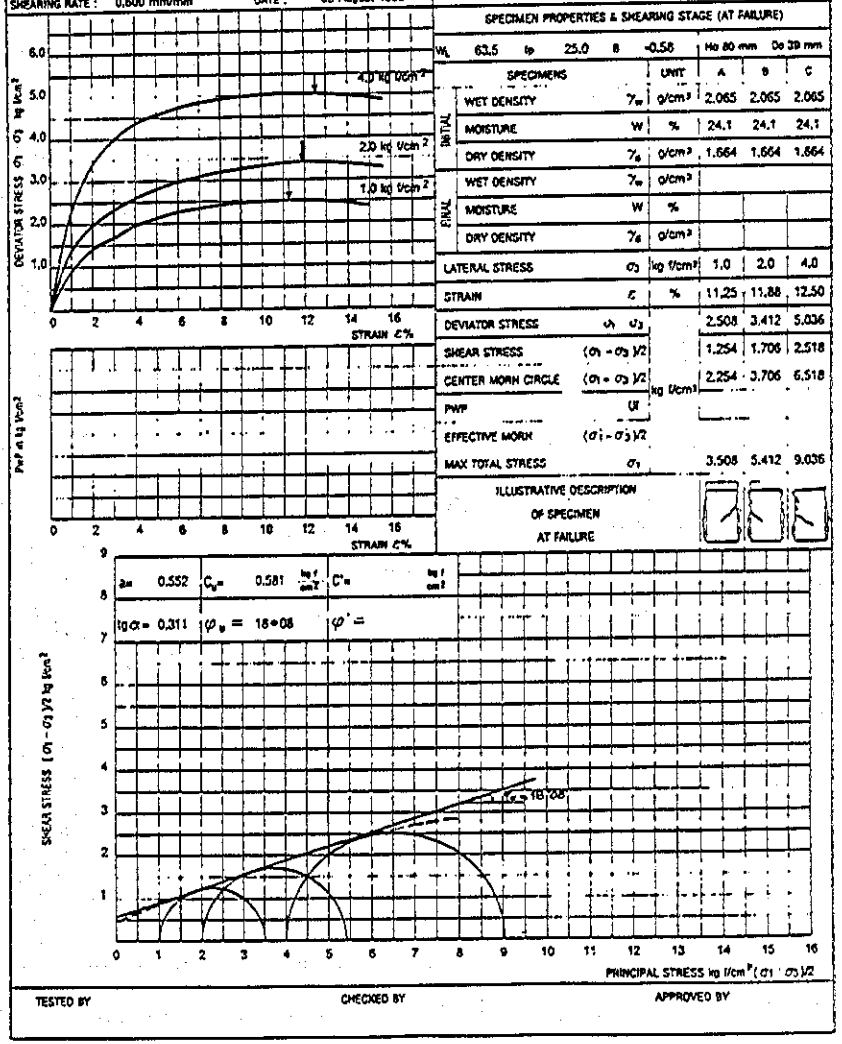
SOIL DESCRIPTION : Reddish brown laterite gravels sandy clay mixture
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.600 mm/min DATE : 05 August 1999
BOREHOLE N°: TP5U
DEPTH OF SAMPLE : 2.5 - 5.0 m

SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

W_L 63.5 I_p 25.0 B -0.56 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	2.065	2.065	2.065
	MOISTURE	W	%	24.1	24.1	24.1
	DRY DENSITY	γ_d	g/cm³	1.664	1.664	1.664
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	%	11.25	11.88	12.50
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	kg f/cm²	2.508	3.412	5.036
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$	kg f/cm²	1.254	1.706	2.518
CENTER MOHR CIRCLE		$(\sigma_1 + \sigma_3)/2$	kg f/cm²	2.254	3.706	6.518
PWP		U				
EFFECTIVE MOHR		$(\sigma'_1 - \sigma'_3)/2$				
MAX TOTAL STRESS		σ_1		3.508	5.412	9.036

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE



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

TEST N° TP7U-2
TEST TYPE UU

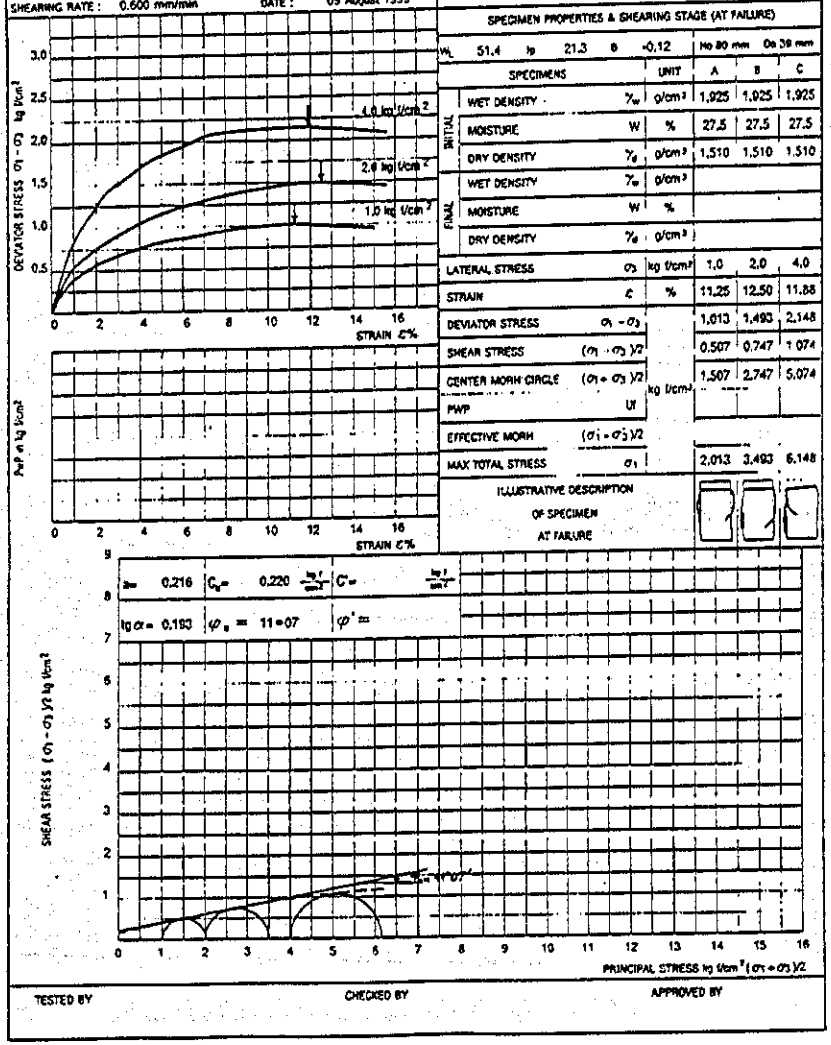
SOIL DESCRIPTION : Yellowish mottle reddish silty clay with few fine gravels
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N° : TP7U
DEPTH OF SAMPLE : 2.5 - 5.0 m
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.600 mm/min DATE : 09 August 1999

SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

WL 51.4 Ip 21.3 B +0.12 No 80 mm Do 39 mm

SPECIMENS			UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	1.925	1.925	1.925
	MOISTURE	W	%	27.5	27.5	27.5
	DRY DENSITY	γ_d	g/cm³	1.510	1.510	1.510
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	%	11.25	12.50	11.88
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	kg f/cm²	1.013	1.493	2.148
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$	kg f/cm²	0.507	0.747	1.074
CENTER MOHR CIRCLE		$(\sigma_1 + \sigma_3)/2$	kg f/cm²	1.507	2.747	5.074
PWP		UI	kg f/cm²			
EFFECTIVE MOHR		$(\sigma_1 + \sigma_3)/2$	kg f/cm²			
MAX TOTAL STRESS		σ_1	kg f/cm²	2.013	3.493	6.148

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE



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

TEST N° TP10U-2
TEST TYPE UU

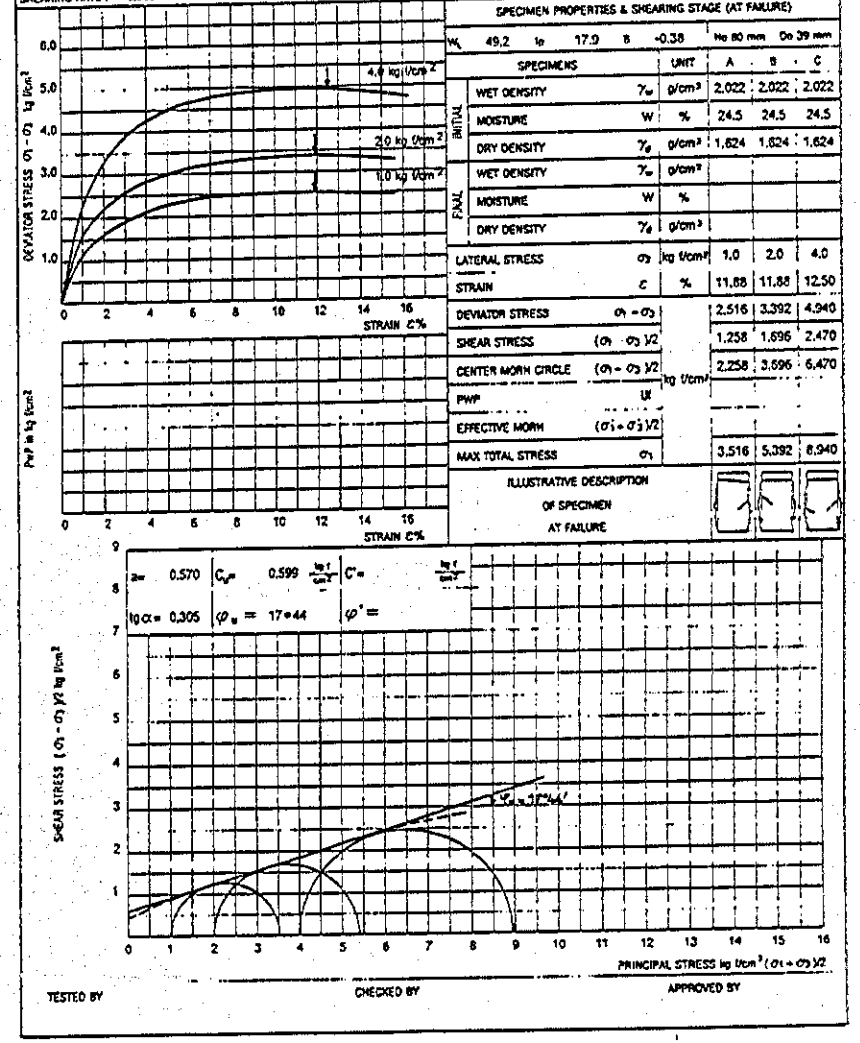
SOIL DESCRIPTION . Reddish brown laterite gravels sandy clay mixture
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N° : TP10U
DEPTH OF SAMPLE : 2.5 - 5.0 m
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.600 mm/min DATE : 09 August 1999

SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

WL 49.2 Ip 17.9 B -0.38 No 80 mm Do 39 mm

SPECIMENS			UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	2.022	2.022	2.022
	MOISTURE	W	%	24.5	24.5	24.5
	DRY DENSITY	γ_d	g/cm³	1.624	1.624	1.624
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	%	11.88	11.88	12.50
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	kg f/cm²	2.516	3.392	4.940
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$	kg f/cm²	1.258	1.696	2.470
CENTER MOHR CIRCLE		$(\sigma_1 + \sigma_3)/2$	kg f/cm²	2.258	3.696	6.470
PWP		UI	kg f/cm²			
EFFECTIVE MOHR		$(\sigma_1 + \sigma_3)/2$	kg f/cm²			
MAX TOTAL STRESS		σ_1	kg f/cm²	3.516	5.392	8.940

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE



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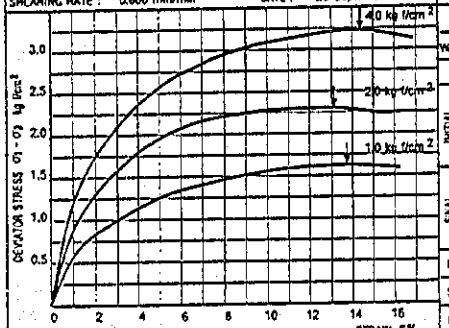
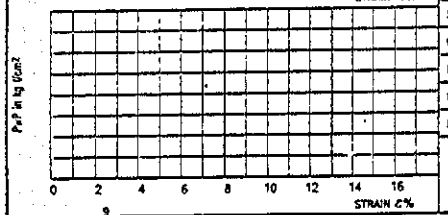
TRIAXIAL COMPRESSION TEST
(SUMMARY AND REPORT DATA SHEET)
THÍ NGHIỆM NÉN BA TRỤC
(BÁO CÁO TỔNG HỢP)

TEST N° : TP12U-1
TEST TYPE : UU

SOIL DESCRIPTION : Yellowish mottle reddish brown silty clay with gravels
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.600 mm/min DATE : 20 September 1999

PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N° : TP12U
DEPTH OF SAMPLE : 1.0 - 3.0 m



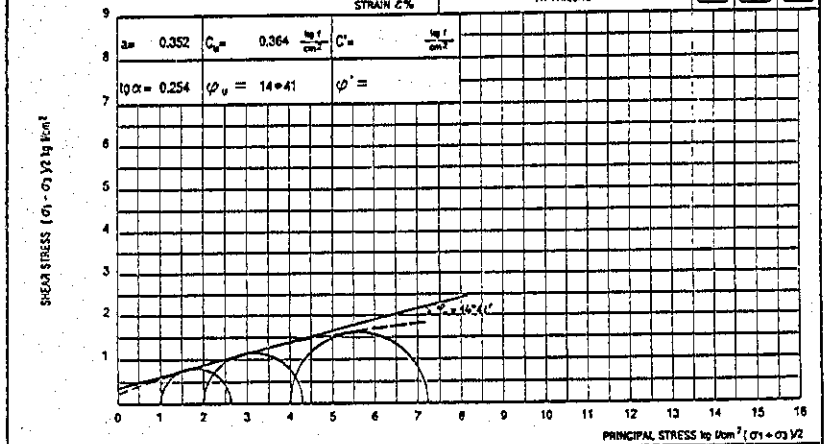


SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

γk 59.0 Ip 25.3 B -0.30 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	1.975	1.975	1.975
	MOISTURE	W	%	26.0	26.0	26.0
	DRY DENSITY	γ_d	g/cm³	1.567	1.567	1.567
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	%	13.75	13.13	14.38
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	kg f/cm²	1.625	2.303	3.226
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$		0.812	1.152	1.613
CENTER MORH CIRCLE		$(\sigma_1 + \sigma_3)/2$		1.812	3.152	5.613
PWP		Uf				
EFFECTIVE MORH		$(\sigma'_1 + \sigma'_3)/2$				
MAX TOTAL STRESS		σ_1		2.625	4.303	7.226

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE



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A - 368

DATA 4.1.1

LABORATORY TEST
OF
EARTH CORE MATERIAL
FOR
DONG NAI No.3 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° : TP2U-1
TEST TYPE : CU-PwP

SOIL DESCRIPTION : Brown laterite gravels sandy clay mixture
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.180 mm/min DATE : 05-06 August 1999

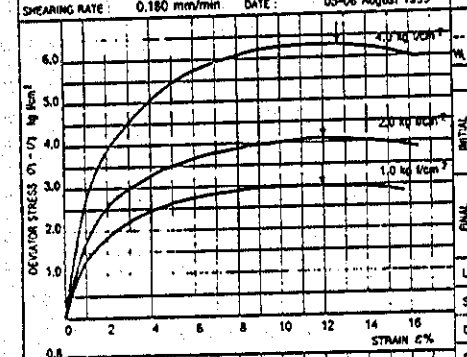
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N° : TP2U
DEPTH OF SAMPLE : 1.0 - 2.5m

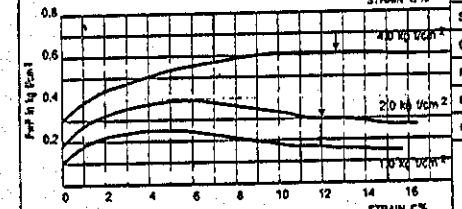
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

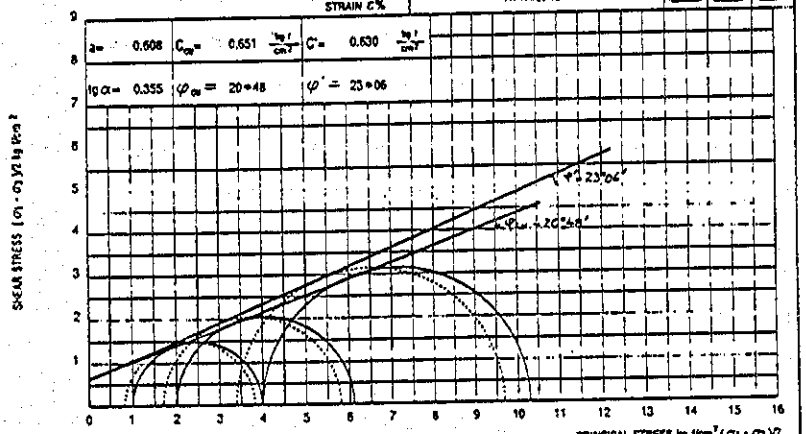
Wi 65.5 Ip 25.5 B 0.62 Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	2.062	2.062	2.062
	MOISTURE	W	%	24.10	24.10	24.10
	DRY DENSITY	γ_d	g/cm³	1.662	1.662	1.662
FINAL	WET DENSITY	γ_w	g/cm³	2.080	2.092	2.105
	MOISTURE	W	%	23.10	22.40	21.70
	DRY DENSITY	γ_d	g/cm³	1.690	1.710	1.730
LATERAL STRESS		σ_3	kg f/cm²	1.00	2.00	4.00
STRAIN		ε	%	11.94	11.99	12.67
DEVIATOR STRESS		$\sigma_1 - \sigma_3$	kg f/cm²	2.982	4.099	5.290
SHEAR STRESS		$(\sigma_1 - \sigma_3)/2$		1.491	2.050	3.145
CENTER MOHR CIRCLE		$(\sigma_1 + \sigma_3)/2$		2.491	4.050	7.145
PWP		U		0.17	0.30	0.61
EFFECTIVE MOHR		$(\sigma_1 + \sigma_3)/2$		2.321	3.750	6.535
MAX TOTAL STRESS		σ_1		3.982	6.099	10.290

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE







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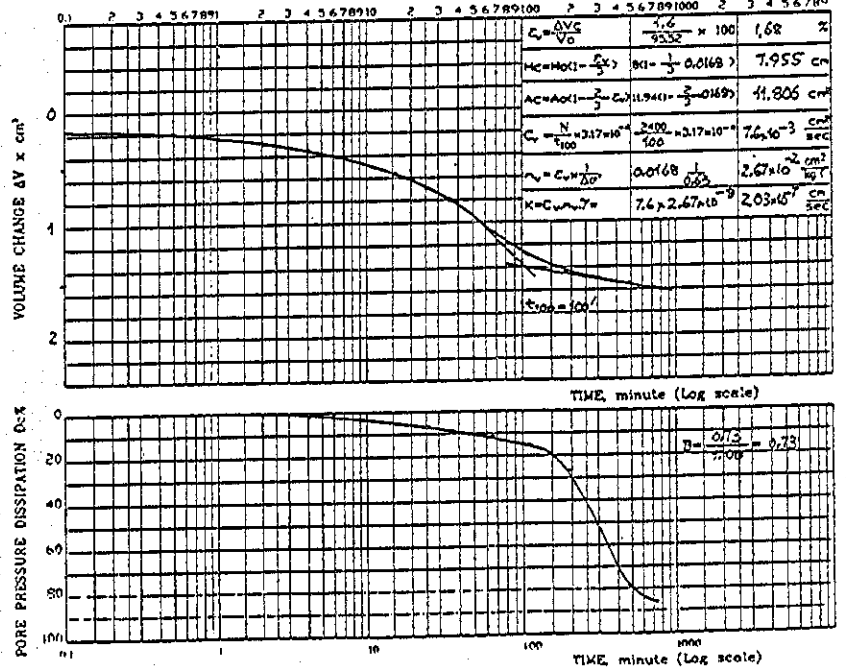
TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N° : TP 2U-1 TEST TYPE : CU - PWP
PROJECT : DONG NAI 3 x 4 HYDRO POWER LOAD RING N° : DATE STARTED : 7-8-99

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		7-8	7h00	0		32.00	0.00	0.73	0	0
VERTICAL STRESS 4.00				30"		31.80	0.20	0.73	-	-
BACK STRESS 0	kg f/cm²			1'		31.75	0.25	0.73	-	-
Pwp AFTER BUILD UP				2		31.70	0.30	0.73	0	0
DIFFERENCE				4		31.65	0.35	0.72	0.01	1.4
EFFECTIVE PRESSURE				9		31.55	0.45	0.71	0.02	2.7
$\sqrt{t_{100}}$ = 10 t_{100} = 100 min.				16		31.45	0.55	0.69	0.04	5.5
$t_f = a \cdot t_{100} = 0.51 \times 100 = 51$				25		31.30	0.70	0.67	0.06	8.2
				36		31.20	0.80	0.66	0.07	9.6
RATE OF DISPLACEMENT				64'		30.90	1.10	0.65	0.08	11.0
$\frac{E_{11} \cdot H_{ps}}{100 \cdot t_{f,s}} = 0.10 \times \frac{79.55}{51} = 0,156$				2h		30.70	1.30	0.62	0.11	15.1
				3		30.55	1.45	0.53	0.20	27.4
select v = 0,180 mm/min				5		30.50	1.50	0.36	0.37	50.7
				8		30.45	1.55	0.15	0.58	79.0
			19h00	12		30.40	1.60	0.10	0.63	86.3
				24h						



$C_v = \frac{\Delta Vc}{Vo}$ $\frac{1.6}{95.52} \times 100$ 1,68 %
$Hc = Ho(1 - \frac{\varepsilon}{3})$ $80(1 - \frac{1}{3} \cdot 0.0168)$ 7.955 cm
$Ac = Ao(1 - \frac{\varepsilon}{3} - C_v)$ $11.94(1 - \frac{1}{3} \cdot 0.0168)$ 11.806 cm²
$C_v = \frac{N}{t_{100}} = 3.17 \times 10^{-4} \frac{2400}{100} = 3.17 \times 10^{-3}$ 7.6×10^{-3} cm²/sec
$m_v = C_v \frac{1}{\Delta\sigma}$ $0.0168 \frac{1}{0.63}$ 2.67×10^{-2} cm²/kg f
$K = C_v \cdot m_v \cdot \gamma_w$ $7.6 \times 2.67 \times 10^{-5}$ 2.03×10^{-7} cm/sec

$U = \frac{0.13}{0.73} = 0.73$

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TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N° : TP2U-1 — Test type : CU - PWP — Depth : 10-2.5m

Project : DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N° : — Date : 07 August 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_{ps} = 7.955 cm	Area A_{ps} = 11.806 cm²	Volume V_{ps} = 93.922 cm³	Eff. cell pressure σ_3 =	1.00	kg f/cm²

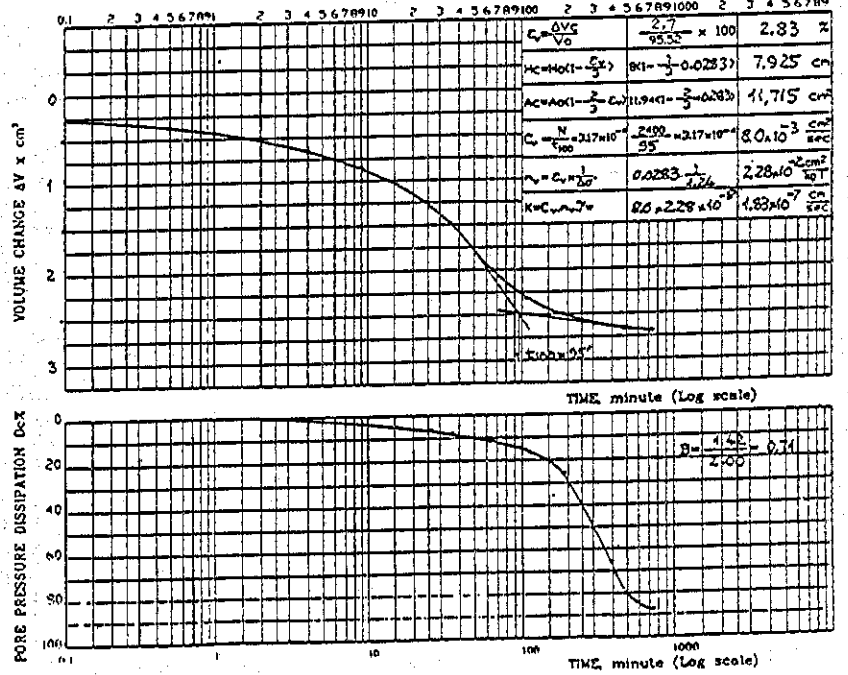
Strain		Load		U	A	Deviator stress kg f/cm²			Stresses kg f/cm²					
Div. 0.01	ε %	Div. 0.01	Load Kg	kg f/cm²	cm²	Stress	Memb. corr.	$\sigma_1-\sigma_3$	σ_1	σ_3	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	σ_1/σ_3
0	0.00	0.00	0.00	0.10	11.806	0.000		0.000	0.900	0.900	0.000	1.000	0.900	1.000
50	0.63	15.00	12.50	0.16	11.881	1.052		1.052	1.892	0.840	0.526	1.526	1.366	2.252
100	1.26	21.40	17.83	0.19	11.956	1.491		1.491	2.301	0.810	0.745	1.745	1.555	2.841
150	1.89	26.00	21.66	0.22	12.033	1.800		1.800	2.580	0.780	0.900	1.900	1.680	3.308
200	2.51	30.00	24.99	0.23	12.110	2.064		2.064	2.834	0.770	1.032	2.032	1.802	3.680
250	3.14	33.00	27.49	0.24	12.189	2.255		2.255	3.015	0.760	1.128	2.128	1.888	3.967
300	3.77	35.50	29.57	0.25	12.269	2.410		2.410	3.160	0.750	1.205	2.205	1.955	4.214
350	4.40	37.40	31.15	0.25	12.349	2.523		2.523	3.273	0.750	1.261	2.261	2.011	4.364
400	5.03	39.30	32.74	0.25	12.431	2.633		2.633	3.383	0.750	1.317	2.317	2.067	4.511
450	5.66	40.80	33.99	0.25	12.514	2.716		2.716	3.466	0.750	1.358	2.358	2.108	4.621
500	6.29	42.00	34.99	0.24	12.598	2.777		2.777	3.537	0.760	1.389	2.389	2.149	4.654
550	6.91	43.20	35.99	0.23	12.683	2.837		2.837	3.607	0.770	1.419	2.419	2.189	4.685
600	7.54	44.00	36.65	0.22	12.769	2.870		2.870	3.650	0.780	1.435	2.435	2.215	4.680
650	8.17	45.00	37.49	0.21	12.856	2.916		2.916	3.706	0.790	1.458	2.458	2.248	4.691
700	8.80	45.60	37.98	0.20	12.945	2.934		2.934	3.734	0.800	1.467	2.467	2.267	4.668
750	9.43	46.20	38.48	0.19	13.035	2.952		2.952	3.762	0.810	1.476	2.476	2.286	4.645
800	10.06	46.80	38.98	0.18	13.126	2.970		2.970	3.790	0.820	1.485	2.485	2.305	4.622
850	10.69	47.20	39.32	0.17	13.218	2.974		2.974	3.804	0.830	1.487	2.487	2.317	4.584
900	11.31	47.60	39.65	0.17	13.312	2.979		2.979	3.809	0.830	1.489	2.489	2.319	4.589
950	11.94	48.00	39.98	0.17	13.407	2.982		2.982	3.812	0.830	1.491	2.491	2.321	4.593
1000	12.57	48.20	40.15	0.16	13.503	2.973		2.973	3.813	0.840	1.487	2.487	2.327	4.540
1050	13.20	48.40	40.32	0.16	13.601	2.964		2.964	3.804	0.840	1.482	2.482	2.322	4.529
1100	13.83	48.50	40.40	0.16	13.700	2.949		2.949	3.789	0.840	1.474	2.474	2.314	4.511
1150	14.46	48.50	40.40	0.15	13.801	2.927		2.927	3.777	0.850	1.464	2.464	2.314	4.444
1200	15.08	48.40	40.32	0.15	13.903	2.900		2.900	3.750	0.850	1.450	2.450	2.300	4.412
1250	15.71	48.00	39.98	0.15	14.007	2.855		2.855	3.705	0.850	1.427	2.427	2.277	4.358

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N° : T.P2U - 1 — TEST TYPE : CU - PWP — DATE STARTED : 6 - 8 - 99

PROJECT : DONG NAI 3&4 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		6-8	7h00	0		34.00	0.00	1.42	0	0
VERTICAL STRESS 2.00	kg f/cm²			30"		33.60	0.40	1.42	–	–
BACK STRESS 0				1'		33.55	0.45	1.42	–	–
Pwp AFTER BUILD UP				2		33.50	0.50	1.42	0	0
DIFFERENCE				4		33.35	0.65	1.40	0.02	1.4
EFFECTIVE PRESSURE				9		33.15	0.85	1.38	0.04	2.8
$\sqrt{t_{100}}$ =	t_{100} = 95 min.			16		32.95	1.05	1.35	0.07	4.9
$t_r = a \cdot t_{100} = 0.51 \times 95 = 48.5$				25		32.75	1.25	1.32	0.10	7.0
				36		32.50	1.50	1.30	0.12	8.5
RATE OF DISPLACEMENT				64'		32.00	2.00	1.27	0.15	10.6
$\frac{E_{11} \cdot H_{ps}}{100 \cdot t_{r,8}} = 0.10 \times \frac{79.25}{48.5} = 0,163$				2h		31.70	2.30	1.19	0.23	16.2
				3		31.50	2.50	1.07	0.35	24.6
				5		31.40	2.60	0.70	0.72	50.7
select v = 0,180 mm/min				8		31.35	2.65	0.28	1.14	80.3
		–	19h00	12		31.30	2.70	0.18	1.24	87.2
				24h						



$C_v = \frac{\Delta V_c}{V_o}$ — $\frac{2.7}{95.55} \times 100$ — 2.83 %

$H_c = H_o(1 - \frac{\varepsilon_v}{3})$ — $80(1 - \frac{1}{3} \cdot 0.0283)$ — 7.925 cm

$A_c = A_o(1 - \frac{2}{3}\varepsilon_v)$ — $11.94(1 - \frac{2}{3} \cdot 0.0283)$ — 11.715 cm²

$C_v = \frac{N}{t_{100}} = 3.17 \times 10^{-4}$ — $\frac{2400}{55} = 3.17 \times 10^{-4}$ — 8.0×10^{-3} $\frac{cm^2}{sec}$

$m_v = C_v \times \frac{1}{2\sigma'}$ — $0.0283 \cdot \frac{1}{1.24}$ — $2.28 \times 10^{-2} \frac{cm^2}{kgf}$

$K = C_v \cdot m_v \cdot \gamma_w$ — $8.0 \times 2.28 \times 10^{-5}$ — 1.83×10^{-7} $\frac{cm}{sec}$

$B = \frac{140}{200} = 0.71$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N° : TP2U-1 — Test type : CU - PWP — Depth : 1.0-2.5m

Project : DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N° : — Date : 06 August 1999

Test type : CU	Load ring constant	Without side drains	Cell pressure σ_3 = 2.00 kg f/cm²
Rate , 0.180 mm/mn	CR = 0.833 Kg/Dv		Vertical stress σ_1 = 2.00 kg f/cm²
Specimen prior to shearing			Back pressure Pb = 0 kg f/cm²
Height H_{ss} = 7.925 cm	Area A_{ss} = 11.715 cm²	Volume V_{ss} = 92.841 cm³	Eff. cell pressure σ_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_3'/σ_1'
0	0.00	0.00	0.00	0.18	11.715	0.000		0.000	1.320	1.820	0.000	2.000	1.820	1.000
50	0.63	19.00	15.83	0.25	11.789	1.342		1.342	3.092	1.750	0.671	2.671	2.421	1.767
100	1.26	29.00	24.16	0.29	11.865	2.036		2.036	3.746	1.710	1.018	3.018	2.728	2.191
150	1.89	36.00	29.99	0.32	11.941	2.511		2.511	4.191	1.680	1.256	3.256	2.936	2.495
200	2.52	41.00	34.15	0.34	12.018	2.842		2.842	4.502	1.660	1.421	3.421	3.081	2.712
250	3.15	44.00	36.65	0.36	12.097	3.030		3.030	4.670	1.640	1.515	3.515	3.155	2.848
300	3.79	47.00	39.15	0.37	12.176	3.215		3.215	4.845	1.630	1.608	3.608	3.238	2.973
350	4.42	50.00	41.65	0.38	12.256	3.398		3.398	5.018	1.620	1.699	3.699	3.319	3.098
400	5.05	52.00	43.32	0.39	12.338	3.511		3.511	5.121	1.610	1.755	3.755	3.365	3.181
450	5.68	54.00	44.98	0.39	12.420	3.622		3.622	5.232	1.610	1.811	3.811	3.421	3.249
500	6.31	56.00	46.65	0.39	12.504	3.731		3.731	5.341	1.610	1.865	3.865	3.475	3.317
550	6.94	57.40	47.81	0.38	12.589	3.798		3.798	5.418	1.620	1.899	3.899	3.519	3.345
600	7.57	58.50	48.73	0.37	12.675	3.845		3.845	5.475	1.630	1.922	3.922	3.552	3.359
650	8.20	60.00	49.98	0.36	12.762	3.916		3.916	5.556	1.640	1.958	3.958	3.598	3.388
700	8.83	61.00	50.81	0.35	12.850	3.954		3.954	5.604	1.650	1.977	3.977	3.627	3.397
750	9.46	62.00	51.65	0.34	12.940	3.991		3.991	5.651	1.660	1.996	3.996	3.656	3.404
800	10.09	63.00	52.48	0.33	13.030	4.027		4.027	5.697	1.670	2.014	4.014	3.684	3.412
850	10.73	64.00	53.31	0.32	13.122	4.063		4.063	5.743	1.680	2.031	4.031	3.711	3.418
900	11.36	65.00	54.15	0.30	13.216	4.097		4.097	5.797	1.700	2 048	4 048	3.748	3.410
950	11.99	65.50	54.56	0.30	13.311	4.099		4.099	5.799	1.700	2 050	4 050	3.750	3.411
1000	12.62	65.70	54.73	0.30	13.407	4.082		4.082	5.782	1.700	2 041	4 041	3.741	3.401
1050	13.25	65.90	54.89	0.30	13.504	4.065		4.065	5.765	1.700	2.033	4 033	3 733	3.391
1100	13.88	66.00	54.98	0.29	13.603	4.042		4.042	5.752	1.710	2.021	4.021	3.731	3.363
1150	14.51	66.00	54 98	0.28	13.704	4.012		4.012	5.732	1.720	2 006	4 006	3.726	3.333
1200	15.14	65.80	54.81	0.27	13.805	3.970		3.970	5.700	1.730	1.985	3.985	3.715	3.295
1250	15.77	65.40	54.48	0.27	13.909	3.917		3.917	5.647	1.730	1.958	3.958	3.688	3.264
1300	16.40	65.00	54.15	0.27	14.014	3.864		3.864	5.594	1.730	1.932	3.932	3.662	3.233

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N° : TP2U-1 — TEST TYPE : CU - PWP — DATE STARTED : 5 - 8 - 99

PROJECT : DONG NAI 3+4 HYDRO POWER — LOAD RING N° :

TEST TYPE CU — WITH / WITHOU 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} = 95 min.

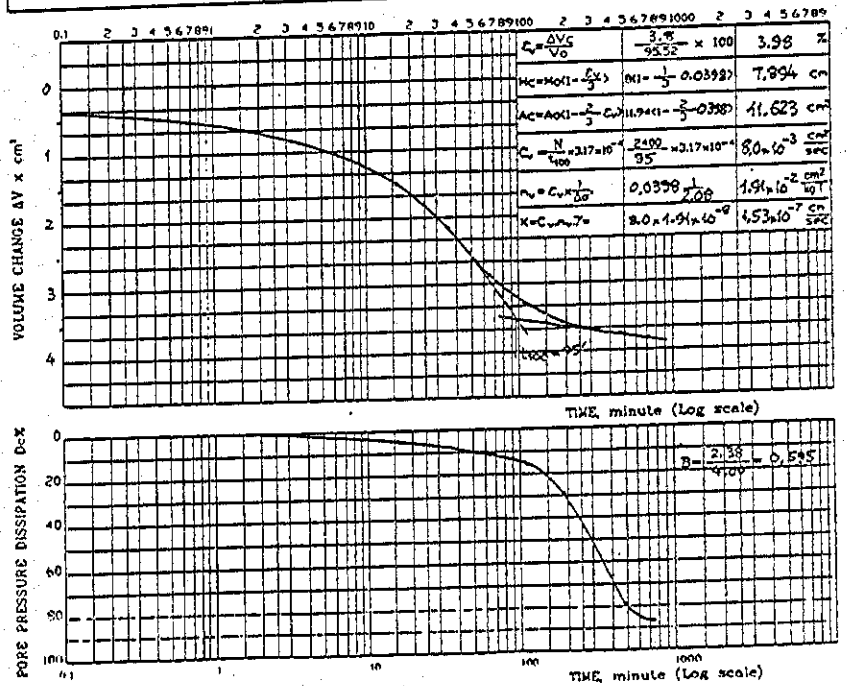
t_{50} = 8 , t_{100} = 0.51 x 95 = 48.5

RATE OF DISPLACEMENT

$\frac{E_{1r} \cdot H_{ss}}{100 \cdot t_{50}} = 0.10 \times \frac{78.94}{48.5} = 0.163$

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	Diss. %
5-8	6h30	0		34.60	0.00	2.38	0	0
		30"		33.50	0.50	2.38	-	-
		1'		33.40	0.60	2.38	-	-
		2		33.30	0.70	2.38	0	0
		4		33.40	0.80	2.34	0.04	1.7
		9		32.80	1.20	2.31	0.07	2.9
		16		32.50	1.50	2.26	0.12	5.0
		25		32.20	1.80	2.22	0.16	6.7
		36		31.80	2.20	2.19	0.19	8.0
		64'		31.10	2.90	2.12	0.26	10.9
		2h		30.60	3.40	2.01	0.37	15.5
		3		30.40	3.60	1.73	0.65	27.3
		5		30.30	3.70	1.18	1.20	50.4
		8		30.25	3.75	0.50	1.88	79.0
	18 30	12		30.20	3.80	0,30	2.08	87.4
		24h						



$\varepsilon_v = \frac{\Delta V_s}{V_o}$ — $\frac{3.8}{95.52} \times 100$ — 3.98 %

$H_c = H_o(1 - \frac{\varepsilon_v}{3})$ — $(1 - \frac{1}{3} 0.0398)$ — 7.894 cm

$A_c = A_o(1 - \frac{2}{3} C_v)$ — $11.94(1 - \frac{2}{3} 0.0398)$ — 11.623 cm²

$C_v = \frac{N}{t_{100}} = 3.17 \times 10^{-4} \frac{2100}{95} = 3.17 \times 10^{-4}$ — 8.0×10^{-3} cm²/sec

$m_v = C_v \times \frac{1}{\Delta\sigma}$ — $0.0398 \frac{1}{2.08}$ — 1.91×10^{-2} cm²/kg

$K = C_v \cdot m_v \cdot \gamma_w$ — $8.0 \times 1.91 \times 10^{-9}$ — 4.53×10^{-7} cm/sec

$B = \frac{2.38}{4.00} = 0.595$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N° : TP2U-1 | Test type : CU - PwP | Depth : 1.0-2.5m

Project : DONG NAI 3&4 COMBINED HYDROPOWER | Load ring N° : | Date : 05 August 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 = 0.833 Kg/Div		Vertical stress σ_1 =	4.00	kg f/cm²
Specimen prior to shearing			Back pressure Pb =	0	kg f/cm²
Height H_{eq} = 7.894 cm	Area A_{eq} = 11.623 cm²	Volume V_{eq} = 91.754 cm³	Eff. cell pressure $\sigma_{3'}$ =	4.00	kg f/cm²

Strain Div	Strain ε %	Load Div.	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	$\sigma_{3'}$	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$\sigma_1/\sigma_{3'}$
0.01		0.01												
0	0.00	0.00	0.00	0.30	11.623	0.000		0.000	3.700	3.700	0.000	4.000	3.700	1.000
50	0.63	30.00	24.99	0.36	11.697	2.136		2.136	5.776	3.640	1.068	5.068	4.708	1.587
100	1.27	45.00	37.49	0.40	11.772	3.184		3.184	6.784	3.600	1.592	5.592	5.192	1.885
150	1.90	54.50	45.40	0.44	11.848	3.832		3.832	7.392	3.560	1.916	5.916	5.476	2.076
200	2.53	61.00	50.81	0.46	11.925	4.261		4.261	7.801	3.540	2.131	6.131	5.671	2.204
250	3.17	67.00	55.81	0.48	12.003	4.650		4.650	8.170	3.520	2.325	6.325	5.845	2.321
300	3.80	72.00	59.98	0.50	12.082	4.964		4.964	8.464	3.500	2.482	6.482	5.982	2.418
350	4.43	76.50	63.72	0.52	12.162	5.240		5.240	8.720	3.480	2.620	6.620	6.100	2.506
400	5.07	80.50	67.06	0.54	12.243	5.477		5.477	8.937	3.460	2.738	6.738	6.198	2.583
450	5.70	84.00	69.97	0.55	12.326	5.677		5.677	9.127	3.450	2.838	6.838	6.288	2.645
500	6.33	86.50	72.05	0.56	12.409	5.807		5.807	9.247	3.440	2.903	6.903	6.343	2.688
550	6.97	89.00	74.14	0.57	12.493	5.934		5.934	9.364	3.430	2.967	6.967	6.397	2.730
600	7.60	91.00	75.80	0.58	12.579	6.026		6.026	9.446	3.420	3.013	7.013	6.433	2.762
650	8.23	93.00	77.47	0.59	12.666	6.116		6.116	9.526	3.410	3.058	7.058	6.468	2.794
700	8.87	94.80	78.97	0.60	12.754	6.192		6.192	9.592	3.400	3.096	7.096	6.496	2.821
750	9.50	96.00	79.97	0.61	12.843	6.226		6.226	9.616	3.390	3.113	7.113	6.503	2.837
800	10.13	97.20	80.97	0.61	12.934	6.260		6.260	9.650	3.390	3.130	7.130	6.520	2.847
850	10.77	98.20	81.80	0.61	13.026	6.280		6.280	9.670	3.390	3.140	7.140	6.530	2.853
900	11.40	99.00	82.47	0.61	13.119	6.286		6.286	9.676	3.390	3.143	7.143	6.533	2.854
950	12.03	99.80	83.13	0.61	13.213	6.292		6.292	9.682	3.390	3.146	7.146	6.536	2.856
1000	12.67	100.50	83.72	0.61	13.309	6.290		6.290	9.680	3.390	3.145	7.145	6.535	2.856
1050	13.30	100.80	83.97	0.61	13.405	6.263		6.263	9.653	3.390	3.132	7.132	6.522	2.848
1100	13.93	101.00	84.13	0.61	13.505	6.230		6.230	9.620	3.390	3.115	7.115	6.505	2.838
1150	14.57	101.00	84.13	0.61	13.605	6.184		6.184	9.574	3.390	3.092	7.092	6.482	2.824
1200	15.20	100.60	83.80	0.60	13.707	6.114		6.114	9.514	3.400	3.057	7.057	6.457	2.798
1250	15.83	100.00	83.30	0.60	13.810	6.032		6.032	9.432	3.400	3.016	7.016	6.416	2.774
1300	16.47	99.50	82.88	0.60	13.914	5.957		5.957	9.357	3.400	2.978	6.978	6.378	2.752

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

TEST N° : TP5U-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 : 05-08 August 1999

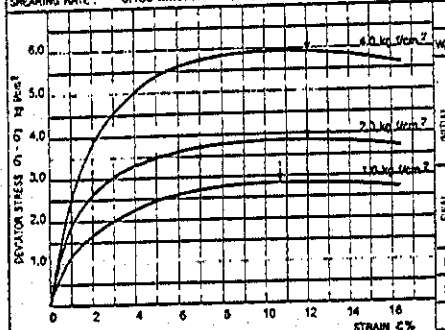
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N° : TP5U
DEPTH OF SAMPLE : 2.5 - 5.0m

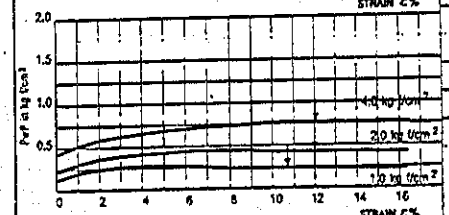
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

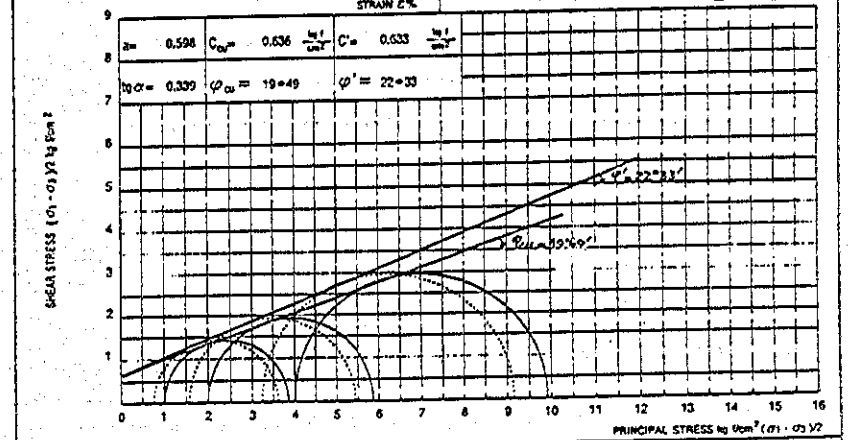
W_L 63.5 W_P 25.0 B -0.58 Ho 60 mm Do 39 mm

			UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	2.065	2.065	2.065
	MOISTURE	W	%	24.00	24.00	24.00
	DRY DENSITY	γ_d	g/cm³	1.665	1.665	1.665
FINAL	WET DENSITY	γ_w	g/cm³	2.084	2.097	2.109
	MOISTURE	W	%	22.90	22.30	21.60
	DRY DENSITY	γ_d	g/cm³	1.695	1.715	1.734
LATERAL STRESS		σ_3	kg f/cm²	1.00	2.00	4.00
STRAIN		ε	%	10.69	11.99	12.04
DEVIATOR STRESS		σ_1 σ_3	kg f/cm²	2.841	3.858	5.915
SHEAR STRESS		$(\sigma_1-\sigma_3)/2$	kg f/cm²	1.421	1.929	2.958
CENTER MORH CIRCLE		$(\sigma_1+\sigma_3)/2$	kg f/cm²	2.421	3.929	6.958
PWP		U	kg f/cm²	0.24	0.43	0.77
EFFECTIVE MORH		$(\sigma_1'+\sigma_3')/2$	kg f/cm²	2.181	3.499	6.188
MAX TOTAL STRESS		σ_1	kg f/cm²	3.841	5.858	9.915

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE







TESTED BY | CHECKED BY | APPROVED BY

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

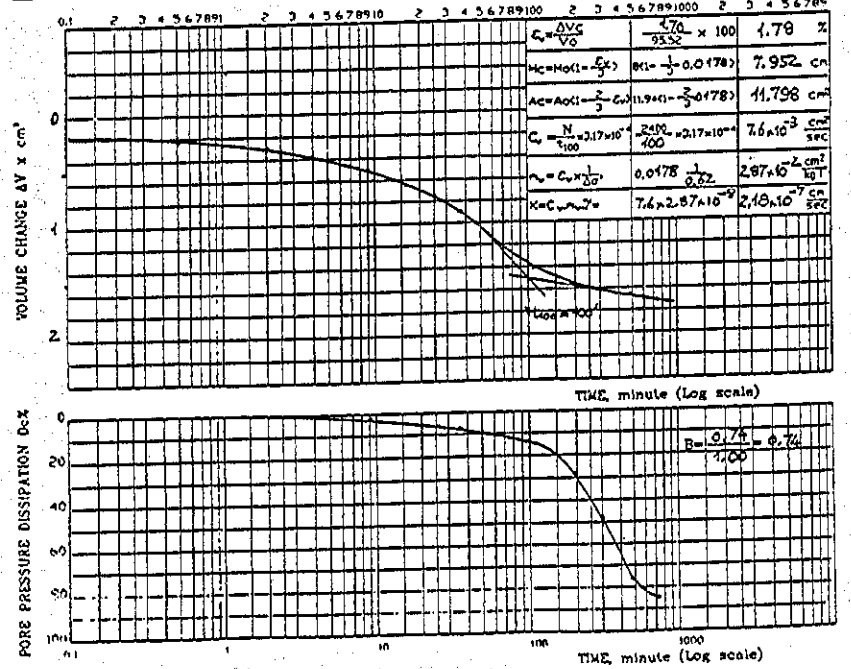
TEST N°: TP5U-2 TEST TYPE: CU - PWP DATE STARTED: 7 - 8 - 99
PROJECT: DONG NAI 3&4 HYDROPOWER LOAD RING N°:

TEST TYPE CU	mm/min WITH 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	7-8	7h00	0		28,00	0,00	0,74	0	0
VERTICAL STRESS 1,00				30"		27,75	0,25	0,74	–	–
BACK STRESS 0				1'		27,75	0,25	0,74	–	–
Pwp AFTER BUILD UP				2'		27,70	0,30	0,74	0	0
DIFFERENCE				4		27,65	0,35	0,73	0,01	1,4
EFFECTIVE PRESSURE				9		27,50	0,50	0,72	0,02	2,7
$\sqrt{t_{100}}$ =	t_{100} = 100 min.			16		27,35	0,65	0,71	0,03	4,1
t_s = 8 , t_{100} = 0,51 x 100 = 51				25		27,25	0,75	0,70	0,04	5,4
				36		27,10	0,90	0,68	0,06	8,1
				64'		26,80	1,20	0,67	0,07	9,5
				2h		26,60	1,40	0,63	0,11	14,9
				3		26,45	1,55	0,53	0,21	28,4
				5		26,40	1,60	0,38	0,36	48,6
				8		26,35	1,65	0,18	0,56	75,7
			19h00	12		26,30	1,70	0,12	0,62	83,8
				24h						

RATE OF DISPLACEMENT

$\frac{\varepsilon_{1f} \cdot H_{ps}}{100 \cdot t_{1f}} = 0,10 \times \frac{79,52}{51} = 0,156$

select v = 0,180 mm/min



$C_v = \frac{\Delta V_c}{V_0}$ $\frac{1,70}{95,52} \times 100$ 1,78 %

$H_c = H_0(1 - \frac{\varepsilon_v}{3})$ $8(1 - \frac{1}{3} 0,0178)$ 7,952 cm

$A_c = A_0(1 - \frac{2}{3} \varepsilon_v)$ $11,94(1 - \frac{2}{3} 0,0178)$ 11,798 cm²

$C_v = \frac{N}{t_{100}} = 3,17 \times 10^{-4}$ $\frac{2400}{100} = 3,17 \times 10^{-4}$ $7,6 \times 10^{-3}$ cm²/sec

$m_v = C_v \times \frac{1}{\Delta\sigma}$ $0,0178 \frac{1}{0,62}$ $2,87 \times 10^{-2}$ cm²/kg

$K = C_v \cdot m_v \cdot \gamma_w$ $7,6 \times 2,87 \times 10^{-9}$ $2,18 \times 10^{-7}$ cm/sec

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP5U-2 Test type: CU - PwP Depth: 2.5-5.0m
Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 07 August 1999

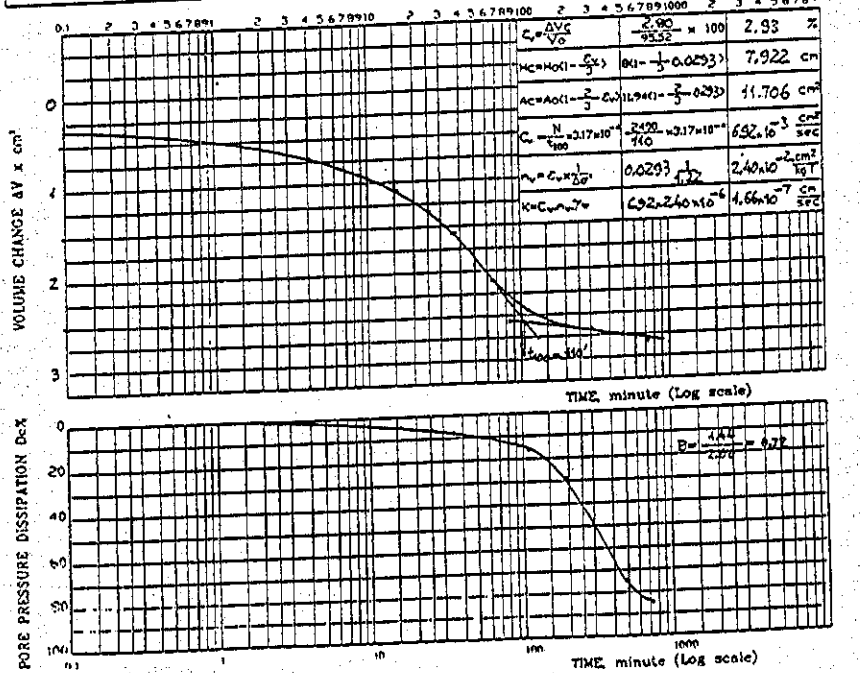
Test type: CU | Load ring constant | Without side drains | Cell pressure σ_3 = 1.00 kg f/cm²
Rate: 0.180 mm/min | CR = 0.766 Kg/Div | | Vertical stress σ_1 = 1.00 kg f/cm²
Specimen prior to shearing | | | Back pressure Pb = 0 kg f/cm²
Height H_{ps} = 7.952 cm | Area A_{ps} = 11.798 cm² | Volume V_{ps} = 93.820 cm³ | Eff. cell pressure σ_3' = 1.00 kg f/cm²

Strain Div.	Strain ε %	Load Div.	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'
0.01		0.01												
0	0.00	0.00	0.00	0.12	11.798	0.000	0.000	0.000	0.880	0.880	0.000	1.000	0.880	1.000
50	0.63	14.50	11.11	0.18	11.873	0.935		0.936	1.756	0.820	0.468	1.468	1.288	2.141
100	1.26	21.00	16.09	0.22	11.948	1.345		1.346	2.126	0.780	0.673	1.673	1.453	2.726
150	1.89	25.50	19.53	0.24	12.025	1.624		1.624	2.384	0.760	0.812	1.812	1.572	3.137
200	2.52	29.50	22.60	0.26	12.102	1.867		1.867	2.607	0.740	0.934	1.934	1.674	3.523
250	3.14	32.40	24.82	0.27	12.181	2.037		2.037	2.767	0.730	1.019	2.019	1.749	3.791
300	3.77	35.20	26.96	0.28	12.261	2.199		2.199	2.919	0.720	1.100	2.100	1.820	4.054
350	4.40	37.80	28.95	0.28	12.341	2.346		2.346	3.066	0.720	1.173	2.173	1.893	4.259
400	5.03	40.00	30.64	0.28	12.423	2.466		2.466	3.186	0.720	1.233	2.233	1.953	4.426
450	5.66	41.80	32.02	0.28	12.506	2.560		2.560	3.280	0.720	1.280	2.280	2.000	4.556
500	6.29	43.20	33.09	0.27	12.590	2.628		2.628	3.358	0.730	1.314	2.314	2.044	4.601
550	6.92	44.50	34.09	0.26	12.675	2.689		2.689	3.429	0.740	1.345	2.345	2.085	4.634
600	7.55	45.50	34.93	0.25	12.761	2.737		2.737	3.487	0.750	1.369	2.369	2.119	4.650
650	8.17	46.70	35.77	0.24	12.848	2.784		2.784	3.544	0.760	1.392	2.392	2.152	4.663
700	8.80	47.40	36.31	0.24	12.937	2.807		2.807	3.567	0.760	1.403	2.403	2.163	4.693
750	9.43	48.00	36.77	0.24	13.027	2.823		2.823	3.583	0.760	1.411	2.411	2.171	4.714
800	10.06	48.60	37.23	0.24	13.118	2.838		2.838	3.598	0.760	1.419	2.419	2.179	4.734
850	10.69	49.00	37.53	0.24	13.210	2.841		2.841	3.601	0.760	1.421	2.421	2.181	4.739
900	11.32	49.30	37.76	0.24	13.304	2.839		2.839	3.599	0.760	1.419	2.419	2.179	4.735
950	11.95	49.50	37.92	0.24	13.399	2.830		2.830	3.590	0.760	1.415	2.415	2.175	4.724
1000	12.58	49.70	38.07	0.24	13.495	2.821		2.821	3.581	0.760	1.411	2.411	2.171	4.712
1050	13.20	49.90	38.22	0.23	13.593	2.812		2.812	3.582	0.770	1.406	2.406	2.176	4.652
1100	13.83	50.10	38.36	0.23	13.692	2.803		2.803	3.573	0.770	1.401	2.401	2.171	4.640
1150	14.46	50.30	38.53	0.23	13.793	2.793		2.793	3.563	0.770	1.397	2.397	2.167	4.628
1200	15.09	50.40	38.61	0.22	13.895	2.778		2.778	3.558	0.780	1.389	2.389	2.169	4.562
1250	15.72	50.20	38.45	0.22	13.998	2.747		2.747	3.527	0.780	1.373	2.373	2.153	4.522
1300	16.35	50.00	38.30	0.22	14.104	2.716		2.716	3.496	0.780	1.358	2.358	2.138	4.482

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP5U-2 TEST TYPE: CU - PWP DATE STARTED: 6 - 8 - 99
PROJECT: DONG NAI 3&4 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 2.00		6-8	7h40	0		30.00	0.00	1.44	0	0
VERTICAL STRESS 2.00	kg f/cm²			30"		29.60	0.40	1.44	–	–
BACK STRESS 0				1'		29.50	0.50	1.44	–	–
Pwp AFTER BUILD UP				2		29.40	0.60	1.44	0	0
DIFFERENCE				4		29.30	0.70	1.42	0.02	1.4
EFFECTIVE PRESSURE				9		29.10	0.90	1.40	0.04	2.8
$\sqrt{t_{100}}$ =	t_{100} = 110 min.			16		28.90	1.10	1.37	0.07	4.9
$t_1 = 8 \cdot t_{100} = 0.51 \times 110 = 56.1$				25		28.65	1.35	1.35	0.09	6.3
				36		28.40	1.60	1.32	0.12	8.3
RATE OF DISPLACEMENT				64'		27.90	2.10	1.30	0.14	9.7
$\frac{\varepsilon_{tr} \cdot H_{ps}}{100 \cdot t_{rs}} = 0.10 \times \frac{79.22}{56.1} = 0.141$				2h		27.55	2.45	1.22	0.23	15.3
				3		27.25	2.65	1.02	0.42	29.2
select v = 0.180 mm/min				5		27.30	2.70	0.72	0.72	50.0
				8		27.25	2.75	0.36	1.08	75.0
			19h40'	12		27.20	2.80	0.22	1.22	84.7
				24h						



$C_v = \frac{\Delta V_S}{V_0}$	$\frac{2.80}{95.52} \times 100$	2.93 %
$H_C = H_0(1 - \frac{\varepsilon_v}{3})$	$80(1 - \frac{1}{3} 0.0293)$	7.922 cm
$A_C = A_0(1 - \frac{2}{3}\varepsilon_v)$	$11.946(1 - \frac{2}{3} 0.029)$	11.706 cm²
$C_c = \frac{N}{t_{100}} = 3.17 \times 10^{-4}$	$\frac{2420}{110} = 3.17 \times 10^{-4}$	692×10^{-3} cm²/sec
$m_v = C_v \times \frac{1}{2\sigma'}$	$0.0293 \frac{1}{12.2}$	2.40×10^{-2} cm²/kg
$K = C_v m_v \gamma_w$	$692 \cdot 2.40 \times 10^{-6}$	1.66×10^{-7} cm/sec

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TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP5U-2 Test type: CU - PWP Depth: 2.5-5.0m
Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 06 August 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_{ss} = 7.922 cm | Area A_{ss} = 11.706 cm² | Volume V_{ss} = 92.735 cm³ | Eff. cell pressure σ_3 = 2.00 kg f/cm²

Strain Div.	Strain ε %	Load Div.	Load Kg	U kg f/cm²	A cm²	Deviator strees 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
0.01		0.01												
0	0.00	0.00	0.00	0.22	11.706	0.000		0.000	1.780	1.780	0.000	2.000	1.780	1.000
50	0.63	24.00	18.38	0.28	11.780	1.561		1.561	3.281	1.720	0.780	2.780	2.500	1.907
100	1.26	33.50	25.66	0.32	11.856	2.164		2.164	3.844	1.680	1.082	3.062	2.762	2.288
150	1.89	40.00	30.64	0.36	11.932	2.568		2.568	4.208	1.640	1.284	3.284	2.924	2.566
200	2.52	45.00	34.47	0.38	12.009	2.870		2.870	4.490	1.620	1.435	3.435	3.055	2.772
250	3.16	49.00	37.53	0.40	12.087	3.105		3.105	4.705	1.600	1.553	3.553	3.153	2.941
300	3.79	52.00	39.83	0.41	12.167	3.274		3.274	4.864	1.590	1.637	3.637	3.227	3.059
350	4.42	54.00	41.36	0.42	12.247	3.377		3.377	4.957	1.580	1.689	3.689	3.269	3.138
400	5.05	56.40	43.20	0.43	12.328	3.504		3.504	5.074	1.570	1.752	3.752	3.322	3.232
450	5.68	58.00	44.43	0.44	12.411	3.580		3.580	5.140	1.560	1.790	3.790	3.350	3.295
500	6.31	59.60	45.65	0.45	12.495	3.654		3.654	5.204	1.550	1.827	3.827	3.377	3.357
550	6.94	61.00	46.73	0.45	12.579	3.715		3.715	5.265	1.550	1.857	3.857	3.407	3.396
600	7.57	62.20	47.65	0.45	12.665	3.762		3.762	5.312	1.550	1.881	3.881	3.431	3.427
650	8.20	63.20	48.41	0.45	12.752	3.796		3.796	5.346	1.550	1.898	3.898	3.448	3.449
700	8.84	64.00	49.02	0.45	12.841	3.818		3.818	5.368	1.550	1.909	3.909	3.459	3.463
750	9.47	64.80	49.64	0.44	12.930	3.839		3.839	5.399	1.560	1.919	3.919	3.479	3.461
800	10.10	65.50	50.17	0.43	13.021	3.853		3.853	5.423	1.570	1.927	3.927	3.497	3.454
850	10.73	66.00	50.56	0.43	13.113	3.855		3.855	5.425	1.570	1.928	3.928	3.498	3.456
900	11.36	66.50	50.94	0.43	13.206	3.857		3.857	5.427	1.570	1.929	3.929	3.499	3.457
950	11.99	67.00	51.32	0.43	13.301	3.858		3.858	5.428	1.570	1.929	3.929	3.499	3.458
1000	12.62	67.30	51.55	0.43	13.397	3.848		3.848	5.418	1.570	1.924	3.924	3.494	3.451
1050	13.25	67.50	51.71	0.43	13.495	3.832		3.832	5.402	1.570	1.916	3.916	3.486	3.440
1100	13.89	67.70	51.86	0.43	13.594	3.815		3.815	5.385	1.570	1.907	3.907	3.477	3.430
1150	14.52	67.90	52.01	0.43	13.694	3.798		3.798	5.368	1.570	1.899	3.899	3.469	3.419
1200	15.15	68.00	52.09	0.42	13.796	3.776		3.776	5.356	1.580	1.888	3.888	3.468	3.390
1250	15.78	67.80	51.93	0.42	13.899	3.737		3.737	5.317	1.580	1.868	3.868	3.448	3.365
1300	16.41	67.50	51.71	0.42	14.004	3.692		3.692	5.272	1.580	1.846	3.846	3.426	3.337

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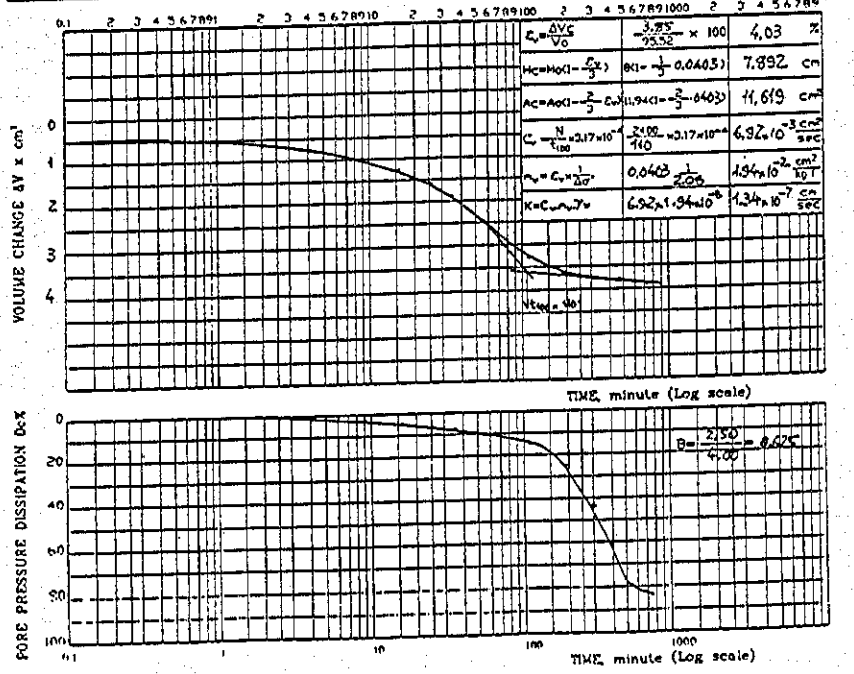
TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP5U-2 TEST TYPE: CU - PWP DATE STARTED: 5 - 8 - 99
PROJECT: DONG NAI 3&4 HYDROPOWER LOAD RING N°:

TEST TYPE CU	WITH / WITHOU 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	4,00	kg f/cm²	5-8	6h40	0		30,00	0,00	2,50	0	0
VERTICAL STRESS	4,00				30"		29,50	0,50	2,50	-	-
BACK STRESS	0				1'		29,40	0,60	2,50	-	-
Pwp AFTER BUILD UP					2		29,30	0,70	2,50	0	0
DIFFERENCE					4		29,20	0,80	2,47	0,03	1,2
EFFECTIVE PRESSURE					9		29,00	1,00	2,43	0,07	2,8
$\sqrt{t_{100}}$ =	t_{100} = 110 min.				16		28,70	1,30	2,40	0,10	4,0
$t_s = a \cdot t_{100} = 0.51 \times 110 = 56,1$					25		28,40	1,60	2,35	0,15	6,0
					36		28,10	1,90	2,30	0,20	8,0
RATE OF DISPLACEMENT					64'		27,40	2,60	2,25	0,25	10,0
$\frac{E_{1/2}.H_{ps}}{100.t_{1/2}} = 0,10\% \frac{76,92}{56,1} = 0,14($					2h		26,70	3,30	2,15	0,35	14,0
					3		26,35	3,65	1,85	0,65	26,0
					5		26,25	3,75	1,42	1,08	43,2
select v = 0,180 mm/min					8		26,20	3,80	0,60	1,90	76,0
				48h40	12		26,15	3,85	0,42	2,08	83,2
					24h						



$\varepsilon_v = \frac{\Delta V_c}{V_o} = \frac{3,85}{95,52} \times 100 = 4,03$ %

$H_c = H_o(1 - \frac{\varepsilon_v}{3}) = 8(1 - \frac{4,03}{3}) = 7,892$ cm

$A_c = A_o(1 - \frac{2}{3}\varepsilon_v) = 11,94(1 - \frac{2}{3} \cdot 4,03) = 11,619$ cm²

$C_v = \frac{N}{t_{100}} = 2,17 \times 10^{-4} \frac{2,00}{110} = 3,17 \times 10^{-4}$ $4,92 \times 10^{-3}$ cm²/sec

$m_v = C_v = \frac{1}{2\sigma'} = 0,0403 \frac{1}{2,00}$ $1,34 \times 10^{-2}$ cm²/kg

$K = C_v \cdot m_v \cdot \gamma_w = 6,92 \times 1,94 \times 10^{-6}$ $1,34 \times 10^{-7}$ cm/sec

$B = \frac{2,50}{4,00} = 0,625$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP5U-2 Test type: CU - PwP Depth: 2.5-5.0m
Project: DONG NAI 3&4 COMBINED HYDROPOWER Load ring N°: Date: 05 August 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 Kp/Div | Vertical stress σ_1 = 4.00 kg f/cm²
Specimen prior to shearing | Back pressure Pb = 0 kg f/cm²
Height H_{ps} = 7.892 cm | Area A_{ps} = 11.619 cm² | Volume V_{ps} = 91.698 cm³ | Eff. cell pressure σ_3' = 4.00 kg f/cm²

Strain Div. 0.01	Strain ε %	Load Div. 0.01	Load Load Kg	U kg f/cm²	A cm²	Deviator strees kg f/cm² Stress	Memb. corr.	σ_1-σ_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	0.42	11.619	0.000		0.000	3.580	3.580	0.000	4.000	3.580	1.000
50	0.63	29.00	22.21	0.49	11.693	1.900		1.900	5.410	3.510	0.950	4.950	4.460	1.541
100	1.27	46.00	35.24	0.54	11.768	2.994		2.994	6.454	3.460	1.497	5.497	4.957	1.865
150	1.90	58.00	44.43	0.58	11.844	3.751		3.751	7.171	3.420	1.876	5.876	5.296	2.097
200	2.53	67.00	51.32	0.61	11.921	4.305		4.305	7.695	3.390	2.153	6.153	5.543	2.270
250	3.17	73.00	55.92	0.63	11.999	4.660		4.660	8.030	3.370	2.330	6.330	5.700	2.383
300	3.80	78.00	59.75	0.65	12.078	4.947		4.947	8.297	3.350	2.473	6.473	5.823	2.477
350	4.43	83.00	63.58	0.67	12.158	5.229		5.229	8.559	3.330	2.615	6.615	5.945	2.570
400	5.07	86.50	66.26	0.69	12.239	5.414		5.414	8.724	3.310	2.707	6.707	6.017	2.636
450	5.70	89.50	68.56	0.70	12.322	5.564		5.564	8.864	3.300	2.782	6.782	6.082	2.686
500	6.34	91.80	70.32	0.71	12.405	5.669		5.669	8.959	3.290	2.834	6.834	6.124	2.723
550	6.97	93.80	71.85	0.72	12.489	5.753		5.753	9.033	3.280	2.876	6.876	6.156	2.754
600	7.60	95.50	73.15	0.73	12.575	5.817		5.817	9.087	3.270	2.909	6.909	6.179	2.779
650	8.24	97.00	74.30	0.74	12.662	5.868		5.868	9.128	3.260	2.934	6.934	6.194	2.800
700	8.87	98.20	75.22	0.75	12.750	5.900		5.900	9.150	3.250	2.950	6.950	6.200	2.815
750	9.50	99.20	75.99	0.76	12.839	5.918		5.918	9.158	3.240	2.959	6.959	6.199	2.827
800	10.14	100.00	76.60	0.77	12.930	5.924		5.924	9.154	3.230	2.962	6.962	6.192	2.834
850	10.77	100.80	77.21	0.77	13.021	5.930		5.930	9.160	3.230	2.965	6.965	6.195	2.836
900	11.40	101.50	77.75	0.77	13.115	5.928		5.928	9.158	3.230	2.964	6.964	6.194	2.835
950	12.04	102.00	78.13	0.77	13.209	5.915		5.915	9.145	3.230	2.958	6.958	6.188	2.831
1000	12.67	102.40	78.44	0.77	13.305	5.895		5.895	9.125	3.230	2.948	6.948	6.178	2.825
1050	13.30	102.70	78.67	0.77	13.402	5.870		5.870	9.100	3.230	2.935	6.935	6.165	2.817
1100	13.94	103.00	78.90	0.77	13.501	5.844		5.844	9.074	3.230	2.922	6.922	6.152	2.809
1150	14.57	103.00	78.90	0.77	13.601	5.801		5.801	9.031	3.230	2.900	6.900	6.130	2.796
1200	15.21	102.80	78.74	0.77	13.703	5.747		5.747	8.977	3.230	2.873	6.873	6.103	2.779
1250	15.84	102.50	78.52	0.77	13.806	5.687		5.687	8.917	3.230	2.844	6.844	6.074	2.761
1300	16.47	102.30	78.36	0.77	13.910	5.633		5.633	8.863	3.230	2.817	6.817	6.047	2.744

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

TEST N° : TP7U-2
TEST TYPE : CU-PWP

SOIL DESCRIPTION : Yellowish gray mottle reddish brown silty clay, a few fine gravels
TYPE OF SAMPLE : Remoulded to 0.95 MDD on wet branch
SHEARING RATE : 0.300 mm/min DATE : 10-12 August 1999

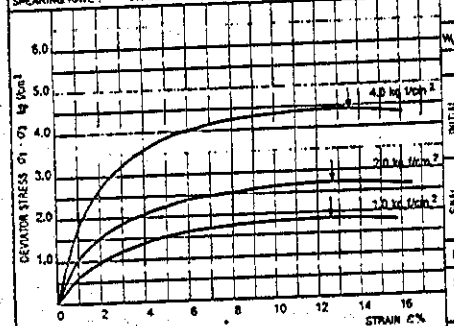
PROJECT : DONG NAI 3&4 COMBINED HYDROPOWER
BOREHOLE N°: TP7U
DEPTH OF SAMPLE : 2.5 - 5.0m

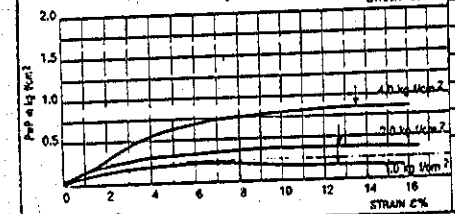
SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

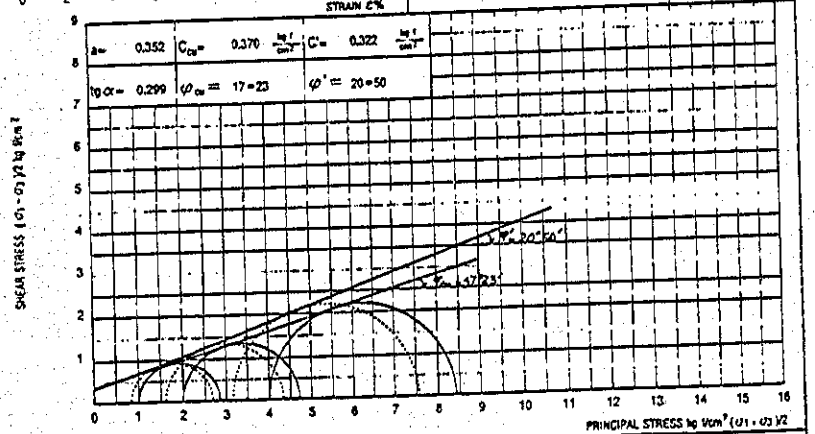
W_L 51.4 I_p 21.3 B -0.12 Ho 80 mm Do 39 mm

SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY γ_w	g/cm³	1.925	1.925	1.925
	MOISTURE W	%	27.50	27.50	27.50
	DRY DENSITY γ_d	g/cm³	1.510	1.510	1.510
FINAL	WET DENSITY γ_w	g/cm³	1.950	1.970	2.008
	MOISTURE W	%	25.80	24.30	21.80
	DRY DENSITY γ_d	g/cm³	1.550	1.584	1.649
LATERAL STRESS	σ_3	kg f/cm²	1.00	2.00	4.00
STRAIN	ε	%	12.61	12.70	13.51
DEVIATOR STRESS	$\sigma_1 - \sigma_3$	kg f/cm²	1.854	2.718	4.414
SHEAR STRESS	$(\sigma_1 - \sigma_3)/2$	kg f/cm²	0.927	1.359	2.207
CENTER MOHR CIRCLE	$(\sigma_1 + \sigma_3)/2$	kg f/cm²	1.927	3.359	6.207
PWP	U	kg f/cm²	0.17	0.38	0.85
EFFECTIVE MOHR	$(\sigma_1' + \sigma_3')/2$	kg f/cm²	1.757	2.979	5.357
MAX TOTAL STRESS	σ_1	kg f/cm²	2.854	4.718	8.414

ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE







TESTED BY CHECKED BY APPROVED BY

A - 376

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N° : TP7U-2 TEST TYPE : CU - PWP DATE STARTED : 12 - 8 - 99
PROJECT : DONG NAI 3 & 4 HYDROPOWER LOAD RING N° :

TEST TYPE CU — WITH/WITHOUT SIDE DRAINS

		kg f/cm²
CELL PRESSURE	1.00	
VERTICAL STRESS	1.00	
BACK STRESS	0	
Pwp AFTER BUILD UP		
DIFFERENCE		
EFFECTIVE PRESSURE		

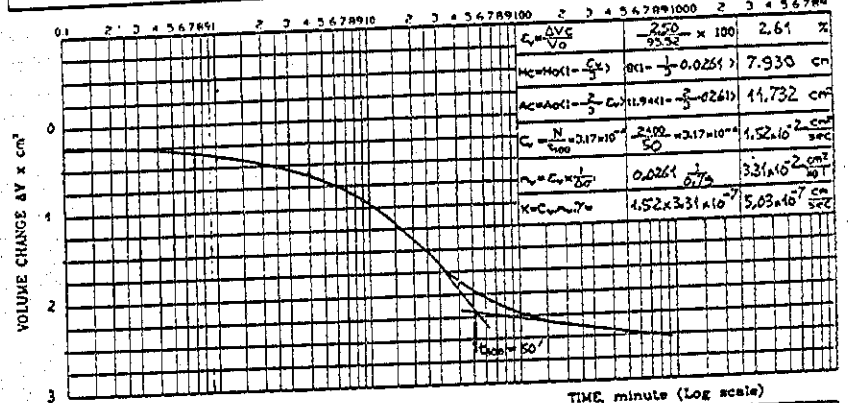
$\sqrt{t_{100}}$ = t_{100} = 50 min.
$t_s = 8 . t_{100} = 0.51 \times 50 = 25.5$

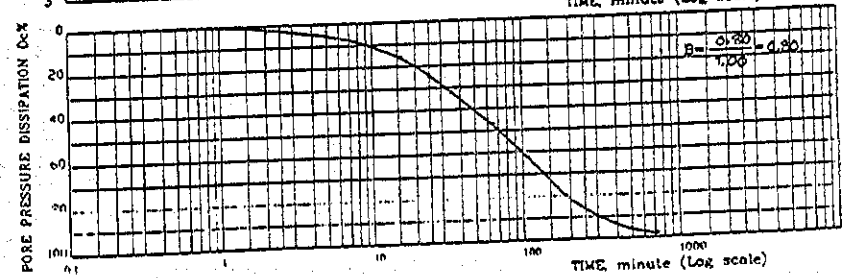
RATE OF DISPLACEMENT

$\frac{\varepsilon_{1f} . H_{po}}{100 . t_{1f}} = 0.10 \times \frac{79.30}{25.5} = 0.311$

select v = 0.300 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. %
12/8	7h00	0		30.00	0.00	0.80	0	0
		30"		29.70	0.30	0.80	-	-
		1'		29.60	0.40	0.80	0	0
		2		29.50	0.50	0.78	0.02	2.5
		4		29.35	0.65	0.76	0.04	5.0
		9		29.10	0.90	0.73	0.07	8.8
		16		28.75	1.25	0.67	0.13	16.3
		25		28.50	1.50	0.60	0.20	25.0
		36		28.20	1.80	0.54	0.26	32.5
		64'		27.90	2.10	0.42	0.38	47.5
		2h		27.75	2.25	0.30	0.50	62.5
		3		27.65	2.35	0.16	0.64	80.0
		5		27.60	2.40	0.08	0.72	90.0
		8		27.55	2.45	0.03	0.77	96.3
	19h00	12		27.50	2.50	0.01	0.79	98.8
		24h						





$C_v = \frac{\Delta V_S}{V_0}$ $\frac{2.50}{95.52} \times 100$ 2.61 %

$H_c = H_o(1 - \frac{\varepsilon_v}{3})$ $80(1 - \frac{1}{3} 0.026) \rightarrow$ 7.930 cm

$A_c = A_o(1 - \frac{2}{3} \varepsilon_v)$ $11.94(1 - \frac{2}{3} 0.26) \rightarrow$ 11.732 cm²

$C_v = \frac{N}{t_{100}} = 3.17 \times 10^{-4} \frac{2.00}{50} = 3.17 \times 10^{-4}$ 1.52×10^{-2} cm²/sec

$m_v = C_v \times \frac{1}{\Delta\sigma'}$ $0.0261 \frac{1}{0.79}$ 3.31×10^{-2} cm²/kg f

$K = C_v . m_v . \gamma_w$ $1.52 \times 3.31 \times 10^{-7}$ 5.03×10^{-7} cm/sec

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TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP7U-2 — Test type: CU - PwP — Depth: 2.5-5.0m

Project: DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N°: — Date: 12 August 1999

Test type: CU	Load ring constant	Without side drains	Cell pressure σ_3 = 1.00	kg f/cm²
Rate: 0.300 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} = 7.930 cm	Area A_{ps} = 11.732 cm²	Volume V_{ps} = 93.032 cm³	Eff. cell pressure σ_3' = 1.00	kg f/cm²

Strain		Load		U	A	Deviator strees kg f/cm²			Stresses kg f/cm²					
Div.		Div.	Load			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
0.01	ε %	0.01	Kg	kg f/cm²	cm²									
0	0.00	0.00	0.00	0.01	11.732	0.000		0.000	0.990	0.990	0.000	1.000	0.990	1.000
50	0.63	7.00	5.36	0.07	11.806	0.454		0.454	1.384	0.930	0.227	1.227	1.157	1.488
100	1.26	11.40	8.73	0.11	11.882	0.735		0.735	1.625	0.890	0.367	1.367	1.257	1.826
150	1.89	14.60	11.18	0.14	11.958	0.935		0.935	1.795	0.860	0.468	1.468	1.328	2.087
200	2.52	17.30	13.25	0.16	12.036	1.101		1.101	1.941	0.840	0.551	1.551	1.391	2.311
250	3.15	19.50	14.94	0.18	12.114	1.233		1.233	2.053	0.820	0.617	1.617	1.437	2.504
300	3.78	21.40	16.39	0.19	12.193	1.344		1.344	2.154	0.810	0.672	1.672	1.482	2.660
350	4.41	23.30	17.85	0.20	12.274	1.454		1.454	2.254	0.800	0.727	1.727	1.527	2.818
400	5.04	24.80	19.00	0.21	12.355	1.538		1.538	2.328	0.790	0.769	1.769	1.559	2.946
450	5.67	26.00	19.92	0.22	12.438	1.601		1.601	2.381	0.780	0.801	1.801	1.581	3.053
500	6.31	27.00	20.68	0.22	12.522	1.652		1.652	2.432	0.780	0.826	1.826	1.606	3.118
550	6.94	27.80	21.29	0.22	12.606	1.689		1.689	2.469	0.780	0.845	1.845	1.625	3.166
600	7.57	28.60	21.91	0.22	12.692	1.726		1.726	2.506	0.780	0.863	1.863	1.643	3.213
650	8.20	29.40	22.52	0.21	12.780	1.762		1.762	2.552	0.790	0.881	1.881	1.671	3.231
700	8.83	30.00	22.98	0.20	12.868	1.786		1.786	2.586	0.800	0.893	1.893	1.693	3.232
750	9.46	30.50	23.36	0.19	12.957	1.803		1.803	2.613	0.810	0.902	1.902	1.712	3.226
800	10.09	31.00	23.75	0.18	13.048	1.820		1.820	2.640	0.820	0.910	1.910	1.730	3.219
850	10.72	31.40	24.05	0.17	13.141	1.830		1.830	2.660	0.830	0.915	1.915	1.745	3.205
900	11.35	31.80	24.36	0.17	13.234	1.841		1.841	2.671	0.830	0.920	1.920	1.750	3.218
950	11.98	32.20	24.67	0.17	13.329	1.851		1.851	2.681	0.830	0.925	1.925	1.755	3.230
1000	12.61	32.50	24.90	0.17	13.425	1.854		1.854	2.684	0.830	0.927	1.927	1.757	3.234
1050	13.24	32.70	25.05	0.17	13.522	1.852		1.852	2.682	0.830	0.926	1.926	1.756	3.232
1100	13.87	32.80	25.12	0.17	13.621	1.844		1.844	2.674	0.830	0.922	1.922	1.752	3.222
1150	14.50	32.80	25.12	0.16	13.722	1.831		1.831	2.671	0.840	0.915	1.915	1.755	3.180
1200	15.13	32.70	25.05	0.16	13.824	1.812		1.812	2.652	0.840	0.906	1.906	1.746	3.157
1250	15.76	32.50	24.90	0.16	13.927	1.787		1.787	2.627	0.840	0.894	1.894	1.734	3.128

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N°: TP7U-2 — TEST TYPE: CU - PWP — DATE STARTED: 11 - 8 - 99

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

TEST TYPE: CU — WITH/WITHOUT SIDE DRAINS

		kg f/cm²
CELL PRESSURE	2.00	
VERTICAL STRESS	2.00	
BACK STRESS	0	
Pwp AFTER BUILD UP		
DIFFERENCE		
EFFECTIVE PRESSURE		

$\sqrt{t_{100}}$ = — t_{100} = 55.0 min.

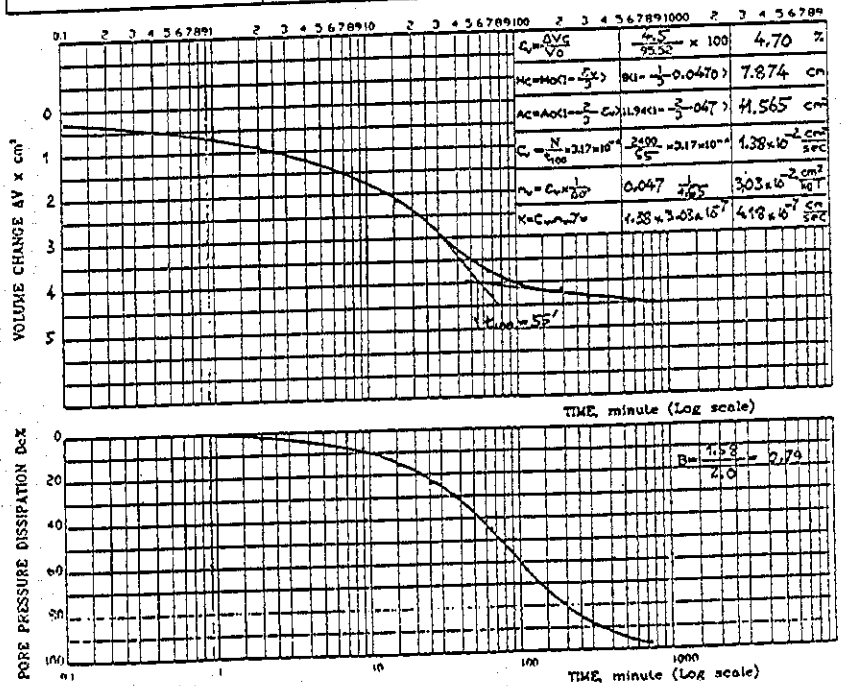
$t_f = a \cdot t_{100} = 0.51 \times 55 = 28.0$

RATE OF DISPLACEMENT

$\frac{E_{11} \cdot H_{ps}}{100 \cdot t_{f3}} = 0.10 \times \frac{78.74}{28.0} = 0.281$

select v = 0.300 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. %
11-8	6'45	0		32.00	0.00	1.58	0	0
		30"		31.50	0.50	1.58	-	—
		1'		31.35	0.65	1.58	0	0
		2		31.15	0.85	1.55	0.03	1.9
		4		30.80	1.20	1.52	0.06	3.8
		9		30.30	1.70	1.45	0.13	8.2
		16		29.85	2.15	1.33	0.25	15.8
		25		29.40	2.60	1.21	0.37	23.4
		36		28.85	3.15	1.11	0.47	29.7
		64'		28.25	3.75	0.96	0.72	45.6
		2h		27.90	4.10	0.58	1.00	63.3
		3		27.75	4.25	0.32	1.26	79.7
		5		27.65	4.35	0.17	1.41	89.2
		8		27.60	4.40	0.09	1.49	94.3
	1845	12		27.50	4.50	0.03	1.55	98.1
		24h						



$C_v = \frac{\Delta V_{cc}}{V_o}$ = $\frac{4.5}{95.32} \times 100$ = 4.70 %

$H_c = H_o(1 - \frac{C_v}{3})$ = $8(1 - \frac{1}{3} \cdot 0.0470)$ = 7.874 cm

$A_c = A_o(1 - \frac{2}{3} C_v)$ = $11.94(1 - \frac{2}{3} \cdot 047)$ = 11.565 cm²

$C_c = \frac{N}{t_{100}} = 3.17 \times 10^{-4}$ $\frac{2400}{55} = 3.17 \times 10^{-4}$ $1.38 \times 10^{-2} \frac{cm^2}{sec}$

$m_v = C_c \times \frac{1}{2.07}$ 0.047 $\frac{1}{2.85}$ $3.03 \times 10^{-2} \frac{cm^2}{kg}$

$K = C_v \cdot m_v \cdot \gamma_w$ $1.38 \times 3.03 \times 10^{-7}$ $4.18 \times 10^{-7} \frac{cm}{sec}$

$B = \frac{1.58}{2.0} = 0.79$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N° : TP7U-2 — Test type : CU - PwP — Depth : 2.5-5.0m

Project : DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N° : — Date : 11 August 1999

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

Rate : 0.300 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_{ec} = 7.874 cm — Area A_{ec} = 11.565 cm² — Volume V_{ec} = 91.063 cm³ — Eff. cell pressure $\sigma_{3'}$ = 2.00 kg f/cm²

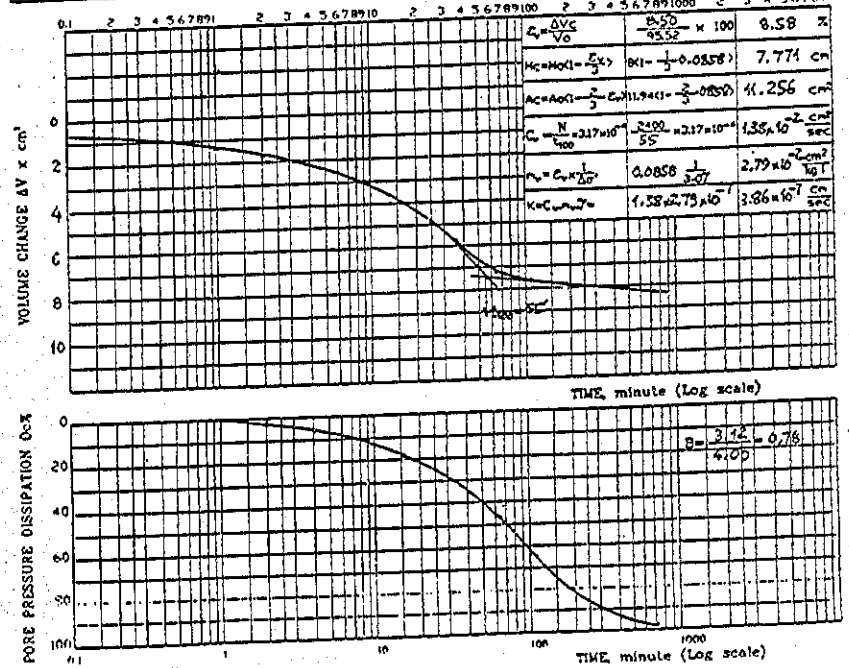
Strain		Load		U	A	Deviator stress kg/cm²			Stresses kg/cm²					
Div.		Div.	Load			Stress	Memb. corr.	$\sigma_1-\sigma_3$	$\sigma_{1'}$	$\sigma_{3'}$	$(\sigma_1-\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$(\sigma_1+\sigma_3)/2$	$\sigma_{1'}/\sigma_{3'}$
0.01	ε %	0.01	Kg	kg f/cm²	cm²									
0	0.00	0.00	0.00	0.03	11.565	0.000		0.000	1.970	1.970	0.000	2.000	1.970	1.000
50	0.64	12.50	9.58	0.12	11.639	0.823		0.823	2.703	1.880	0.411	2.411	2.291	1.438
100	1.27	18.50	14.17	0.17	11.714	1.210		1.210	3.040	1.830	0.605	2.605	2.435	1.661
150	1.91	23.00	17.62	0.21	11.790	1.494		1.494	3.284	1.790	0.747	2.747	2.537	1.835
200	2.54	26.80	20.53	0.24	11.866	1.730		1.730	3.490	1.760	0.865	2.865	2.625	1.983
250	3.18	29.80	22.83	0.27	11.944	1.911		1.911	3.641	1.730	0.956	2.956	2.686	2.105
300	3.81	32.00	24.51	0.30	12.023	2.039		2.039	3.739	1.700	1.019	3.019	2.719	2.199
350	4.45	34.20	26.20	0.31	12.103	2.165		2.165	3.855	1.690	1.082	3.082	2.772	2.281
400	5.08	36.00	27.58	0.32	12.184	2.263		2.263	3.943	1.680	1.132	3.132	2.812	2.347
450	5.72	38.00	29.11	0.33	12.266	2.373		2.373	4.043	1.670	1.187	3.187	2.857	2.421
500	6.35	39.20	30.03	0.34	12.349	2.432		2.432	4.092	1.660	1.216	3.216	2.876	2.465
550	6.99	40.20	30.79	0.35	12.433	2.477		2.477	4.127	1.650	1.238	3.238	2.888	2.501
600	7.62	41.20	31.56	0.36	12.519	2.521		2.521	4.161	1.640	1.260	3.260	2.900	2.537
650	8.26	42.20	32.33	0.37	12.606	2.564		2.564	4.194	1.630	1.282	3.282	2.912	2.573
700	8.89	43.20	33.09	0.38	12.693	2.607		2.607	4.227	1.620	1.303	3.303	2.923	2.609
750	9.53	44.00	33.70	0.38	12.783	2.637		2.637	4.257	1.620	1.318	3.318	2.938	2.628
800	10.16	44.80	34.32	0.38	12.873	2.666		2.666	4.286	1.620	1.333	3.333	2.953	2.646
850	10.80	45.40	34.78	0.38	12.965	2.682		2.682	4.302	1.620	1.341	3.341	2.961	2.656
900	11.43	46.00	35.24	0.38	13.057	2.699		2.699	4.319	1.620	1.349	3.349	2.969	2.666
950	12.07	46.60	35.70	0.38	13.152	2.714		2.714	4.334	1.620	1.357	3.357	2.977	2.675
1000	12.70	47.00	36.00	0.38	13.247	2.718		2.718	4.338	1.620	1.359	3.359	2.979	2.678
1050	13.34	47.30	36.23	0.38	13.344	2.715		2.715	4.335	1.620	1.358	3.358	2.978	2.676
1100	13.97	47.50	36.39	0.38	13.443	2.707		2.707	4.327	1.620	1.353	3.353	2.973	2.671
1150	14.61	47.60	36.46	0.37	13.543	2.692		2.692	4.322	1.630	1.346	3.346	2.976	2.652
1200	15.24	47.60	36.46	0.37	13.644	2.672		2.672	4.302	1.630	1.336	3.336	2.966	2.639
1250	15.88	47.50	36.39	0.36	13.747	2.647		2.647	4.287	1.640	1.323	3.323	2.963	2.614
1300	16.51	47.50	36.39	0.36	13.852	2.627		2.627	4.267	1.640	1.313	3.313	2.953	2.602

TRIAXIAL COMPRESSION TEST (Consolidation stage data sheet)

TEST N° : TP7U-2 — TEST TYPE : CU - PWP — DATE STARTED : 9-8-99

PROJECT : DONG NAI 3 & 4 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		9/8	7h00	0		31.00	0.00	3.12	0	0
VERTICAL STRESS 4.00				30"		30.00	1.00	3.12	-	-
BACK STRESS 0	kg f/cm²			1'		29.60	1.40	3.12	0	0
Pwp AFTER BUILD UP				2		29.35	1.65	3.06	0.06	1.9
DIFFERENCE				4		28.90	2.10	2.93	0.19	6.1
EFFECTIVE PRESSURE				9		28.00	3.00	2.78	0.34	10.9
$\sqrt{t_{100}}$ = t_{100} = 55 min.				16		27.00	4.00	2.56	0.56	17.9
$t_f = a, t_{100} = 0.51 \times 55 = 28$				25		26.10	4.90	2.34	0.78	25.0
				36		25.20	5.80	2.12	1.00	32.0
RATE OF DISPLACEMENT				64'		23.80	7.20	1.62	1.50	48.0
$\frac{E_{1f} \cdot H_{pc}}{100 \cdot t_{f,s}} = 0.10 \times \frac{77.74}{28} = 0.278$				2h		23.30	7.70	1.08	2.04	65.4
				3		23.10	7.90	0.62	2.50	80.0
select v = 0,300 mm/min				5		23.00	8.00	0.31	2.81	90.0
				8		22.90	8.10	0.12	3.00	96.1
			19.00	12		22.80	8.20	0.05	3.07	98.4
				24h						



$\varepsilon_v = \frac{\Delta V_c}{V_o}$ — $\frac{8.50}{95.52} \times 100$ — 8.58 %

$H_c = H_o(1 - \frac{\varepsilon_v}{3})$ — $8(1 - \frac{1}{3} \times 0.0858)$ — 7.771 cm

$A_c = A_o(1 - \frac{2}{3}\varepsilon_v)$ — $11.94(1 - \frac{2}{3} \times 0.0858)$ — 11.256 cm²

$C_v = \frac{N}{t_{100}} \times 3.17 \times 10^{-4}$ — $\frac{2400}{55} \times 3.17 \times 10^{-4}$ — 1.38×10^{-2} cm²/sec

$m_v = C_v \times \frac{1}{\Delta\sigma'}$ — $0.0858 \frac{1}{3.07}$ — 2.79×10^{-2} cm²/kg

$K = C_v \cdot m_v \cdot \gamma_w$ — $1.38 \times 2.73 \times 10^{-7}$ — 3.86×10^{-7} cm/sec

$B = \frac{3.12}{4.00} = 0.78$

TRIAXIAL COMPRESSION TEST (CU method shearing stage data sheet)

Test N°: TP7U-2 — Test type: CU - PwP — Depth: 2.5-5.0m

Project: DONG NAI 3&4 COMBINED HYDROPOWER — Load ring N°: — Date: 10 August 1999

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

Rate: 0.300 mm/min — CR = 0.766 Kg/Div — Vertical stress σ_1 = 4.00 kg f/cm²

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

Height H_{pg} = 7.771 cm — Area A_{pg} = 11.256 cm² — Volume V_{pg} = 87.475 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 0.01	ε %	Div. 0.01	Load Kg	kg f/cm²	cm²	Stress	Memb. corr.	$\sigma_1-\sigma_3$	$\sigma_{1'}$	$\sigma_{3'}$	$(\sigma_1-\sigma_3)/2$	$(\sigma_{1'}+\sigma_{3'})/2$	$(\sigma_1+\sigma_3)/2$	σ_1/σ_3
0	0.00	0.00	0.00	0.00	11.256	0.000		0.000	3.950	3.950	0.000	4.000	3.950	1.000
50	0.64	20.00	15.32	0.11	11.329	1.352		1.352	5.242	3.890	0.676	4.676	4.566	1.348
100	1.29	32.00	24.51	0.18	11.403	2.150		2.150	5.970	3.820	1.075	5.075	4.895	1.563
150	1.93	40.00	30.64	0.27	11.478	2.670		2.670	6.400	3.730	1.335	5.335	5.065	1.716
200	2.57	46.00	35.24	0.38	11.553	3.050		3.050	6.670	3.620	1.525	5.525	5.145	1.843
250	3.22	50.50	38.68	0.47	11.630	3.326		3.326	6.856	3.530	1.663	5.663	5.193	1.942
300	3.86	54.50	41.75	0.54	11.708	3.566		3.566	7.026	3.460	1.783	5.783	5.243	2.031
350	4.50	57.50	44.05	0.60	11.787	3.737		3.737	7.137	3.400	1.868	5.868	5.268	2.099
400	5.15	60.40	46.27	0.64	11.867	3.899		3.899	7.259	3.360	1.949	5.949	5.309	2.160
450	5.79	62.30	47.72	0.68	11.948	3.994		3.994	7.314	3.320	1.997	5.997	5.317	2.203
500	6.43	64.00	49.02	0.71	12.030	4.075		4.075	7.365	3.290	2.038	6.038	5.328	2.239
550	7.08	65.80	50.40	0.74	12.113	4.161		4.161	7.421	3.260	2.080	6.080	5.340	2.276
600	7.72	67.40	51.63	0.76	12.198	4.233		4.233	7.473	3.240	2.116	6.116	5.356	2.306
650	8.36	68.50	52.47	0.77	12.283	4.272		4.272	7.502	3.230	2.136	6.136	5.366	2.323
700	9.01	69.70	53.39	0.79	12.370	4.316		4.316	7.526	3.210	2.158	6.158	5.368	2.345
750	9.65	70.60	54.08	0.80	12.458	4.341		4.341	7.541	3.200	2.170	6.170	5.370	2.357
800	10.29	71.60	54.85	0.81	12.548	4.371		4.371	7.561	3.190	2.185	6.185	5.375	2.370
850	10.94	72.50	55.54	0.82	12.638	4.394		4.394	7.574	3.180	2.197	6.197	5.377	2.382
900	11.58	73.20	56.07	0.83	12.730	4.405		4.405	7.575	3.170	2.202	6.202	5.372	2.389
950	12.22	73.90	56.61	0.84	12.824	4.414		4.414	7.574	3.160	2.207	6.207	5.367	2.397
1000	12.87	74.50	57.07	0.85	12.918	4.418		4.418	7.568	3.150	2.209	6.209	5.359	2.402
1050	13.51	75.00	57.45	0.85	13.014	4.414		4.414	7.564	3.150	2.207	6.207	5.357	2.401
1100	14.16	75.30	57.68	0.85	13.112	4.399		4.399	7.549	3.150	2.199	6.199	5.349	2.397
1150	14.80	75.50	57.83	0.85	13.211	4.378		4.378	7.528	3.150	2.189	6.189	5.339	2.390
1200	15.44	75.60	57.91	0.85	13.312	4.350		4.350	7.500	3.150	2.175	6.175	5.325	2.381
1250	16.09	75.50	57.83	0.85	13.414	4.312		4.312	7.462	3.150	2.156	6.156	5.306	2.369

TRIAXIAL COMPRESSION TEST

(SUMMARY AND REPORT DATA SHEET)

THÍ NGHIỆM NÉN BA TRỤC

(BÁO CÁO TỔNG HỢP)

TEST N° TP10U-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: 10-12 August 1999

PROJECT: DONG NAI 3&4 COMBINED HYDROPOWER

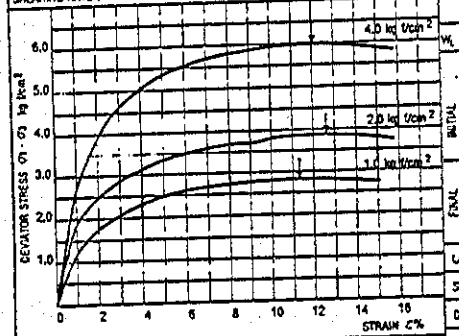
BOREHOLE N°: TP10U

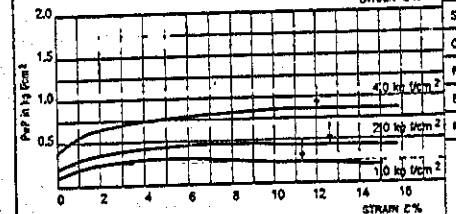
DEPTH OF SAMPLE: 2.5 - 5.0m

SPECIMEN PROPERTIES & SHEARING STAGE (AT FAILURE)

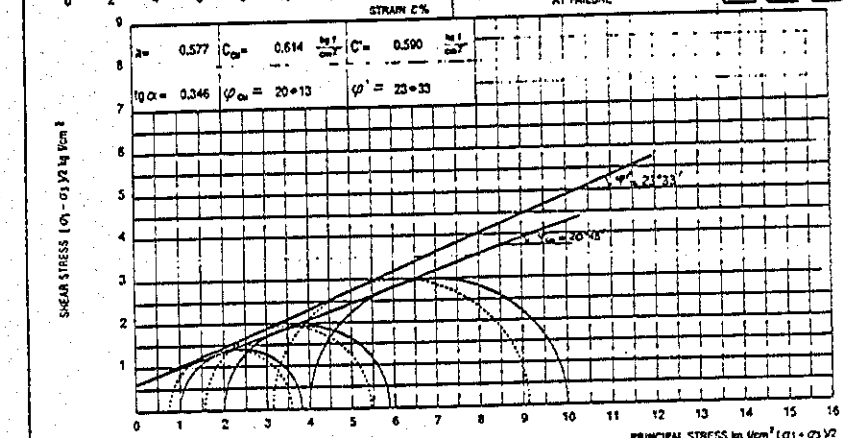
W_L 49.2 I_p 17.9 B -0.38 — Ho 80 mm Do 39 mm

	SPECIMENS		UNIT	A	B	C
INITIAL	WET DENSITY	γ_w	g/cm³	2.022	2.022	2.022
	MOISTURE	W	%	24.50	24.50	24.50
	DRY DENSITY	γ_d	g/cm³	1.624	1.624	1.624
FINAL	WET DENSITY	γ_w	g/cm³	2.039	2.050	2.063
	MOISTURE	W	%	23.60	22.90	22.10
	DRY DENSITY	γ_d	g/cm³	1.650	1.669	1.689
LATERAL STRESS		σ_3	kg f/cm²	1.00	2.00	4.00
STRAIN		ε	%	11.31	12.62	12.03
DEVIATOR STRESS		σ_1 σ_3	kg f/cm²	2.815	3.881	5.985
SHEAR STRESS		$(\sigma_1-\sigma_3)/2$		1.407	1.940	2.993
CENTER MOHR CIRCLE		$(\sigma_1+\sigma_3)/2$		2.407	3.940	6.993
PWP		u		0.24	0.44	0.85
EFFECTIVE MOHR		$(\sigma_1+\sigma_3)/2$		2.167	3.500	6.133
MAX TOTAL STRESS		σ_1		3.815	5.881	9.965





ILLUSTRATIVE DESCRIPTION OF SPECIMEN AT FAILURE



TESTED BY — CHECKED BY — APPROVED BY